





LET SUNSHINE POWER THE SUNSHINE STATE



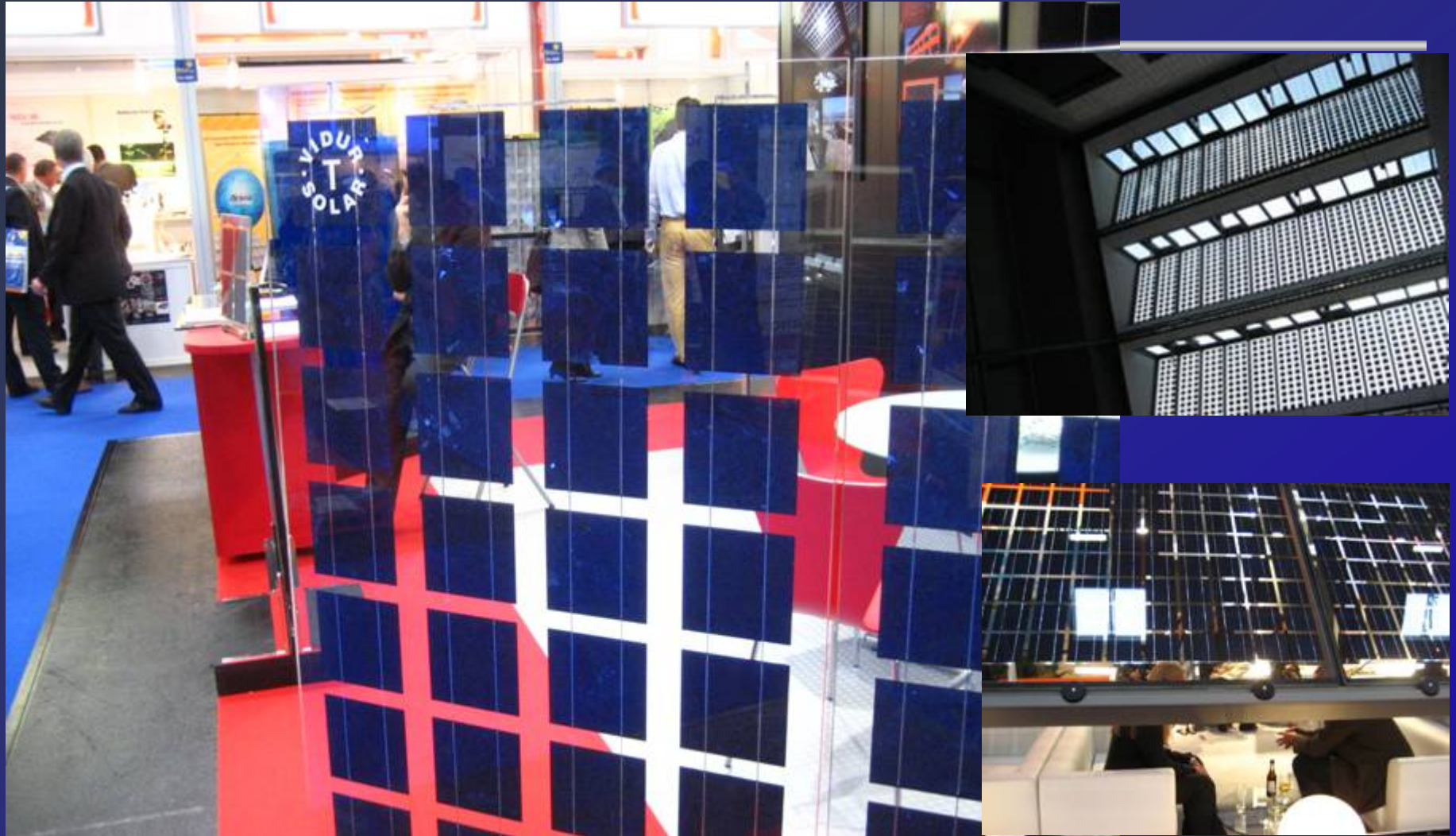
# Solar Factory



# Large Roof PV System



# Facades and Skylights



# Solar Shingles and Systems for Tile Roofs



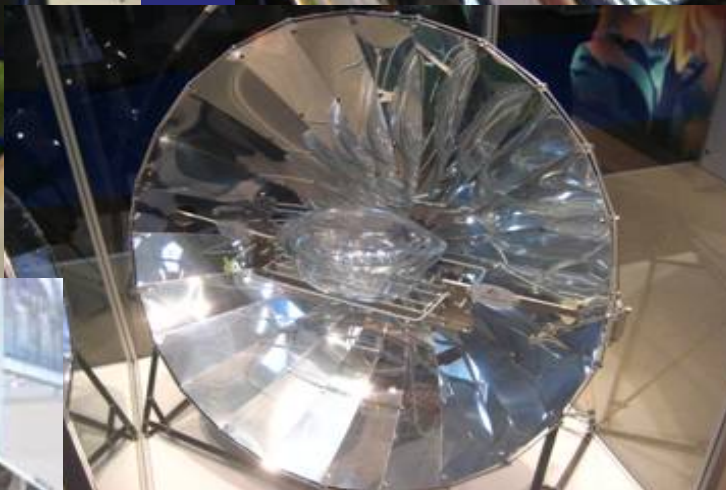
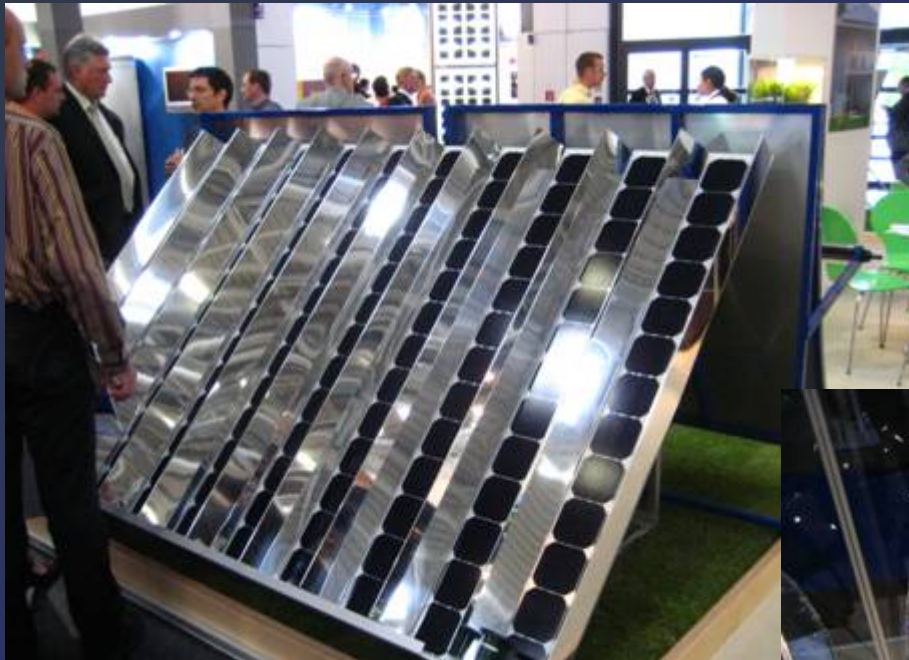
# Examples of BIPV Installations



