

**2010 Annual Report on Energy**  
(Japan's "Energy White Paper 2010")  
<Outline>

June, 2010

Ministry of Economy, Trade and Industry  
Government of Japan

## Energy White Paper

- The Energy White Paper is a legal white paper reported annually to the Diet following a cabinet decision based on Article 11 of the Basic Act on Energy Policy.
- The white paper is usually made of Part 1 which sets themes and topics in accordance with the recent situation, analyses the policies and introduces trends; Part 2 which shows domestic and overseas energy trends with the use of graphs and data; and Part 3 which looks back on the resource and energy policies in the previous fiscal year.
- Important issues in the subject fiscal year have been selected as the themes of Part 1. For example, in the 2008 white paper, factors for the sharp rise in the crude oil price up to 2008 were analyzed.

## Objective of the 2010 white paper (challenges and future policies on energy)

This white paper aims to transmit information particularly on the following 2 points.

### (1) Country-by-country comparison through quantitative evaluation of energy security

○ With the growing need to respond to energy security and global warming issues when planning energy policy, the white paper aims to show the necessity and direction of the energy policies from the viewpoint of energy security by diachronically analysing and comparing the energy security of major consuming countries.

### (2) Trend of introduction and efforts toward future expanded introduction of renewable energy

○ The white paper explains the growing international interest in renewable energy while touching on trends on investment and business deployment. It introduces renewable energy introduction trends and the actual situation on renewable energy in Japan and other major countries, as well as explaining the details of Japan's policy measures including the two energy-related laws established in July 2009 and the viewpoints toward future dramatically expanded introduction.

## Date of the Cabinet decision

June 15 Cabinet decision and report to the Diet

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# I. Country-by-Country Comparison through Quantitative Evaluation of Energy Security

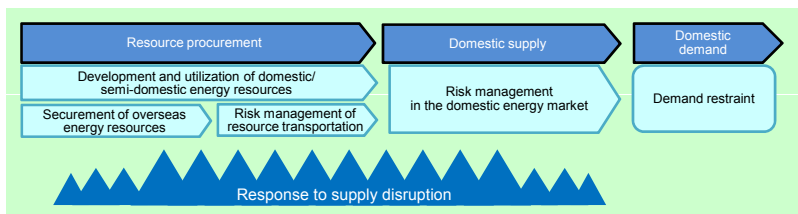
## 1. The fundamentals of energy security

Energy security refers to being able to secure energy in the “quantity” necessary for people’s lives, economic and social activities, and national defense, etc. at affordable “prices.” With changes through the years in the political situation, economic/industrial structures, and risks threatening them, the environment around the fundamentals have also changed.

- [1] In the 18th century, the Industrial Revolution dramatically expanded the use value of energy resources for production & transportation and germinated the strategic importance of energy resources
- [2] In the 20th century, energy was secured to enhance national power and prosecute wars.
- [3] After the oil shocks, supply disruptions became a major risk and the key policy target was to minimize their effects.
- [4] In the 2000s, on top of supply disruption risks, avoidance of supply and demand tightness risk and minimization of their effects have also challenged us.

## 3. Concept of quantitative evaluation

- ◇ Indices (key indices) related to core elements among comprehensive energy security components are quantitatively evaluated. In addition, indices that can supplement key indices (supplementary indices) are also quantitatively evaluated.
- ◇ For evaluation, at each stage of the supply chain, specific key indices and supplementary indices have been selected, from the viewpoint of understanding changes with age and country-by-country comparison.



## 2. Risk threatening energy security

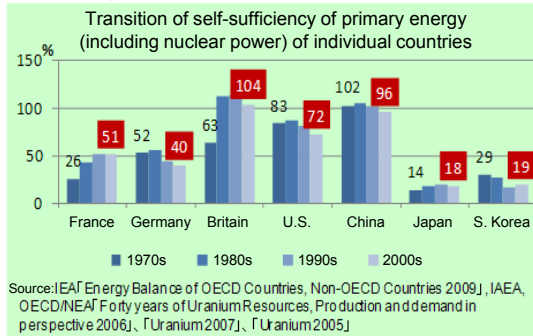
- Geopolitical risk (Countermeasures: increase in self-sufficiency, diversification of import counterparts, diversification of energy sources, response to supply disruption by stockpiling, etc.)
  - Political and military situations (wars, civil wars, embargos, etc.) of individual countries (resource producing countries and neighboring countries + countries near the transportation route)
  - International relations
  - Risk used as diplomatic tool (crude oil embargos, stopping of gas delivery via pipelines, etc.)
  - Resource nationalism (seizure/nationalization, levy increase, export regulations, etc.)
  - Scramble for resources among resource consuming countries
  - Other geopolitical risks
    - \* In recent years, risk of terrorism, piracy, etc. has become apparent.
- Geological risk (Countermeasures: increase in self-sufficiency, diversification of energy sources, etc.)
  - Reduction of reserves
  - Uneven distribution of resources
- Risk in domestic supply system (Countermeasures: enhancement of supply reliability, etc.)
  - Reduction in equipment investment (aging of equipment)
  - Stagnant technological development
- Supply and demand tightness risk (Countermeasures: increase in self-sufficiency, diversification of import counterparts, diversification of energy sources, etc.)
- Market price risk (Countermeasures: international cooperation toward market stabilization, etc.)
- Risk of natural disasters, accidents, strike, pandemic, etc. (Countermeasures: increase in self-sufficiency, enhancement of supply reliability, response to supply disruption by stockpiling, etc.)

