

**The Goal of the Japanese Gas Industry  
in a Low Carbon Society  
~ Mid- to Long-term Scenarios ~**



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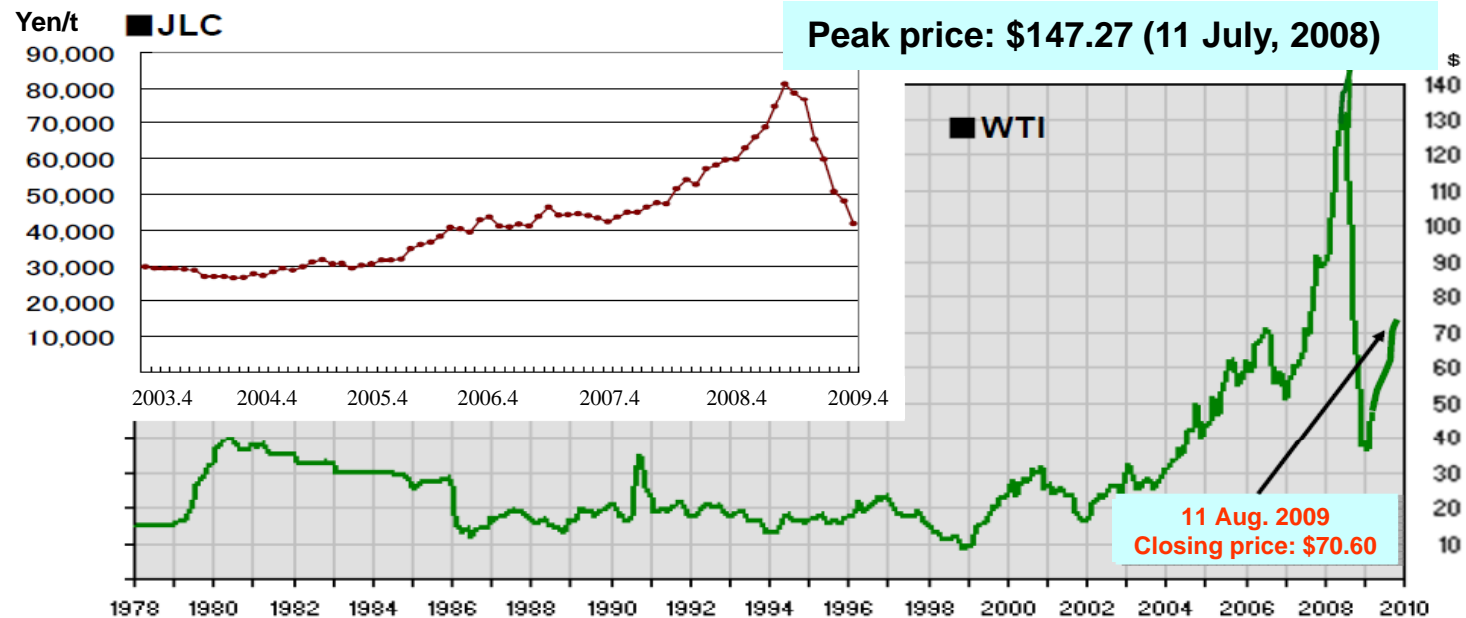
## Agenda



- 1. Major Changes in Global Energy Market**
- 2. Changes in Japan's Policies on Energy and the Environment**
- 3. The Vision of the Gas Industry in a Low Carbon Society**
- 4. The Strategy for Realizing Our Vision in a Low Carbon Society**
- 5. Conclusion**

# 1. Major Changes in Global Energy Market

- Energy prices have fluctuated widely since 2005.
- Prices are expected to remain high because of global demand growth.

