

# **Japanese Policy on New Energy**

**Yoji Matsui**

# Topics

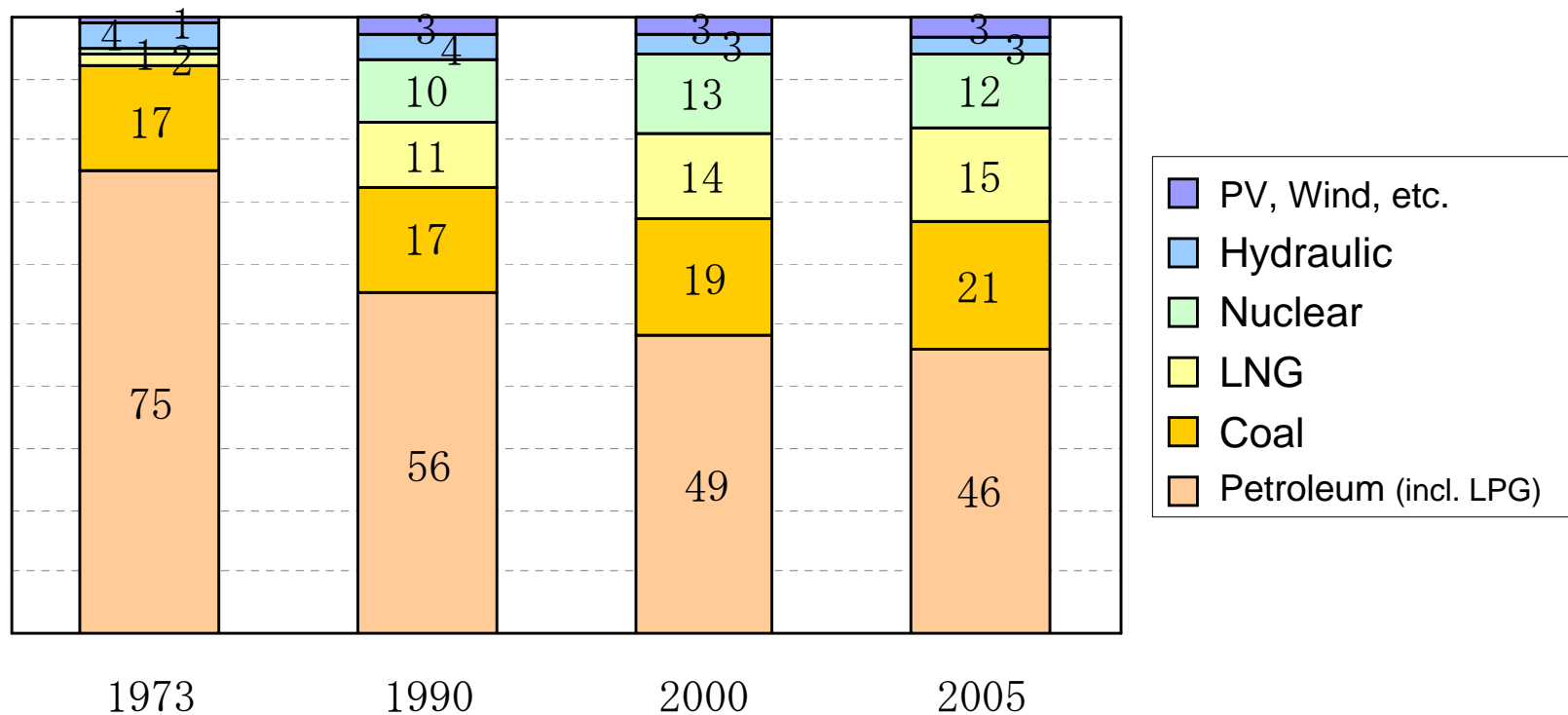
- **Necessity of Renewable Energy**
- **Japanese Policy on Renewable Energy**
  - Support to local governments
  - R&D Projects
  - Measures for Deployment
- **Policy on New Usage of Energy & New Technology**
  - Energy Management System
  - Storage Battery

# **Necessity of Renewable Energy**

# Primary Energy Supply in Japan

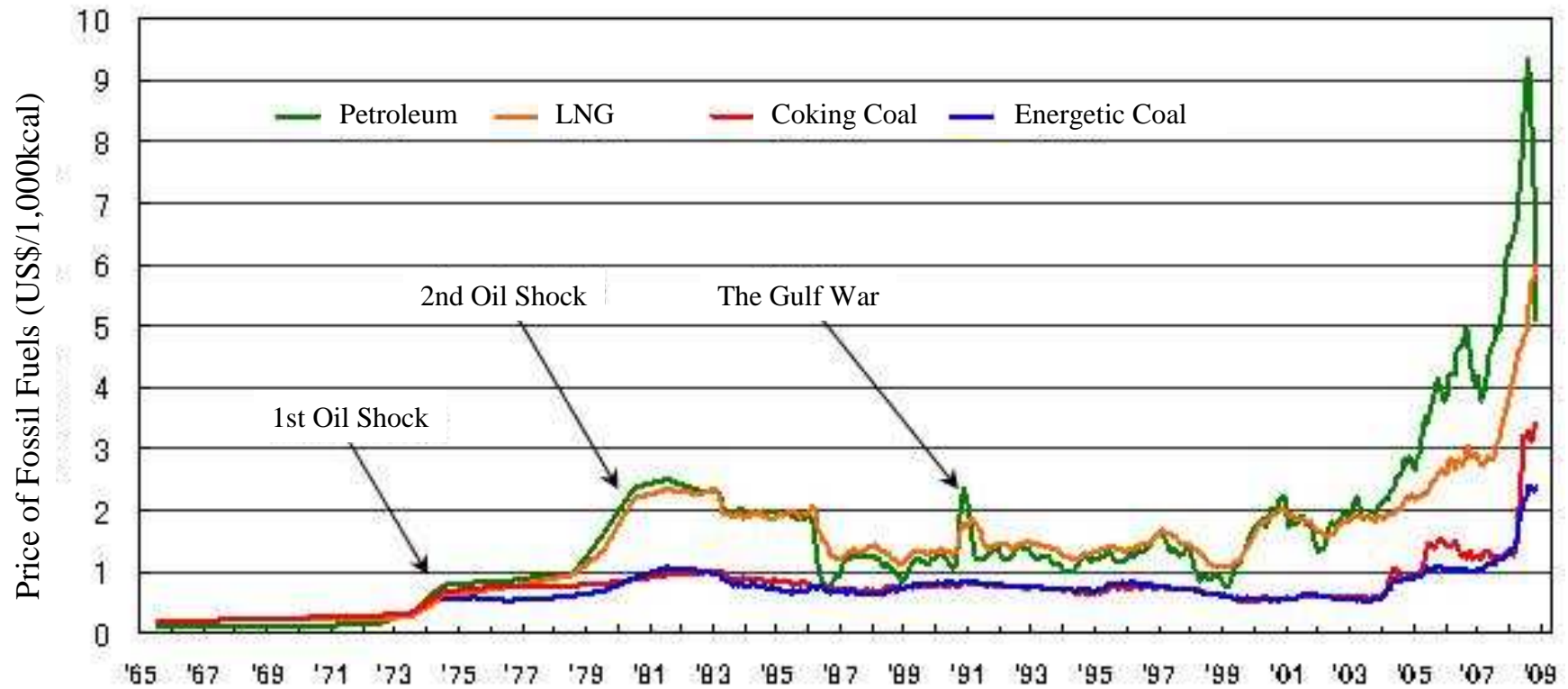
The proportion of petroleum to the primary energy supply has come down, while that of fossil fuels have not decreased.

Proportion of Each Energy to the Primary Energy Supply in Japan



# Price of Fossil Fuels

The prices of fossil fuels will continue to go up.



# Employments created by Renewables



2008.9.24 Report at UNEP concerning with “Green Industry” ( referred to the draft of “Clean Energy New Deal Policy”, IEA )

- 2.3 million has been already employed in the renewable energy sector
- 2.1 million employment in the area of wind power and 6.3 million in photovoltaic until 2030



2007.1.19 Chairman for European Renewable Energy Policy Conference

- 2 million new employment by 2020 in EU 15 countries



2006.9.12 Report by Ministry for Environment

- employment in the industry related renewable energy will become 300 thousand until 2020, will exceed 330 thousand



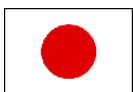
2008.11.17 Minister for Ecology, Energy and Sustainable Development of Country

- create 100 thousand employment until 2020 by supplying renewable energy more than 23% of energy consumption



2009.2.17 American Recovery and Reinvestment Act

- \$ 584 billion investment in two years (\$ 787 billion until 2019), create 0.6 - 1.8 million new employment by the forth quarter 2011
- \$ 83 billion tax reductions and bond, etc. in the area of clean energy & renewable energy,
- \$ 11 billion investment for the reinforcement of electric distribution networks



2010.6.18 Economic Growth Strategy

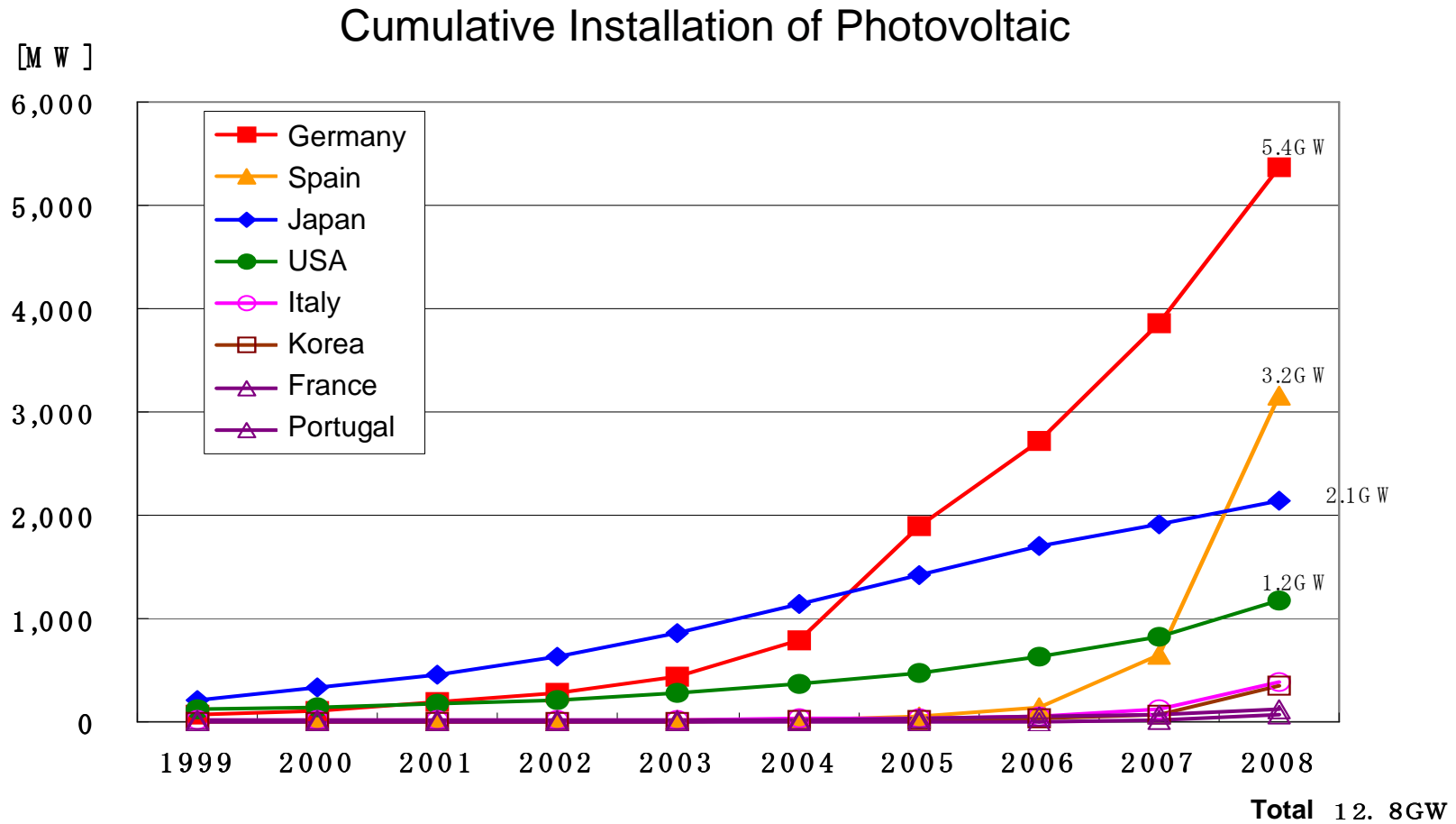
- create 1.4 million employment until 2020 in the area of environment and energy
- 10 trillion yen market for renewable energy by 2020

# Necessity of Renewable Energy

- Renewable Energy such as Photovoltaic, Wind Power, Hydraulic, Geothermal are expected as low CO<sub>2</sub> energy.
- Without CO<sub>2</sub> emission issue (Global Warming Protection), Renewable Energy is important for Japan to reduce the dependence on limited resources and energy imports.
- Renewable Energy will contribute to create markets and employments.

# Cumulative Installation (Photovoltaic)

Japan ranks at 3rd in the world.



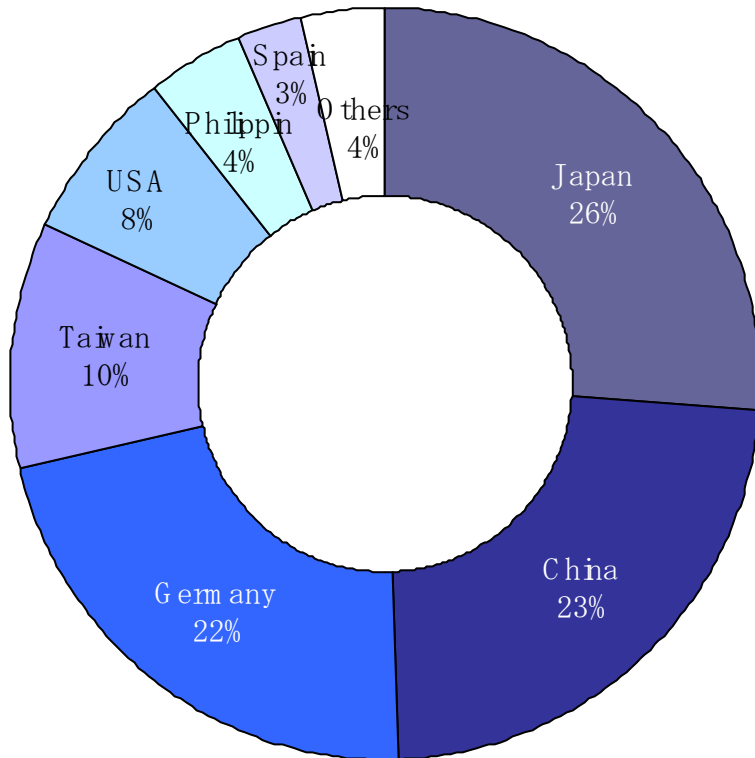
Data: TRENDS IN PHOTOVOLTAIC APPLICATIONS Survey report of selected IEA countries between 1992 and 2007, IEA



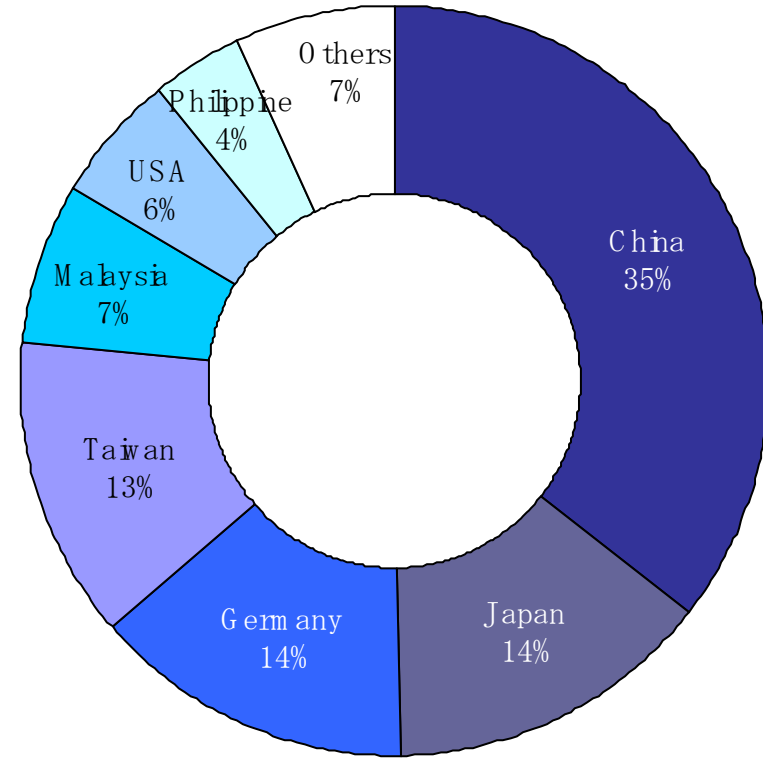
# World Market Share (Photovoltaic)

Japan ranks at 2nd.

