



# **Feed-in Tariffs: Practice and Recommendations**

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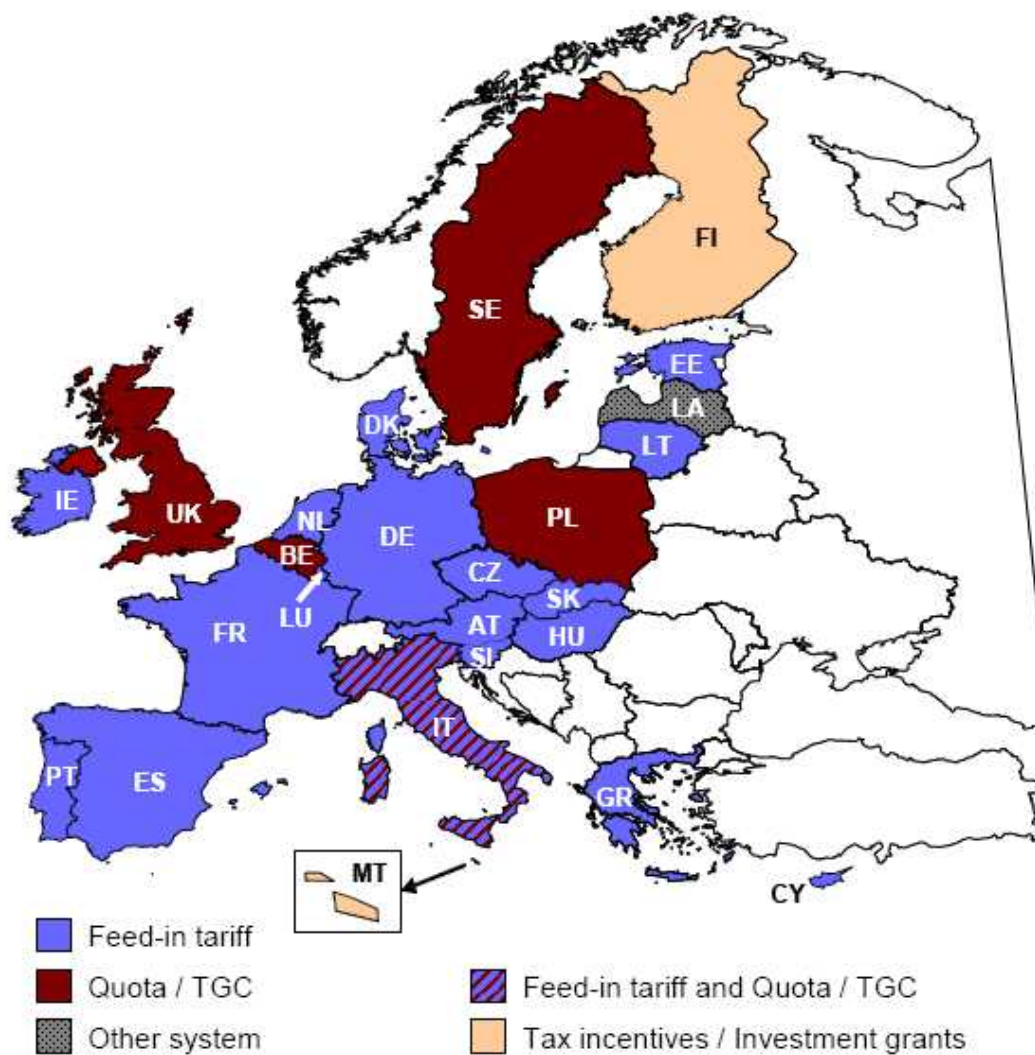
- Definition and incentive taxonomy
- European experience
  - Widely varying practices
  - Selected examples
- Solar Alliance policy on FIT
- Recommendation

