Document 5

Provisional Translation

Global Warming

November 13, 2017

Agency for Natural Resources and Energy
Ministry of Economy, Trade and Industry

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Carbon Reduction Targets

CO_2 emissions in 2015 (100 million tons)

	World (ex-Japan)	Asia (ex-Japan)	Japan in brackets: for 2030
Total	312	136	11.5 (9.3)
Electricity	122	60	5.0 (3.6)
Transport	75	16	2.0 (1.5)
Automobiles	56	14	1.9
Others (aircraft, ships etc.)	19	2	0.2
Industry	81	46	3.2 (3.3)
Iron and Steel (excl. coke production etc.)	18	14	1.4
Chemical (incl. petrochemicals etc.)	8	5	0.7
Heat (commercial & residential sectors)	34	13	1.3 (0.9)

* Definitions in IEA and METI data may be different.
* Note that CO2 emissions represented in “Long-term Energy Supply and Demand Outlook” are indirect emissions
* Not that the boundary of each sector is different from the one in “Commitment to a Low Carbon Society”.

Source: IEA, METI statistics

The Strategies of Major Countries for 2050

	Reduction Target	Flexibility	Main Strategy, Posture: Zero Emission	Main Strategy, Posture: Energy Conservation /Electrification	Main Strategy, Posture: Overseas
United States	**▲80% or more** (as percentage of 2005)	**Ambitious vision towards reduction target** (not intended as current policy proposals) providing **an ambitious vision** to reduce net GHG emissions by 80 percent or more below 2005 levels by 2050.	**Increase** Variable renewable energy + Nuclear power	**Large-scale electrification** (20%→45~60%)	**Contribution through expanding market for US products**
Canada	**▲80%** (as percentage of 2005)	**Informing the conversation** (not a blue print for action) not a blue print for action. Rather, the report is meant to **inform the conversation** about how Canada can achieve a low-carbon economy.	**Securing the electricity** Hydro power・Variable renewables + Nuclear power Approx. 80% of electricity source already zero emission	**Large-scale electrification** (20%→40~70%)	**Looking to contribute internationally (0~15%)**
France	**▲75%** (as percentage of 1990)	**Possible path for achieving objectives** (not an action plan) the scenario is not an action plan: it rather **presents a possible path** for achieving our objectives.	**Securing the electricity** Renewable energy + Nuclear power ※Zero emission rate already at more than 90%	**Large-scale energy conservation** (half as percentage of 1990)	**Contribution through international development support by French businesses**
United Kingdom*	**▲80% or more** (as percentage of 1990)	**Helps players identify steps to take in the next few years by exploring potential pathways** (long-term predictions are difficult) exploring the plausible potential pathways to 2050 **helps us to identify low-regrets steps we can take in the next few** years common to many versions of the future	**Increase** Variable renewables + Nuclear power	**Promote energy conservation/electrification**	**Lead the world through environmental investment**
Germany	**▲80~95%** (as percentage of 1990)	**Point to the direction towards reducing emissions** (not a search for masterplan) ※Conduct regular reviews not a rigid instrument; it points to **the direction** needed to achieve a greenhouse gas-neutral economy.	**Increase** Variable renewable energy	**Large-scale energy conservation** (half as percentage of 1990)	**Maintaining and bolstering investment sentiment in LDCs**

* Not yet submitted to UNFCCC as long-term strategy. Created from *The Clean Growth Strategy* (November 2017).

National Long-term Strategies (United States)

Long-term Strategy Summary

Reduction Target: ▲80% or more (as percentage of 2005)