Amount of Products in Each Country  
(2007)

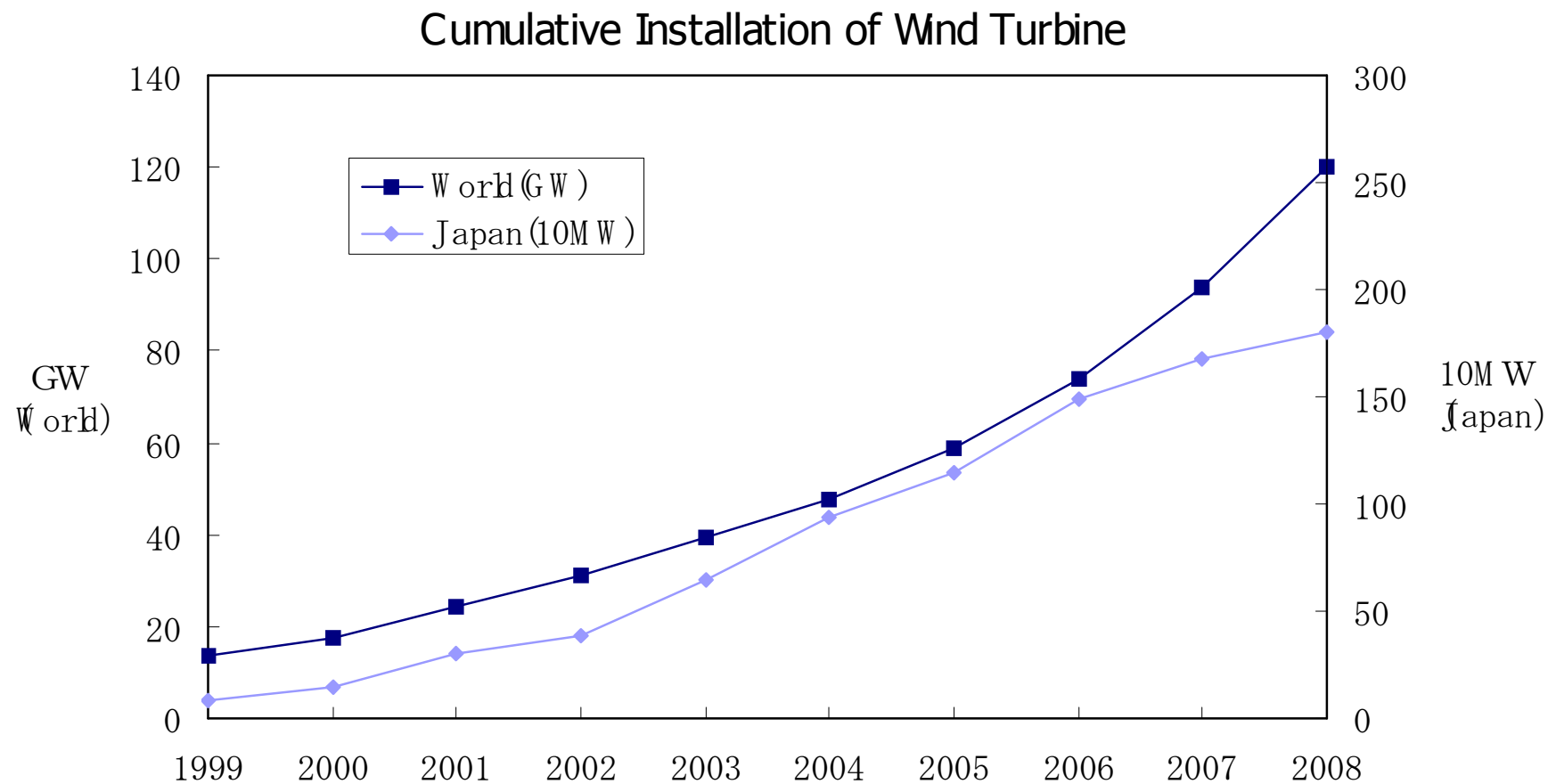


Amount of Products in Each Country  
(2009, estimated)



# Cumulative Installation (Wind Power)

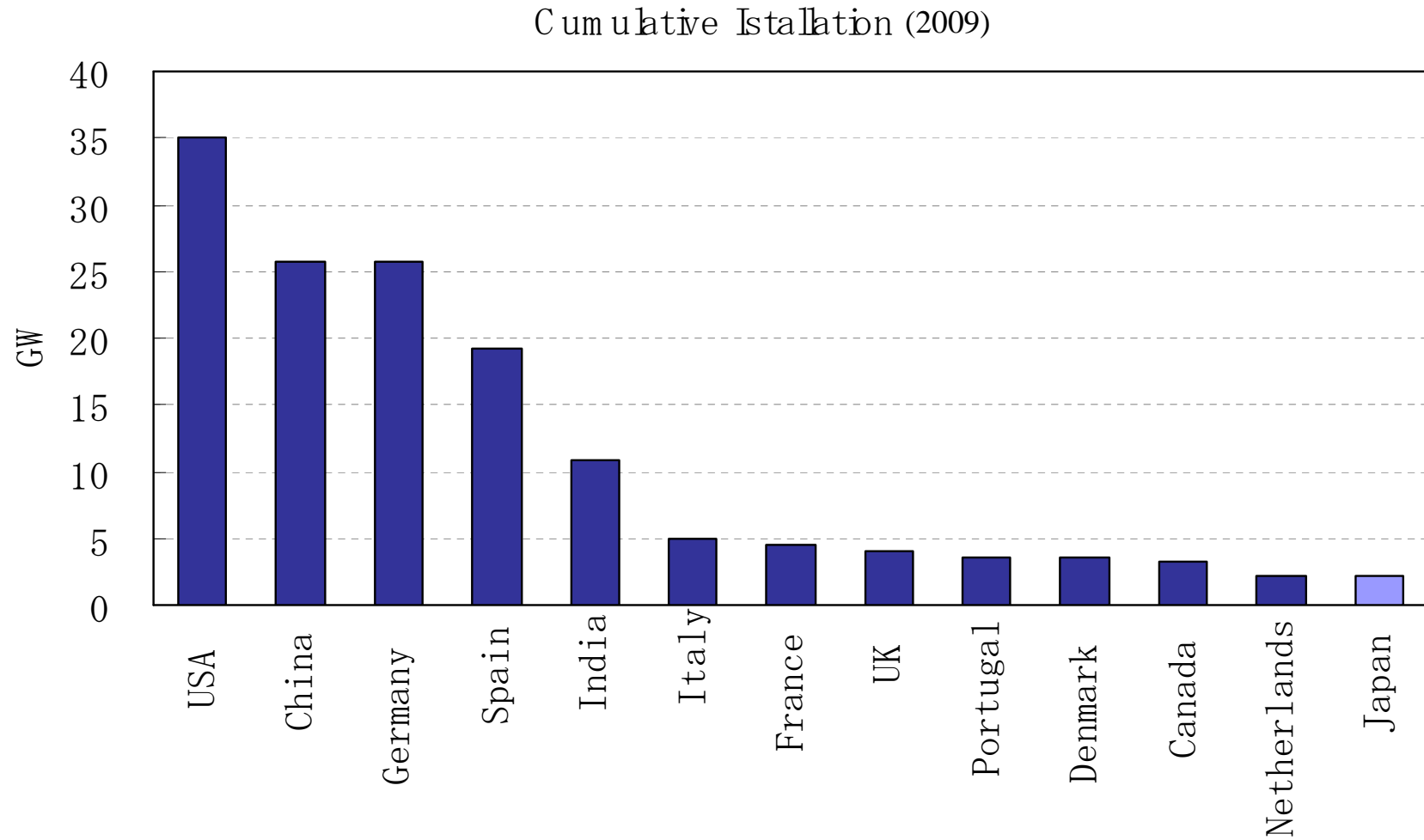
Installation pace has come down in Japan.



(Data) NEDO, GWEC

# Cumulative Installation (Country)

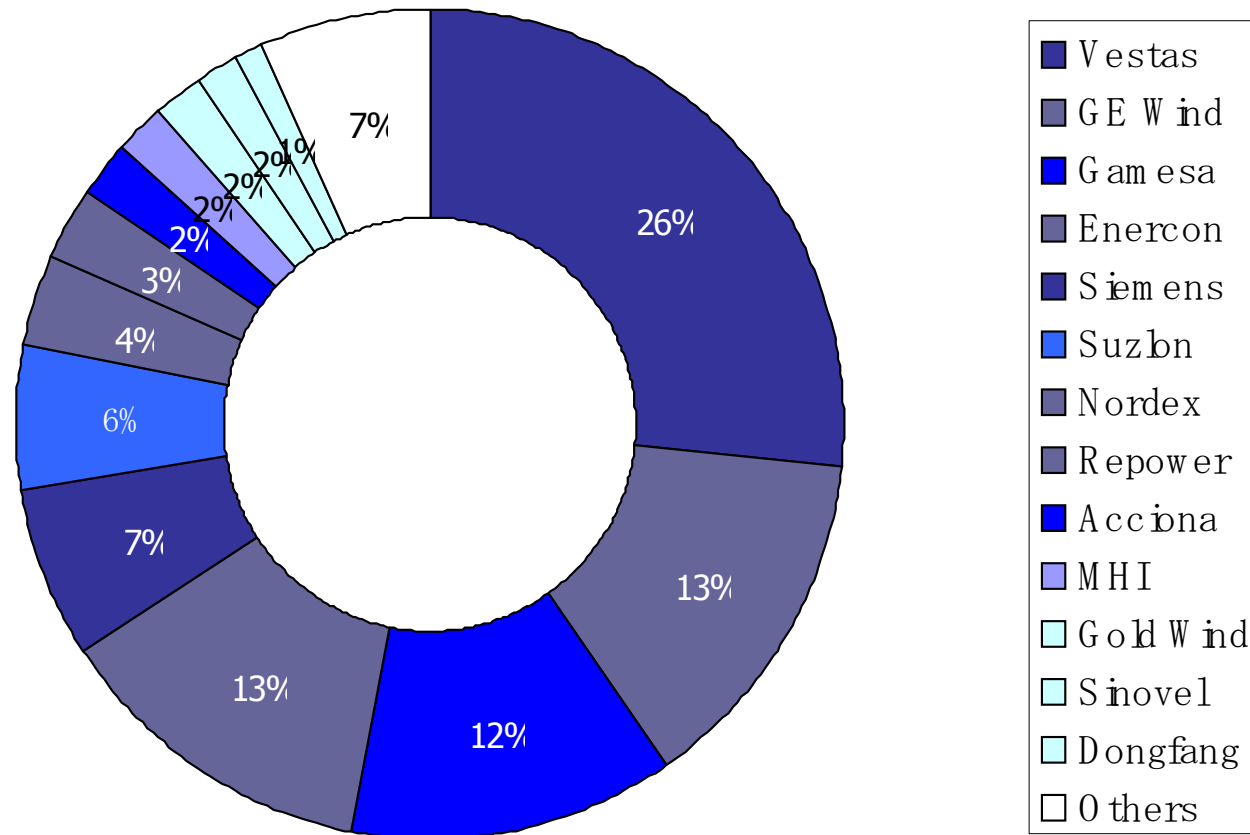
Japan ranks at 13th in the world.



# Cumulative Installation (Producer)

The share of Japanese leading company MHI is 2% in the world.

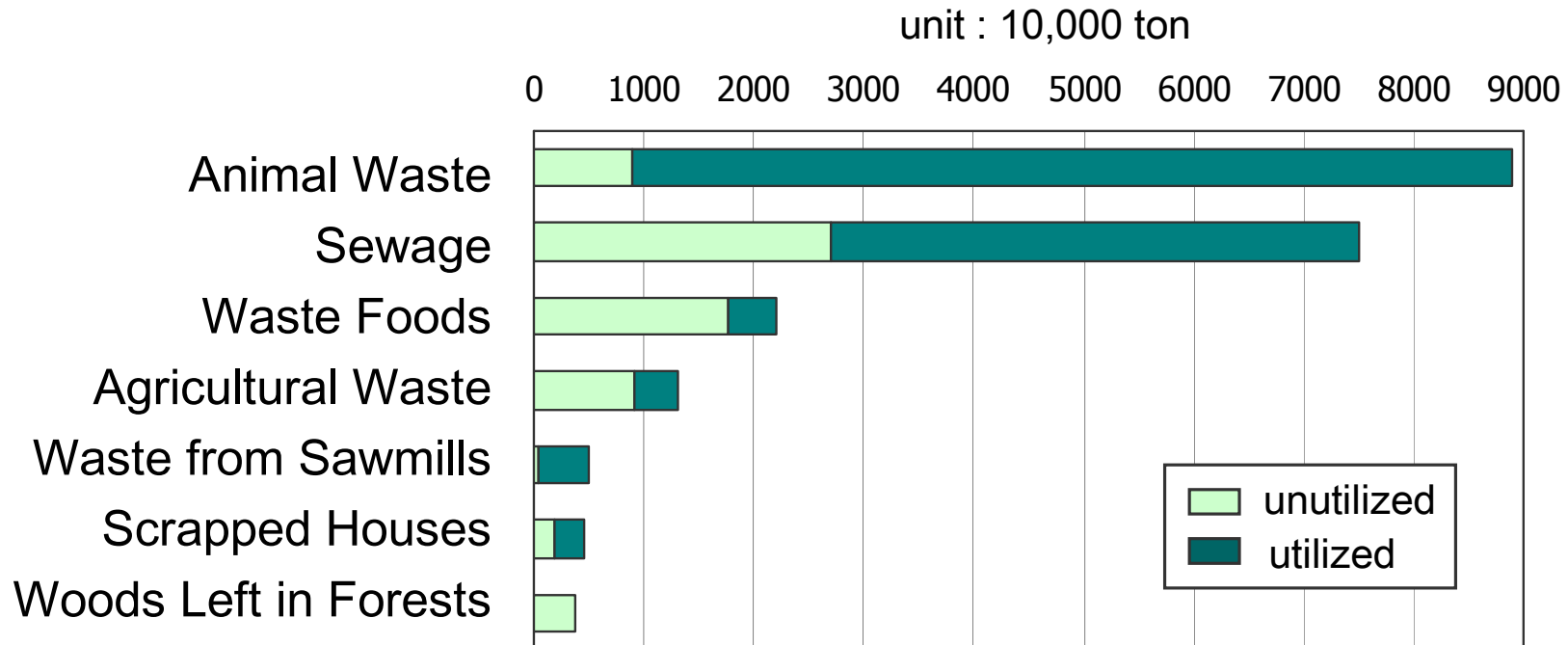
Cumulative Installation Share of Wind Turbine (2008)



# Potential of Bio Energy

## Unutilized Biomass Energies

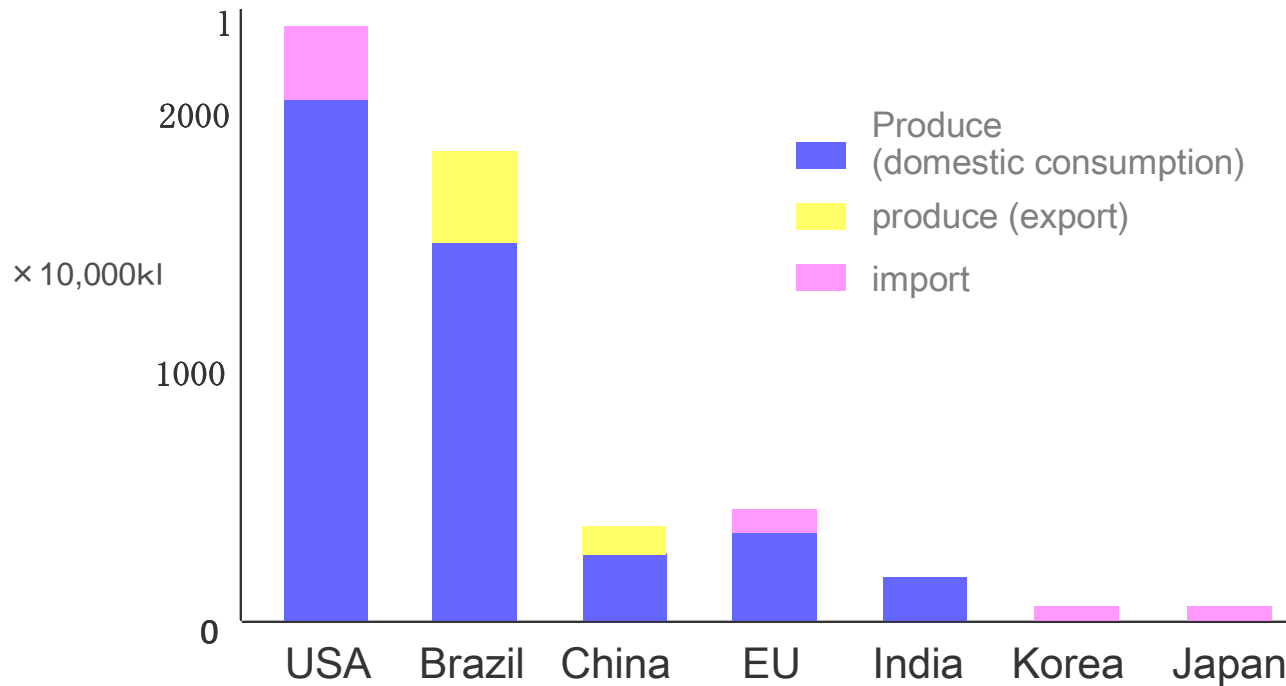
Data from Biomass Japan Comprehensive Strategy (March, 2006)



# Bio Fuel

- Bio Fuel has been already in use in USA and Brazil.
- EU and USA have high numerical target.