# Notice The Bicycle Sheds!



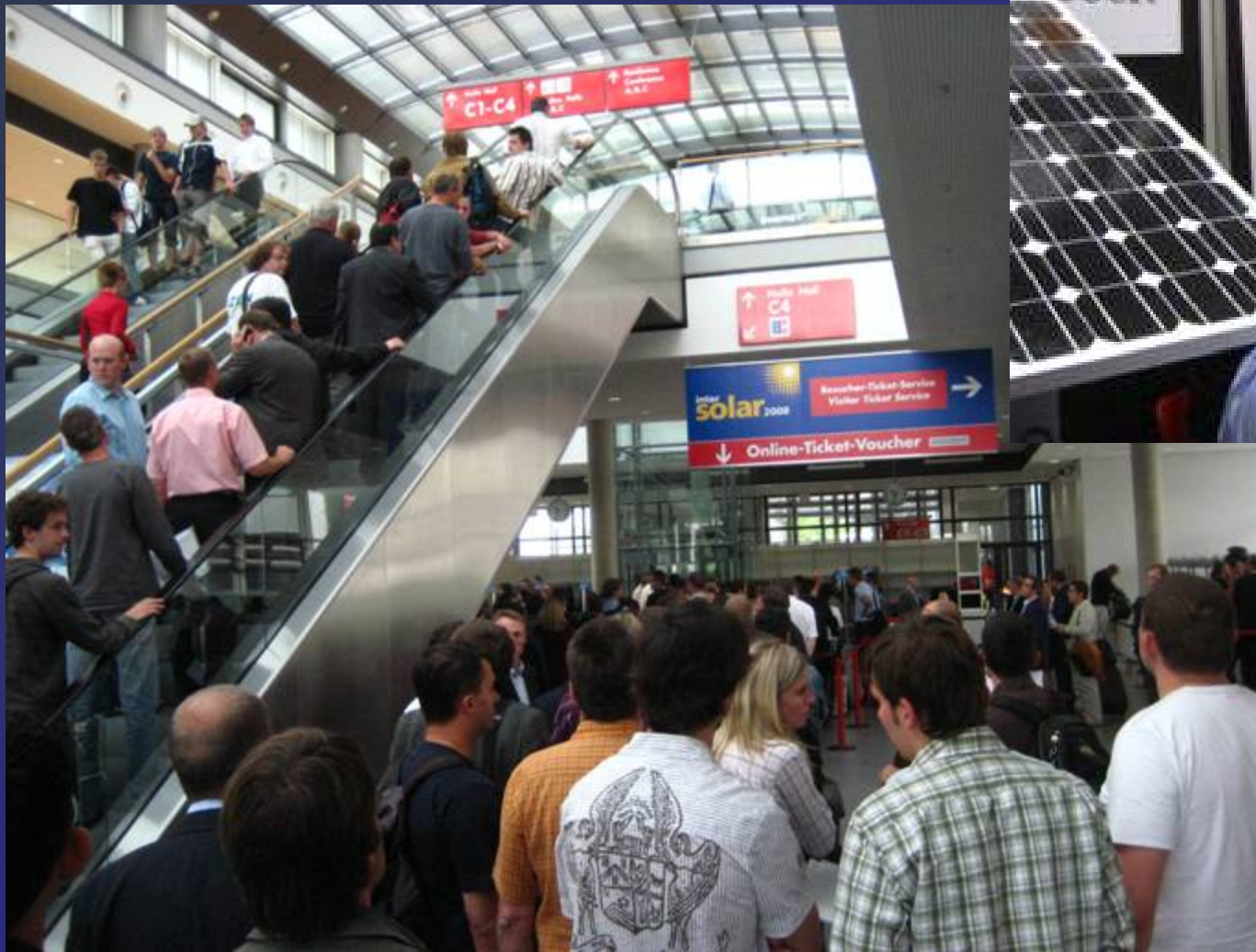
# Concentrator Systems



# New Forms and Ideas

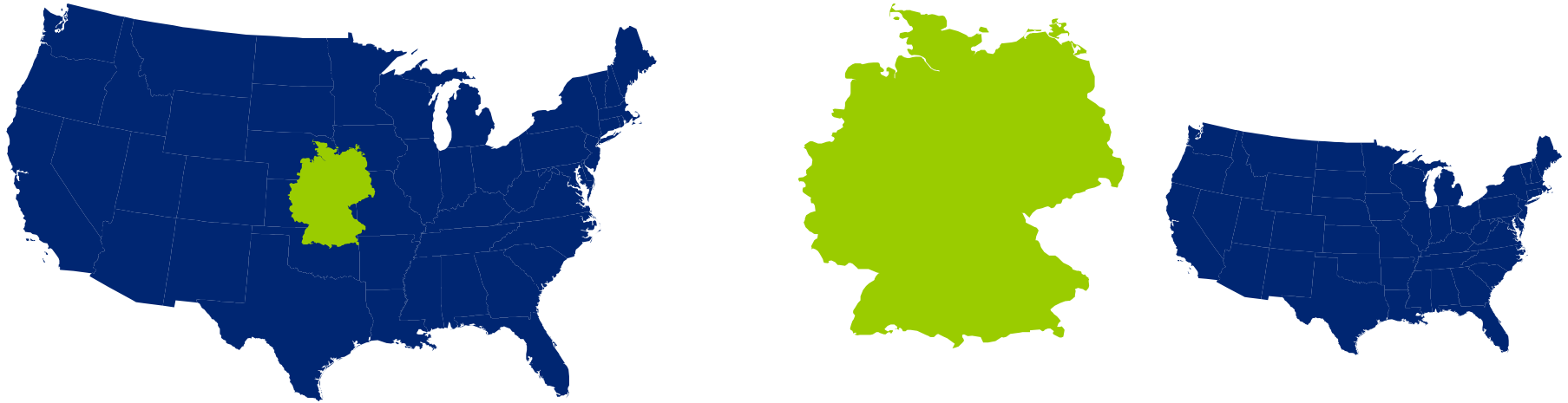


# Jobs and Opportunity



# Renewables - US Is Left in the Dust...

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Landmass vs. Wind energy (MW) in Germany and Continental United States (2007)

|          | <u>Area</u>               |           | <u>Installed Capacity</u> |
|----------|---------------------------|-----------|---------------------------|
| Germany: | 357,030 km <sup>2</sup>   | Germany*: | 22,247 MW                 |
| US*:     | 8,154,157 km <sup>2</sup> | US:       | 16,818 MW                 |

\*23 times larger, without Alaska

\*1.3 times larger

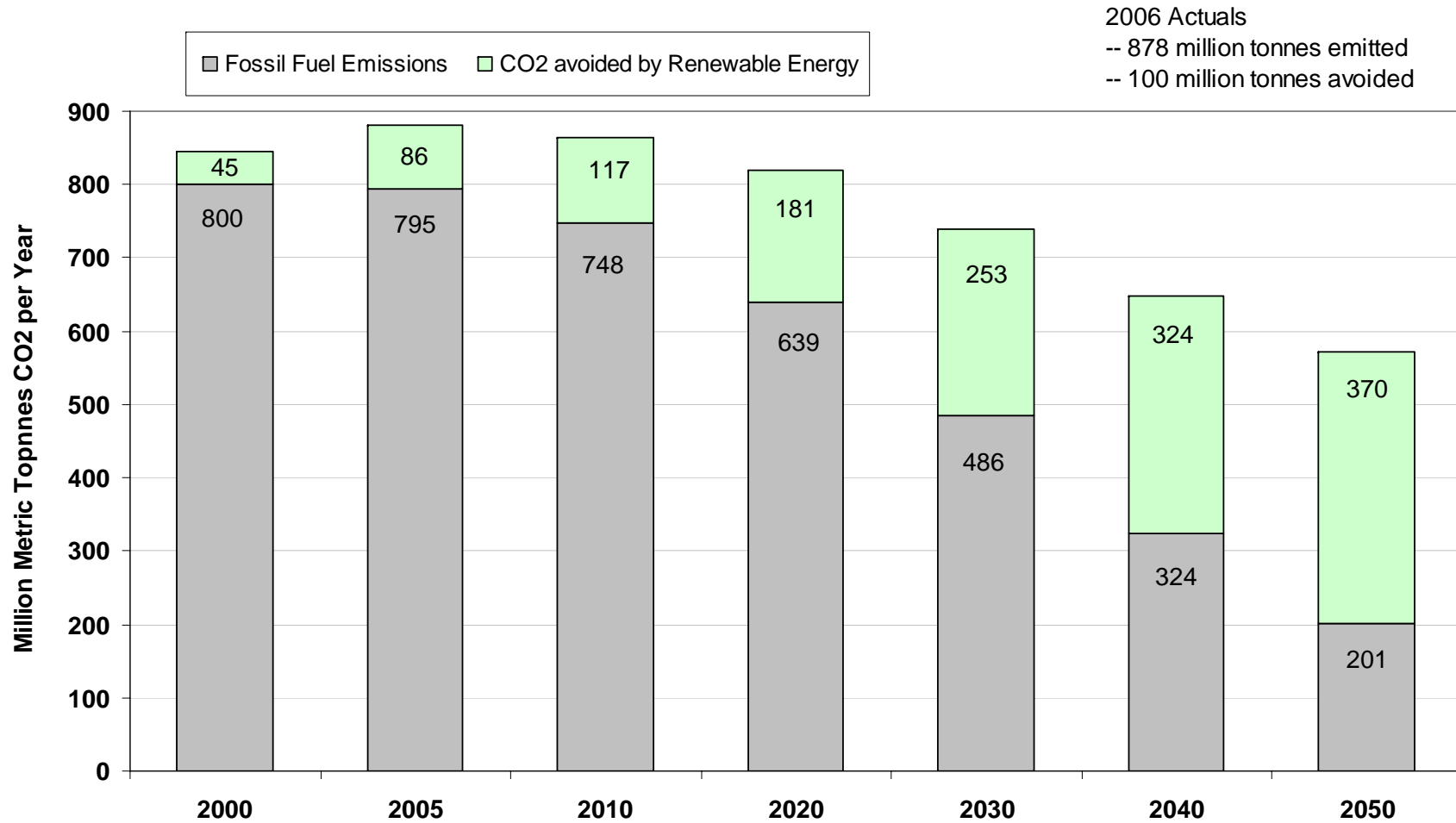
# Renewables – Why Bother?

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- ◆ **Energy Security - Pickens/Woolsey**
  - Reduce dependency
  - Russia/Ukraine, Gazprom, Chavez, Iran
  - Grid security
- ◆ **Wealth Creation - Jobs – Friedman**
  - Higher local ownership; beneficial impact on local economy
  - Germany employs 250,000 – forecasting 500,000; “Export Machine”
  - Germany – 2006 - Net benefit \$9BN per annum
- ◆ **Environmental Benefits - Gore**
  - Hydro, wind, solar minimal CO2

# GERMANY'S CO<sub>2</sub> EMISSION TARGETS

(Set by European Union)



SOURCE: German Federal Ministry for the Environment, Nature Conservation, and Nuclear Safety

