IGRC Seoul 2011
International Gas Union Research Conference

Keeping gas in the buildings of tomorrow:
will codes and standards kill gas?

Housing/Building Efficiency Standard and Energy Supply in Japan

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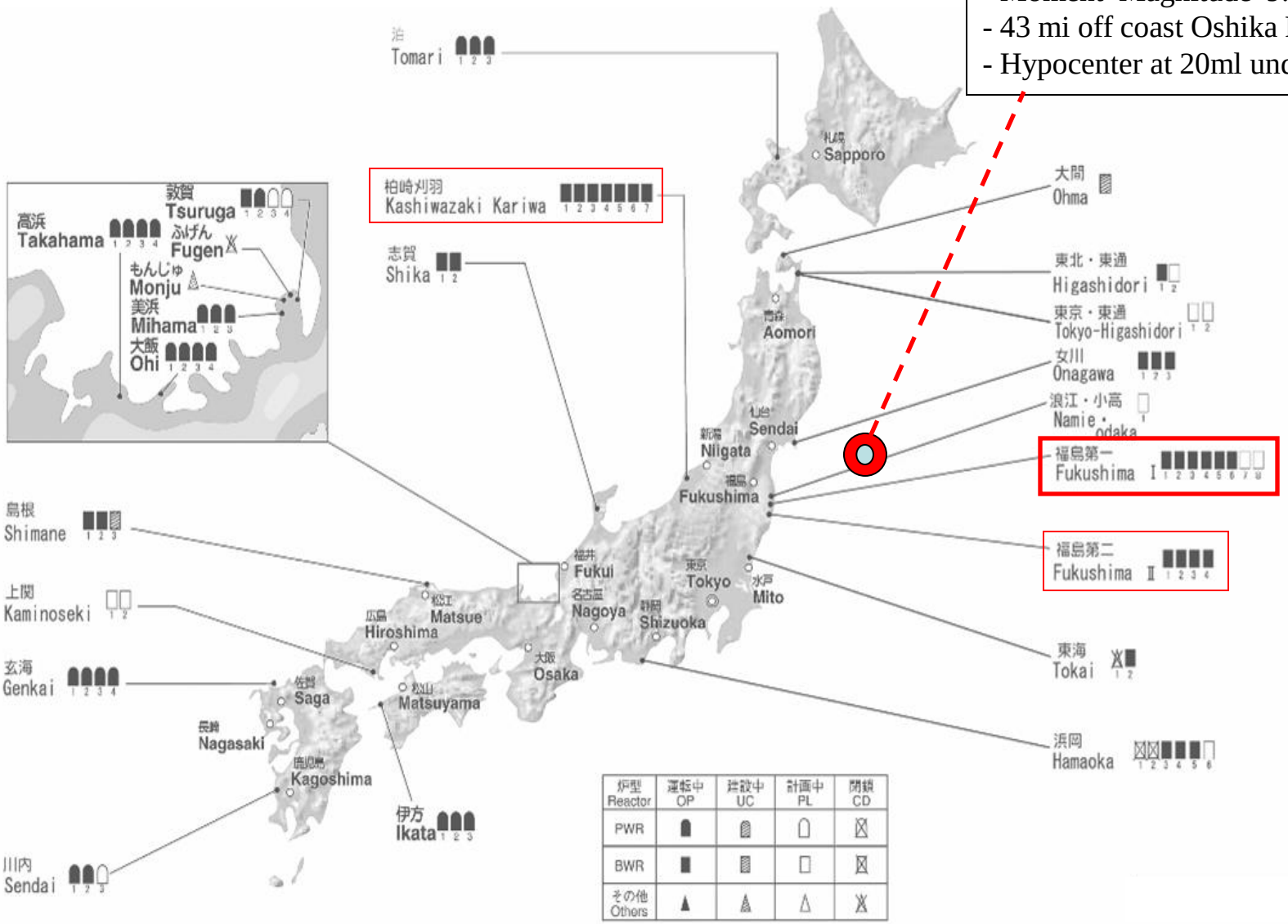
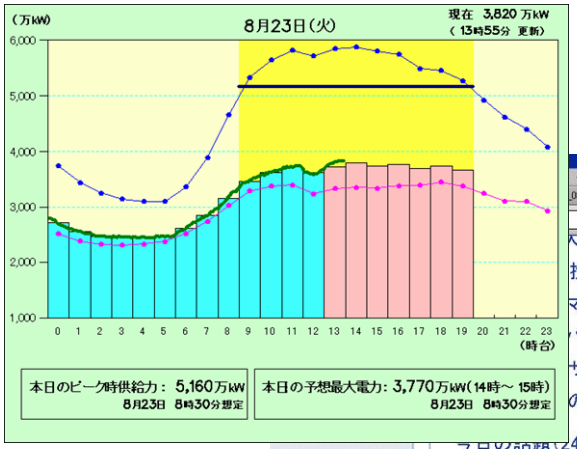
What happened on March 11th 2011?

