

# Efficient Energy System for Green Economy

Yoshiki Inuma, Ph.D.

Japan Electric Power Info. Ctr.

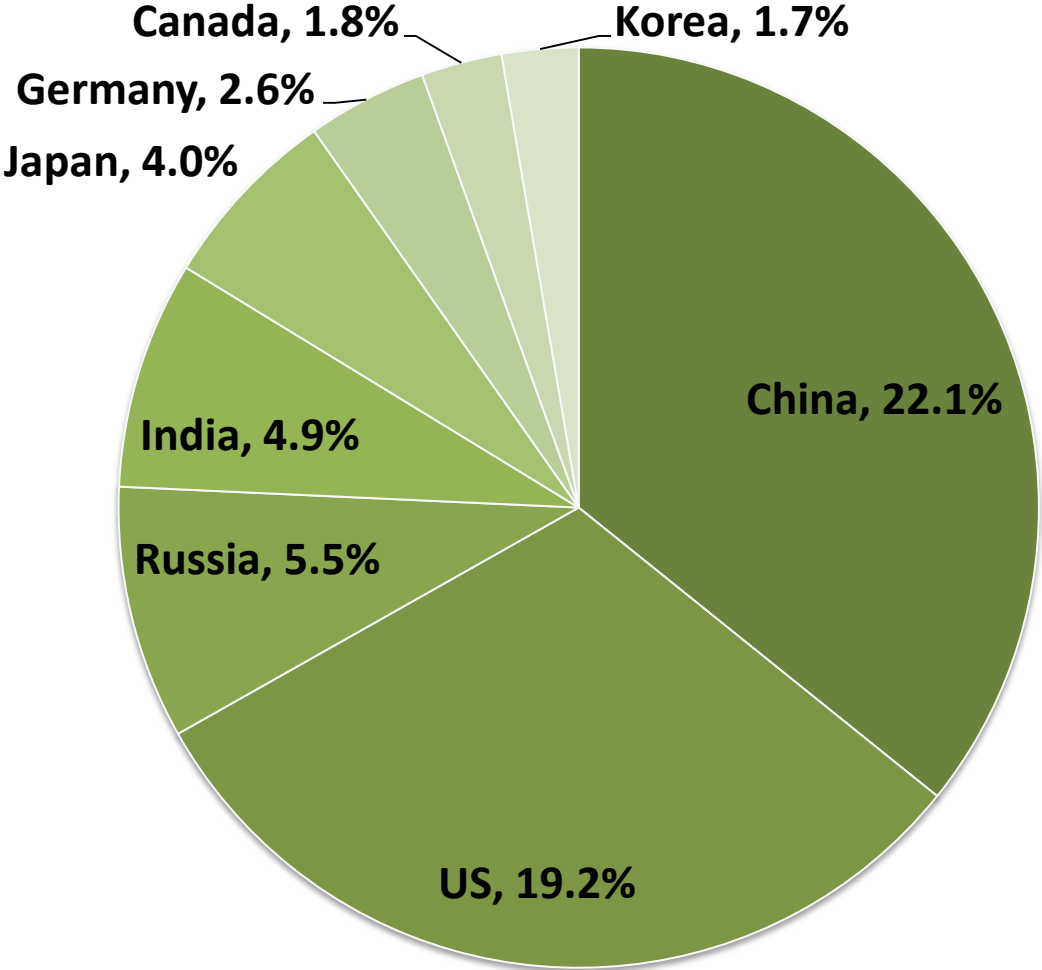
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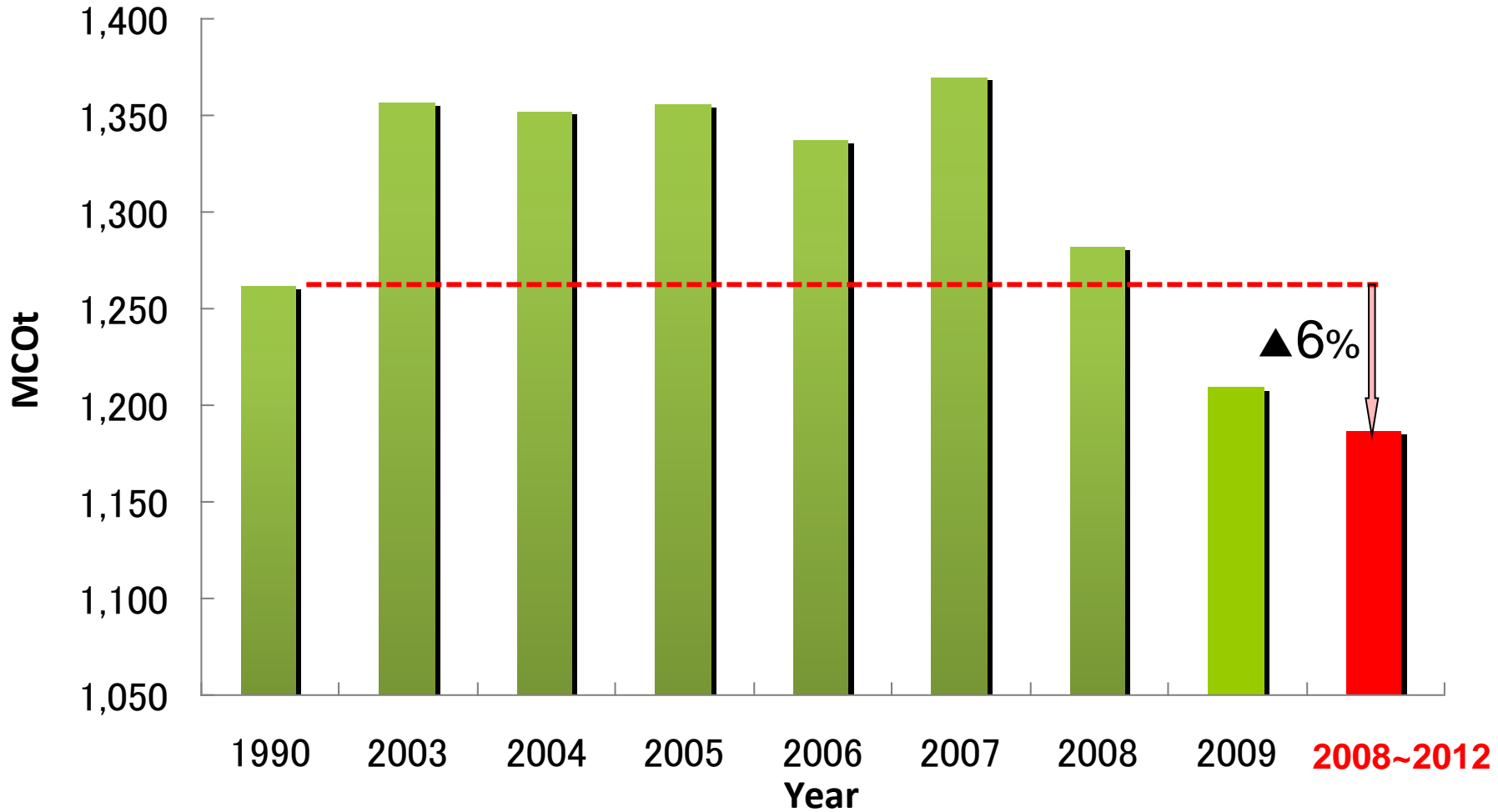
- Status of CO<sub>2</sub> Emission
- Efficient Energy System
  - Smart Power System
  - More Advanced Thermal Power Generation
  - High-Efficiency Heat Pumps
  - PV
  - Challenges for New Energies
- March 11 Tohoku Earthquake