Stage in the supply chain	Key indices	Supplementary indices
1. Development and utilization of domestic/semi-domestic energy resource	A. Primary energy self-sufficiency (including nuclear power)	➤ Utilization rate of power supply facility
2. Procurement of overseas energy resources, and risk management of resource transportation	B. Diversification of countries from which energy is imported C. Diversification of energy source D. Reduction of dependency on choke points	➤ Amount of direct investment into resource-producing countries
3. Risk management in the domestic energy market	E. Reliability in electric power supply	➤ Energy-related governmental R&D expenses
4. Demand restraint	F. GDP specific energy consumption	➤ GDP specific energy consumption at each sector
5. Response to supply disruption	G. Response capability to supply disruption by stockpiling	➤ Usable years of domestic resources

# I. Country-by-Country Comparison through Quantitative Evaluation of Energy Security

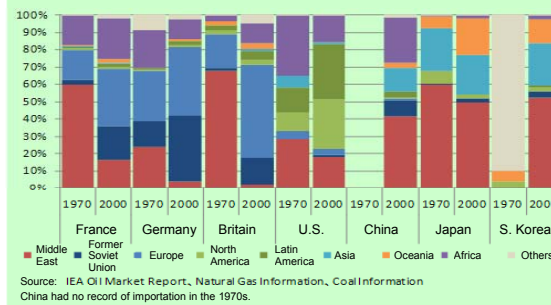
## 4. Evaluation of key indexes

### A. Primary energy self-sufficiency (including nuclear power)



- France increased its self-sufficiency from 26% in the 1970s to the current 50% or more by adopting measures for promoting nuclear power plants.
- Britain secured a high level of self-sufficiency by promoting maintenance and increase of the production amount of domestic resource energy.
- China sharply increased domestic demand through industrialization and economic progress. It has been a net importer of petroleum since 1993 and of natural gas since 2006.

### B. Diversification of import counterparts



- It is important to promote diversification of import counterparts in order to strengthen energy security.
- China has diversified import counterparts to countries in Latin America and Africa while accepting certain country risks.
- Western nations have decreased dependency on the Middle East, while shifting import counterparts to neighboring resource-producing countries. However some of such countries have certain country risks.
- In Japan, despite the decreased dependency on the Middle East in the 1980s, dependency on the Middle East subsequently increased. Expanded use of coal has increased its share in Oceania.

◆ Evaluation on import counterpart diversification for crude oil and natural gas based on the import quantity (in the 2000s) Herfindahl-Hirschman Index (HHI)

Crude oil	HHI
China	1,032
U.S.	1,077
France	1,190
S. Korea	1,459
Japan	1,736
Germany	2,187
Britain	4,162

- China is rated high since it has advanced diversification to the Middle East, Asia, and Africa, etc.
- Britain is rated low since Europe accounts for a high percentage of the imported crude oil.

◆ Evaluation on diversification of import counterparts by multiplying import quantity by country risk

Crude oil	HHI
France	1,306
U.S.	1,347
S. Korea	1,411
China	1,487
Japan	1,733
Britain	2,085
Germany	3,401

- Evaluation for China which aggressively promotes diversification to Africa, etc. has been slightly lowered.
- Evaluation for Britain which highly depends on Europe with low country risk improves.

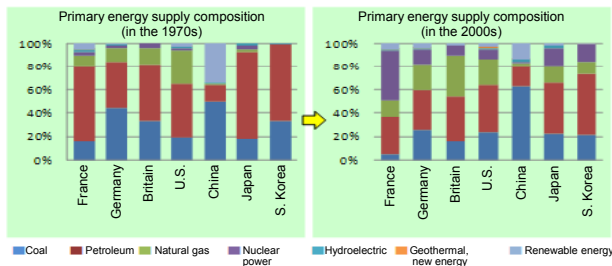
Natural gas	HHI
Japan	1,680
France	1,934
S. Korea	2,119
Germany	3,259
Britain	4,905
China	7,281
U.S.	7,858

- Germany is rated medium since it depends approx. 40% on former Soviet Union and approx. 50% on Europe.
- China is rated low since it substantially solely depends on Oceania.

Natural gas	HHI
S. Korea	2,418
France	2,518
Japan	2,613
China	3,272
Britain	3,896
U.S.	4,972
Germany	6,654

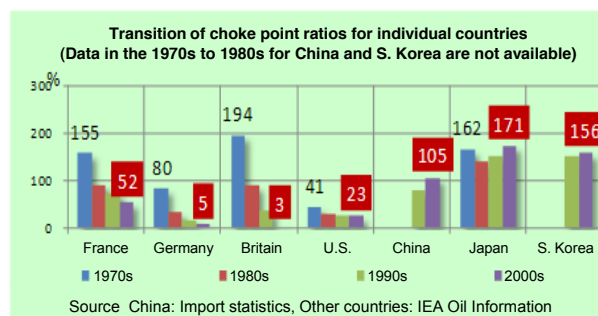
- Evaluation for Germany worsens reflecting dependency on the former Soviet Union.
- Evaluation becomes better since country risk of Oceania is low.

### C. Diversification of energy source



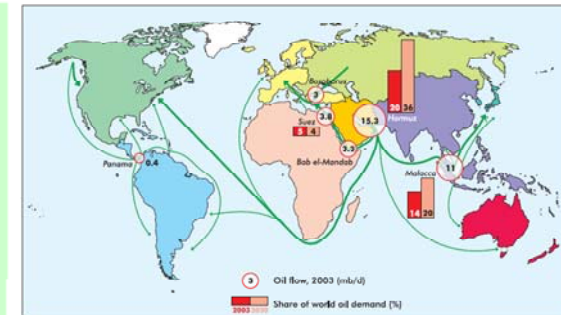
- France strongly promotes nuclear power, while suppressing the ratios of coal-fired and petroleum-fired power generation.
- Germany promotes introduction of natural gas and nuclear power, replacing coal and petroleum. Currently, it is moving toward the phase-out of nuclear power and the expansion of the introduction of renewable energy.
- Britain promotes the expanded use of domestic natural gas.
- Japan and S. Korea take measures to expand the utilization of alternatives to oil, and particularly encourage diversification of energy sources for power generation.

### D. Dependency on choke points



- A choke point refers to a strategic point on a sea route or on water such as a straight or a canal that is strategically important from the viewpoint of geopolitics, and economy and defense, etc. A choke point is, in many cases, used for transporting a large quantity of energy and extremely vital for energy security.
- The choke point ratio is a ratio of the total quantity of crude oil which passes a choke point with respect to the total import quantity. The ratio can sometimes exceed 100% because when a choke point is passed multiple times all the multiple times are calculated.
- Decrease in Britain and Germany is remarkable. Among China, Japan and S. Korea, all of which have high dependency, the dependency of China which has diversified import counterparts ranging from Africa and South America, etc. is relatively low.