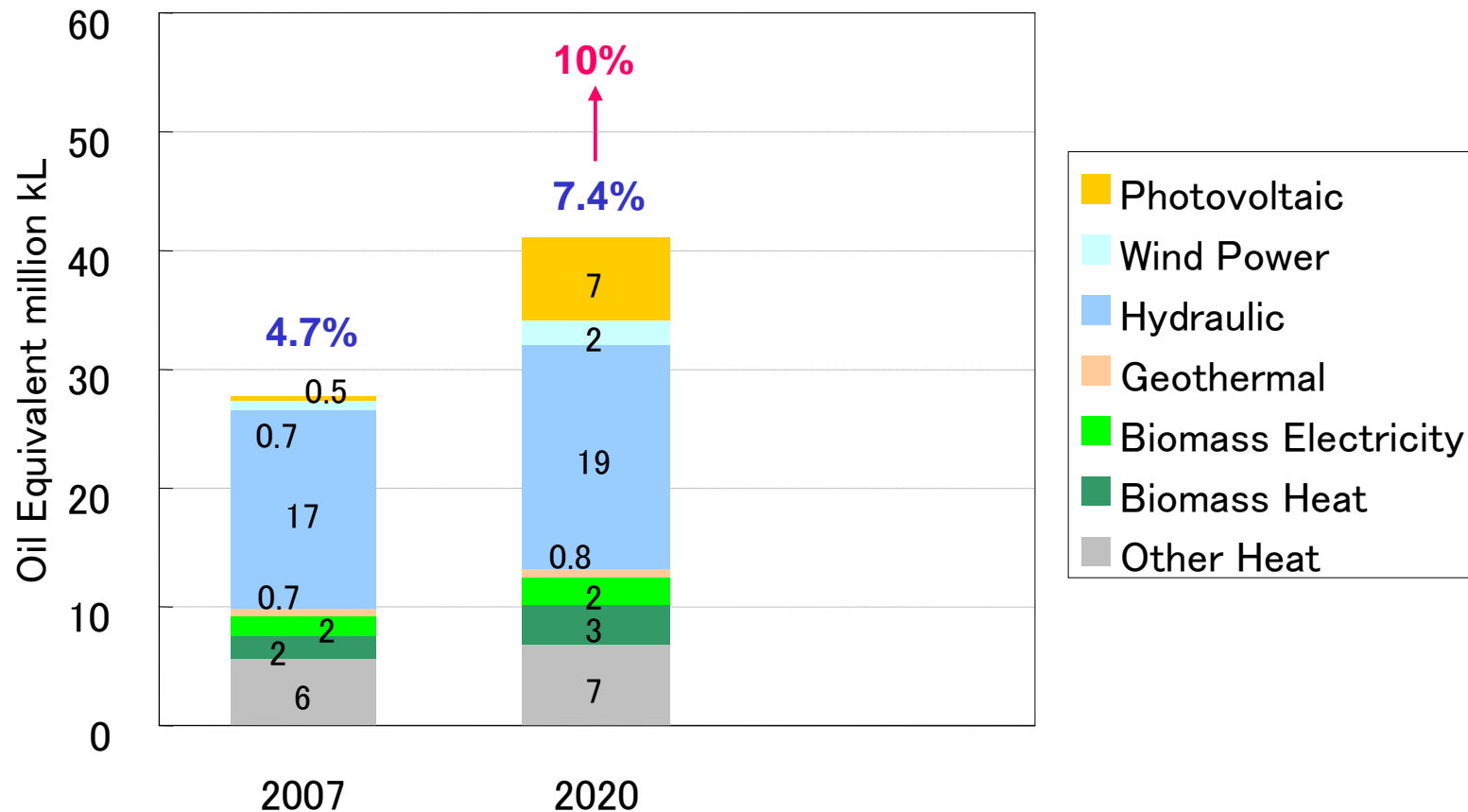
Demand & Supply of Bio Ethanol (2006)  
(Total Product in the World : around 51 million kl)



# Target of Renewable Energy

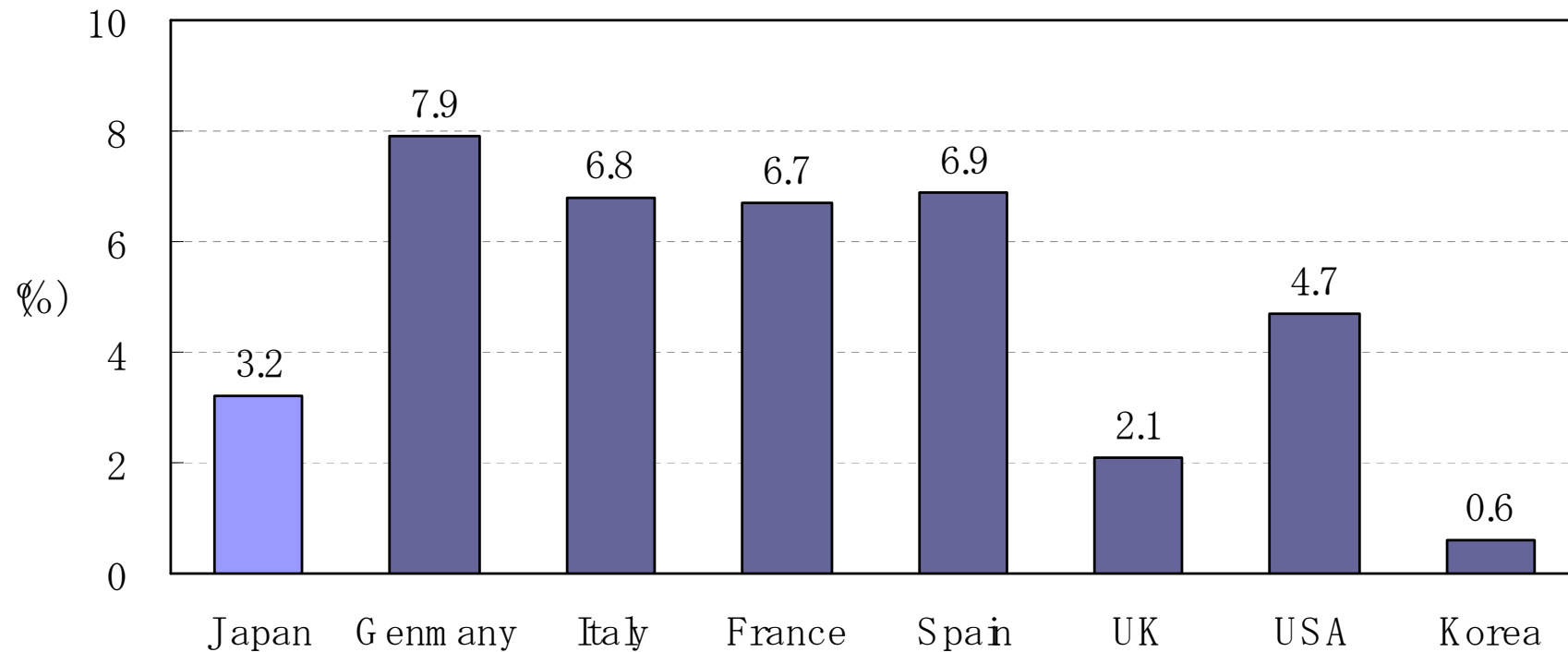
10% of Primary Energy Supply is the target by Economic Growth Strategy.

Predict of Renewable Energy Installation



# Installation of Renewable Energy

Renewable Energy / Primary Energy Supply (2007)

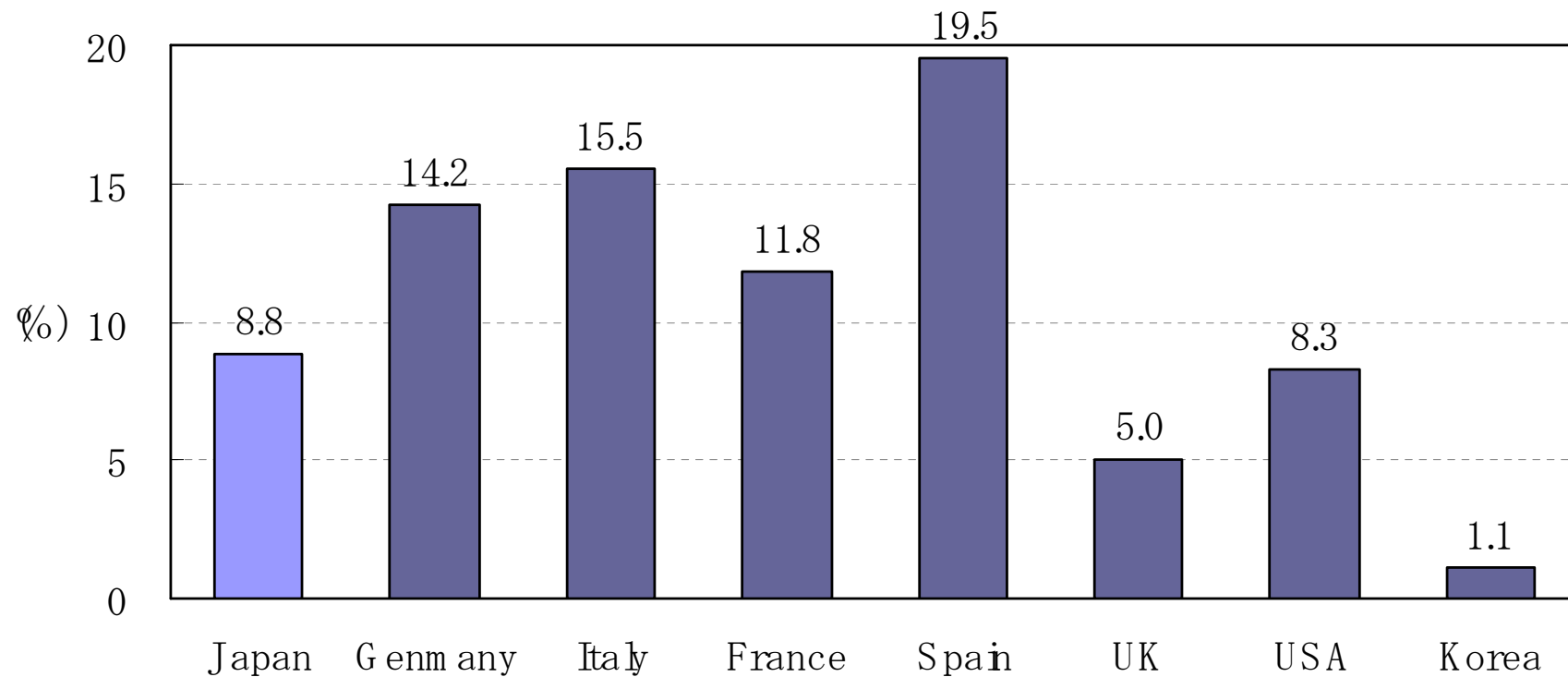


(Data) IEA 2007



# Installation of Renewable Energy

Renewable Electricity / Total Electricity Generation (2007)



(Data) IEA 2007

# **Policies on Renewables**

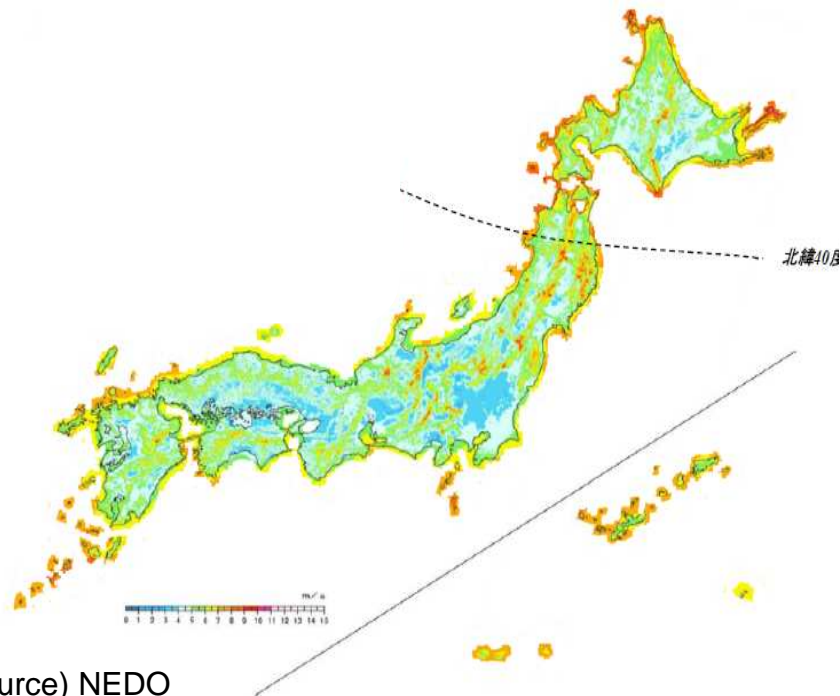
# Subjects and Measures on Renewables

- Climate condition, Geometrical restriction
  - best practice for each area
- High cost
  - R&D, Demand expansion
- Instability, Influence on distribution systems
  - Energy management to stabilize the networks
- Global competition
  - R&D, Standardization, develop new market

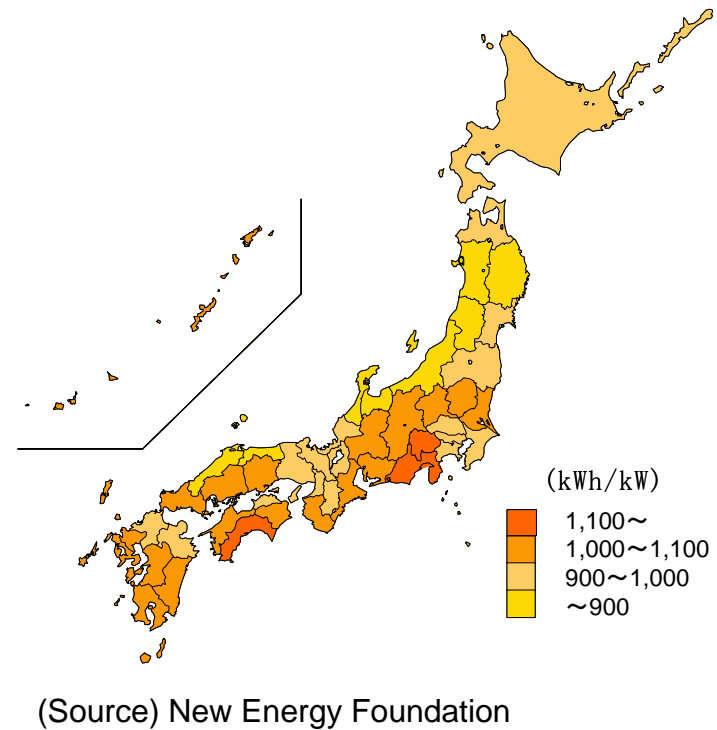
# Geometrical Restriction

Renewable Energy suitable for each area should be concerned.  
METI has supported many towns to make plans for new energies.