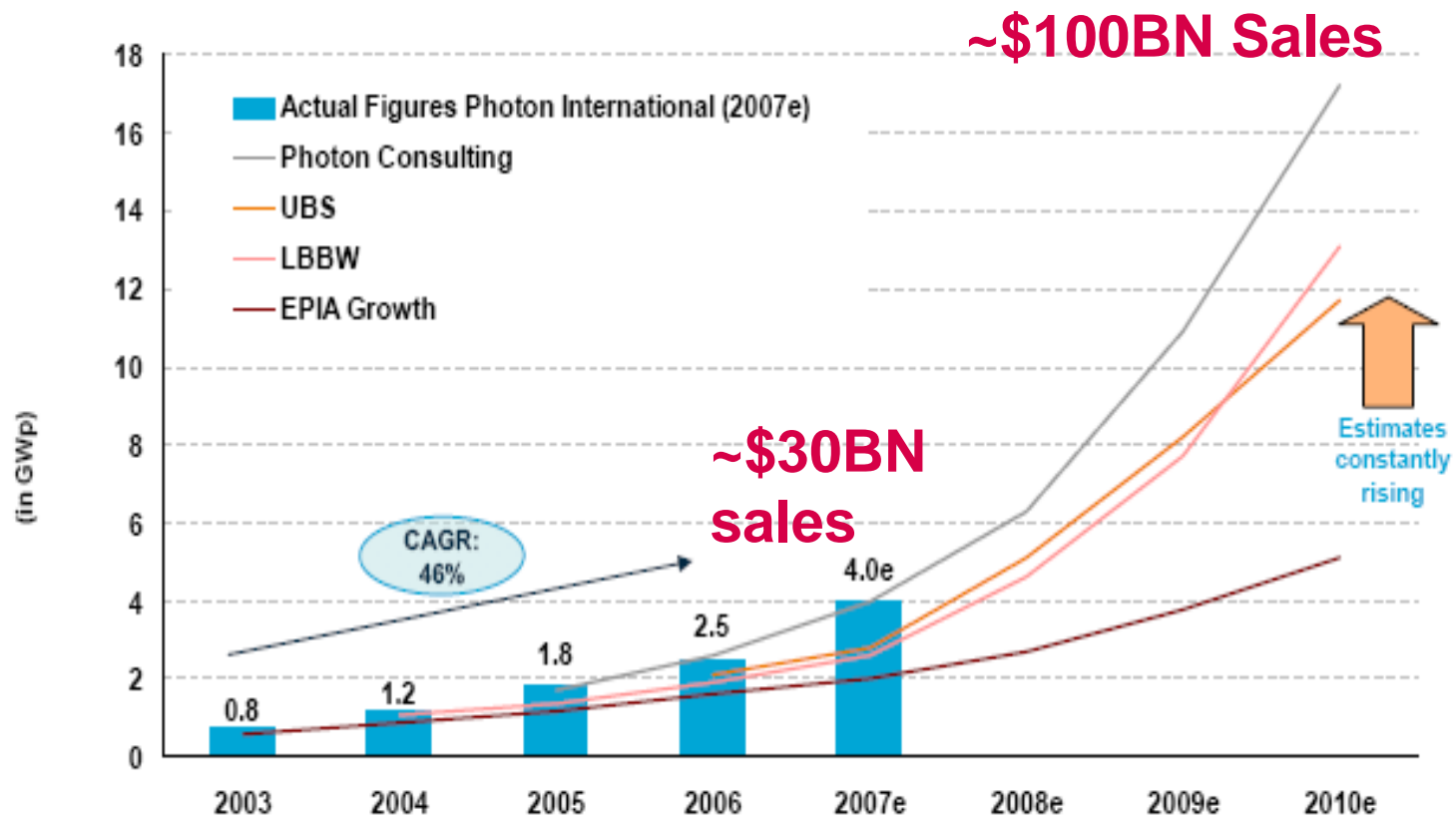
## **Business Perspective – The Opportunity**

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- ◆ VC investment in clean energy - \$117 BN + 35% 2007 (NEF)
- ◆ Solar is a \$ 30 billion industry – \$120BN sales by 2011 - 50% CAGR
  - ~\$100BN stock market valuation for solar
- ◆ US solar producers largely for export; overseas cannot get enough
- ◆ US / Florida solar initiatives deeply flawed; deterring investment
- ◆ RPS unattainable under BAS (Ask CA Energy Commission)
- ◆ Florida is missing massive solar investment opportunity:
  - \$5BN sales - export industry
  - Employing 25-50,000 people; Construction/Manufacturing, High tech R&D

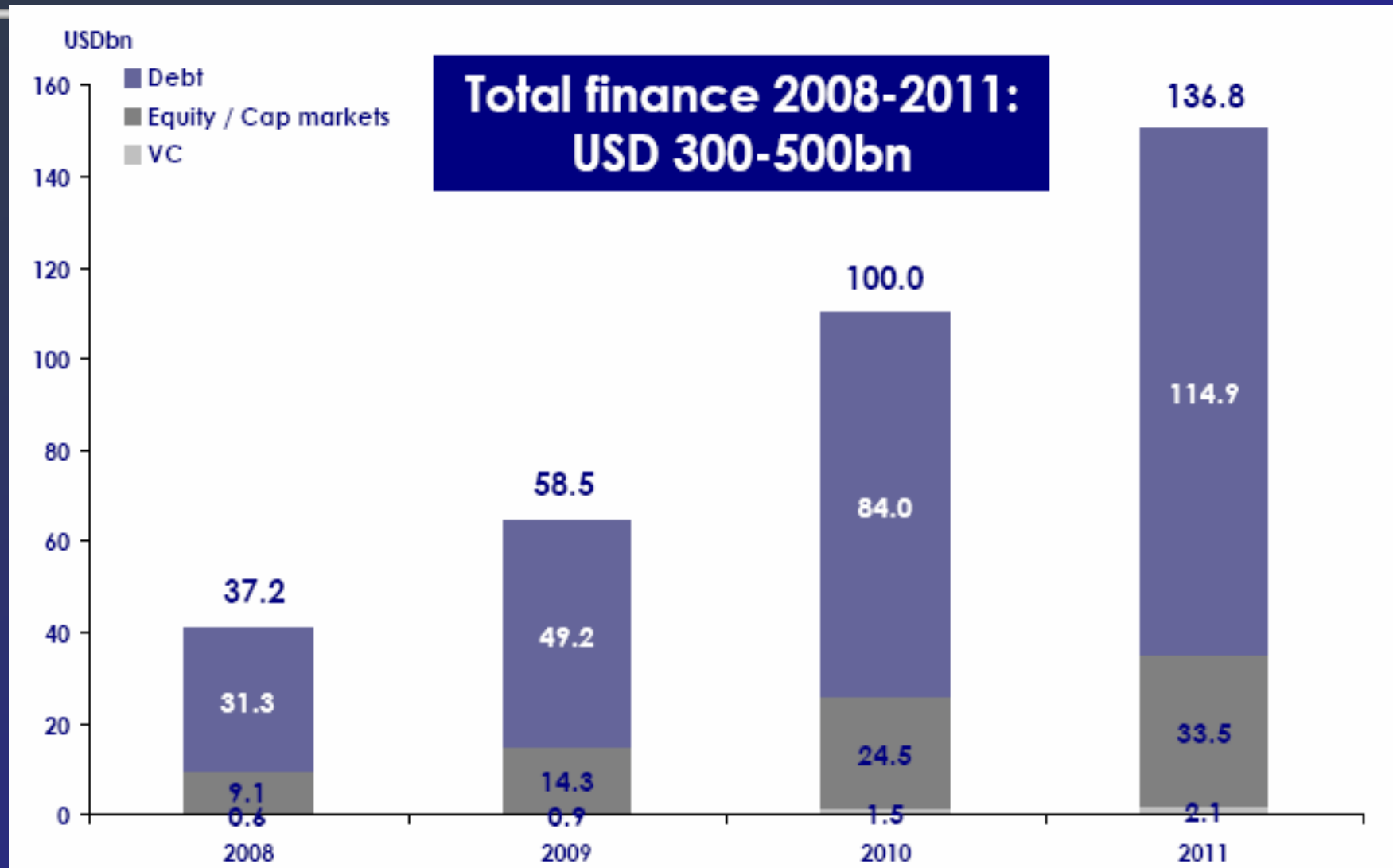
**Florida has < 2MW of solar. Germany will install ~1.5 Gigawatts/2008 \$8BN – 75% CAGR**

