# PV Market and Industry Development in China, Taiwan, South Korea and Malaysia

PV Industry Forum June 10-11, 2008

Munich, Germany

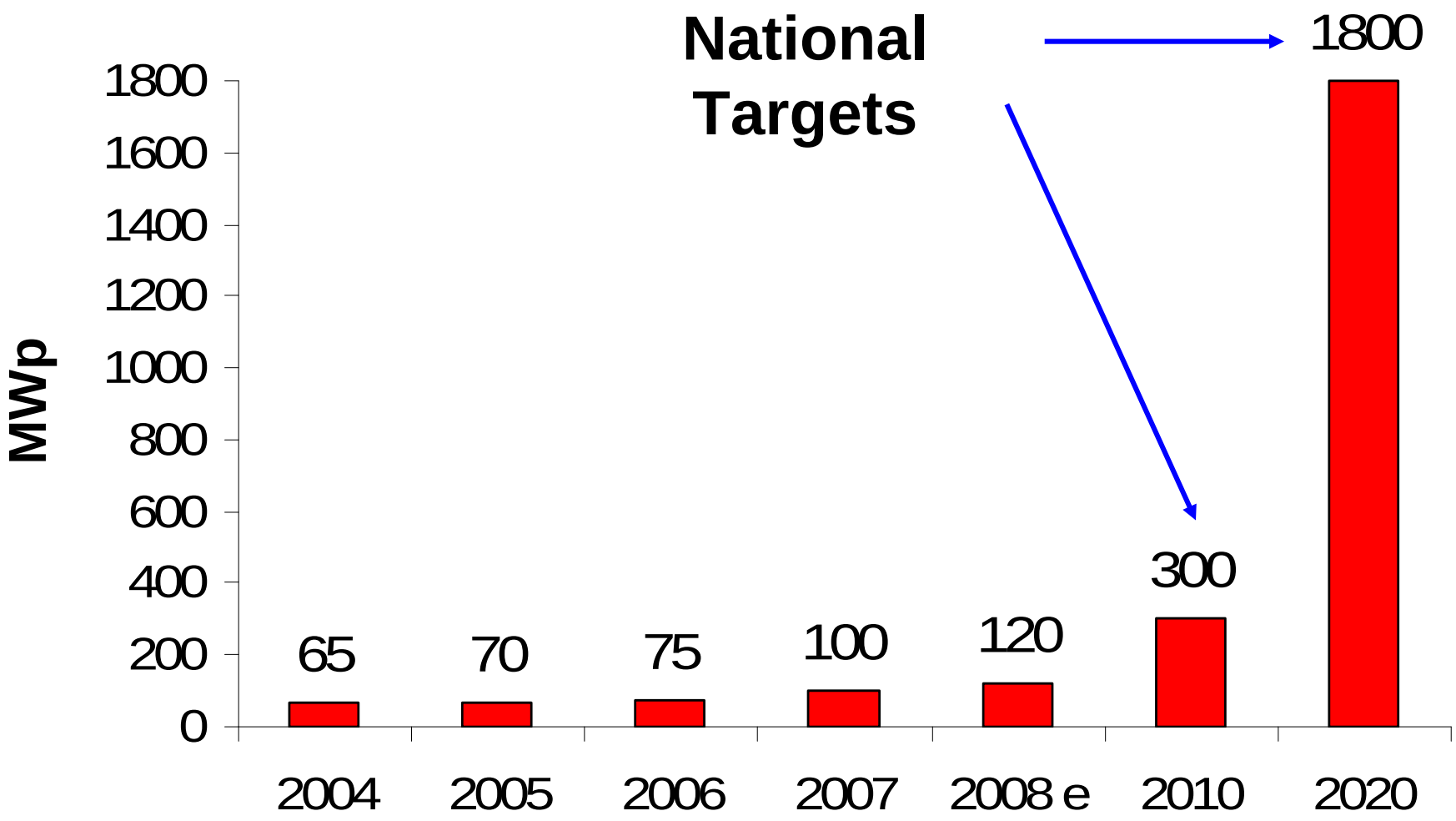
Frank Haugwitz

# China

## Political Framework Conditions

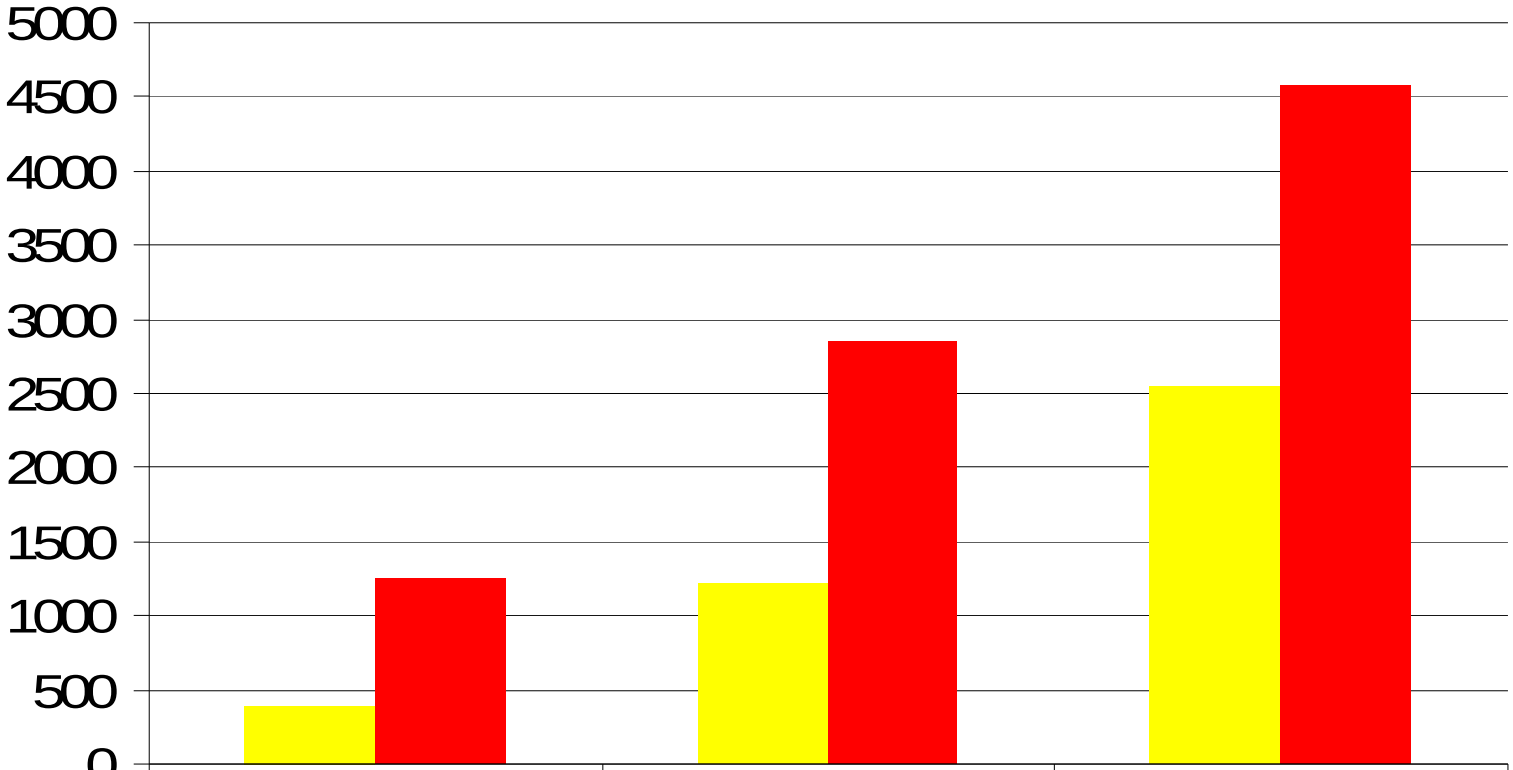
- Jan. 06 RE-Promotion Law came into effect
- PV is among the top priorities
- State Council established RE Development Fund
- Long-term Scientific & Technological Dev. Plan
- Sept. 07 Mid and Long-Term Targets announced

