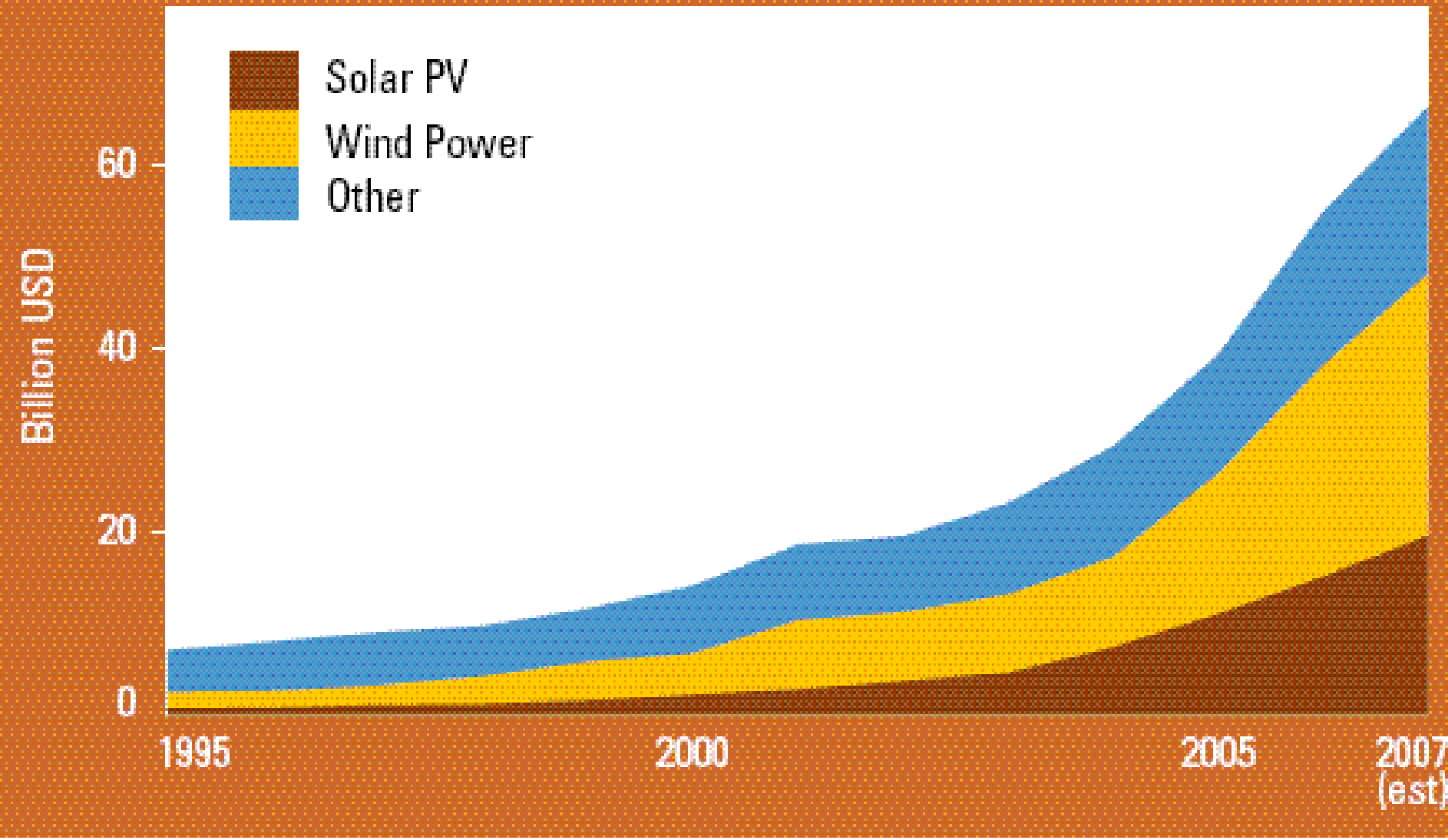
# Effective Utilization of Natural Energy