# CO2 Emission by Country (2009)

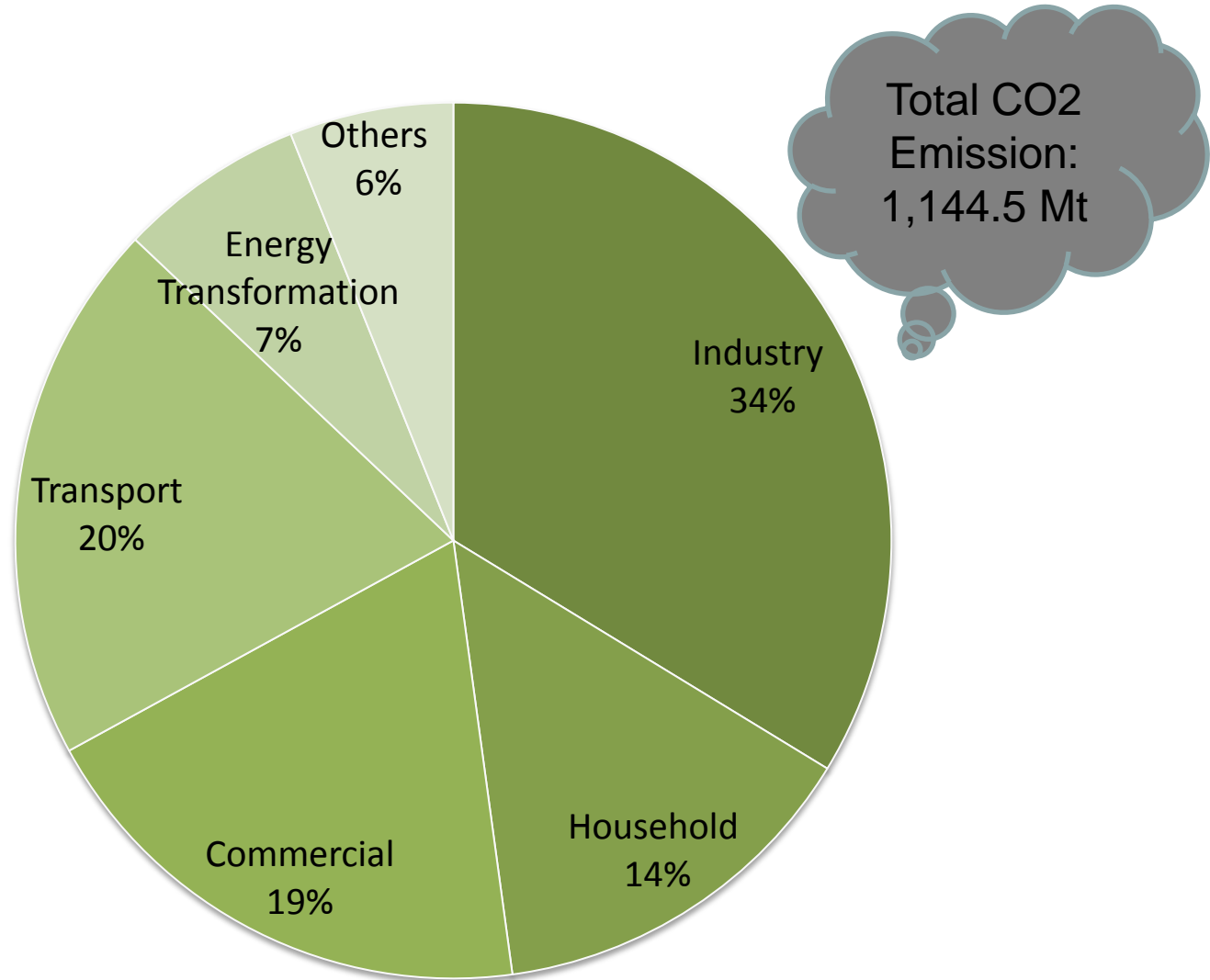


Total CO2 Emission: 29,471 Million Ton

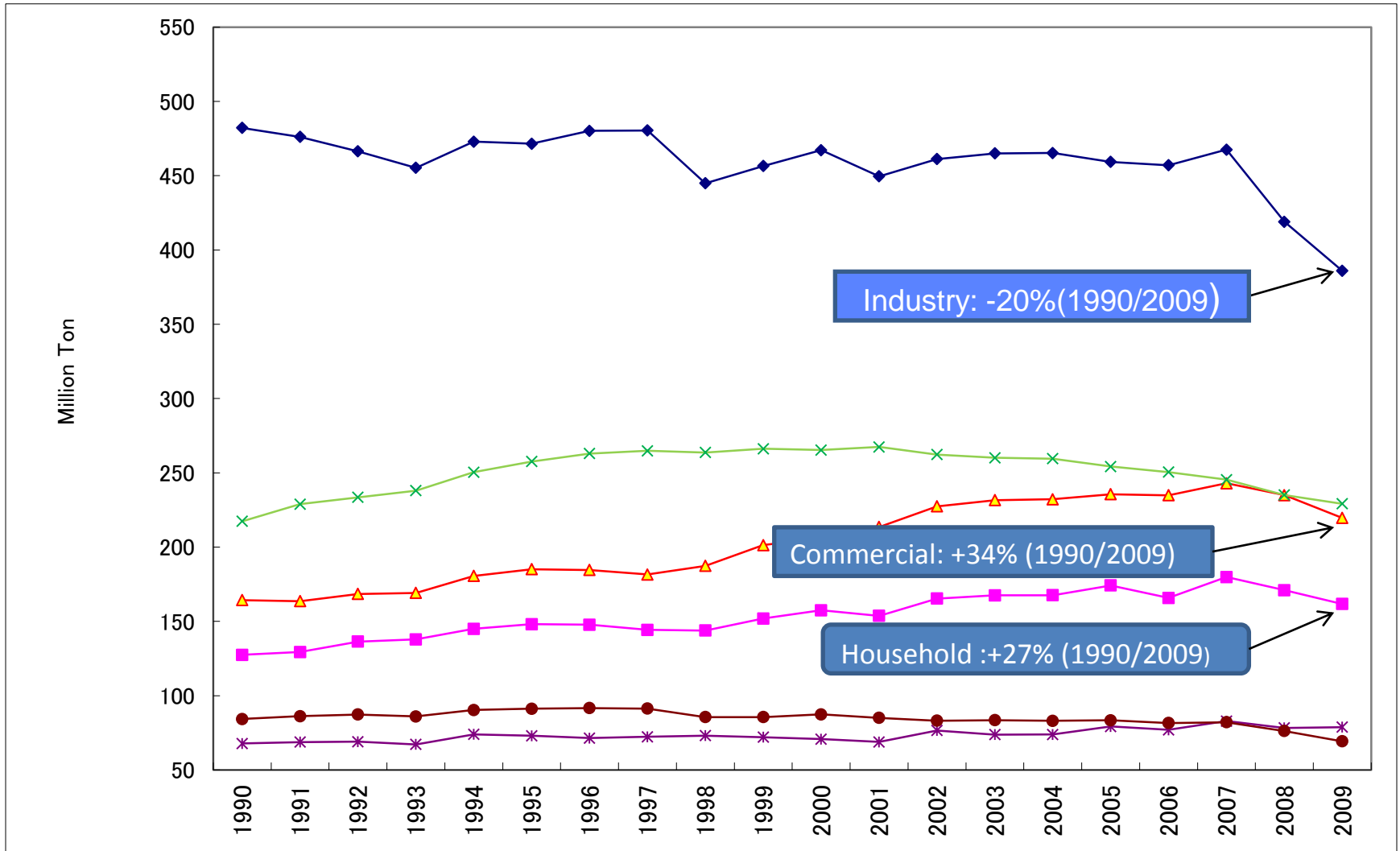
# Status of GHG in Japan



# CO2 Emission by Sector (2009)



# CO2 Emission by Sector(1990-2009)



# CO<sub>2</sub> Identity

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

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

CO<sub>2</sub> Intensity  
in energy

