

# PV Status in Korea

*Kyung Hoon Yoon, \*Donghwan Kim*

*Korea Institute of Energy Research (KIER)*

**\* Korea Photovoltaic Development Organization (KPVDO)**

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# Energy Profile of Korea (2006)

## Demand Side

**Energy Consumption**  
**10<sup>th</sup> in the World**

**Oil Consumption**  
**7<sup>th</sup> in the World**

**Energy Consumption Increase Rate (4.22 %)**  
**1<sup>st</sup> Among OECD Countries**

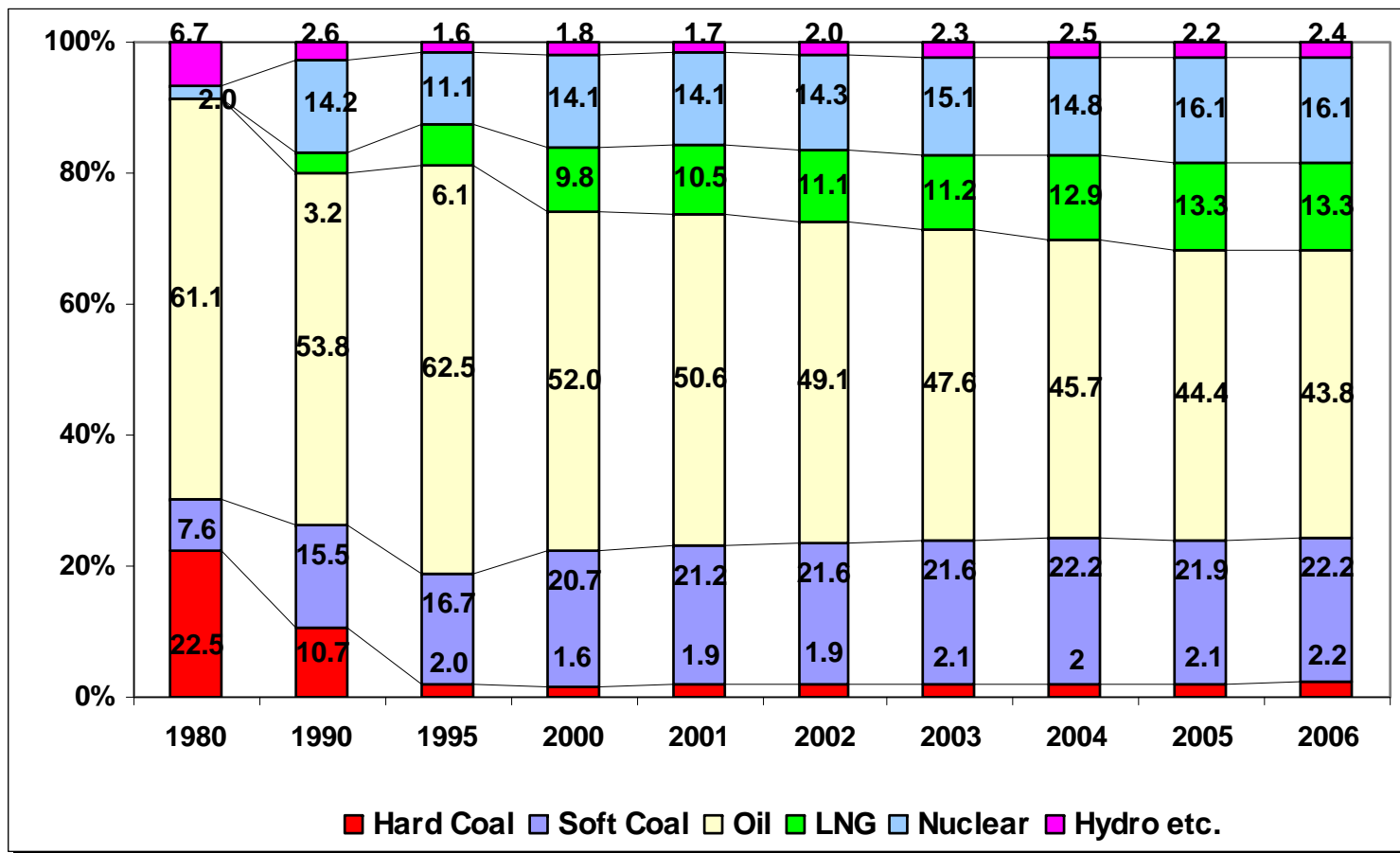
## Supply Side

- **Energy Imports : US\$ 85.6 billion (Oil : US\$ 55.9 billion)**
- **Dependency on Imports of Energy : 97% (as of 2006)**
- **More than 82% of oil from Middle East (as of 2006)**