Session 1

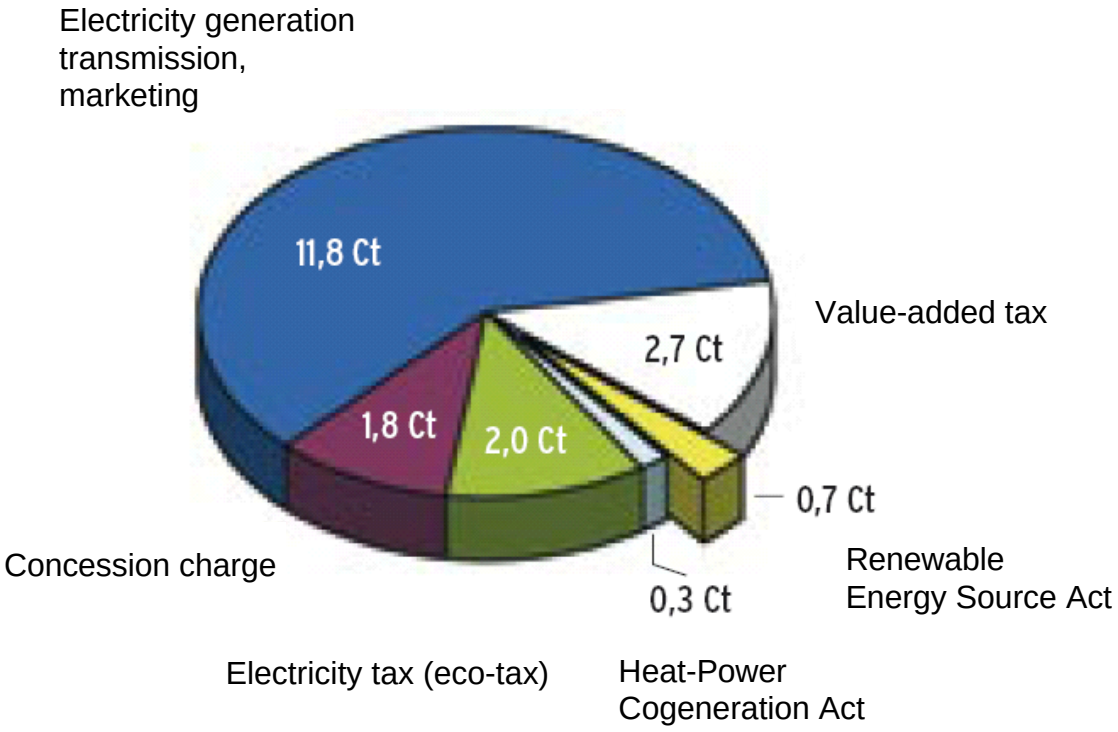
CRDS JST
独立行政法人科学技術振興機構 研究開発戦略センター
Center for Research and Development Strategy Japan Science and Technology Agency