Energy intensity  
in economy

# Decomposition of Changes in CO2

(%)

	1990–2000	2000–2005	2007/2008	2008/2009	30% Reduction (2005–2020)
$\Delta$ GDP	+1.1	+1.3	-4.1	-2.4	+1.1
$\Delta$ (CO2/ENERGY)	-0.6	+0.3	-1.0	-0.6	-3.5
$\Delta$ (ENERGY/GDP)	+0.4	-1.1	-1.6	-2.8	
$\Delta$ CO2	+0.9	+0.5	-6.6	-5.8	-2.4



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

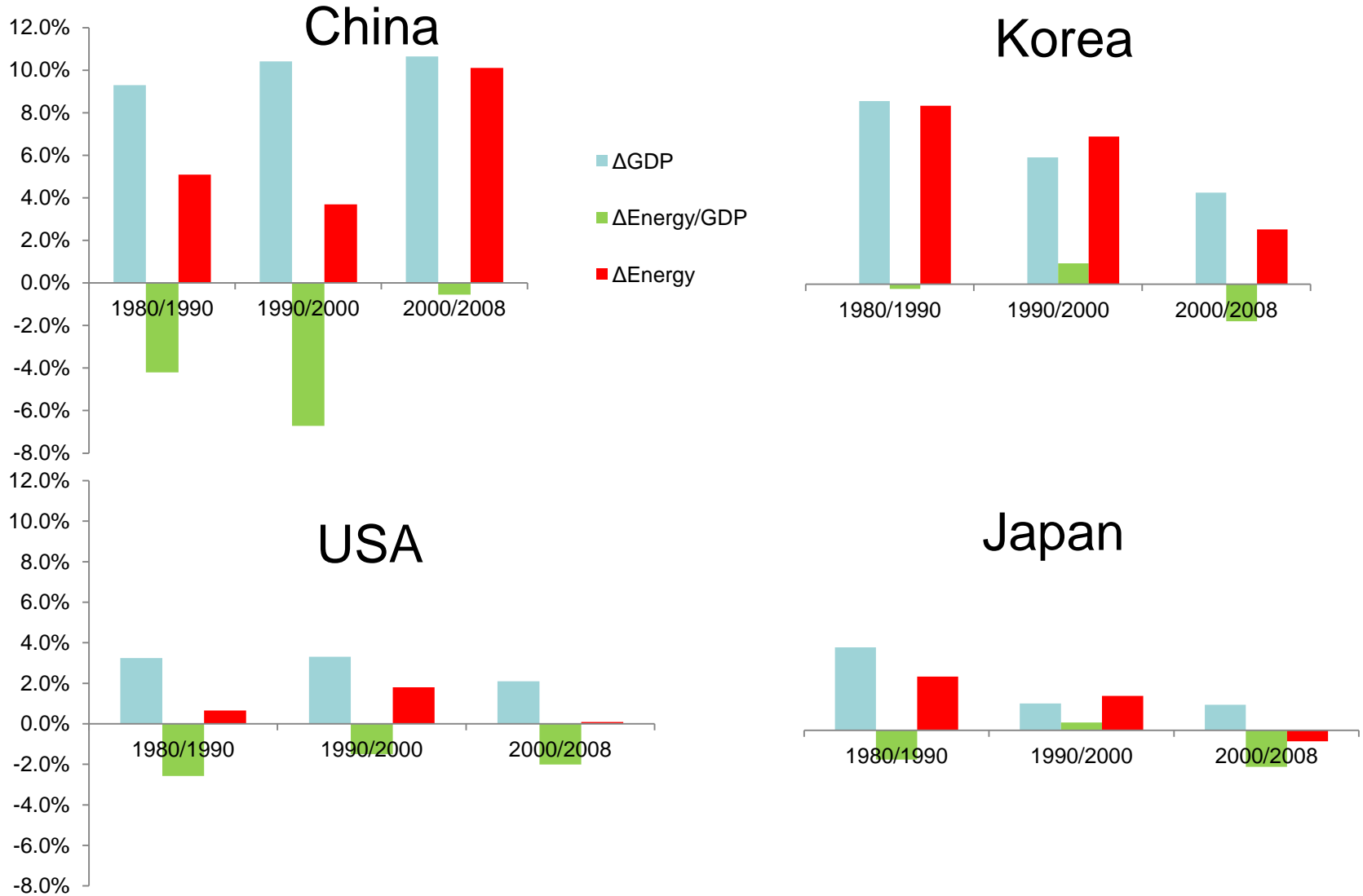
(+)                      (-)