Source : MOCIE, 2007, BP Statistics 2007, World Bank 2007

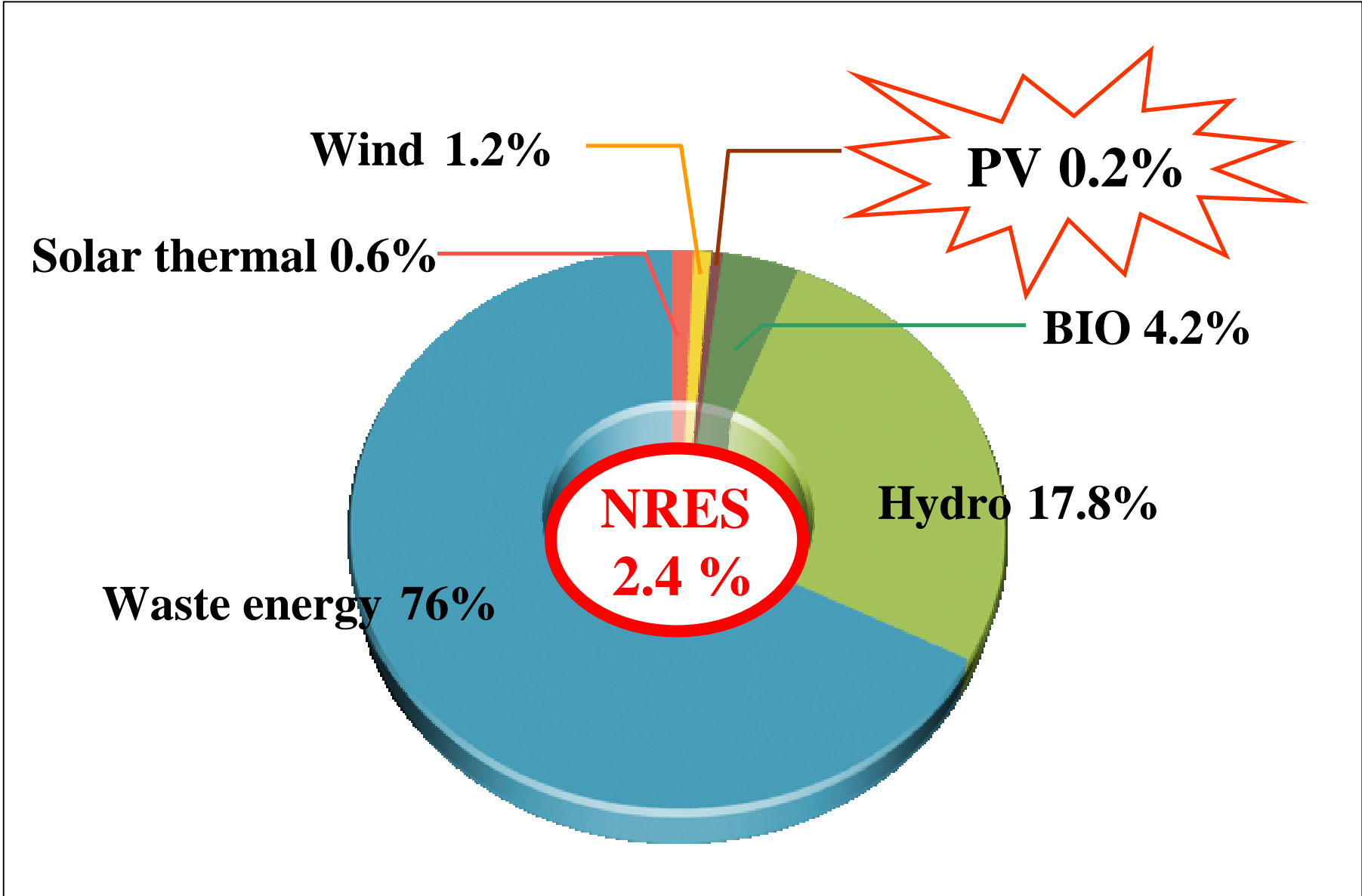
# Total Primary Energy Supply Trends (2006)