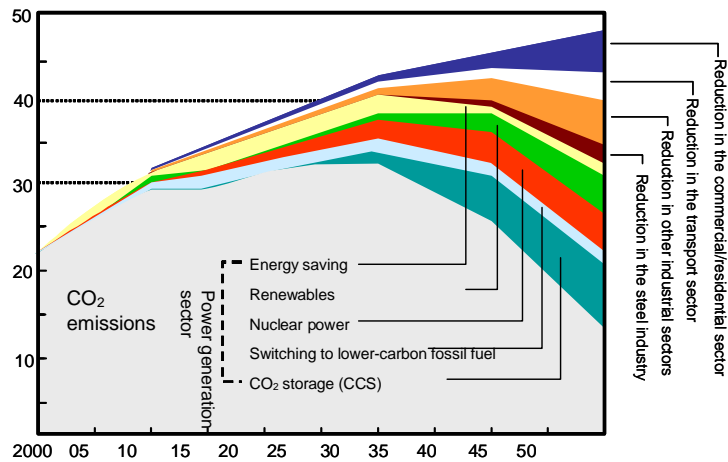


Average monthly data from January 1978 through July 2009

## 2. Changes in Japan's Policies on Energy and the Environment

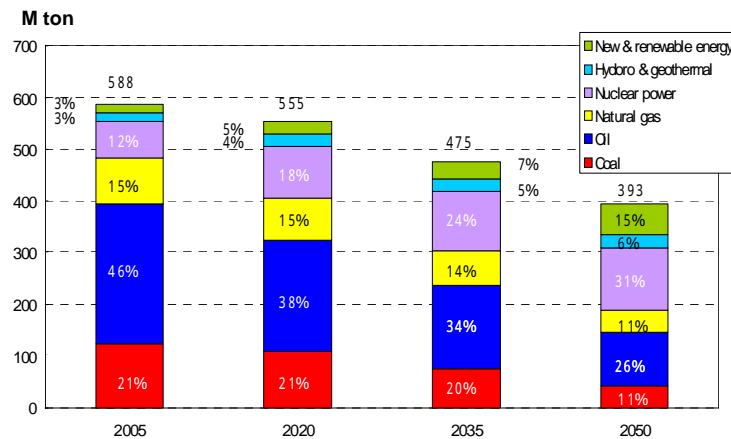
- The legislation concerning structural switch of energy supply from fossil fuel to non-fossil fuel is established in this summer.
- Long-term plan of energy demand and supply is now being discussed in line with new legislation.

Scenario up to 2050 for the reduction of worldwide CO<sub>2</sub> emissions



Source: Research Institute of Innovative Technology for the Earth (RITE)

Scenario of the mid- to long-term primary energy consumption in Japan



Source: The Institute of Energy Economics, Japan

**Action plans must support the gas industry in a low carbon society and materialize mid- to long-term scenarios.**

### 3. The Vision of the Gas Industry in a Low Carbon Society

#### Stable energy supply

Energy security through diversified supply sources and the optimum energy mix.

#### Combating global warming

Natural gas, as a low carbon fuel, and highly efficient systems will play a key role to a low carbon society.



