Power Systems Business Operation

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MITSUBISHI HEAVY INDUSTRIES, LTD.

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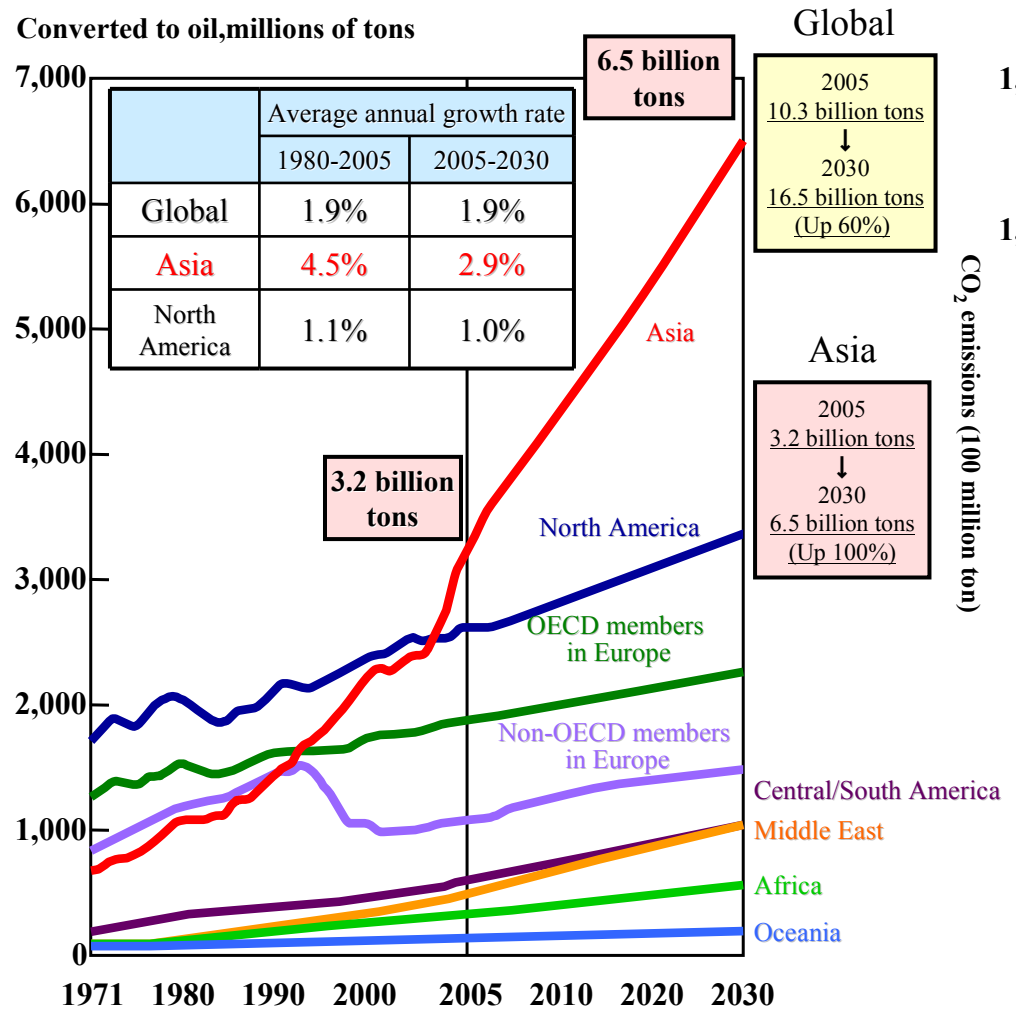
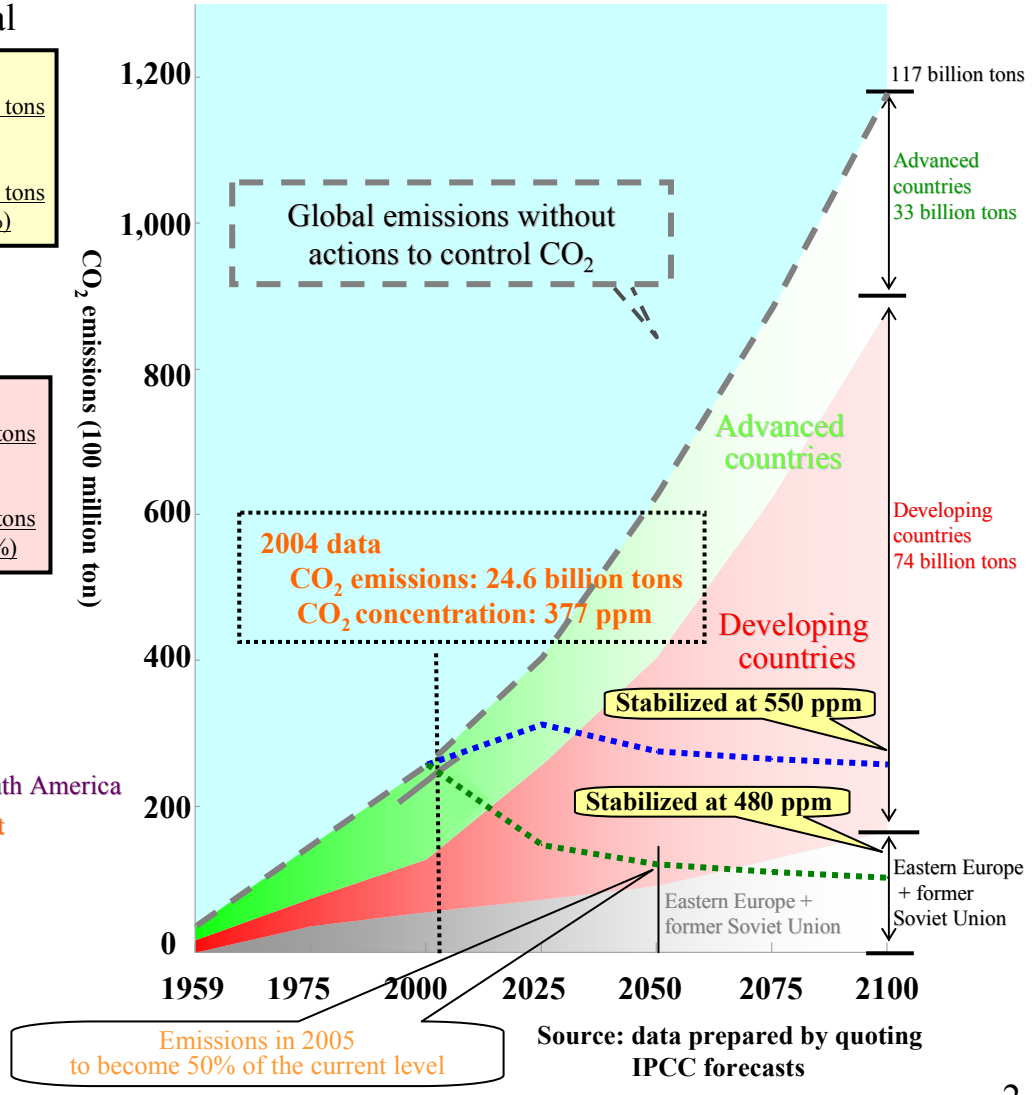
Global Primary Energy Consumption Forecasts by Region
Growing Energy Demand in Asia, Centering on China and India