# Strong Global Solar PV Market Growth



Favourable development with expected growth rates of 30% p. a. and higher

# PV Financing Requirements: Who Lends?



Source: Good Energies

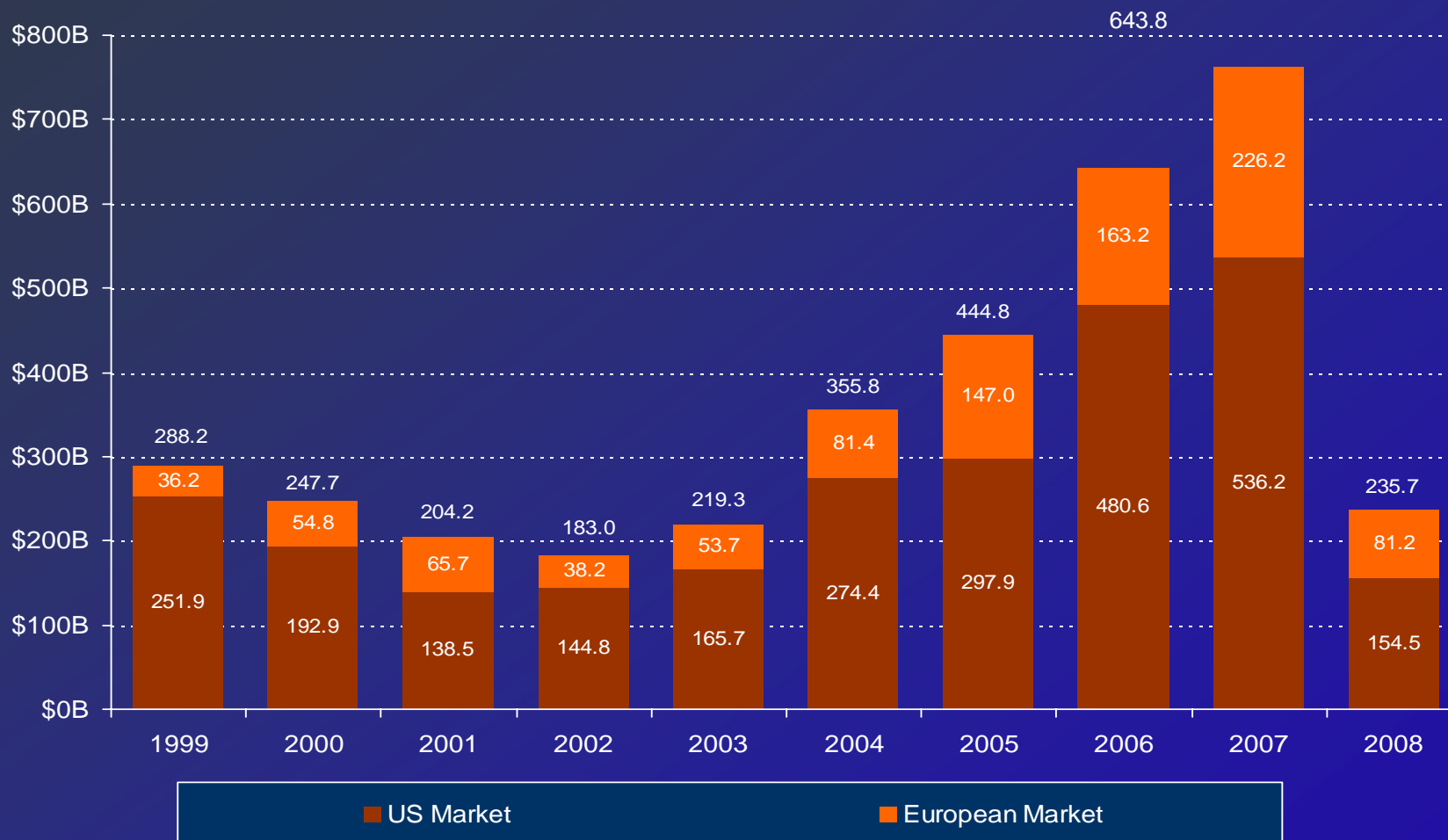
# Downward Spiral

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- ◆ Global financial meltdown
- ◆ Less tax capacity & capital available by institutional investors
  - Federal Tax credits become “worthless”
  - Equity supply dries up; returns increase
- ◆ Fewer renewable energy projects
  - ~3,000 MW less wind farms installed in US in '09 vs. '08
- ◆ Loss of ~38,000\* “green collar” jobs

# Senior Loan Volume

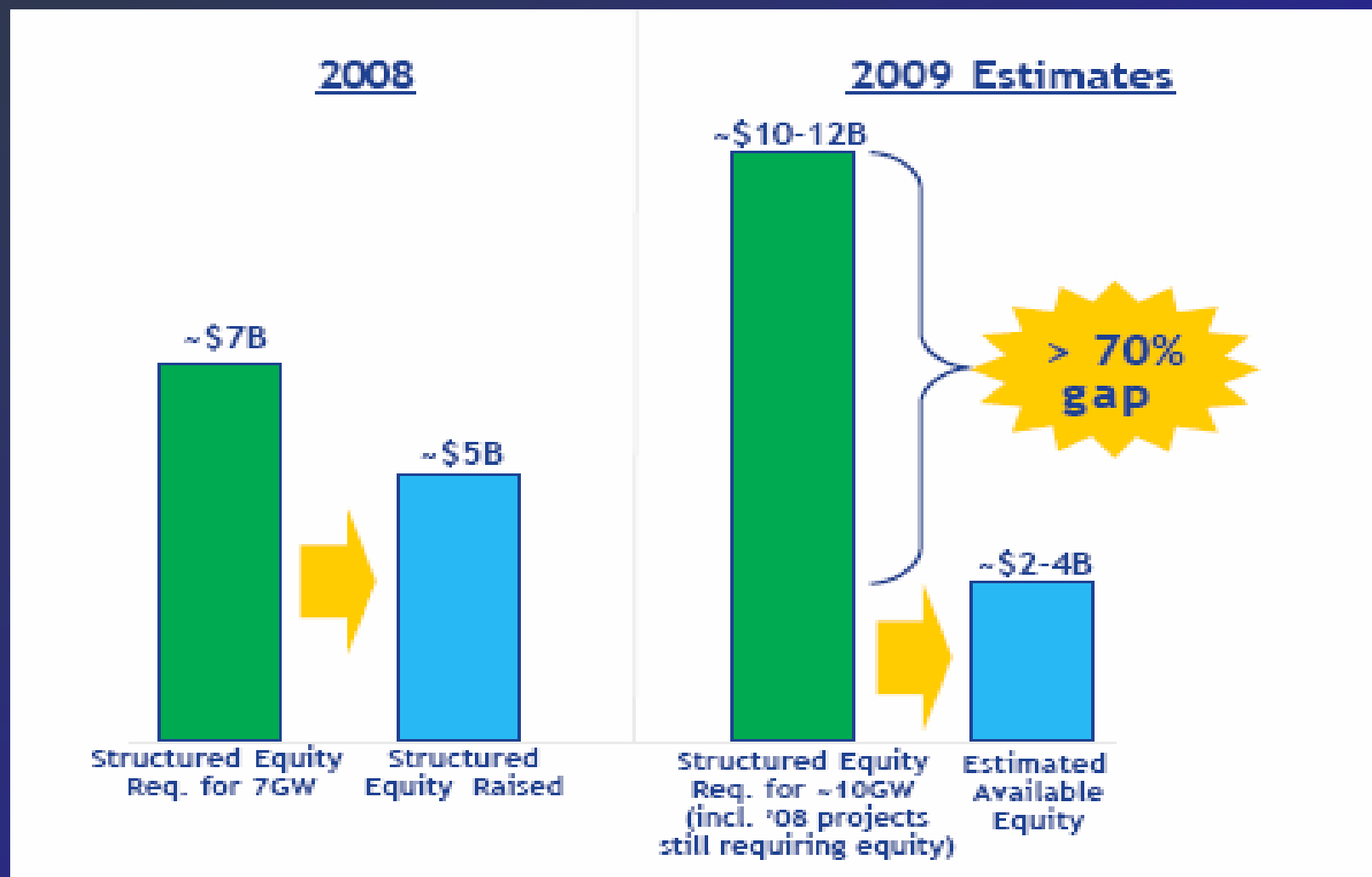
762.4



This chart reflects the estimated primary volume to the US and European loan markets. The US Market includes tranches denominated in non-USD currencies as well as US dollars. The European Market includes tranches denominated in non-Euro or Sterling currencies as well as Euros and Sterling. Exchange rates from non-USD currencies are based upon date of launch of the individual transactions.

Source: S&P

# Shortfall in Tax Equity



Source – GE Energy Financial Services

# Solutions

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- ◆ Modify Federal ITC
  - Refundable
- ◆ RE Performance Based Incentives
  - Feed In Tariffs
  - Quotas – tradable RECs

# Regulatory Regimes – High Risk

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## ◆ ROCs (UK)

## ◆ RPS / RECs / SRECs (US)

- Price risk for electricity
- Price risk for the ROCs / RECs (usually)
- Lending restricted to duration of RPS obligation and stability of regime
- Price & volume risk reduces maturities; reduces leverage and increases price

# Regulatory Regimes – Low Risk

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- ◆ Feed-in Tariffs
  - No price risk
  - No volume risk
  - Limited or no regulatory risk once project is built
  - Counterparty risk is utility/sovereign
  
- ◆ Attracts more capital on better terms

# Post Banking Crisis...*creates new uncertainty*

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| (end 2007)                  | Feed-in               | RECs / RPS            | PTC              |
|-----------------------------|-----------------------|-----------------------|------------------|
| Leverage (debt, %)          | >90%<br>70-80%        | 60-80%<br>50-70%      | 75%<br>???       |
| Maturity (after completion) | 15-18y<br>13-15y      | 3-15y<br>Mini-perms   | 12y<br>???       |
| Margins                     | 60-100pb<br>170-200bp | 90-120pb<br>200-250bp | 100-125pb<br>??? |

**Capital will flow to least risk regulatory mechanism**

# What are Feed in Tariffs ?

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# Renewable Energy Dividends

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- ◆ Simple, transparent – available to all
- ◆ Priority access to the grid for all renewable producers
- ◆ Long term standard offer contracts; fixed price guaranteed
  - 20 years
- ◆ Cost + reasonable profit (tba by PSC)
  - Price Differentiation by size, technology
- ◆ Price degression
  - Germany 9-10% fall
  - Spain 30%



# Renewables - Issues ► Solution

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- ◆ Utilities finance fossil fuel under 20 yr rate base
  - Guaranteed – cost pass through
- ◆ Renewables require same treatment; private sector will finance
- ◆ **Solution:**
  - Covers all renewables; solar likely to be most productive
  - RE priority access to grid, 20 yr contracts, differentiated pricing,
  - **We need every school, church, farmer, household and real estate developer to become entrepreneurs & sell back power & so drive us to a more secure clean electricity future**
- ◆ FACT – happening now throughout Europe; growing in US
- ◆ Florida Legislature should prioritize immediately