# Market Development (2004-2020)




Source: China PV Industry Association, own estimate

# Cell & Module Prod.-Capacity (2005-2007)

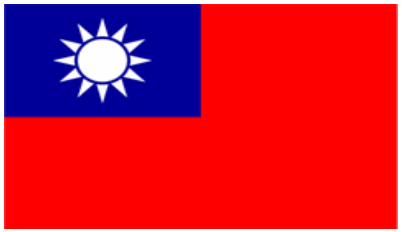



| | 2005 | 2006 | 2007 |
|---|---|---|---|
| Cells (MW) | 388 | 1221 | 2549 |
| Modules (MW) | 1250 | 2850 | 4580 |

Source: ENF, own figures

# Strengths vs. Weaknesses

| | |
|---|---|
| Unskilled labour 1 €/hrs | Limited skilled labour |
| Lower Costs for Construction, Lease Land, and Electricity | Lack of Quality Consciousness |
| Income Tax Holidays / VAT Refund | 80% of production technologies imported |
| OEM Manufacturer Ambitions | Lack of Transparency regarding Market Stakeholder |
| Willingness to constantly improve production process | Moderate govt. budget for R&D |
| Domestic prod. technologies could further reduce costs | Limited Poly-Silicon Production Expertise & Capacities |



# Taiwan

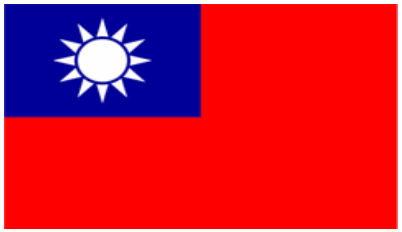
## Political Framework Conditions

- Natl. Plan 10% of electricity consumption from RE by 2010
- 2010: Natl. Target is 31 MWp
- Residential Investor Programme (50% subsidy)
- Renewable Energy Development Act (FiT) under discussion

## Status and Perspectives of Market Development

- 2007: 10 MWp, moderate annual growth rate
- 2015: 320 MWp, domestic HH Prog. under discussion
- By 2030 approx. 1/3 of population uses PV (4,5 GWp)

