APEC EGNRET43, Chiang Mai, Thailand

Renewable Energy Projections Through 2030 and Strategy

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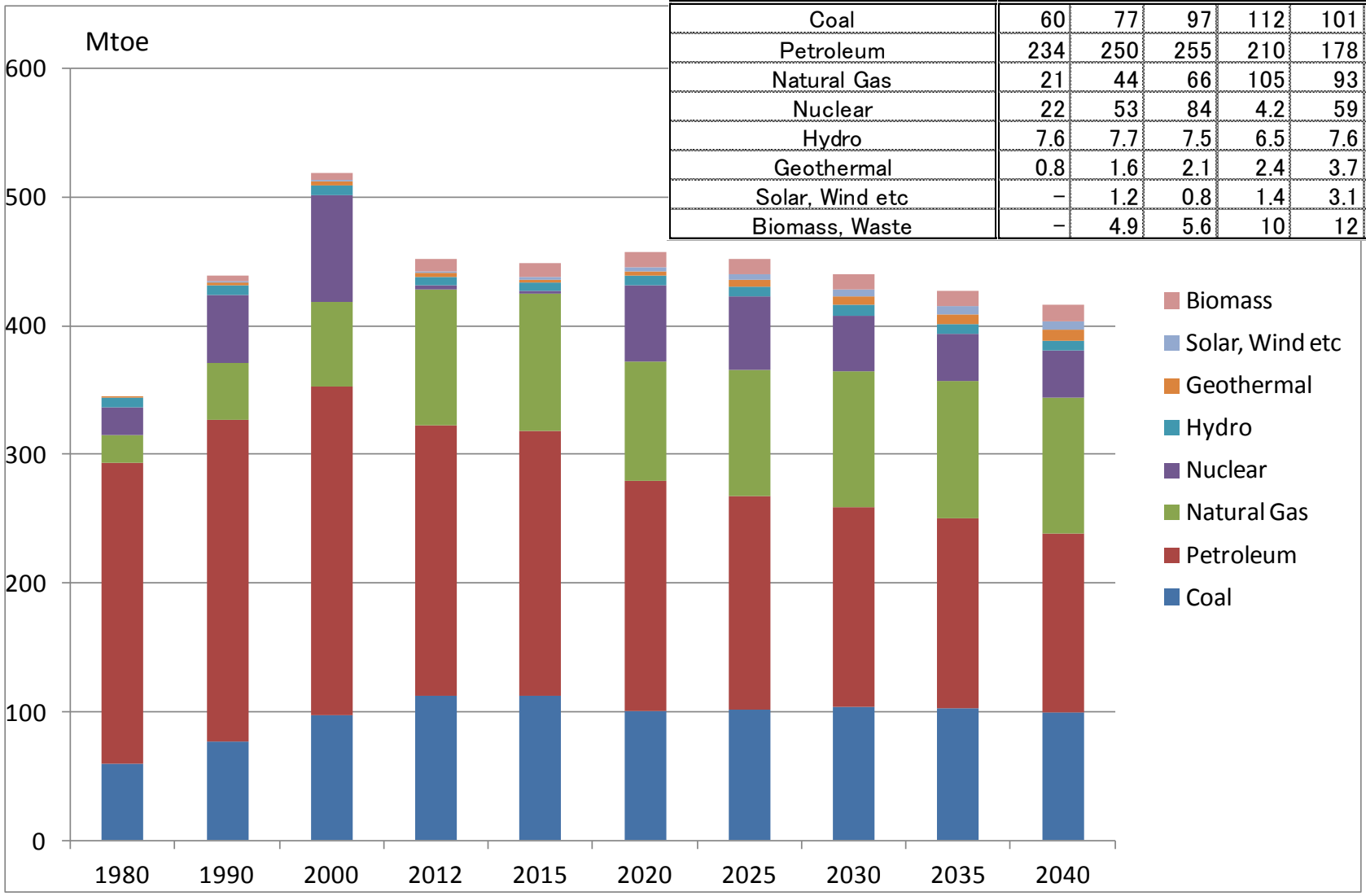
Energy Outlook for Japan

(MTOE)