# Annual Investment in Renewable Energy Capacity (excluding large hydro), 1995–2007



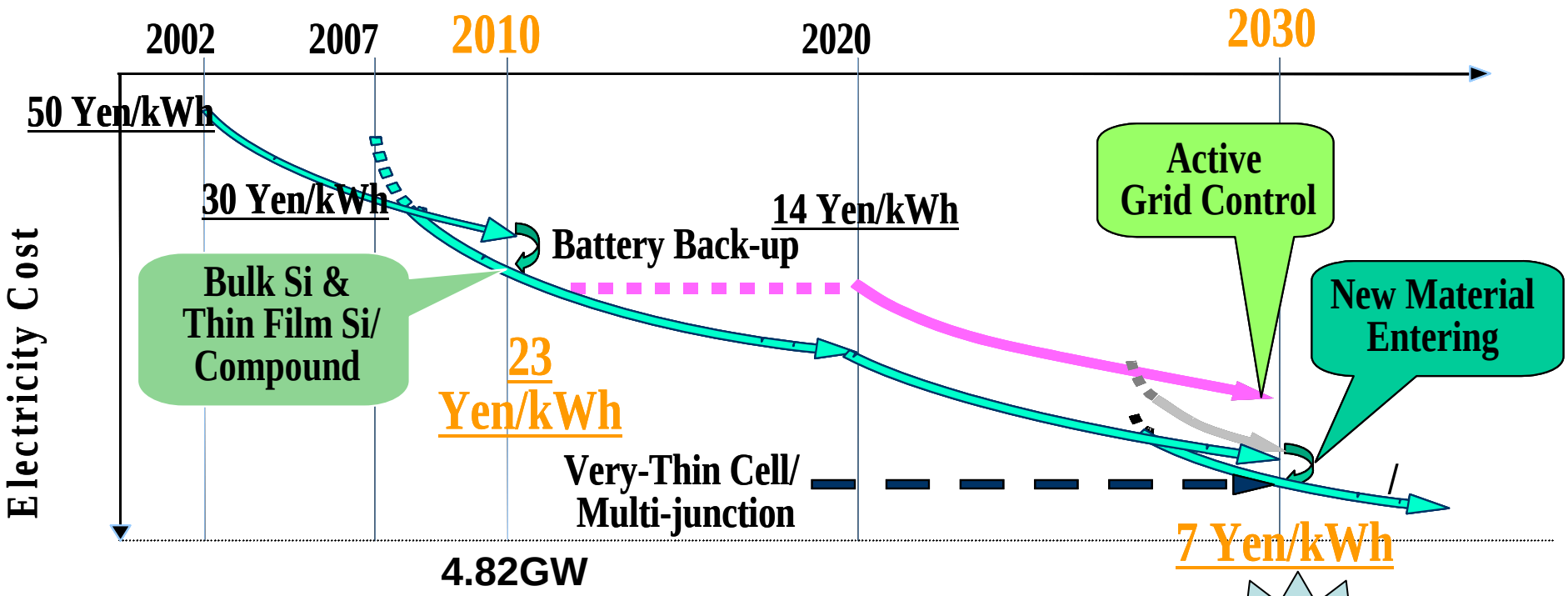

Source: REN21 – Renewables 2007, Global Status Report (pre-publ. for Bali)

# EEG: Share of costs for one kWh of electricity in private households (19,4 €-Cent), 2006.




Source: BMU 2006

# Japanese PV Roadmap until 2030




100GW

**Present utility cost:**

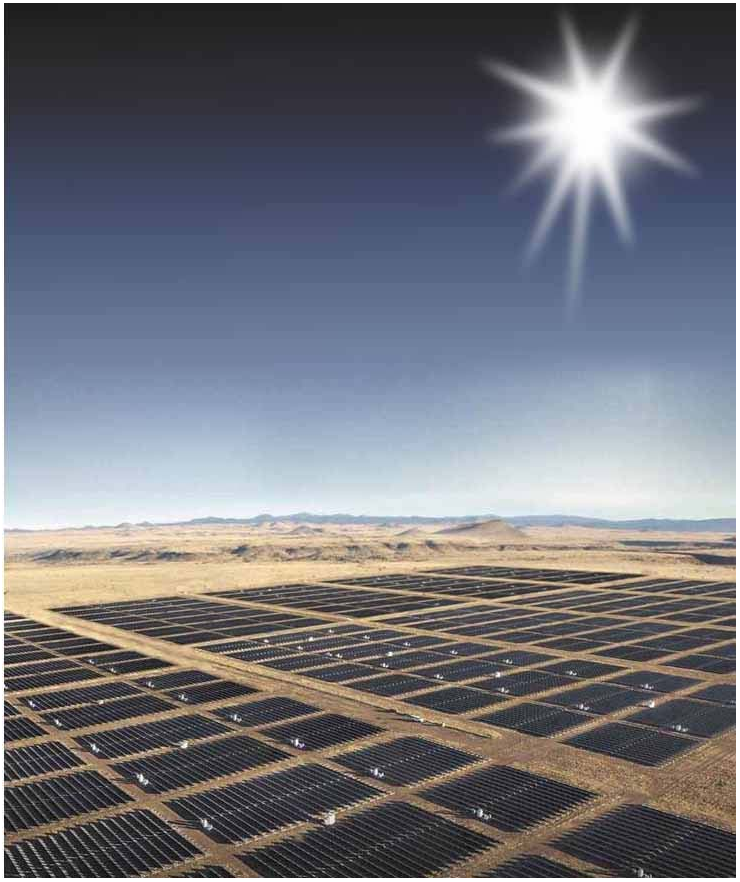
- 23 yen/kWh (private household)
- 15 yen/kWh (industry)