Source: IEEJ 2007 data



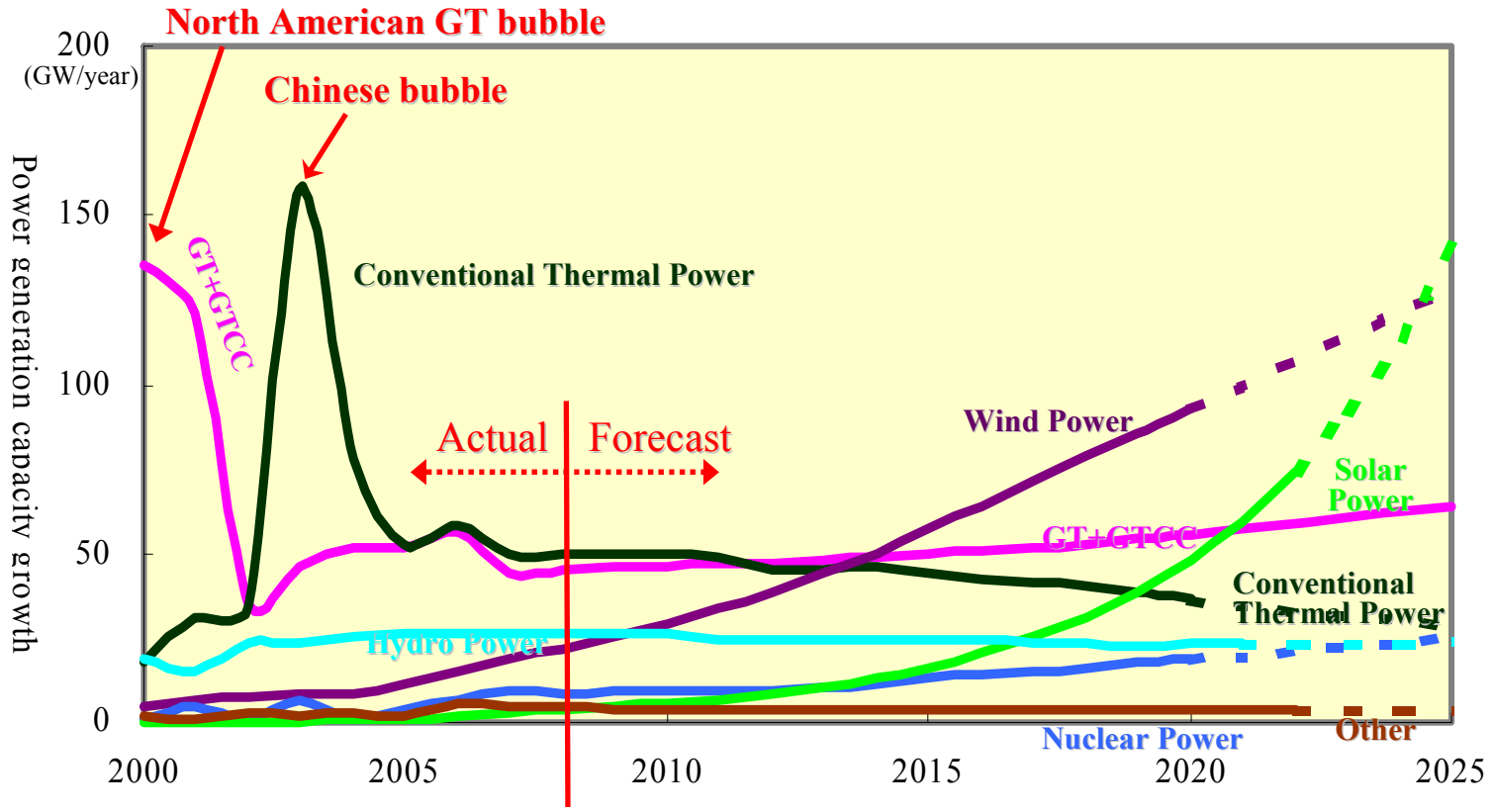
Global CO_2 emission forecasts



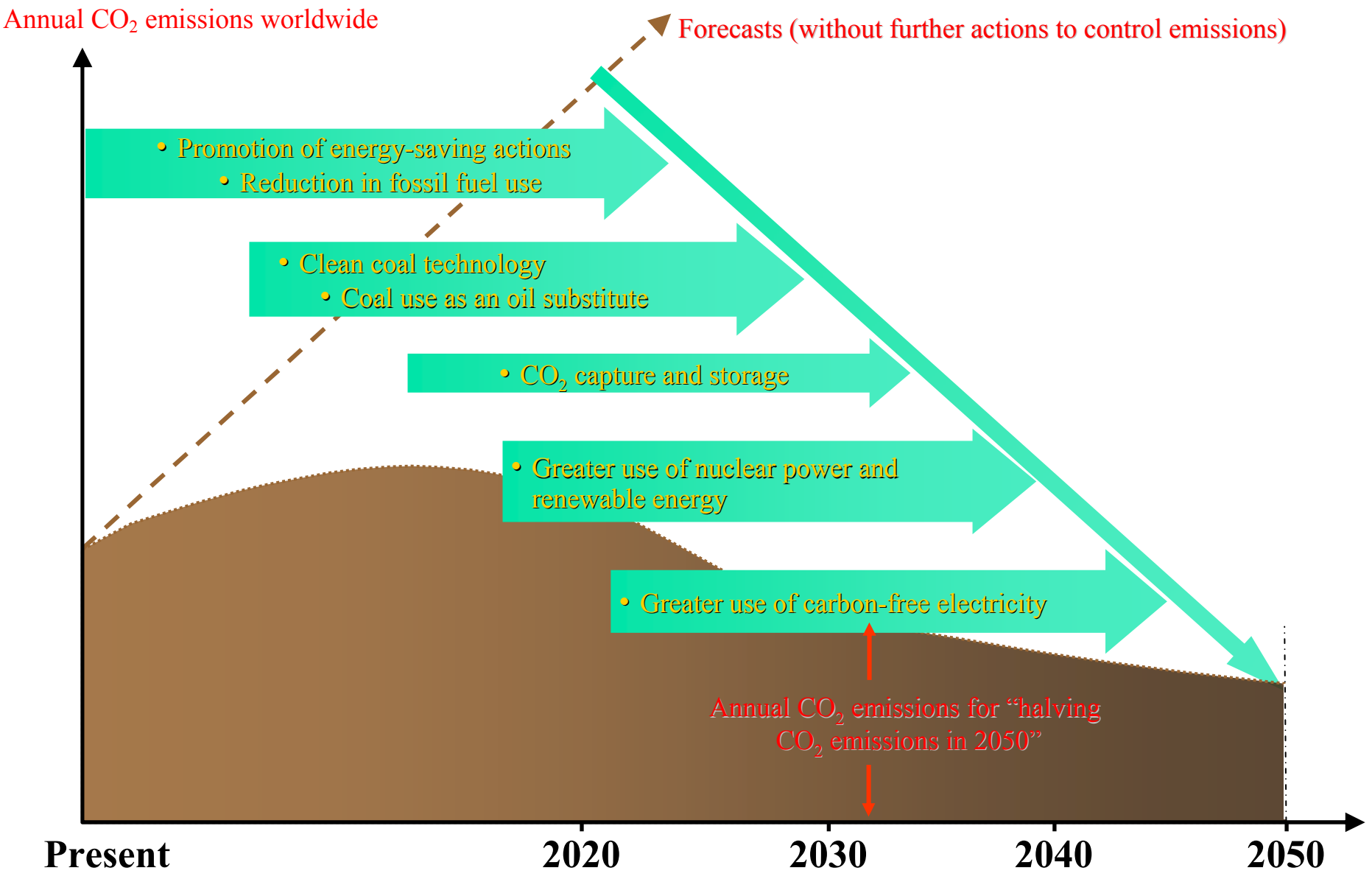
Source: data prepared by quoting IPCC forecasts

Demand Forecast for Major Power Generation Facilities

- **Demand for GT and GTCC predicted to grow steadily at a rate of around 50GW/year.**
- **Demand for conventional thermal power generation facilities will decline because of the CO_2 emissions issue. Nuclear power generation facilities will replace them over the long term.**
- **In renewable energy, demands for wind turbines and photovoltaic power generation facilities are expected to expand rapidly.**



Activities for Efficient Energy Use and CO_2 Reduction



MHI Portfolio for Power Generation

	Coal-fired thermal power	Nuclear Energy	GTCC	Wind turbines	Photovoltaic
	Focused on existing technologies ◄				► Focused on new technologies
					
Business assessment	Stability in fuel supply	Low CO_2 emissions	Relatively small environmental load Relatively short construction period	Low CO_2 emissions Short construction period	Low CO_2 emissions Short construction period
	High CO_2 emissions CCS Feasibility	Public acceptance Long construction period and rise in material cost	Secure of inexpensive fuels	Grid restriction Need for subsidies	Site restrictions Need for subsidies Emergence of new technologies
MHI activity	Technology transfer to China and India Verification of IGCC technology	Orders in the United States	Production increase, anticipating demand Cooperation with Chinese and South Korean manufacturers Development of 1700ºC class gas turbine	Production increase for the U.S.market Development of offshore wind turbines	Development of proprietary thin-film technologies Mass production achievement and production increase

External factors

Government policies for global warming, surge in fuel price, soaring construction material price, electricity demand (business conditions) and technical innovations

The degree of contribution by each power generation method in fulfilling electricity demand remain unclear.

MHI's strengths

- Business operations based on proprietary technologies and management dedicated to operation of products to satisfy electricity demand
- Company-wide responses to changes in external factors (resource optimization)

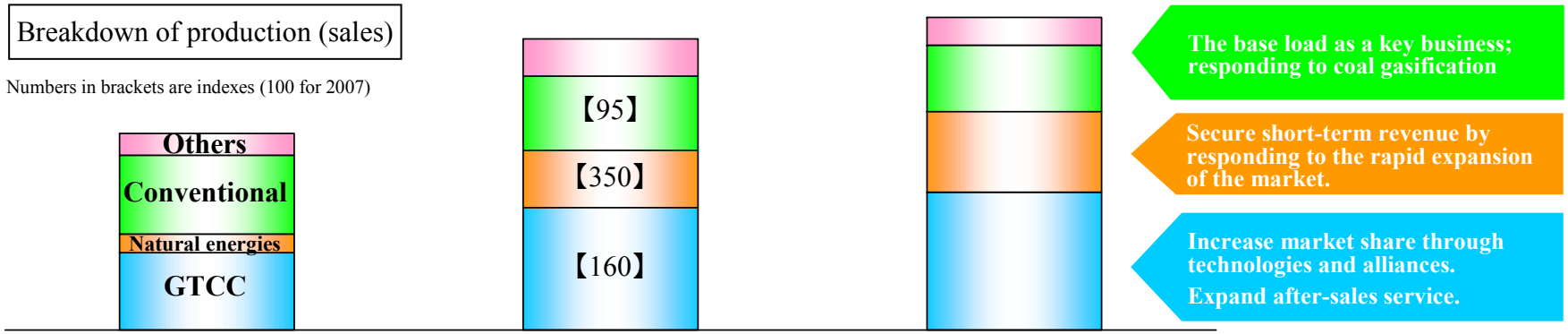
Action List

Greatly expanding business scale leveraging growing global efforts against global warming

Expanding the scale and revenue of the business by accelerating the change from conventional thermal power to natural energy (Accelerating the development of major products, bolstering production capacity)

Breakdown of production (sales)

Numbers in brackets are indexes (100 for 2007)



	2007	2010	2012		
Gas turbines	Establishing a 30-unit/year production system	Building a 36-50 unit/year production system			GTCC
	Developing an ultrahigh-temperature (1700°C) gas turbine				
	Bolstering the after-sales services system				
Wind turbines	Establishing a 1,600MW production capacity	Establishing a 2,600MW production capacity			Natural energies
	Developing offshore wind turbines				
Solar cells	Establishing a 130MW production capacity	Considering a structure for additional production			
IGCC	Domestic demonstration equipment				Conventional
		Developing facilities to produce commercial equipment			
		Realizing overseas commercial plants			

