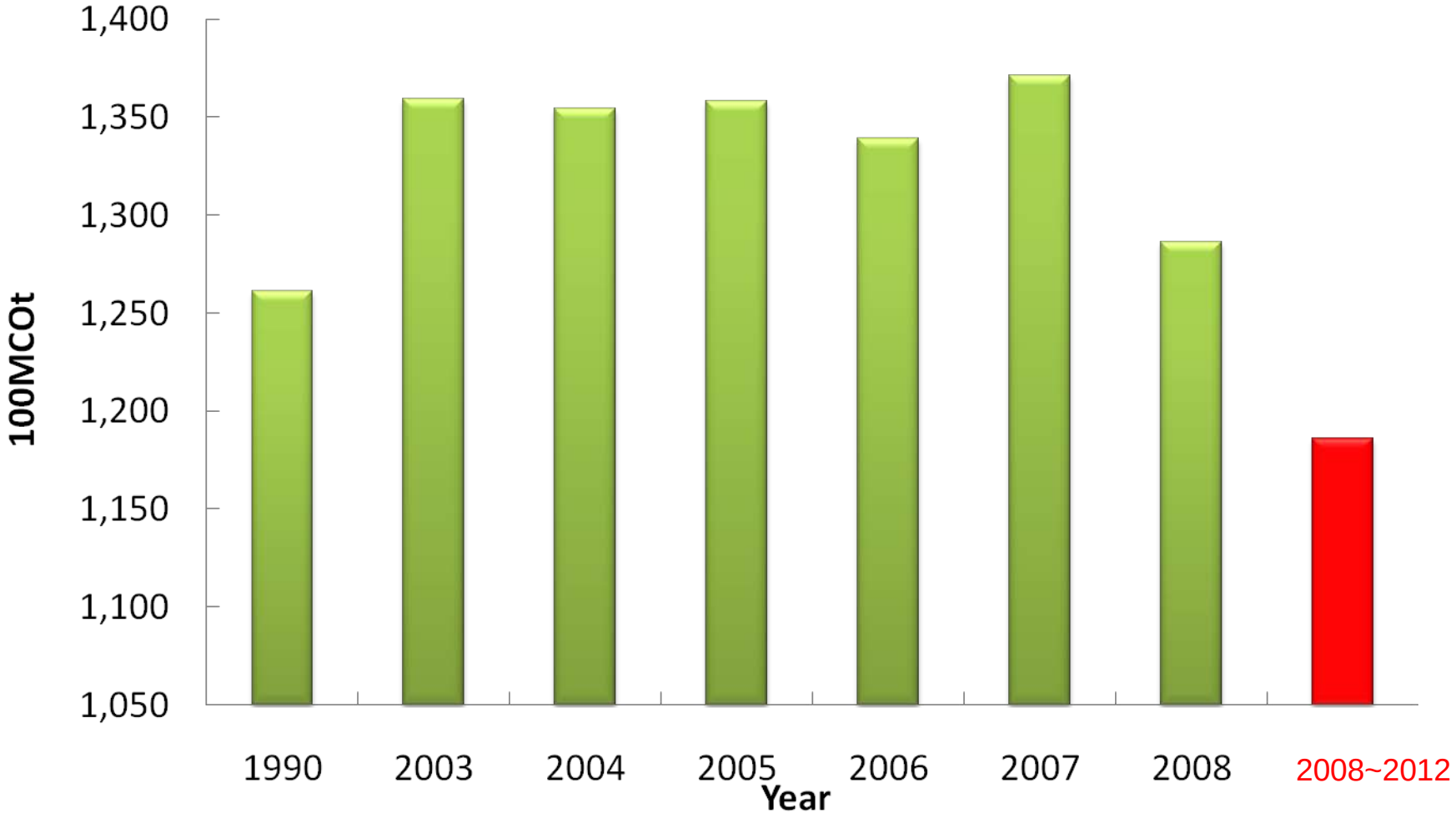
Outline

1. Status of Japan's CO2 emission
2. CO2 mitigation by the electric utilities
   - Demand side
   - Supply side
3. Nuclear and Renewable Energy
   - Status
   - Policy
   - Challenges

Status of GHG in Japan



Kaya Identity

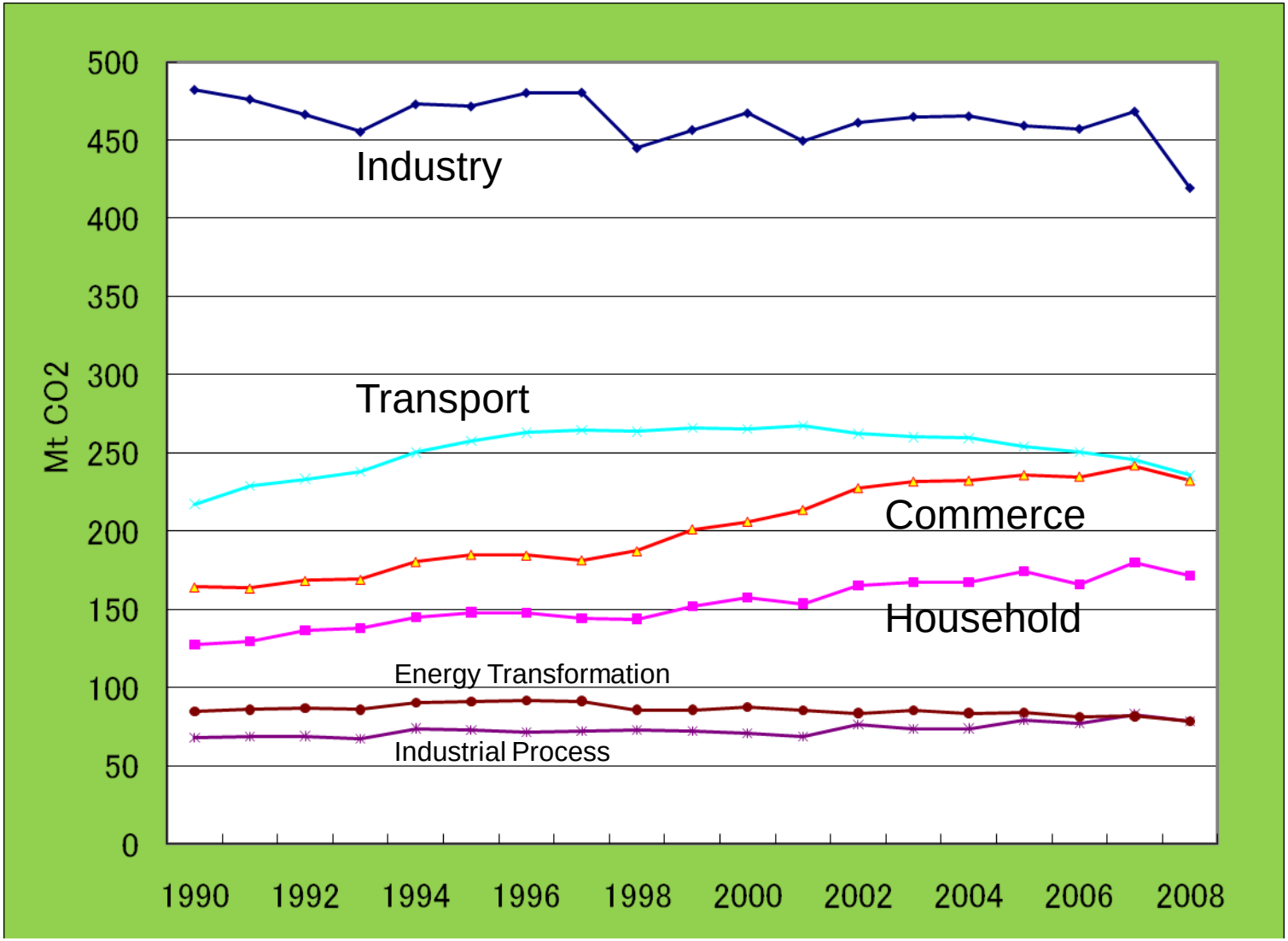
$$CO_2 = \frac{CO_2}{E}\frac{E}{GDP}GDP$$

$$\therefore \Delta CO_2 = \Delta\frac{CO_2}{E} + \Delta\frac{E}{GDP} + \Delta GDP$$