Decrease in Oil, increase in LNG



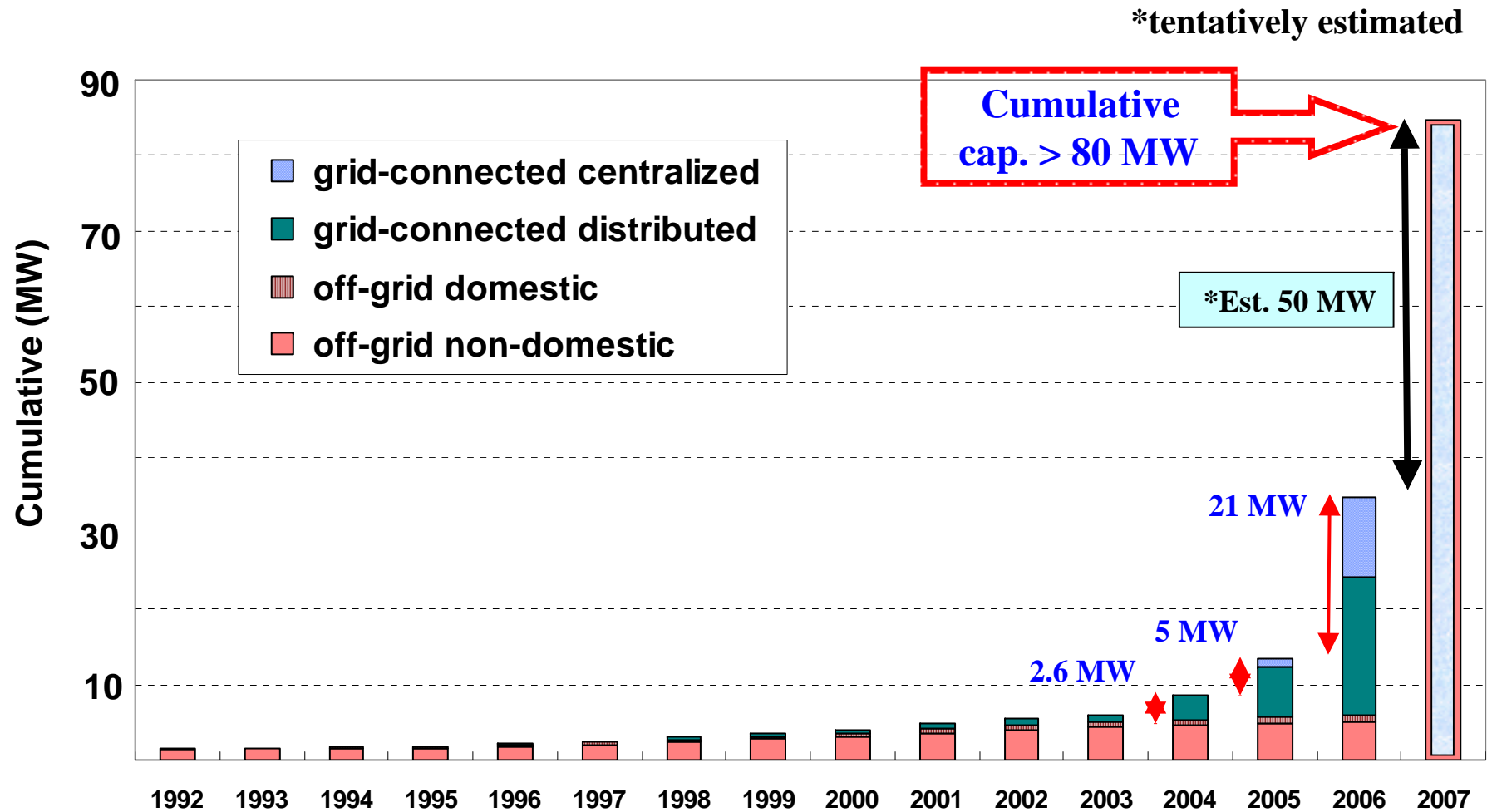
Source : MOCIE, 2007

# New & Renewable Energy Supply (2006)



Source : MOCIE, 2007

# PV installed in Korea : Annual & Cumulative



# PV Deployment Measures

- **100,000 Solar Roof Program**

- **Feed-in-Tariff (FIT)**