Status: Ambitious Vision aimed at Reduction Targets

		Main Entries	Quantitative Target
Shift to Zero Emission	**Renewable Energy**	Infrastructure and regulatory support necessary such as batteries, systems buildup towards expanding variable renewable energy.	Year 2015 13% (VRE※ 5%) → Year 2050 55~65% (VRE 45~59%)
	Nuclear Power	Necessary to extend lifespan of existing plants and invest in light water reactors and next-generation nuclear power.	Year 2015 19% → Year 2050 17~26%
	Thermal Power	Map out future without thermal power depending on CCS technology development.	Year 2015 0% (CCS thermal power) → Year 2050 0~25% (CCS Thermal power)
Energy Conservation/ Electrification	**Energy conservation**	Enhance efficiency of energy system as a whole Smart grids, raising fuel efficiency, making industrial processes more efficient, etc.	Year 2050 ▲24~30% (as percentage of 2005)
	Electrification	Greater electrification of autos, household heat demand, industrial steam, etc.	Year 2015 21% → Year 2050 45~60%
	CCUS/ Hydrogen	Hydrogen may play important role in areas where electrification is difficult. (FCV, aircraft, industrial cogeneration)	No Quantitative Target
Over seas	**Overseas Contributions**	Contribute to global emissions reduction by expanding market for US goods and services.	No Quantitative Target

※VRE: Variable Renewable Energy

National Long-term Strategies (Canada)

Long-term Strategy Summary

Reduction Target : ▲80% and more (as percentage of 2005)

Status: Informing the Conversation

		Main Entries	Quantitative Target
Shift to Zero Emission	Renewable Energy	Expand use of wind power, photovoltaics and hydro power.	Year 2015 63% (Hydro Power 57%) → Year 2050 50~80% (Hydro Power 30~70%)
	Nuclear Power	250 USD investment expected in 10 plants over the next 15 years.	Year 2015 15% → Year 2050 5～50%
	Thermal Power	Thermal power equipped with CCS may exist depending on scenario.	Year 2015 0% (CCS Thermal Power) → Year 2050 0~10% (CCS Thermal Power)
Energy Conservation/ Electrification	Energy conservation	Improving energy efficiency and demand management are the main elements of long-term emissions reduction strategy.	Year 2050 ▲5～35% (from 2014 level)
	Electrification	Electrification of Automobiles, buildings, heat systems, industry, etc. is essential to reducing emissions.	Year 2015 22% → Year 2050 40～72%
	CCUS/ Hydrogen	Room for reduction in major emitting industries (gas and petroleum, iron and steel, paper manufacturing, chemicals, etc.) with CCS Potential for using hydrogen in heavy industries, shipping, etc.	Year 2015 0% → Year 2050 0~32%
Over seas	Overseas Contributions	Encouraging international cooperation contributes to efficient global cost reduction. Include cross-border reduction in international contribution.	Year 2015 0% → Year 2050 0~15%

National Long-term Strategies (France)

Long-term Strategy Summary

Reduction Target : ▲75% (as percentage of 1990)

Status: Possible Path for achieving Objectives

		Main Entries	Quantitative Target
Shift to Zero Emission	Renewable Energy	Further flexibility necessary to integrate renewable energy (utilizing hydropower for peak demand, energy storage, international grids)	Year 2015 16% (VRE※ 5%) → Year 2030 40% (Details unknown)
	Nuclear Power	Reduce weight in electricity composition to 50% by 2025. (Energy Conversion Act) ※French government announced in 7/11/2017 that the target year will be postponed to 2030 ~ 2035.	Year 2015 78% → Year 2025 50%
	Thermal Power	Shift to zero emission CCS essential in complete shift to zero emission scenario.	Year 2015 0% (CCS Thermal Power) → No Quantitative Target (CCS Thermal Power)
Energy Conservation/ Electrification	Energy conservation	Large-scale energy conservation in industry, construction and transport sectors.	Year 2050 ▲50% (as percentage of 1990)
	Electrification	Electrification important to promoting energy conservation Timeframe for developing EV infrastructure, etc. important	Year 2015 25% → Year 2025 Approx. 40%
	CCUS/ Hydrogen	Restrain carbon intensity of products through CCS in industrial processes in iron and steel , cement, etc.	No Quantitative Target
Over seas	Overseas Contributions	Promote carbon intensity reduction through support for international development by French businesses (utilize export credit insurance, etc.)	No Quantitative Target

※VRE: Variable Renewable Energy

National Long-term Strategies (United Kingdom)

Long-term Strategy Summary

Reduction Target : ▲80% or more (as percentage of 1990)

Status: Help identifying steps for the next few years by exploring potential pathways*

* Content aimed at achieving UK's "Fifth Carbon Budget" (2028-2032). Some entries up to 2050.