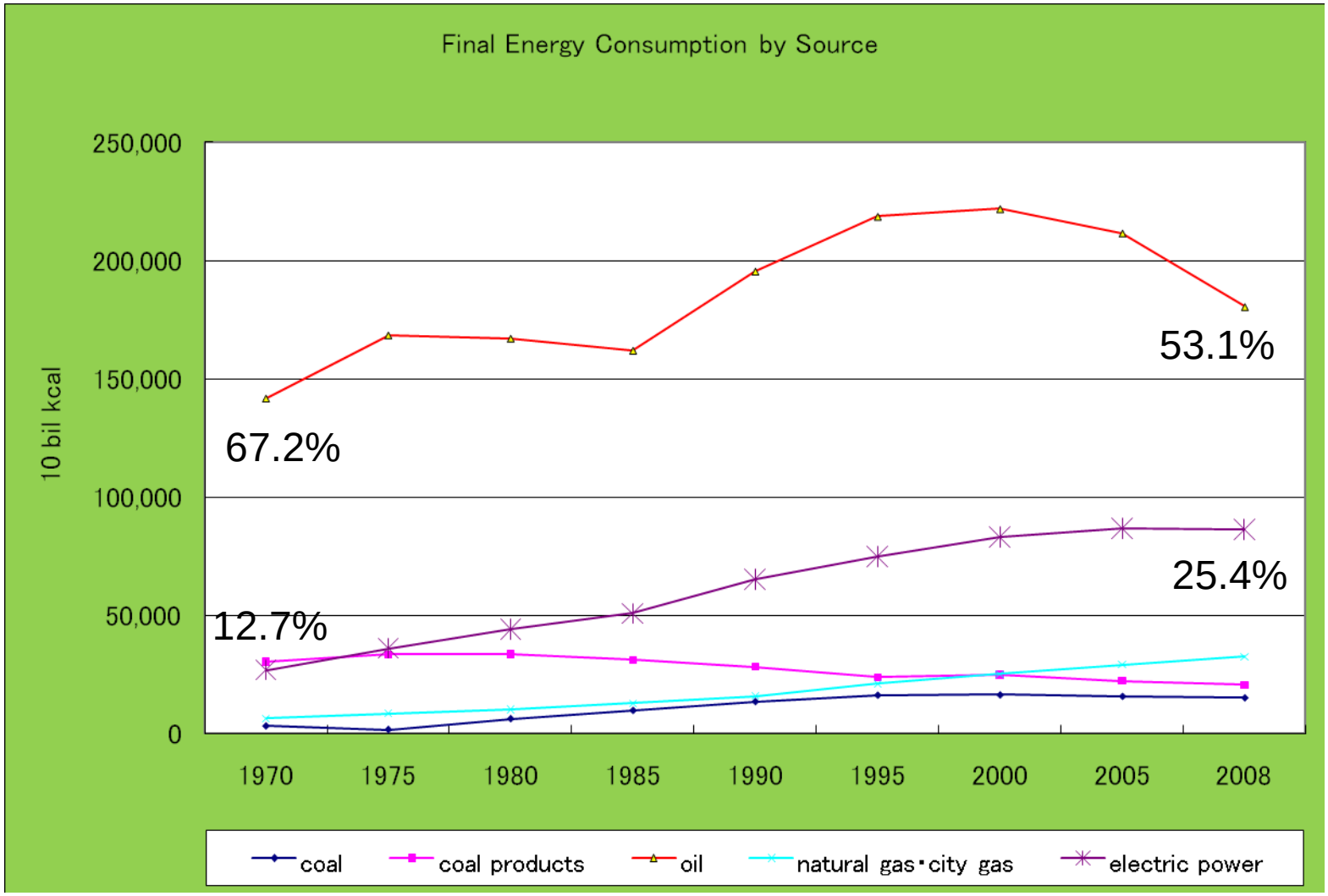
Decomposition of Changes in CO2

	1990-2000	2000-2005	2007-2008	2005-2020	
				Aso	Hatoyama
△GDP	+1.2	+1.3	-3.8	+1.1	+1.1
△CO2/Energy	−0.4	+0.6	-4.2	-2.3	-3.7
△Energy/GDP	+0.2	-1.1	+1.6		
△CO2	+1.0	+0.8	-6.3	-1.2	-2.6

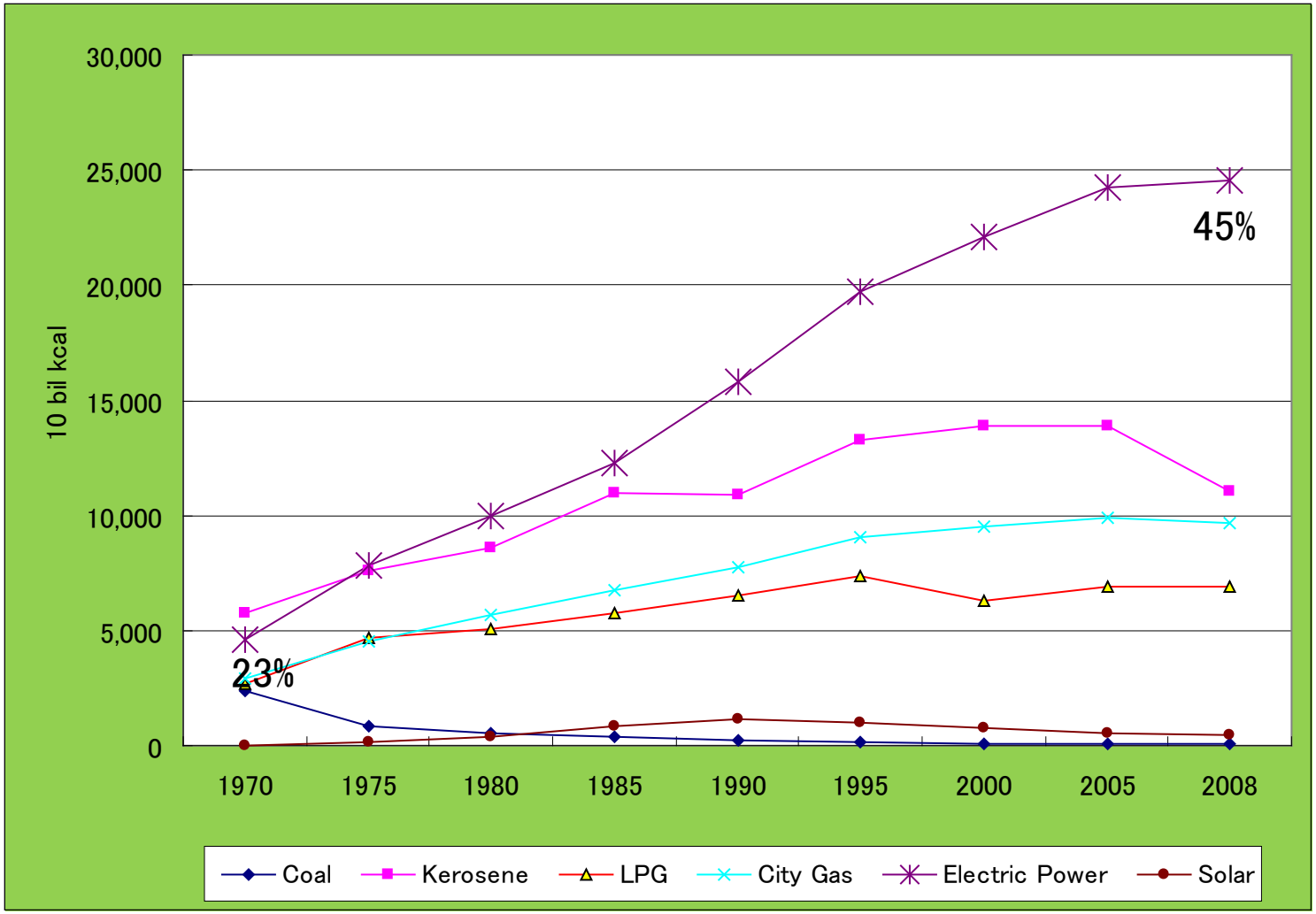
CO2 Emission By Sector (1990-2008)



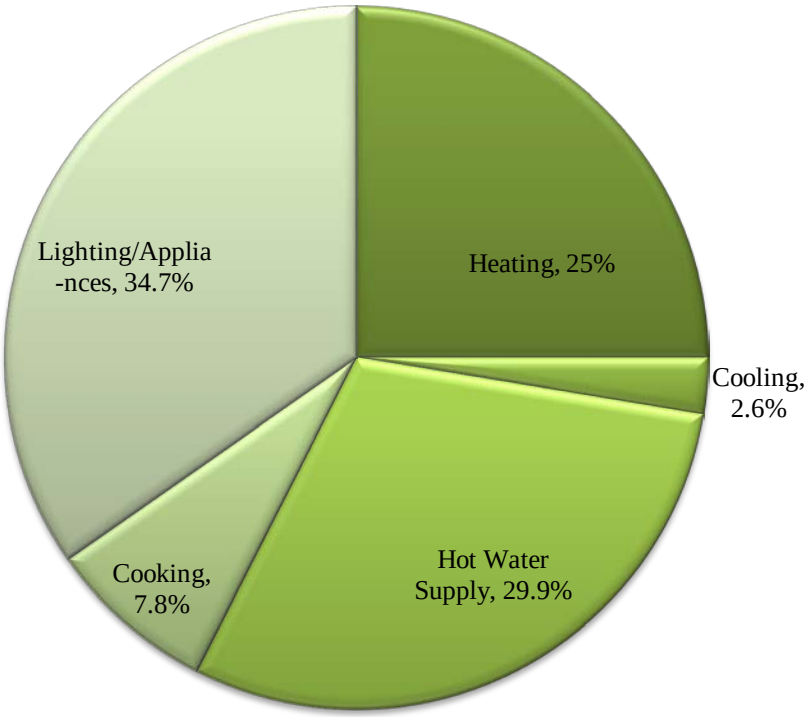
Electrification in Economies



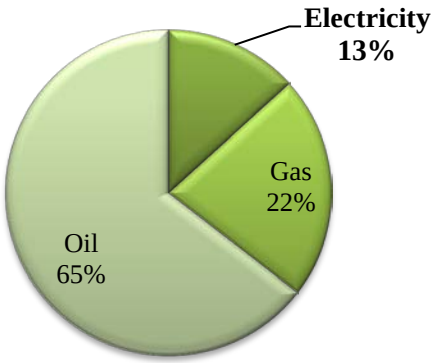
Electrification in the Household Sector



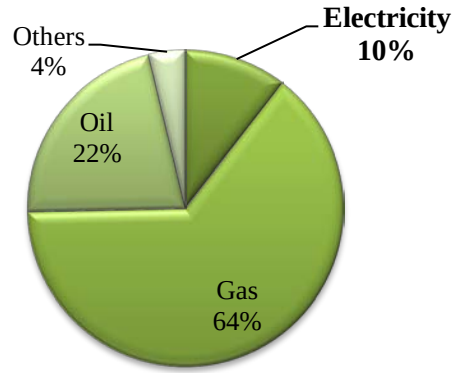
Energy Use in the Household Sector (2008)