- **Public Building Program**

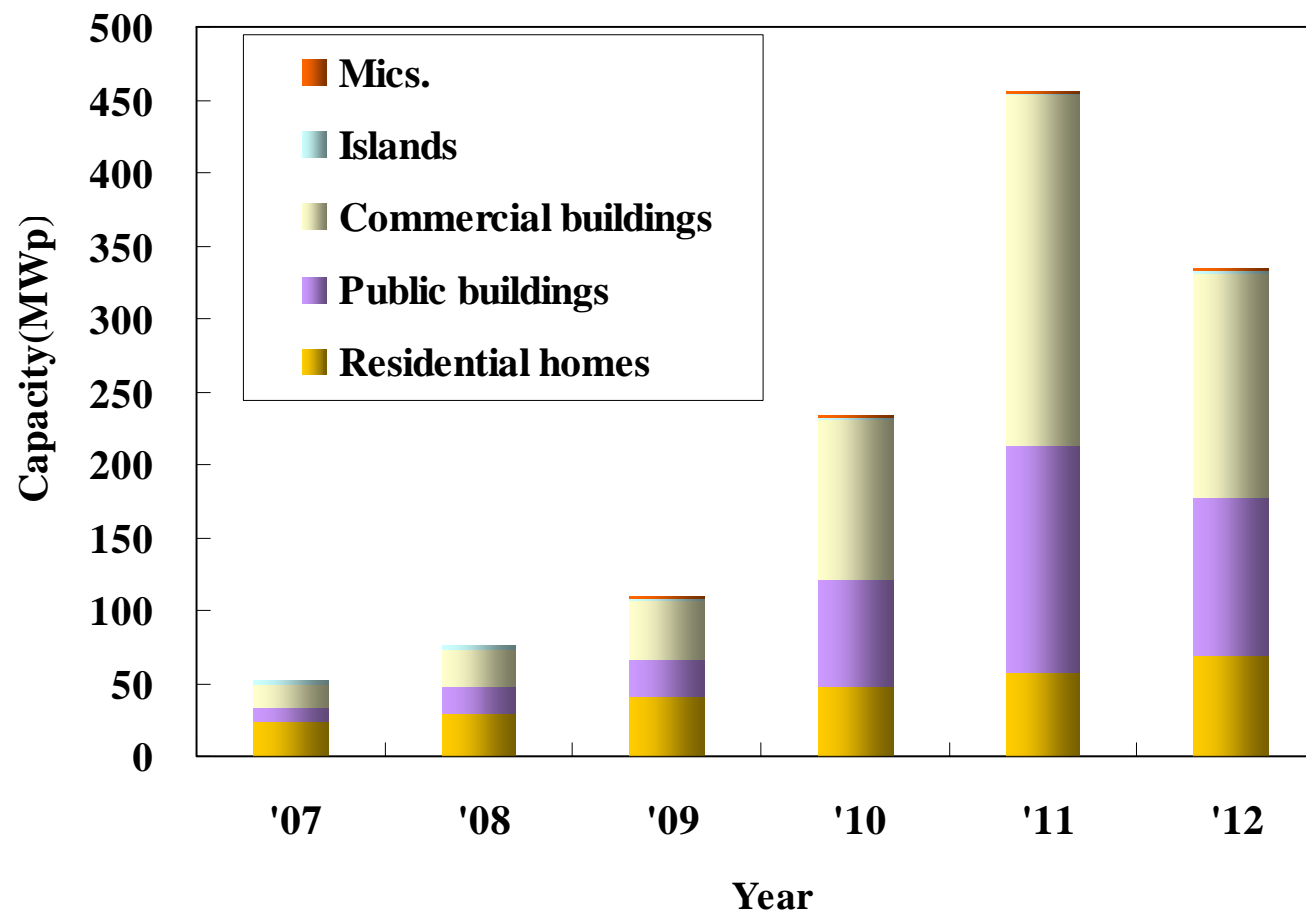
- **Loan**

- **Regional Energy Program**

- **Others**

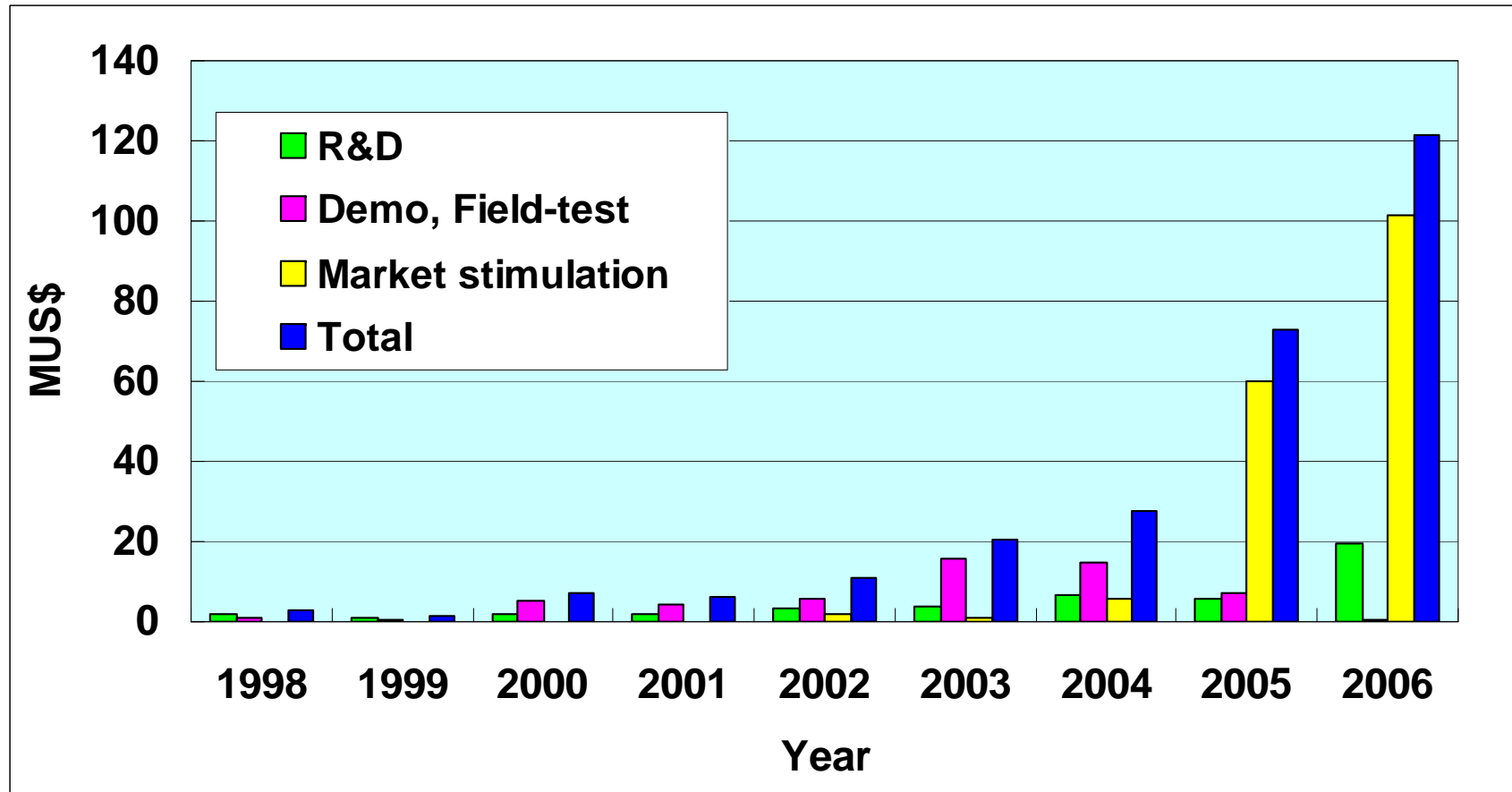
# Plan for PV Dissemination Toward 2012

- 2nd Basic Plan on NRES R&D and D, MOCIE (2003)
- 5 % share of NRES in 2011
- 1.3 GW PV until 2012