Source: PV Status Report 2007, JRC, Sun & Wind Energy, 4/2007



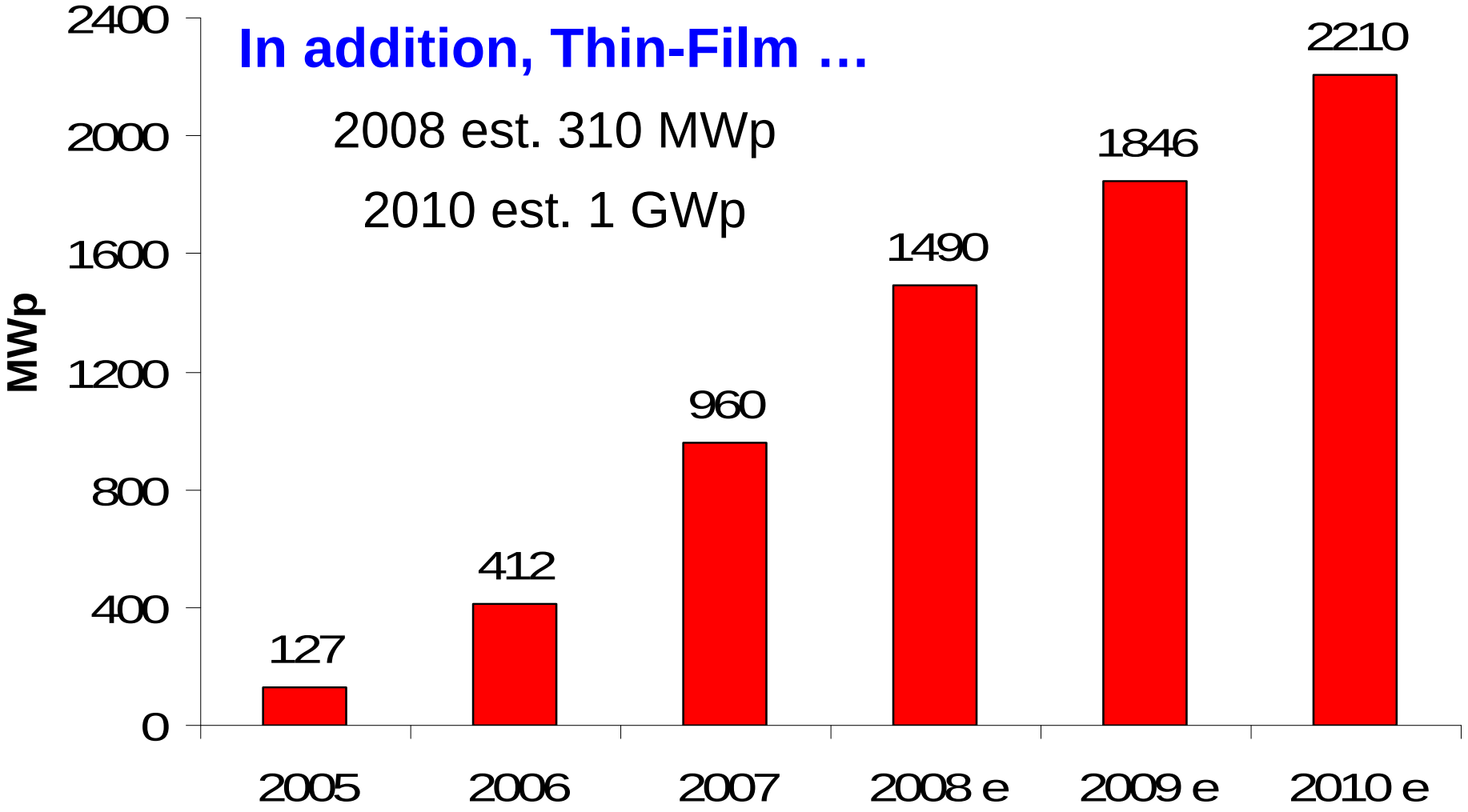
# Cell-Prod. Capacity (2005-2010)

INTEGRATION
umwelt & energie

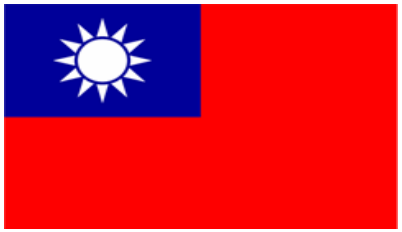
**In addition, Thin-Film …**

2008 est. 310 MWp

2010 est. 1 GWp




Sources: CLSA, Solarplaza, DigiTimes, own figures



# Industry Development

## Perspectives

- 2nd largest Semiconductor Industry (Flat panel, LED Display)
- Since 1997 est. € 550 Mio. invested (R&D, Industry)
- Annual Turnover est. € 3,2 Bill. by 2010
- Highly dependent on foreign poly-silicon supply
  ≈ 98% of wafers imported and 97% of cells exported
- Increasing Investment in Poly-Silicon Facilities (e.g. Taiwan Semiconductor (2009/5000 t/a), Big Sun, E-ton, Motech)
- Increasing Investment in China (Motech, Panjit, Wafer Works)

Source: TAITRA, ITRI, DigiTimes

# South-Korea

INTEGRATION
umwelt & energie

## Political Framework Conditions

- 2nd Basic Plan for RE (2003-2012) Budget ≈ € 6 Bill.
- 5 % share of NRES by 2011
- PV is one priority technology
- Natl. Target 1,3 GW PV by 2012 (4 GW by 2020)

## PV Incentive Prog. (Budget in 2007: US$ 210 Mio)

- 100,000 Solar Roof Program (19,7 MWp by 4Q07)
- Deployment Subsidy Program (8,9 MWp by 4Q07)
- Regional Deployment Program (10 MWp by 4Q07)
- Public Building Obligation Programme
- Feed-in-Tariff (FiT)