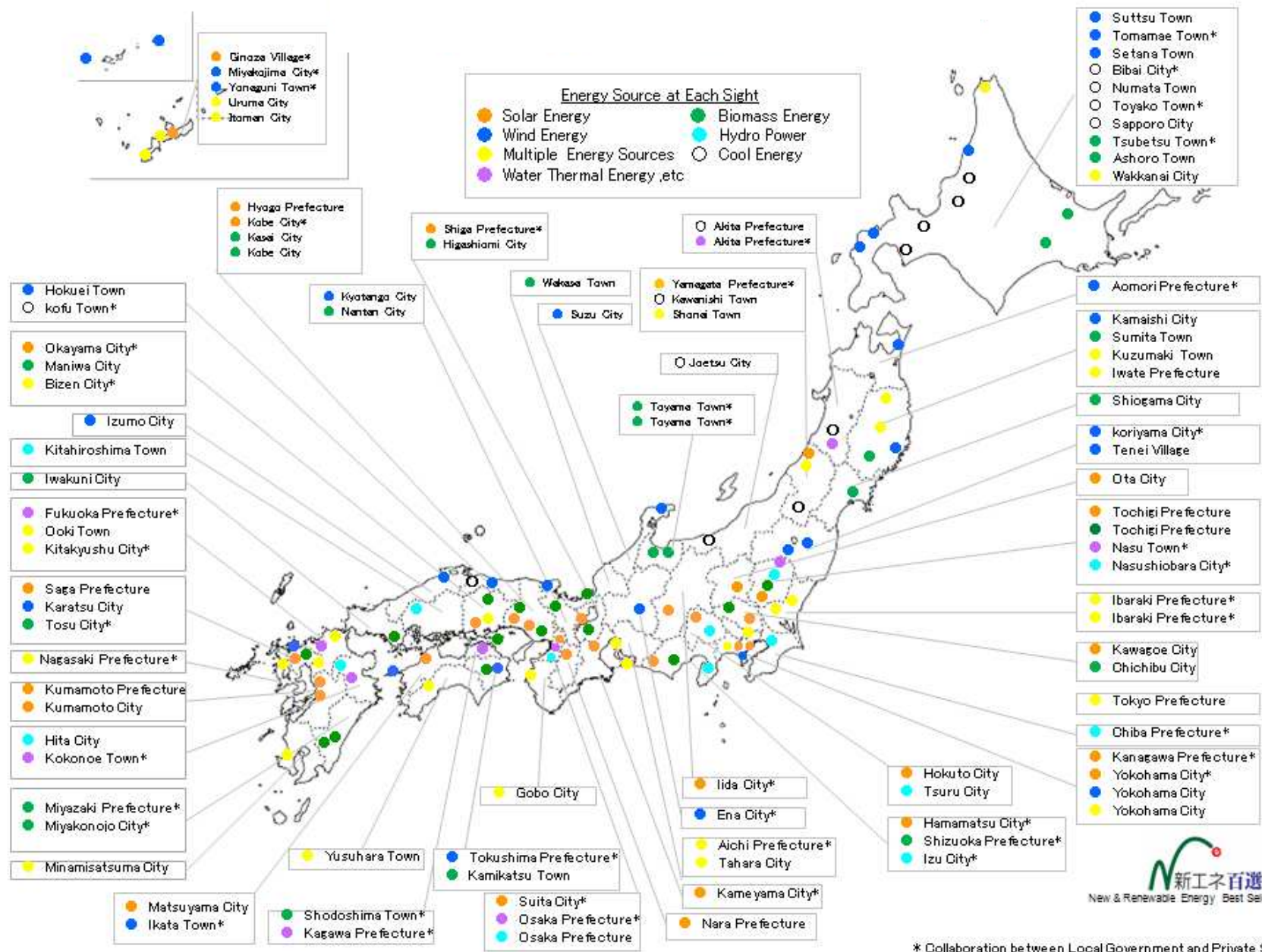
Wind Velocity



Output by photovoltaic system

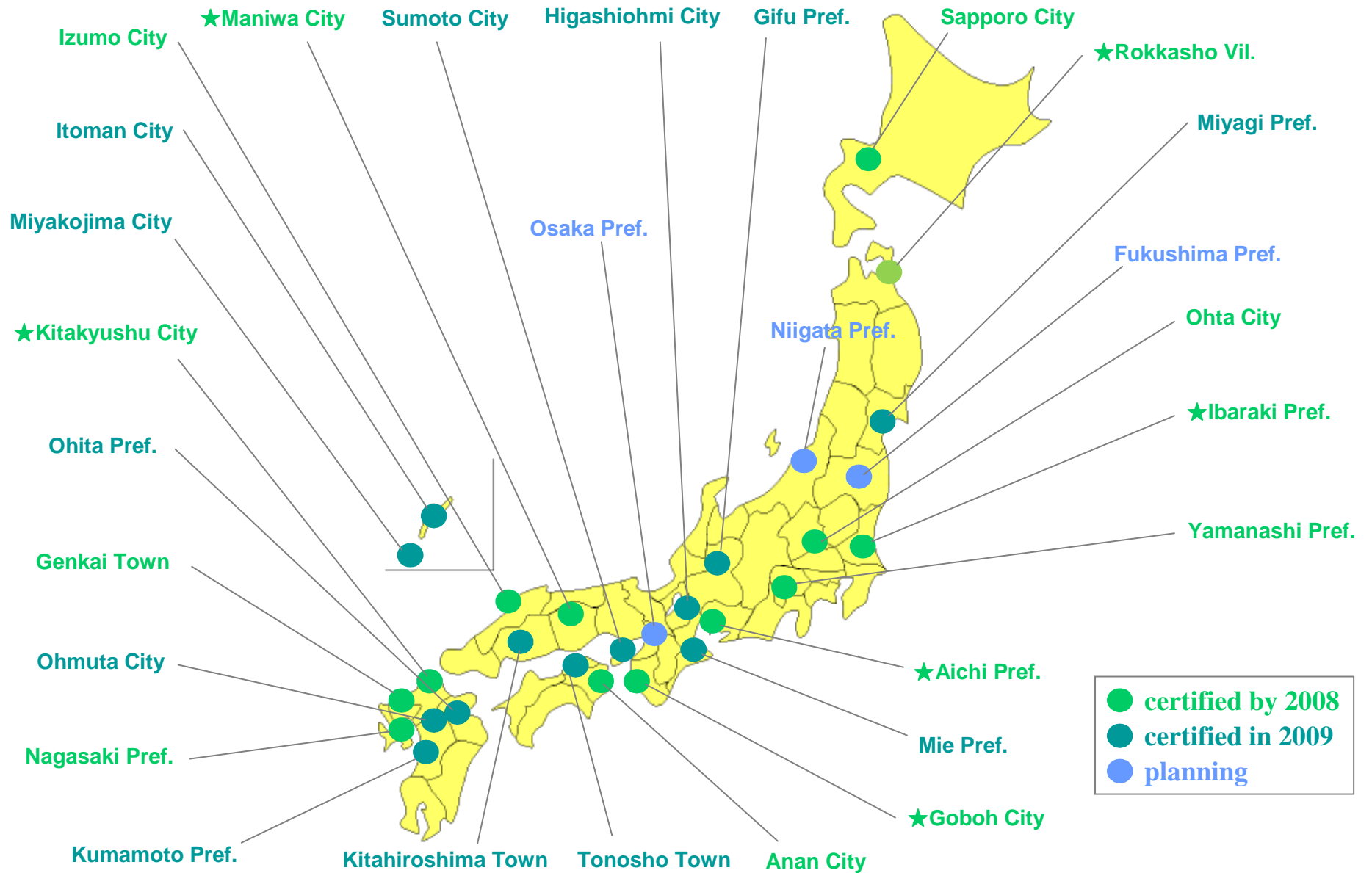


# 100 Advanced & Excellent Local New & Renewable Sights



\* Collaboration between Local Government and Private Sector.

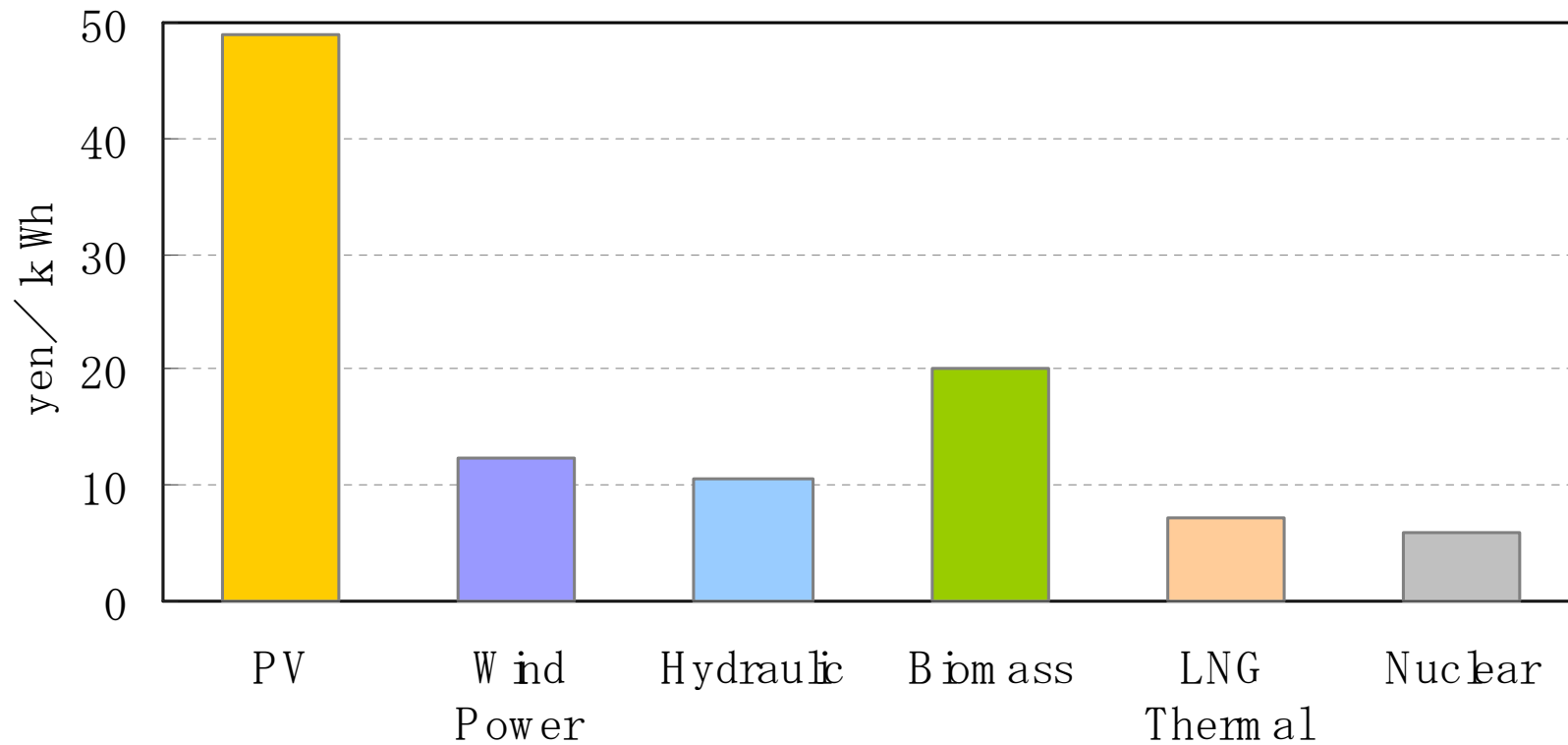
# Next Generation Energy Park



# Cost for Renewable Energies

Renewable Energies are expensive (especially, Photovoltaic).

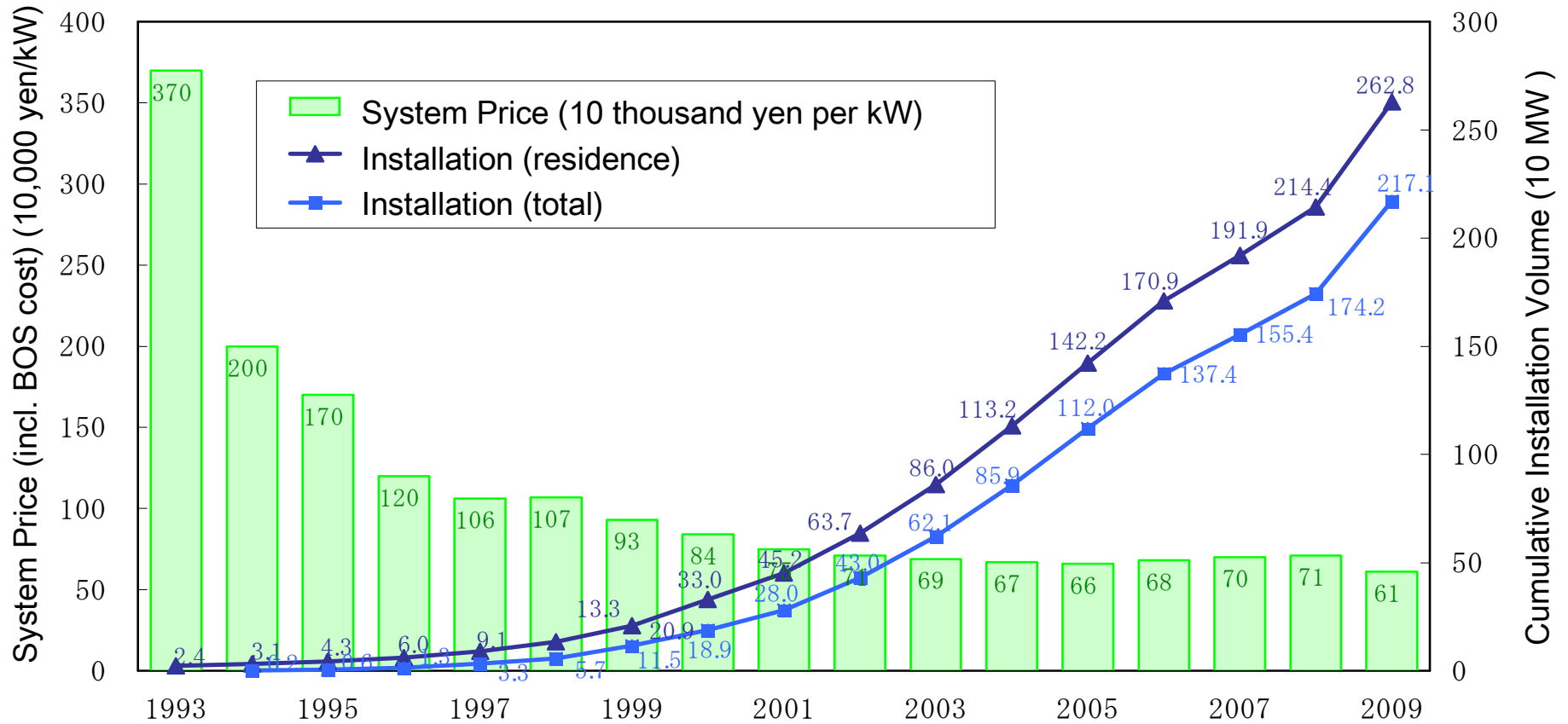
Comparison of the Cost (Example)



# Is the Cost Reduced ?

The cost for PV system is not easily reduced recently.

### Cumulative Installation and System Price

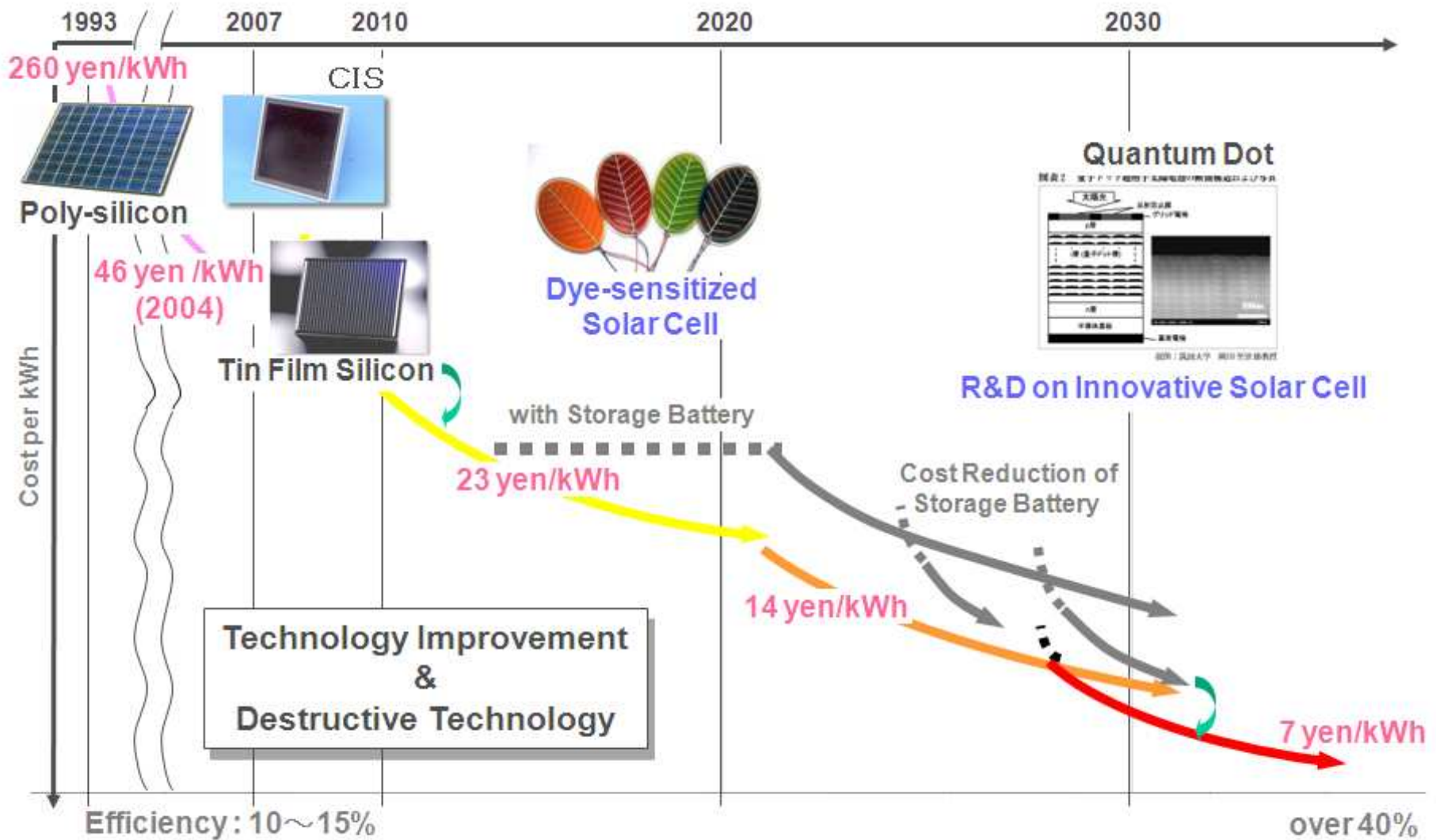




# Is the Cost Reduced ?

- Concerning with the wind, hydraulic and geothermal power plants, low cost locations are developed in advance. The construction cost will become higher in future.
  - The cost for local environmental protections is also increasing recently.
- The cost reduction by R&D and the demand expansion is expected.

# PV Cost Reduction Scenario by R&D



METI arranged the Report of the committee on Road-map toward 2030 (PV2030), NEDO, June 2004

# R&D

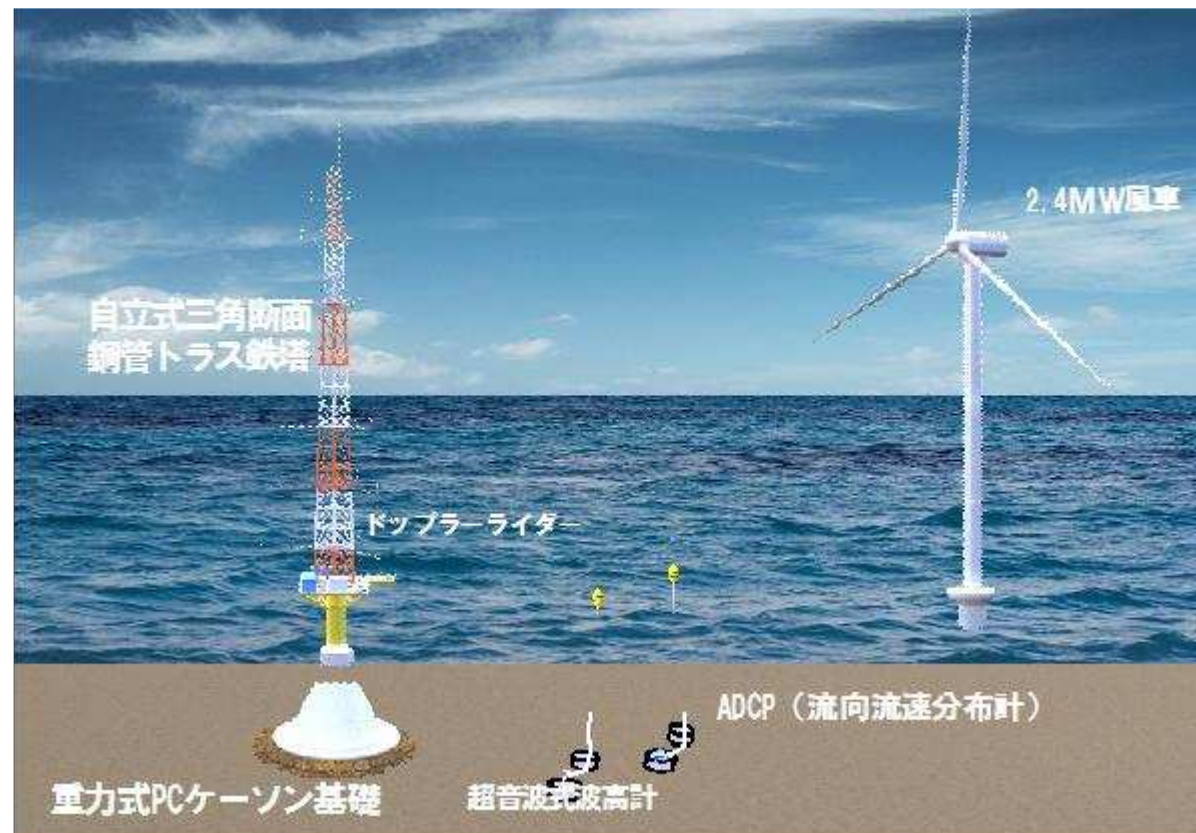
- Methods to estimate the performance and the safety of small sized wind turbines
- Wind velocity measurement (remote sensing technology) and technologies against lightning to improve the efficiency
- Noise reduction technology for social acceptances



# Development of Offshore

The offshore wind turbine has been developed since 2009.