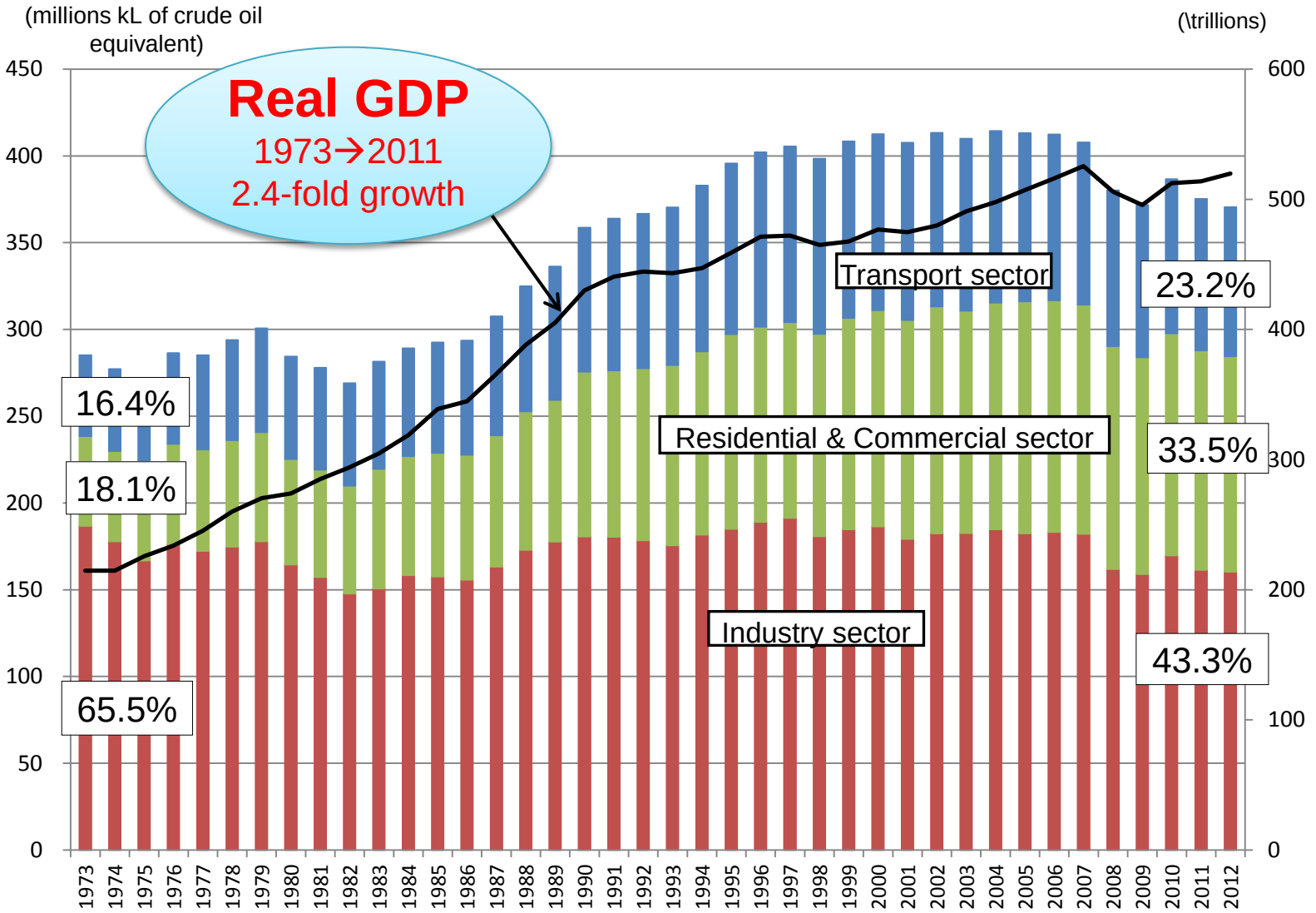
	1980	1990	2000	2012	2020	2030	2040
Total Primary Energy Supply	345	439	512	452	457	440	416
Coal	60	77	97	112	101	104	99
Petroleum	234	250	255	210	178	156	139
Natural Gas	21	44	66	105	93	105	106
Nuclear	22	53	84	4.2	59	44	37
Hydro	7.6	7.7	7.5	6.5	7.6	7.6	7.6
Geothermal	0.8	1.6	2.1	2.4	3.7	7.3	8.6
Solar, Wind etc	–	1.2	0.8	1.4	3.1	4.7	6.6
Biomass, Waste	–	4.9	5.6	10	12	12	13



Source: “Asia/World Energy Outlook 2014”, The Institute of Energy Economics, Japan

Current Status of Renewable Energy in Japan

Trends in Final Energy Consumption in Japan



Final energy consumption
1973→2012
1.3-fold growth

Transport	1973→2012 1.8-fold growth
Residential & Commercial	1973→2012 2.4-fold growth
Industry	1973→2012 0.9-fold growth

Sources: "Comprehensive Energy Statistics (Preliminary Report for 2012) " and "Annual Report on National Accounts."

Shifts in Japan's Measures to Increase Renewable Energy Use

■ Japan's measures to increase the use of renewable energy shifted from (1) financial support through subsidies, (2) aid through placing an obligation on electric power companies to source part of their electricity from renewable sources (the RPS scheme), to (3) the feed-in tariff (FIT) scheme that requires electric power companies to purchase electricity at fixed prices.

Japan

(1) Support through **subsidies** (1997–)

- Enactment of the Act on the Promotion of New Energy Usage (New Energy Act)
  - ✓ Provides partial financial aid to private companies implementing new-energy projects and guarantee on loans taken from financial institutions.
  - ✓ Provides financial aid to local governments implementing new-energy projects.