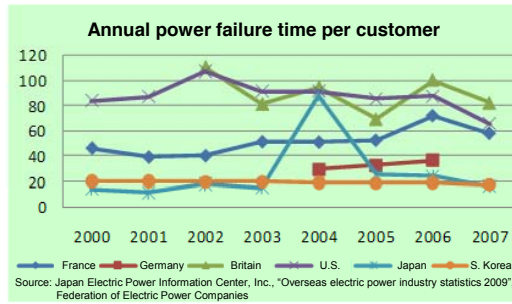
### Flow of petroleum and major choke points (Source: IEA World Energy Outlook 2004)



# I. Country-by-Country Comparison through Quantitative Evaluation of Energy Security

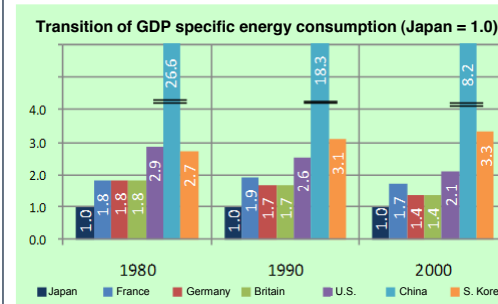
## 4. Evaluation of key indexes (continued)

### E. Reliability in electric power supply



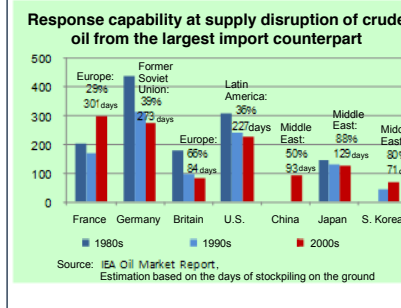
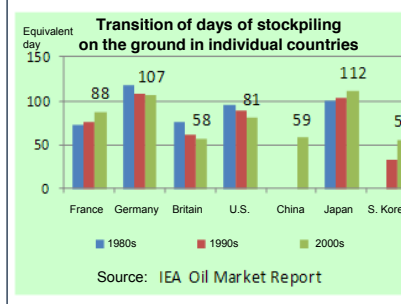
- In Britain and the U.S., electricity deregulation caused the selection of inefficient power sources and sluggish investment in building new power supply facilities, etc. Accordingly, their power failure time is longer than that in other countries in the 2000s.
- Power transmission and distribution facilities were established by large scale electric power supply businesses including EDF in France and E. On in Germany. As a result, the power failure time has been fluctuating between approx. 30 to 50 minutes.
- In Japan, general electricity utilities undertake obligations for supplying sectors for which retail sales are to be regulated and for ultimately assuring the supply to consumers subject to deregulation. Accordingly, the power failure time is generally low.

### F. GDP specific energy consumption



- Specific energy consumption in advanced countries has improved due to low economic growth and population increase rates, changes in industrial structure, progress of introduction of energy saving equipment, etc.
- Though the evaluation for China has improved because of the expanding GDP due to recent economic progress, there is still a great difference compared to other countries.
- In S. Korea, specific energy consumption deteriorated due to negative growth caused by the Asian currency crisis.

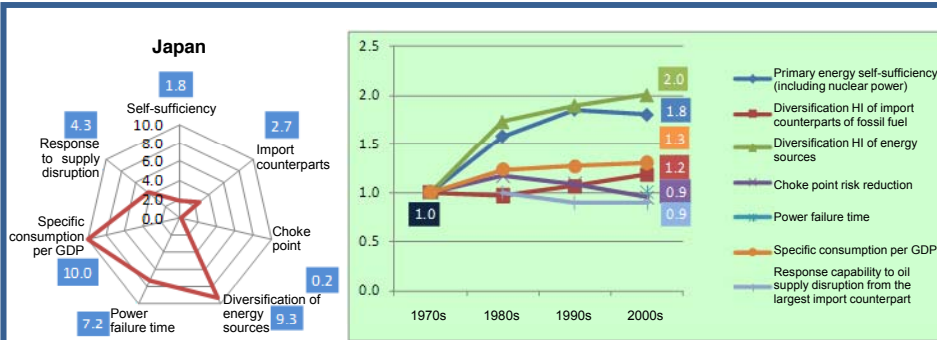
### G. Response capability to supply disruption



- IEA member countries are promoting the establishment of stockpiling based on the agreement related to stockpiling.
- China clarified the establishment of state oil stockpiling in the 10<sup>th</sup> 5-year plan (2001 to 2005), and promotes its establishment.
- France, which has an energy dependency rate of 29% even in Europe, has a strong response capability to supply disruption.
- Germany has a sufficient stockpile despite high dependency on Russia (39%).
- Both in Japan and S. Korea, with 80-90% dependencies on the largest import counterpart, the Middle East, their response capability to supply disruption by oil stockpiles are only 129 and 71 days, respectively.
- Britain's response capability to supply disruption by oil stockpiling is approx. 80 days because it has as high as a 66% dependency on Europe and no mandatory stockpile amount. China is on the way to establishing state stockpiling, with a current response capability to supply disruption being 93 days.
- Britain, the U.S. and China are capable of covering domestic consumption for a considerable period of time by domestic crude oil in addition to their stockpiles.

## 5. State of energy security in individual countries

**Radial chart: Country-by-country comparison in the 2000s (assuming the OECD average is 100, any difference from the OECD average is converted into an index for each key evaluation. Ten points are given to the highest rated country, and scores for other countries are given on the relative evaluation.)**  
**Line graph: Increase and decrease in each key evaluation when a value in the 1970s or the oldest identifiable value is assumed as 1.0**