#### Contribution to low carbon society

Distributed energy systems

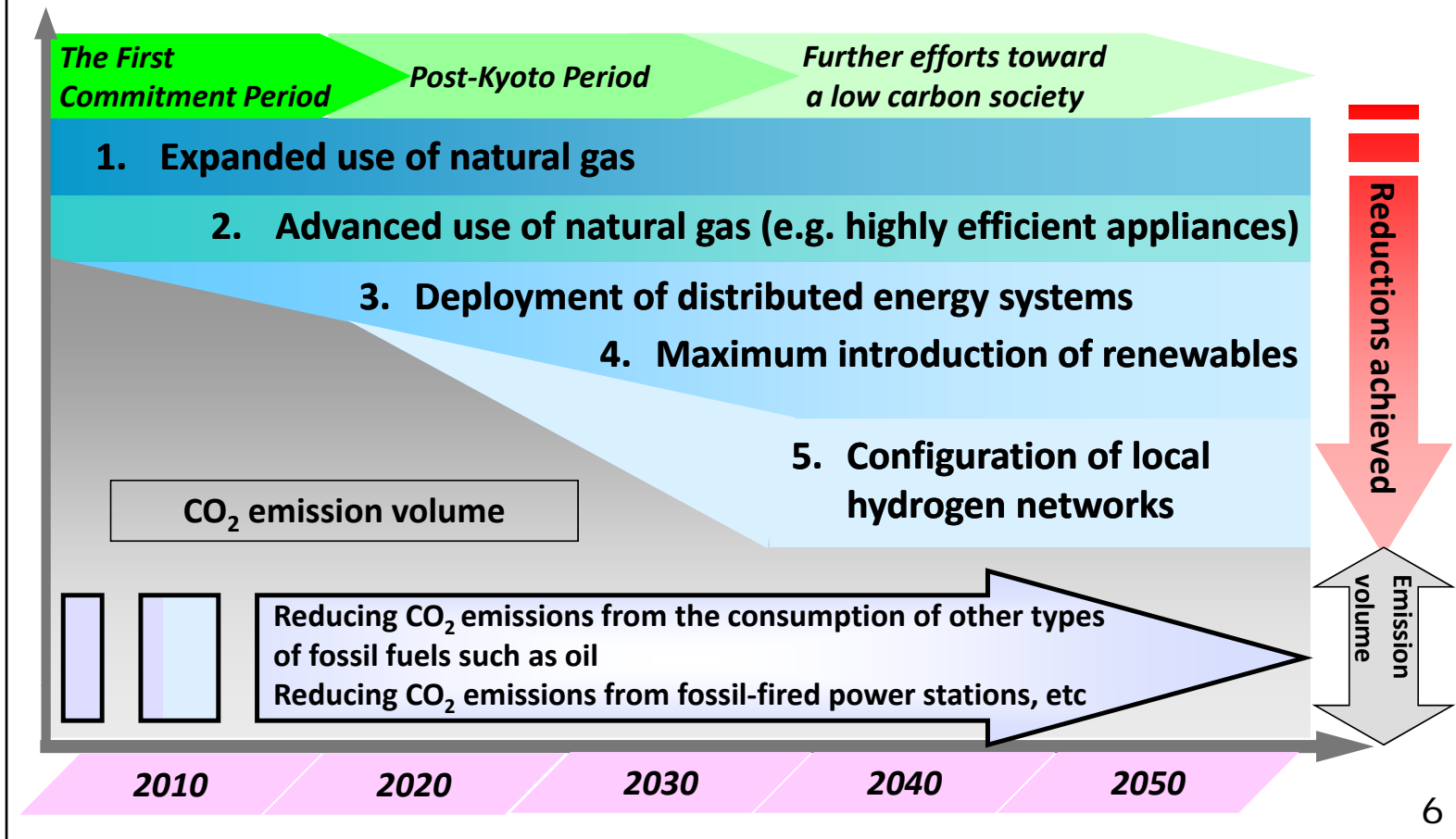
Hydrogen-driven society

Advanced use of natural gas

renewable energy sources

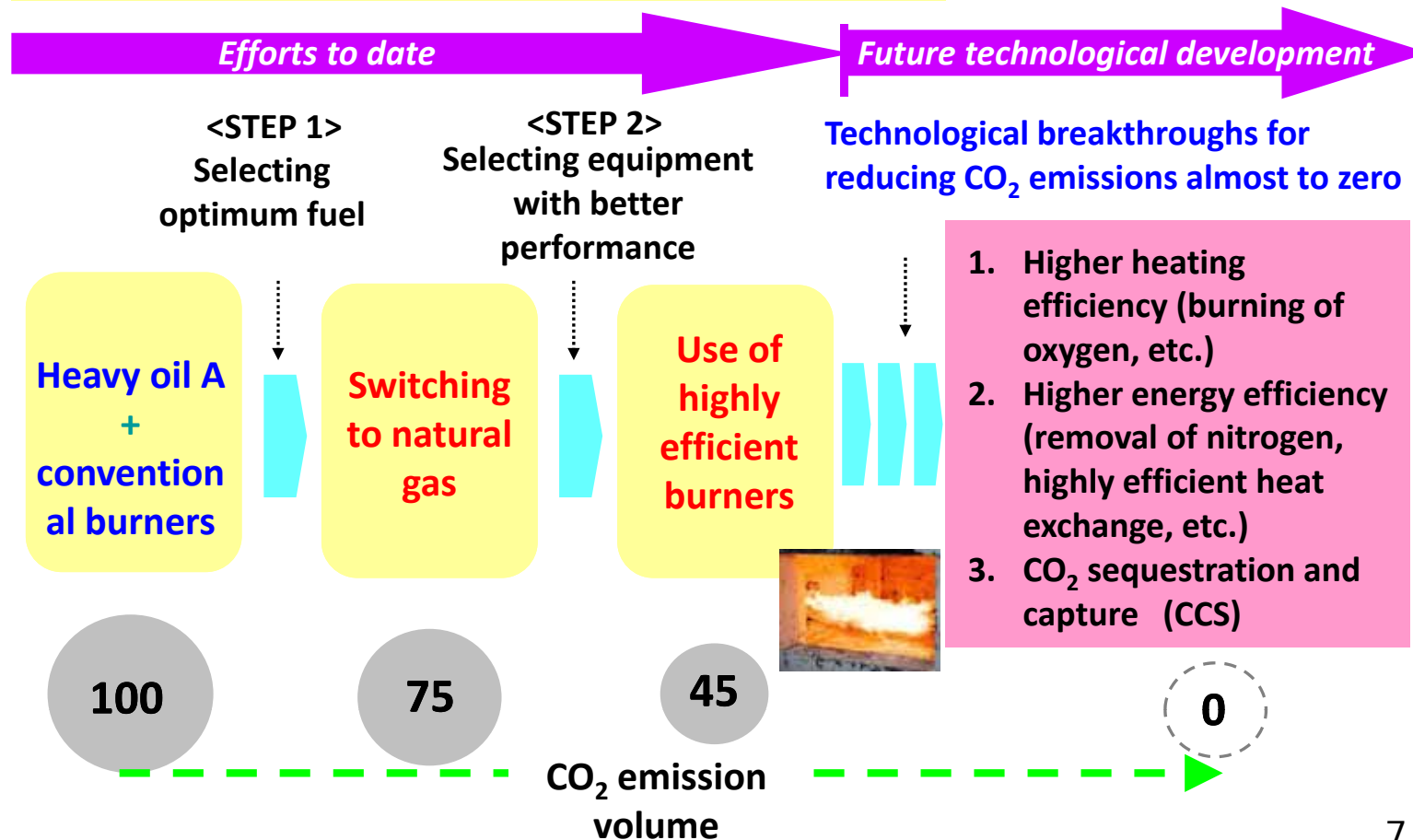
## 4. The Strategy for Realizing Our Vision in a Low Carbon Society

Supporting 60-80% reduction of CO<sub>2</sub> emissions by expanding the advanced use of natural gas



## 4. The Strategy for Realizing Our Vision in a Low Carbon Society


### Expanded and Advanced use of natural gas



## 4. The Strategy for Realizing Our Vision in a Low Carbon Society


### Deployment of distributed energy systems

#### Residential fuel cell (PEFC) initiatives



Manufactures  
**Panasonic, Toshiba, Nippon Oil**


Generation efficiency: 37%  
Energy saving: 32%  
CO<sub>2</sub> reduction: 45%



(LHV)

**Stationary Fuel Cell Large-Scale Demonstration Project (2005 - 2008)**  
3,300 units installed nationwide

#### Generation efficiency enhancement (SOFC\*) initiatives



Residential (achieved): 45%  
Industrial (target): 67%  
(combined with GT)

(LHV)

SOFC Demonstration Research Project (2007- )  
Following PEFC initiatives, this marks the start of demonstration research aiming at development of practical applications.