		Main Entries	Quantitative Target
Shift to Zero Emission	Renewable Energy	Support more renewable energy market entries such as offshore wind Develop electricity storage, DR and new grid stabilization methods.	Year 2015 25% (VRE※ 14%) → Year 2030 44% (Details unknown)
	Nuclear Power	Reduce cost, maintain stability (support new construction) Support innovation towards developing next-generation nuclear power, etc.	Year 2015 21% → Year 2030 28%
	Thermal Power	Decommission coal-fired power plants without CCS by 2025.	Year 2015 0% (CCS Thermal Power) → No quantitative target (CCS Thermal Power)
Energy Conservation/ Electrification	Energy conservation	Achieve 20% energy conservation in the office and industrial sectors by 2030, raise energy efficiency in all households to specific levels.	Year 2030 ▲10% (as percentage of 2008)
	Electrification	Electrify energy intensive industries, utilize heat pumps in household Promote adoption of EVs	Year 2015 21% → Year 2030 23%
	CCUS/ Hydrogen	Lead the world in CCUS technology development (invest 100 million GBP) Hydrogen to be used in FCVs, industrial processes, and heat supply to households and offices	No Quantitative Target
Over seas	Overseas Contributions	Lead the world in environmental investment (establish task force to encourage public and private investment, 20 million GBP investment in immature technologies, etc.) ※UK actions to date are expected to save almost 500 million tons of CO2, while they do not count these results against the domestic budgets	No Quantitative Target

※VRE: Variable Renewable Energy

National Long-term Strategies (Germany)

Long-term Strategy Summary

Reduction Target : ▲80～95% (as percentage of 1990)

Status: Point to the Direction towards reducing Emissions

		Main Entries	Quantitative Target
Shift to Zero Emission	Renewable Energy	Fully promote renewable energy in areas where it is usable (mainly wind power). Optimize variable renewable energy by sector-coupling.	Year 2015 29% (VRE※ 18%) → Year 2050 80% (Details unknown)
	Nuclear Power	No entry.	Year 2015 14% → Year 2050 0%
	Thermal Power	New construction of coal-fire power plants will not be supported.	Year 2015 0% (CCS Thermal Power) → No Quantitative Target (CCS Thermal Power)
Energy Conservation/ Electrification	Energy conservation	Energy conservation first. (promote energy conservation in all sectors)	Year 2050 ▲50% (as percentage of 2005)
	Electrification	Increase electricity demand through electrification of automobiles and heat use in buildings.	Year 2015 20% → Year 2050 Approximately 30%
	CCUS/ Hydrogen	Consider CCU and CCS--in that order--when carbon reduction through new technology is difficult in the industrial sector. Hydrogen has potential for FCVs and as alternative fuel source.	No Quantitative Target
Over seas	Overseas Contributions	Contribute through partnerships for climate action plan. (maintain and strengthen investment sentiment in LDCs and contribute to their fundraising)	No Quantitative Target

※VRE: Variable Renewable Energy

（Reference）Kyoto Protocol and Paris Agreement

	Kyoto Protocol	**Paris Agreement** Reduction target for each country (for 2030, to be revised every 5 years)	**Paris Agreement** long-term low greenhouse gas emission development strategies (for 2050)
Countries	Developed countries	Developed countries + **Emerging countries**	Developed countries + **Emerging countries**
Target	**Domestic** target × **Multinational** agreement	**Domestic** target × Nationally Determined (**mandatory**)	**Domestic & Global** Massive reduction of GHG × Nationally Determined (**voluntarily**)

Current State of Zero Emission Ratio

	Japan		US (in 2015)	EU (in 2015)			
	In 2010	In 2015		EU ave.*1	Germany	UK	France
Zero emission rate	35%	16%	33%	56%	44%	46%	93%
Renewable energy	10%	15%	13%	29%	29%	25%	16%
Variable renewables	0.7% (PV：0.3% Wind：0.4%)	4% (PV：3% Wind：1%)	5% (PV：1% Wind：4%)	13% (PV：3% Wind：10%)	18% (PV：6% Wind：12%)	14% (PV：2% Wind：12%)	5% (PV：1% Wind：4%)
Stable renewables	9% (Hydro：7% Geo*2：0.2% Biomass：1%)	11% (Hydro ：9% Geo：0.3% Biomass ：2%)	8% (Hydro ：6% Geo ：0% Biomass ：1%)	16% (Hydro ：11% Geo ：0.2% Biomass ：6%)	11% (Hydro ：3% Geo ：0% Biomass ：7%)	11% (Hydro ：2% Geo ：0% Biomass ：9%)	11% (Hydro ：10% Geo ：0% Biomass ：1%)
Nuclear	25%	1%	19%	27%	14%	21%	78%