2011.3.11 Tohoku Earthquake
- Moment Magnitude 9.0
- 43 mi off coast Oshika Peninsula
- Hypocenter at 20ml underwater depth



Continuous Electricity Shortage: Save Electricity Summer 2011



"Save Electricity" in Japan

For the first time, power generation capacity is less than demand.

Energy Policy Basic Plan (2010): before 3.11

"1/3 of CO_2 reduction to be achieved by Nuclear Power increase"

Total accumulated investment

Ref.

	Major reduction measures	Reduction amount (approx.)	Total investment amount
Private sector	○ Energy conservation of houses and buildings	59 million tons	50.3 trillion yen
	○ High efficiency hot water supply devices (for households)	19 million tons	4.6 trillion yen
	○ Highly efficient illumination	28 million tons	4.2 trillion yen
	○ Energy conservation in IT equipment (green IT)	30 million tons	6.0 trillion yen
	○ Other	30 million tons	11.4 trillion yen
Industrial sector	○ Energy conservation in the manufacturing division ○ Innovative technological development ○ Conversion to gas	39 million tons	6.6 trillion yen * Cost for the entire industrial sector
Transportation sector	○ Diffusion and fuel efficiency improvement of next-generation automobiles ○ Biofuels	54 million tons	13.6 trillion yen
Section of conversion	○ Renewable energy * Photovoltaic, wind power, medium and small hydroelectric, geothermal, biomass	60 million tons	26.1 trillion y * Entire renewable energy (Assuming that buyback cost is app trillion yen and system stabilization approx. 18 trillion yen)
	○ Nuclear power plants	160 million tons	5.6 trillion y
	○ Improvement in efficiency in thermal power generation	25 million tons	2.5 trillion y

Total: 131 trillion yen

If energy saving merit is taken into account: 62 trillion yen

"1/3 of CO_2 reduction to be achieved by Nuclear Power increase"

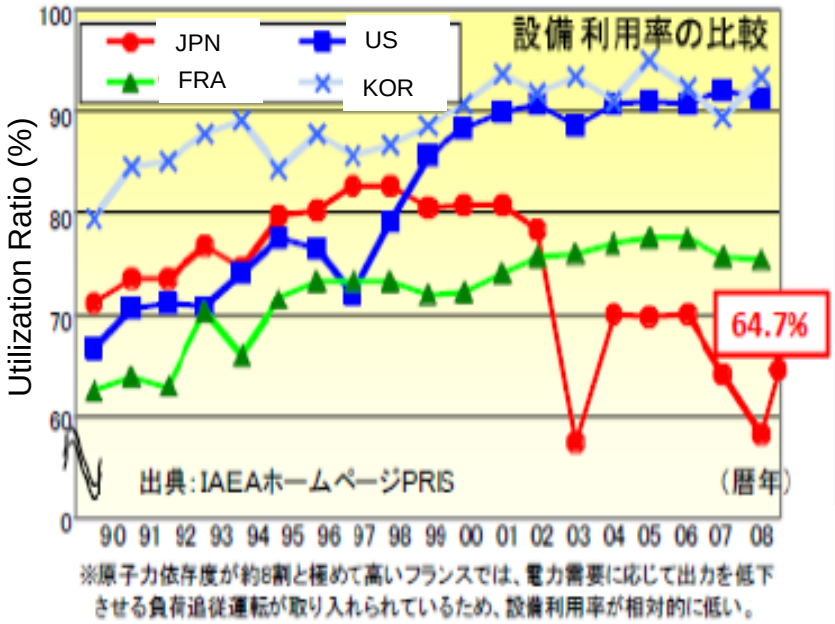
* Total investment amount needed by 2030 has been roughly estimated. (Accumulation of differences in price from existing products. Provided that the price difference is assumed to be gradually decreased, in principle.)