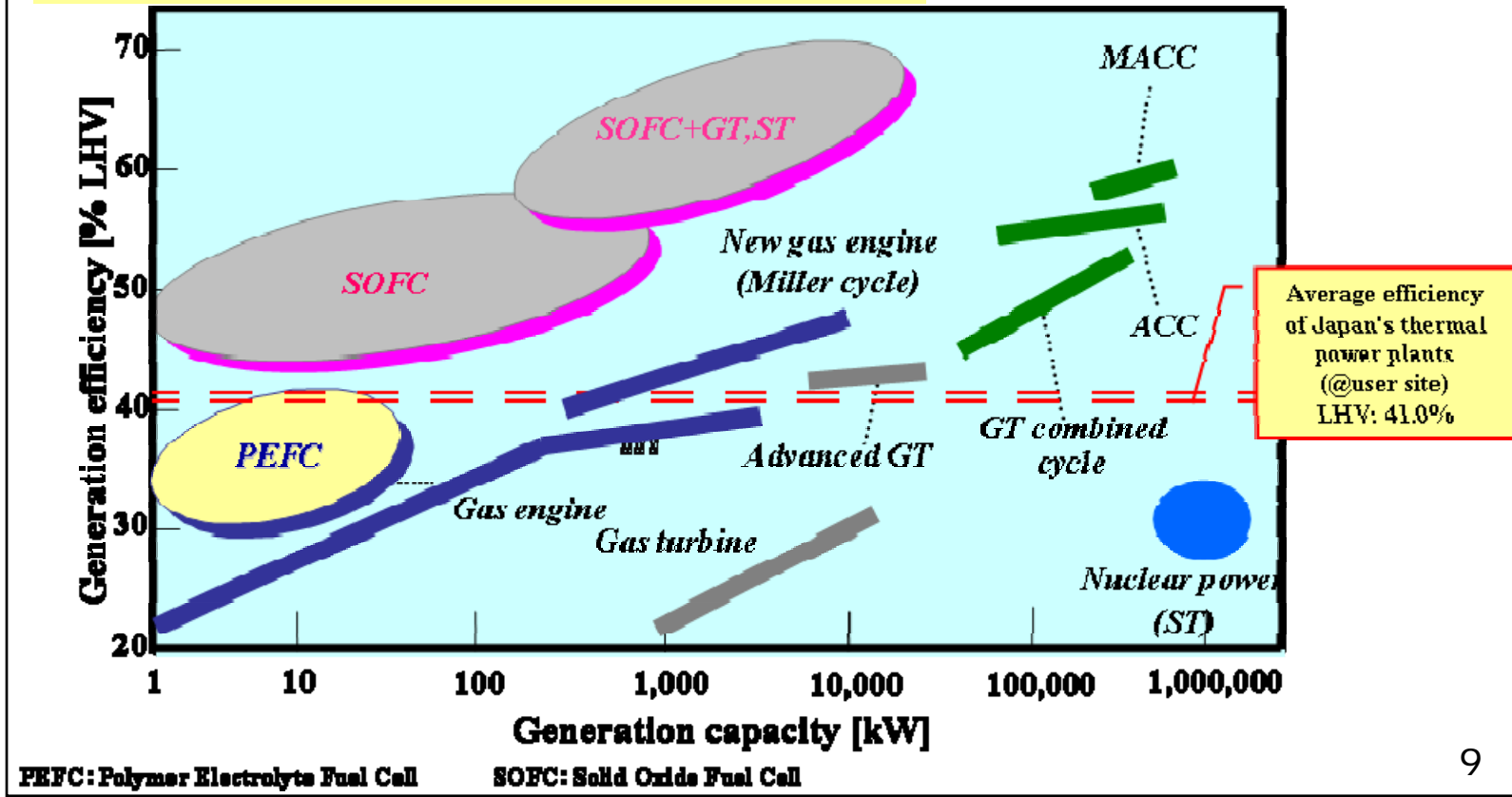
**Commercialization started for PEFC (2009)**  
**Price \$17,000 (After government \$14,000 subsidy) 7,000 units targeted nationwide**



#### 4. The Strategy for Realizing Our Vision in a Low Carbon Society

Various types of cogeneration that surpass generation efficiency of commercial grid at the users' site.

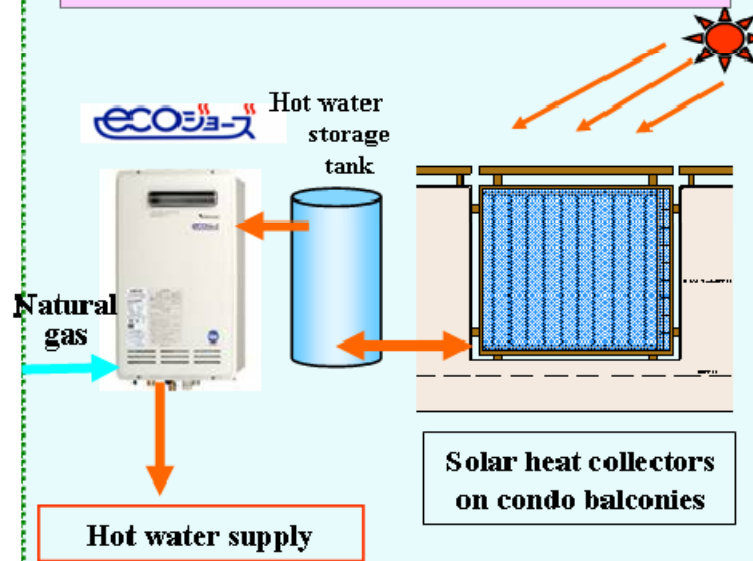
#### Deployment of distributed energy systems



