

Challenges for Electricity and Gas Market Reform: The Implication of Market Liberalization

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Why the energy market regulated?

- **Natural monopoly**
 - **Economy of scale**
- **Energy, regarded as “special commodity”**
 - **Externalities**
 - **“Too important to be left for market mechanism”**

But, “market mechanism” revisited

- **The waves of market reforms in US/UK**
 - Reaganomics and Thatcherism
 - “Washington consensus”
 - “Principal-agent theory”

- **Energy became “ordinary commodity”**
 - Lower and stable energy prices in 1990s
 - Perception “oil price continues to be low”

What actually done to reform market?

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■ Privatization (if applicable)

- State dominant companies to be exposed to market forces
- “Principal-Agent theory”

■ Deregulation

- Introduction of competition (power generation, retail)
- Unbundling
- Remove tariff/profit control
- Regulator to check/monitor competition situation
- Etc.

Deregulated market sees “volatility”

- **Electricity, as essentials for life, tends to have lower price elasticity (short term)**
- **Electricity, difficult to storage, needs to have constant supply-demand matching**
- **Changing market fundamentals can easily result in fluctuation in prices in competitive market**
- **“Financialization” of the market and entry of new players accelerate price volatility**
- **Issues may arise from speculative trading and market power (manipulation)**
- **Things become serious when market is in supply crunch (or in oversupply)**

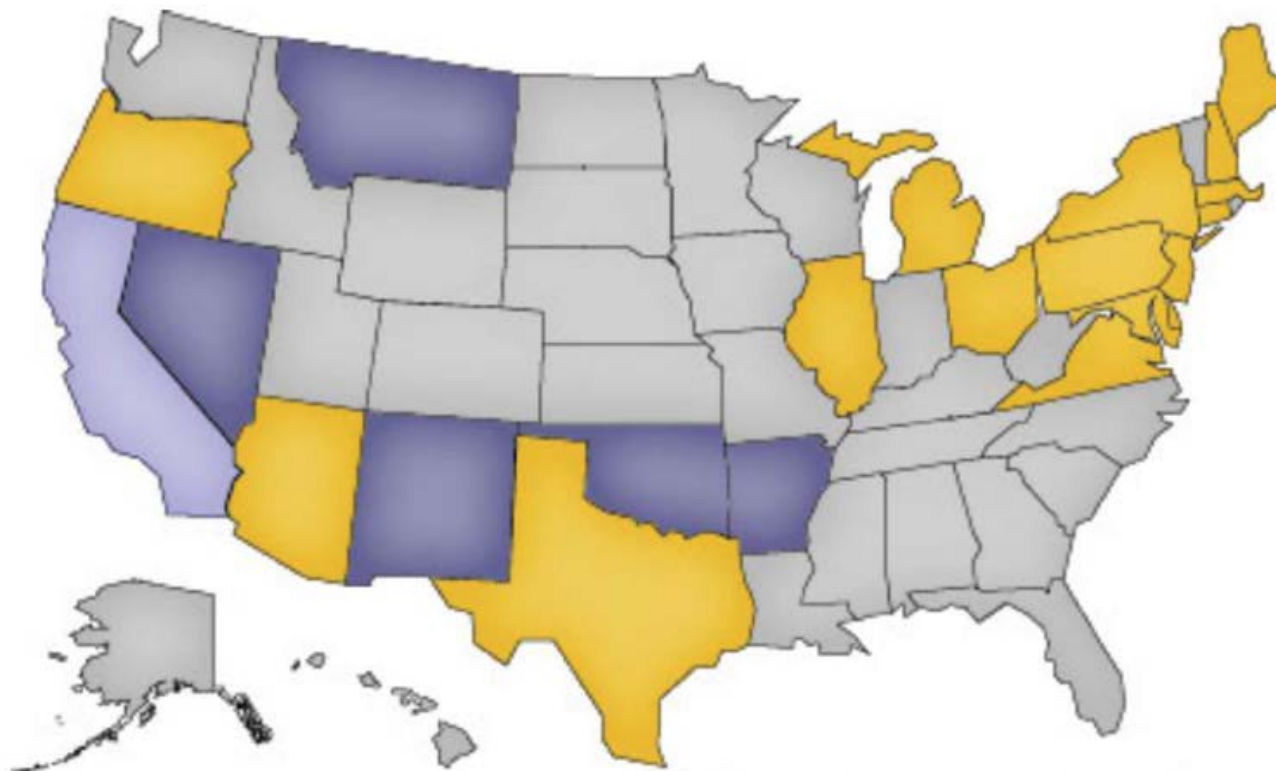
Importance of Check/Review/Modify

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- Market reform can be regarded as “social experiment”
- The experiment may turn out “success” or “failure”
- If it is regarded as a failed experiment, the reform needs to be modified to overcome the problem
- Market conditions themselves as well as political/economic surroundings are always changing
- The history of market reform can be characterized as “continued process to fix/modify the reform”

US, diversified market reform situation

Current status of retail market deregulation



Source: ClearlyEnergy (2014)

Implications to US power generation

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- **US energy market after 2000s is unique under the ongoing shale revolution**
- **Natural gas turns out as winner under the competitive energy market**
- **In power sector, share of coal declined to loose its top share in 2016, gas being 1st fuel in power**
- **In liberalized states (NY, Illinois, etc.), lower price environment created pressure to existing nuclear power stations**
- **These states are now planning to introduce to new mechanism to value zero-emission power**

Implications of large inflow of RE

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■ Price

- Inflow of policy-supported RE pushed supply curve in wholesale electricity market (“merit-order principle”)
- Supply-demand adjustment through grid connectivity (where available)
- Lower prices in wholesale market
- Negative impact on the economy of fossil fuel power generation and incumbent utilities

■ Intermittency

- Create new challenges to adjust intermittency
- Problem for electricity supply-demand stability?
- IEA starts to focus on electricity security of supply

Implications to incumbent utilities

- **Competition creates uncertainty to secure demand (revenue)**
- **Reform also means opportunities to explore new business chances**
- **Lower margins under the competitive environment often cause negative financial results**
- **Needs to market survival lead to pressure to reduce costs and scrutinize investment programs**
- **“Winner takes all” situation may emerge**

Industry and Market Response

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(1) Change in Industrial Organization

(2) Companies to “Go Abroad”

(3) Impact on Prices

(4) Securing Adequate Investment

(5) Realization of Adequate Energy Mix

(1) Change in Industrial Structure: Power market

Although the situation differs country by country, energy utilities have been integrated across borders in general terms.