Heating



Hot Water Supply



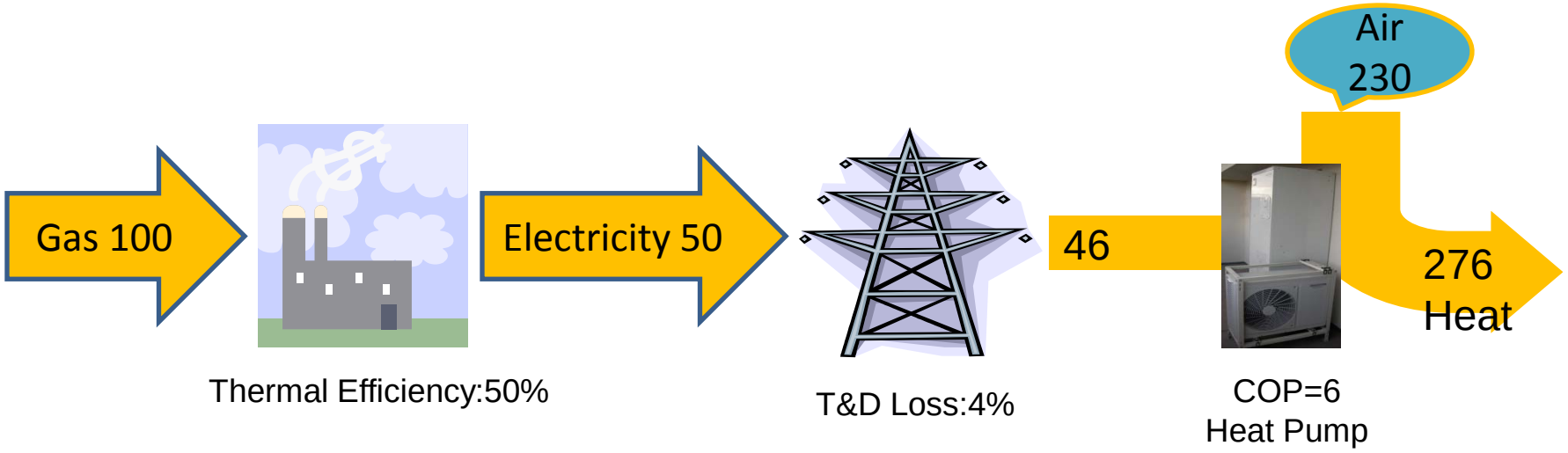
CO2 Mitigation by the Electric Utility Industry

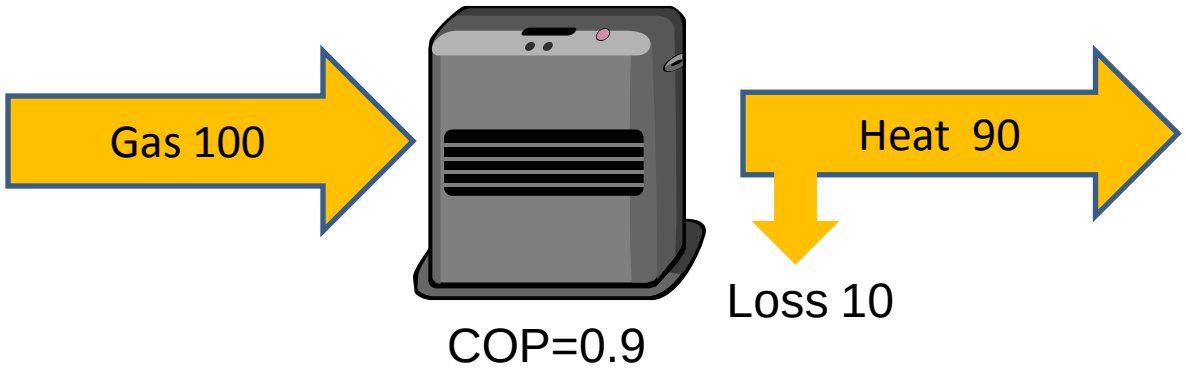
- Demand Side
  - Electrification and diffusion of high efficiency device
    - Heat Pump
    - Thermal Storage Air-Conditioning
    - EV
  - Use of untapped energies
    - River water
    - Geothermal heat & waste heat

Heat pump is Renewable

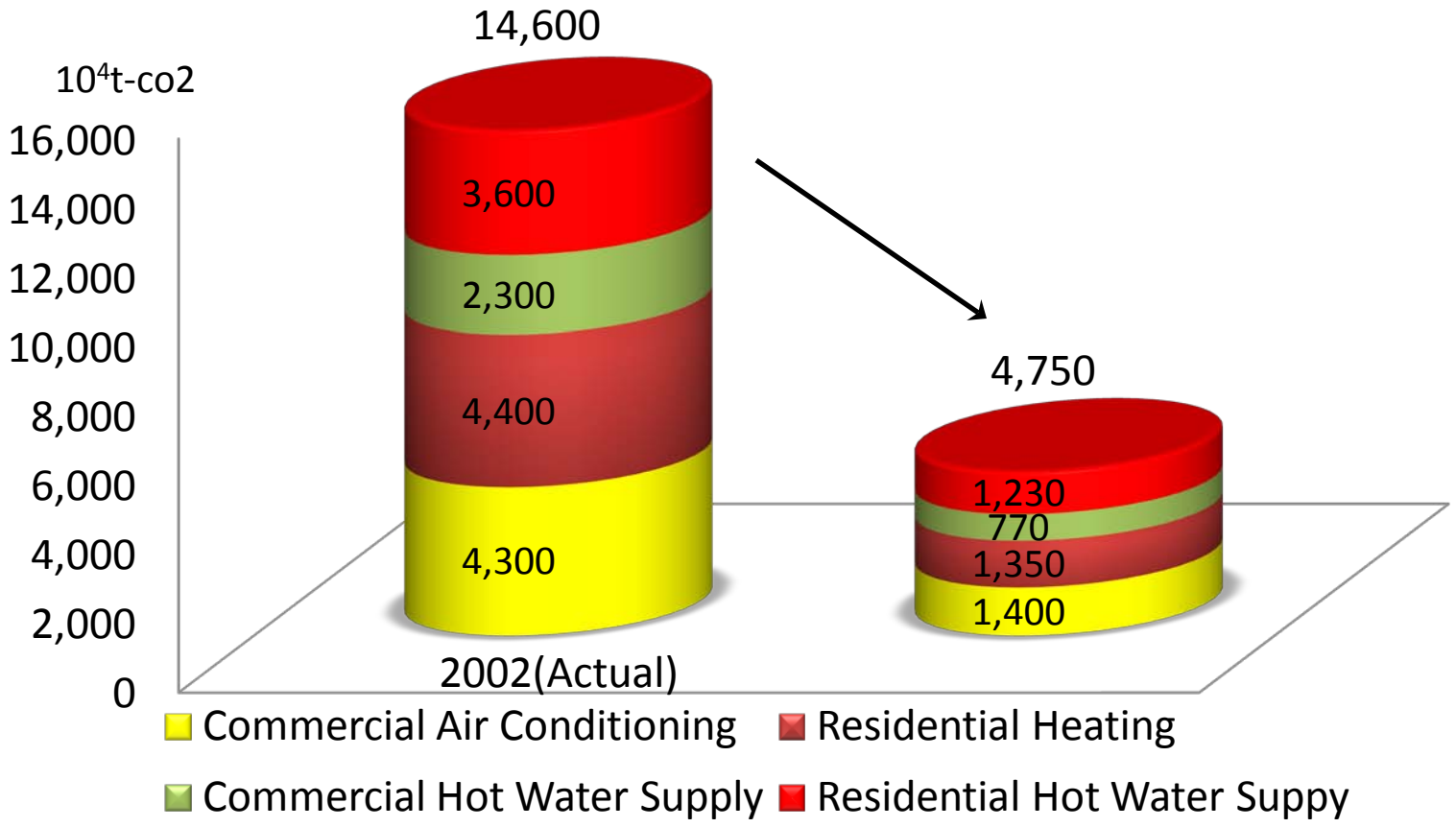
- Device to pump up heat with little electric power.
- Heat in the air is renewable resource for heating, cooling and hot water supply.
- Heat is used for generating electricity. Heat pump uses electric power to generate more heat.
- Grid electricity with heat pump is CHP.