IGCC : Integrated Coal Gasification Combined Cycle

Global GTCC Operations: Activities Since 2007

Viridian M701F begins operation in Ireland in 2007

Order received from NUON in the Netherlands for 3 M701F GTCC systems

Order received from IUD in Hungary for M701D BFG-burning GTCC

Order received from WDEPC in Egypt for four M701F units

Order received from TGK-4 in Russia for one M701F GT unit

M701F begins operation at Qianwan Power Plant in China in 2007

M701F begins operation at Anshan Iron & Steel in China in 2007

M251 begins operation at Lianyuan & Steel in China in 2007

M701D begins operation at Maanzan Iron & Steel in China in 2007

Order received from Taiyuan Iron & Steel in China for two M251 units

M701G2 begins operation in line 1 of Kawasaki Thermal Power Plant of Tokyo Electric Power in 2007

M501G begins operation at PGE in the United States in 2007

Order received from Georgia Power in the United States for six M501G GT units

Order received from Korea Western Power/KDHC for two M501G units and two M501F units

M501F begins operation at KDHC in South Korea in 2007

M501D begins operation at POSCO in South Korea in 2007

M501F begins operation at ARAMCO in Saudi Arabia in 2007

M701F begins operation at RPC Ratchaburi in Thailand in 2008

Order received from PLN in Indonesia for three M701F units

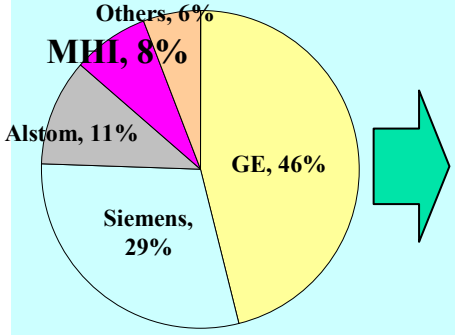
M501G begins operation at Datang plant of Taiwan Power in 2007

Order received from Alinta in Australia for one M701DA GT unit

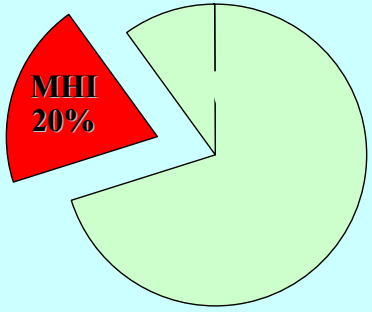
M701F begins operation at Genesis in New Zealand in 2007

M701F begins operation at San Isidro II in Chile in 2008

Average share for the past three years

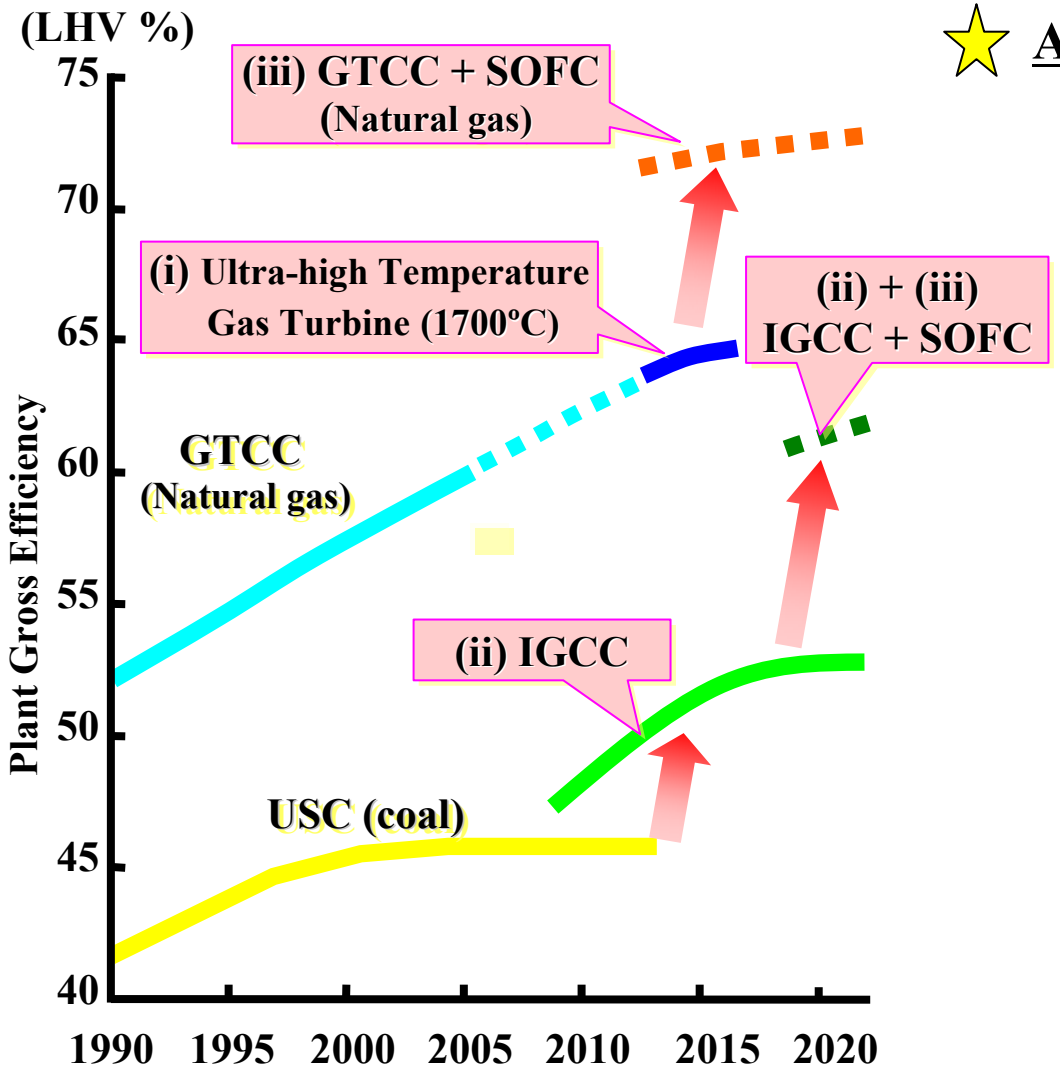


Achieving the target share of 20%



- Series of orders received from advanced countries in North America, Europe and others for 1500ºC-class G units
- Expansion of blast furnace gas-fired GTCC from China to Europe
- Launch of marketing activities in licensed markets
- Launch of business activities in Russia and other new markets
- Expansion of the maintenance business following successive operational launch of delivered units

Long-Term Plan for Increasing the Efficiency of Thermal Power Generation



Aiming to increase the efficiency of thermal power generation

(i) Ultrahigh-Temperature Gas Turbine (1700 °c)

(ii) IGCC (Coal Gasification)

(iii) GTCC + SOFC (Hybrid Cycle)

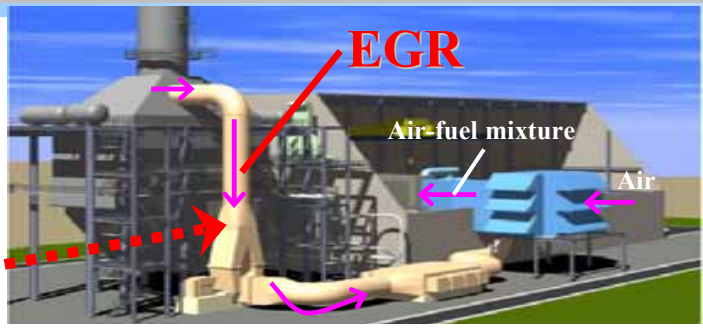
(iv) Advanced Cycles
- Carbon Capture
- Nuclear Gas Turbine (PBMR)

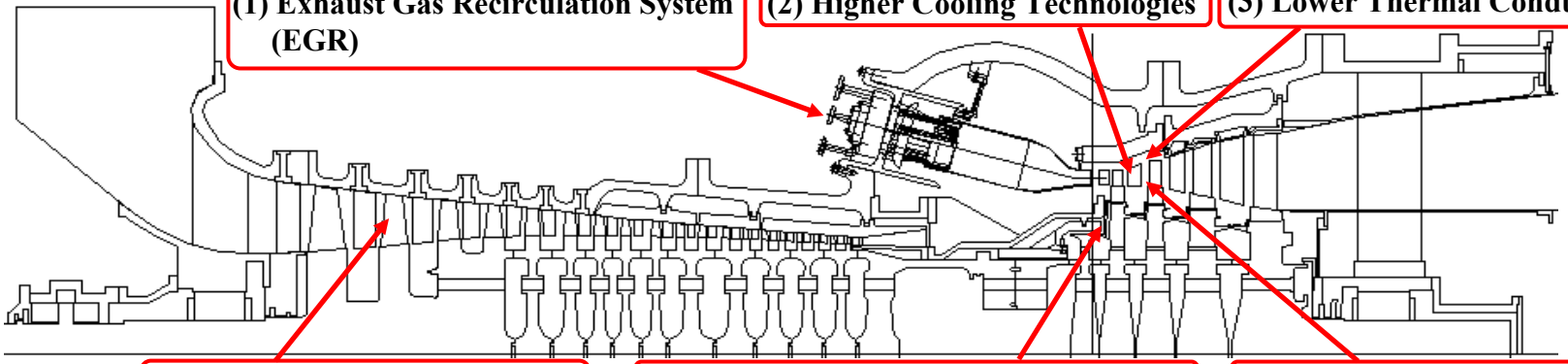
IGCC: Integrated Gasification Combined Cycle
SOFC: Solid Oxide Fuel Cell