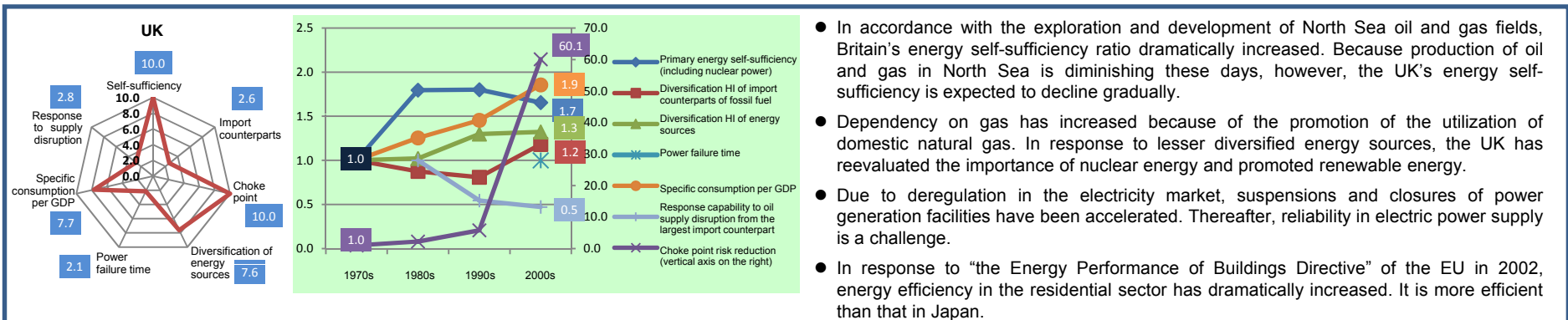
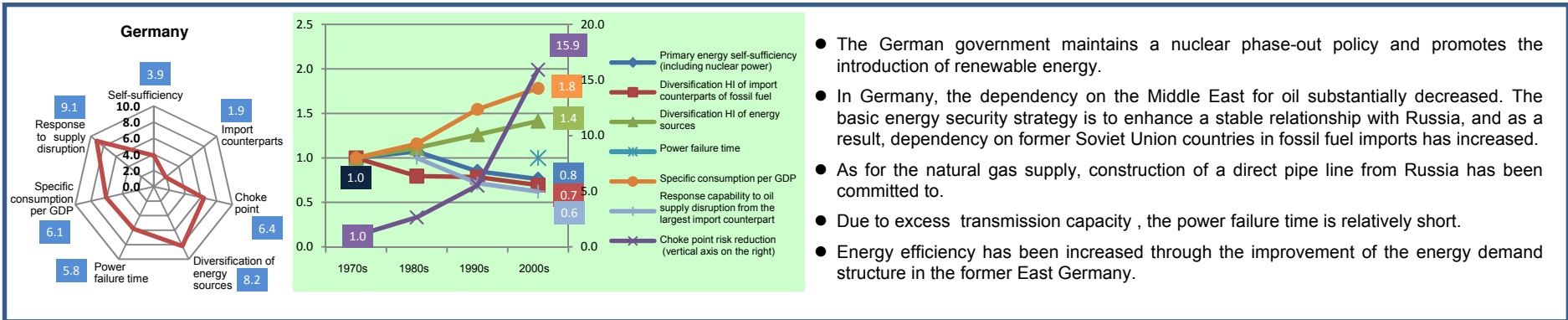
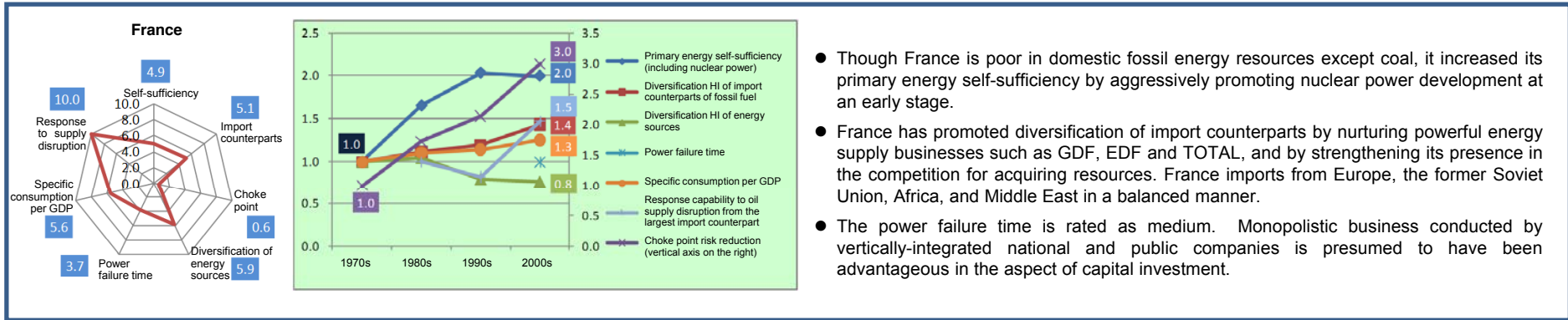
- In the 1980s and thereafter, primary energy self-sufficiency increased through continuous promotion of nuclear power utilization. Since however Japan is poor in domestic energy resources, it is rated low in the country-by-country comparison.

- Despite an decrease in dependency on the Middle East for petroleum after the oil shock, dependency increased again in the 2000s, so did dependency on choke points. Diversification of import counterparts are ongoing for natural gas. Though dependency on Australia for coal is high, its country risk is low.
- As a result of the expansion of the utilization of coal, natural gas and nuclear power as alternatives to petroleum, Japan is highly rated in the country-by-country comparison on supply source diversification.
- The average power failure time is the second shortest after S. Korea. Because deregulation-induced competitive pressures that were weaker than those of western nations and because of other reasons, liberalization in power distribution has been advanced since the 1980s.
- An expansion of the Law Regarding the Rationalization of Energy Use (the Energy Conservation Law) established and enforced in 1979 has led to the application of the regulatory scope from energy consuming manufacturing industries to the transportation, business, home electric appliance and housing sectors and the promotion of energy conservation in individual sectors.
- Dependency on Middle East for petroleum is structurally high, and thus the response capability to supply disruption by stockpiling is rated low in the country-by-country comparison.