## Maximum introduction of renewables in a Low Carbon Society

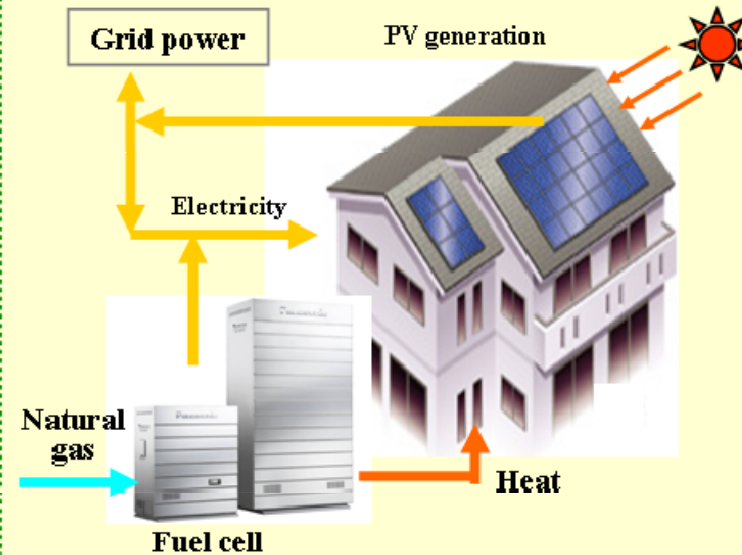
### (1) Instantaneous water heater + solar water heater (balcony rail installation)

Natural gas water heater provides backup for solar water heater which has an unstable hot water supply



### (2) Fuel cell + PV

The best mixture; Fuel cells compensate the output instability of PV cells.



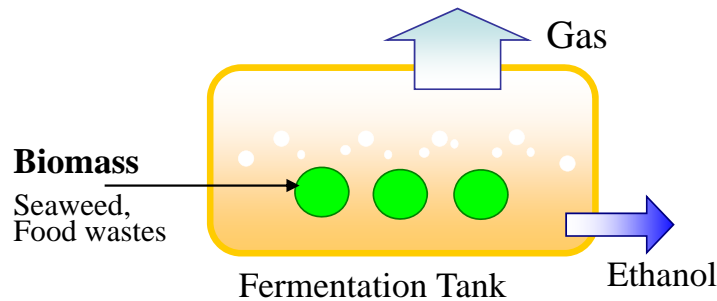
## 4. The Strategy for Realizing Our Vision in a Low Carbon Society

### Maximum introduction of renewables

Various types of biomass can be gasified by fermentation or partial combustion. And produced energy is consumed in the same area.