Heat Pump Is Clean and Efficient



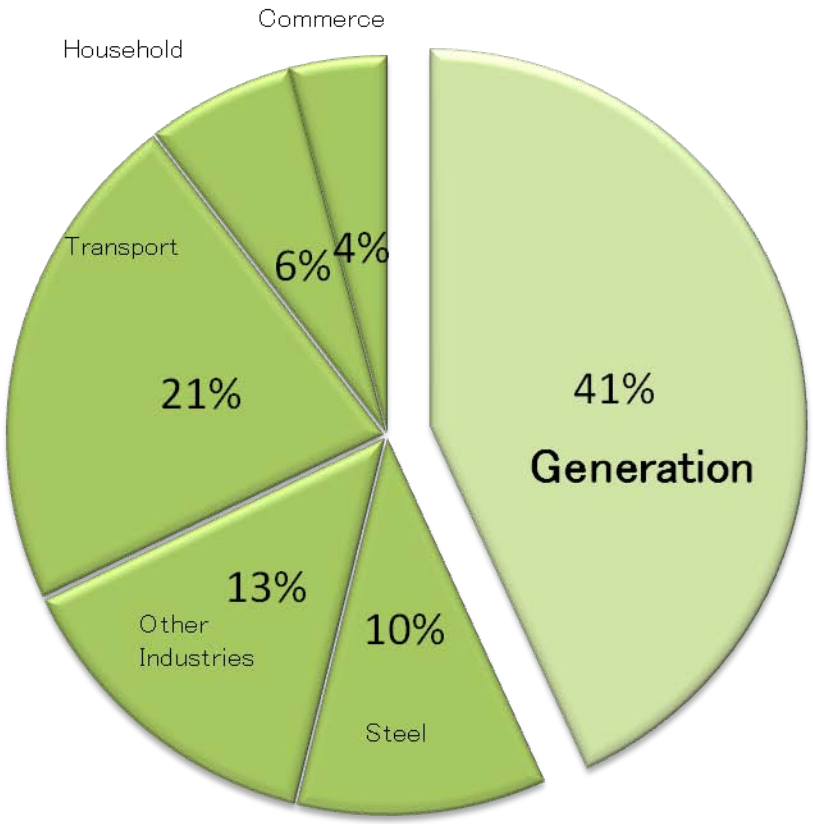


Potential CO2 Reduction by Heat Pump



Source: Heat Pump and Thermal Storage Tech. Center of Japan

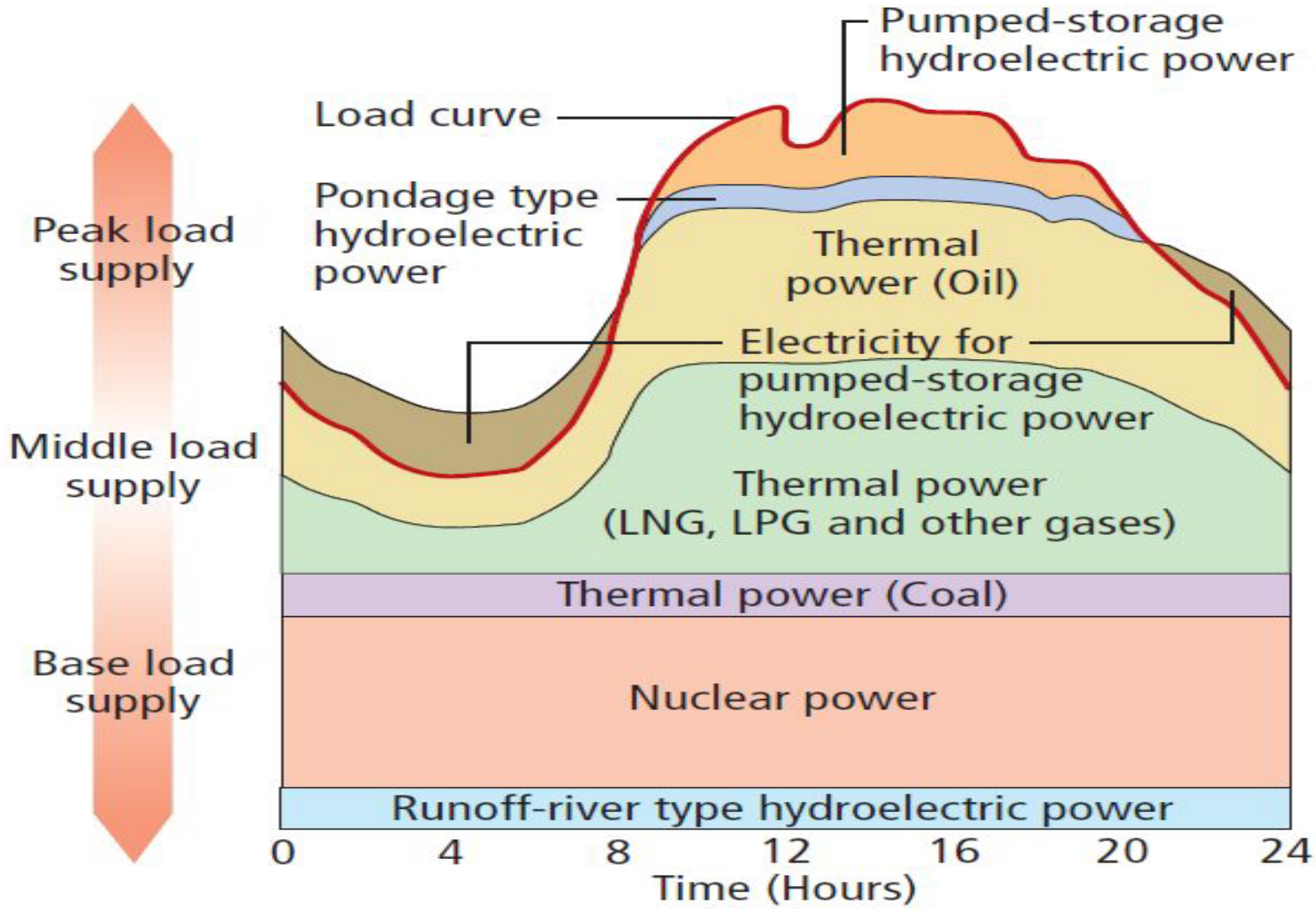
Electric Generation: Biggest CO2 Emitter



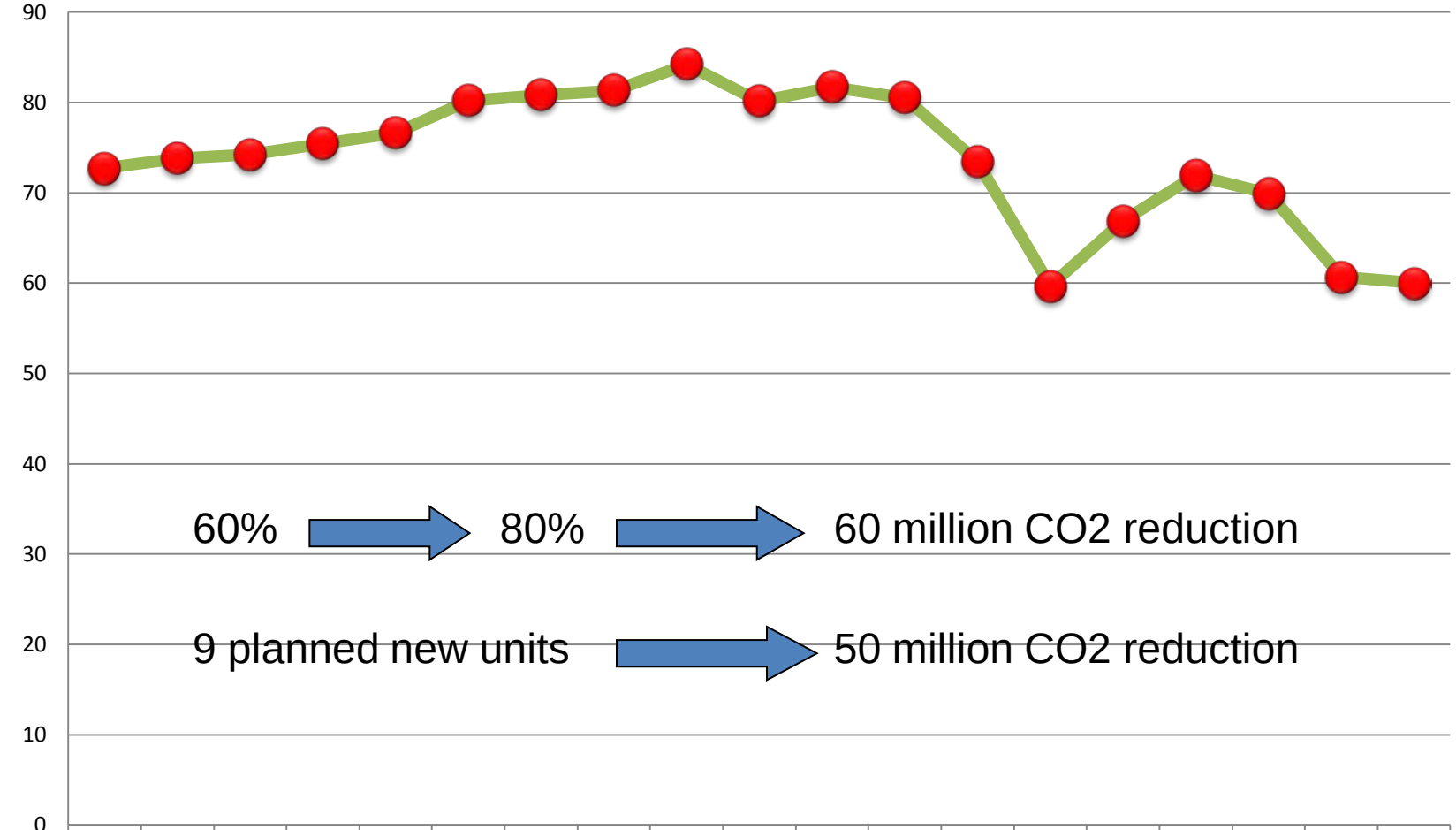
CO2 Mitigation by the Electric Utility Industry

- Supply Side
  - Use of non-fossil resources
    - Nuclear power
    - Renewable energies
  - Improving efficiency of electric power facilities
    - LNG combined cycle and coal-fired power
    - Reducing T & D loss