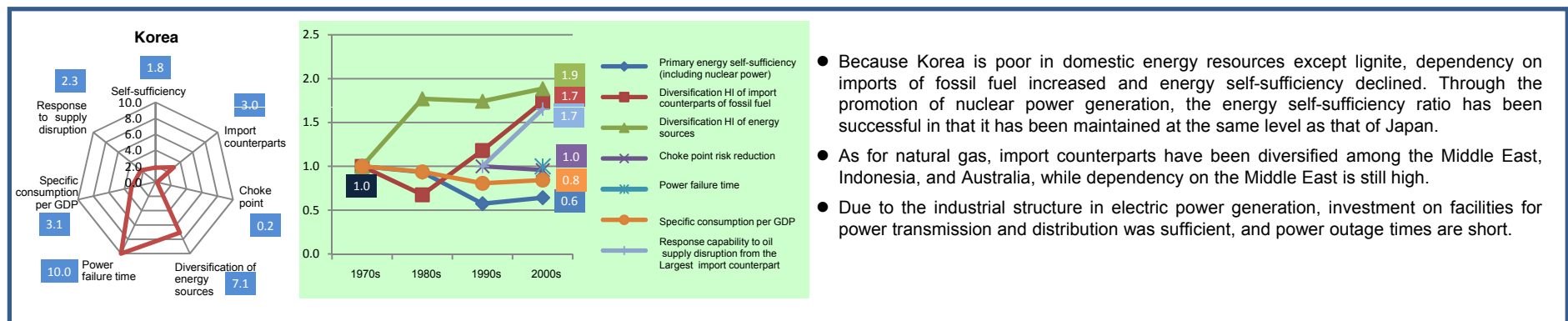
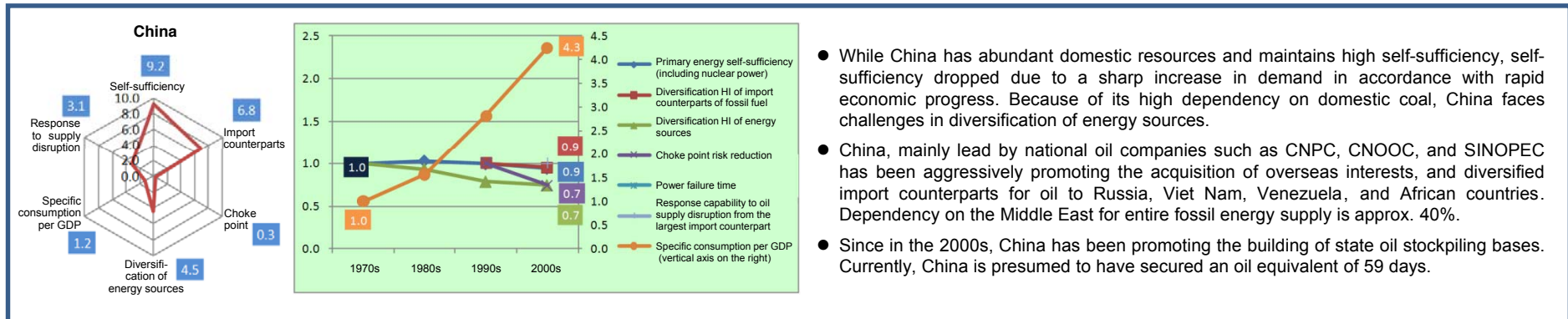
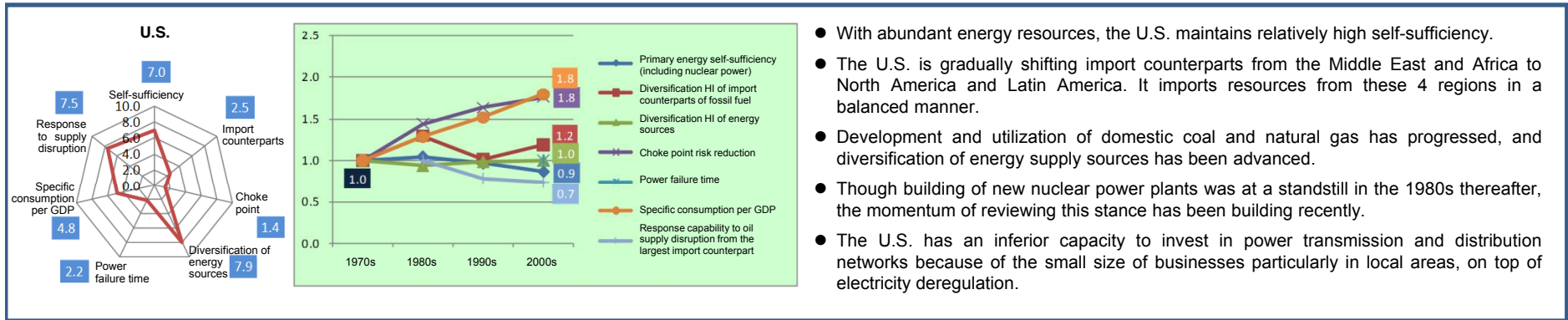
# I. Country-by-Country Comparison through Quantitative Evaluation of Energy Security

## 5. State of energy security (continued) in individual countries



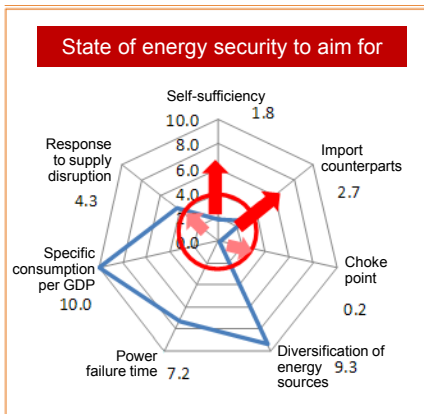
# I. Country-by-Country Comparison through Quantitative Evaluation of Energy Security

## 5. State of energy security (continued) in individual countries



# I. Country-by-Country Comparison through Quantitative Evaluation of Energy Security

## 6. Viewpoints for future measures



Energy security refers to being able to secure energy in the necessary amount at an acceptable price. Japan, with its poor domestic resources, needs to ***pursue securing a necessary amount and strengthening its resistance against situations such as increased resource prices, rising resource nationalism and others.***

### (1) Enhancement of independent energy ratio including promoting independent development

An appropriate business portfolio in the energy/resource supply chain should be constructed. The **development of domestic resources and independently explored & developed energy & natural resources should be promoted**, as well as construction of optimum production systems & the maintenance and strengthening of the domestic supply network.

#### ◆ Significance of independently explored and developed energy and natural resources

Independent development of resources by Japanese companies is likely to enable the stable acquisition of a certain amount of resources for an extended period, since the companies are directly engaged in production/operation. Independent development also contributes to strengthening a wide range of mutually-dependent relationships with resource-producing countries, early detection of changes in supply and demand based on the policies of resource producing countries, and understanding the strategies of resource producing countries/majors and technical trends, etc.