*1 OECD members, *2 Geothermal power

Source: IEA, METI statistics

Renewable energy is the major target of electricity investment

	2000	2016	
	Investment	**Investment**	**Capacity Stock** * For 2014
Thermal Power & Nuclear Power	**7 trillion yen** Thermal Power :6 trillion yen Nuclear Power:1 trillion yen	**14 trillion yen** ※Japan: 0.4 trillion yen Thermal Power :11.5 trillion yen Nuclear Power:2.5 trillion yen	**4,300GW** Thermal Power :3,900GW Nuclear Power:400GW
Renewable Energy	**6 trillion yen** (Mainly Hydro Power)	**30 trillion yen** *Japan: 2.2 trillion yen (mainly Wind Power & Solar power)	**1,800GW**

※ Estimated at conversion rate 1$ = 100 JPY, world total yen

Source: Created by Agency for Natural Resources and Energy from IEA “World Energy Investment 2017”

Three challenges to be addressed for renewable energy to be a major power source

See, for example, **“Clean energy‘s dirty secret - Wind and solar power disrupting electricity systems" *Economist*, Feb 25th, 2017**

	(i) Cost	(ii) Operating reserves	(iii) NW
Current	**Significantly declined in foreign countries**	**Depending on thermal power as operating reserves**	**Constructed in accordance with the locations of thermal and nuclear power plants**
Challenges	**Reduce higher cost in Japan**	**Maintain thermal power as operating reserves + Reduce battery cost**	**Restructure NW in accord with renewable energy expansion + Introduce distributed NW**

Europe in the Lead in reducing Renewable Energy Costs

Photovoltaic Costs in Europe and Japan [yen/kWh]

	2010	2016			
	Total Cost※	Total Cost	Equipment	Construction	Operational Cost
Europe	40 yen	10 yen	6 yen	2 yen	2 yen
Japan	40 yen	20 yen	12 yen	5 yen	3 yen

- Equipment: ○High FIT prices and lack of competition; ○Multilayered distribution structure
- Construction: ○Multilayered subcontracting structure; ○Uneven geographical terrain
- Operational Cost: ○Immaturity of specialized businesses; ○Unused big data

※ Total costs for Europe and Japan are world photovoltaics power generation average

Source: Agency for Natural Resources and Energy estimate based on Bloomberg New Energy Finance data, etc.