# REP Policies

- ◆ Deliver More Capacity--
  - --More Quickly
  - --More Equitably
- ◆ By Enabling Participation
  - --Everyone
- ◆ 18 EU Countries use Electricity Feed Laws
  - 46 Countries world wide
  - 2008 additions: UK, Switzerland, Ukraine, India
  - US – Hawaii, OR, CA, IL, MI, MN, RI, LADWP, City of Gainesville

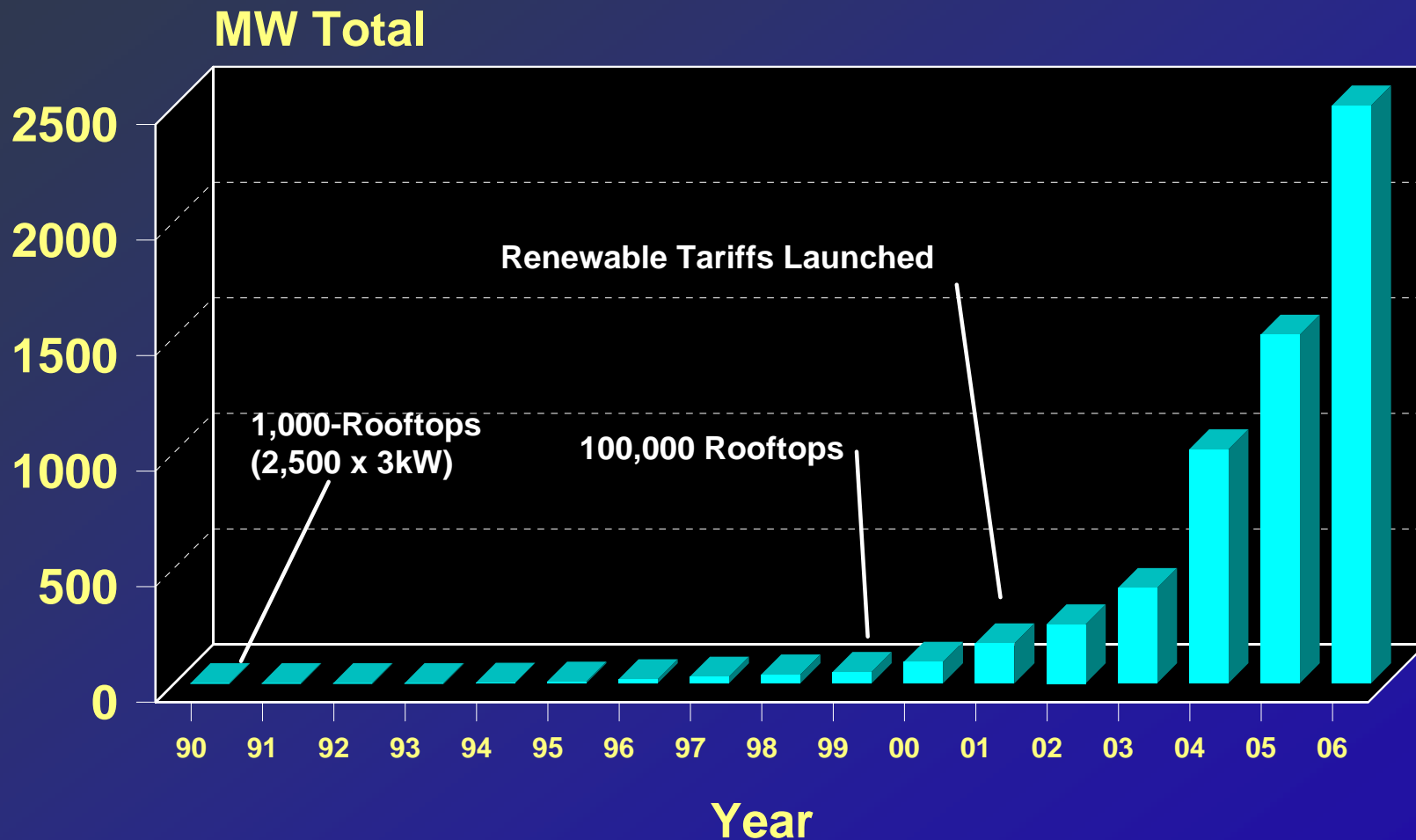




## 2008 IEPR Recommendations for Feed-in Tariffs

1. The CPUC should immediately implement a feed-in tariff program for all RPS-eligible generating facilities up to 20 MW in size. Such a program should include must-take provisions as well as cost-based technology-specific prices that generally decline over time and are not linked to the CPUC's market price referent.
2. The Energy Commission and CPUC should continue to evaluate feed-in tariffs for renewable projects larger than 20 MW using the information in the Energy Commission's report on feed-in tariffs expected to be completed in early 2009.

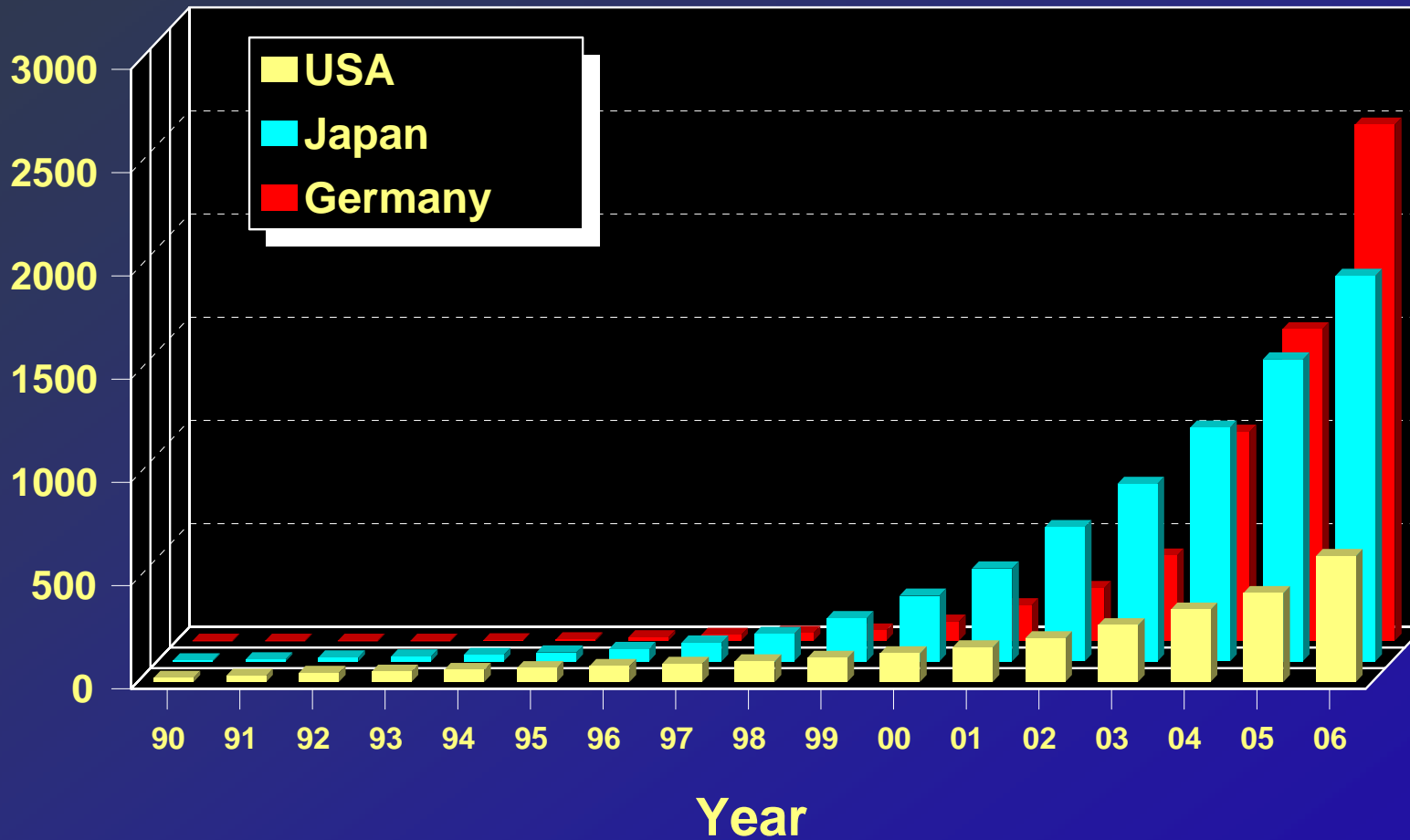
# Feed In Policies & Solar Photovoltaics in Germany