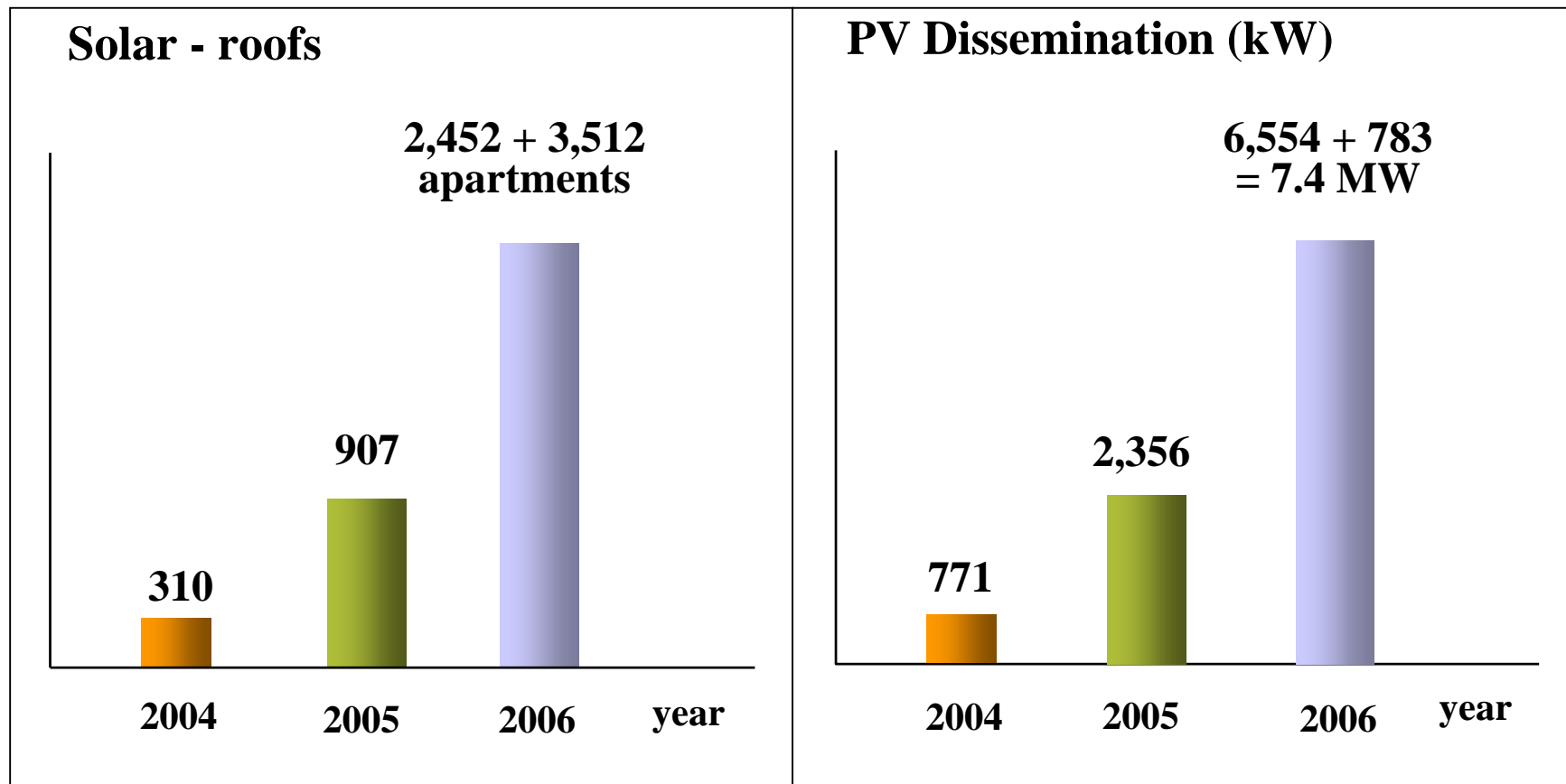
# Public Budget



Sharp increase in budget since 2004  
2007 : No further increase ?

# 100,000 Solar Roof Program

- **100,000 solar roofs by 2012 (10.5 MW until 2006)**
- **Government subsidy up to 70% in 2006 (60% from 2007)**
- **2007 : 8.8 MW for 8,000 households**
- **Survey in summer 2007 : 95.3 % satisfaction**