Source: Korea Institute of Energy Research

# Feed-in-Tariff Scheme

INTEGRATION
umwelt & energie

## Status as of Jan. 08

- Sys.-Size < 3 kW, 15 years, tariff every 3 yrs reduced by 4%
- 46 MWp installed / 567 MWp planned or under construction

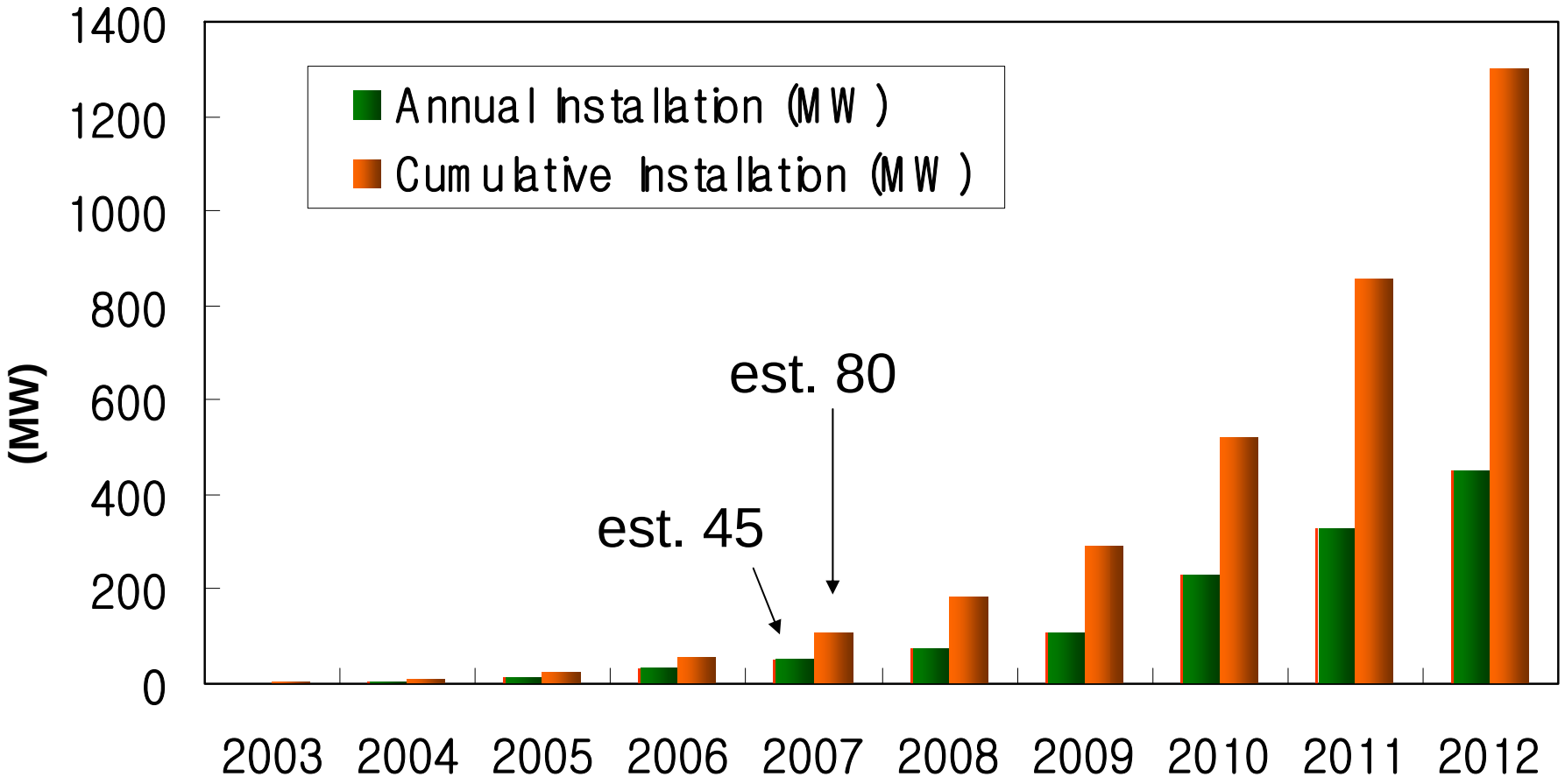
| System-Size | Tariff |
|---|---|
| < 30 kW | ≈48 €Cents/kWh / ≈75 $Cents/kWh |
| > 30 kW | ≈46 €Cents/kWh / ≈72 $Cents/kWh |