Generation Mix

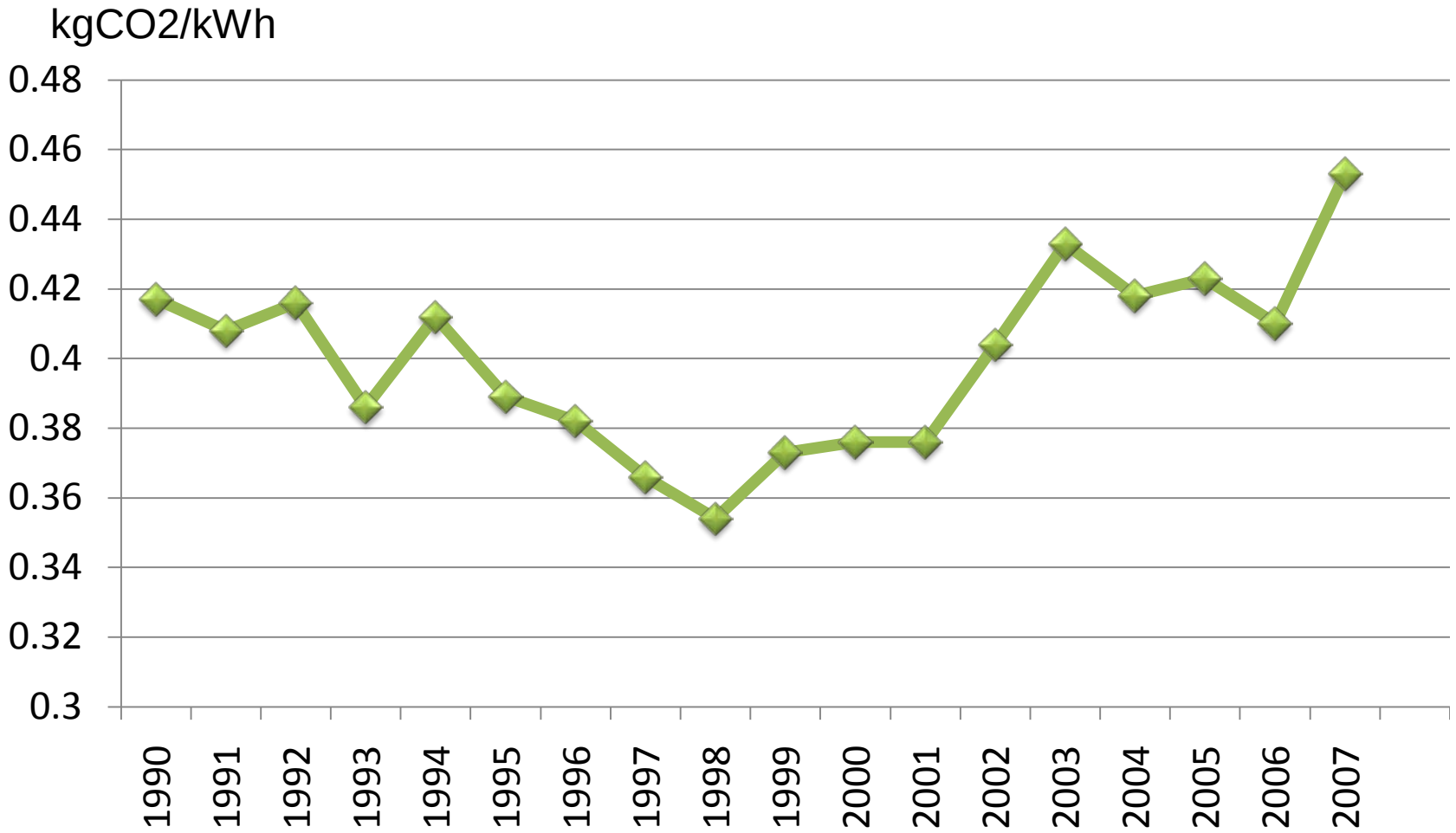


Nuclear Capacity Factor (1990～2008)

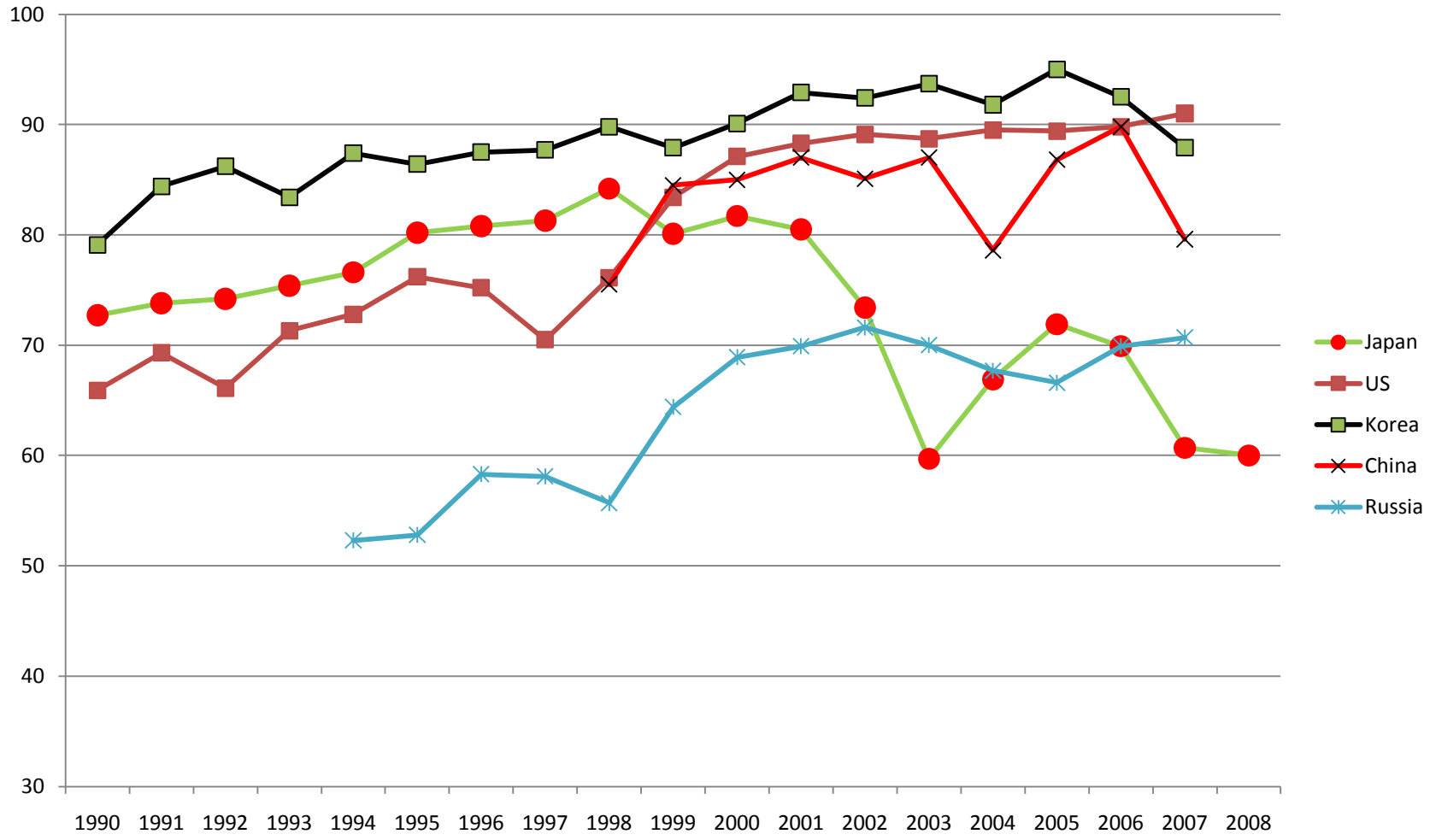


	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
CF(%)	72.7	73.8	74.2	75.4	76.6	80.2	80.8	81.3	84.2	80.1	81.7	80.5	73.4	59.7	66.9	71.9	69.9	60.7	60.0