**Electricity generation cost:**

- 5-6 yen/kWh (Nuclear)
- 9 yen/kWh (hydro)

1US$= 120 JPY

## Additional proposal:
## Nano-Based Solar Energy Materials and Solar Cells for Low Latitudes Application



Photovoltaic system in low latitudes
(by courtesy of Prof.Kurokawa)

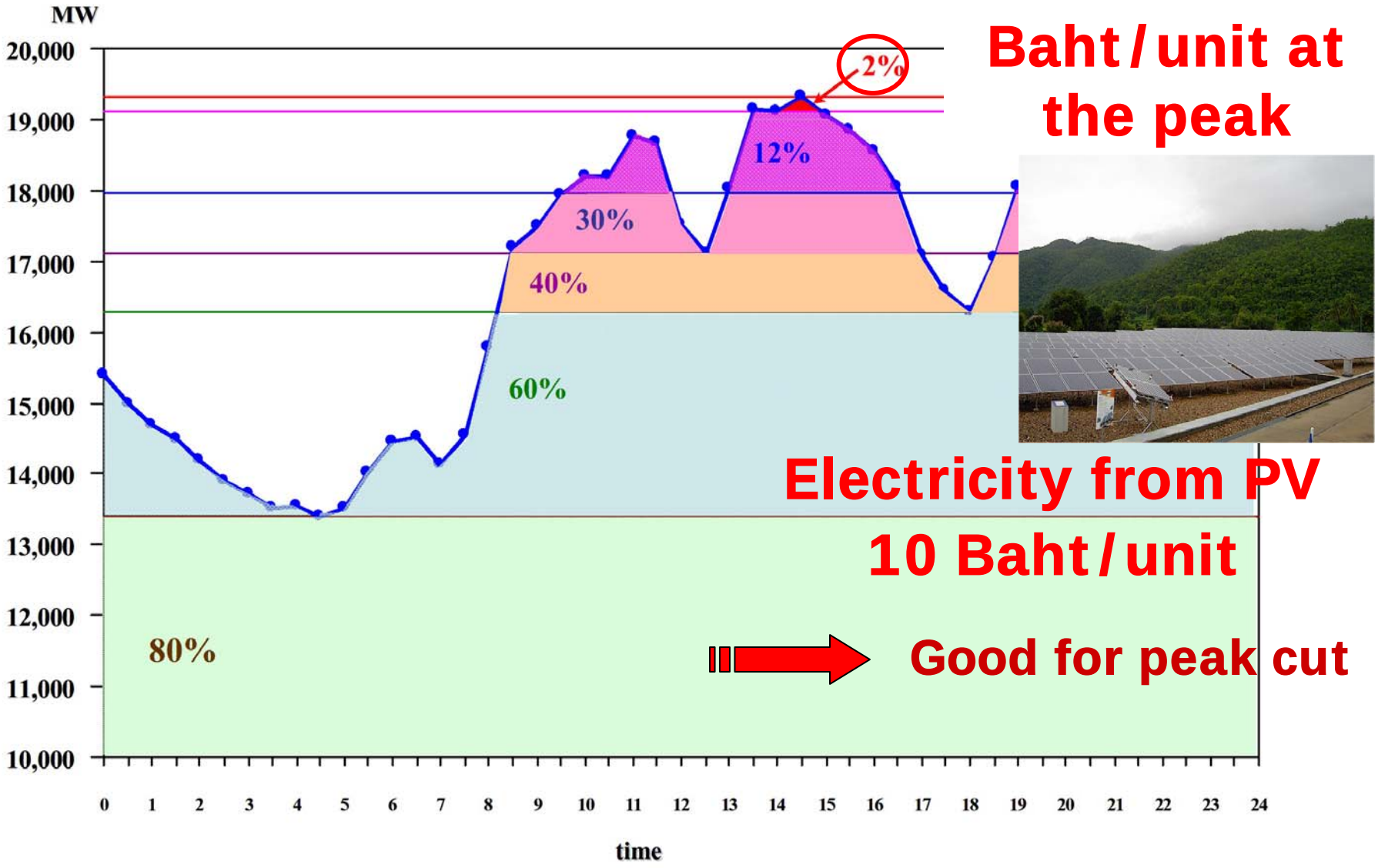
**In Japan, photovoltaic systems with a capacity of 100 GW will be installed by 2030. This number is equal to a 1 kW solar power generation per one citizen.**