**Production-based incentive  
paid to non-utility owner  
of system connected to utility side of meter**

**(net metering irrelevant)**

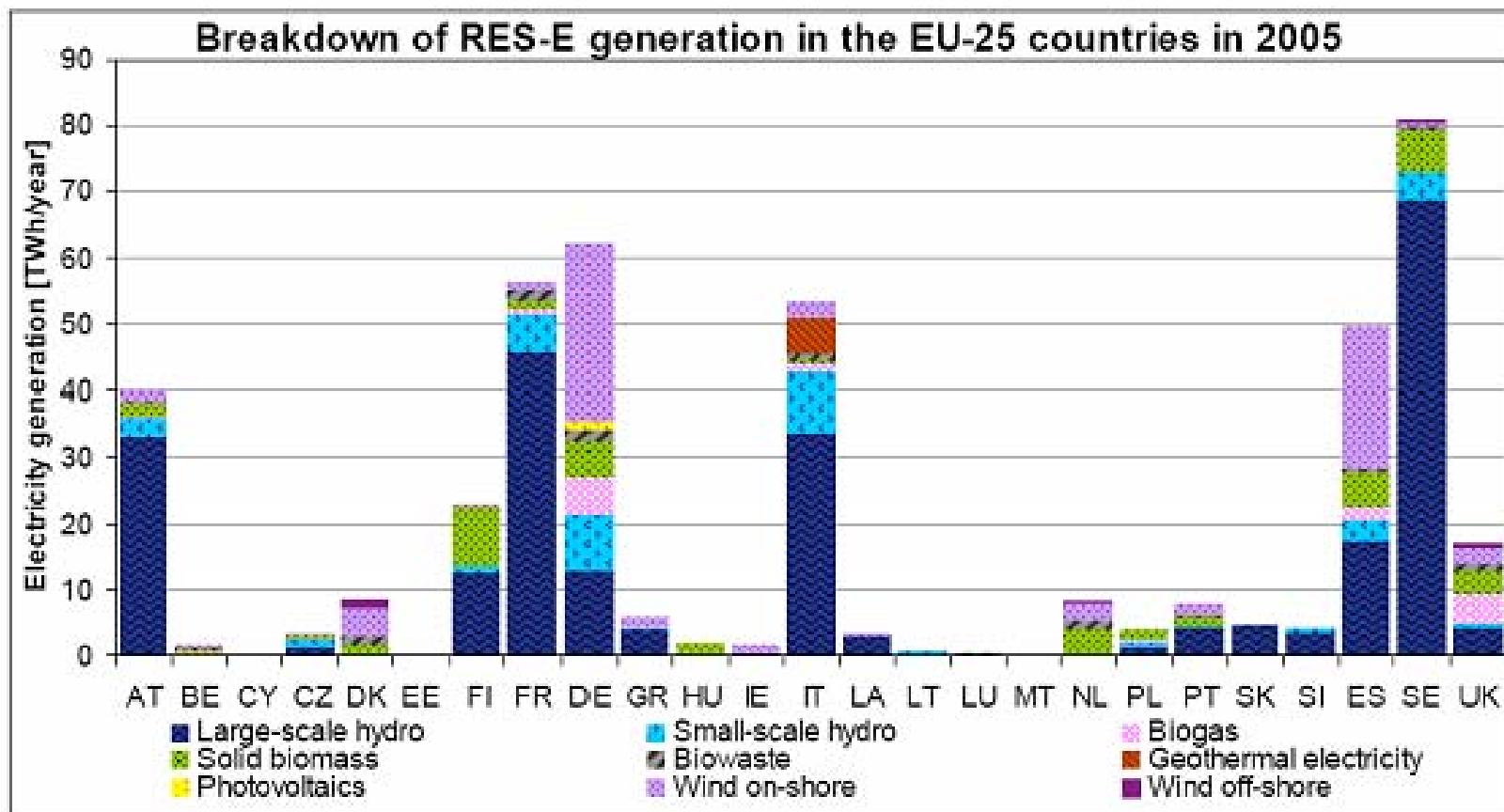
- Rebates
  - Up-front **capacity**-based payments
- Performance-Based Incentives (PBI)
  - **Energy**-based payments to systems on **customer** side of meter
- Feed-In Tariff
  - **Energy**-based payments to systems on **utility** side of meter
- RPS / RECs
  - **Energy**-based payments for energy **attributes** (not energy)
  - Also encompasses future carbon or other attribute incentives
- Tax Credits
  - ITC, property, sales; federal, state, local