USC: Ultra Super critical pressure Coal-fired plant
PBMR: Pebble Bed Modular Reactor

Development of 1700ºC-class Gas Turbine (National Project)

- Completion of component development (2004 to 2008)
- Application of component technology (2008 to 2011)
- Target of efficiency: 62% LHV or higher





Schedule for 1700ºC GT development

2005	2010	2015 -
Component Development (2004 to 2008)	Application of Component Technology (2008 to 2011)	Actual Engine Design & Development → Actual Engine Verification
・Application starts with existing low-risk 1500ºC units (in 2007)		Combined-cycle power generation
	When 1700ºC GTCC power generation ratio is raised to 30%, **annual CO_2 emissions by Japan fall approximately 3%**	・Combined-cycle LNG power generation of the CO_2 recovery type using EGR

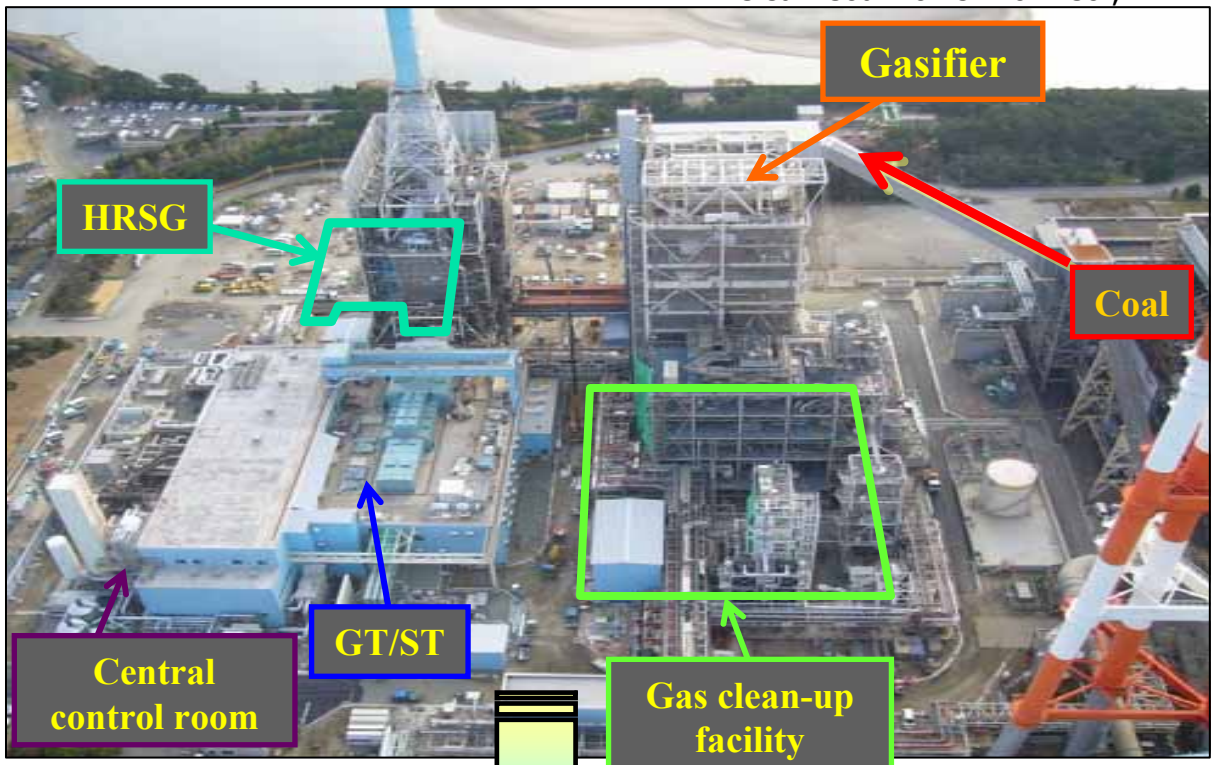
Clean Coal Technology

<IGCC>

Approx. 11% reduction in CO_2 emission, compared with BTG.

Demonstration plant at Nakoso in Japan

Clean Coal Power R&D Co., LTD



<Advanced cycle>

IGCC with CO_2 capture

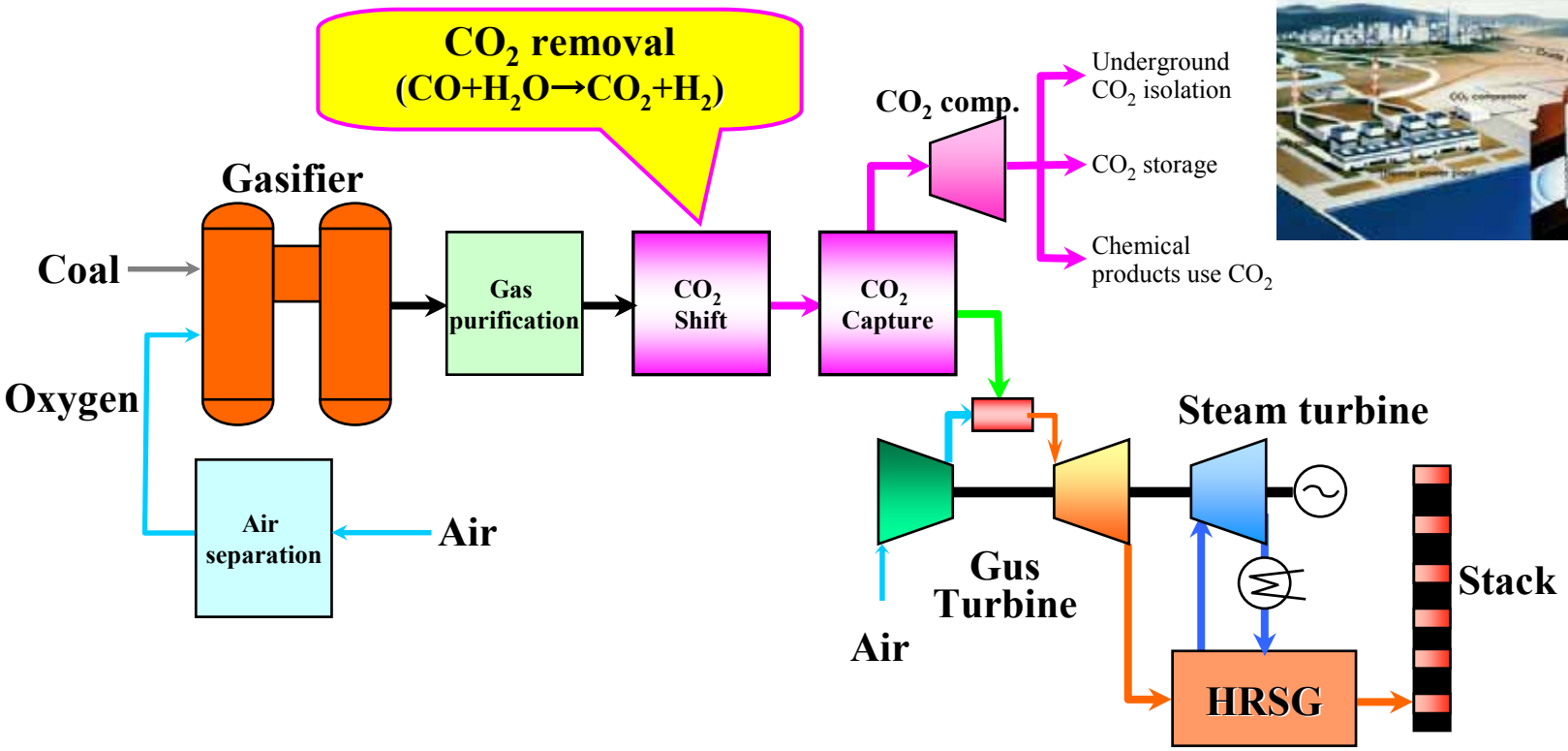
Features of MHI IGCC

(1) Air-blown gasification
(2) Dry coal feed
(3) Water wall structure
(4) Low-calorie gas firing GT

➢ Construction Launch: Aug. 2004
➢ Demonstration Run: Sep. 2007～

IGCC with CO_2 Capture

- Coal gas is separated into CO_2 and H_2.
- Separated CO_2 is captured and stored underground.
- H_2-based gas after CO_2 capture is burned with a gas turbine for generating electricity.



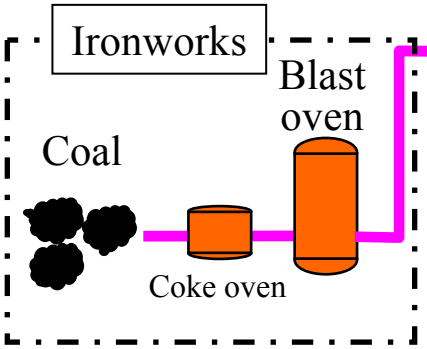
System integration including CO_2 capture is performed by the entire Mitsubishi Group, and verification is conducted at feasible locations in Japan and abroad.