(2) Support through placing an obligation (the RPS scheme) (2003–2012)

- Launch of **the RPS Scheme** in 2003
  - ✓ Requires electric power companies to source a specified proportion of their electricity from renewable sources (**without fixed prices**).

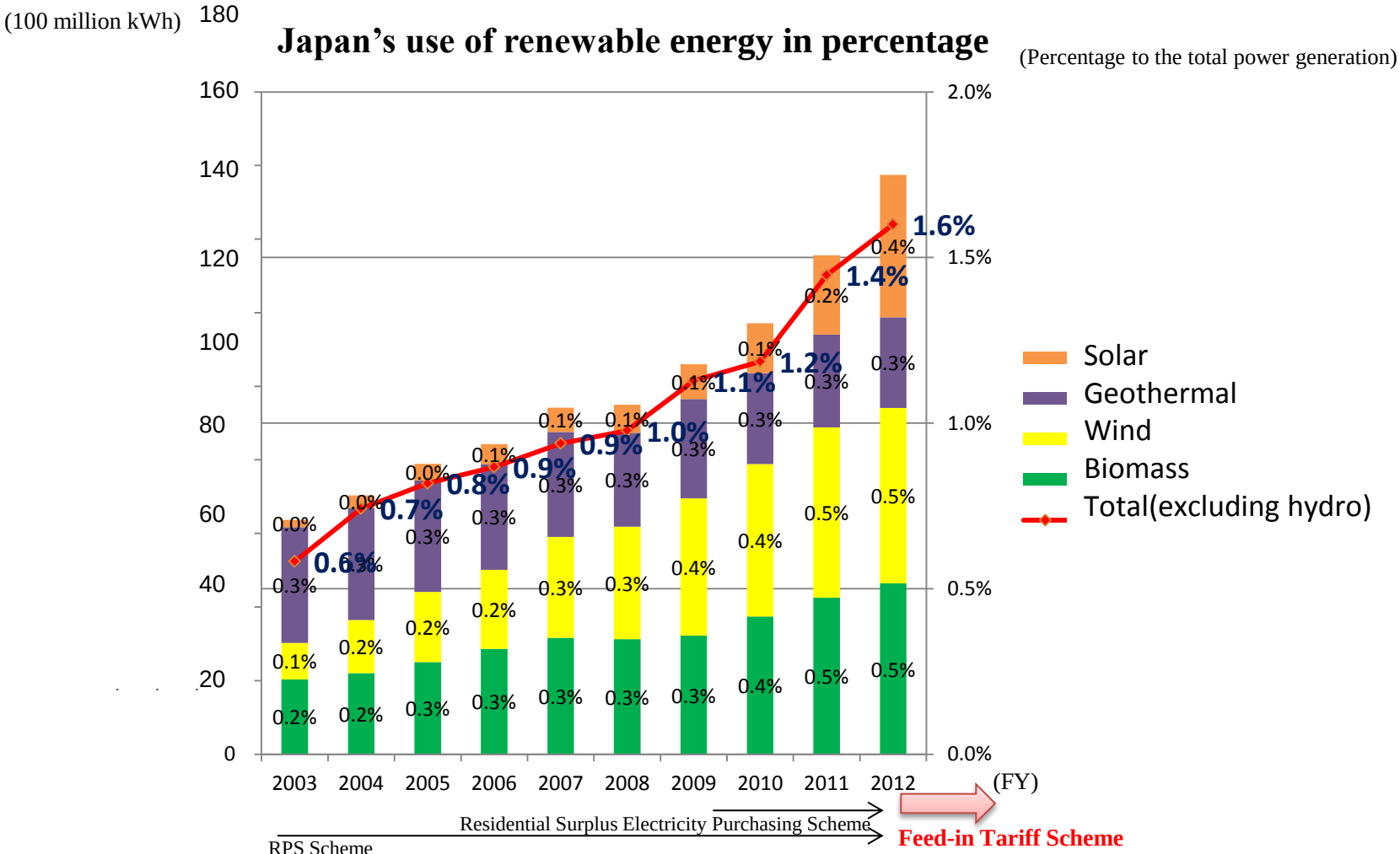
(3) Support through buyback at fixed prices (to give prospects for recovering investment) (2009–)

- Launch of **the Residential Surplus Electricity Purchasing Scheme** in 2009
  - ✓ Requires electric power companies to purchase home-generated solar power of less than 500 kW at **the procurement price and for the procurement period set by the government**.

- Launch of **the Feed-in Tariff (FIT) Scheme** in 2012
  - ✓ Requires electric power companies to purchase electricity produced from renewable sources, including solar, wind, hydro, geothermal and biomass at **the procurement price and for the procurement period set by the government**.