Image



# R&D on Biomass Energy

- Bio-ethanol Production from Celluloses
- Biomass to Gas/Liquid
- Combustion of Unutilized Biomass in Coal Thermal Power Plant

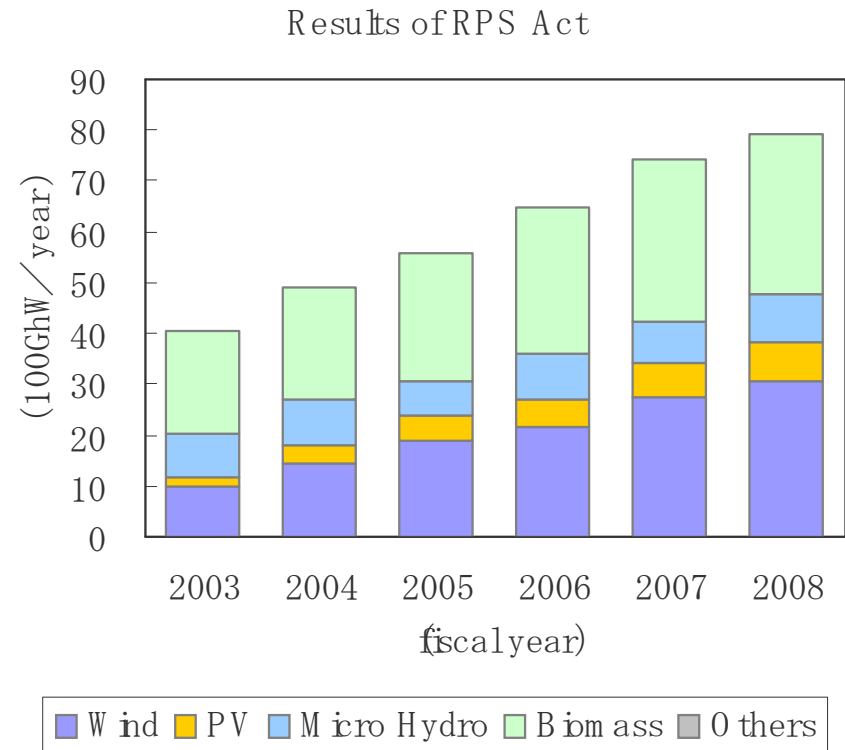
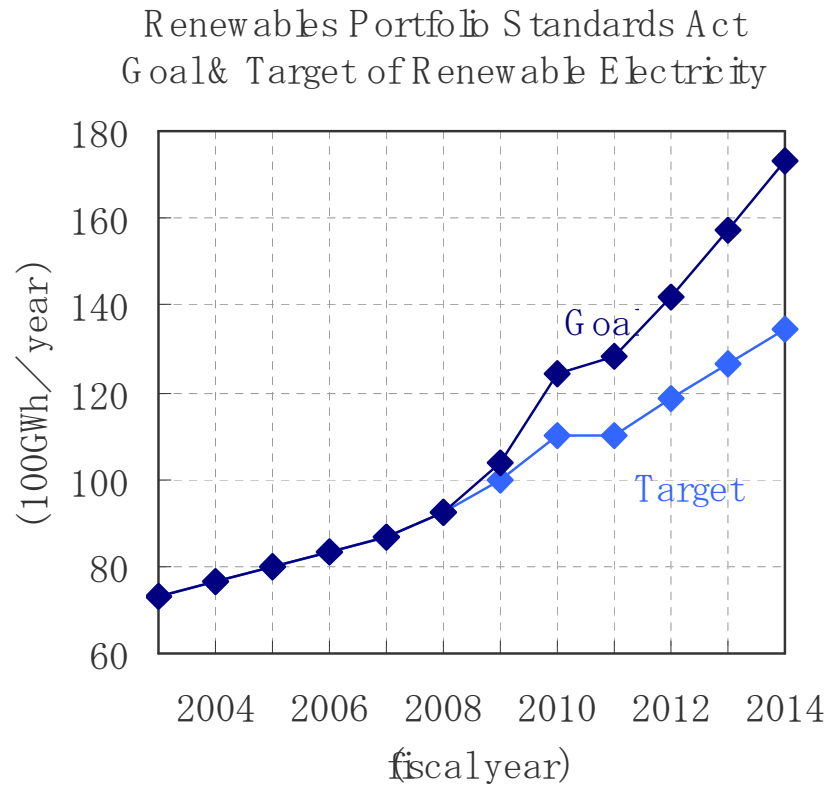
# Measures for Deployment

## Incentives (Subsidies and Taxations)

	for Residence	for Institution
Subsidies	<p><b><u>Photovoltaic</u></b> 70,000 yen/kW (system under 650,000 yen/kW)</p> <p><b><u>Fuel Cell</u></b> 1.3 million yen for 1 unit</p>	<p><b><u>All the New Energies</u></b> non profit bodies etc. half of installation cost companies 1/3 of installation cost</p>
Taxations	<p><b><u>Photovoltaic</u></b></p> <ul style="list-style-type: none"> <li>• Tax Reduction for Home</li> <li>• Loan and for Reform to save the energy</li> </ul>	<p><b><u>All the New Energies</u></b> 7% Tax Reduction (Small &amp; Medium Entities) or Special Depreciation</p>

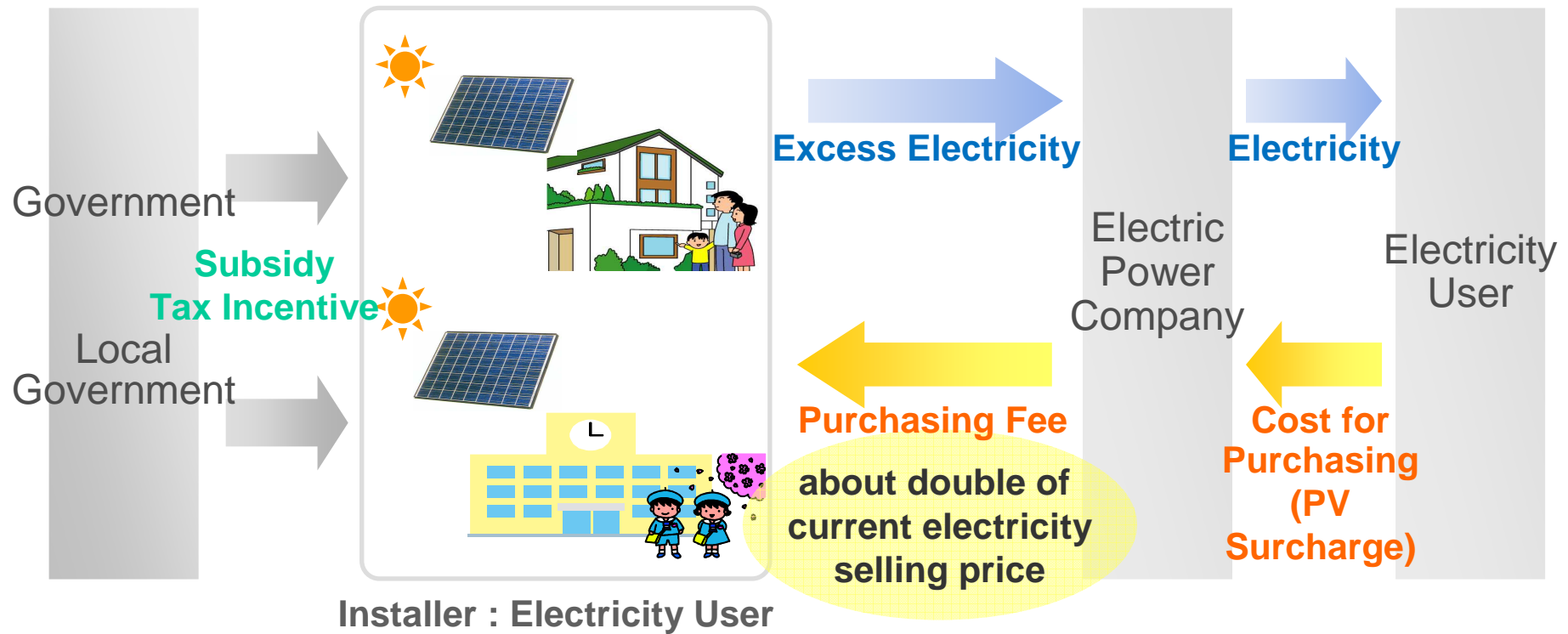
# Measures for Demand Expansion

Electric utilities have to use renewable electricity by RPS Act.



# Measures for Deployment

Excess Electricity Purchasing Scheme for PV started last November. Enlargement of the scheme is under consideration.





# Enlargement of the Scheme

- Enlargement of the scheme to every renewable electricity is under consideration at METI's task force.
- Ideas in which every renewable electricity (except PV) is purchased at 15~20 yen/kWh for 15~20 years are submitted by METI.
- The outline of the reformation will be published this summer.

Ideas (Optional Cases) by METI

Case	A. Range of R.E.	B. Purchasing of Electricity by PV	C. Purchasing from Old Facility	D. Purchasing Rate (yen/kWh)	E. Length of Purchasing (years)	Cumulative Installation (GW)	Electric generation (TWh/year)	CO <sub>2</sub> Reduction (million ton)	Cost for CO <sub>2</sub> Reduction (yen/ton)	Cost for Purchasing (billion yen/year)
1	A1 every R.E.	B1 every electricity	C1 every facility	D1 one price for every R.E.	E3 20 years	38 ~	51 ~	31 ~	~ 52,297	1608 ~
3	A2 every available R.E.		C2 restricted to newly constructed facilities		20	E3/ 20 years	32 ~ 38	40 ~ 51	24 ~ 31	25,743 ~ 28,854
4		15			E2 15 years					
5		20			E2 20 years	32 ~ 35	40 ~ 48	24 ~ 29	19,407 ~ 21,798	462 ~ 629
		B2 excess electricity in case of residences		D2 individually	E2 15 years	31	40	24	20,596	491

# Enlargement of the Scheme (for PV)

Enlargement for the business utilities or large size plants ?

Revision for the non-residential PV ?

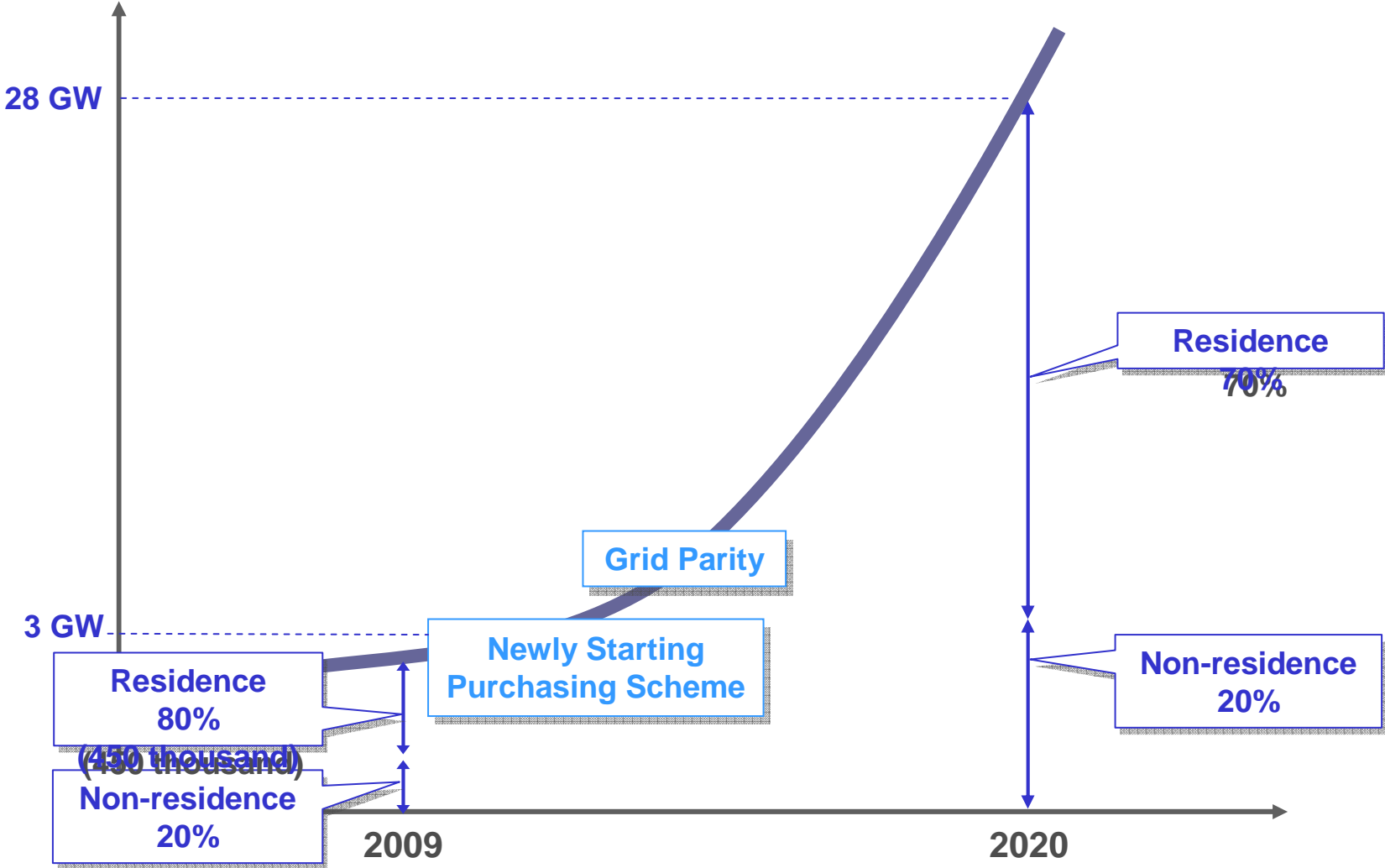
→ expand the installation by non-residence and the thin film solar market

Current Scheme for PV Excess Electricity Purchasing

	~10kW	10~500kW	500kW~
Residence excess ratio : 60% in ave.	purchasing excess electricity at 48 yen per kWh <sup>+</sup>		
Non-residence excess ratio : 10~20%	purchasing excess electricity at 24 yen per kWh <sup>+</sup>		
For Business	out of the obligation		

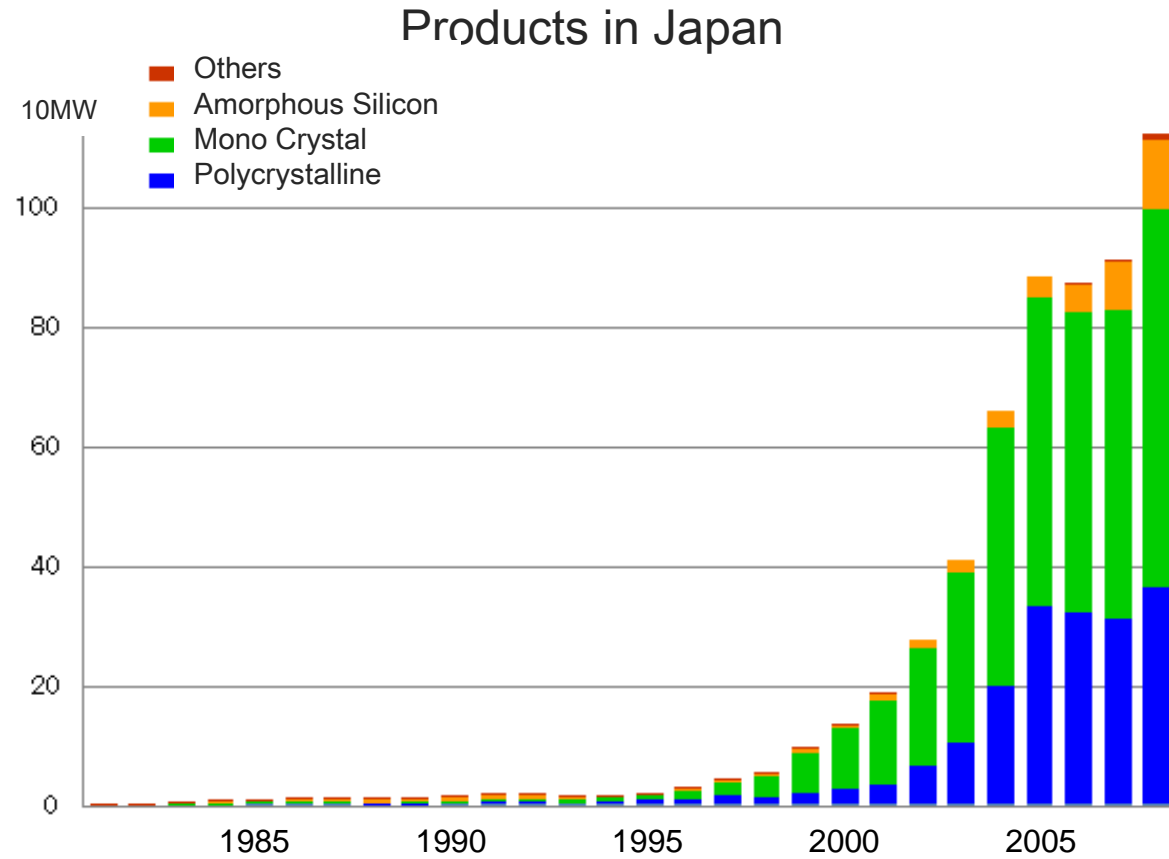
<sup>+</sup> in case of using gas generators, the purchasing price is in principle 39 yen/kWh for the system under 10kW, 20 yen/kWh for the system over 10kW.