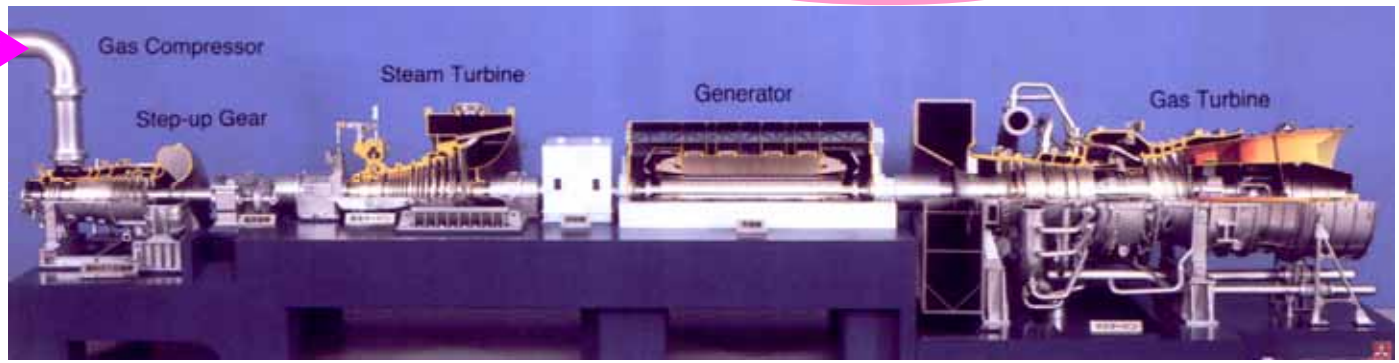
Clean Coal Technology

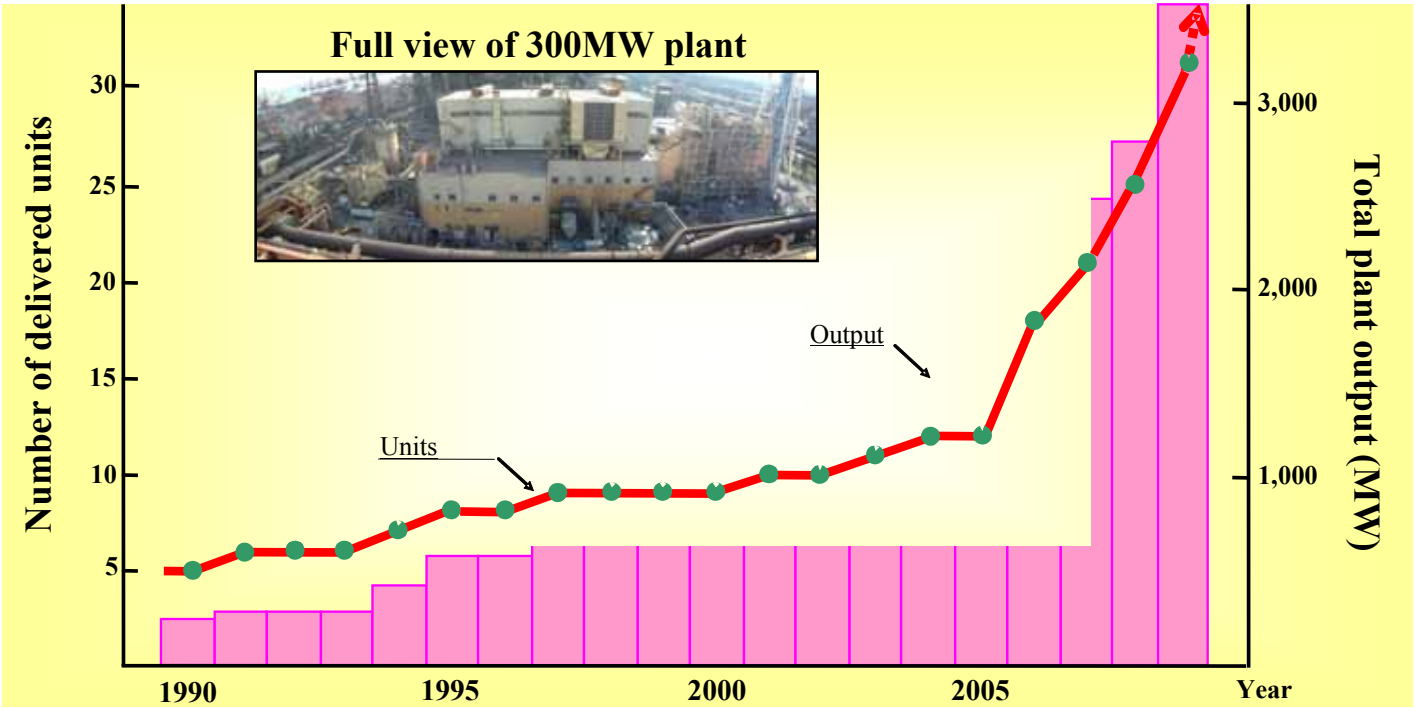
<BFG※-firing GTCC>

※Blast Furnace Gas

Approx. 22% reduction in CO2 emission, compared with BTG.



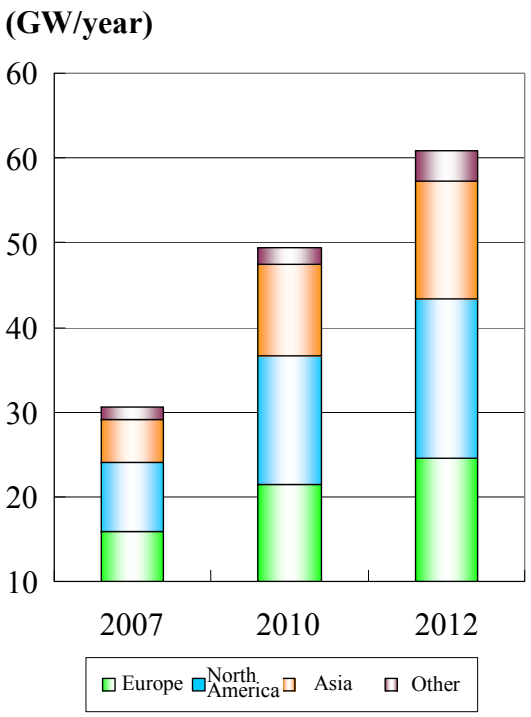




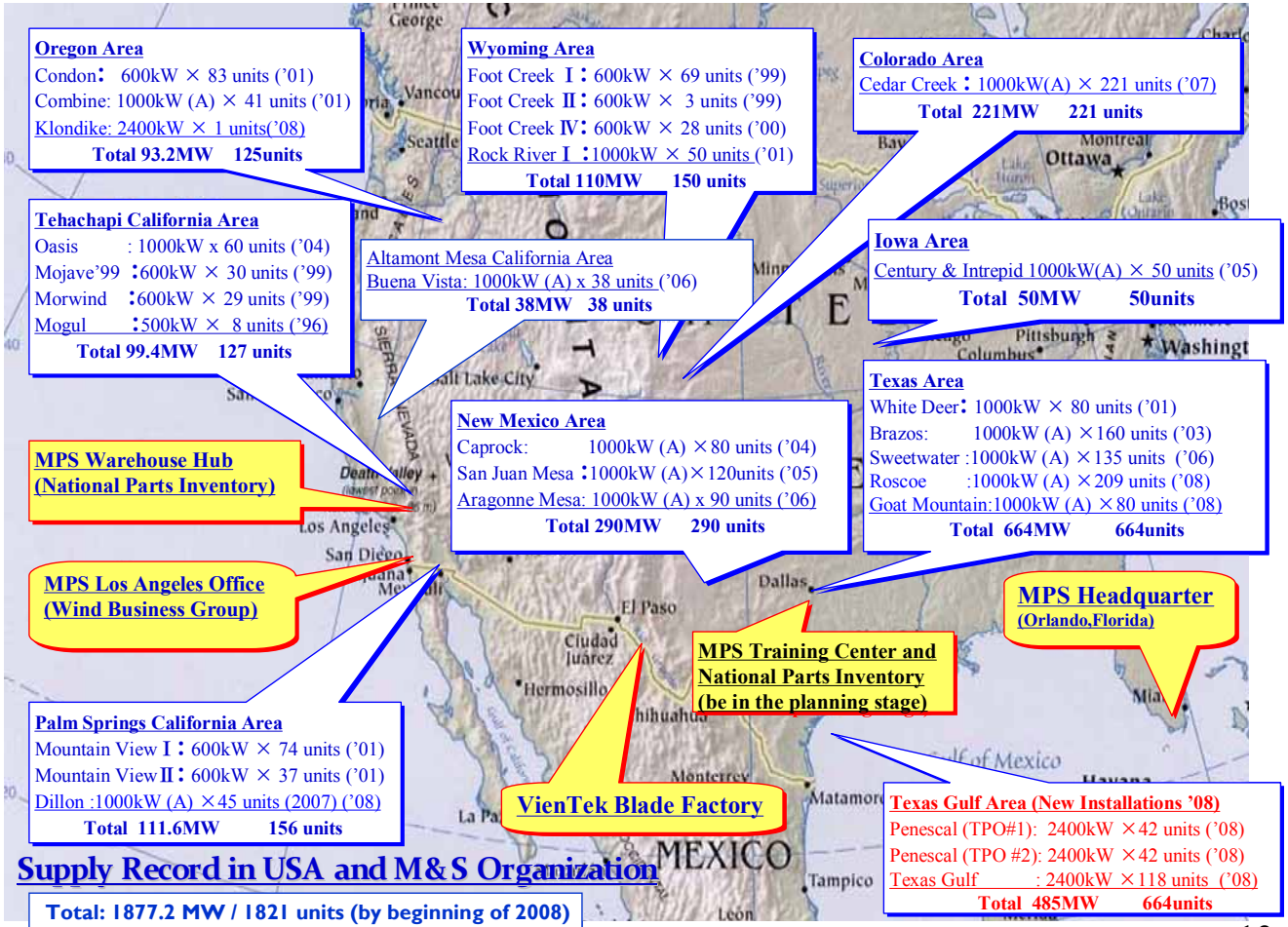
Wind Turbine Business

Market growth will continue in North America in the immediate future.
MHI will expand operations in markets centering on North America.