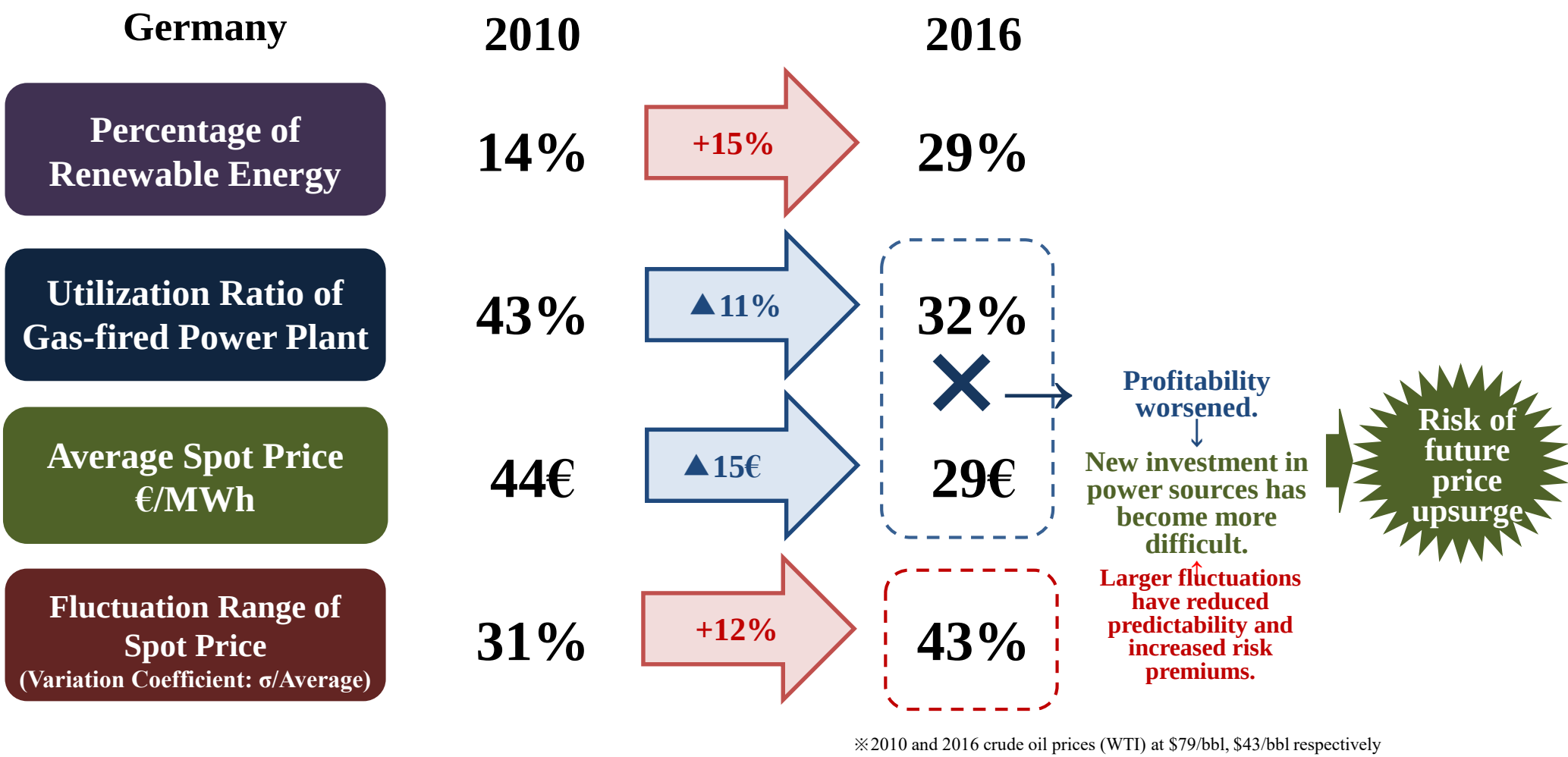
Thermal power plants are required as variable renewable expands

CO_2 Emission per kWh and Composition of Electricity Sources for Major EU Members and Japan (2015)

	Sweden	France	Denmark	Spain	EU Average	Germany	Japan
	11 gCO_2/kWh	46 gCO_2/kWh	174 gCO_2/kWh	293 gCO_2/kWh	311 gCO_2/kWh	450 gCO_2/kWh	540 gCO_2/kWh
Stable Zero Emission	**87%**	**88%**	**15%**	**35%**	**43%**	**25%**	**12%**
	Stable RE: 52% Nuclear: 35%	Stable RE: 11% Nuclear: 78%	Stable RE: 11% Nuclear: 0%	Stable RE: 15% Nuclear: 21%	Stable RE: 16% Nuclear: 27%	Stable RE: 11% Nuclear: 14%	Stable RE: 11% Nuclear: 1%
Variable Renewable Energy	**10%**	**5%**	**51%**	**21%**	**13%**	**18%**	**4%**
	PV: 0% Wind: 10%	PV : 1% Wind: 4%	PV : 2% Wind: 49%	PV : 3% Wind: 18%	PV : 3% Wind: 9%	PV : 6% Wind: 12%	PV : 3% Wind: 1%
Thermal Power	**3%**	**7%**	**34%**	**44%**	**44%**	**56%**	**84%**
	Coal: 0% Gas: 1% Oil: 1%	Coal: 2% Gas: 4% Oil: 1%	Coal: 25% Gas: 6% Oil: 4%	Coal: 19% Gas: 19% Oil: 7%	Coal: 25% Gas: 16% Oil: 3%	Coal: 44% Gas: 10% Oil: 2%	Coal: 32% Gas: 40% Oil: 12%

Source: IEA CO2 emissions from fuel combustions 2017, METI Statistics

Dissemination of renewable energy with no marginal cost has decreased the capacity utilization of thermal power plants, which leads to declining profitability of large-scale power sources. Fluctuations in spot prices have reduced predictability in investment.