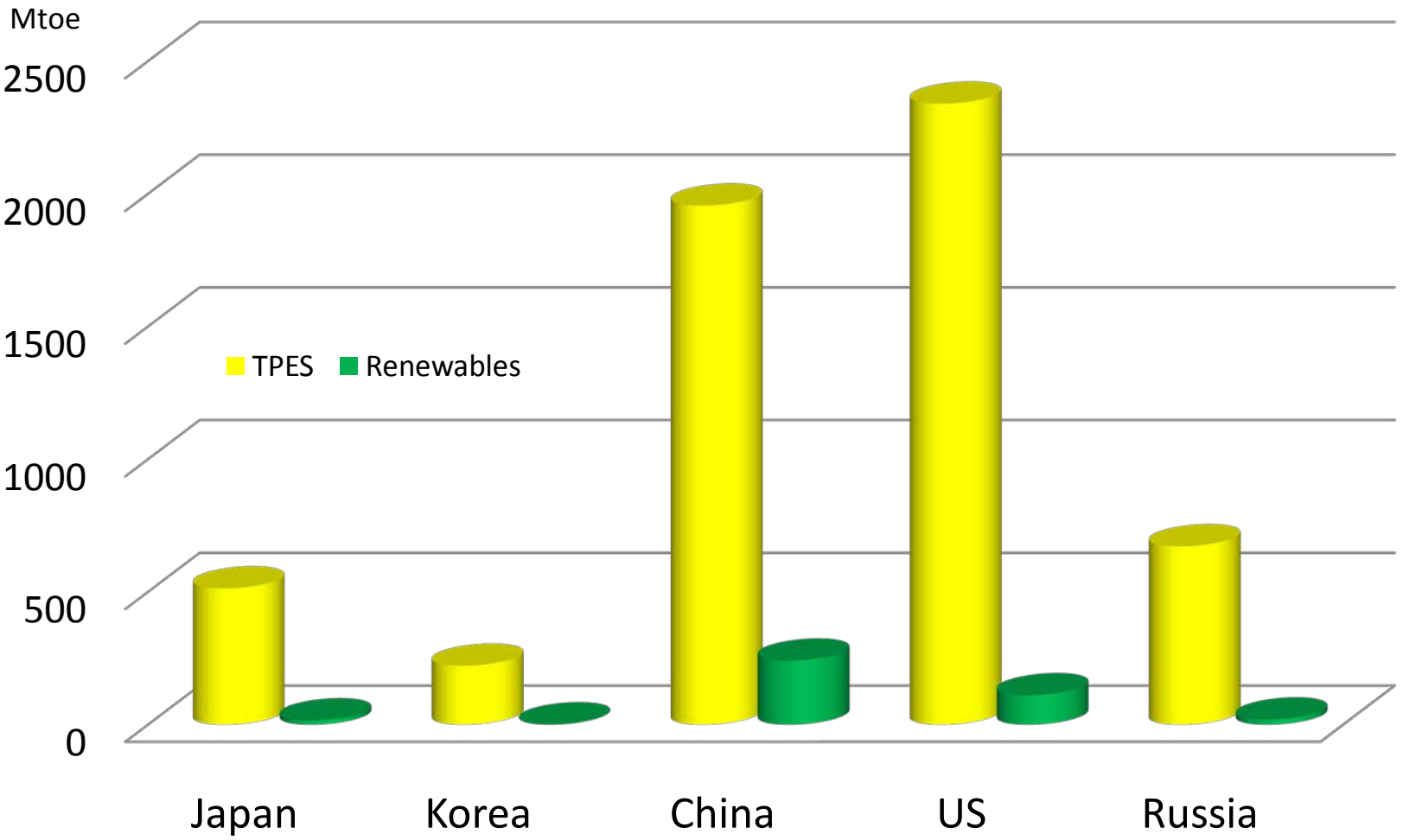
CO2 Intensity per kWh



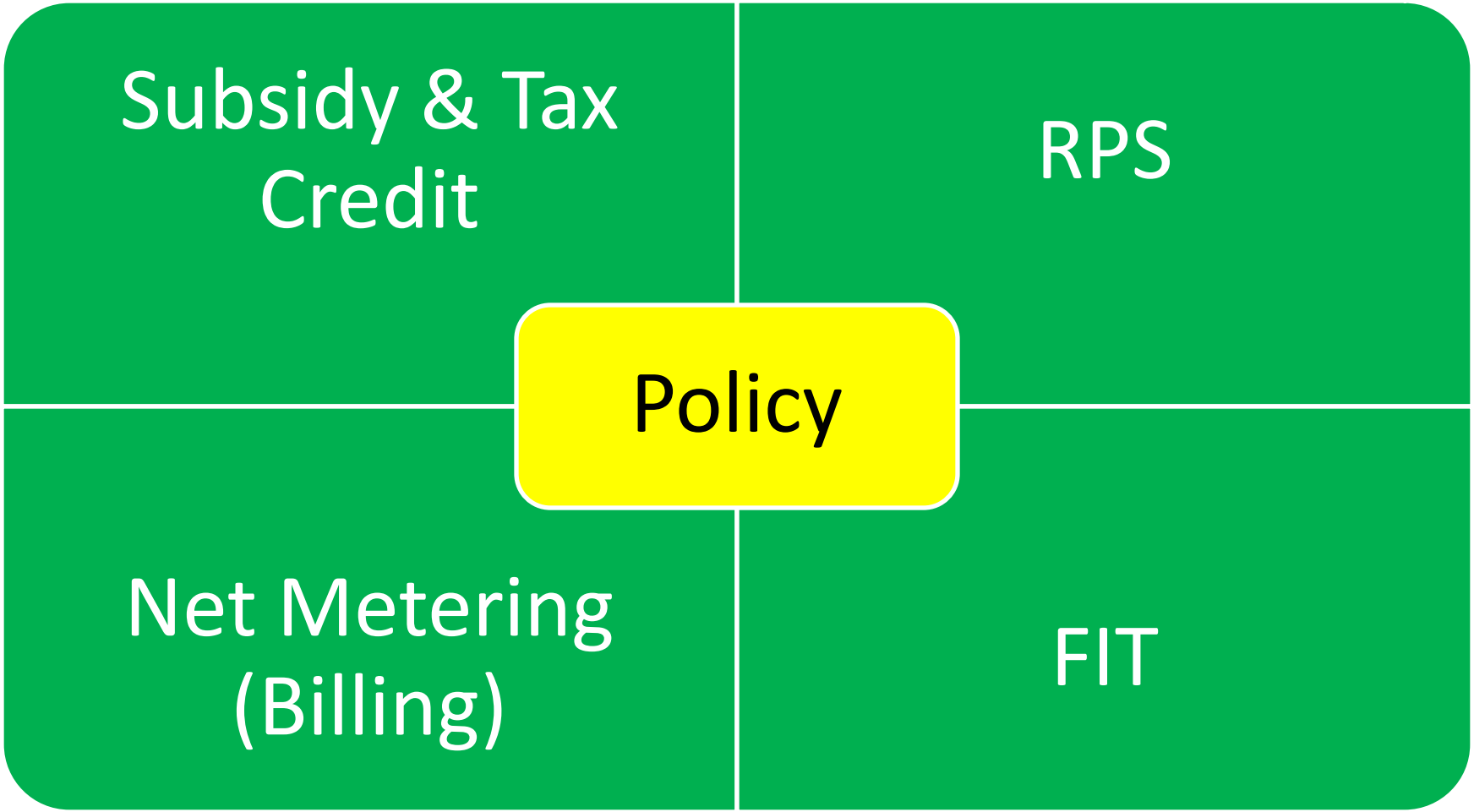
International Comparison of Nuclear Capacity Factor



Renewables in Total Primary Energy Supply (2007)