Wind turbine market forecasts



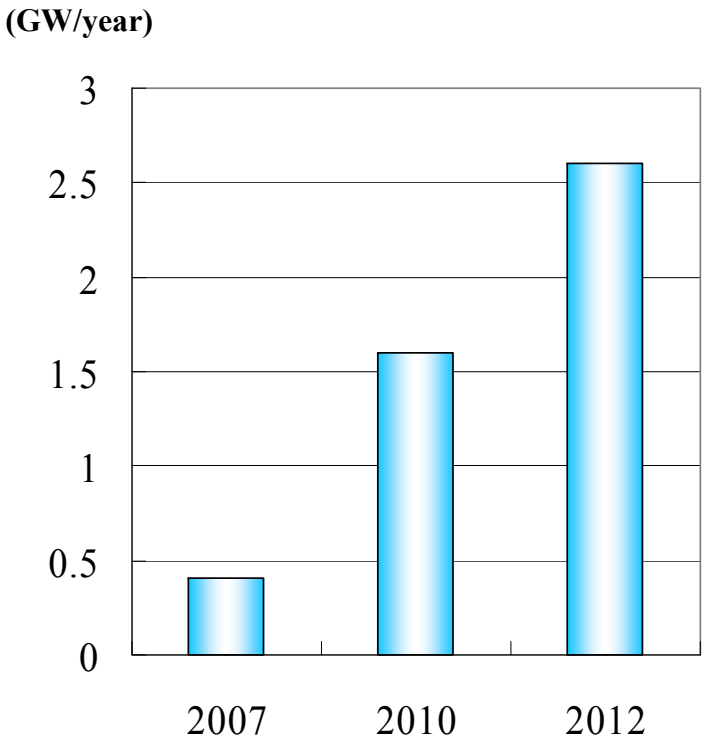
Supply record in USA



Wind Turbine Business

The 2.4 MW model has been in great demand. MHI bas been expanding production capacity.

MHI's production capacity



Outline of 2.4MW model	
Rated output	2.4MW
Rotor diameter	92m/95m
Hub height	70m/80m
Pitch control	Individual pitch control
Yaw control	Active control
Sales performance	Orders received for more than 1,000 units

Development of Offshore Wind Turbines

- **Installation of offshore wind turbines is expected to grow to take advantage of favorable wind conditions. Fundamental technologies are being developed in Japan and other countries.**
- **MHI is the world's only manufacturer involved in both the wind turbine and shipbuilding (marine structure) businesses. MHI will leverage its overall technological capabilities to deliver world-class offshore wind turbines.**

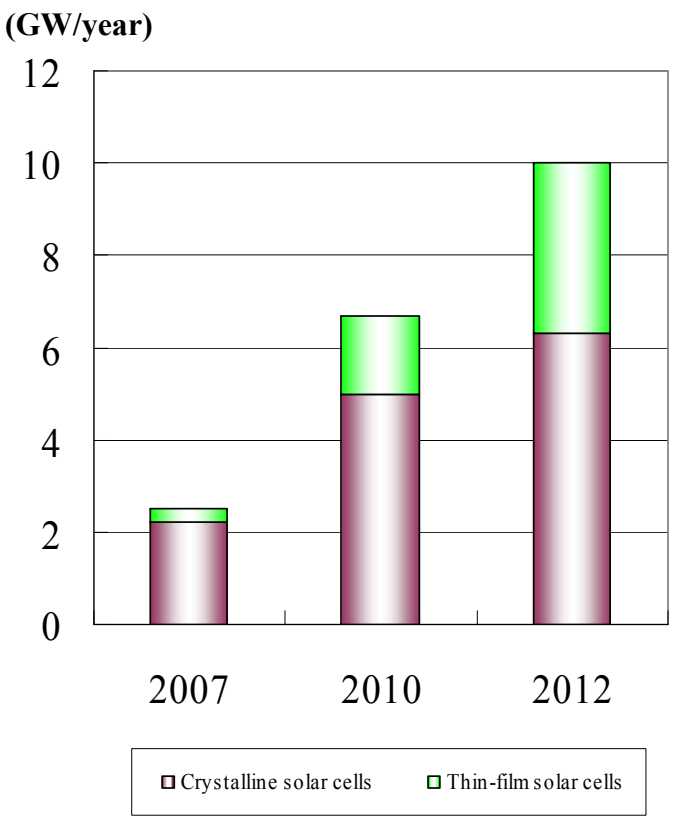
Offshore wind turbines in Europe
(mounted on towers stood from the ocean floor: other companies)

Example of offshore wind turbines mounted on a floating platform (Tokyo University)

Photovoltaic Business

Thin-film solar cells have gathered a lot of attention recently as a competitively-priced technology.

PV market forecasts



- The market is expanding at an annual rate of 30-40%. Crystalline PV have been dominant, but thin-film PV have gathered a lot of attention with their competitive prices and significant potential for further efficiency improvement in the future.

Focusing on thin-film PV ahead of competitors, MHI has begun to introduce new microcrystalline tandem PV to the market.

Outline of microcrystalline tandem solar cells

- Large size (1.4m x 1.1m)
- High conversion efficiency
  (up 30% from prior MHI cells)
- Silicon use reduced to approx. 1/100 compared with crystalline cells

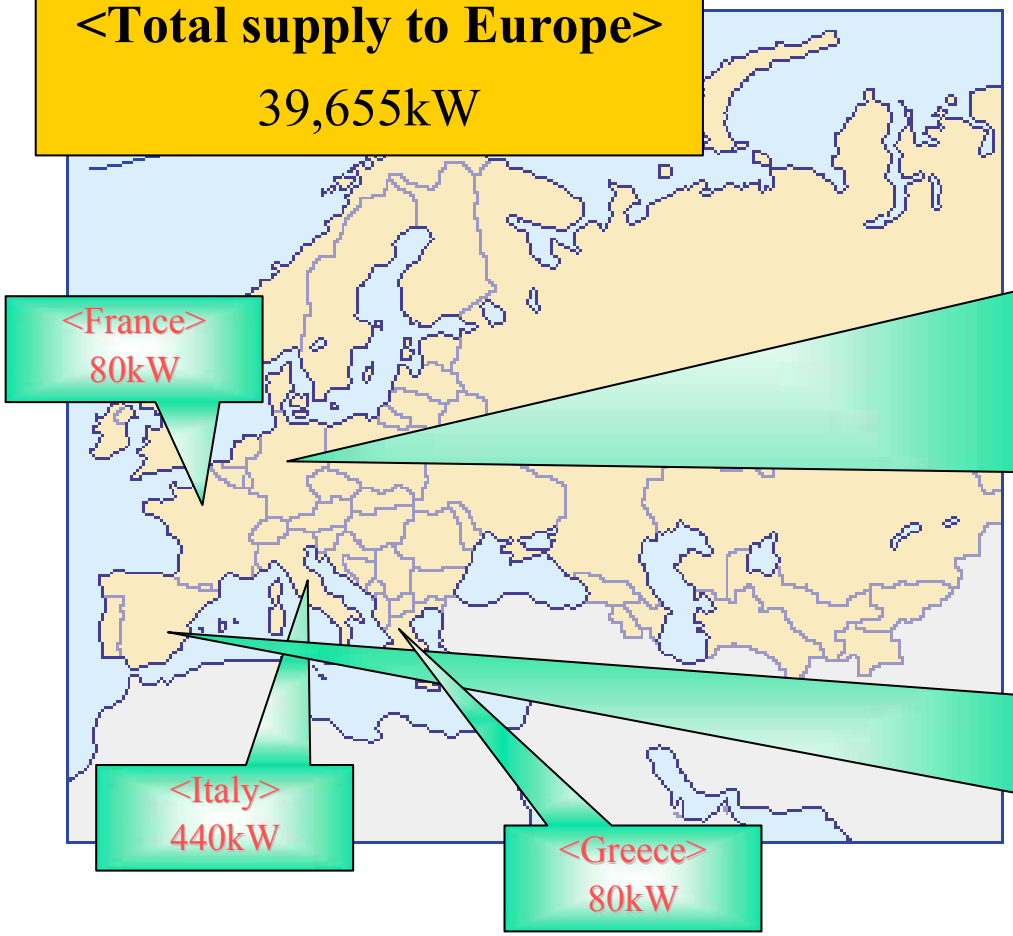
Photovoltaic Business

Demand is expanding in the European and other markets.