# Goal of PV Installation



# Type of Products in Japan

Demand for Thin Film Type (A-Silicon, CIS) should be increased.



(Data) JPEA

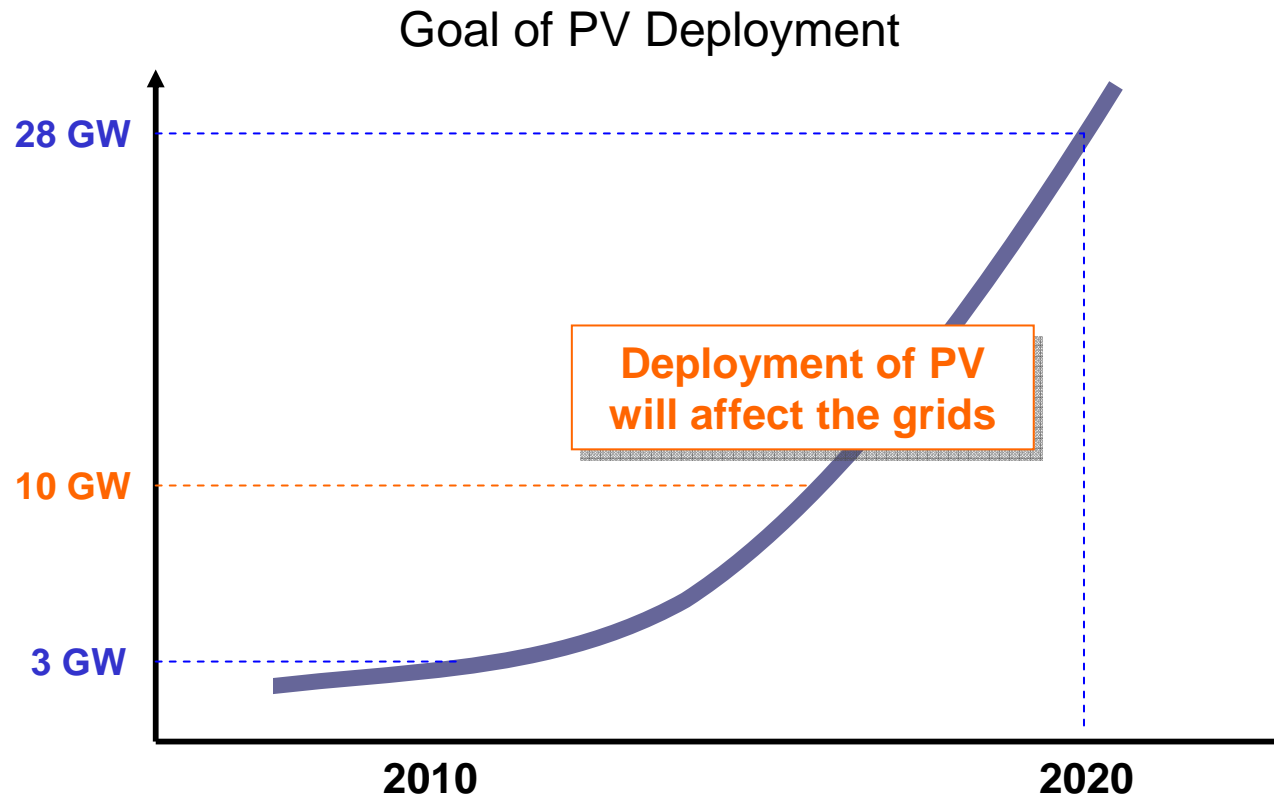
# **Energy Management**

# Policies on Energy Management

- In the wide spread of renewable energies, the network stability control is necessary.
- Energy Management by the combination of conventional energies (electricity, gas, oil), new energies and energy saving technologies is important to cut the CO<sub>2</sub> emission.
- Similar ideas are seen in many countries and areas.
  - **R&D, Verification research, Standardization, Demand expansion, Overseas expansion**

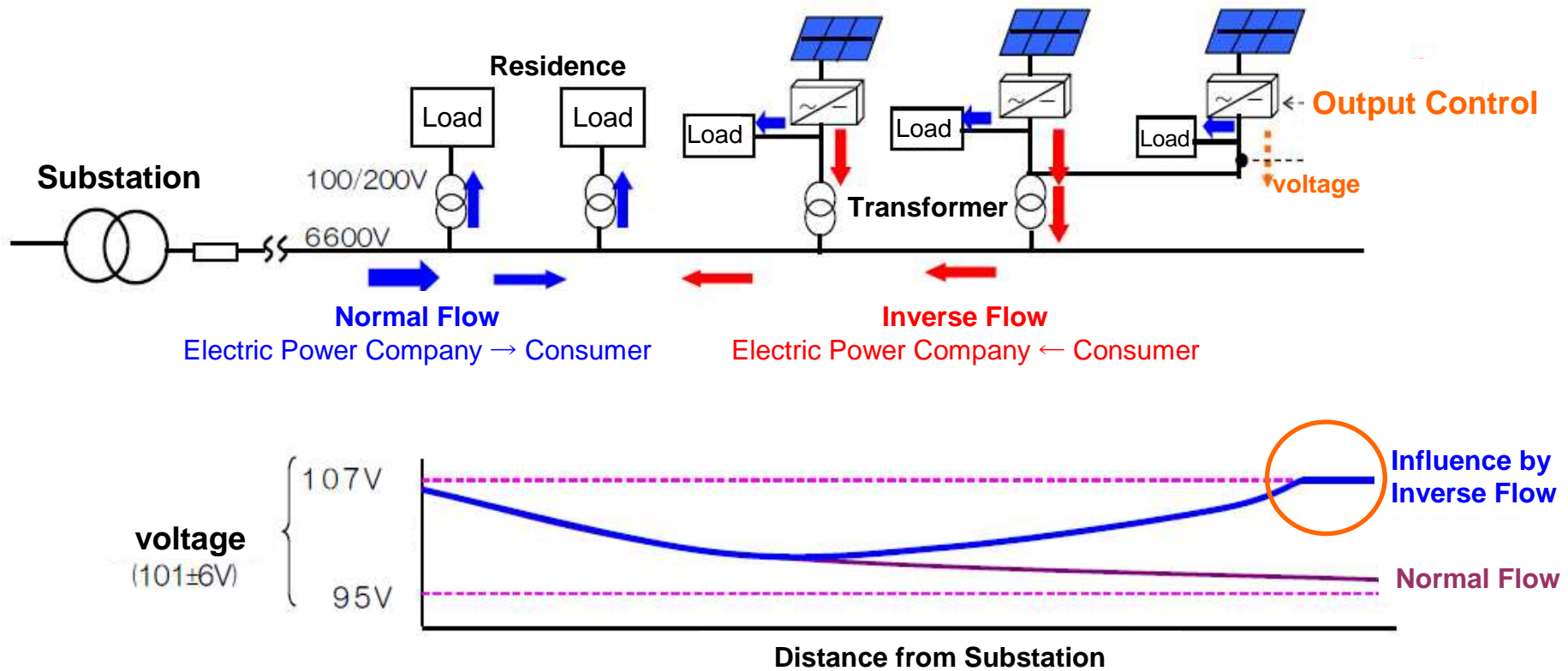
# Influence on Grids

- By the deployment of PV, unstable outputs may affect the grids.
- Energy Management Systems using storage batteries will be important to stabilize the grids.



# Influence on Grids

Voltage of the distribution lines will go up by the residential PVs.

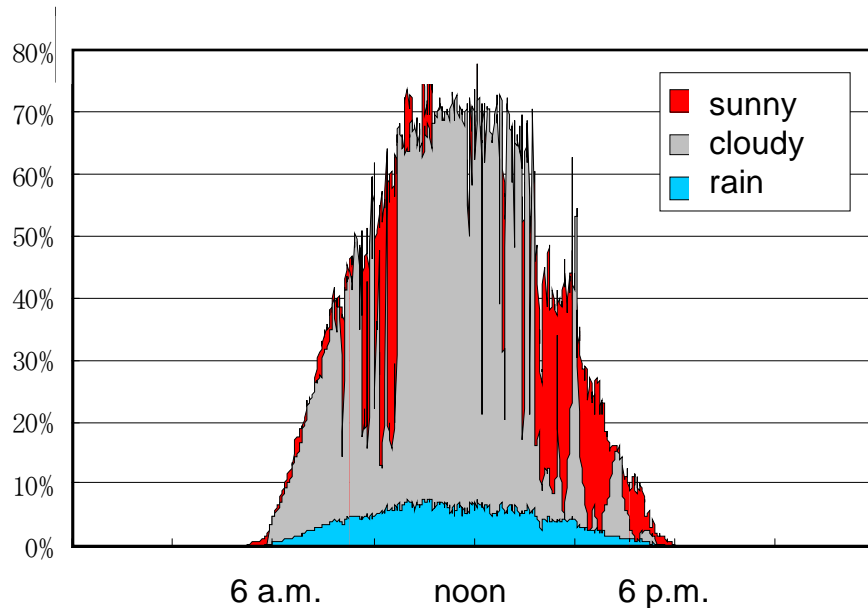




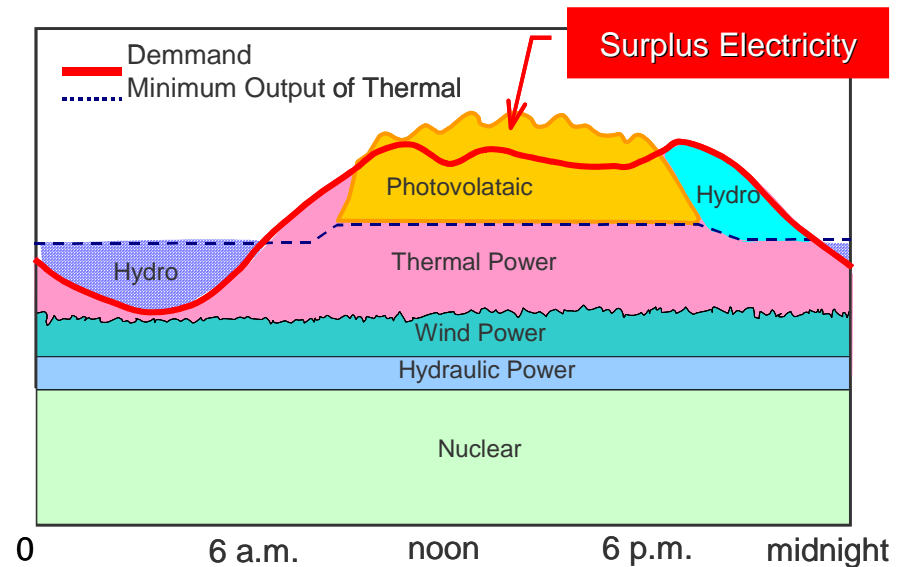
# Influence on Grids

Measures for the output fluctuation and the surplus electricity caused by the residential PV systems will be also required.

### PV Output Fluctuation

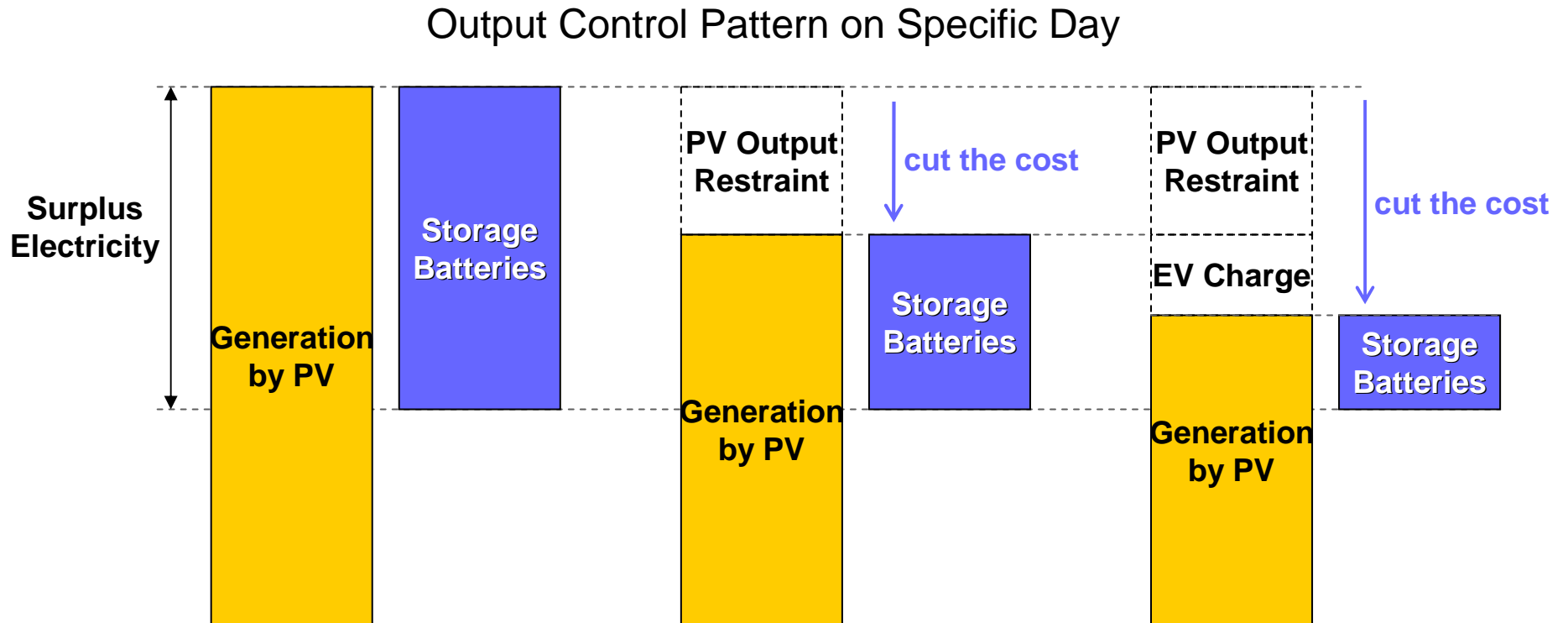


### Surplus Electricity



# Measures for Grid Stabilization

The cost to stabilize grids are estimated 0.14~5.7 billion yen by 2020. PV Output Control, EV Charge and Heat Pumps will be able to reduce the cost (= the volume of storage batteries).



# Measures for Grid Stabilization

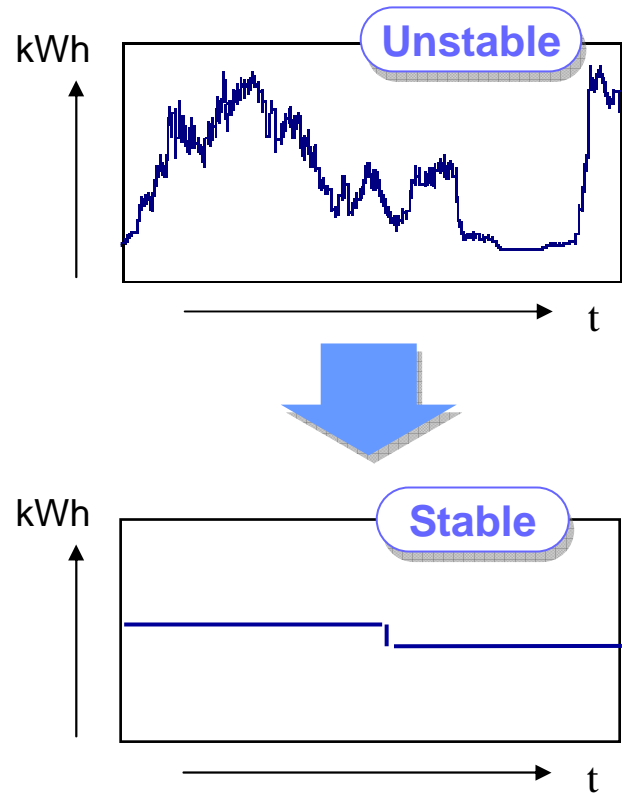
Concentrated installations on residential roof tops has been tested.



Ohta City, Gunma (553 houses)

# Measures for Grid Stabilization

The stability control by storage batteries attached to the wind power plant has been verified. Efficiency of the plant has been improved.



# Measures for Grid Stabilization

Large scale PV plants connected to electricity distribution systems are demonstrated.



