Major Stream of Energy Shifts

First shift

From domestic coal to petroleum (1960s)

- Dramatic decline in self-sufficiency rates

Energy self-sufficiency rates

1960 **58%** → 1970 **15%**

Second shift

Two oil crises (1970s)

- Price surge

Electricity rates (1970=100)

1970 100 → 1980 **203**

* Consumer price index

Third shift

Liberalization of markets and global warming (1990s-)

- Kyoto Protocol (adopted in 1997)
- CO2 reduction as a challenge

Fourth shift

Great East Japan Earthquake and Fukushima Daiichi NPS (1F) accidents (2011-)

- Most serious power supply crisis
- Values as premise of energy supply
- Renewable energy as a new energy option

Fifth shift

Paris Agreement 2050 Reduction targets (2030-)

- Sharing the ambitious goal with many participating countries
- Structural changes in technologies, industries and systems

We are here

1960 - 1970 - 1990 - 2011 - 2030 -

◎ Major changes in situations; forecasting future changes as an important perspective

- ○ Decline of oil and renewable-energy prices
- ○ Introduction prediction of full-fledged development of storage batteries, and current states thereof
- ○ Presently, some countries are phasing out nuclear power, whereas many countries still make use of nuclear power.
- ○ Full liberalization of markets and further popularization of renewable energy; degradation of investment environments
- ○ No change seen in energy trends even after the United States' withdrawal from the Paris Agreement
- ○ Ongoing expansion of global energy and electricity demand
- ○ Rise of emerging companies; significant financial industries presence
- ○ Growing geopolitical risks; strategies requested to address such risks

○ Strategic Energy Plan 2014 setting goals to be achieved by 2030; progress made therein (as of FY2016)

[i] Scenario for cutting CO2 emissions
(Target to be achieved by 2030 → 44% as the zero-emission power source rate)
→ From 10% in 2013 to 17% in 2016
(approx. renewable energy:15%; nuclear energy: 2%)

[ii] Scenario for improving energy self-sufficiency rates
(Target to be achieved by 2030 → 24% as a self-sufficiency rate)
→ From 6% in 2013 to 8% in 2016

[iii] Scenario for curbing costs
(Target to be achieved by 2030 → cut electricity costs as soon as possible)
→ Electricity rate hike by 30% after the occurrence of Great East Japan Earthquake in 2011 (recently by 10% after this)
(oil price ↓, purchase cost of renewable energy ↑,
coal-fired energy as an alternative for nuclear energy ↑)

○ **Identifying issues standing in the way of realization**
○ **2030 = Working with a focus on realization**

○ Paris Agreement

- Developed countries share very ambitious, high-level goals for decreasing greenhouse gas emissions by 2050.

	Japan (from 2013)	U.S. (from 2005)	Canada (from 2005)	Germany (from 1990)	France (from 1990)
2030	Down by 26%	Down by 26 -28%	Down by 30%	Down by 40%	Down by 40%
2050	Down by 80%	Down by 80%	Down by 80%	Down by 80-95%	Down by 75%

* As for Japan, no base year for the 2050 target is determined yet.
* As for the U.S., 2025 target = decrease emissions by 26-28% from 2005 level.

- Common factors of participating countries
  - Technological innovations (nuclear energy, renewable energy, CCS, energy efficiency, etc.)
  - Contribution to related efforts overseas
  - Human resources development; accelerated investment

○ **Establish industrial structures and policies under which Japan can engage in technological innovation and investment as well as in contributions to related efforts overseas, as indispensable initiatives**
○ **2050 = pursuing all possibilities**

Advisory Committee for Natural Resources and Energy

Round Table for Studying Energy Situations

Changes in Japan's Situation over the Six Years since the 2011 Great East Japan Earthquake

Change 1: Decrease in crude oil price per barrel from 100 dollars to 50 dollars
Some expect that a shift of the major energy sources of nuclear energy and coal to gas will advance if the United States establishes a position as a resource producer (i.e., rise of resource producers in non-Middle East areas) and if oil and natural-gas prices remain low. Meanwhile, others estimate that the crude oil price may rise again to 100 dollars from 2030 onward.

Change 2: Decrease of renewable energy price outside Japan from 40 yen/kWh to 10 yen/kWh
Some believe renewable energy should be considered one of the major power sources by becoming independent from the subsidy target under the Feed-in Tariff (FIT) Scheme. Meanwhile, the insufficiency of ground lines and regulated power sources caused new additional burdens on consumers. Japan is still facing higher electricity fee rates than other countries.

Change 3: More intense competition for development of electric vehicles in the automobile industry
Some consider that commercialization of related batteries will bring about vehicles operated by renewable energy alone. However, the prices of such batteries are still relatively high.

Change 4: Presently, some countries are phasing out nuclear power, whereas many countries still make use of nuclear power
In light of the accidents that occurred at Fukushima Daiichi, some countries (i.e., Germany, Italy, Switzerland, Belgium, Taiwan and the ROK) declared a nuclear power phase-out. Meanwhile, many countries choose nuclear power plants as a means of curbing global warming or as an effort to curb the use of fossil fuels, or they support such efforts under national policies. Both of these countries are facing potential risks associated with the operation of a first nuclear reactor in developing new nuclear power plants and they face public concerns over such risks.

Change 5: Full liberalization of markets and further popularization of renewable energy is causing new challenges in investment environments
The lack of marginal costs due to the popularization of renewable energy has decreased the wholesale trading prices of electricity, making it difficult to attract long-term, large-scale investment. Full liberalization of markets and further popularization of renewable energy have introduced new challenges.

Change 6: No change seen in energy trends surrounding the Paris Agreement even after the United States' withdrawal from the agreement
The U.S. declared it will take the lead in technological development ahead of China and European countries. This is expected to trigger global competition in addressing efforts involved in low-carbon technologies, in five areas: [i] renewable energy, [ii] nuclear energy, [iii] CCS, [iv] economic assistance measures, and [v] contribution to overseas efforts. Japan has been economically assisting businesses by allocating subsidies for as much as about 3 trillion yen per year through tax break measures under the FIT scheme or through projects for addressing global warming. Currently, designing such measures is a challenge for Japan.

Change 7: Ongoing expansion of global energy and electricity markets
The electricity market in Japan is already mature (approx. 1 trillion kWh). Meanwhile, the total scale of all electricity markets overseas is now 20 trillion kWh and is expected to expand to 30 trillion kWh by 2030. Japanese companies' investment in the energy field through such markets in emerging countries may become a key to solving the climate change problem.

Change 8: Rise of government-run companies in China; advancement of M&A among European energy companies
Both China and European countries have launched cross-border investment. However, Japan's electricity industry has just entered an early stage of overseas business development.

Change 9: Growing presence of financial players
The financial industry is having a great impact on energy options worldwide. China's presence has been growing in the industry, while China has been striving to harmonize specific efforts with related organizations in Japan and the U.S. Designing a financial system based on the energy industry is currently a challenge for Japan.

Change 10: Growing geopolitical tensions across all regions worldwide
Major countries, including the U.S., Russia, China, India and Saudi Arabia, have been striving to design national energy strategies, aiming to expand their own economic fields. Japan needs to establish its own position.