PV supply record in Europe (through 2007)

<Total supply to Europe>

39,655kW



<Germany> 29,629kW

Major large-scale PV plants

- Waltenhofen
  400kW
  (2004)

- Buttenwiesen
  1,000kW
  (2004)

<Spain> 9,426kW

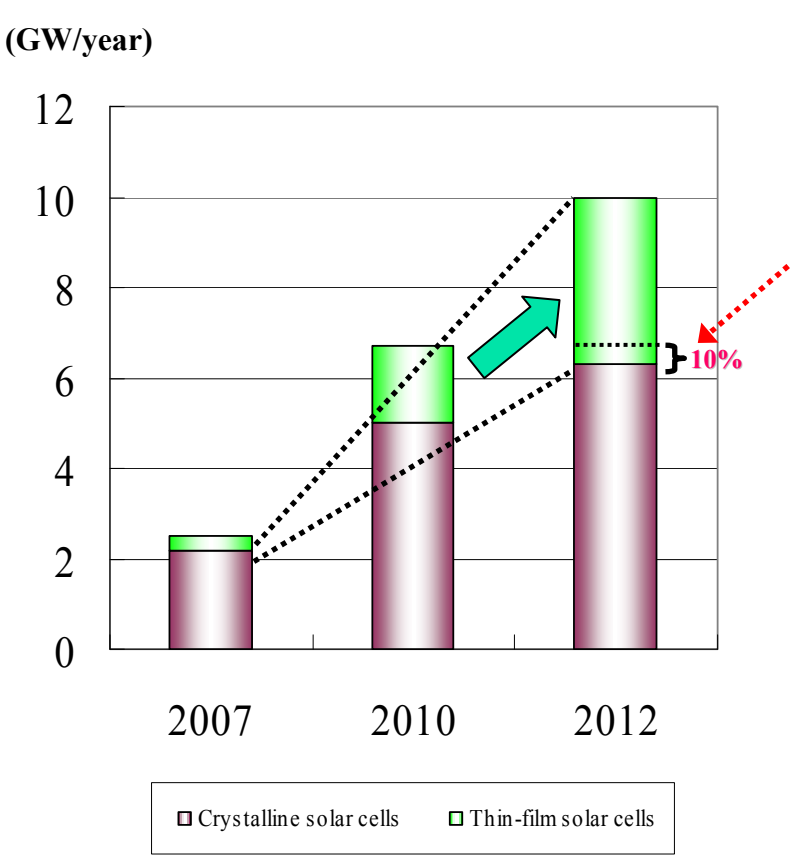
Major large-scale PV plants

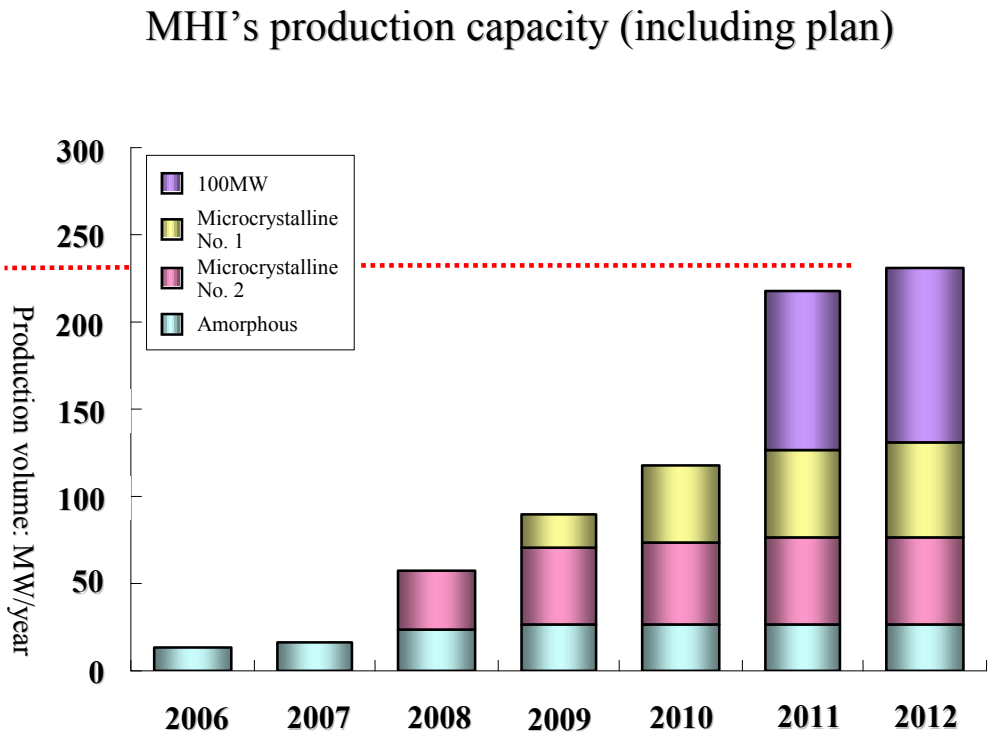
- Toledo
  1,400kW
  (2007)

Photovoltaic Business

New PV has been in great demand, and production capacity expansion is being considered.

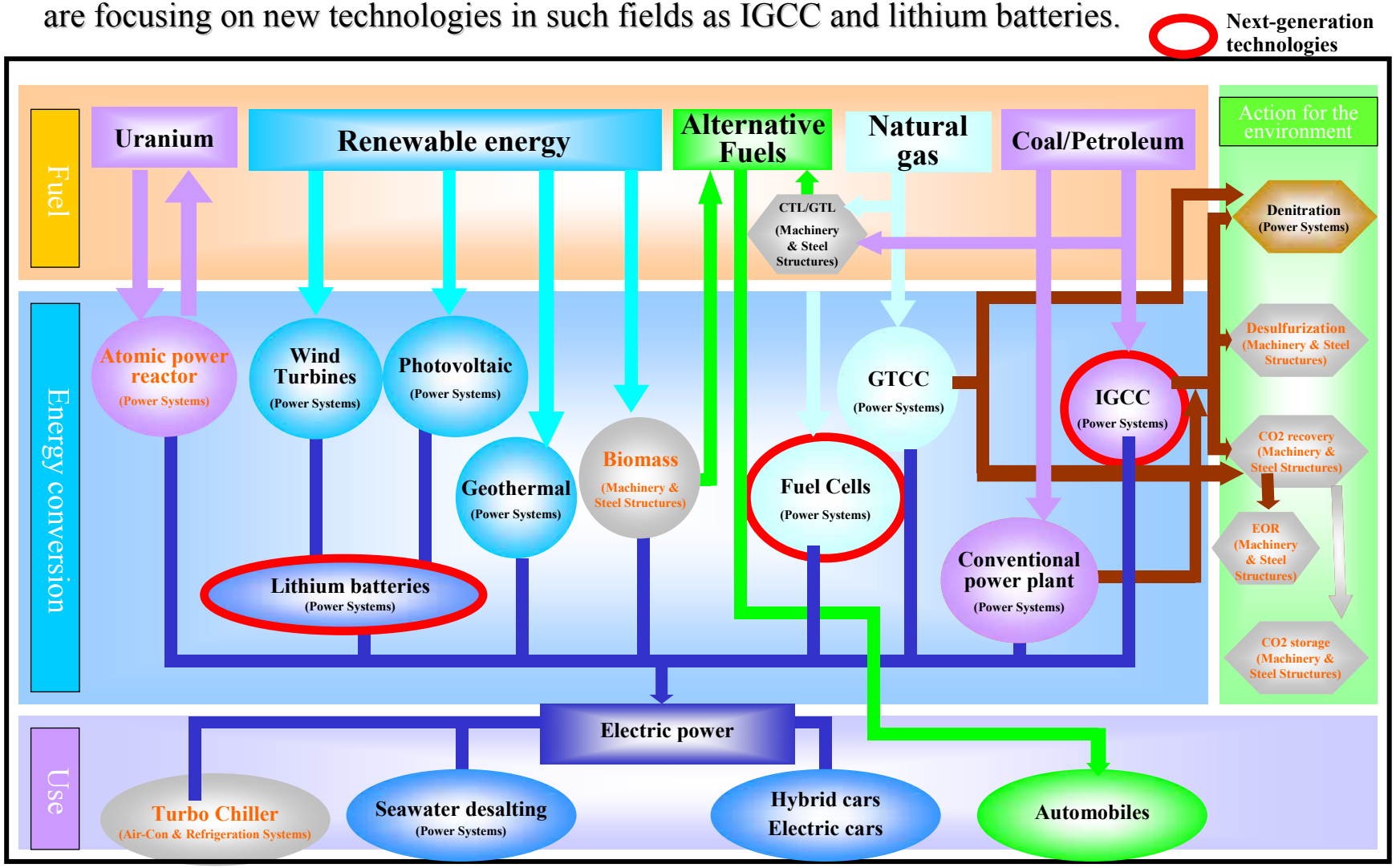
Execute the investment needed to raise the thin-film PV share to approximately 10%.