# Widespread use of FIT



Source: Fraunhofer Institute

# Substantial European markets



Source: Fraunhofer Institute

## Substantial FIT flexibility



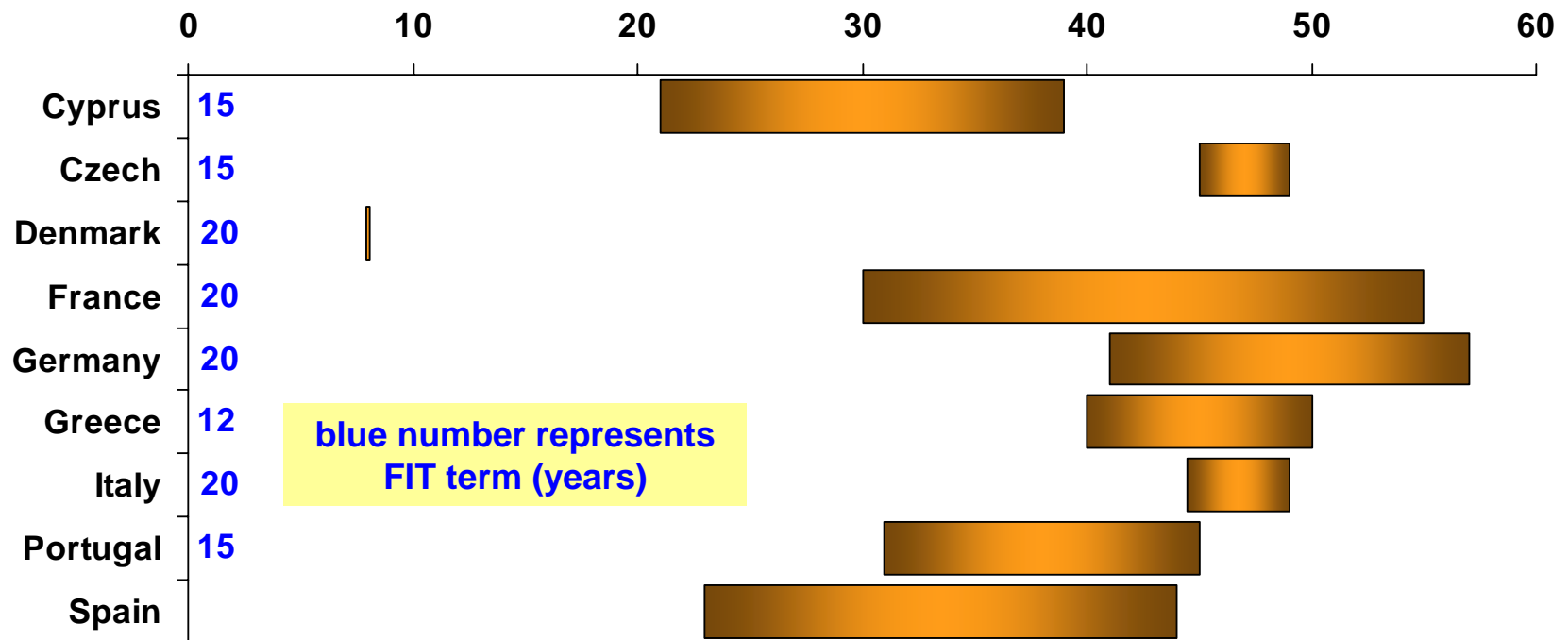
- Country
- Technology
- Location
- Production output
- Market segment / location
- Installation year

# By country



PV -- Tariff Range and Term (2006)