**Cheonan, Habitat, 2006**



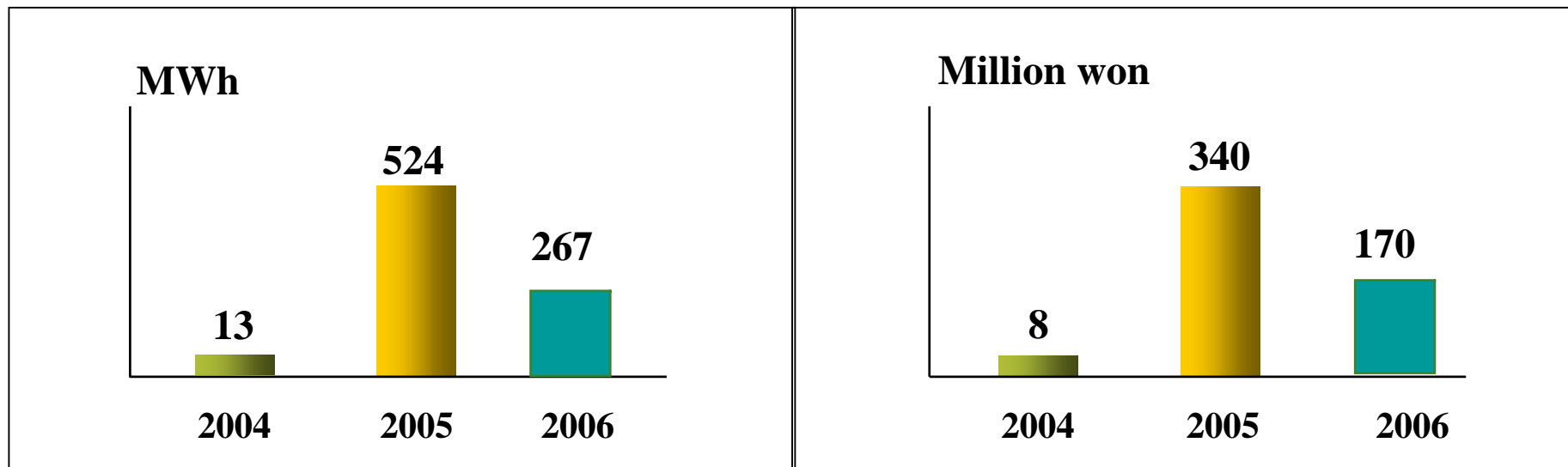
**Apartment Complex, Gimcheon, 2006**



# Feed-in-Tariff (FIT)

- **Government purchases PV electricity at special rates**
  - FIT rate good for 15 years
  - FIT rate changes periodically
  - Wind : 107.7, Hydro : 73.7, LFG : 61.8-65.2

Capacity	Class	Fixed Price (Won/kWh) [After Oct.11. 2006]	Previous Price	Reference
More 3kW	Over 30kW	677.38	716.40	Reduction rate 4% (after 3year)
	Under 30kW	711.25		

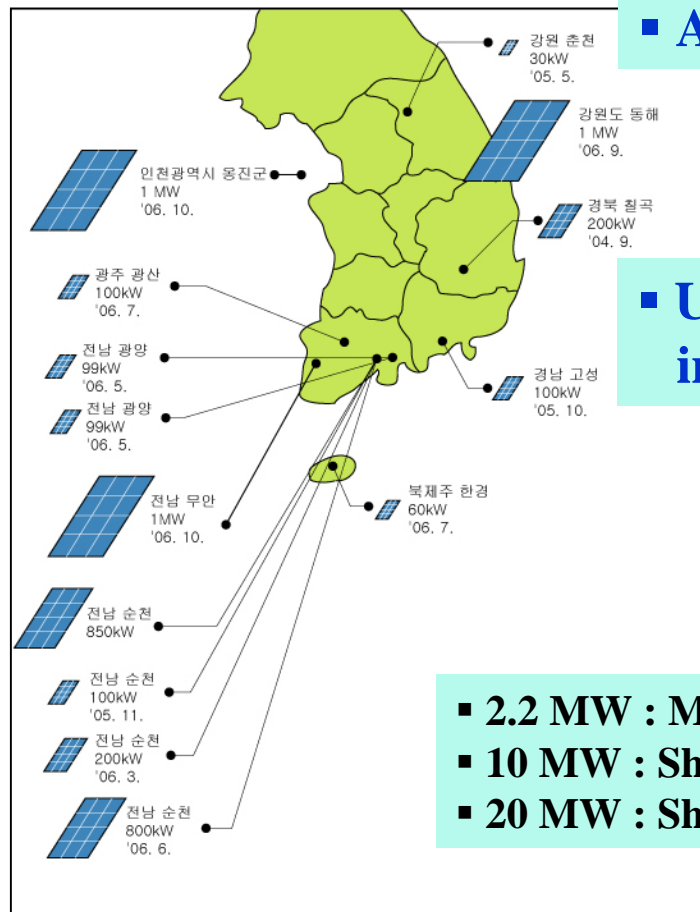


Exchange rate: 1000 Won ~ 1 US\$

# PV Power Plants

As of Sep. 2007 :

- 16 MW, 92 systems completed
- 287 MW, 546 systems in total are permitted for construction
- Current cap is 100 MW in the order of construction : cap increase ?



▪ Annual budget for 100 MW electricity : 70 B KRW

▪ Use of roof top of industry building for PV installation under consideration : potential > 1 GW

- 2.2 MW : MunKyung (LG CNS May '07) PowerLight
- 10 MW : ShinAhn (LG CNS Planning)
- 20 MW : ShinAhn (DongYang Construction) Sun Technics

**Gwangju, 1MW, 1 axis, 2006**



**Gohung, 1.5MW, 1 axis, 2006**



**1.5MWp(Sanyo 205W)  
Location:Go-Hung,Chun-Nam Prov.  
Inverter:Maei-den,Japan / Fronius  
Installed: 2005~ April 2006, single-tracker**

**Donghae Power Co., 1MW, 2006**



**Mungyeong, 2.2 MW, Apr. 2007**



# Public Building Program

- **For New public buildings over 3,000m<sup>2</sup> total floor area**
- **5 % of the total construction budget spent for NRE system**
- **Under consideration**
  - include existing buildings                      - floor area >1,000 m<sup>2</sup> ?
  - include schools and military buildings ?