Energy Policy Basic Plan(2010):Promoting Nuclear Power

- - Building 9 new or additional nuclear plants (13mil. kW) by 2020 and 5 more (total 14, Cap. 19 mil. kW) by 2030

EXTREMELY unlikely!

- Increasing Utilization Ratio (64.7%@2009), 85% by 2020 and 90% by 2030
  - > Extending allowed Operation Cycle (13 months to 18 months)
  - > Decreasing Maintenance Duration (4 months to 1 month)



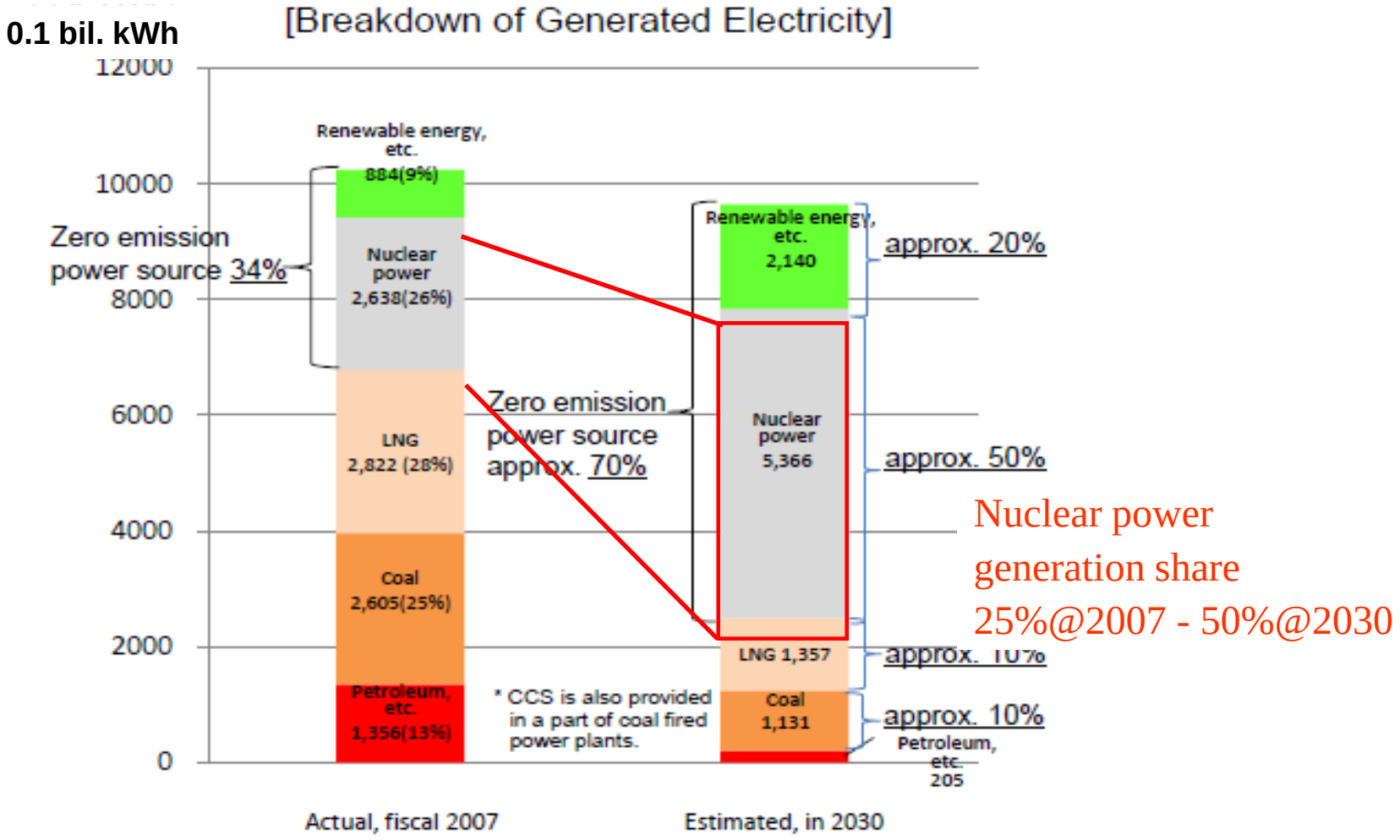
※原子力依存度が約8割と極めて高いフランスでは、電力需要に応じて出力を低下させる負荷追従運転が取り入れられているため、設備利用率が相対的に低い。