And in general  $\Delta E > 0$

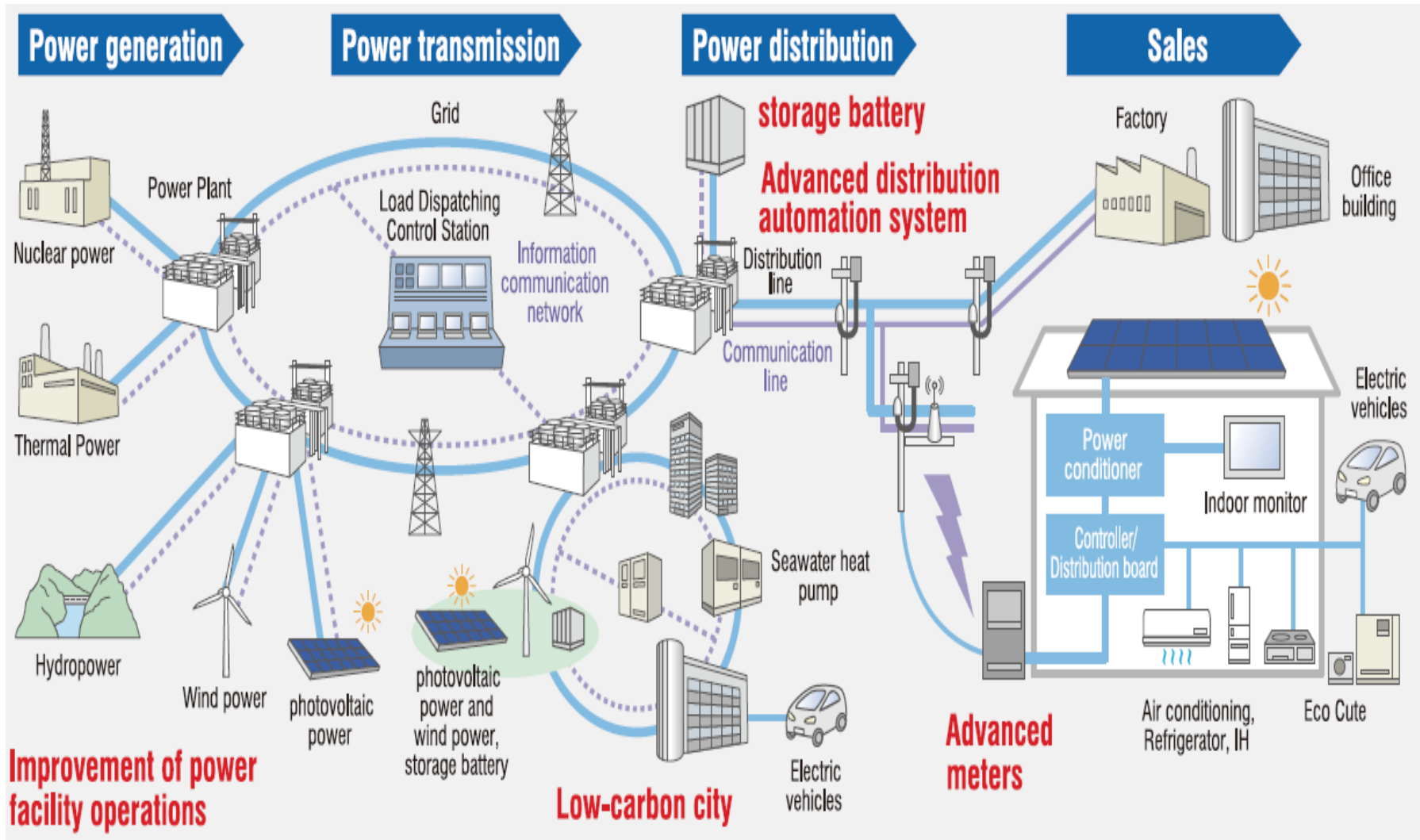
To reduce CO<sub>2</sub>,

$$-\Delta \frac{CO_2}{E} > \Delta E$$

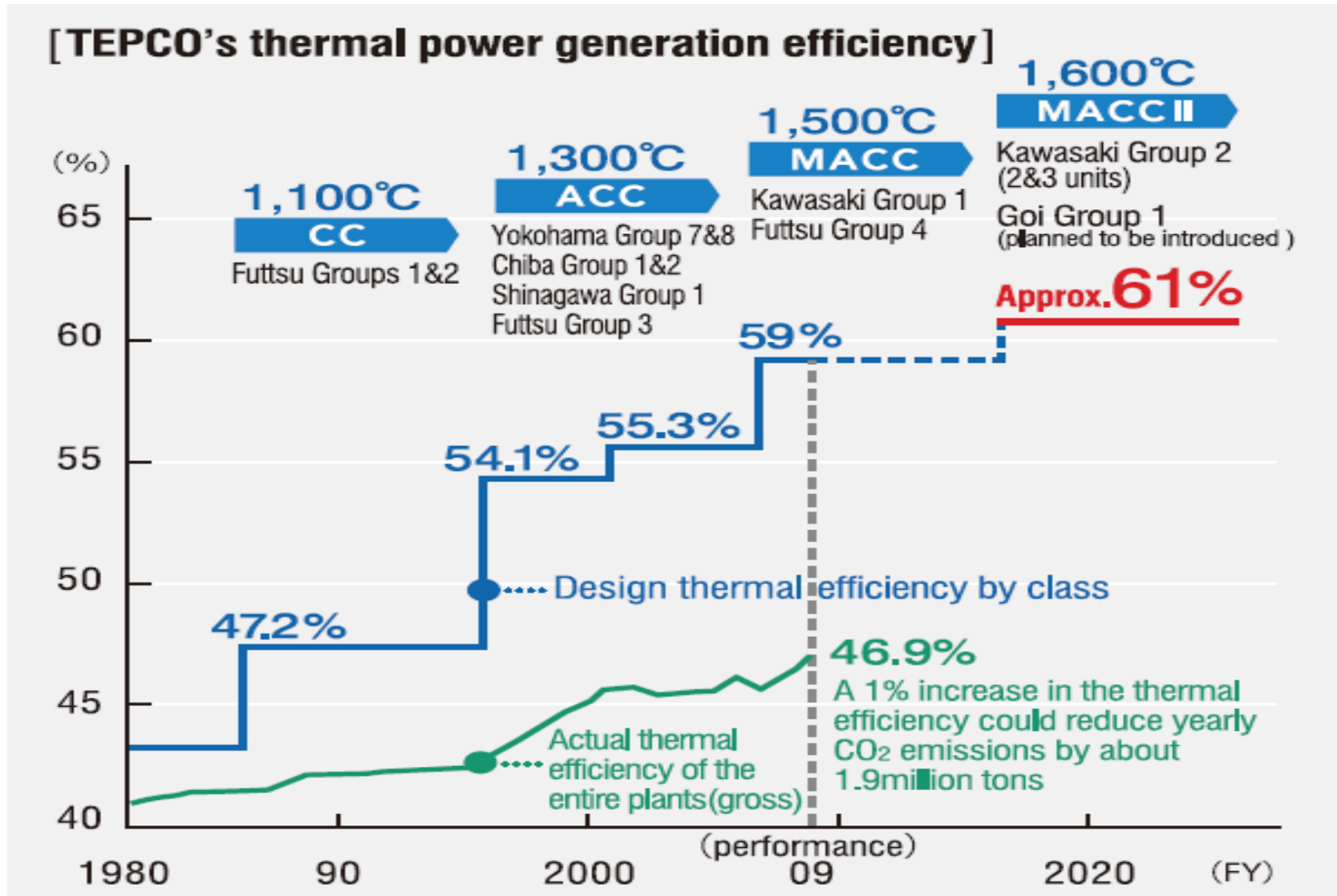
# Energy Saving



# Smart Power System