※2010 and 2016 crude oil prices (WTI) at $79/bbl, $43/bbl respectively

Source: Created by Agency for Natural Resources and Energy from ENTSO-E, AG Energiebilanzen, etc.

Holding thermal power as operating reserves + Fundamental reduction in battery cost

Unit: yen/kWh

	Current	In the Future	Current Cost	Parity (Households)	Parity (Industry)
			150 yen	25 yen	15 yen
Power Generation	Renewable Energy	Renewable Energy	= 20 yen	= 7 yen (Target for 2030)	= 7 yen (Target for 2030)
	+	+	+	+	+
Adjustment	Thermal Power	Storage Batteries	130 yen	> 18 yen	> 8 yen
			Battery Cost: 40,000 yen/kWh	Battery Cost: approx. 400 yen/kWh	Battery Cost: approx. 40 yen/kWh
	CO_2 emissions	No CO_2 emissions			

LIB cell price (hearings by ANRE)

NAS is approximately 40,000 yen/kWh for system

Ministry of Economy, Trade and Industry, *Storage Battery Strategy 2012*

1%

0.1%

* Based on the premise of receiving no backup, it is assumed that a battery needs a capacity capable of meeting demand for three full days. The above parities may not be achieved when taking into consideration personnel and material costs (the above battery costs show the cost for a battery pack, and the cost for the entire system is assumed to be five to 10 times larger). Adjustment cost includes control and grid costs. It should be noted that the term "parity" here has a different meaning from the definition of such terms as "grid parity," which means that the cost for distributed renewable energy that also uses backup thermal power through the grid equates with the cost for grid-connected power.

Source: Estimate by Agency for Natural Resources and Energy

Structural reform of electricity NW in accordance with the development of renewable energy

	Until now	Current	In the future
Power Source	Thermal power /Nuclear power	Renewable energy ＋Thermal power	Dispersed renewable energy + Batteries
Locations	Urban areas Coastal areas	Rural areas sustainable for generation (Hokkaido, Kyushu, etc.)	Close to urban areas
NW Players	Japanese conventional general electric utilities (10 companies)	Japanese conventional general electric utilities (10 companies)	Various players

Required NW Investment

Investment in existing NW's renovation

Structural change

NW restructuring

Structural change

Investment in dispersed NW

Renewable Energy Ratio is Ratio between Renewable Energy Power Generation Density and Electricity Demand Density

<Factorization Formula for Renewable Energy Ratio>

$$\text{Renewable Energy Ratio} = \frac{\text{Renewable Energy Power Generation [kWh]}}{\text{Land Area [km}^2\text{]}} \div \frac{\text{Total Power Generation [kWh]}}{\text{Land Area [km}^2\text{]}}$$

	Renewable Energy Power Generation Density [kWh/km²]	Electricity Demand Density [kWh/km²]
Interpretation	State of natural energy utilization	Size of electricity demand per unit area
Contribution to Renewable Energy Ratio	The greater it is, the **higher** the renewable energy ratio	The greater it is, the **lower** the renewable energy ratio

While Japan has much Renewable Energy Power Generation Capacity, it also has a High Power Demand Density

	Power Generation per Land Area			Power Demand Density (Total Power Generation ÷ Land Area)	Proportion of Electricity Source		
	PV	Wind	Hydro		PV	Wind	Hydro
Japan	9	1	23	269 10,000 kWh/km² (Total power generation: 1,020 billion kWh, Land area: 380,000 km²)	3%	1%	9%
Germany	11	22	7	181 10,000 kWh/km² (Total power generation: 650 billion kWh, Land area: 360,000 km²)	6%	12%	4%
Spain	2	10	6	56 10,000 kWh/km² (Total power generation: 280 billion kWh, Land area: 510,000 km²)	3%	18%	11%
Italy	8	5	16	94 10,000 kWh/km² (Total power generation: 2,80 billion kWh, Land area: 300,000 km²)	8%	5%	17%
Denmark	1	33	0	67 10,000 kWh/km² (Total power generation: 30 billion kWh, Land area: 40,000 km²)	2%	49%	0%
Sweden	0	4	17	37 10,000 kWh/km² (Total power generation : 1,60 billion kWh, Land area: 440,000 km²)	0%	10%	47%

Source: Created from IEA and Ministry of Interior Affairs and Communication statistics

Four Countries decided to phase out Nuclear Power after Fukushima Accident. Many other Countries are choosing Nuclear Power for Carbon Reduction and other Reasons.