Paul Gipe, wind-works.org

# Solar Photovoltaic Development

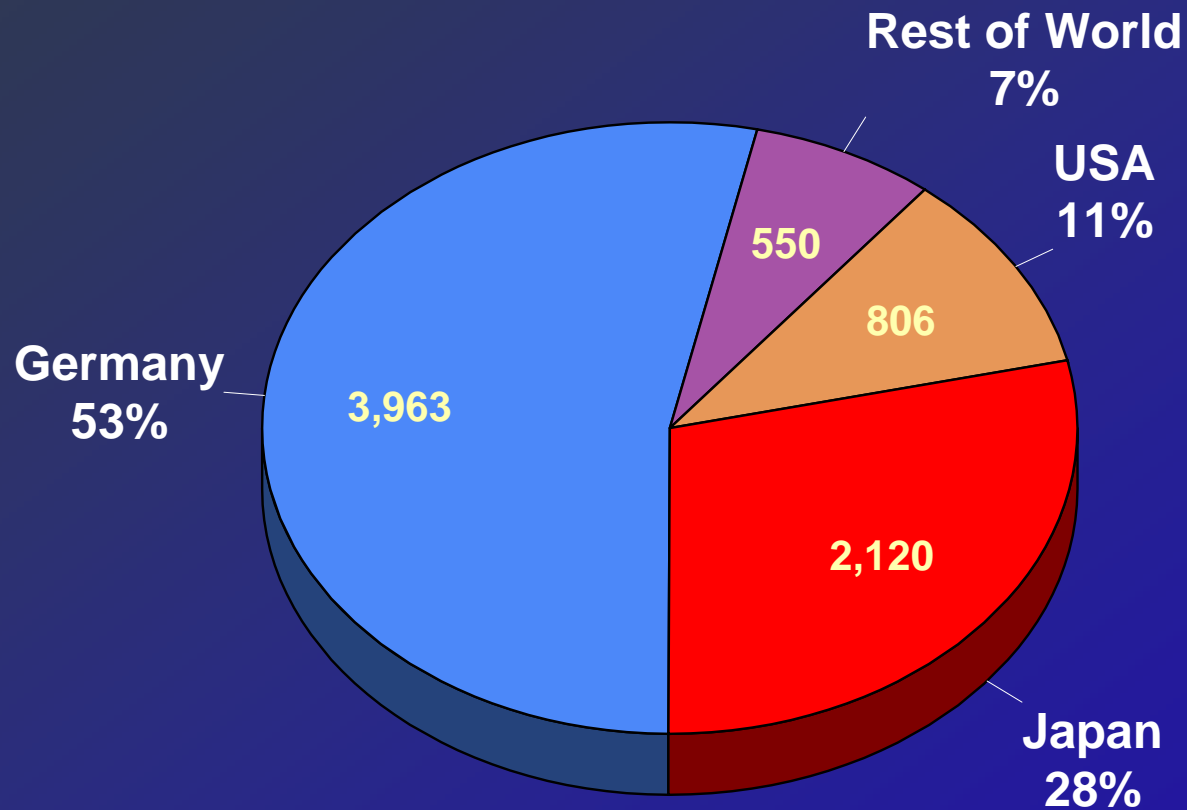
Total Installed MW



Paul Gipe, wind-works.org

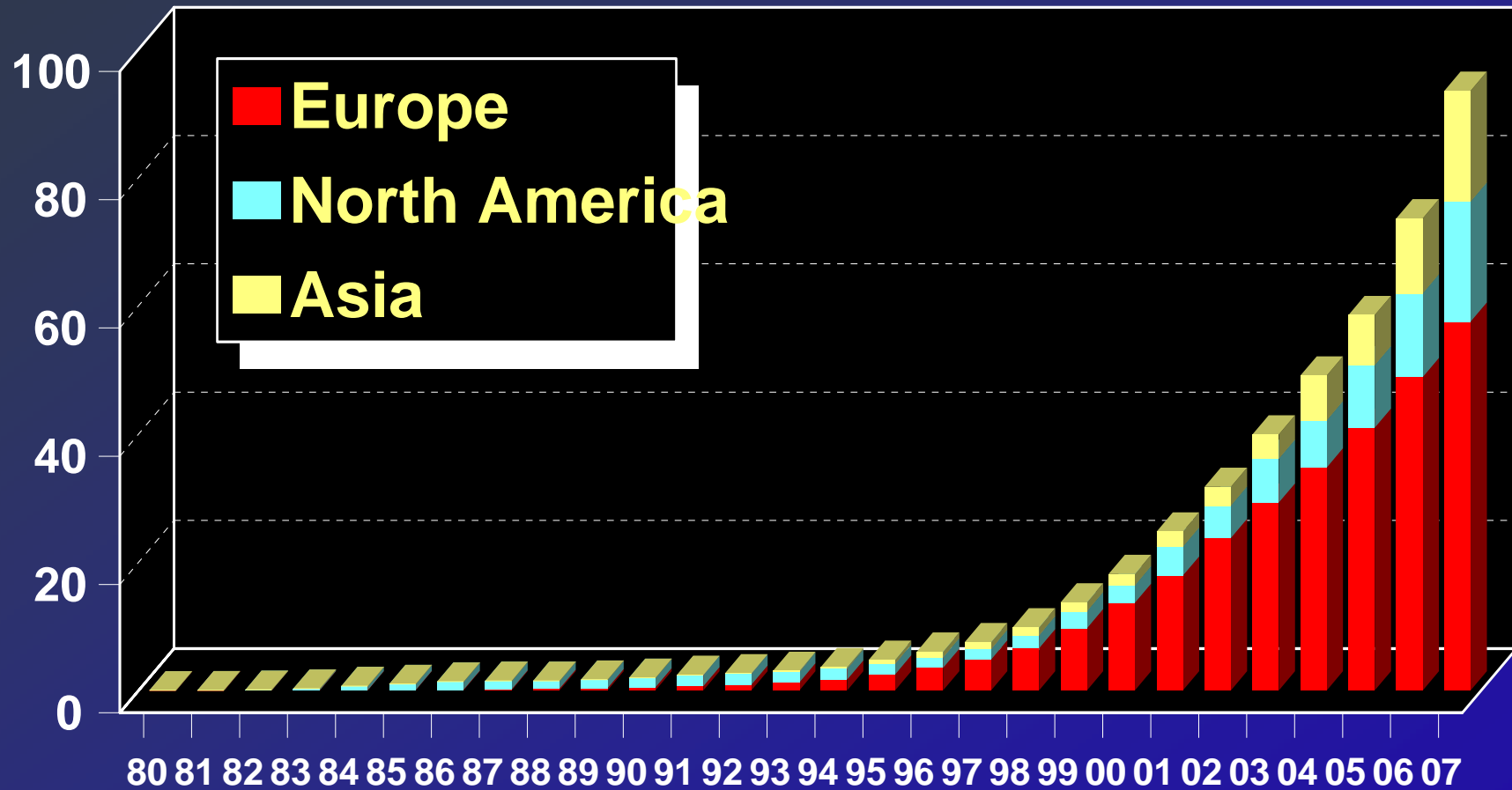
# World PV Capacity 2007 ~8,000 MW

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# World Wind Generating Capacity

Megawatts (Thousands)



Paul Gipe, wind-works.org

Year

# Germany's Renewable Tariffs

## The Results (2007)

- ◆ Renewables 15% of Supply; 27% target 2020, 45% 2030
- ◆ Renewables 6% of Primary Energy
- ◆ 70,000 Employed in Wind Industry
- ◆ 50,000 Employed in PV Industry
- ◆ 8,000 Employed in Biogas Industry
- ◆ 250,000 Employed in Renewables
- ◆ €22 (~\$30) Billion Turnover
- ◆ Net Benefit \$9BN annually

# NREL Research Findings

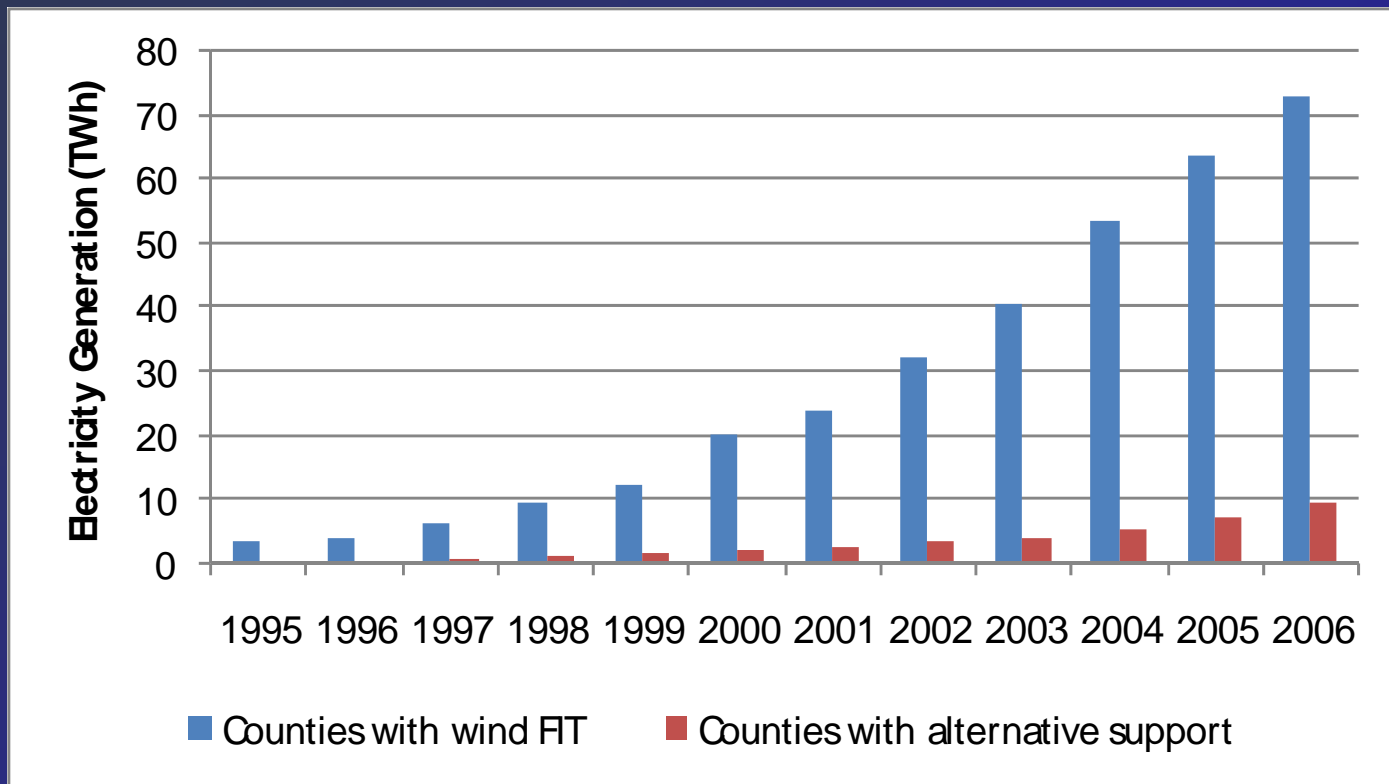
## ◆ Countries with FITs:

- Have highest RE deployment
- Have highest job creation; highest economist benefits tied to industry, manufacturing & services
- Have counter-intuitively delivered lower-cost RE generation than countries employing “competitive” policies like the RPS & RO in the UK



# FITS vs. Alternative Policies

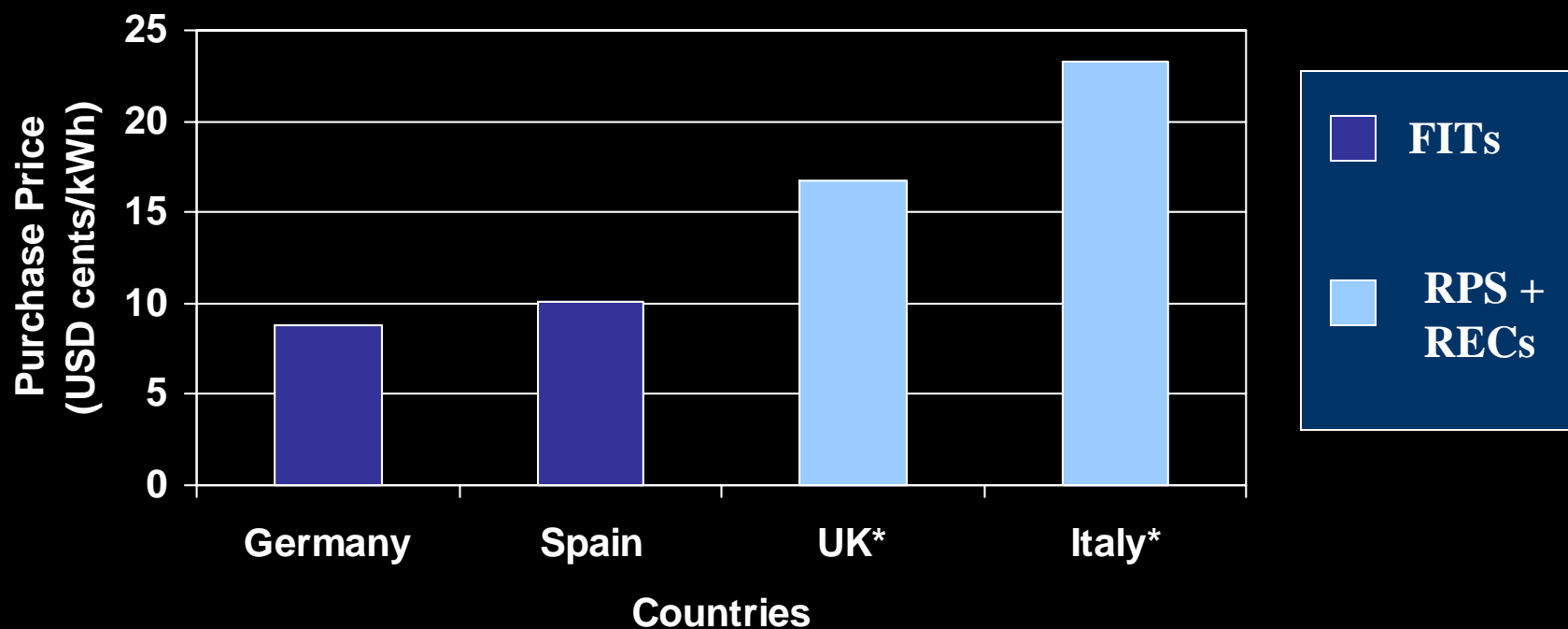
## Wind power deployment in the EU:



Source: EUROSTAT, 2008; NREL, 2008

# NREL Findings - RE Policy & Cost

## Average per kWh Payment for Onshore Wind (2008)



\* Electricity price + Tradable Green Certificate (i.e. REC)

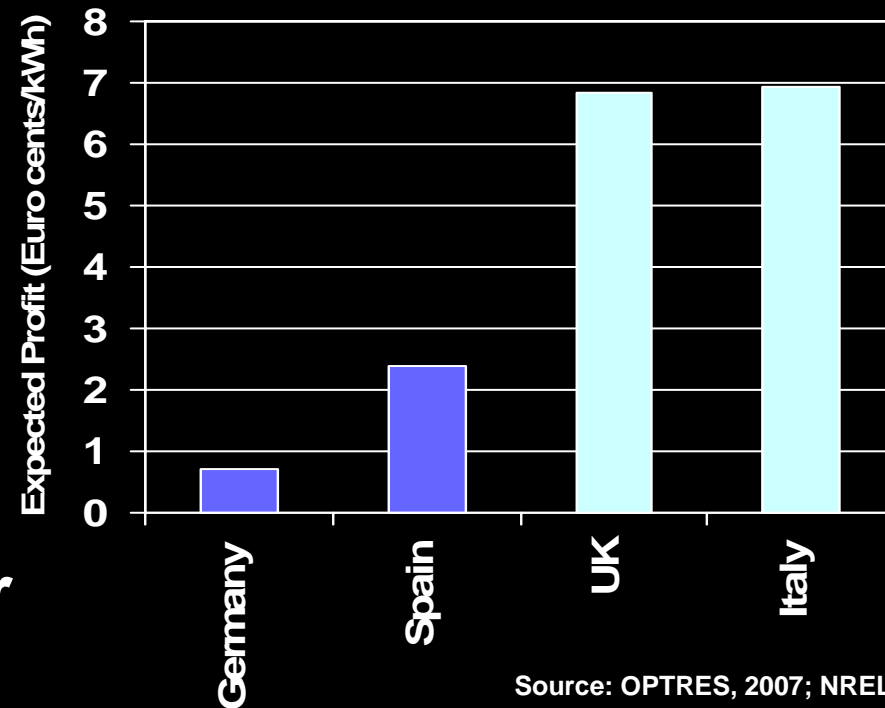
Source: BMU 2008; ISI, 2008; Fouquet, D. et al., 2008

# NREL - FITS vs. RPS on Cost



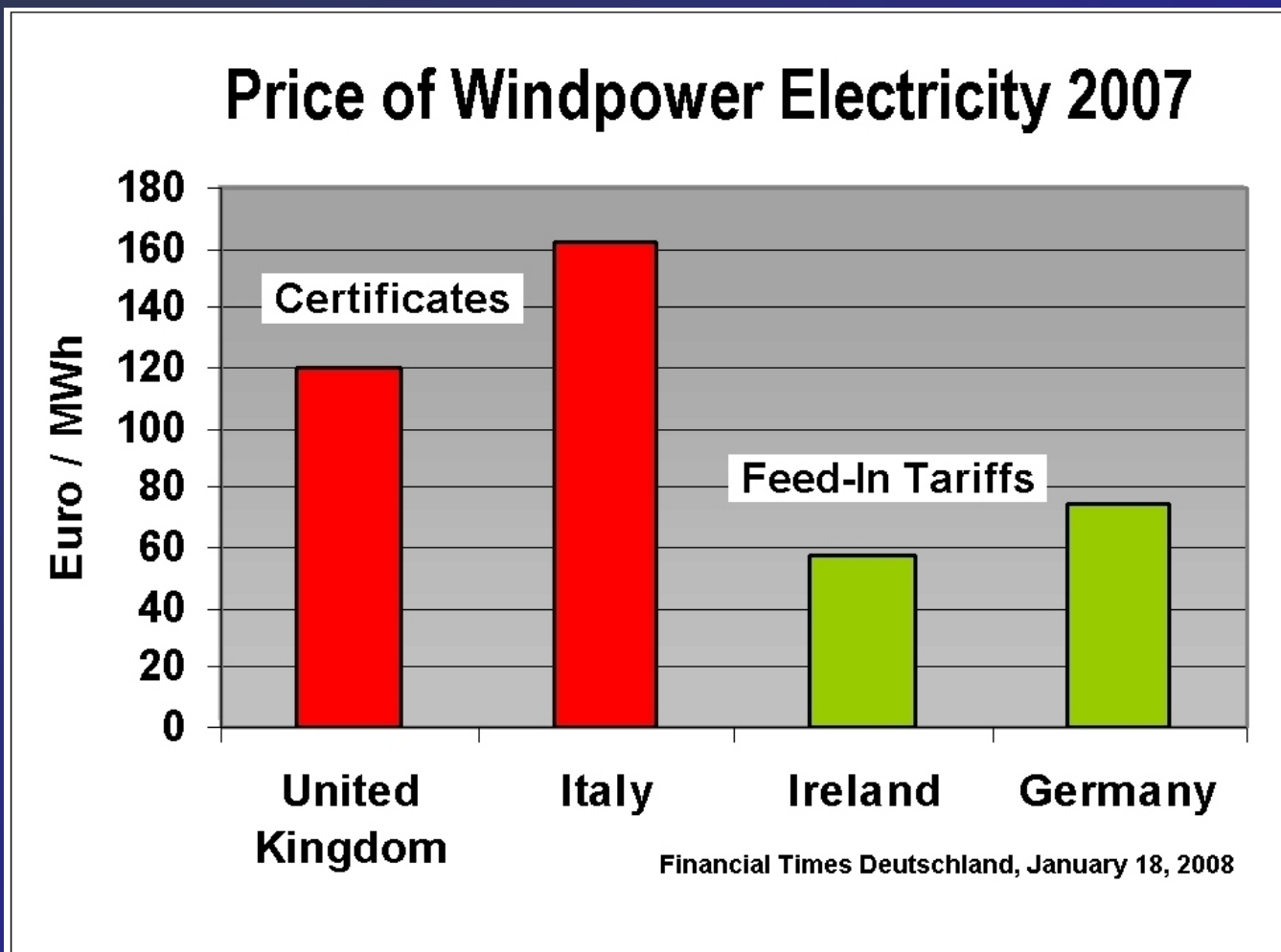
→ NREL Research finding that FITs offer better value for money