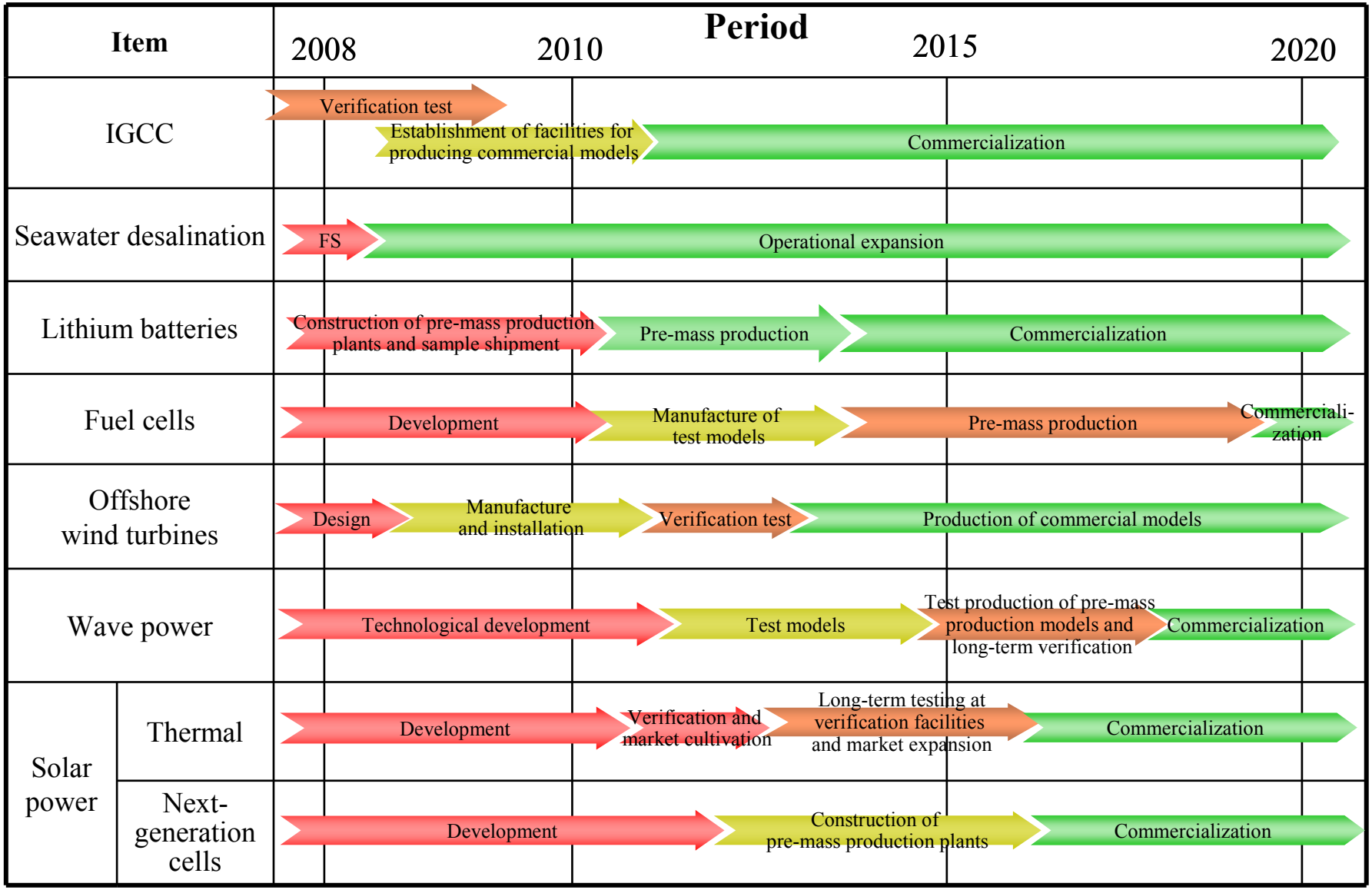
Energy Value Chain

- The Power Systems Headquarters are performing important roles in energy conversion technologies. In addition to wind turbines and photovoltaic power generation, the Headquarters are focusing on new technologies in such fields as IGCC and lithium batteries.

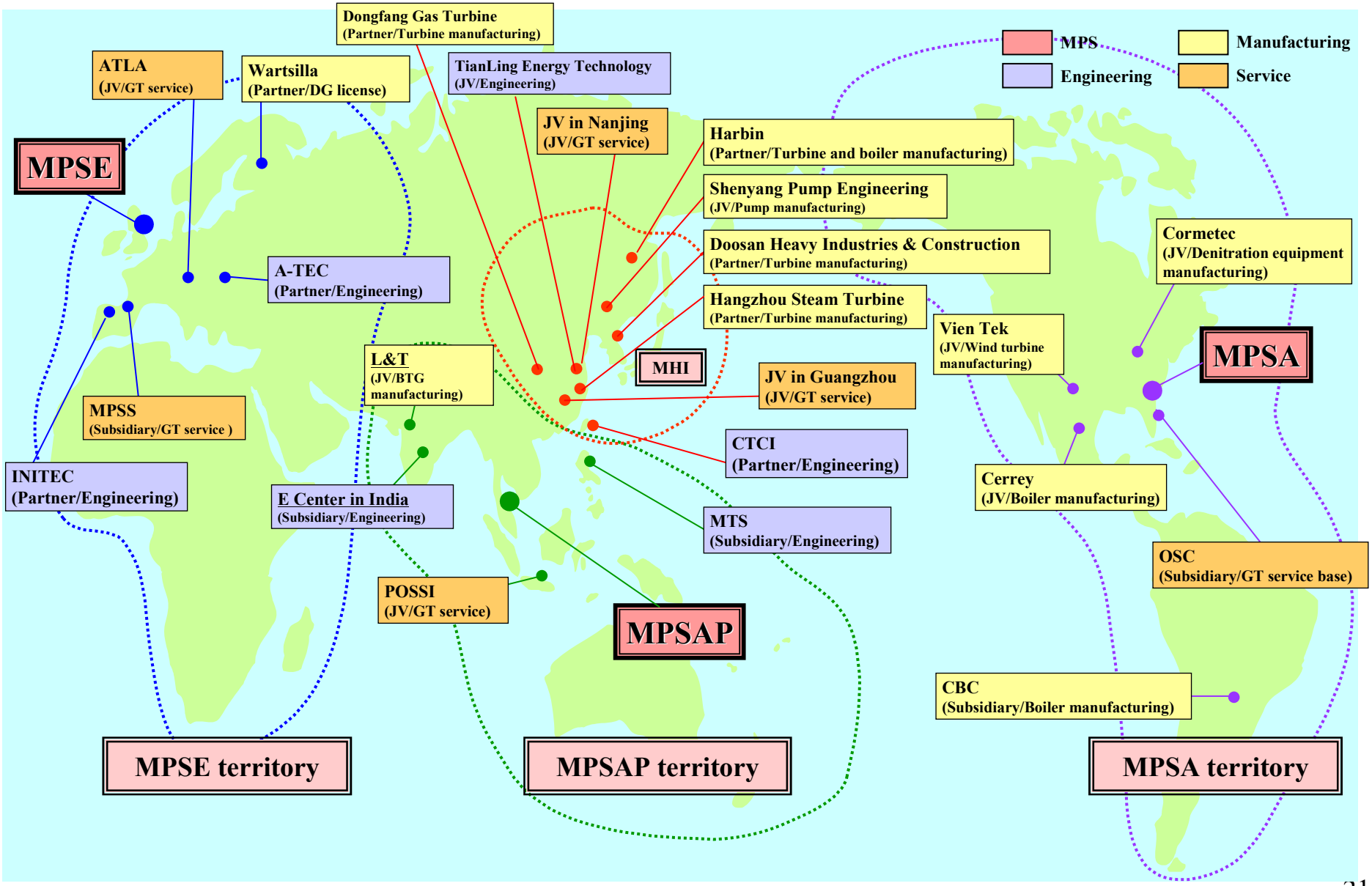


CTL: Coal to Liquid GTL: Gas to Liquid EOR : Enhanced Oil Recovery

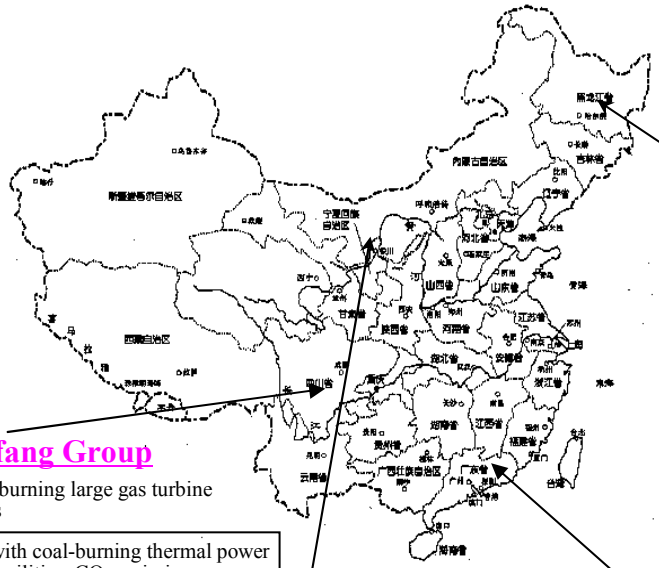
Roadmap for Next-Generation Technologies



MPS: Enhancing Global business Structure with Three Bases（MPSs）



Providing Environmentally-friendly Power Generation Facilities and Technologies to China and India



Harbin Group

Supercritical and ultra-supercritical thermal power generation technologies

Compared with conventional coal-burning thermal power generation facilities, CO_2 emissions are reduced by approximately 5%

Dongfang Group

Natural gas-burning large gas turbine technologies

Compared with coal-burning thermal power generation facilities, CO_2 emissions are reduced by approximately 50%.

Mitsubishi Heavy Industries Dongfang Gas Turbine (JV)

Hot parts technology for natural gas-burning large gas turbines

Compared with coal-burning thermal power generation facilities, CO_2 emissions are reduced by approximately 50%.

Ningxia Electric Power Group

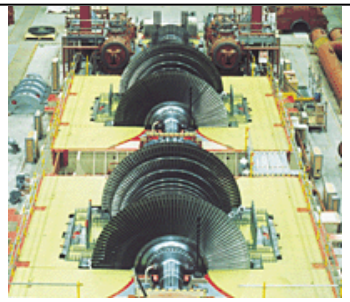
1000-kw generating wind turbine technologies

Power generating technologies that emit no CO_2

L&T-MHI Turbine Generators Private Ltd.(JV)

Supercritical and ultra-supercritical steam turbine technologies

Compared with conventional coal-burning thermal power generation facilities, CO_2 emissions are reduced by approximately 5%.



L&T-MHI Boilers Private Ltd.(JV)

Supercritical and ultra-supercritical boiler technologies

Compared with conventional coal-burning thermal power generation facilities, CO_2 emissions are reduced by approximately 5%.