## Loan

- **Low interest rate loans with 5 yr grace and 10 yr repayment period**
- **For manufacturing or purchase of NRE facilities**

# Regional Energy Program

- **Central government pays up to 60%**
- **Local government + beneficiary 40%**



# Environment-Friendly Innovation Cities

- **Daegu Solar City**
  - subsidy for NRES installation
- **Gwangju Solar City since 1993**
  - to invest about 200 MUS\$ by 2011 for NRES industry
- **Ulsan City**
  - PV systems for new public & administration building
  - Energy industry cluster
- **Seoul Metropolitan City**
  - 10 % share of NRES by 2020
  - 2.5 MW PV in 2008 in cooperation with power company

# Others

- **Tax Incentives**

**Income tax credit for 10 percent of the total investment in NRE projects**

- **RPA (Renewable Portfolio Agreement)**

**Agreement on NRE dissemination between energy utility companies and the Government**

**PV 12.4 MW is expected in 2007**

- **Certification**

**Certification program to guarantee the quality of NRE facilities for public acceptance of the technology**

- **NRE Specialty Company**

**Companies meeting certain criteria may participate in the dissemination program**

# PV Industry in Korea

( ) production in 2006

## ● Poly-Si , Ingot & Wafer

DCC, 3000t poly-Si by the end of 2007

KCC, 100t poly-Si production 2008

Woongjin Energy + Sunpower, 500t sc-Si ingot in 2007 (1,400 t in 2008)

LG Siltron, 10 MW sc-Si wafer in 2007

## ● c-Si Solar Cells, 37 MW

KPE, 35 MWp (18 MW, 30% for domestic) (5.34 MW in 2005)

Hyundai Heavy Industries, 30 MW (2007 under construction)

Millinet Solar, 30 MW (2007 under construction)

ShinSung ENG, 50 MW (2008)

LG Chemical, LG Electronics, Samsung (Planning)



## Thin Film Si Solar Cells, 20 MW

Korea Iron and Steel Co. 20 MW in 2008

# PV Industry in Korea

( ) production in 2006

- **Modules, 130 MW (95 MW in 2005) (17 MW) (6.4 MW in 2005)**
  - Sympony, 50 MW (6.5 MW)**
  - Hyundai Heavy Industries, 10 MW (4.5 MW), 110 MW by 2008**
  - S-Energy, 20MW (2.2 MW)**
  - Kyung Dong Solar, 20MW (2 MW)**
  - LS I&E, Solartech, Unison, Haesung Solar,**
- **PCS**
  - Hax Power, Hanyang Precision**
  - Hyundai Heavy Industries**
- **System Integration & Installation :**
  - LG CNS, Dongyang Eng. & Constr. Co**
  - S-Energy and 60+**

# PV Industry in Korea

**Module price : 4,400 KRW/W ('06) (4,600 KRW/W in 2005)**

**Inverter price : 530 KRW/W (600 KRW/W in 2005)**

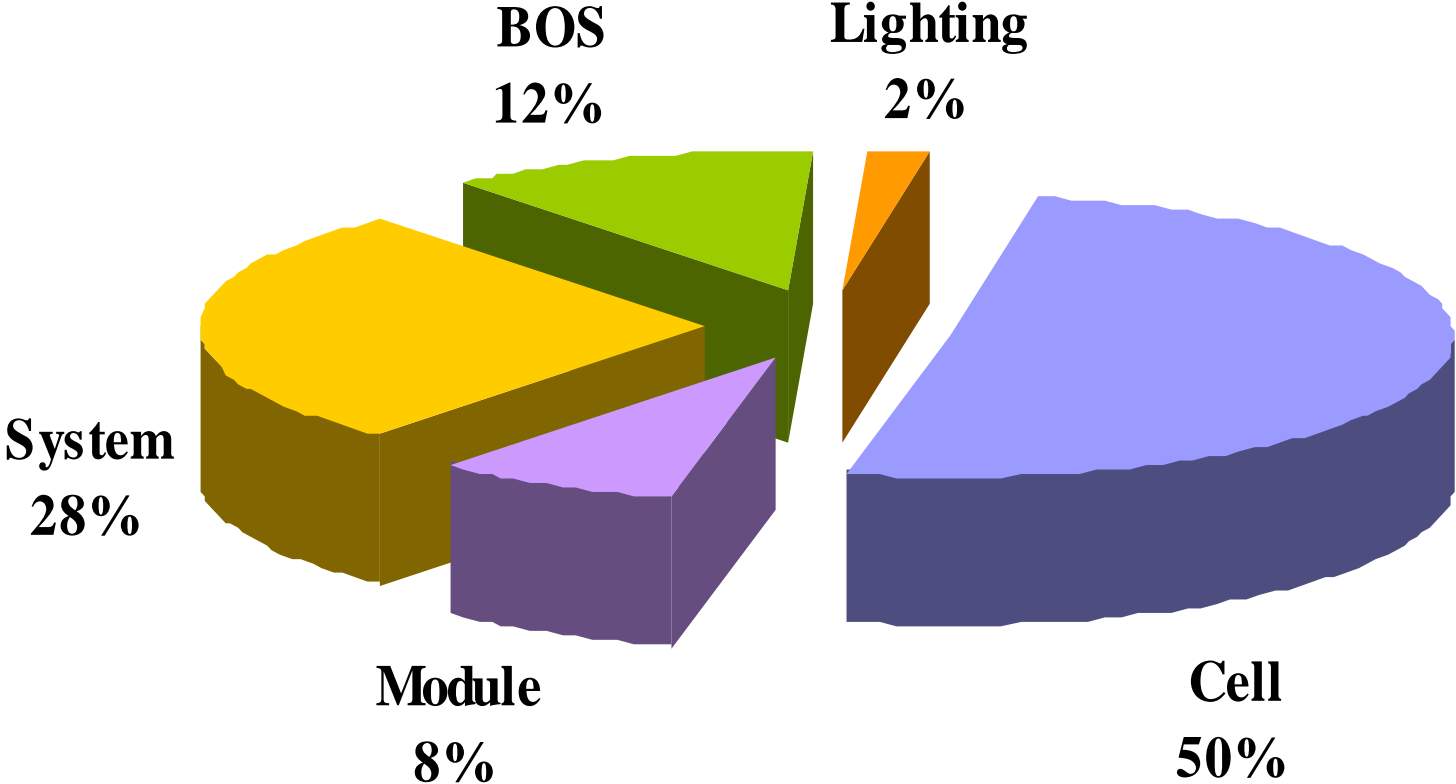
**Roof-top system price : 8,550 KRW/W ('06)**