Japan's Use of Renewable Energy

- The contribution of renewable energy (excluding hydro power) to the total power generation in Japan has covered around 1%.
- Since the launch of the Residential Surplus Electricity Purchasing Scheme for Photovoltaic Power in November 2009 and the Feed-in Tariff Scheme in July 2012, Japan's use of renewable energy, led by solar power, has steadily increased.
- Renewable energy accounted for 1.6% in FY2012.

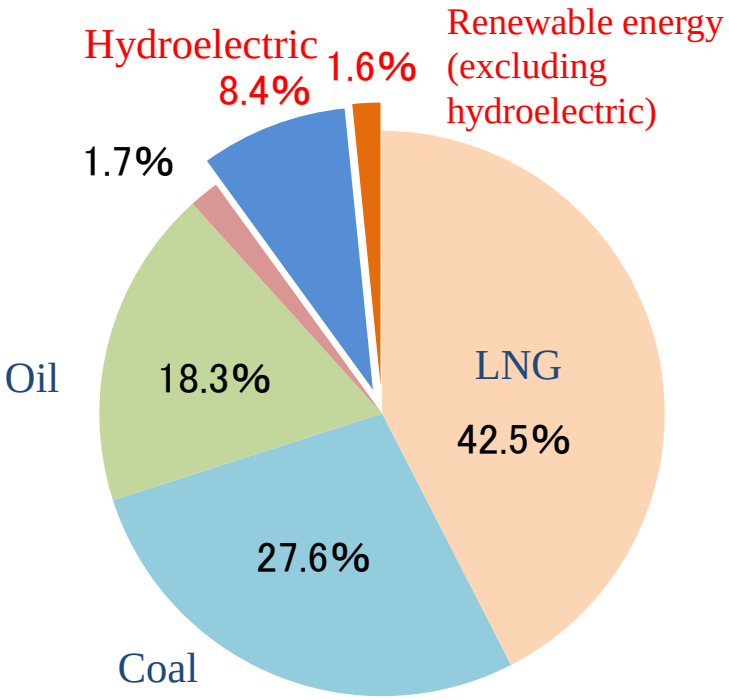


＊ Created by the Agency for Natural Resources and Energy using Electric Power Statistics, RPS data, buyback under the Feed-in Tariff Scheme, etc.

Current State of Renewable Energy

- Renewable energy accounted for approximately 10% of power generation in 2012.
- More specifically, hydroelectric power generated by large-scale dams, etc., accounted for 8.4%, with solar PV, wind, geothermal and biomass power accounting for 1.6%.

Composition of power generation by energy source in Japan (FY 2012)



Source: Federation of Electric Power Companies of Japan, *Composition of power generation by energy source*

Japan's Strategic Energy Plan
(revised in April, 2014)

Japan's New Energy Policy

To Overcome energy challenges while reducing costs in the procurement, distribution, and consumption sectors.

1. Production (Procurement) Sector

＜Diversify electricity sources＞

(1)Maximize introduction of renewable energy
①Deregulation
(E.g. Accelerate procedures for environmental assessments)

②Promote wind and geothermal power, through enhancing grid, etc.

(2)Restart nuclear power plants once safety is assured.

(3)Introduce high-efficiency thermal power plants (coal and LNG) while considering the environmental impact

〈Diversify fuel sources〉

(1)Procure low-cost LNG.

(2)Promote development of domestic energy sources including methane hydrate.

2. Distribution Sector

(1) Electricity market reform

①Full liberalization of generation and retail.

②Unbundling

③Nation wide transmission operation
(2)Strict assessment of power rate
(Cut down fuel cost)

3. Consumption Sector

(1)Enhance competitiveness and promote energy efficiency by installing cutting edge and efficient facilities in industries.
(2)Enhanced energy conservation by adding house/buildings, in the Top Runner Program.

(3) Promote efficient energy management systems such as demand response.

Japan's Strategic Energy Plan

- Japan's Strategic Energy Policy Law stipulates that the government must establish a Strategic Energy Plan that includes basic policy for energy supply-demand and its implementing measures and consider its revision at least every three years.
- The Japanese government has tried to revise the Strategic Energy Plan 2010 since March 2013 and released the draft of the government on Feb 25.
- After the stakeholders' discussions including those by administration party, the plan was finalized by Cabinet decision on 11 April 2014.