## Feed-in Tariff revised (1H08)

- Previous FiT cap (100 MW) was abolished
- After 100 MW, a new fixed price will be determined
- Proposal: Extended duration 20 years, 33 €Cents/kWh

Source: Korea Institute of Energy Research

# Market Development until 2012




**In 2012 est. turnover approx. € 1,5 Bill.**

**≈ 10% global market share (2007: ≈ 2%)**

Source: Korea Institute of Energy Research, Samsung Economic Research Institute

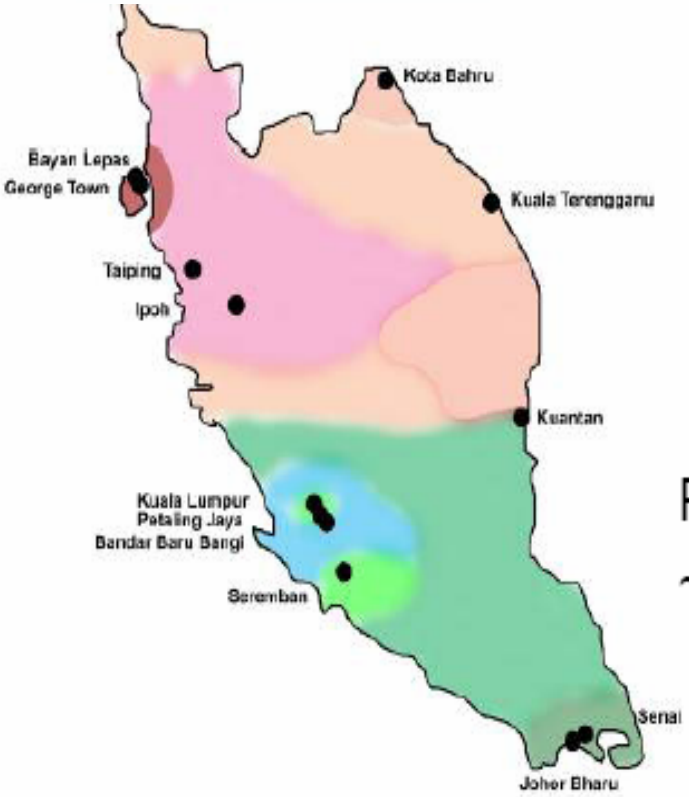
# Industry Development

## Perspectives

- Low Interest Loans (4,25%) for manufacturer & procurement of facilities (5 year grace period, 10 year repayment period) (till 2007: € 122 Mio / 25% of total disbursement)
- Jan. 08 Jeollanam-Do Province regional cluster dev. plan
- New Domestic Market Players e.g. LG, Samsung, Hyundai
- Increased foreign engagement as Manufacturer & Developer
- Nov. 2007 – 8% import duty on modules (market protection?)

Source: Korea Institute of Energy Research, Ministry of Commerce, Industry and Energy