Independent development can help for reduce risks of physical supply disruption and enhance the upstream development and the competitiveness of Japanese companies. Even at the time of oil shock or similar events, despite decrease in the entire supply amount, the import quantity of crude oil under independent development mainly in the Middle East increased, which has contributed to the securing of a stable supply in emergencies.

Petroleum import quantity in times of emergency (unit: 10 thousand BD)  
Examined by Agency for Natural Resources and Energy

	First oil crisis			Gulf crisis		
	Fiscal 1973	Fiscal 1974	Increase/decrease	Fiscal 1990	Fiscal 1991	Increase/decrease
Total import quantity	498	476	-22	412	412	0
Crude oil under independent development	42	47	5	45	50	4
Crude oil not under independent development	456	429	-27	366	362	-4

### (2) Promotion of support by supplying risk money in order to secure interest of Japanese companies

Dependency on overseas procurement is unavoidable in order for Japan to secure a necessary amount of energy resources. It is important to pursue **diversification of risks by diversifying the energy sources themselves and by diversifying import counterparts for each energy resource.**

When diversifying the import counterparts, it is necessary to take into consideration the country risk of each resource producing country. When promoting diversification of import counterparts through securing independent development, there are many cases where the energy resource interests which will be accessible in the future exist in countries/regions with relatively higher country risks. Such risks cannot be taken merely by the resource developing company, and it is necessary, **as a nation, to promote support by supplying risk money, risk taking with use of trade insurance, etc. or the establishment of appropriate risk management system, etc.**

### (3) Reduction of choke point risk and establishment of stockpiling

It is impossible to completely avoid the choke point risk itself under the situation where overseas dependency for energy resources is high. Accordingly, it is necessary to promote international cooperation to ensure safe sea lanes, as well as **to steadily establish state stockpiling of petroleum/petroleum gas in preparation for supply disruption caused by straight blockades in emergencies or the delayed supply of energy resources.**



## II. Trend of Introduction and Efforts toward Future Expansion of Renewable Energy

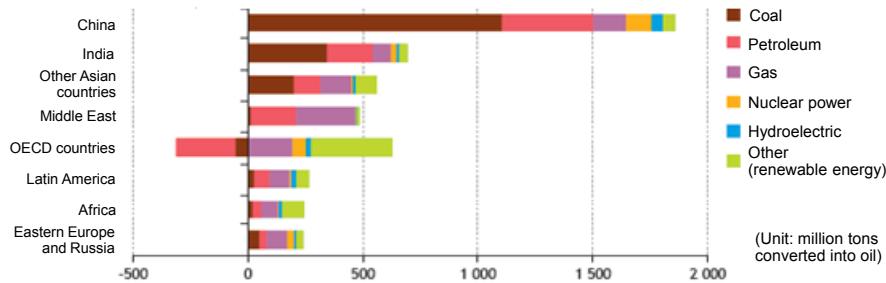
### 1. Growing international interest in renewable energy

- Demand for renewable energy is expected to expand from now because of the hike in fossil fuel prices due to increased energy demand in emerging countries and the accelerated scramble for energy resources.

[Prospects of increases/decreases in global energy demand]

#### Prospects of increases/decreases in primary energy by energy source in individual regions

\* Comparison between 2007 and 2030 in the case where the current demand growth rate continues



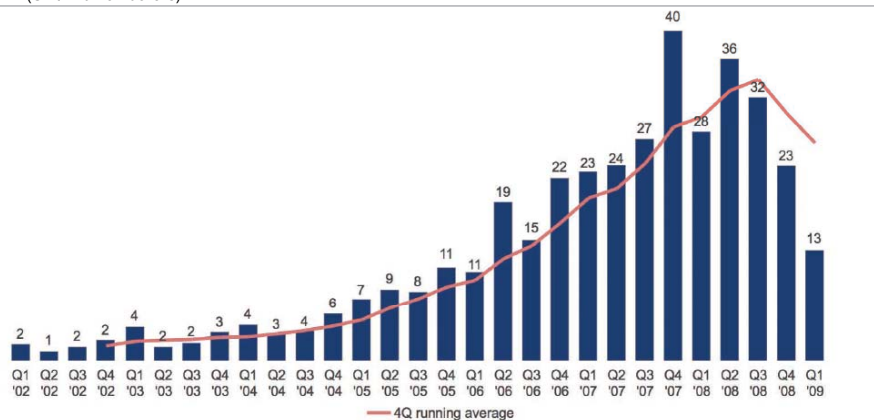
\* "Other" energy sources include biomass, waste, wind, geothermal, photovoltaic, solar heat, tidal wave power.

(Source) IEA "World Energy Outlook 2009"

- Investment started increasing dramatically around 2005 when a sharp increase in fossil fuel prices started. Individual governments are aggressively increasing public spending in order to create employment and foster industries. Such investments triggered expanded inflows of private money to the renewable sector (which started decreasing in the latter half of 2008 due to financial crisis and other reasons).

[Global trend of investment in renewable energy (by quarter)]

(Unit: 1 billion dollars)



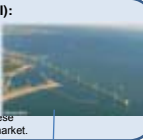
(Source) Created based on UNEP SFEI "Global Trends In Sustainable Energy Investment 2009"

- Renewable energy has been aggressively deployed targeting advanced countries in the fields such as photovoltaic, solar heat, and wind power, etc. Japanese companies are also advancing efforts in joint-venture businesses with overseas companies and in business operations taking advantage of their technological advantages. Cases in which electric utilities, trading companies, and manufacturers, etc. participate in overseas power generation businesses also increased.

[Examples of business being deployed by Japanese companies]

#### Mitsubishi Heavy Industries, Ltd. (MHI): Wind power generation (Britain)

MHI and its motor section headquarters in Europe Power Systems Europe (MPSE), signed a memorandum with the British government to work for a demonstration and development project of offshore wind turbines with subsidies from the Department for Business, Innovation and Skills (BIS). This is the first time for a Japanese manufacturer to enter the offshore wind turbine market.