1. Current Status

17 meetings at the sectional committee for basic policy in the Advisory Committee on Energy and Natural Resources (March 2013 – December 2013)

→ "Opinions for the Japan's Strategic Energy Plan" by the committee was published (December 2013)

→ The Japanese government gathered about 19,000 comments from the public through the Internet for the opinions by the committee

→ The Japanese government released the draft for the Japan's Strategic Energy Plan (Feb 25 2014)

→ Processed by administration party

→ Finalized on 11 April,2014 by Cabinet Decision

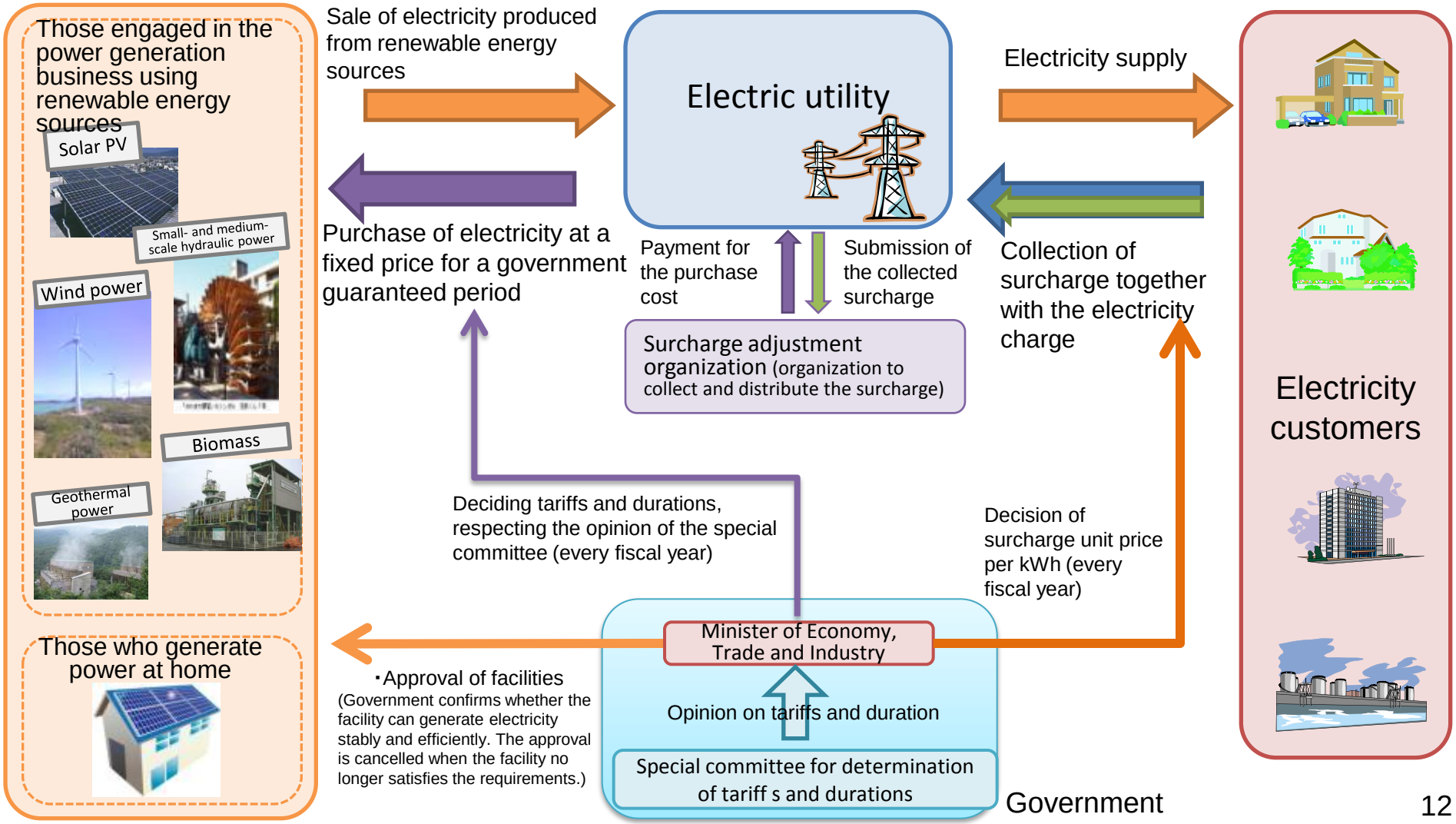
2. Overview of the government draft

	Strategic Energy Plan 2010 (Established at the former administration (DPJ government))	The 4th Strategic Energy Plan
Positioning of nuclear power	• Backbone energy source in the medium and long term	• Important base load power source • Promote restart once safety is assured
Ratio of Nuclear Power(NP)/Additional NP building	• 70% in 2030, nuclear and renewables altogether • More than 14 additional NP buildings	• "Will assess the volume of nuclear power needed to be secured"
Renewable Energy	• 10% of the primary energy supply in 2020	• Will accelerate the introduction to the maximum in three years and promote it after that
Natural Gas	• Will become an important energy source for low carbon society • Shift to natural gas should be promoted	• Will play a core role as the middle electricity source • Important energy source whose role will be more significant
Coal	• Energy source that is excellent at cost and supply stability • Will utilize coal appropriately	• Important base load power source • Will continue to utilize coal reducing the environmental load
Oil	• Backbone energy source	• Will function as a peak electricity source • Important energy source from the viewpoint of portability and versatility

Current Status of FIT in Japan

Basic Mechanism of the Feed-in Tariff Scheme

■ Under the feed-in tariff scheme, if a renewable energy producer requests an electric utility to sign a contract to purchase electricity at a fixed price and for a long-term period guaranteed by the government, the electric utility is obligated to accept this request.