# Malaysia

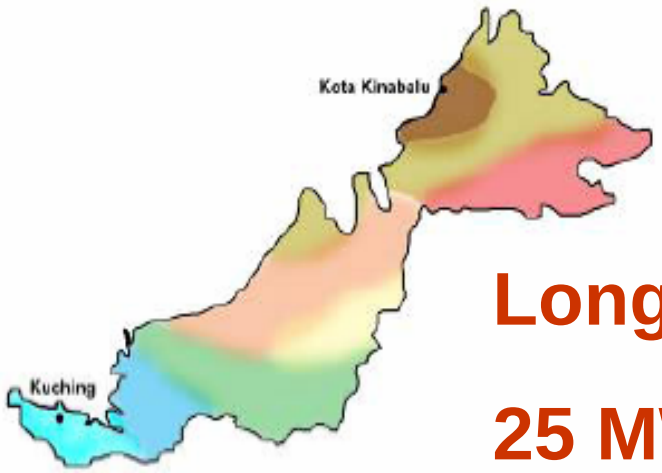



**Irradiance (Yearly average value - global)**

| | |
|---|---|
| Kuching | 1470 kWh/m2 |
| Bandar Baru Bangi | 1487 |
| Kuala Lumpur | 1571 |
| Petaling Jaya | 1571 |
| Seremban | 1572 |
| Kuantan | 1601 |
| Johor Bharu | 1625 |
| Senai | 1629 |
| Kota Bahru | 1705 |
| Kuala Terengganu | 1714 |
| Ipoh | 1739 |
| Taiping | 1758 |
| Georg Town | 1785 |
| Bayan Lebas | 1809 |
| Kota Kinabalu | 1900 |

Potential for Malaysia = 7.5 GWp resulting in

~ 9 TWh per year ~ 15% of electricity consumption


**Long-Term Target**

**25 MW by 2020 !**

Source: PTM, Envision

# Market Development

INTEGRATION
umwelt & energie

## Off-Grid

- Since 1996 various Rural Electrification Programme
- 100% Natl. Electrification by 2020 (today $\approx$ 82%)
- At present: Off-Grid installed capacity 1-1,5 MWp/a
- At the end of 2007: $\approx$ 5 MWp installed off-grid PV

Source: Envision

# National BIPV Programme

INTEGRATION
umwelt & energie

## MBIPV 2005 – 2010

Objective: Reduce GHG by reducing long-term cost of BIPV

Project Cost: ≈ US$ 25 Mio

**Component 1:** BIPV Information Services, Awareness & Capacity Building

**Component 2:** BIPV Market Development & Infrastructure Development

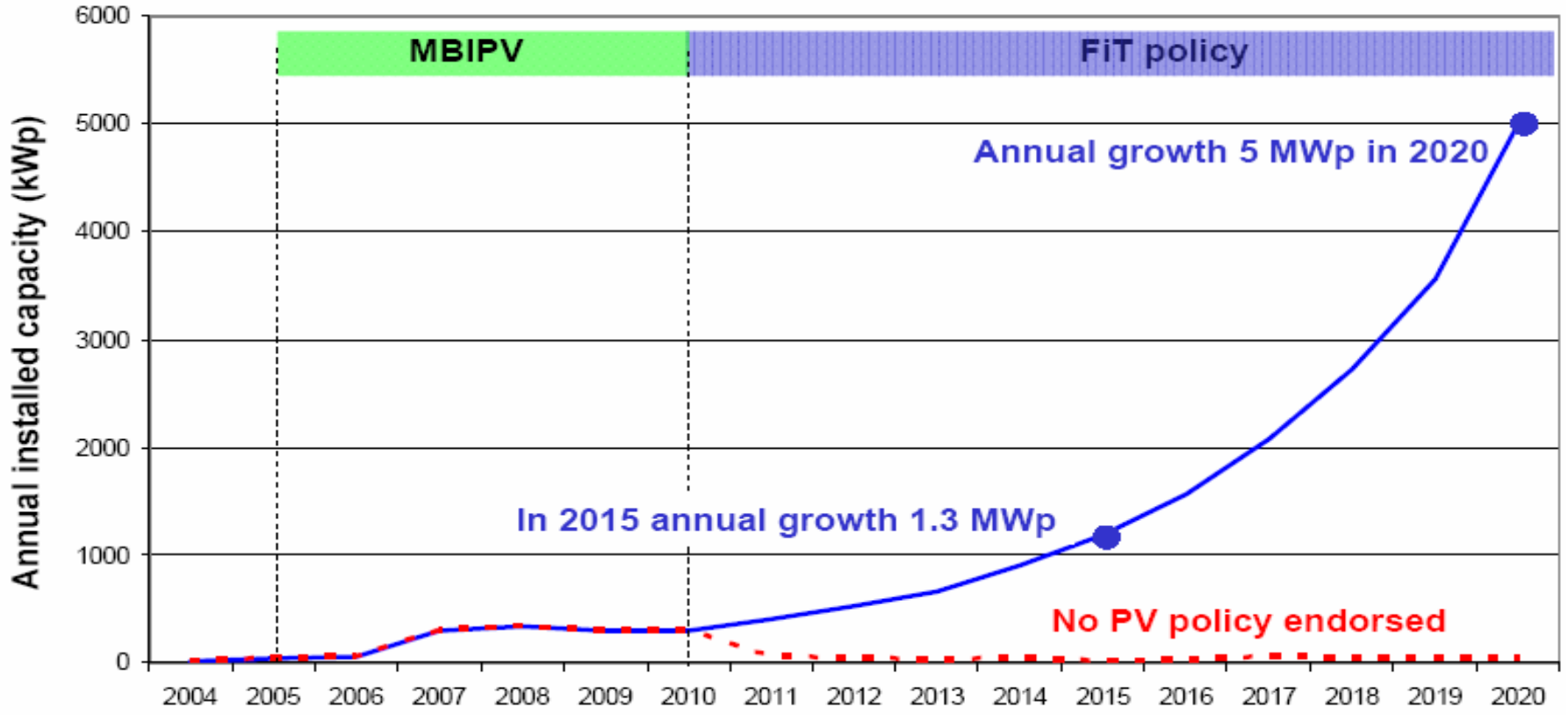
**Component 3:** BIPV Policies & Financing Mechanism Programme