# More Efficient Generating Plant



# High Efficiency Heat Pump

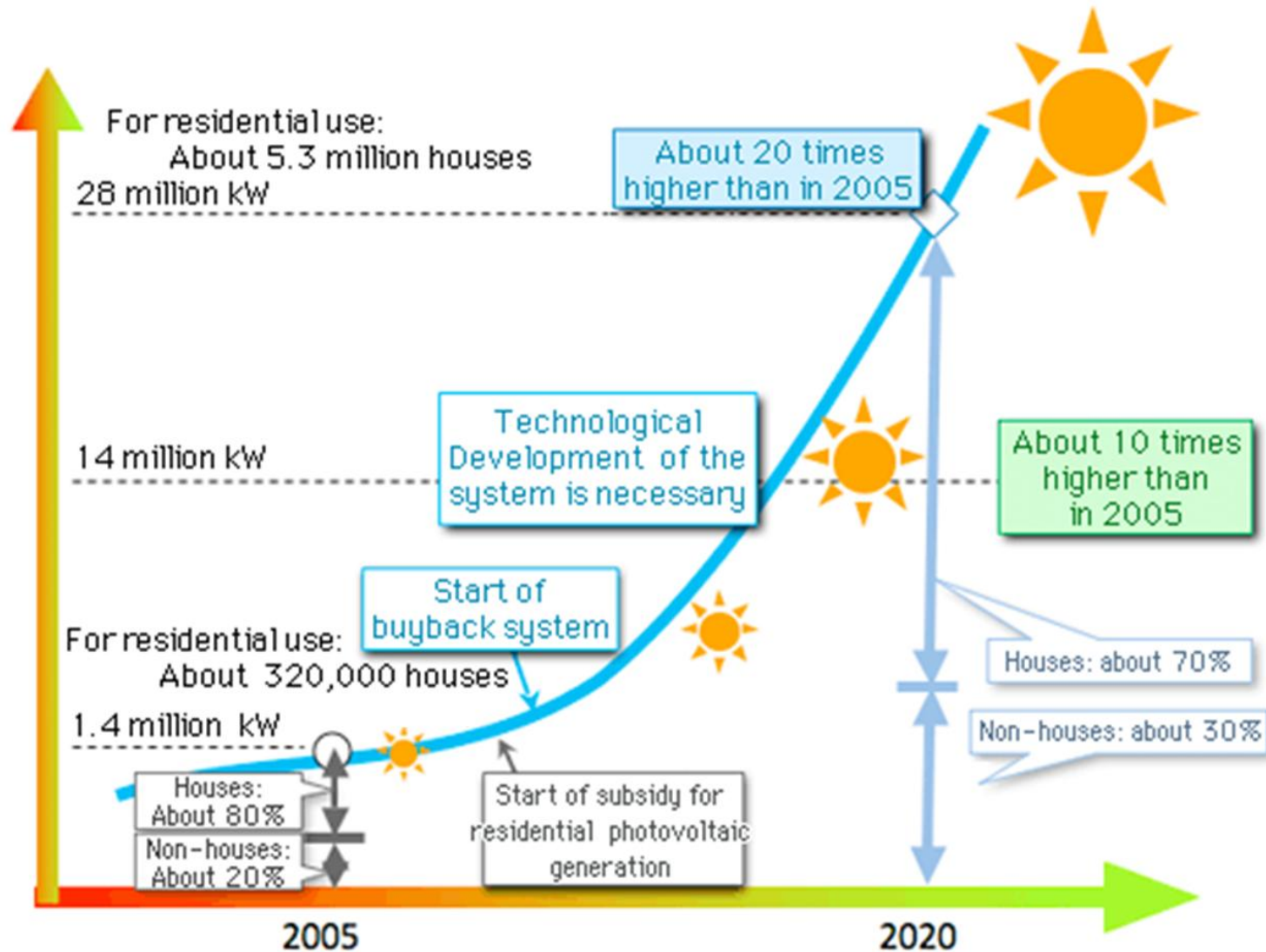
- Heat in the air is renewable resource for heating, cooling and hot water supply.
- Ideal COP is quite high.