	Allowed Oper. Cycles (months)		Maintenance Cycles (months)	
	JPN	US	JPN	US
1990年	12. 4	14. 2	4. 6	3. 1
1995年	13. 1	15. 5	3. 2	2. 1
2000年	13. 5	17. 5	2. 9	1. 4
2005年	12. 4	18. 9	4. 2	1. 3

※1 日本:併入から定期検査開始による発電停止までの期間(定期検査以外による停止期間は除く)。
※2 日本:定期検査開始による発電停止から併入までの期間(800日以上の定期検査を除く)。
米国:燃料交換期間。 出典:IAEA－PRIS等から作成

Energy Policy Basic Plan (2010): Nuclear Plants Powers share, from 50% to 25%

Energy Policy Basic Plan needs to be re-structured with less dependency on Nuclear Powers.

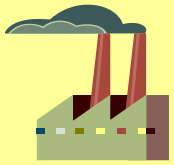


Nuclear power generation share 25%@2007 - 50%@2030

→ **Tighter Energy Efficiency Level.**

Energy Efficiency Standard (Regulations)

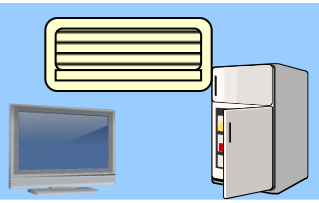
① **Large Volume User (Industrial Factory)**



② **Transportation**

③ **Houses/Buildings**

④ **Appliances and Electronics**



<u>Buildings(Apr 2010 -)</u>

(Floor Space with 300m^2 and more)

+

<u>Houses(April 2009 -)</u>

(Detached Property Developer with 150/year units sales and more)

Energy Efficiency Standard for Buildings

- The energy efficiency standards for buildings consist of:
  > **PAL** (Perimeter Annual Load) Standards
  > **CEC** (Coefficient of Energy Consumption) Standards.
  PALs and CECs are expressed according to the use of buildings. (offices, hotels, hospitals, stores, restaurants, schools, assembly halls and factories)

- PAL
  The index indicates thermal performance of buildings.
  It is used for architectural planning and design of building envelopes
  (such as specifications for glazing and thickness of insulation materials).

- CEC
  The index that indicates energy efficiency of building equipment. CEC standard values are set for building equipment:
  CEC / AC (air-conditioning)
  CEC / V (mechanical ventilation)
  CEC / L (lighting)
  CEC / HW (hot water supply)
  CEC / E (elevators).

Energy Efficiency Standard for Homes (2009.April～)

Regulation by Primary Energy Consumption based on the Model Simulation.