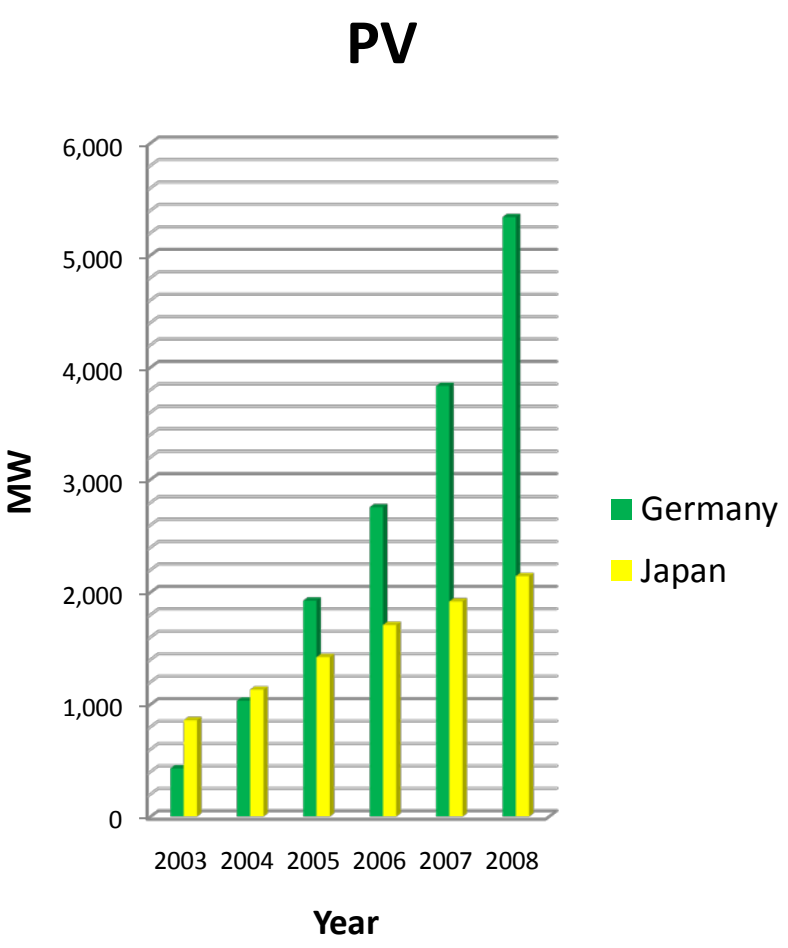
Green Energy Promotion Policies

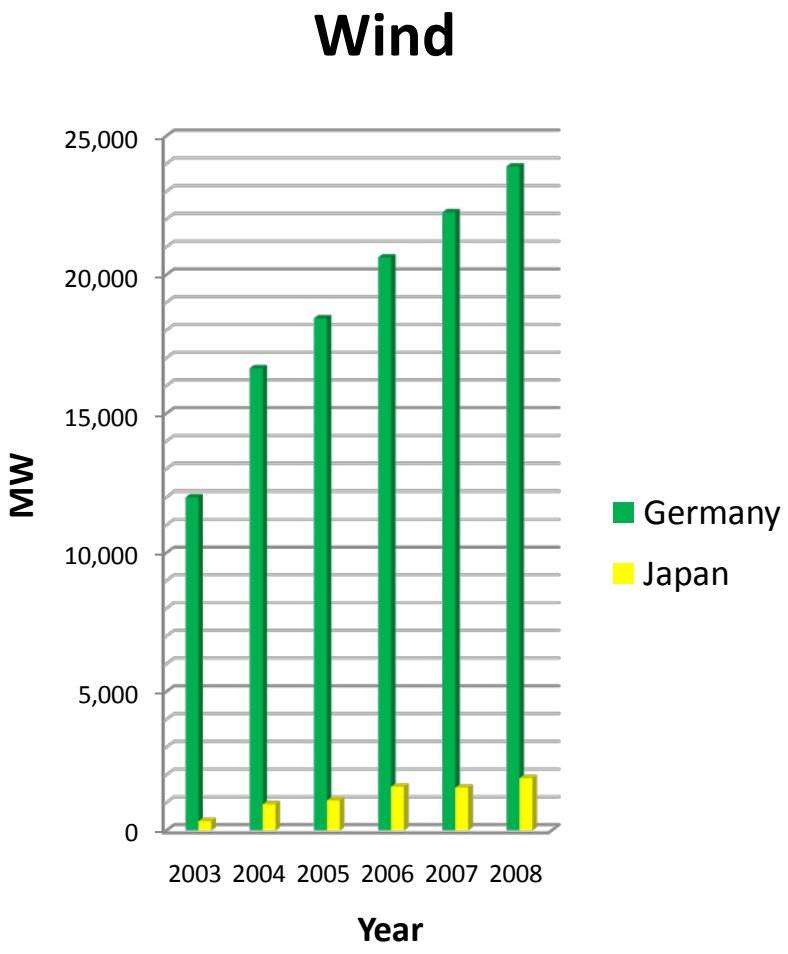


Feed In Tariff

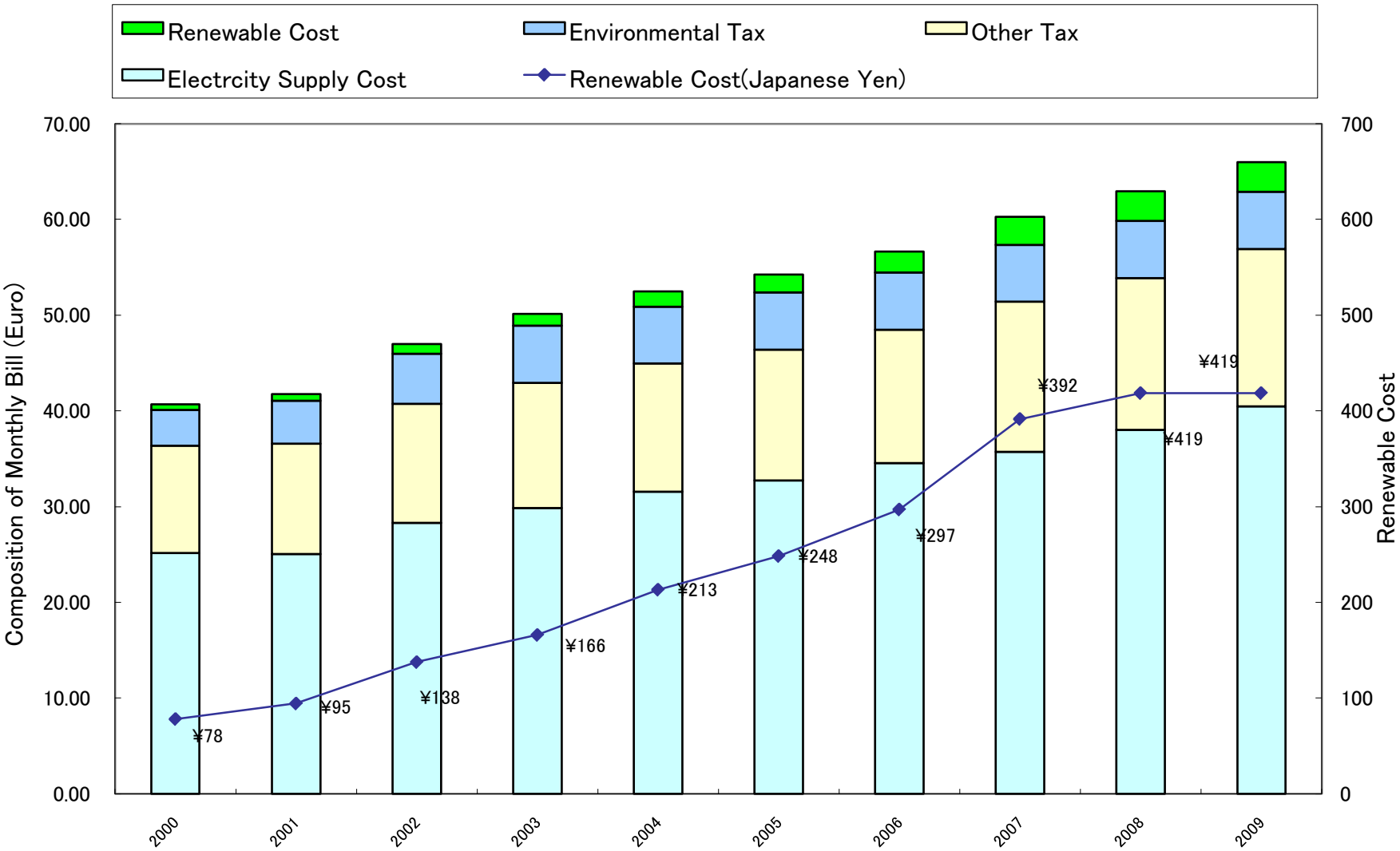
- FIT has been introduced in Nov. 2009.
- The purpose is to accelerate PV development and it's diffusion.
- Electric utilities are required to purchase at \48 (53 US cent) from residential PV and \24 from non-residential PV.
- Purchase period is ten years. Purchase price is fixed for 10 years.
- Eligible customer will be residential and non-residential but only for excess power.

German Case

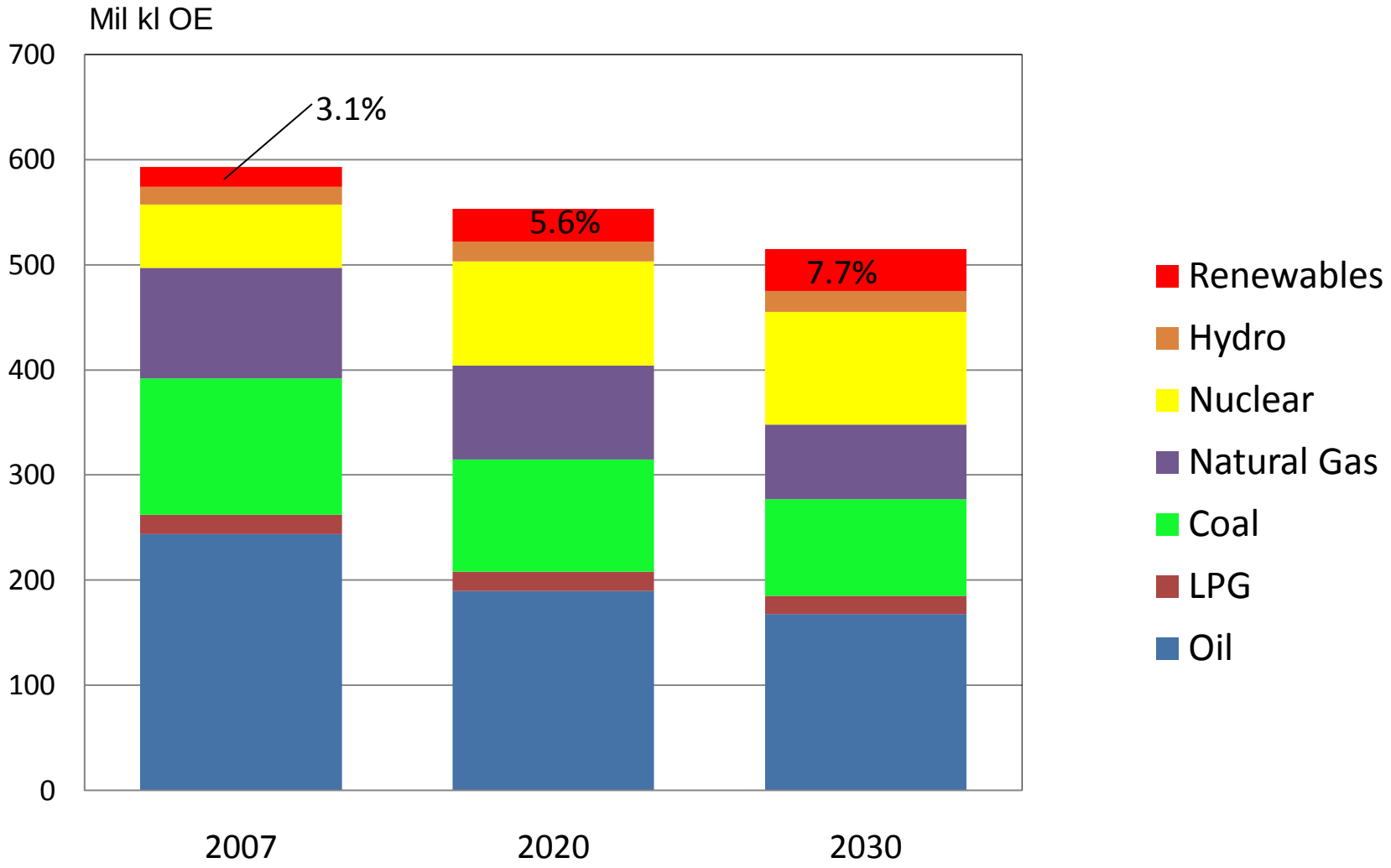

PV
6,000
5,000
4,000
3,000
2,000
1,000
0
MW
2003 2004 2005 2006 2007 2008
Year
Germany
Japan


Wind
25,000
20,000
15,000
10,000
5,000
0
MW
2003 2004 2005 2006 2007 2008
Year
Germany
Japan