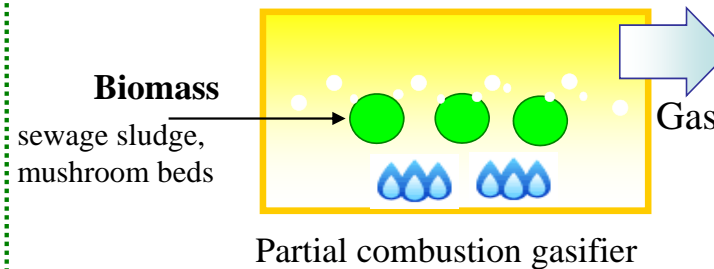
#### (1) Biological reforming

Methane and ethanol fermentation using seaweed or food wastes



#### (2) Thermo chemical reforming

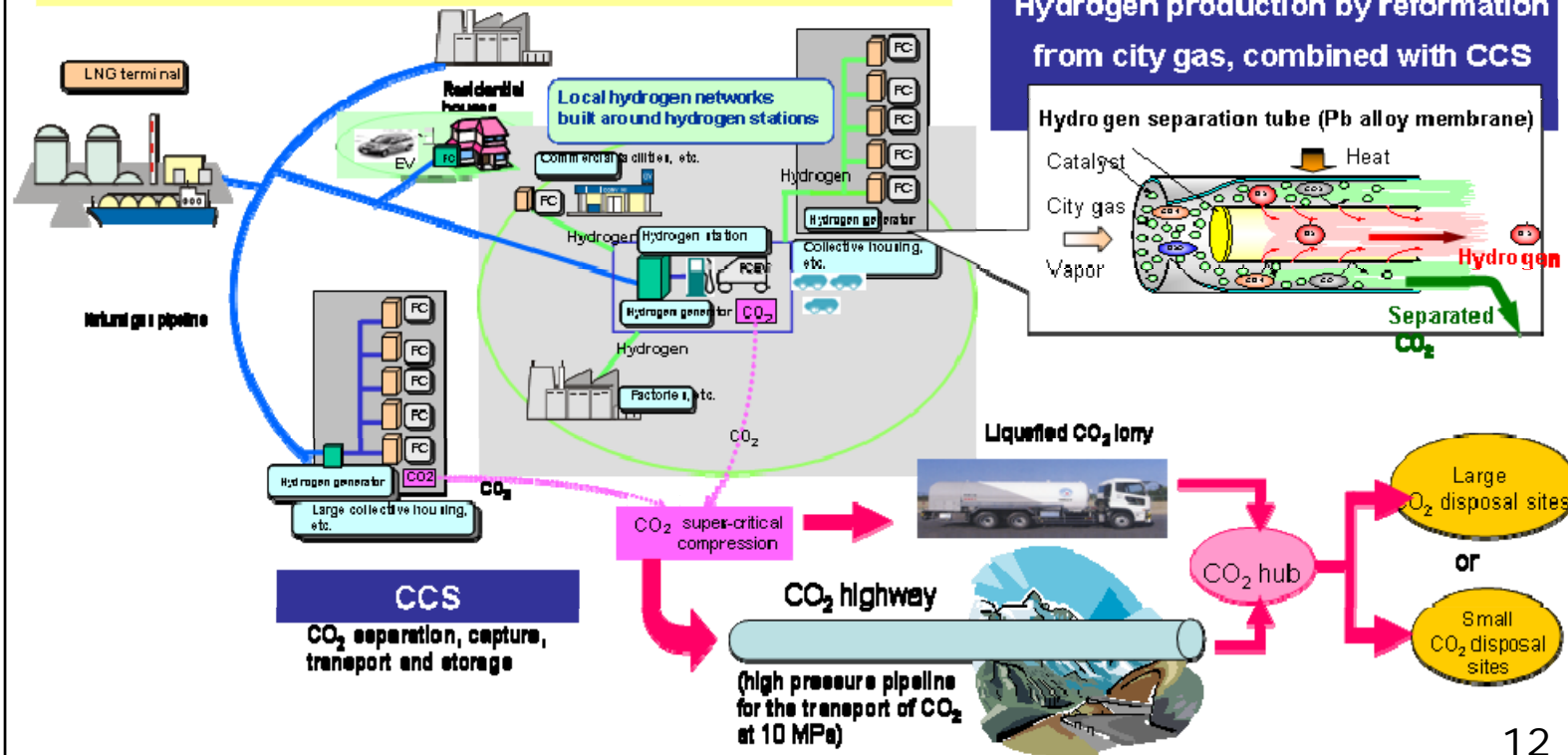
Partial combustion gasification for sewage sludge or mushroom beds