- (Europe)**
- ① **UK:** 1 originally state-owned utility has become **Big 6**.
 - ② **Germany:** 8 originally leading utilities integrated into **Big 4**.
 - ③ **France:** The regime consisting of **1 large state owned utility** and **other small utilities** remains unchanged in both the electricity and gas sectors.
 - ④ **Italy:** The market originally dominated by state-owned utility (Enel) is now open to **many other companies** triggered by the sale of thermal power plants.

(U.S.) The states that introduced full retail liberalization were limited to **13 states + Washington DC**

Note 1: Crisis in California electric market affected other states planning to implement liberalization.

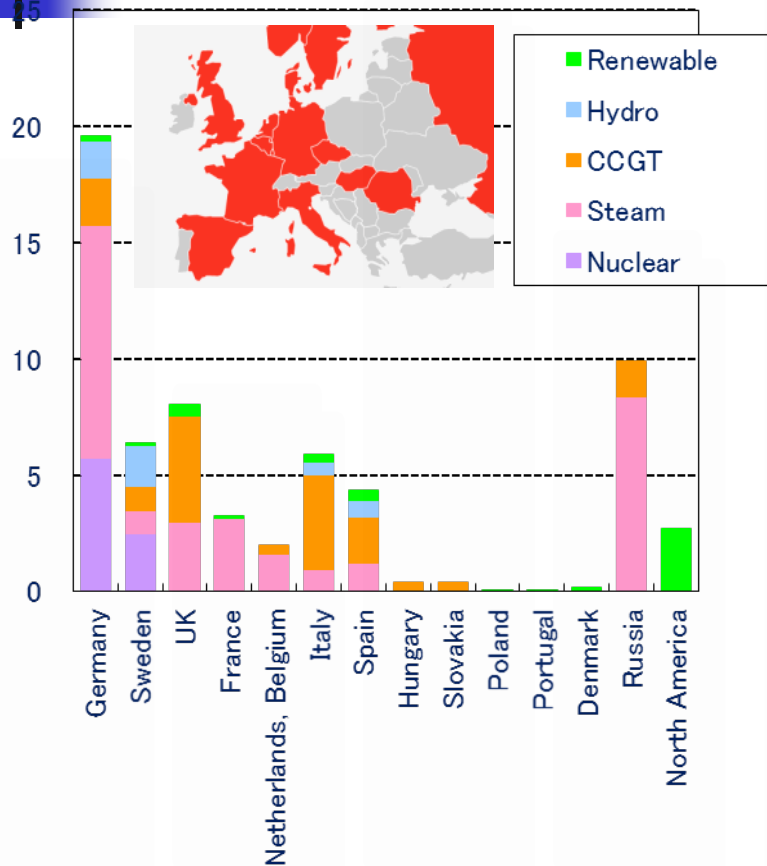
Note 2: Although the electricity market in such states as NY, Massachusetts, and Texas used to be monopolized by the local utilities, many firms have entered the market after the liberalization.



(2) Companies to “Go Abroad”

To be “International Electricity/Gas and Integrated Energy companies”

Installed power generation capacity of E.ON Group



❖ International electricity/gas utilities in Europe (Major Business Area)

EDF: France, U.K., Italy, Belgium, etc.

E.ON: Germany, Sweden, U.K., Italy, Spain, France, Netherlands, Hungary, Czech, Slovakia, Romania, Russia, Brazil, Turkey, North America, etc.

RWE: Germany, U.K., Netherlands, Belgium, Central and Southern Europe

ENEL: Italy, South America, Slovakia, Russia, Romania, etc.

Iberdrola: Spain, U.K., U.S., Portugal, Germany, France, Canada, Brazil, Mexico, etc.

Integrated energy enterprises are expected to emerge in Japan, due to such conditions as : demand decline in the future; improvement in purchasing power in the upstream sector; and effective use of information technology.

Source: Prepared on the basis of E.ON, “Facts & Figures”.