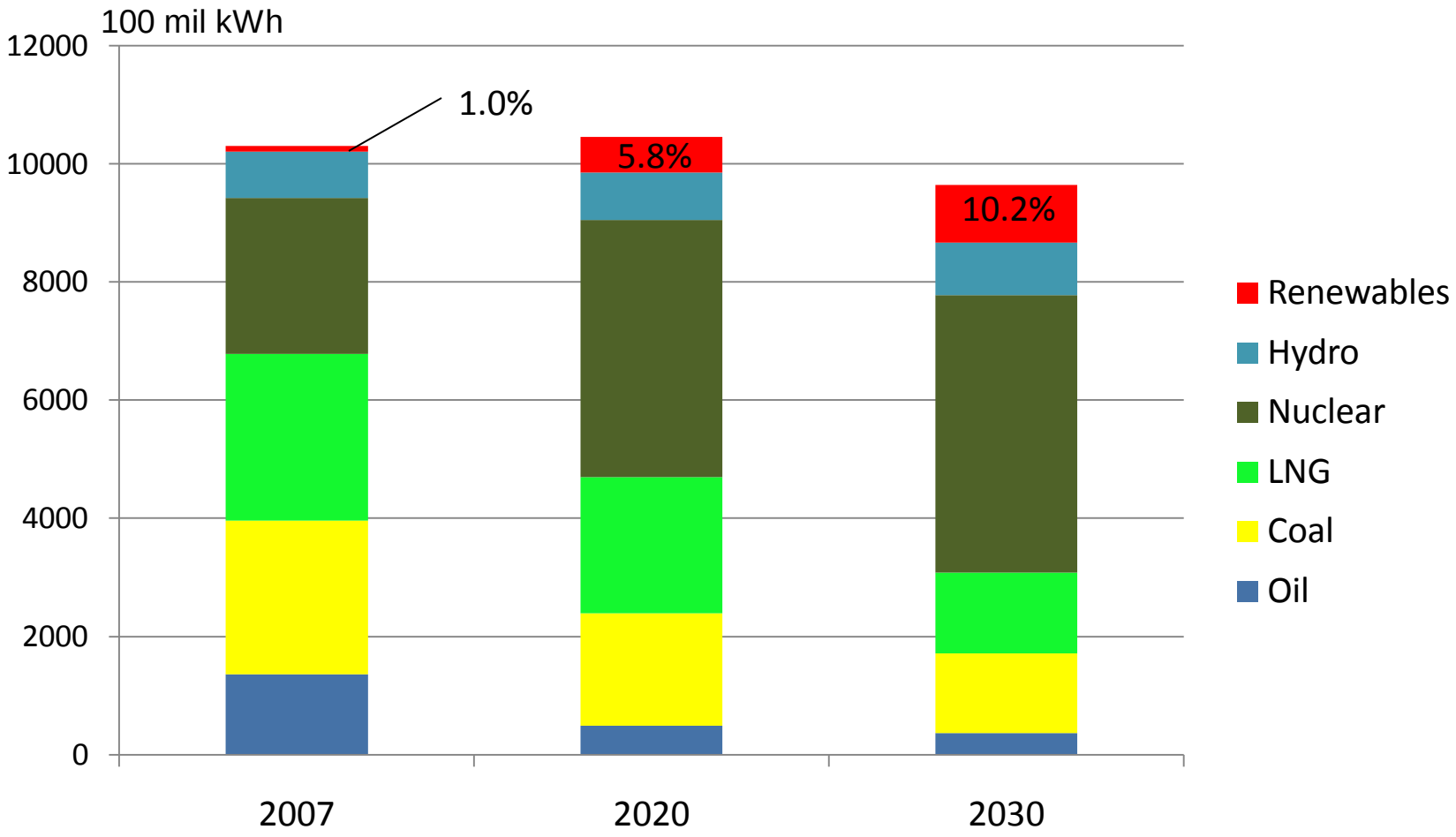
Renewable Cost for German Household



Renewables in TPES 2007/2020/2030



Renewables in Generation Mix (2007/2020/2030)



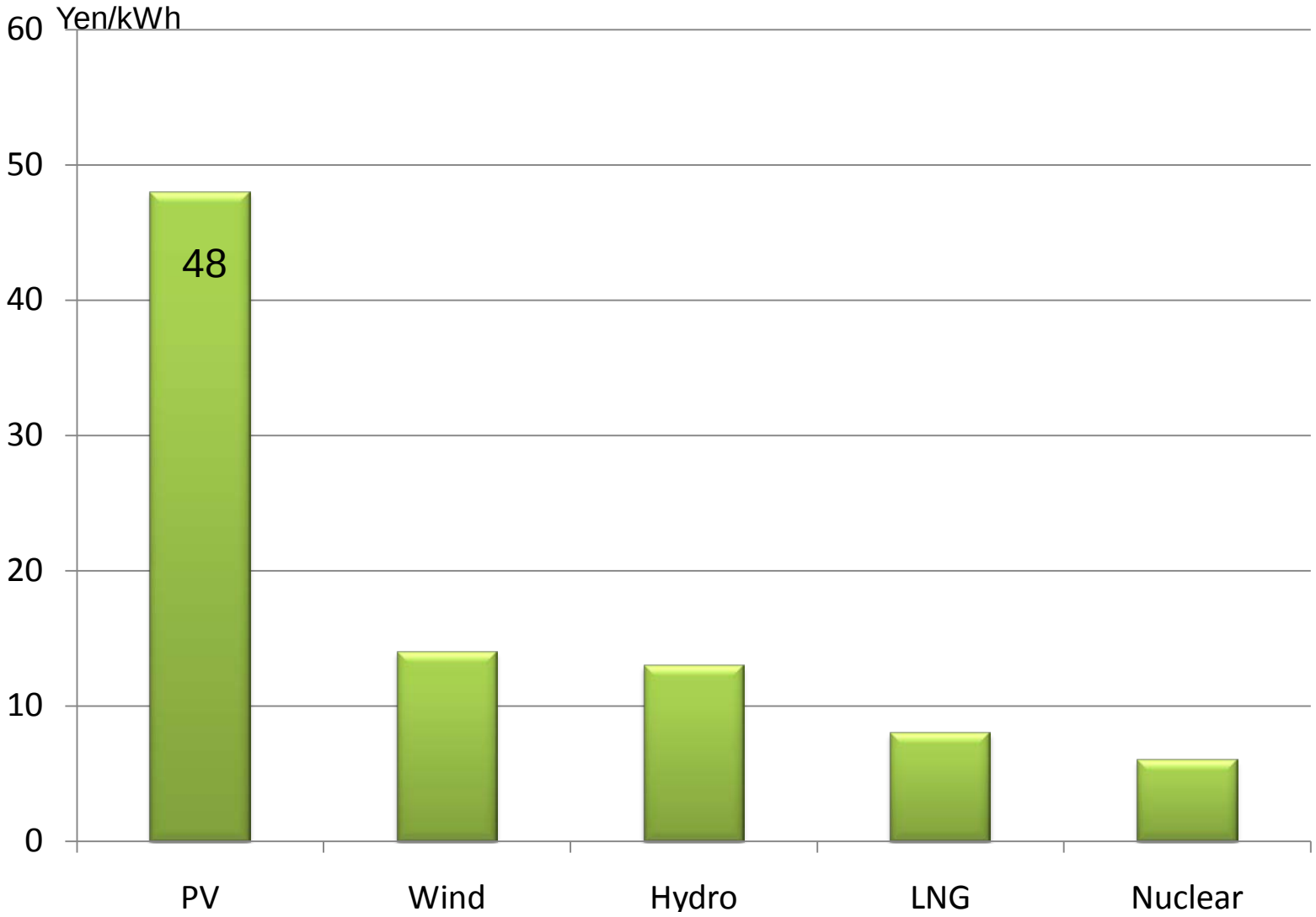
Outlook for Renewables

10^4 kl

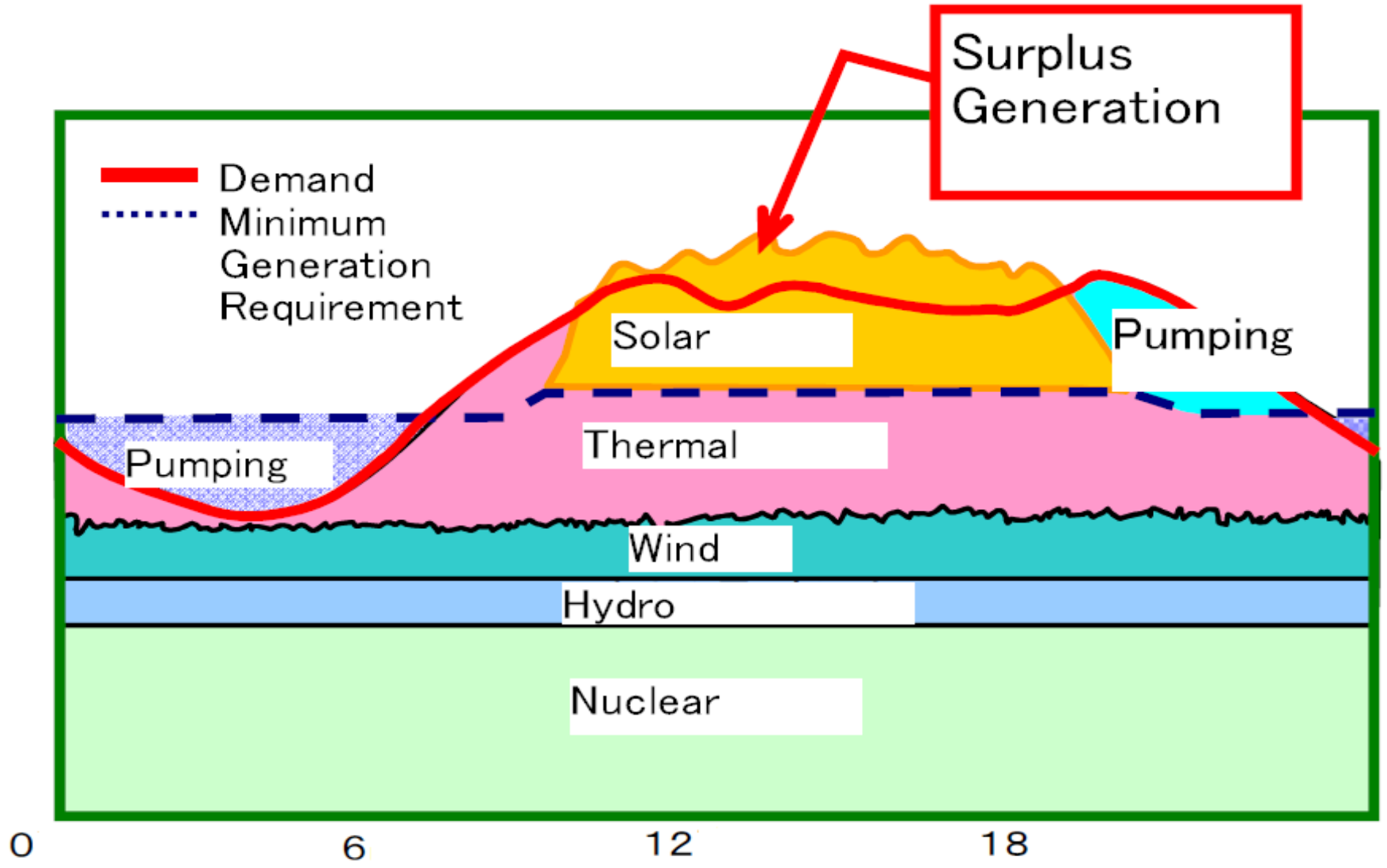
	2005	2020	2030
PV	35(1,420MW)	700(2,800MW)	1,300
Wind	44(1,080MW)	200(5,000MW)	269
Waste + Biomass	252(2,010MW)	408	494
Biomass Heat Use	142	335	423
Other	687	812	727
Total	1,160	2,455	3,213

METI, Long-term Demand and Supply Outlook（Revised), August 2009

Generating Cost by Technology



What If Generation Exceeds Load ?



How much cost?

	Trillion Yen	Billion Dollar
Battery on grid side	16.2	180
Battery on customer side	45.9-57.2	510-630
Controlling power output	3.67	40

Thank you for your attention