**Component 4:** Industry & Enhancement Programme

**Post MBIPV:** Widespread & Sustainable PV Applications, Natl. BIPV with 30% annual growth rate !

Source: PTM, Envision

# On-Grid PV Development




**2007: 790 kWp installed !**

**FiT Proposal for after 2010: 21 yrs, 42 €Cents/kWh**

Source: PTM, Envision

# Local Manufacturing

INTEGRATION
umwelt & energie

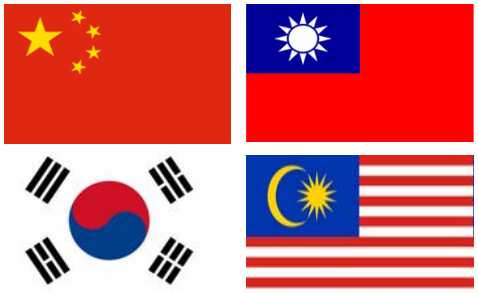
## Attractive Investment Climate

- 5 years of income tax holiday
- Low Cost Land, competitive electricity tariff of (US$ 4-6 Cents/kWh) for industry
- High political stability, IPR are protected
- Several High-Tech Parks with excellent infrastructure
- Qualified local employees, English widely spoken
- Proximity to Asian Markets

First Solar. Q.CELLS SUNPOWER

Invest ≈ € 2 Bill. in
≈ 2 GWp Prod.-Cap.

Source: PTM, Envision



# Summary & Outlook

## Political Framework Conditions

- Targets, Programmes & Investments confirms the political commitment to promote the utilization of PV

## Industrial Development

- Future Global Centre of Production (incl. Japan/India)
- By 2010 half of the global Thin-Film Modules from Asia
- Entire value chain in South-Korea and Taiwan soon too; future domestic silicon supply will further enhance cost-competitiveness

## Market Development

- In the near future moderate market demand expected
- All will depend on EU / US Markets in the foreseeable future

# Thank you for your attention !

## Contact

**Frank Haugwitz**
EU Renewable Energy Manager
EU-China Energy & Environment Programme
China Address:
B-1909, Jia. No. 11, Muxidibeili
Xicheng District, Guohong Hotel
100038 Beijing
Tel.: +86 10 6390 8988 Ext. 211
Mobile: +86 10 13901133214
E-Mail: fhaugwitz@integration.org
E-Mail: Frank.Haugwitz@gmail.com
URL: China Renewable Energy Information
URL: www.frankhaugwitz.info

**INTEGRATION**
Umwelt & Energie GmbH
Bahnhofstrasse 9
91322 Gräfenberg / GERMANY
Tel.: +49 (0)9192 9959-0
Fax: +49 (0)9192 995910
www.integration.org