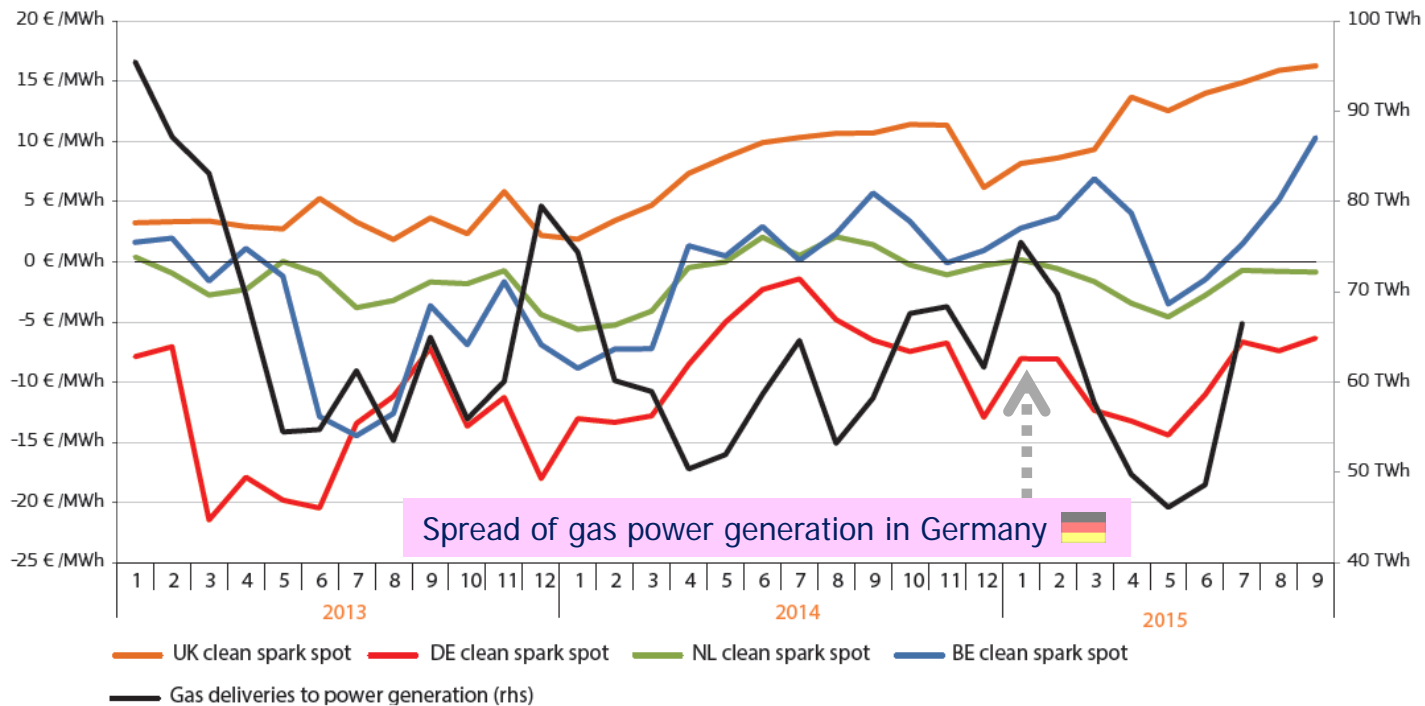
(3) Impacts on Prices

- ❖ Liberalization means “exposure” to the spot market.
As a result, fluctuations in fuel prices are reflected in energy prices in an exaggerated manner.
- ❖ So far, a widely held view is that liberalization has not necessarily reduced prices because fuel prices had been rising up until 2014.
- ❖ In recent years, wholesale prices decline due to lower fuel prices and increasing renewable energy generations.
- ❖ The business performance of power industries is deteriorating in most countries.



Profitability of Natural Gas Power Generation in Europe

- ❖ The profitability of thermal power generation is analyzed based on the factor called “spread”, which is the difference between electricity wholesale prices and fuel costs (fuel prices ÷ power generation efficiency).
- ❖ The spread of natural gas power generation in Europe is called “Clean Spark Spread”. Recently, the spread became negative in some countries including Germany, causing the difficult situation of not being able to recover even fuel prices. Under these circumstances, applications for terminating gas power generation have increased, and the framework of the wholesale market is being reconsidered even in Germany.

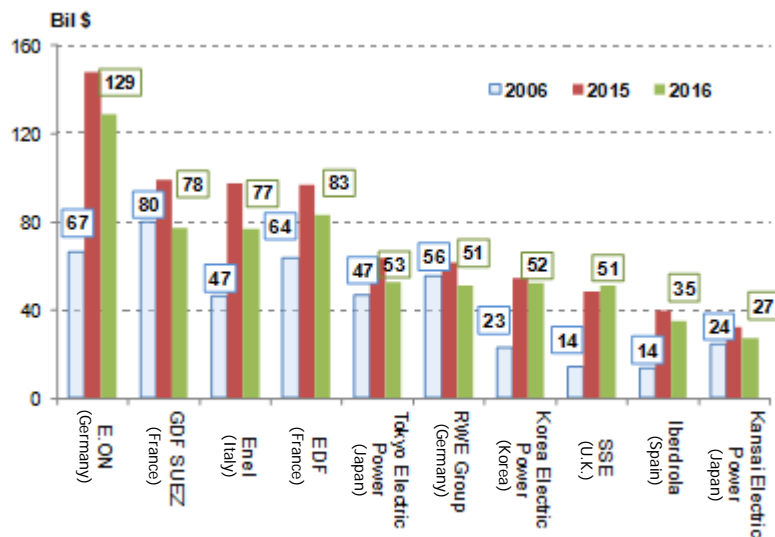




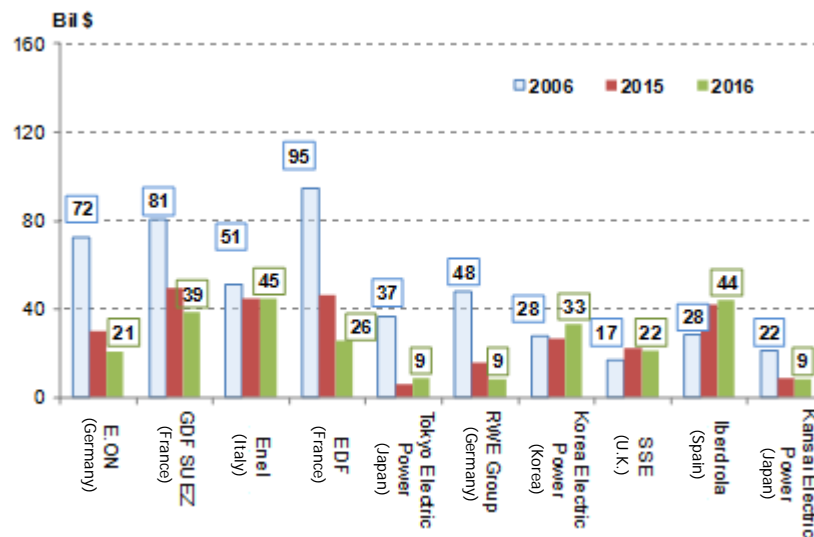
Details of World's Top 10 Utilities in Sales (2016)

- Each company has expanded sales since 2006, while seeing a downward trend for profits.
- Market capitalization has declined generally → indicating the market's harsh view of the future course of power and gas utilities. From 2015 to 2016, sales and market capitalization are decreasing generally.
- Global power and gas utilities exist and maintain their respective positions. However, their future prospects are problematic.

Comparison of sales
(2006, 2015, 2016)



Comparison of market capitalization
(2006, 2015, 2016)



Source: Forbes, "The World's Biggest Public Companies"
Note: 2006 data for GDF Suez represent combination of data for GDF and Suez.

(4) Securing Adequate Investment

- ❖ Adequate investment cannot be secured by liberalization alone.