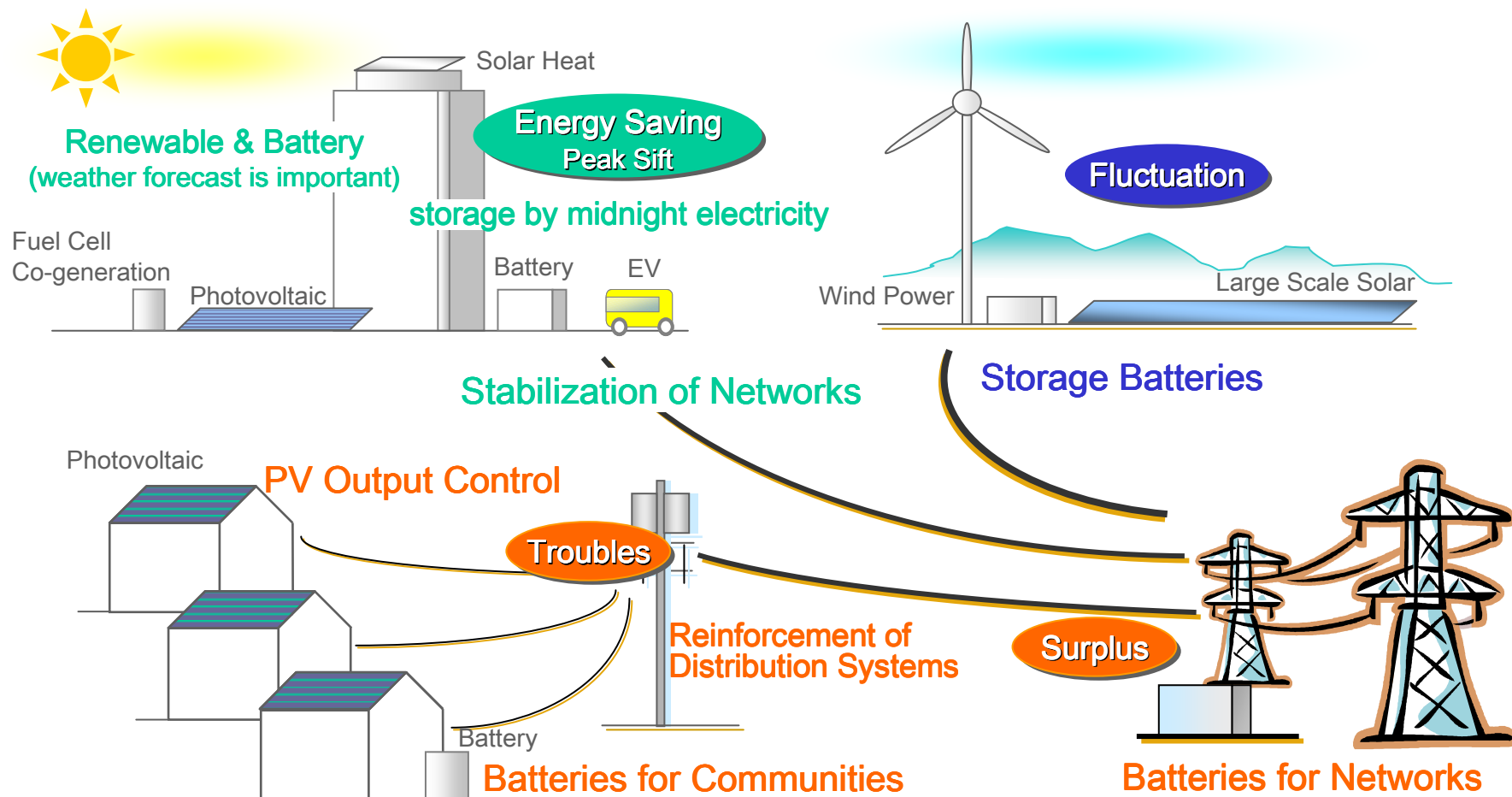
Wakkanai Site, Hokkaido (5MW)



Hokuto Site, Yamanashi (2MW)

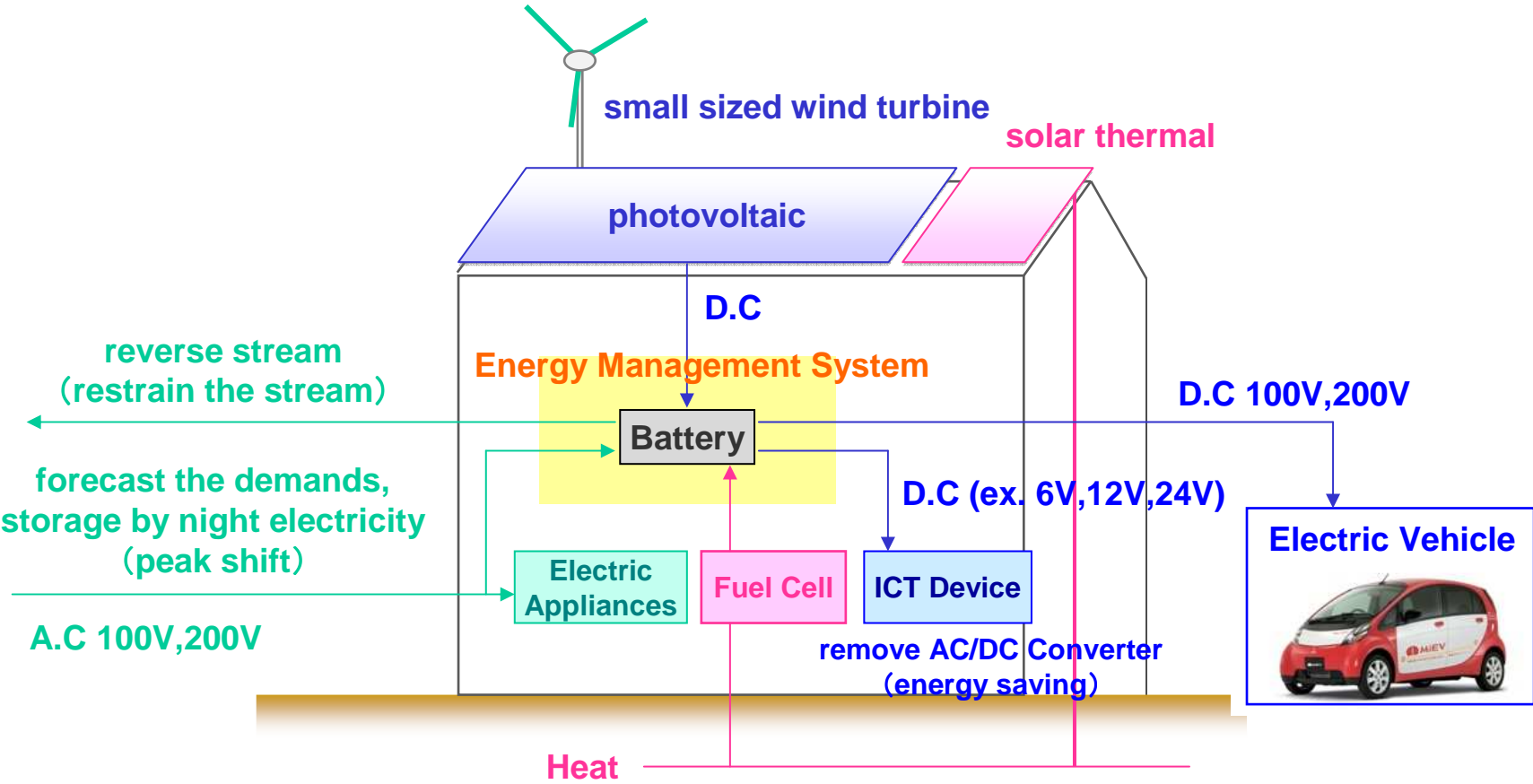
# Energy Management System

Renewable Energy, Energy Saving Technology, Storage Battery and Information & Communication Technology will play important rolls.



# Energy Management System

Energy managements in houses and buildings are possible.



# Standalone Type

- from “selling to grids” to “minimum influence on grids” by energy management technologies
- for example, the commercialization of “standalone type PV system with storage battery” will be expected by many areas



# **Storage Battery**

# Importance of Storage Battery

- Storage batteries are key components for Energy Management Systems. (essential for the deployment of renewable energies, effective for peak shift)
- Storage batteries are key devices for electric appliances and next generation vehicles, etc.
- The related industry has a chance to become one of the major industries.

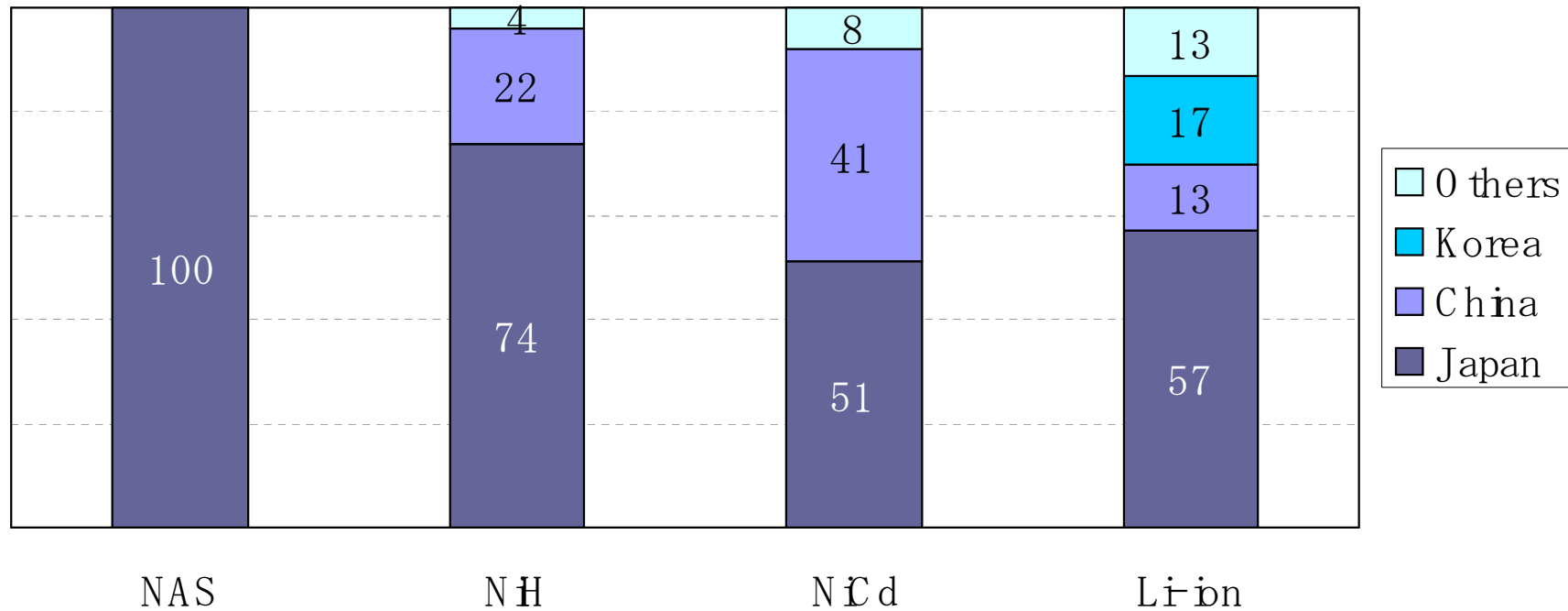
# Policies on Storage Batteries

- International Competition and Collaboration
  - Cost Reduction
  - Performance Improvement
- **R&D, Standardization, Demand Expansion**

# Market Share of Storage Batteries

Japanese manufactures have high market share in various batteries.

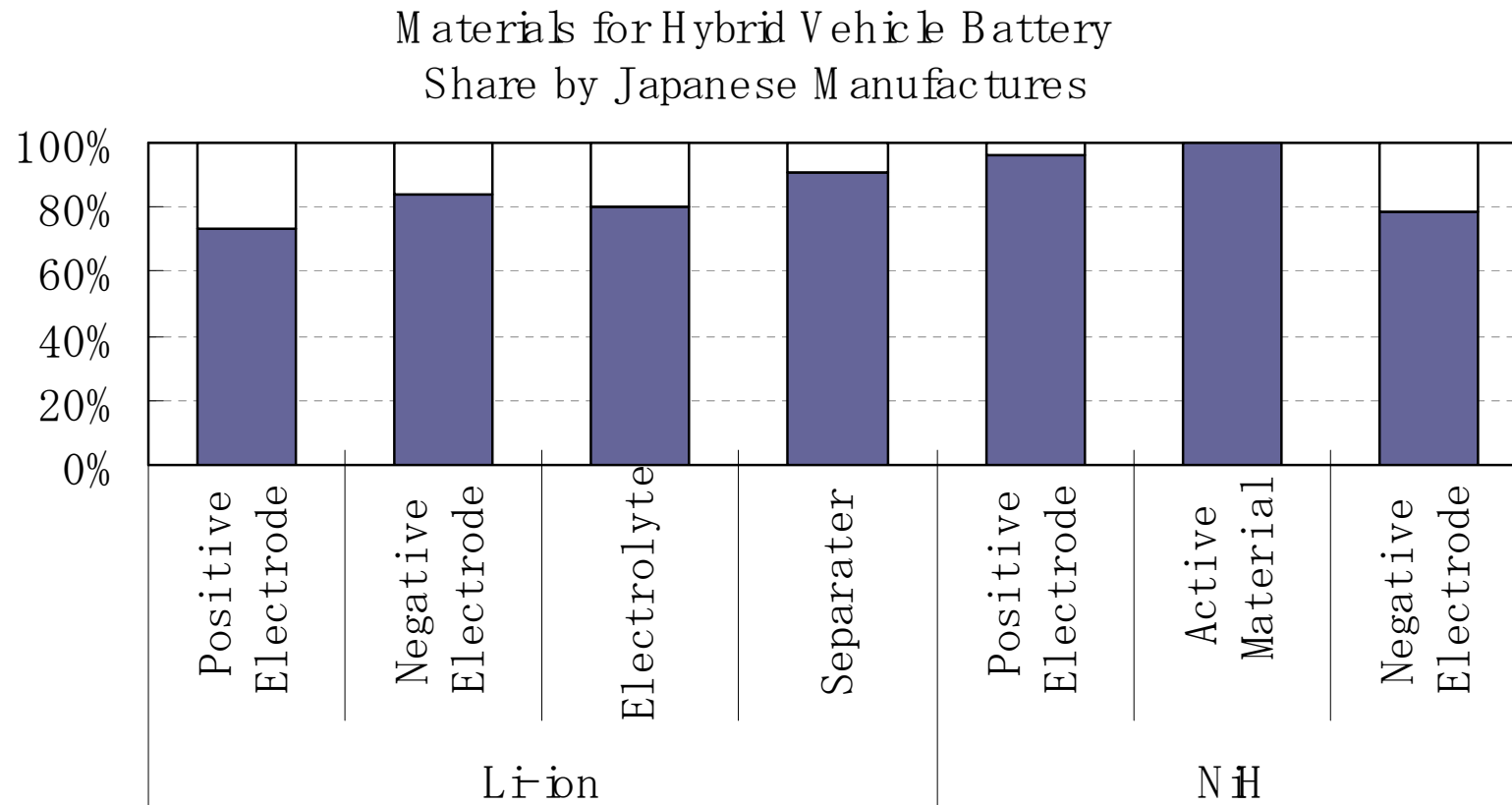
World Market Share of Storage Batteries



(Source) ITI, METI

# Market Share of Materials for Batteries

Japanese companies also have high market share in materials for hybrid vehicle batteries.



# Global Competition

Korean and Chinese manufactures increase their sales volume.

World Market Share of Li-ion Battery

2005		2008	
1	SANYO Group (Japan)	1	SANYO Group (Japan)
2	SONY (Japan)	2	Samsun SDI (Korea)
3	Samsun SDI (Korea)	3	SONY (Japan)
4	Panasonic (Japan)	4	BYD (China)
4	BYD (China)	5	LG Chemical (Korea)
6	LG Chemical (Korea)	6	BAK (China)
7	天津力神 (China)	7	Panasonic (Japan)
8	NEC Tohkin (Japan)	8	HitachiMaxeII (Japan)
9	HitachiMaxeII (Japan)	9	ATL (Hongkong)

(Source) ITI, NEDO

# Current Situation of Storage Battery

The improvement of the price and the performance is important.

ex. Goal of R&D for EV Battery by 2015

Cost : 1/7, Performance : 3/2 (compared to current level)

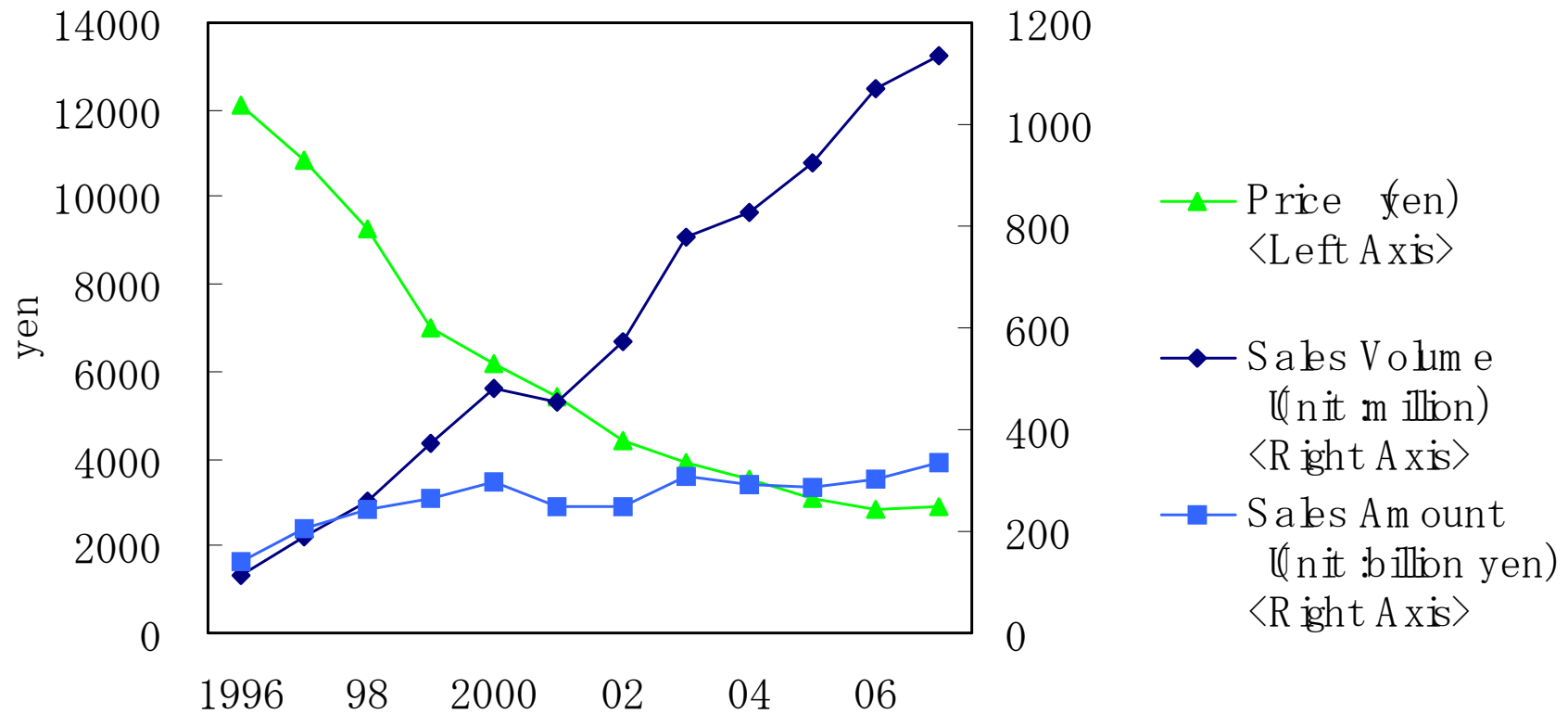
Characteristics of Various Batteries (sample)

	Pb	NAS	Ni-H	Li-ion
Energy Density (Wh/kg)	35	110	60	120
Efficiency (%)	86.8	87.4	90	95
Life Cycle	4500	4500	2000	3500
Cost for kW (1,000 yen)	150	240	100	200
Cost for kWh (1,000 yen)	50	25	100	200

# Is the Cost Reduced ?

The price of the battery is not easily reduced recently.