Use nuclear power in the future

- **United States** [99]
- **France** [58]
- **China** [37]
- **Russia** [35]
- **India** [22]
- **Canada** [19]
- **Ukraine** [15]
- **United Kingdom** [15]
- **Sweden** [8]
- **Czech** [6]
- **Pakistan** [5]
- **Finland** [4]
- **Hungary** [4]
- **Argentina** [3]
- **South Africa** [2]
- **Brazil** [2]
- **Bulgaria** [2]
- **Mexico** [2]
- **Netherlands** [1]

[] indicates number of units in operation

- **Turkey**
- **Belarus**
- **Chile**
- **Egypt**
- **Indonesia**
- **Israel**
- **Jordan**
- **Kazakhstan**
- **Malaysia**
- **Poland**
- **Saudi Arabia**
- **Thailand**
- **Bangladesh**
- **UAE**

- **There are also many countries that have not clarified their stance**

Now using Nuclear Power

- **South Korea*** [24] (by cabinet decision 2017, closing expected after 2080)
- **Germany** [8] (by legislation in 2011, to be closed in 2022)
- **Belgium** [7] (by legislation in 2003, to be closed in 2025)
- **Taiwan** [6] (by legislation in 2017, to be closed in 2025)
- **Switzerland**** [5] (by legislation 2017, closing TBD)

(year nuclear power generation closing determined/year scheduled for closedown)

*In South Korea, 5 reactors are under construction.
(2 of them are decided to continue after deliberative polling)

**In Switzerland, there is not placed a limit on years in operation.

[]: units in operation

Not using Nuclear Power

- **Italy** (by cabinet decision 1988, closed down in 1990)
- **Austria** (by legislation 1979)
- **Australia**(by legislation 1998)

Abandon nuclear power in the future

Source: Created by Agency for Natural Resources and Energy from World Nuclear Association website (viewed August 1, 2017)
Note: Only major countries are listed.

Cost for nuclear power generation

- Increasing expenses for dealing with the aftermath of the nuclear accident in Fukushima and the need to strengthen safety measures are factors that increase overall cost, but such cost increase is shared among multiple nuclear reactors over a long term and exerts only limited influence on the unit cost.
- OECD attributes the cost increase in overseas nuclear power plants to factors concerning risks for initial units.

	Capital Costs, etc.	Costs for Nuclear Fuel Cycles	Costs for Accident Risks	Total
2011	**5.8 yen** Capital Costs:440 billion yen Estimation based on a depreciation method	**1.4 yen** Cost related to Reprocessing: 12.2 trillion yen Unit price of uranium fuel : 0.8 yen	**0.5 yen～** Fukushima Daiichi Accident: 5 trillion yen Founded on the basis of 2000 reactor-years	**8.9 yen～**
2015	**7.0 yen** Capital Costs: 500 billion yen Estimation based on a lump-sum accounting method	**1.5 yen** Reprocessing Costs: 12.6 trillion yen Unit price of uranium fuel: 0.9 yen	**0.3 yen～** Fukushima Daiichi Accident: 11 trillion yen Founded on the basis of 4,000 reactor-years	**10.1 yen～** * Total includes other policy expenses as well
Trends at present	○ There are cases where construction cost exceeds 1 trillion yen in foreign countries. "Nuclear New Build" (OECD/NEA 2015) (OECD analysis) (i) Unconventional types of reactors (ii) Poor planning and process management * In some cases, contractual modes affect the total cost. ○ Circumstances in Japan are different.	**+0.1 yen** Cost related to reprocessing: 13.9 trillion yen	**+0.1～0.3 yen** Fukushima Daiichi Accident: 21.5 trillion yen Founded on the basis of 4,000 reactor-years	