Many countries are addressing the shortage of investment by introducing such means as the **Capacity Market**.

Note: It is difficult to invest in power generation facilities with high fixed costs requiring mid- to long-term recovery of costs, when there is significant uncertainty in both prices and quantities.

The Capacity Market is an initiative to offer a certain level of certainty.

- ❖ However, there are countries which successfully operate the Capacity Market, and those which do not.




Types of Capacity Market and Current Status

- ❖ **Resolution of classical missing money issue:** Introduce the capacity market because the wholesale price is decided based on the marginal cost principle in the pool market, and the fixed costs of the peak power source cannot be recovered.
- ❖ **Measures against stagnant wholesale prices due to the spread of renewable energy:** Introduce the capacity mechanism as a measure to secure investment for power generation or to avoid shutdown due to stagnant wholesale prices due to the spread of renewable energy and increase in uncertainty of power generation volume.
- ❖ **Enhancement of reliability:** The capacity mechanism may be introduced as a measure to reduce the risk of blackout caused by extreme weather like a heat wave or cold wave in case the electricity demand for air conditioners is high (capacity mechanism is adopted by necessity) and also as a measure to secure high reliability in big cities.

		Resolution of classical missing money issue	Measures against stagnant wholesale prices due to the spread of renewable energy	Enhancement of reliability
Price type	Capacity payment	Old U.K. pool market, Spain, etc.		
Capacity market (Supply capacity obligation)	Centralized capacity market		U.K.	U.S. PJM
	Distributed capacity market			France
Partial capacity market (Strategic reserved capacity)	Controlled type		Germany	
	Effective use of market type			Sweden, Finland
No capacity mechanism		State of Texas, Australia (Allowing for price spike)		

(5) Realization of Adequate Energy Mix

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- A decorative graphic consisting of a yellow square, a white square, and a red square, with a vertical black line and a horizontal white line intersecting them.
- ❖ In some countries where the degree of liberalization is high, investment in zero-carbon electricity sources is not adequately made , which tend to require stronger involvement by the government.
 - UK: Introduction of “FIT/CFD”
 - US (states level): Introduction of “ZEC”
 - US (DOE proposal): consideration for “baseload power”

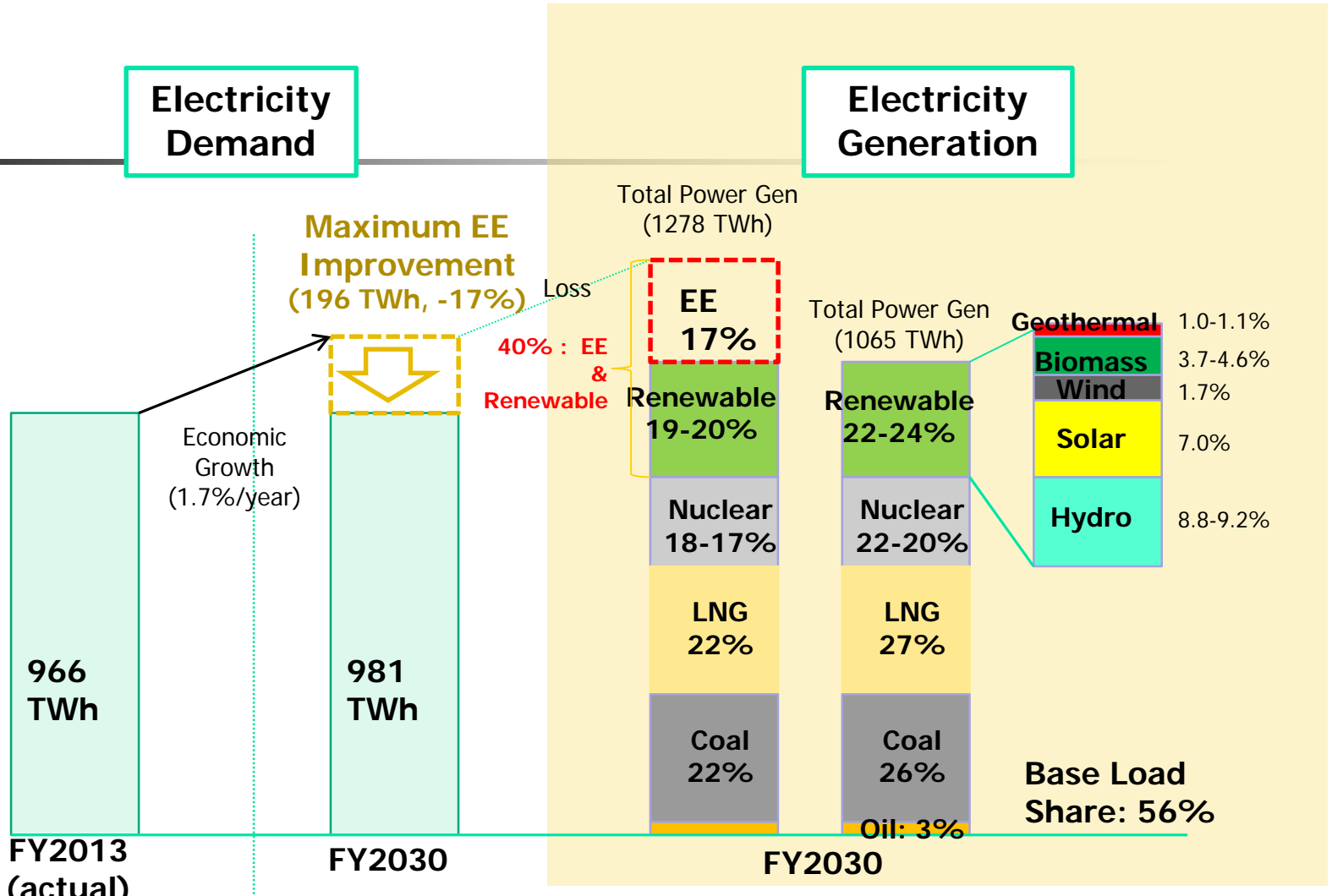


Challenges for Japan's Energy Policy

- Best Energy Mix: How to achieve it?
- Re-start of Nuclear Power
- *Energy Market Reform*
- Security of Supply for Fossil Fuels
- GHG Emission Reduction Target
- *Revision of "Strategic Energy Plan" underway*