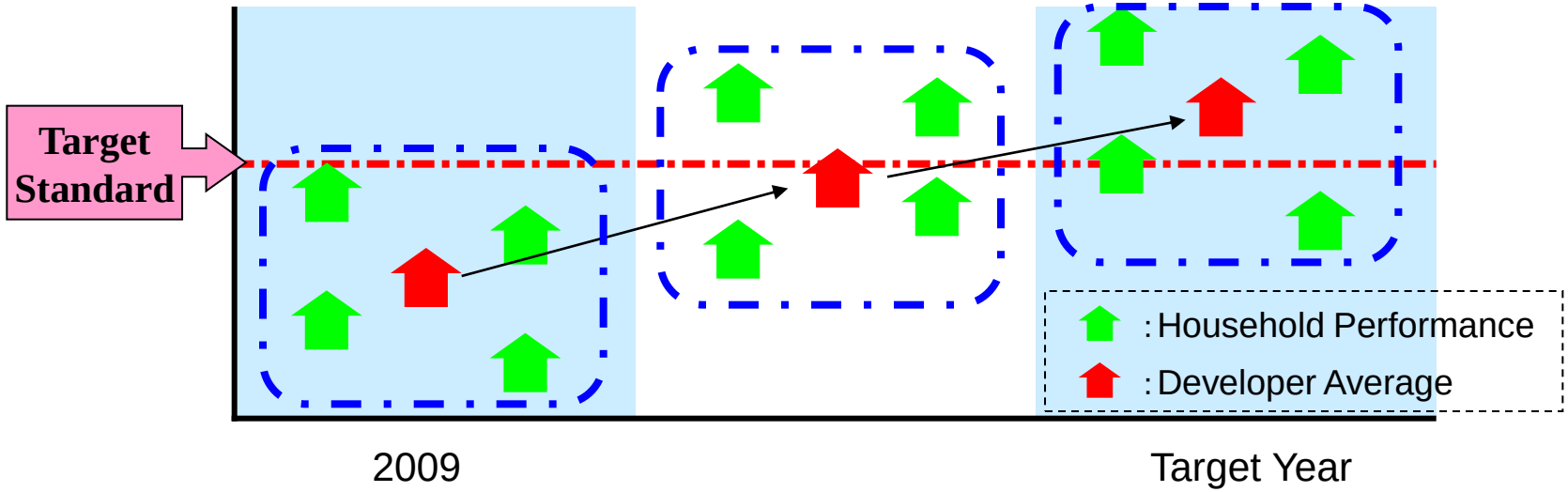
< Insulation > < Appliances >

Wall, Windows.. ＋ HVAC Hot Water Lighting

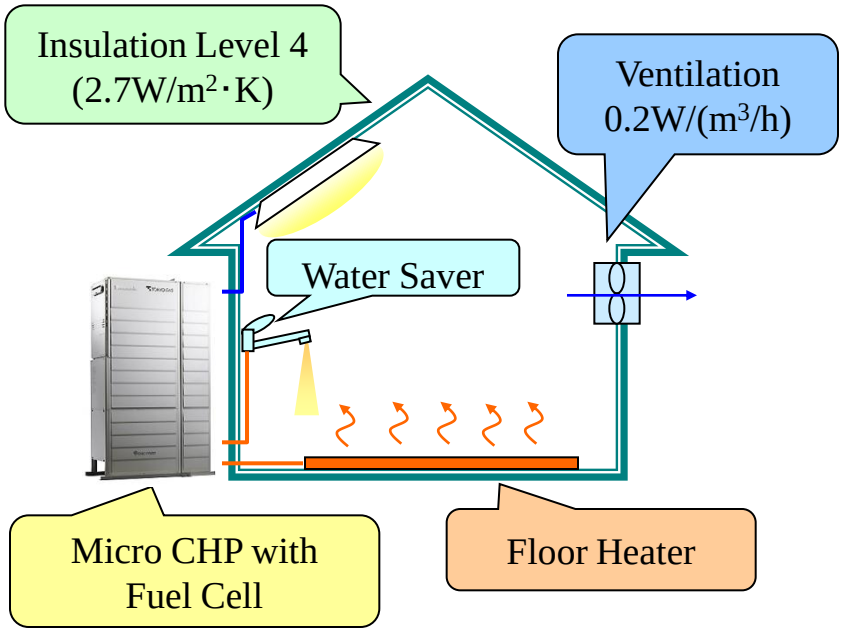
Photovoltaic, Solar heat

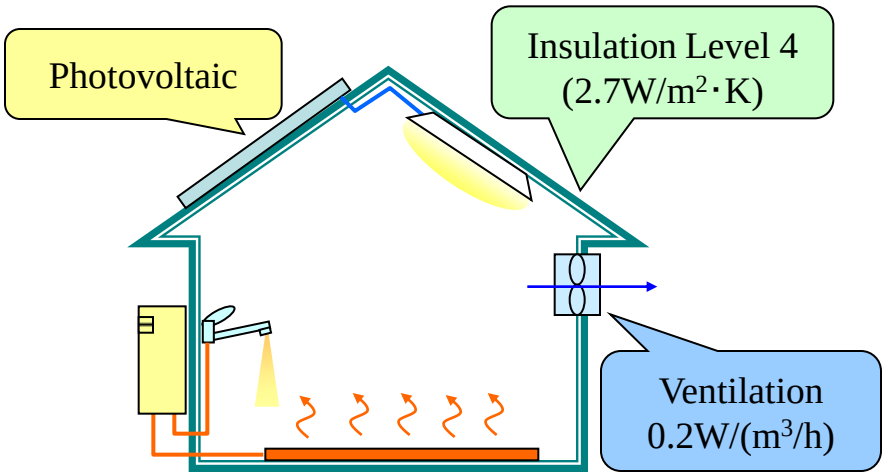
Calculation of Primary Energy → Target Year : 2013 (10% Reduction from 2009 Level)