#### Sumitomo Corporation: Photovoltaic power generation (Spain)

Sumitomo Corporation started operation of mega solar (large-scale photovoltaic) power plants in Tenerife Island in the Spanish Canary Islands, which have been aggressively introducing wind power and photovoltaic power generation recent years from the viewpoint of protecting environmental resources. This is the largest power plant in the world with the output of 12.6 MW among the power plants operated mainly by a Japanese company. Sumitomo procured photovoltaic panels manufactured by Sharp.



#### Sharp Corporation: Solar cells (Italy)

Sharp made a joint venture contract related to business for manufacturing thin-film photovoltaic cells with Enel greenpower (EGP) and STMicroelectronics, and a joint venture contract on independent power producing businesses with EGP.



#### Mitsubishi Corporation: Photovoltaic, solar heat and wind power (Spain)

Mitsubishi Corporation is jointly developing and operating a new energy power generation business with Acciona, which owns new energy power generation facilities with an output of approx. 7 million kW.

#### NGK Insulators Ltd.: NAS cells (UAE)

NGK received an order for a sodium-sulfur (NAS) battery system with the output of 50 MW from the Abu Dhabi Water and Electricity Authority of the United Arab Emirates. Operation of gas turbine electric generator has been made more efficient by leveling the electric load using energy efficient NAS batteries with a high energy density. NGK is studying future application to the Abu Dhabi mainland where demand for electric power is expanding remarkably and to large scale photovoltaic power generation.

#### Showa Shell Sekiyu K.K.: Photovoltaic (Saudi Arabia)

Showa Shell started a feasibility study with the national oil company, Saudi Aramco, on a small-scale distributed power generation business utilizing solar light in Saudi Arabia.

#### Eurus Energy: Wind power generation, etc. (Europe and America)

Eurus Energy, a joint venture company between Tokyo Electric Power Company and Toyota Tsusho Corporation, will build and operate new power generation plants with the total output of 1 million kW in the coming 5 years.

(Source) Created based on press releases of individual companies

- Renewable energy not only serves as a countermeasure to global warming while enhancing energy security, but also has features such as broad related industries and strong relationships with regional economies. Therefore, large positive effects both on economic growth and employment are also anticipated in Japan in relation to renewable energy.

\* On the other hand, the fact has also been pointed out that imported products increased in Germany which rapidly expanded introduction of photovoltaic power recent years (share of Chinese products is 50%).

[Forecast of domestic market size (photovoltaic)]

[Forecast of amount of global photovoltaic power generation to be introduced in FY2020 and FY 2030]

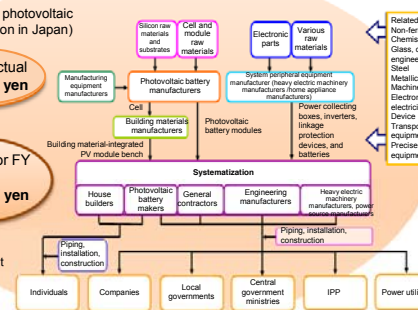
#### [Photovoltaic power generation industry]

(Market size of photovoltaic power generation in Japan)

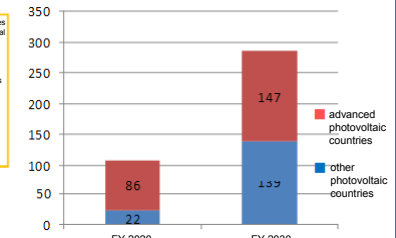
FY 2008 actual  
500 billion yen

Forecast for FY 2020  
1.5 trillion yen

(Source) FY 2008 Energy environment comprehensive strategic survey



(Unit: GW)



(Source) IEA "World Energy Outlook 2009"

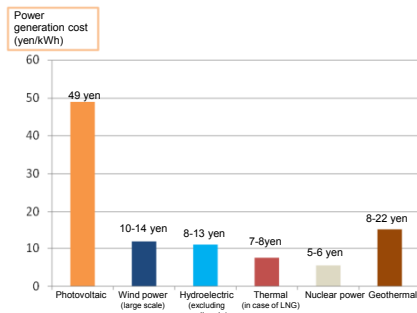
## II. Trend of Introduction and Efforts toward the Future Expansion of Renewable Energy

### 2. Trend of introduction of renewable energy

- The actual achievement and future prospects related to the introduction of renewable energy in Japan are comparable to those in other major countries. On the other hand, the introduction of renewable energy always involves challenges such as unstable output, high costs, and installation constraints. So far, renewable energy has been introduced through various measures within a certain potential.
- The stages of introduction and potential also differ greatly among major countries, depending on differences in geography and climate, retention and utilization conditions of resources, and social and economic scale, as well as other factors. It is important to promote introduction based on the various relevant conditions and characteristics of different types of renewable energy. [Representative characteristics of renewable energy]

Renewable Energy Type	Representative Characteristics
<b>Photovoltaic</b>	<ul style="list-style-type: none"> <li>○ Considerable reduction in power generation cost is anticipated. Both residential and non-residential sectors have great potential in the amount to be introduced. There are a wide range of supporting industries.</li> <li>○ Power generation cost is higher than other power generation methods.</li> </ul>
<b>Wind power</b>	<ul style="list-style-type: none"> <li>○ Since power generation cost is relatively low, the business is profitable. New technologies including offshore power generation have also emerged.</li> <li>○ There are constraints on installation (wind conditions, natural parks, landscapes, bird strikes, noise issues, etc.). Power generation costs are gradually increasing.</li> </ul>
<b>Geothermal</b>	<ul style="list-style-type: none"> <li>○ Stable power generation is possible with matured technologies. There are abundant sources in Japan.</li> <li>○ Constraint on installation (natural parks, hot spring regions, etc.) is large, and thus power generation cost will likely gradually increase in the future.</li> </ul>
<b>Hydroelectric</b>	<ul style="list-style-type: none"> <li>○ Stable power generation is possible with matured technologies. There is a growing interest in middle and small-sized hydroelectric power generations.</li> <li>○ Since constraints on installation are large, power generation costs will likely gradually increase in the future</li> </ul>
<b>Biomass</b>	<ul style="list-style-type: none"> <li>○ Costs differ greatly depending on types and utilization method.</li> <li>○ Depending on the future direction on the support system, increases in import materials may increase and affect the biomass industries in Japan. The imported materials may compete with power generation, heat utilization, and material utilization.</li> <li>○ Biofuels need to be introduced in a sustainable manner while ensuring sufficient greenhouse gas emissions reduction effects with LCA, energy security and cost reduction.</li> </ul>
<b>Air thermal, earth thermal</b>	<ul style="list-style-type: none"> <li>○ Heat pump technologies used in hot water supply systems and air conditioners have international competitive edges.</li> <li>○ Initial costs are higher compared to combustion-type heaters and hot-water supply systems.</li> </ul>