Tariffs and Durations (PV, Wind, Geothermal and Hydro)

Act on Purchase of Renewable Energy Sourced Electricity by Electric Utilities (Feed-in Tariff Scheme for Renewable Energy)

- This Act obliges electric utilities to purchase electricity generated from renewable energy sources (PV, wind power, offshore wind power, hydraulic power, geothermal and biomass) at the procurement price and for the procurement period.
- Approved at the 177th session of the Diet 2011 and started on July 1st, 2012.

<Tariffs for FY2014>

Energy source		Solar PV		Wind power		Offshore Wind	Geothermal power		Small- and medium-scale hydraulic power		
Procurement category		10 kW or more	Less than 10 kW (purchase of excess electricity)	20 kW or more	Less than 20 kW	20 kW or more	15,000 kW or more	Less than 15,000 kW	1,000 kW or more but less than 30,000 kW	200 kW or more but less than 1,000 kW	Less than 200 kW
Cost	Installation cost	275,000 yen/kW	385,000 yen/kW	300,000 yen/kW	1,250,000 yen/kW	565,000 yen/kW	790,000 yen/kW	1,230,000 yen/kW	850,000 yen/kW	800,000 yen/kW	1,000,000 yen/kW
	Operating and maintenance costs (per year)	8,000 yen/kW	3,600 yen/kW	6,000 yen/kW	–	22,500 yen/kW	33,000 yen/kW	48,000 yen/kW	9,500 yen/kW	69,000 yen/kW	75,000 yen/kW
Pre-tax IRR		6%	3.2%	8%	1.8%	10%	13%		7%	7%	
Procurement price per kWh	Tax inclusive (*3)	**34.56 yen**	**37 yen**	**23.76 yen**	**59.40 yen**	**38.88 yen**	**28.08 yen**	**43.20 yen**	**25.92 yen**	**31.32 yen**	**36.72 yen**
	Tax exclusive	32 yen	37 yen	22 yen	55 yen	36 yen	26 yen	40 yen	24 yen	29 yen	34 yen
Procurement period		20 years	10 years	20 years	20 years	20 years	15 years	15 years	20 years		

Tariffs and Durations (PV, Wind, Geothermal and Hydro)

<Tariffs for FY2014>

Energy source		Small- and medium-scale hydraulic power(Utilization of existing headrace)		
Procurement category		1,000 kW or more but less than 30,000 kW	200 kW or more but less than 1,000 kW	Less than 200 kW
Cost	Installation cost	425,000 yen/kW	400,000 yen/kW	500,000 yen/kW
	Operating and maintenance costs (per year)	9,500 yen/kW	69,000 yen/kW	75,000 yen/kW
Pre-tax IRR		7%	7%	
Procurement price per kWh	Tax inclusive (*3)	**15.12 yen**	**22.68 yen**	**27.00 yen**
	Tax exclusive	14 yen	21 yen	25 yen
Procurement period		20 years		

Tariffs and Durations (Biomass)

<Tariffs for FY2014>

Energy source		Biomass				
Biomass type		Biogas	Wood fired power plant (Timber from forest thinning)	Wood fired power plant (Other wood materials)	Wastes (excluding woody wastes)	Wood fired power plant (Recycled wood)
Cost	Installation cost	3,920,000 yen/kW	410,000 yen/kW	410,000 yen/kW	310,000 yen/kW	350,000 yen/kW
	Operating and maintenance costs (per year)	184,000 yen/kW	27,000 yen/kW	27,000 yen/kW	22,000 yen/kW	27,000 yen/kW
Pre-tax IRR (Internal Rate of Return)		1%	8%	4%	4%	4%
Tariff (per kWh)	**Tax inclusive**	**42.12 yen**	**34.56 yen**	**25.92 yen**	**18.36 yen**	**14.04 yen**
	Tax exclusive	39 yen	32 yen	24 yen	17 yen	13 yen
Duration		20 years				

State of approval and operational start of RE facilities under the FIT program

- The approval of the Minister of Economy, Trade and Industry is required for renewable energy power generation facilities for the FIT program to apply. The total output of facilities approved up to March 2014 is approx. 68.6 GW.
- In comparison, the amount for facilities that began operation during the same period was 8.9 GW (More than 40% increase over the year the program started).