Expected Profit/kWh for Onshore Wind 2006



Source: OPTRES, 2007; NREL 2009

# RE Policy & Cost – FITs Cheaper



# Florida's Energy Issues

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- ◆ Over-reliant on fossil fuels; imported Gas > 50% power
  - \$50+ oil - (IEA - \$200 by 2030 ) FL's long term electricity costs?
  - Utility rate increases of 25%
- ◆ Coal not an option
- ◆ Nuclear ? 10 yrs w/out opposition at \$10-41 p/m
- ◆ Renewables - Speed
  - Currently < 3% of power generation mix
  - Solar – the Sunshine State; public support – 81% ok with \$1 month

# FL – Excellent RE Resources

## Capacity and Energy Estimates by 2020

### Technical Potential

| Resource Type               | Capacity (MW) | Energy (GWH) |
|-----------------------------|---------------|--------------|
| Ground Mounted Solar PV     | 89,000        | 173,000      |
| Ocean Current               | 750           | 5,900        |
| Wind-Offshore-Class 4       | 40,311        | 125,230      |
| Biomass                     | 13,750        | 99,666       |
| Solar Water Heating – 2MW + | 1,136         | 2,000        |

Note: Data taken from Navigant Consulting Study dated 12/30/08.

# Florida PSC Draft RPS Rule

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- ◆ 20% RE by 2020
- ◆ Rate cap of 2% IOU sales ~ \$370MM
- ◆ Recommended tradable REC market
  - Spot; longer term contracts (unclear how)
- ◆ Wind and solar 25% of target
- ◆ Wind and solar 75% of \$370MM
- ◆ ROE penalties for non-compliance
- ◆ 3<sup>rd</sup> party administrator appointed by IOUs
- ◆ Clean energy alternative including nuclear power
- ◆ Alternate SOC proposal made

# A Trading System



## **SRECs – Not A “Trading” System**



**TRADABLE SRECS GIVE NO INVESTMENT SECURITY**

# GRU's Solar Feed in Tariff Schedule

Effective March 1, 2009

| Contract Entered into Under This Policy During Calendar Year | Fixed Rate per kWh Applied Uniformly From the Date of Installation Through December 31, | Fixed Rate \$/kWh Over Life of Contract                   |  |
|--|---|---|--|
|  |   | Building or Pavement Mounted (any size) or Ground Mounted | Free Standing (Non-Building or Non-Pavement Mounted) |
|  |   | < 25 kW   |  |
| 2009   | 2030  | \$0.32  | \$0.26   |
| 2010   | 2031  | \$0.32  | \$0.26   |
| 2011   | 2032  | \$0.30  | \$0.25   |
| 2012   | 2033  | \$0.28  | \$0.23   |
| 2013   | 2034  | \$0.27  | \$0.22   |
| 2014   | 2035  | \$0.26  | \$0.21   |
| 2015   | 2036  | \$0.25  | \$0.20   |
| 2016   | 2037  | \$0.23  | \$0.19   |



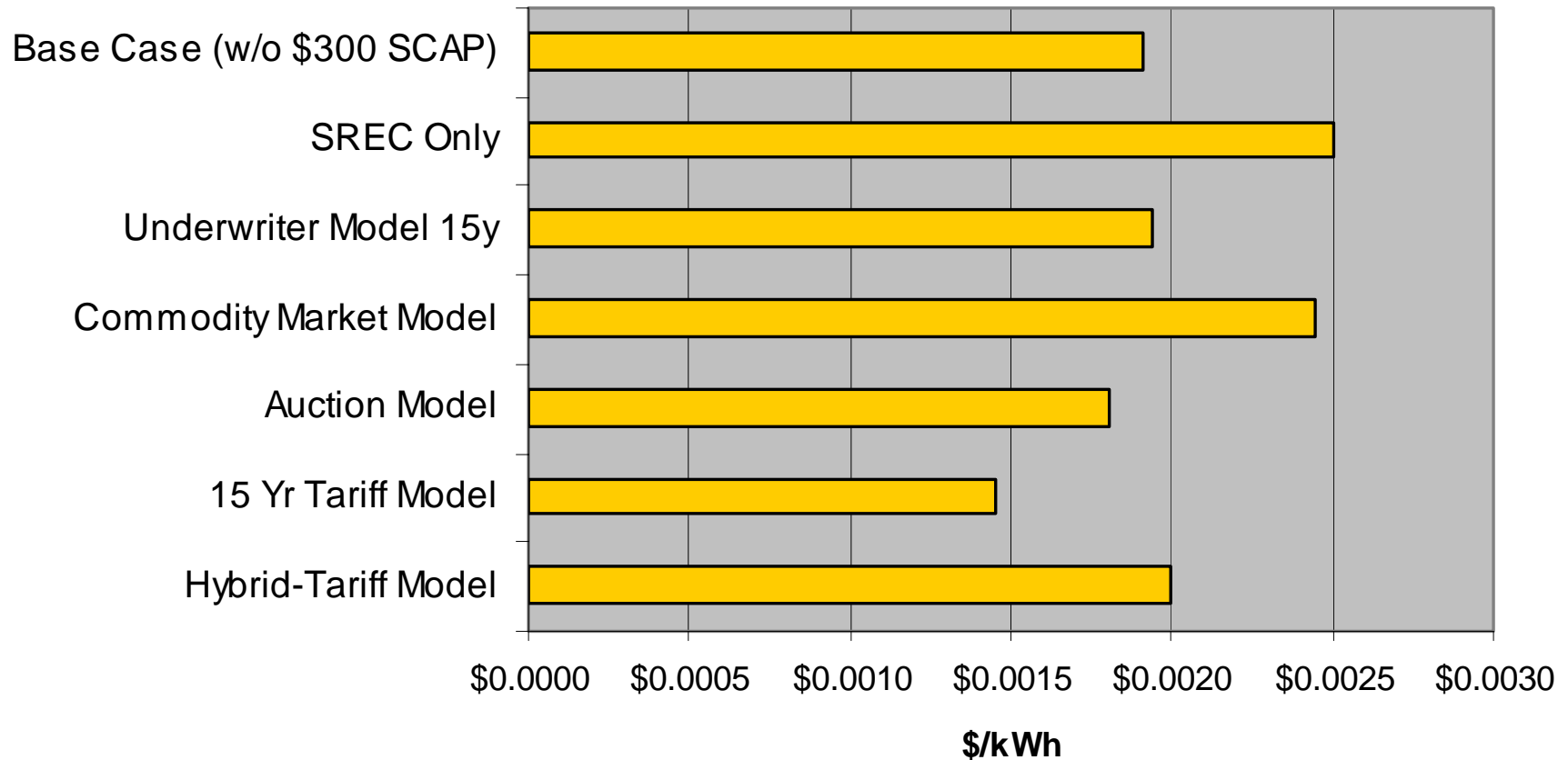


## Results – Feb 5<sup>th</sup> – March 1st

- ◆ GRU Achieves First Year Target for Solar Program
- ◆ 4MW completed applications; doubles FL capacity
- ◆ “We are extremely excited about the popularity of the program - our efforts to stimulate the market have been successful,” said Bob Hunzinger, GRU GM
- ◆ Guarantees purchase of all electricity produced by the PV system at a fixed rate for 20 years at \$0.32 kwhr for customers for first 2 yrs
- ◆ The rate of \$0.32 per kilowatt hour will remain in effect for 2010.

# NJ BPU Analysis By Summit Blue – Projected Tradable SREC ~ 50% More Expensive For Ratepayers

Ratepayer Impacts  
Wgt. Avg. by Project Type



# NJ – What Actually Happened

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- ◆ 2.1% solar by 2021; 1500MW or ~ 117-140MW per annum
- ◆ 2008 target – 90MW; 63MW actual – off track for RPS
- ◆ ACP 71c kwhr REC value - declines 3%
- ◆ Spot: 65-67c/kwhr + 15c net metered energy = 2.5x GRU FIT
- ◆ Some 3 yr contract -5-7 yr rare; 50-55c > 2x GRU FIT
- ◆ BPU recognizes that lack of long term contract a problem – securitization being discussed

**Without must take long term fixed price contracts – ratepayers pay 2x GRU**

# FARE RPS REDs Amendment

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- ◆ Integrate into RPS legislation
- ◆ 20% by 2020
- ◆ German model; similar to CA Energy Comm recommendation
- ◆ A feed in tariff for all < 20MW renewable producers
- ◆ Pricing technology cost + profit
- ◆ Pricing differentiated by size
- ◆ Payments equalized across IOU ratepayers
- ◆ Cheapest \$/MWhr of RE for ratepayers
- ◆ Drive green jobs