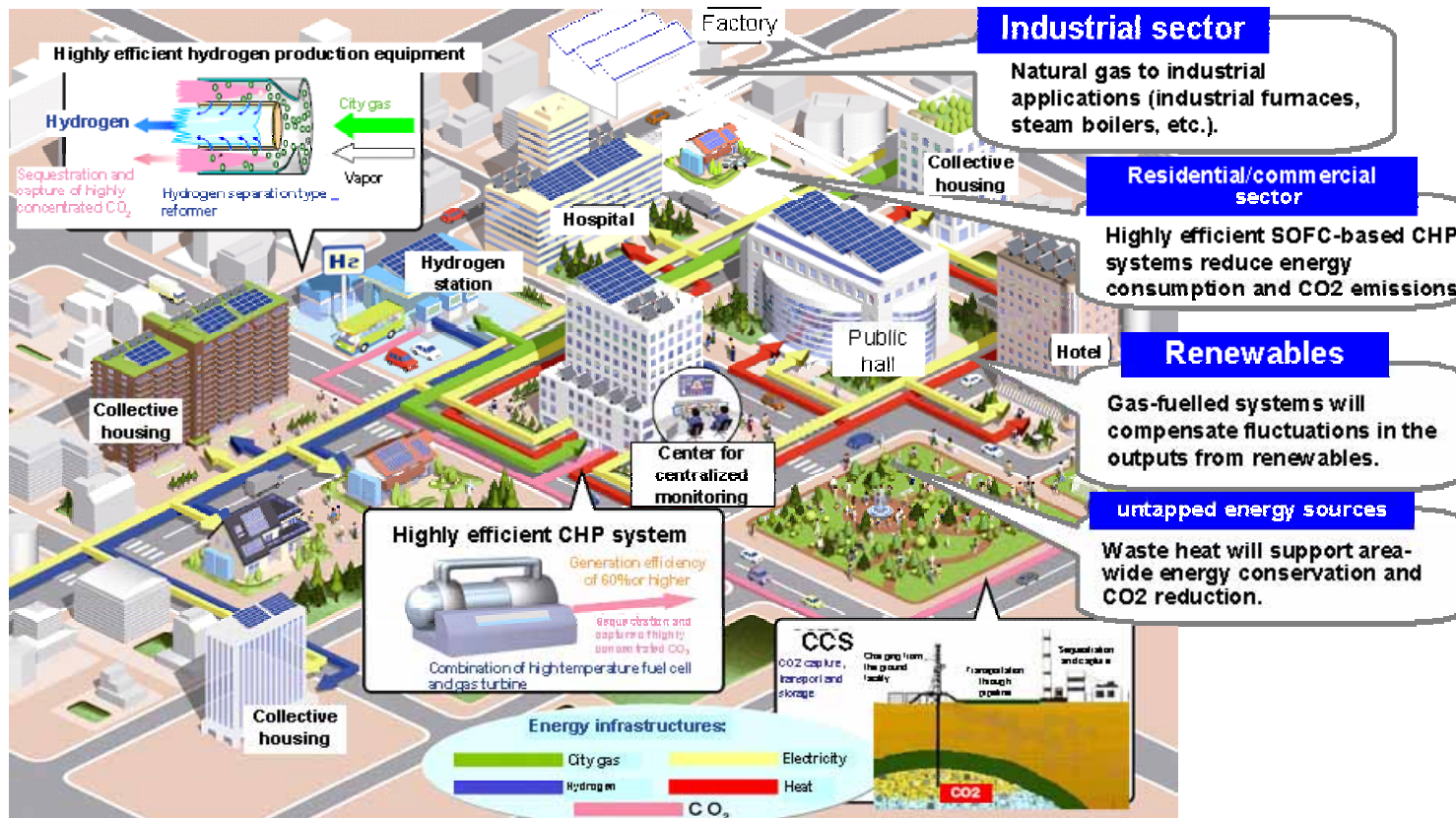
## 4. The Strategy for Realizing Our Vision in a Low Carbon Society

The natural gas reformation is the most efficient and stable way to produce hydrogen.  
 CO<sub>2</sub> from the natural gas reformation will be separated and captured by CCS facilities.

### Configuration of local hydrogen networks



# Smart Energy Systems



## 5. Conclusion



- **Natural gas must play a significant role in a low carbon society through advanced utilization technologies.**
  
- **Need to expand the scope of our R&D activities not only single device but also integrated energy systems like smart energy network.**
  
- **Appropriate combination and harmonization with renewables and centralized power sources required.**
  
- **Strong need of a single voice (lobbying) toward each country's policy makers.**