**MW system price : 5,800 KRW/W ('06)**

**The value of PV business in 2006 : 140,9 billion KRW**

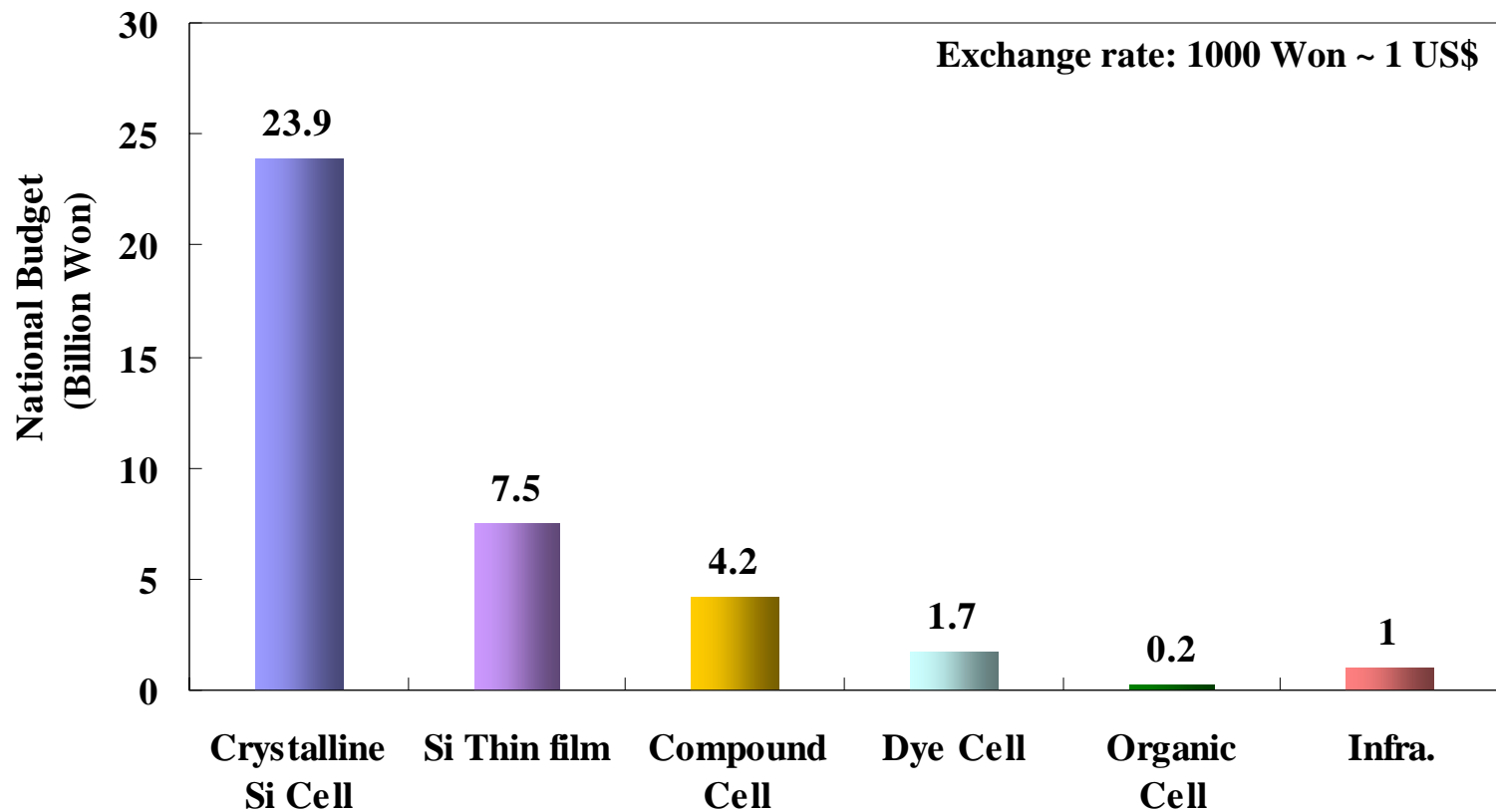
# PV R&D Program from 1988 to 2006

('89 ~'06, Total 101 projects)



# PV R&D Program from 1988 to 2006

## Solar Cell Program ( '89 ~ '06, Total 38.5 Billion Won)



Medium to large scale projects led by industry

## Summary

- **Korea has been significantly magnifying the PV budget for R&D and dissemination since 2004.**
- **Korea's PV industry is taking shape from the Si feedstock to BOS sector.**
- **3rd Basic Plan on NRES R&D and D in 2008, PV Roadmap 2030 under preparation by MOCIE**