※ Regulation is not by household. (by Developer Average)

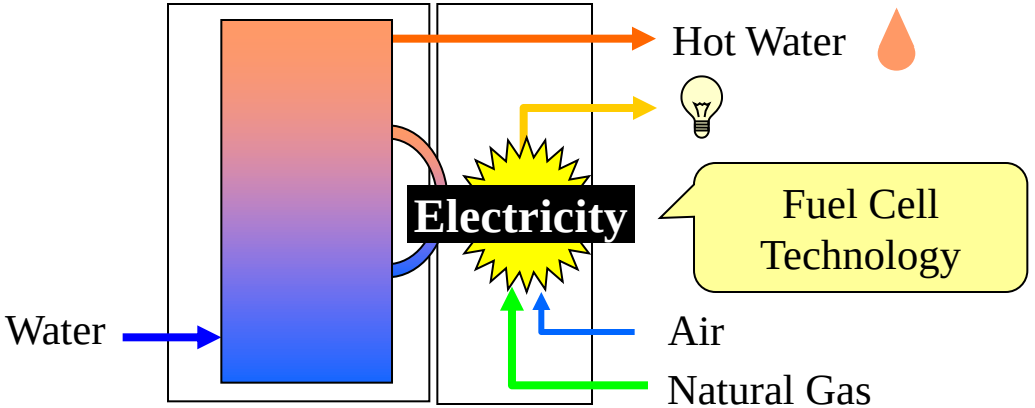


Example of EE Standard achieved house





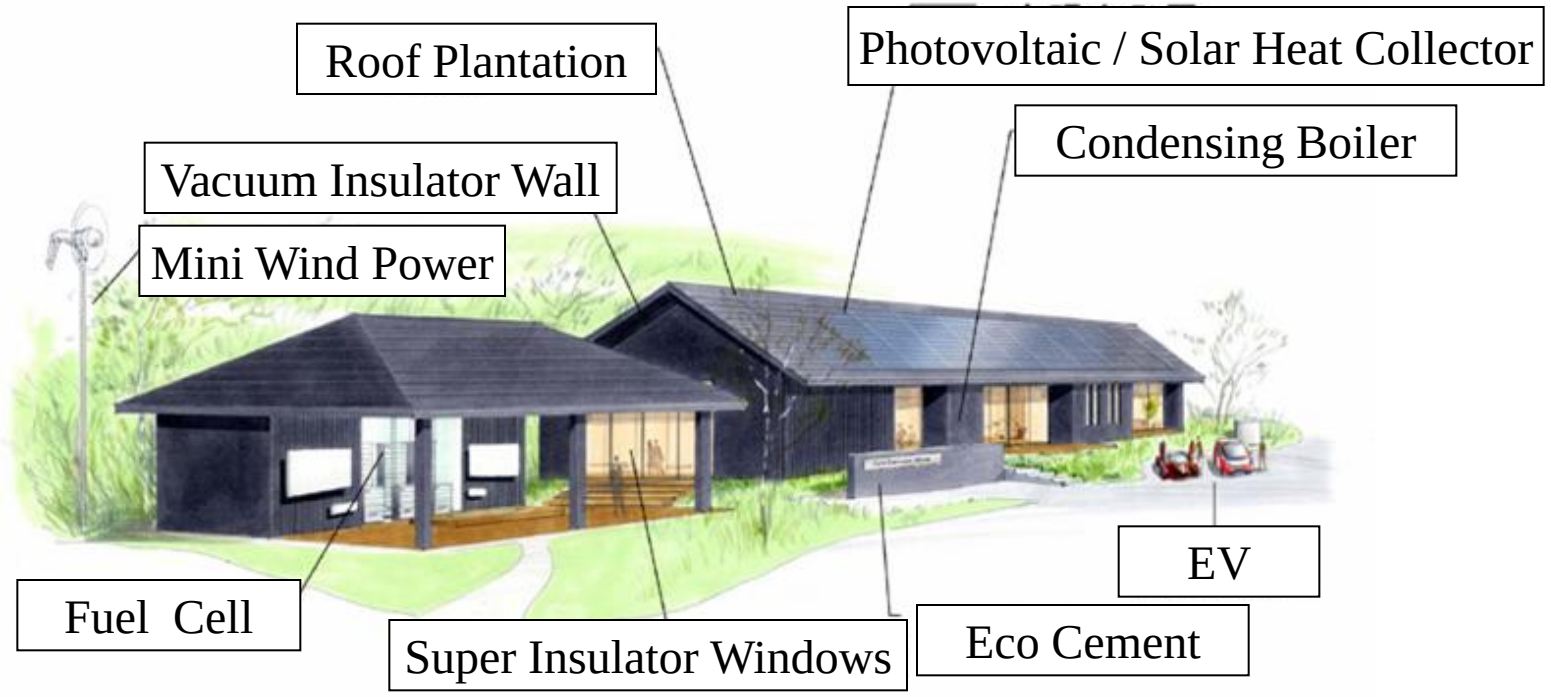
Micro CHP with Fuel Cell



Forecast of Energy Efficiency Regulation towards 2020 (Plan)

- All new houses / buildings must meet EE standard by 2020.
- New detached house and new public buildings are expected to meet ZEH / ZEB (Zero Energy House / Zero Energy Building) in 2020.