[State of adoption of renewable energy power generation]

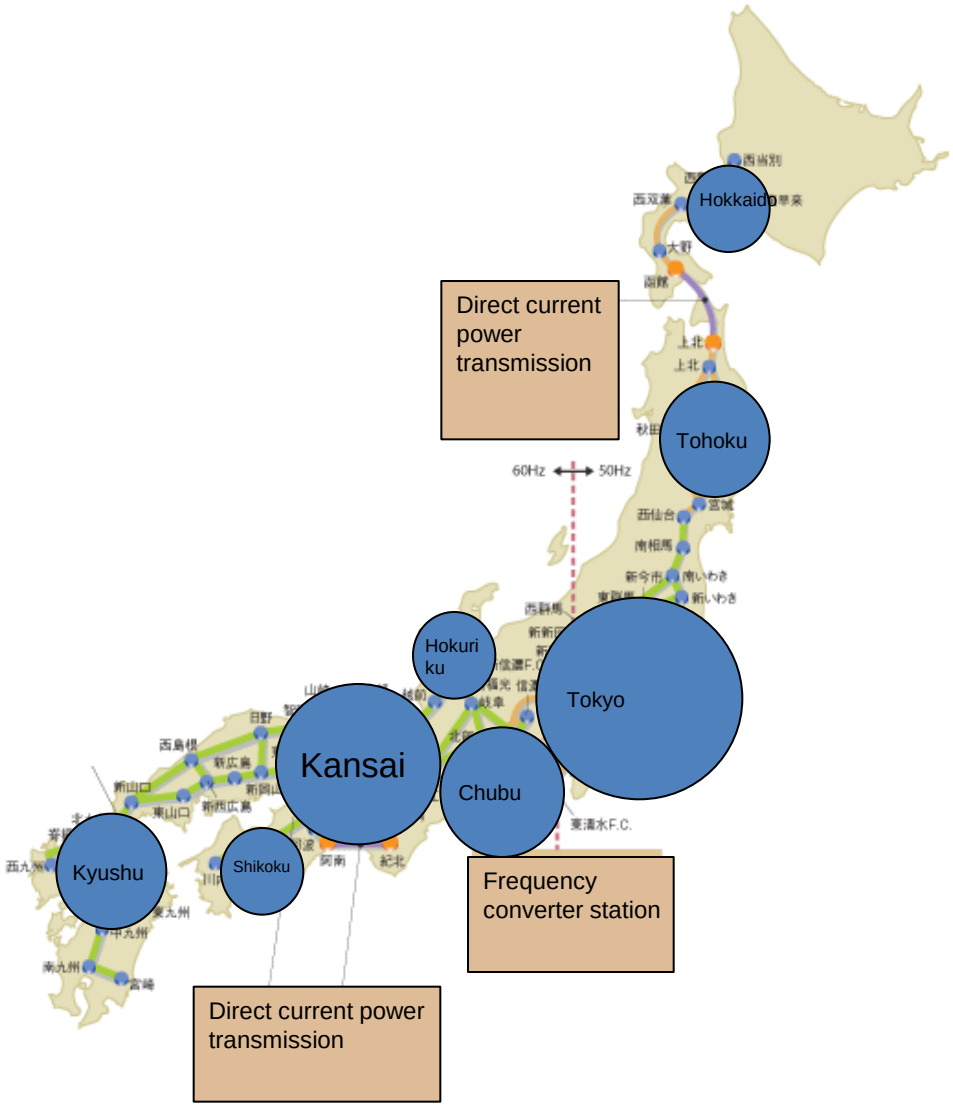
Before the FIT program ← → After introduction of the FIT program

	Cumulative adopted amount up to July 2012	Amount adopted in FY2012 (Jul. - Mar.)	Amount adopted in FY2013 (Apr. - Mar.)	Facilities approved from July 2012 through March 2014
Solar (Residential)	Approx. 4.7 GW	1.0 GW	1.2 GW	2.7GW
Solar (Non Residential)	Approx. 0.9 GW	0.7 GW	5.7 GW	63.0GW
Others	Approx. 15.0 GW	0.1 GW	0.2GW	2.9 GW
Total	Approx. 20.6 GW	1.8 GW	7.1 GW	68.6GW

8.9 GW

(Note) converted to amount of power generated, this is approx. 2.4 billion kWh for 2012, which is the equivalent of 0.3 nuclear plants (one plant: 1.2 million kW given 70% facility utilization).