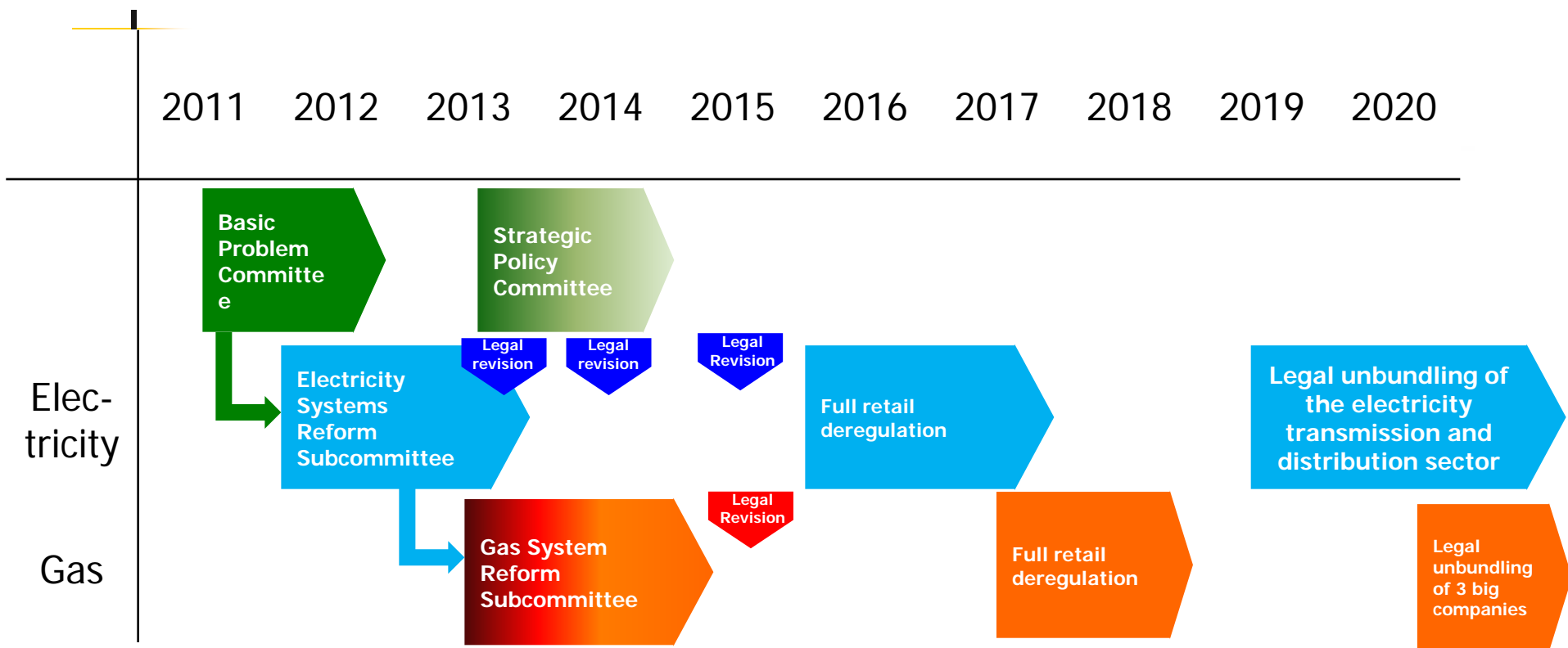
Strong Electricity Saving and Balanced Power Mix