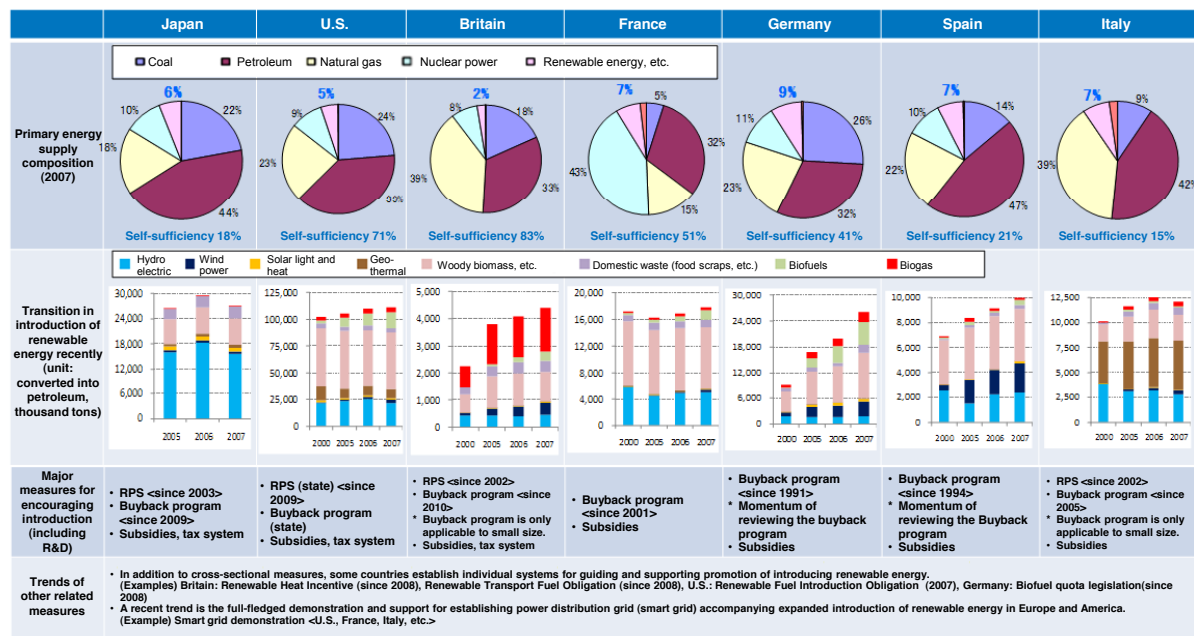
[Power generation cost for major energy source]



(Source) Created based on materials by project team on renewable energy feed in tariff

[Introduction status of renewable energy in major advanced countries (2007)]

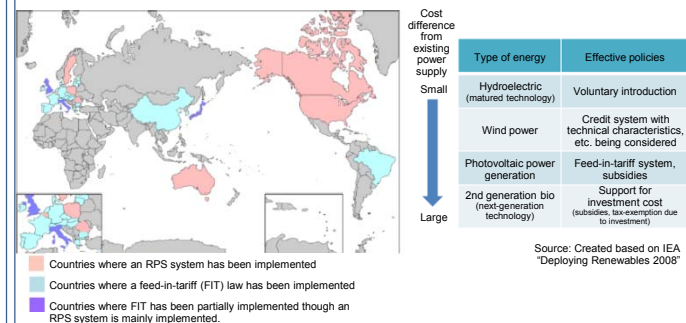
\* Renewable energy, etc. refers to photovoltaic, solar heat, wind, hydroelectric, geothermal, biomass (woody biomass, general waste, biofuel, biogas), etc.



**Supplement:** Supply composition of primary energy. The "transition in introduction of renewable energy" is created based on the statistics of the International Energy Agency (IEA). (For Japan, this is created based on comprehensive energy statistics, etc.)  
 For Japan, renewable energy is set to account for 10% of the primary energy supply (in 2020). < Basic Law for Prevention of Global Warming: Cabinet meeting, March 2010 >  
 On the other hand, the EU decides the ratio of the renewable energy with respect to final energy consumption base as the target index, and sets the ratio as 20% for the entire EU (2020).  
 Future prospect (2020) for Japan, if calculated according to the same method as the EU, is expected to be approx. 20% (New and Renewable Energy Subcommittee, August 2009)

### 3. New policy deployment for expanding introduction of renewable energy

- Measures for encouraging introduction in the world are roughly classified into two systems, on top of subsidies.
  - RPS system (quantity-based regulations: requires electricity companies to use at least a certain amount of renewable energy)
  - Feed-in-tariff law (price-based regulations: requires electricity companies to purchase renewable energy at a certain price)
- Even the IEA has pointed out that effective measures are different depending on the cost difference from existing power sources.



(Source) Project team on an all-quantity buyback system of renewable energy (March 2010)

- Japan has so far promoted the introduction of renewable energy through the expansion of demand by supporting introduction, voluntary efforts by electric utilities to purchase surplus electricity, and the RPS system, and achieved a certain result.

- As institutional measures to effect a dramatic expansion of introduction in the future, it is important to have the following viewpoints in addition to support for introduction, and innovative technological development and demonstrations. It is necessary to take effective measures such as regulations and support suitable for the characteristics of each energy source.

#### (1) Establishment of a feed-in-tariff law in accordance with the circumstances of Japan

The Excess Electricity Purchasing Scheme for photovoltaic power started in November 2009 to promote the use of photovoltaic power. Currently, an all-quantity buyback program is being studied by the project team on an all-quantity buyback system for renewable energy.

#### (2) Building a next-generation smart energy system and community

Measures for an electric power system (building of smart grids) accompanying expanded introduction of renewable energy, and demand-side energy management

#### (3) Mitigating constraint conditions based on geographical conditions, etc.

Solving institutional and social challenges such as by the expanded introduction of wind power generation (e.g. projects in a natural park).