indoor temperature : 28 Celsius    outdoor temperature: 35 Celsius

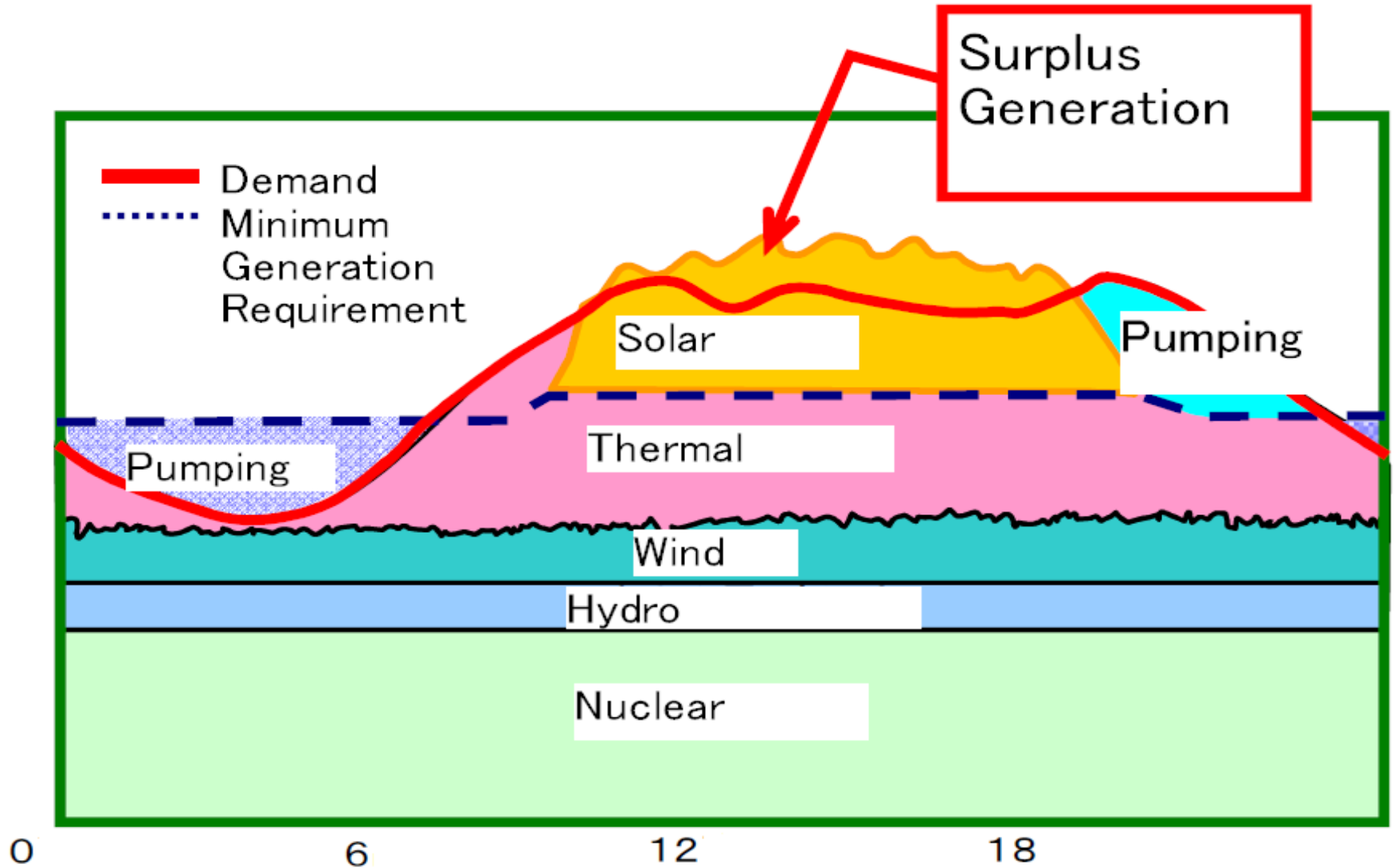
Ideal COP is  $(273+28)/(35-28)= 43$

- Air-conditioner using heat pump is now available even in frigid place.