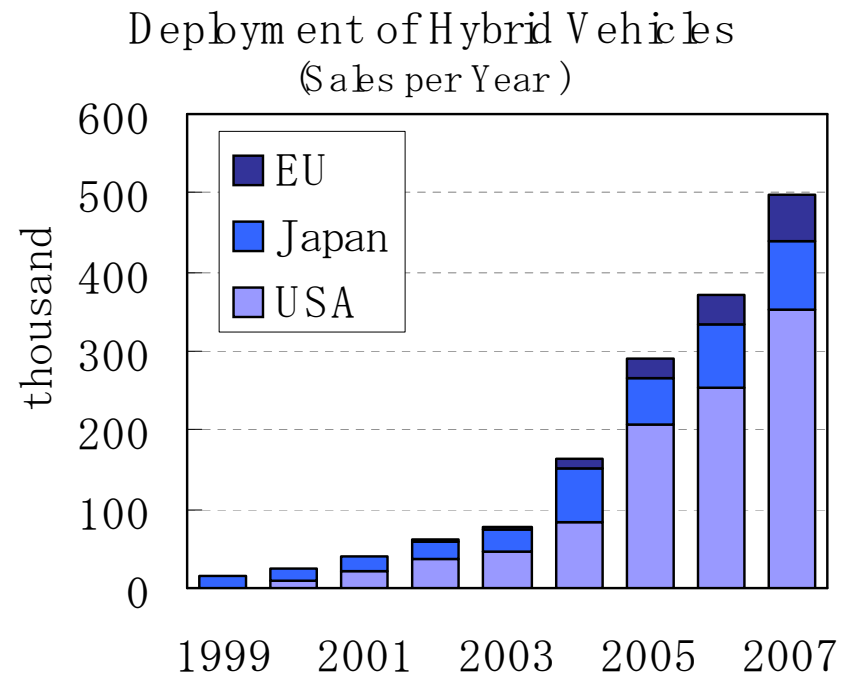
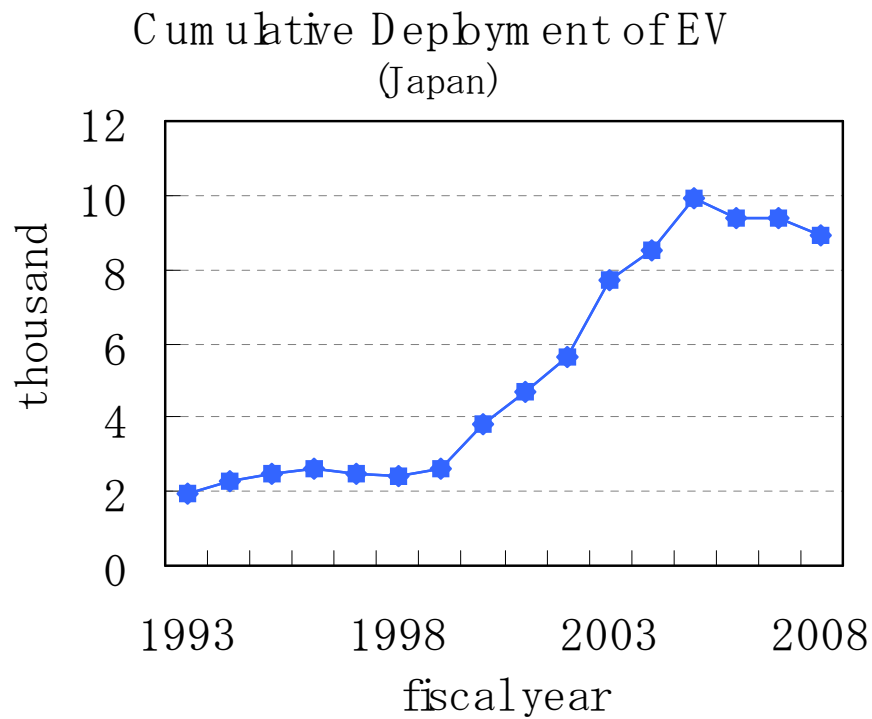
Sales Trend of Li-ion Storage Battery





# Is the Cost Reduced ?

Although the sales volume of hybrid vehicles is increasing, the deployment of EV has stopped recently in Japan.



# Budget for Storage Battery

## Budget for Storage Batteries

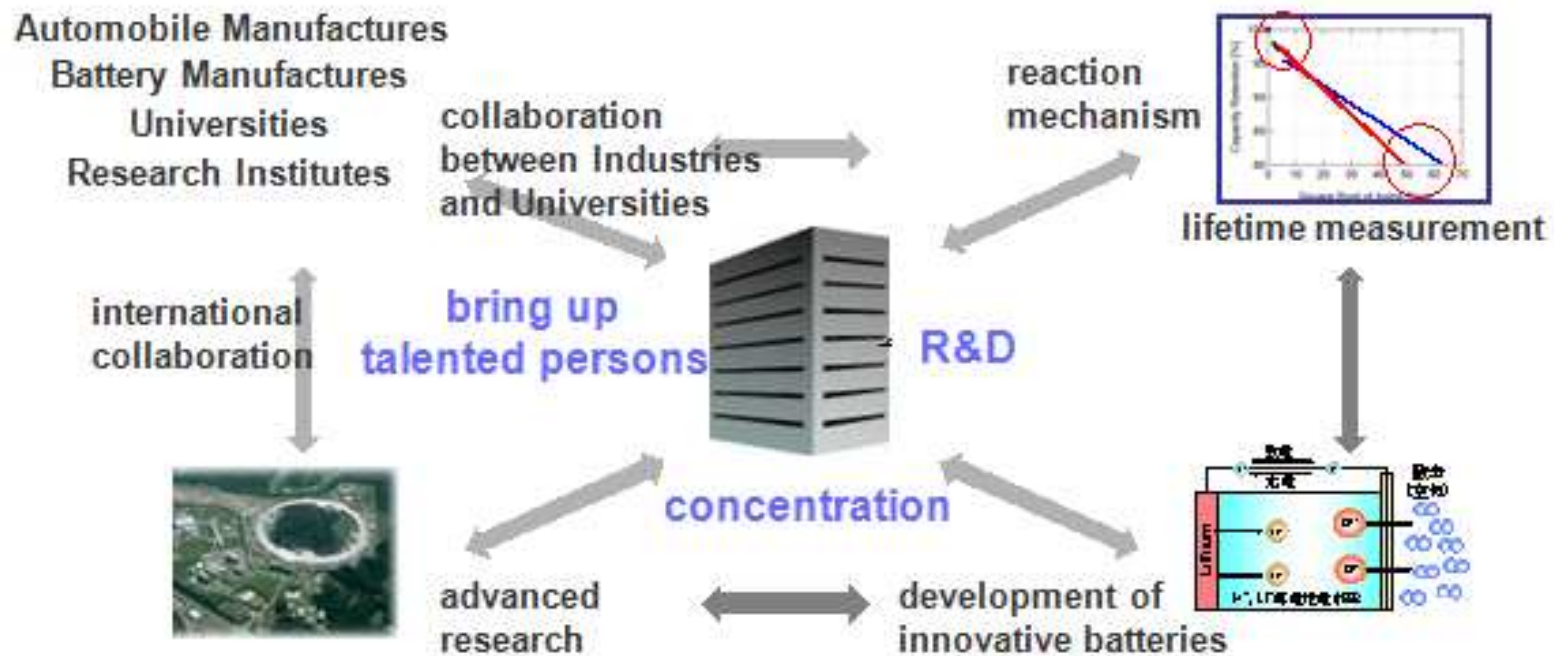
Unit : billion yen

	FY2010	FY2009
Fundamental R&D	3.0	3.0
R&D on Automotive Batteries	2.5	2.6
Battery for Stabilization of Network	0.8	1.7
Battery for Large Scale Solar Plant	0.2	2.0
Battery with Various Appliances	4.3	
Subsidy for Installation of EV,etc.	13.7	4.3

# R&D on Storage Battery

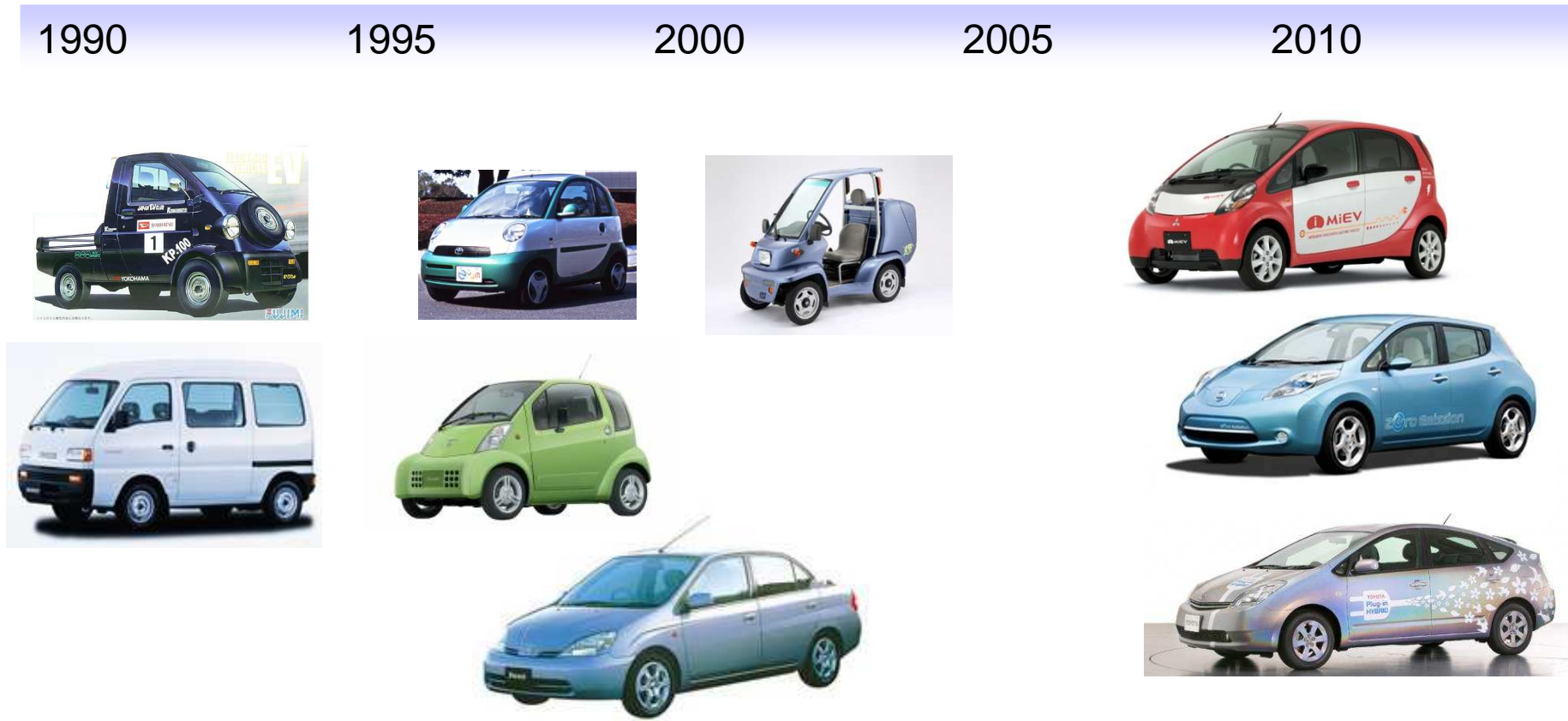
R&D on innovative fundamental technologies has been started under the collaboration between industries and universities since 2009.

Formation for Fundamental Research of Innovative Battery



# New EV Boom ?

Japan experienced EV booms several times.  
New boom has come ?



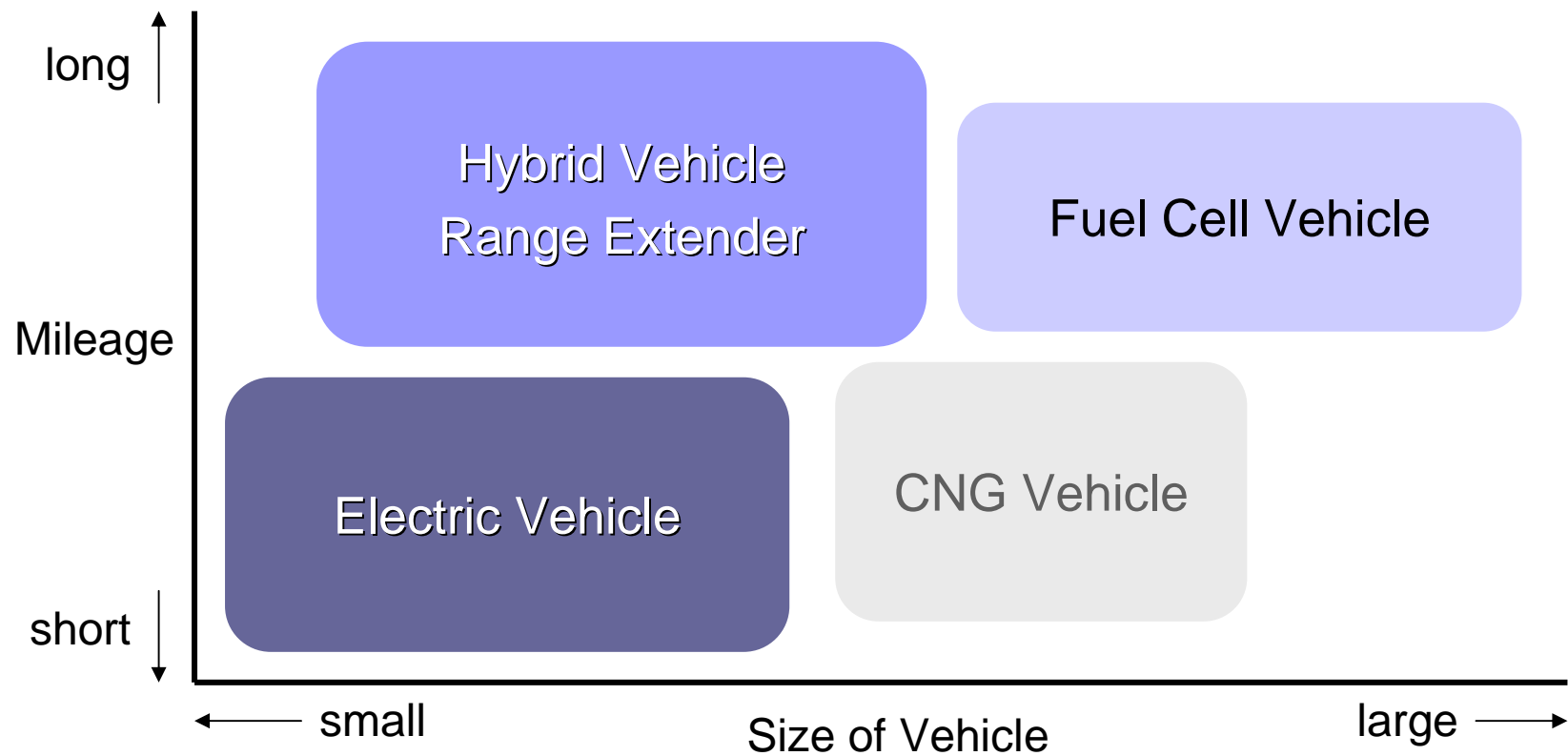
# One Example ...

A “Rescue EV” is demonstrated in Niigata Prefecture.



# Characteristics of EV

EV is thought to be used for short mileage & small car.



# Conclusion

- **Policy on Renewable Energy**
  - Support to local governments
  - R&D, Standardization
  - Deployment
    - Incentives, FIT
- **Energy Management System & Storage Battery**
  - R&D, Standardization
  - Deployment
    - Demonstrations, Incentives



# Budget for New & Renewable Energy

134 billion yen for FY 2010 Budget

unit : billion yen

	FY2010 Budget	FY2009 Supplemental Budget
<b>Deployment (Subsidy)</b>		
Subsidy for Installation of Residential Photovoltaic System	40.1	22.0
Subsidy for Purchasing of Clean Energy Vehicle	13.7	
Subsidy for Installation of Residential Fuel Cell	6.8	2.0
Subsidy for Installation of New Energy (non-residence)	34.5	16.1
<b>Research and Development</b>		
<b>Photovoltaic</b>	<b>6.4</b>	<b>0.9</b>
Innovative Photovoltaic Cells	1.9	0.9
R&D on Next Generation High Efficiency Solar Cell	4.1	
<b>Wind Power</b>	<b>2.6</b>	
Off Shore Wind Power Technologies	2.3	
<b>Bio Energy</b>	<b>6.2</b>	
Bio-ethanol Production System from Celluloses	1.9	
<b>Storage Battery</b>	<b>10.6</b>	
R&D for Scientific Innovation on New Generation Batteries	3.0	
Research on Storage Batteries with Various Appliances	4.3	
<b>Fuel Cell</b>	<b>10.7</b>	<b>0.3</b>
<b>Support for Start-up Business on New Energy</b>	<b>1.6</b>	