N.B: EE stands for Energy Efficiency

Source: METI

Electricity and Gas Systems Reform after 2011

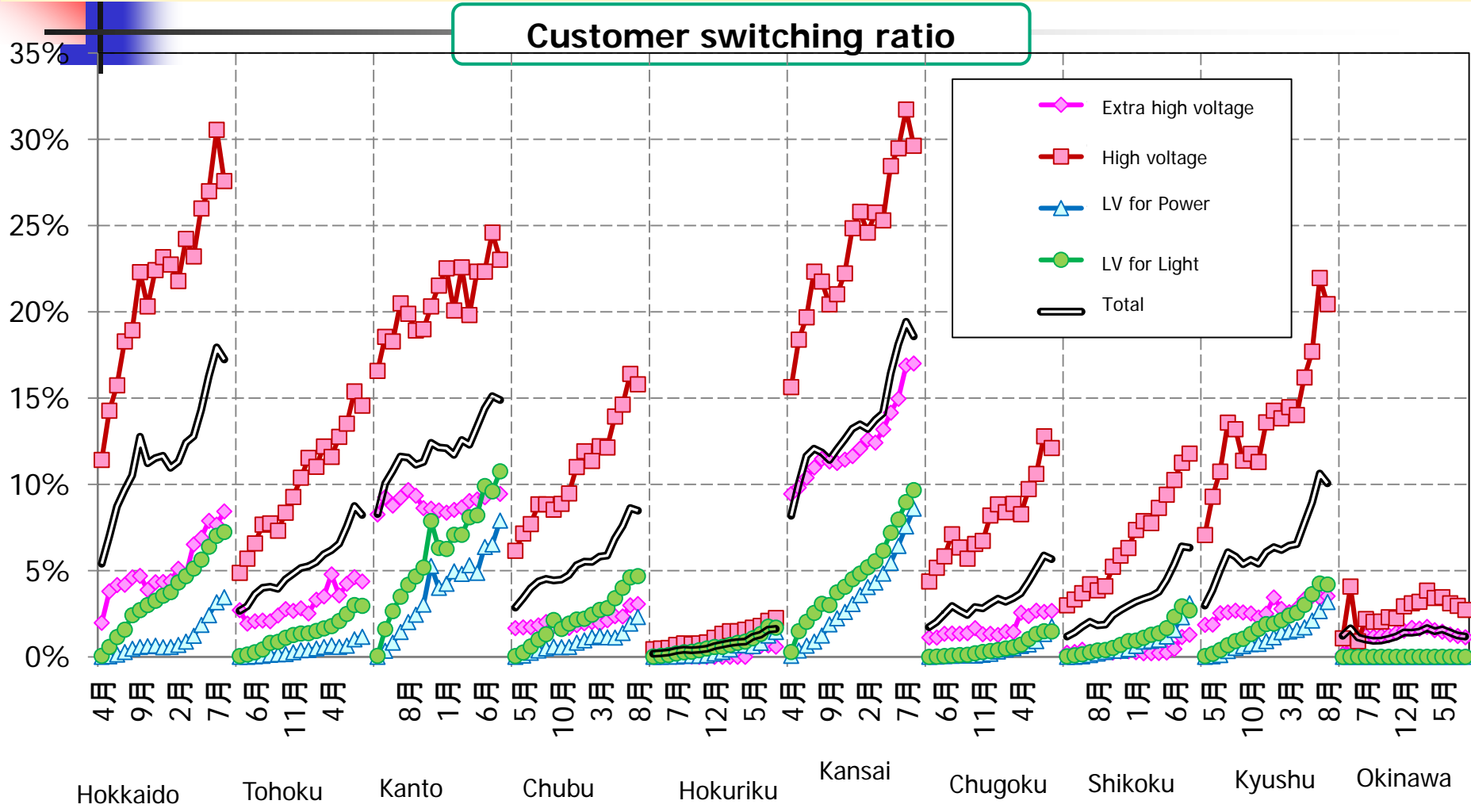


- Electricity system reform has 3 steps, and gas system reform has 2 steps.
- Electricity market: Full retail market liberalization (April 2016) and legal unbundling (2020)
- Gas market: Full retail market liberalization (April 2017) and legal unbundling for big 3 companies (2022)



Current Status of Power Market Reform

- Share of "New entrants" accounts for 12.1% in household sector as of August 2017.
- Kansai area features severe competition, followed by Kanto and Hokkaido.



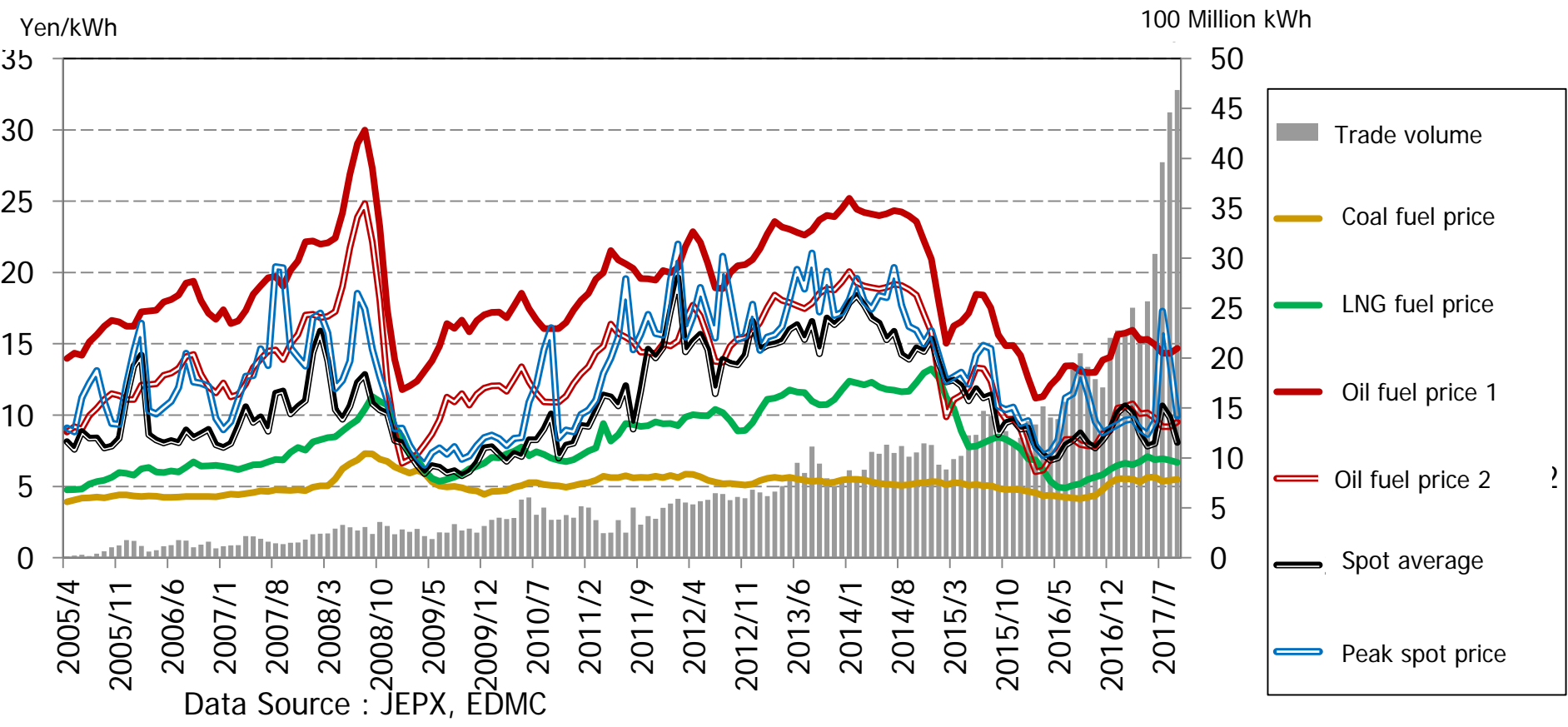
Source: Junichi Ogasawara, "Electric Industry Outlook and Challenges for 2018" (IEEJ, December 2017)



Price of the Wholesale Power Market

- JPEX trading volume increased significantly.
- JEPX price increasingly to be linked with oil price.
- Current price hovers at around 10 yen/kWh.