Grid Framework in Japan



Solar and Wind Power Deployment Potential in Japan

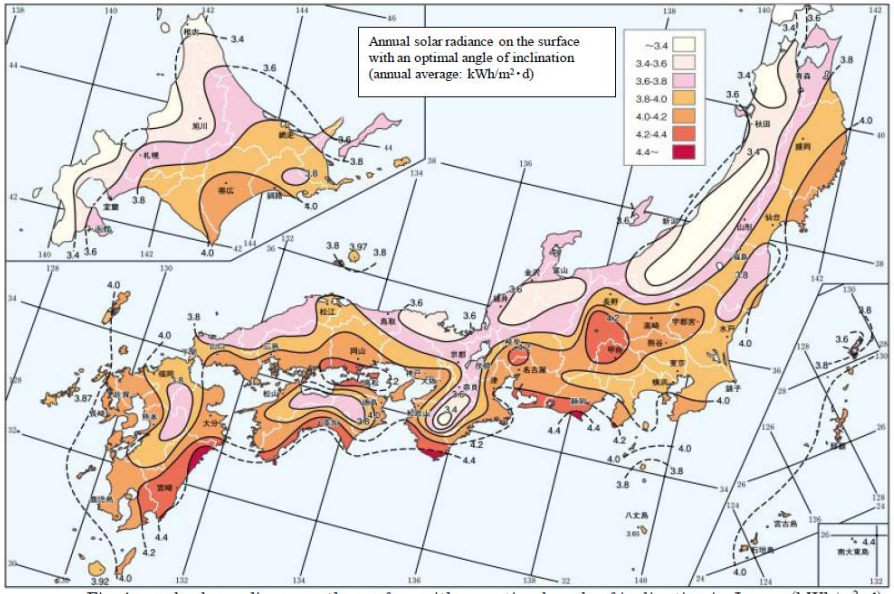
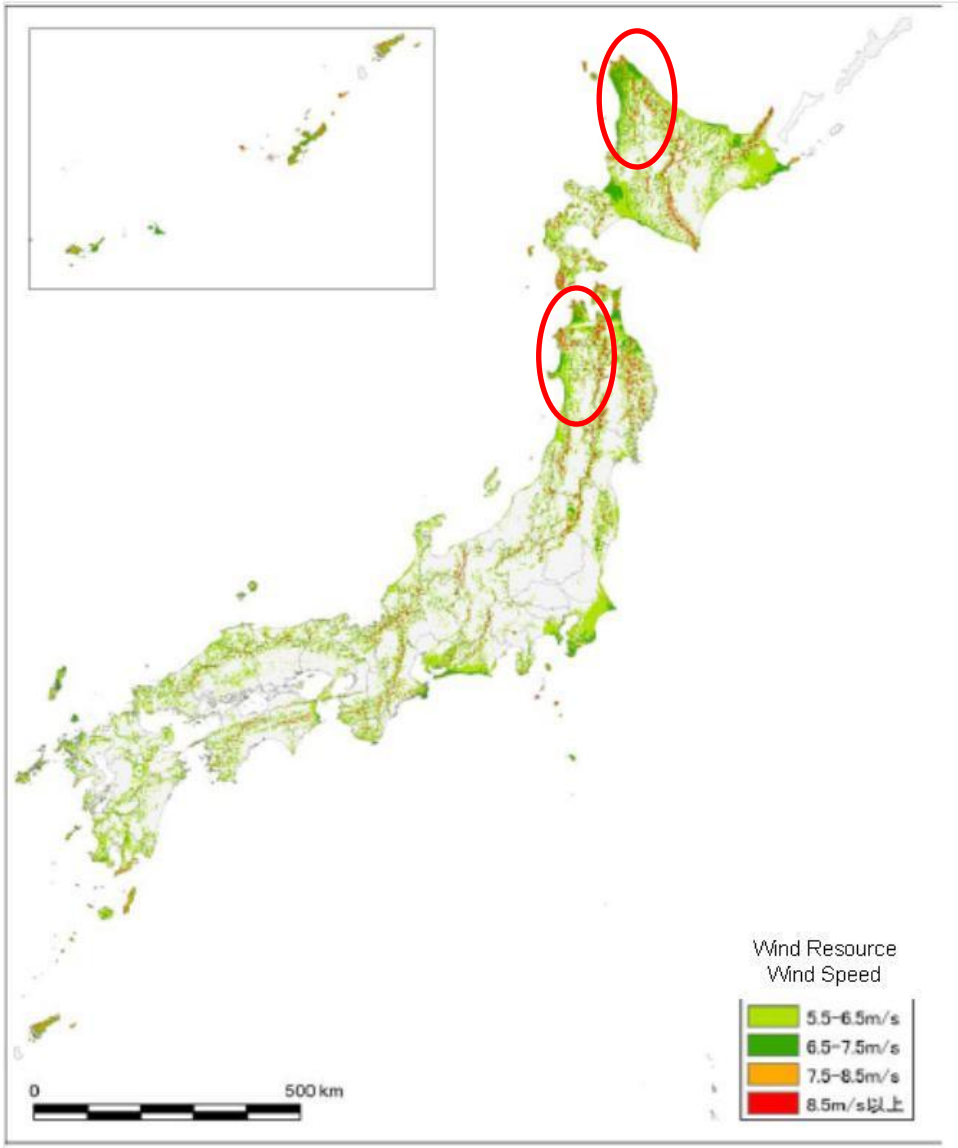


Fig. Annual solar radiance on the surface with an optimal angle of inclination in Japan (kWh/m²・d)

Source: NEDO, Guidelines for PV Power Generation Field Test Project (Design, Construction and System), 2010



Thank you for your attention !