**Let us consider that solar cells with a cumulative capacity of 1 kW will be needed for one people in the world on average. According to an estimation of United Nations (UN), the world population will be about 9.3 billion in 2050. Simply saying that the world population in 2050 will be 10 billion, then solar cells with a capacity of 10 billion kW (10 TW) will be required.**

**Where should we install these 10 TW photovoltaic systems? In general, the PV systems should be installed close to the users. Based on the prediction of the UN, from these 10 billion world population, 5.4 billion of them are the Asian population. Hence, most of the PV systems will be installed in the Asia region, particularly in the low latitudes region.**

**The development of solar energy materials for applications in the low latitudes region, the research on physics and optimum design of solar cells, the demonstration and fabrication of solar cells, as well as the research on PV system applications, will be required.**

# Comparison of electricity




**16.67 Baht/unit at the peak**



**Electricity from PV**

**10 Baht/unit**

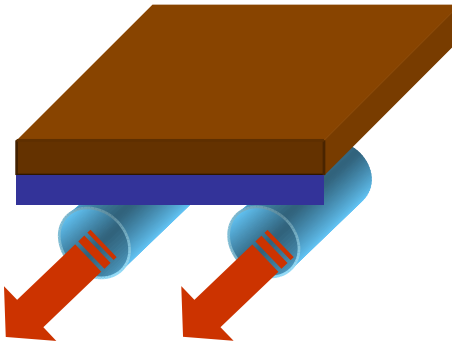
**Good for peak cut**

# Stand-alone Bio diesel production system

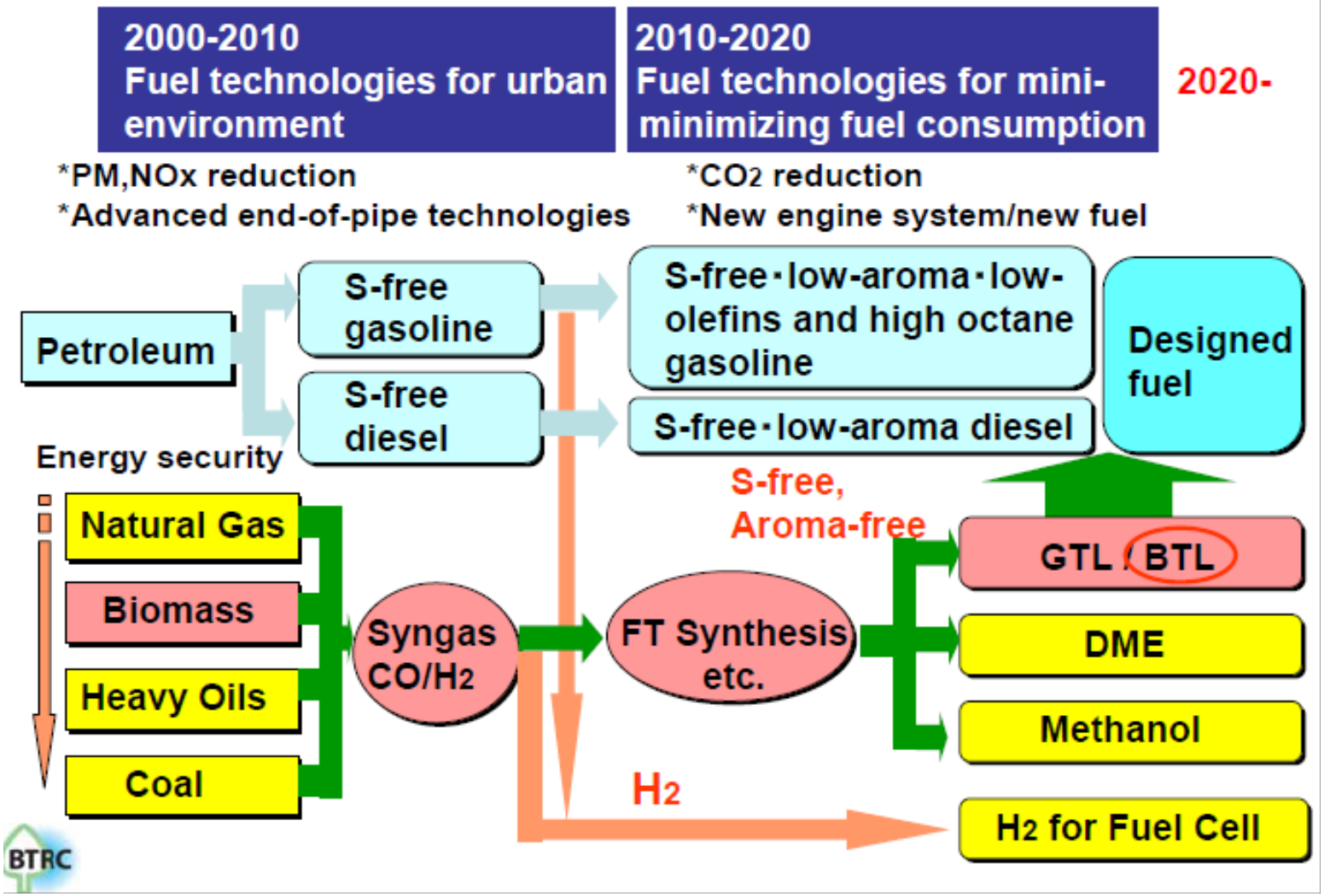
production of bio diesel

PVT

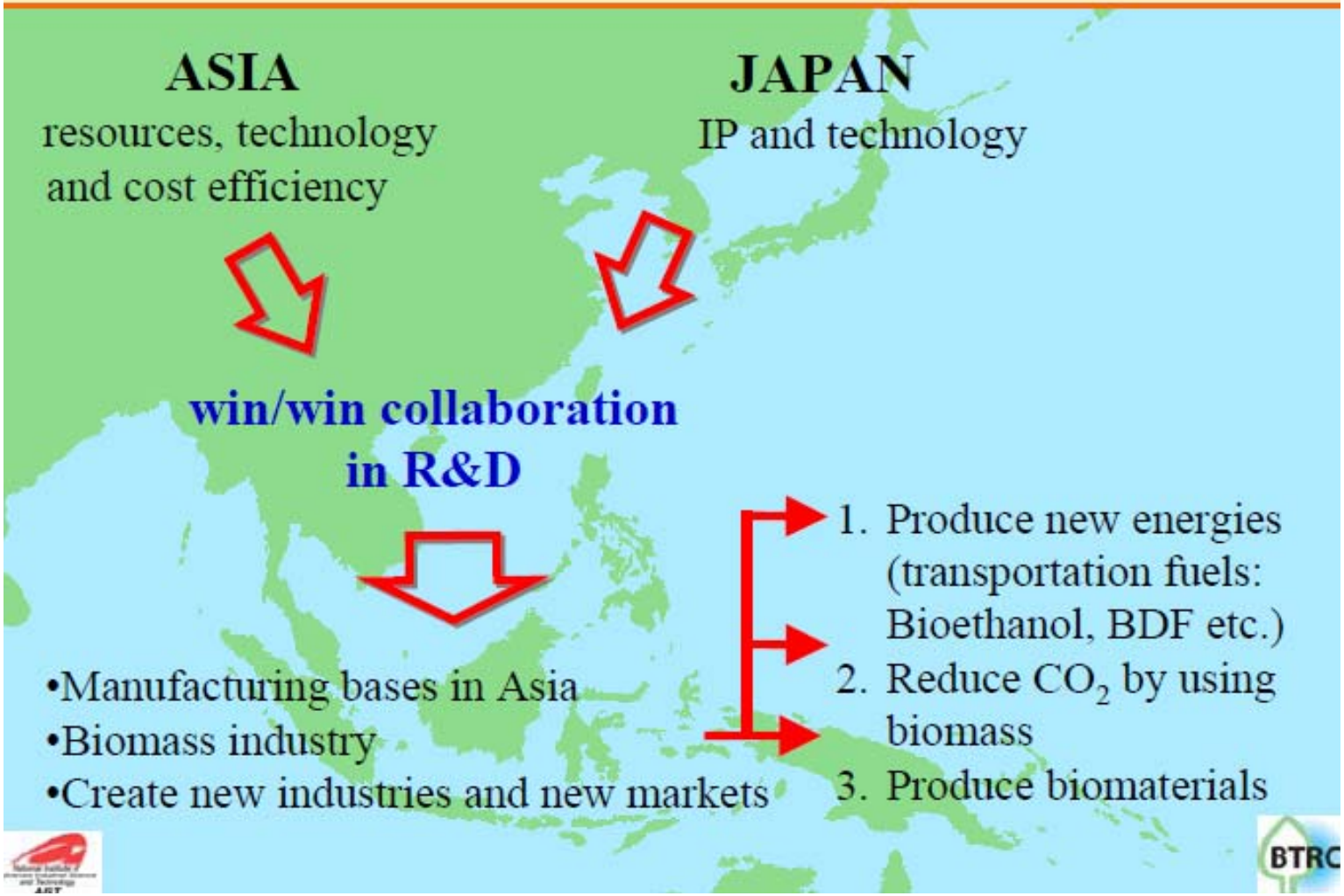
Electricity &
Hot water

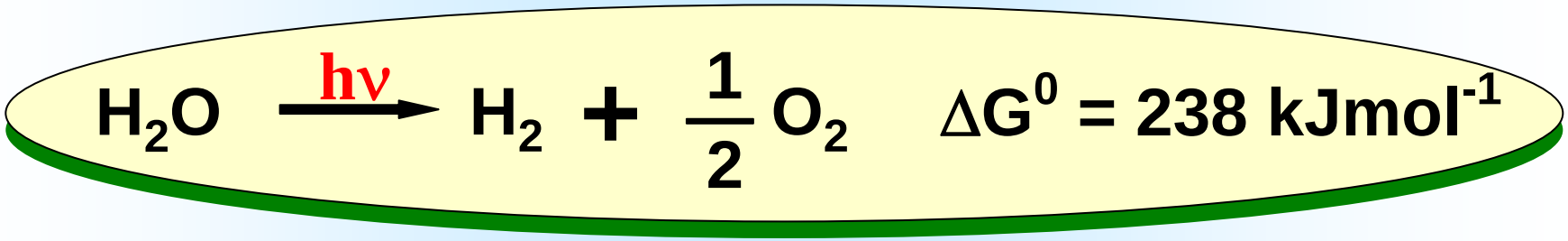


# *Future Needs for Alternative Transportation Fuel*



# *Biomass-Asia Strategy--- for Sustainable Growth*





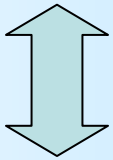

- Solar cell + Electrolysis
- Photoelectrochemical Cell
- Artificial Photosynthesis (Photocatalysis)
  - Inorganic solid material
  - metal complex
  - organic material
  - biomaterial
- Photosynthesis

# Hydrogen Production from Water using Solar Energy

- Solar cell + Electrolysis

*vs*

- Photoelectrochemical Cell



materials

- Artificial Photosynthesis (Photocatalysis)

***Key Issues***

New materials

Hybridization; structure

Application to wide area; Reactor design

# International Schemes

- An international taskforce for discussing technology, systems, and joint projects, to promote the spread of natural energy technology and supply systems using such technology throughout the world, including developing countries
- An Asian natural energy laboratory for establishing a research alliance/integration mechanism with a view to focused investment in development of groundbreaking technologies for solar energy, non-edible biomass, and utilization of aquatic and marine organisms (and microbes) as energy resources
- Creation of international networks for promoting the diffusion of natural energy in each country through information exchange and collaboration