Japan is one of the leading countries in Energy Consumption Efficiency

		Japan	UK	France	Germany	US
Industry	Energy consumption efficiency *1 [MJ/USD]	2.1	1.6	1.9	2.2	3.2
	Manufacture [MJ/USD]	3.3	4.4	3.7	3.0	5.2
	(Ratio of manufacture)	(20%)	(9%)	(11%)	(23%)	(12%)
	Commercial, Transport etc *2 [MJ/USD]	1.8	1.4	1.7	1.9	2.9
	(Ratio of other sectors)	(80%)	(91%)	(89%)	(77%)	(88%)
	Energy Consumption Efficiency *3 [MJ/US]	2.1	2.2	2.3	2.3	4.9
Residential	Energy Consumption Efficiency [GJ/person]	14	24	24	27	34

Standardized by the composition of Japanese industry

*1「Final energy consumption ÷ GDP」 *2 Other sectors other than manufacturing
*3 Standardized by the composition of Japanese industry in 2015

Source: IEA, OECD stat etc.

(Reference) Japan's Energy Mix assumed to have Incorporated Energy Conservation at a high level

Main Energy Conservation Measures		FY2015		FY2030
Overall	LED	Adoption Rate Industry: Approx. 31% (330,000kl) Office: Approx. 21% (490,000kl) Households: Approx. 30% (600,000kl)	→	All Sectors 100%(5,380,000kl)
Industry	Top-runner Motors (used widely in pumps, ventilators, etc.)	Units in Use Approx. 750,000 (40,000kl)	→	Approx. 31.2 million (1,660,000kl) → Assumes replacement of half (of total 66,000,000)
Office	Buildings	Ratio of energy conservation standards compliance (Consumed Energy Basis) Large-scale: Approx. 97% Middle-scale: Approx. 94% Small-scale: Approx. 69% (250,000kl)	→	Make compliance mandatory (3,320,000kl)
Households	High-efficiency Water Heaters	Units in Use Approx. 11.52 million (380,000kl)	→	Approx. 46.3 million (2,690,000kl) → Assumes use in approximately 9/10th of all households (51,200,000 households).
Transport	EVs, PHVs, FCVs and other Next-Generation Autos	Proportion of New Auto Sales Approx. 28% (of 590,000kl)	→	50～70%(of 9,390,000kl) → Assumes EVs/PHVs and FCVs account for 20~30% (16% cumulative) and maximum 3% (1% cumulative) of new auto sales respectively.

National Efforts towards EV Expansion

	Main Targets and Statements	Stocks of automobiles In 2015	Quantitative Targets for EVs and PHVs			
			2016	2020	2030	2040
Japan	**Aim at 20~30% share for EVs and PHVs by 2030** (Ministry of Economy, Trade and Industry)	**80 million**	**150,000 (cumulative)**	**1 million (cumulative)**	**20~30% (new car sales)**	
United Kingdom	**End Gasoline and Diesel Car Sales by 2040*1** (Department for Transport and Department for Environment, Food and Rural Affairs	**40 million**	**90,000 (cumulative)**	**1.5 million (cumulative)**		**End of gasoline and diesel car sales**
France	**End GHG-emitting Car Sales by 2040※1** (Nicolas Hulot, Ecology Minister)	**40 million**	**80,000 (cumulative)**	**2 million (cumulative)**		**End of gasoline and diesel car sales**
Germany	**Diesel and Gasoline Cars do not exist on the German Government's Agenda** (government spokesperson)	**50 million**	**70,000 (cumulative)**	**1 million (cumulative)**	**6 million (cumulative)**	
China	**A Portion of Production*2 must be EVs, FCVs, and PHVs from 2019** (Ministry of Industry and Information Technology)	**160 million**	**650,000 (cumulative)**	**5 million (cumulative)**	**80 million (cumulative)**	
United States (California)	**A Portion of Sales*3 must be ZEVs*4 (HVs will not be eligible from 2018)** (California)	**25 million**	**560,000 (cumulative)**	**1.5 million (cumulative)** ※target for 2025		

※1 End of PHV and HV sales has not been mentioned. ※2 2019 10%,2020 12% ※3 2020 6% (only for EV&FCV) ※4 Zero Emission Vehicles(EV・FCV・PHV)