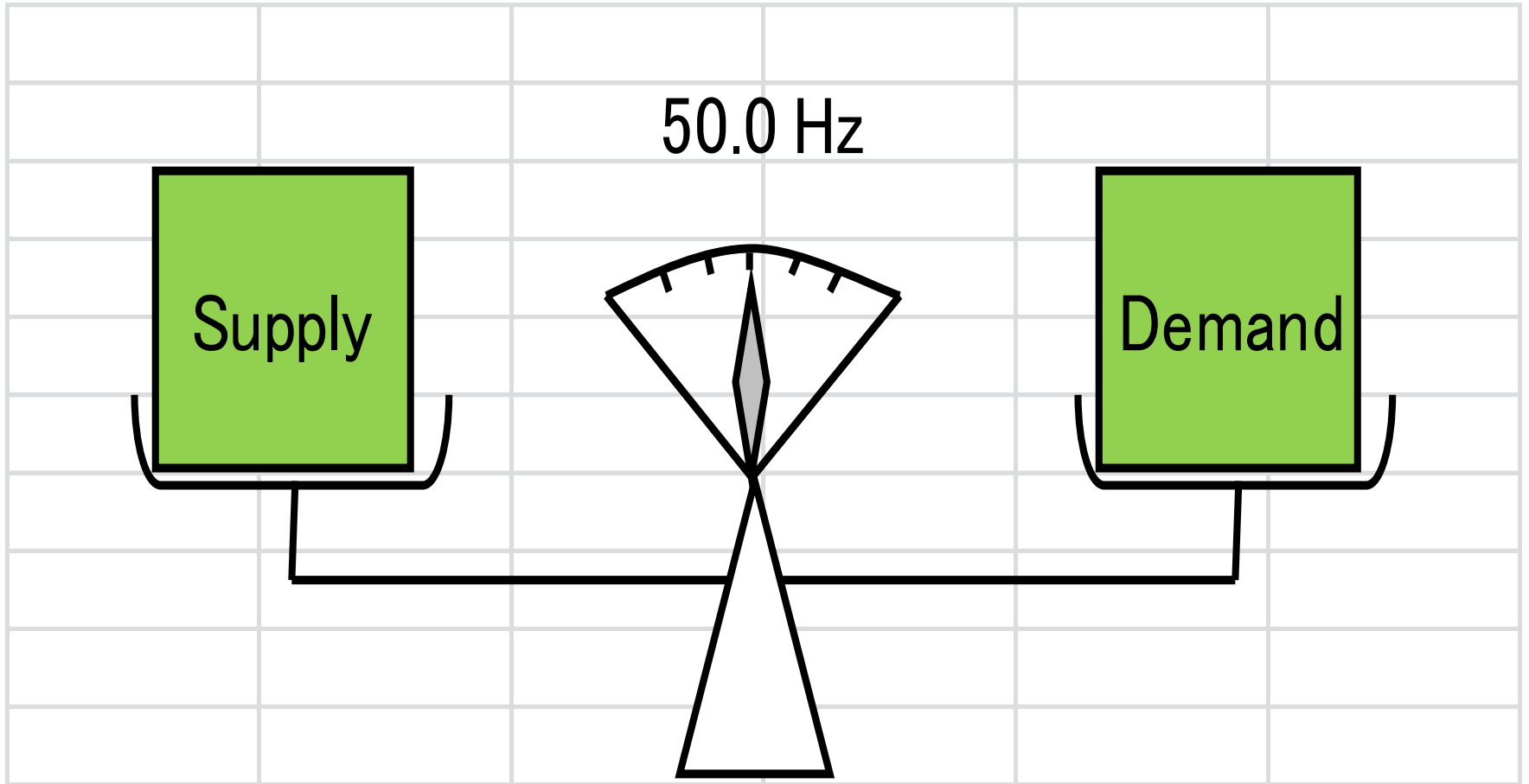
# 28GW PV in 2020



# What If Generation Exceeds Load ?

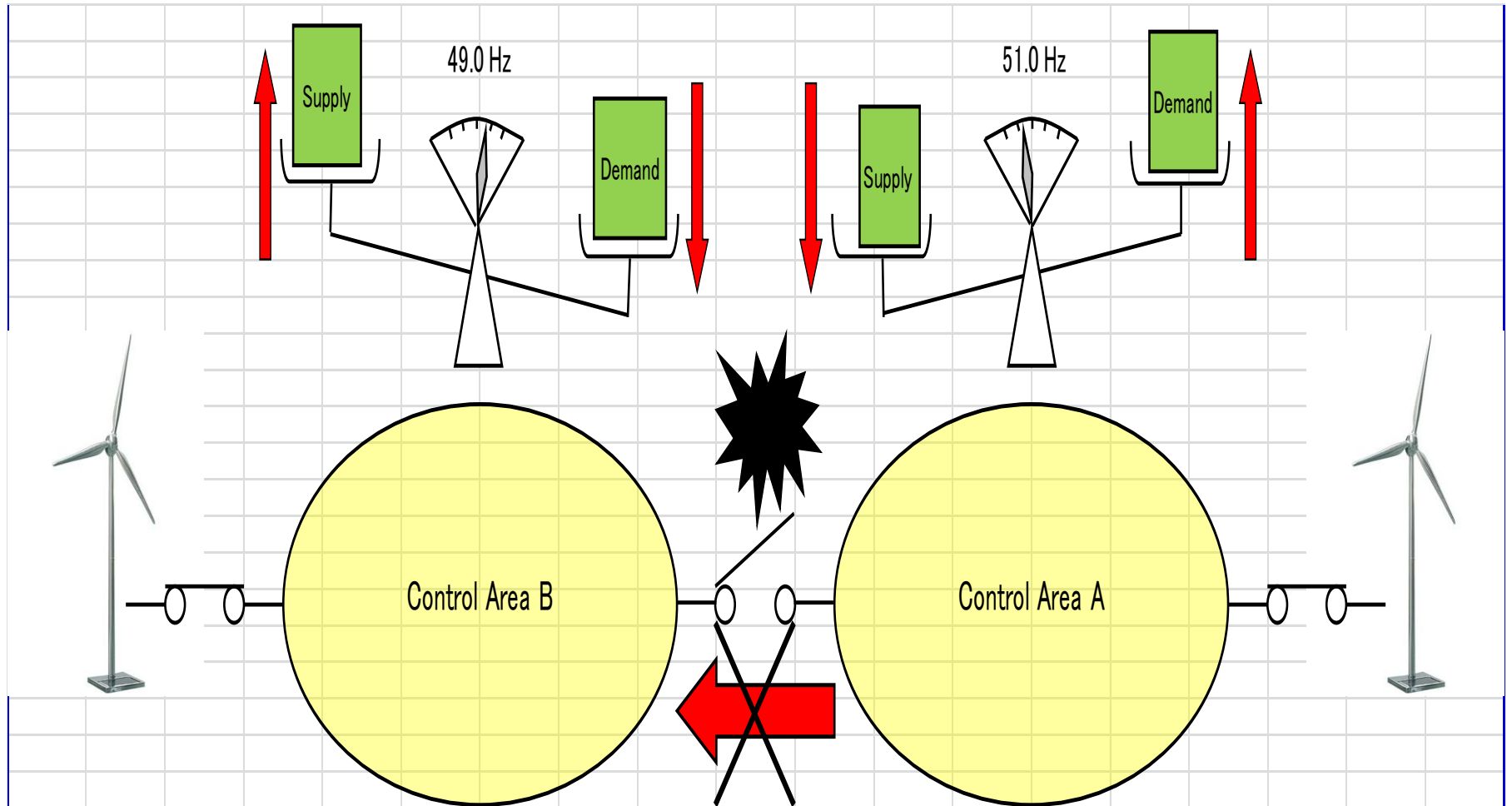


# Electricity 101





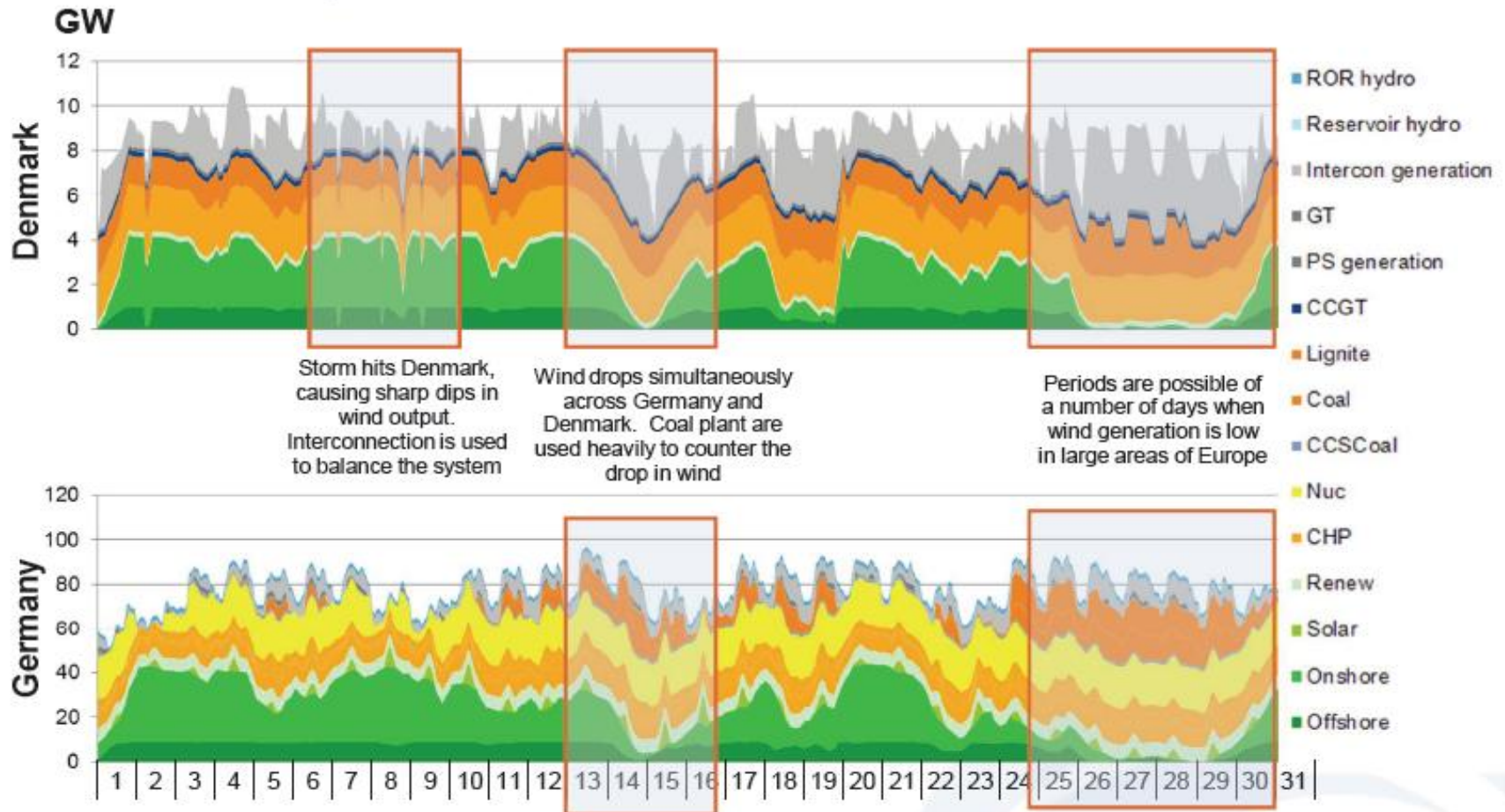
# Challenges for Intermittent Energies



# Future Generation Patterns

Plant generation will have to become more flexible, with greater requirements for within-day balancing and greater use of interconnection

Examining the impact of the weather of Jan 2005 on the generation patterns in 2020 shows more flexible use of plant, with lower load factors and increased use of interconnection



# Aftermath of Fukushima Nuclear Havoc

- Unprecedented earthquake and tsunami was also a major shock for nuclear power industries in not only Japan also the world.
- Revising energy policies is inevitable.
- Realistically, nuclear will remain an option on the condition of safety and emergency preparedness in our country in light of climate changes and national security in the foreseeable future.