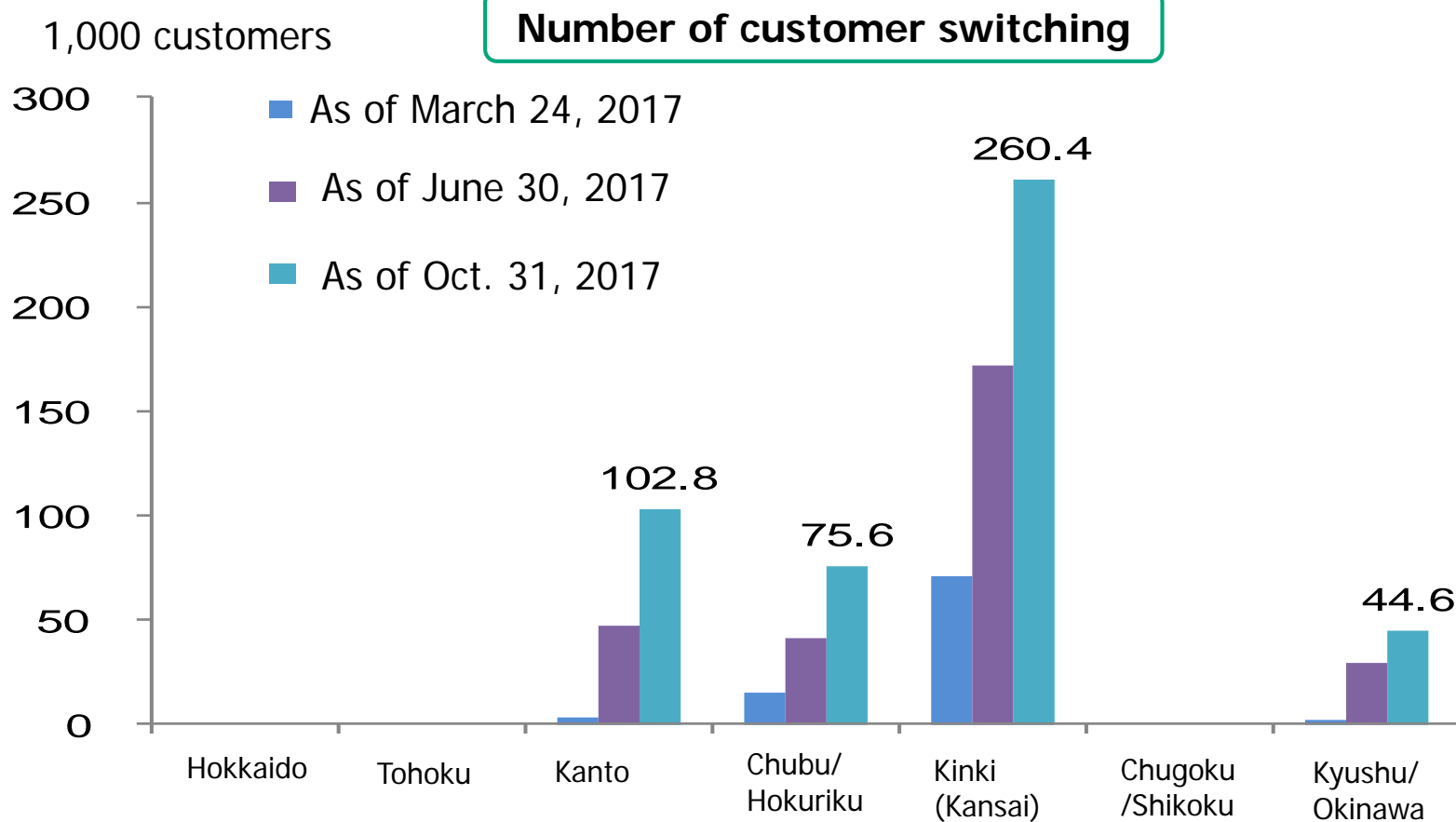
JEPX spot price and fuel price





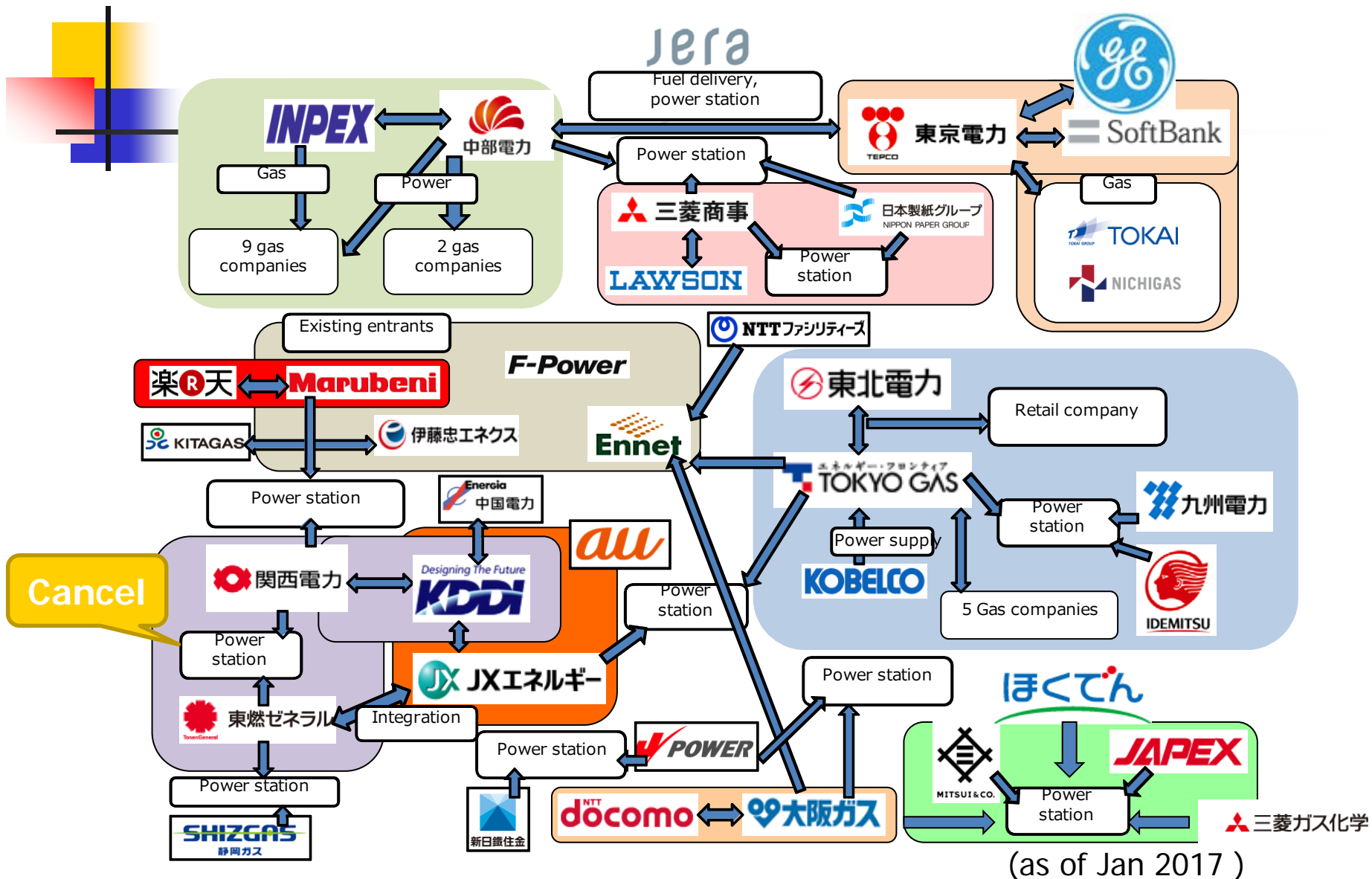
Current Status of Gas Market Reform

- Share of "New entrants" accounts for 1.2% in household sector as of August 2017.
- Kansai area features severe competition.
- Key for the future is marketing strategy by electric utilities.
- TPA for LNG terminals





Business Alliances of Stakeholders

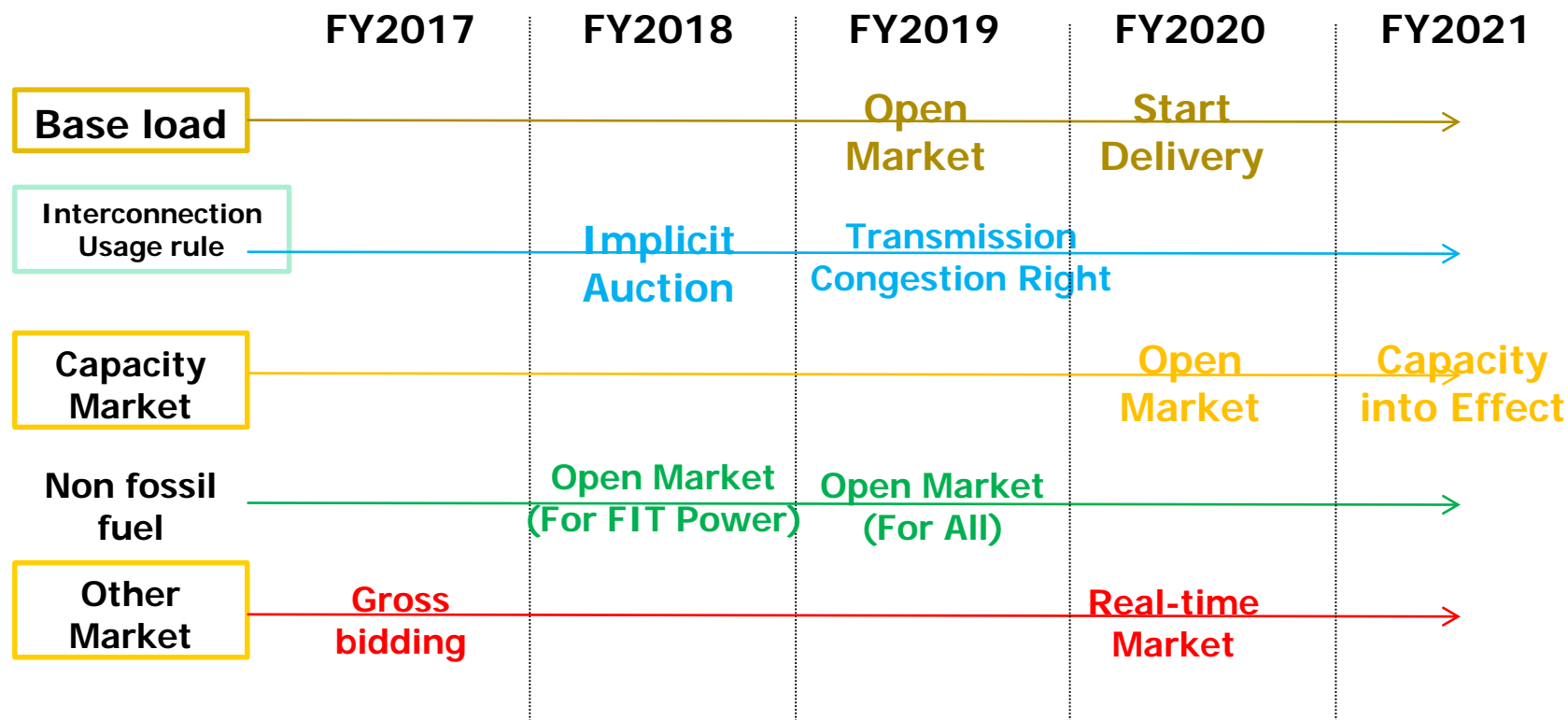


(as of Jan 2017)

Roadmap of New Markets Power Market Design

■ The Value of Power should be realized in each market.

- kWh → Wholesale power market
- kW → Capacity market
- Δ kW → Reserve Tender, Real-time market
- Others → Non fossil fuel market



Conclusion

1. Market reform is natural development in terms of streamlining the electric power and gas industry.
2. Considering the situation in Europe/US/Japan, price effects of liberalization were often mixed up with other important factors such as volatility in fuel prices and RE introduction (from consumers' viewpoint), while various challenges are notable such as lack of investment and difficulty in achieving an adequate energy mix.
3. It is critical for any country to plan and implement market reform, taking into account the successes and failures in the advanced experiences.