- Average EE level of new houses / buildings is expected to meet ZEH / ZEB level by 2030.

Example of Zero Energy House



This plan has been take into consideration in Energy Policy Basic Plan(2010)

Realistic Method to reduce CO2

"1/3 of CO2 reduction to be achieved by Nuclear Power increase" will be unlikely to be realized

Realistic Method

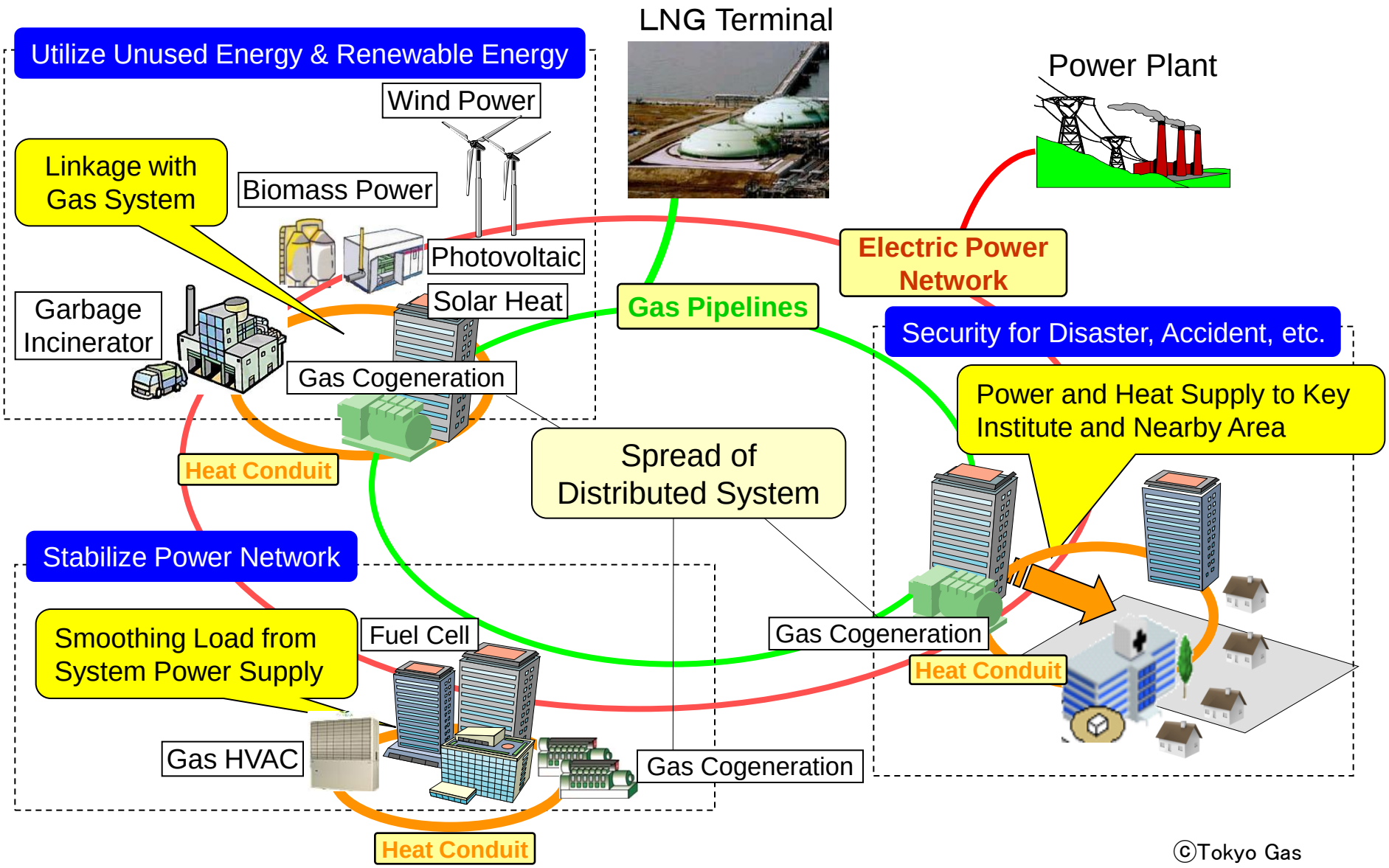
- ◆New natural-gas fired power plants
- ◆Replacement of old coal-fired and oil-fired power plants by high efficiency natural gas fired power plants

- ◆Energy saving including existing houses/buildings
- ◆Spread of distributed system
  - ✓ Utilize renewable energy
  - ✓ Gas cogeneration

In future

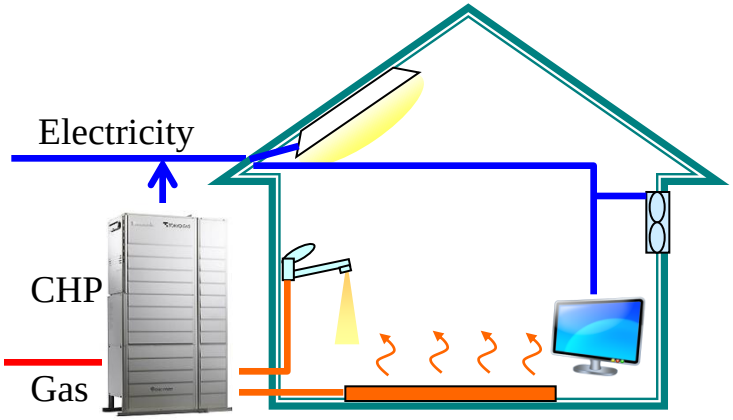
Smart Energy Network

Smart Energy Network (conceptual drawing)



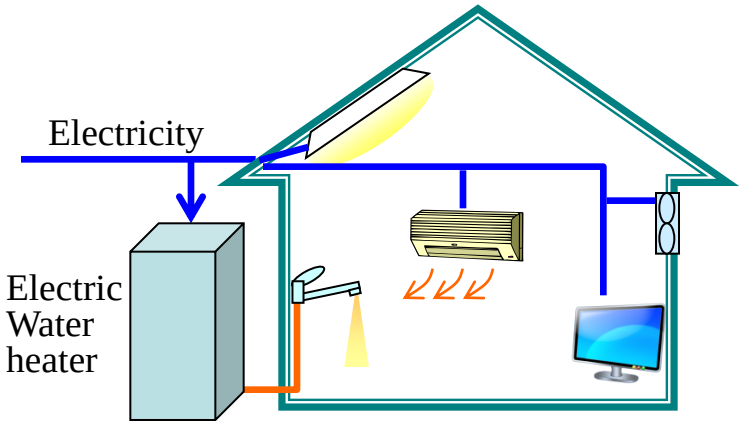
Energy supply in Japan(1)

- Before 3.11
  - Energy of Japanese houses is in stiff competition.



Combination use of gas and electricity

VS.



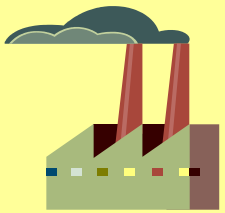
All-electric house

- After 3.11
  - Electric power supply will depend on thermal power generation in the new Energy Policy Basic Plan.
  - In future, we must consider not only demand side energy but supply side energy to realize the optimum mix of energy.

Energy supply in Japan(2)

The best combination of energy supply considering heat demand, electric demand and regional characteristics should be realized.

- Large demand of heat and electricity (e.g Industrial factory)
  → Smart Energy Network



- Houses/Buildings difficult to connect SEN
  → Fuel cell CHP, Solar heat, PV, System power supply, etc.