€cents / kWh



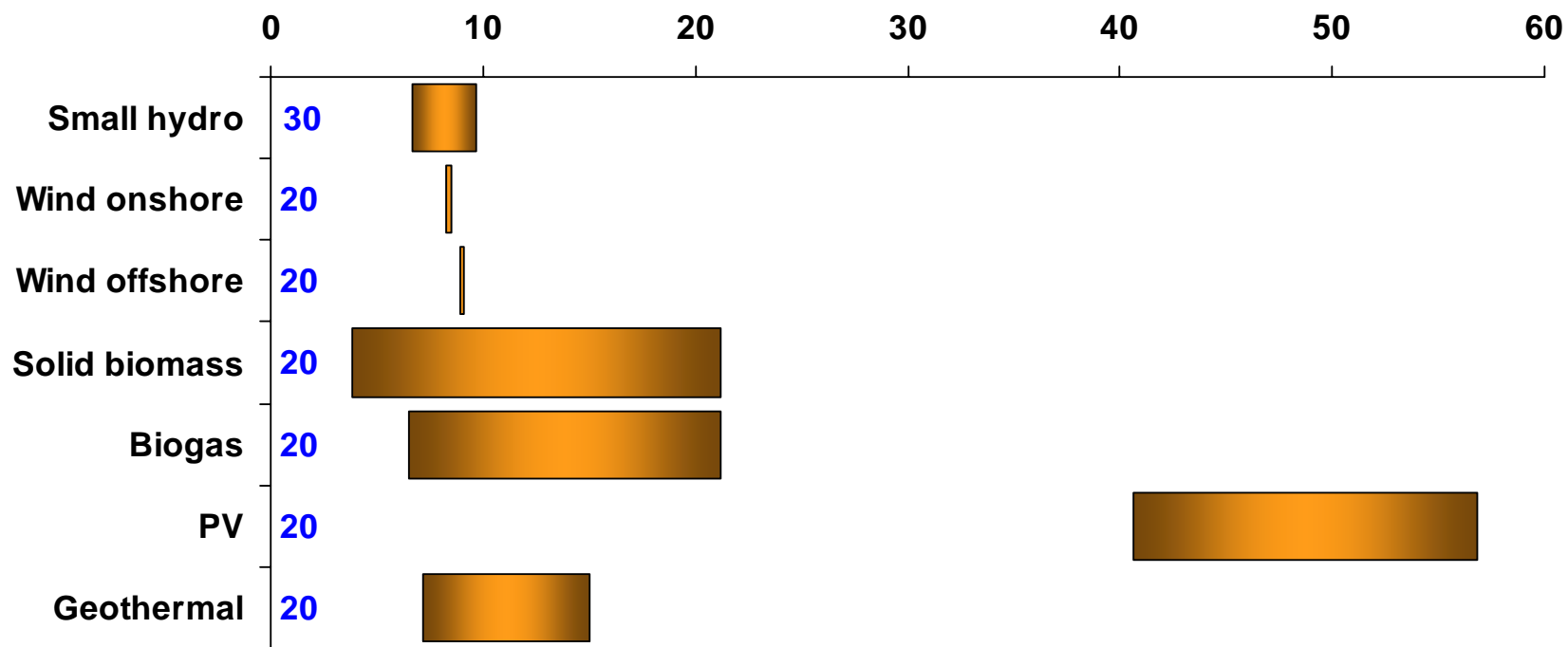
blue number represents FIT term (years)

Source: Fraunhofer Institute

# By technology

Germany -- Tariff Range and Term (2006)

€cents / kWh



blue number represents  
FIT term (years)

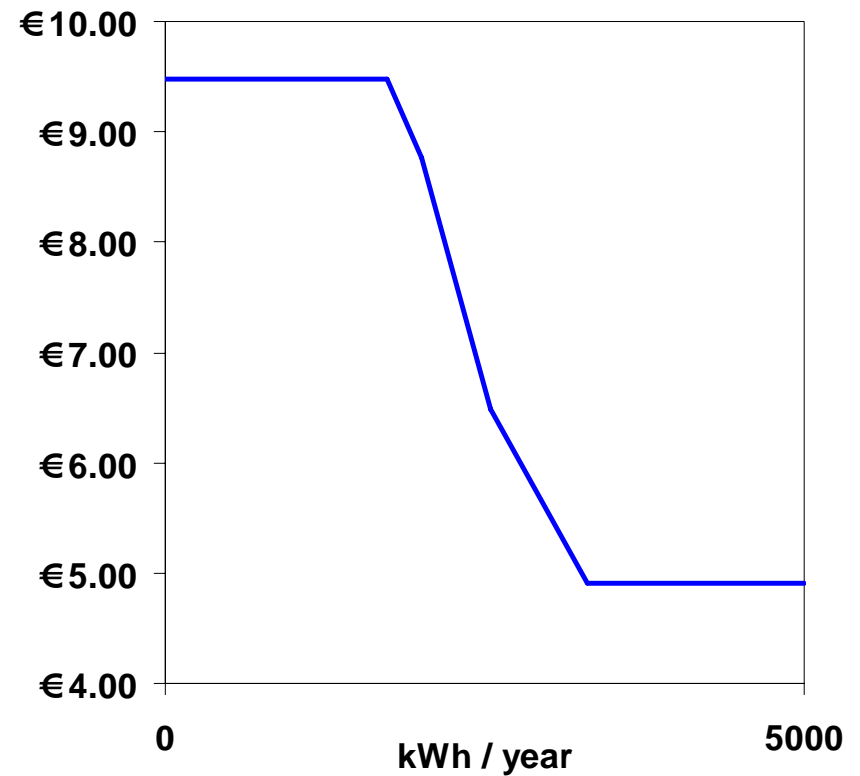
- In Germany, off-shore wind FIT varies by location
  - Off-shore premium for first 12 years
  - If > 12 miles offshore, premium period extended 0.5 months / mile
  - If > 20 meters water depth, premium period extended 1.7 months / meter

# By production output



- In Cyprus, wind FIT >30kW varies with production experience
  - First 5 years: €9.48/kWh
  - Following 10 years: depends on average production in first 5 years

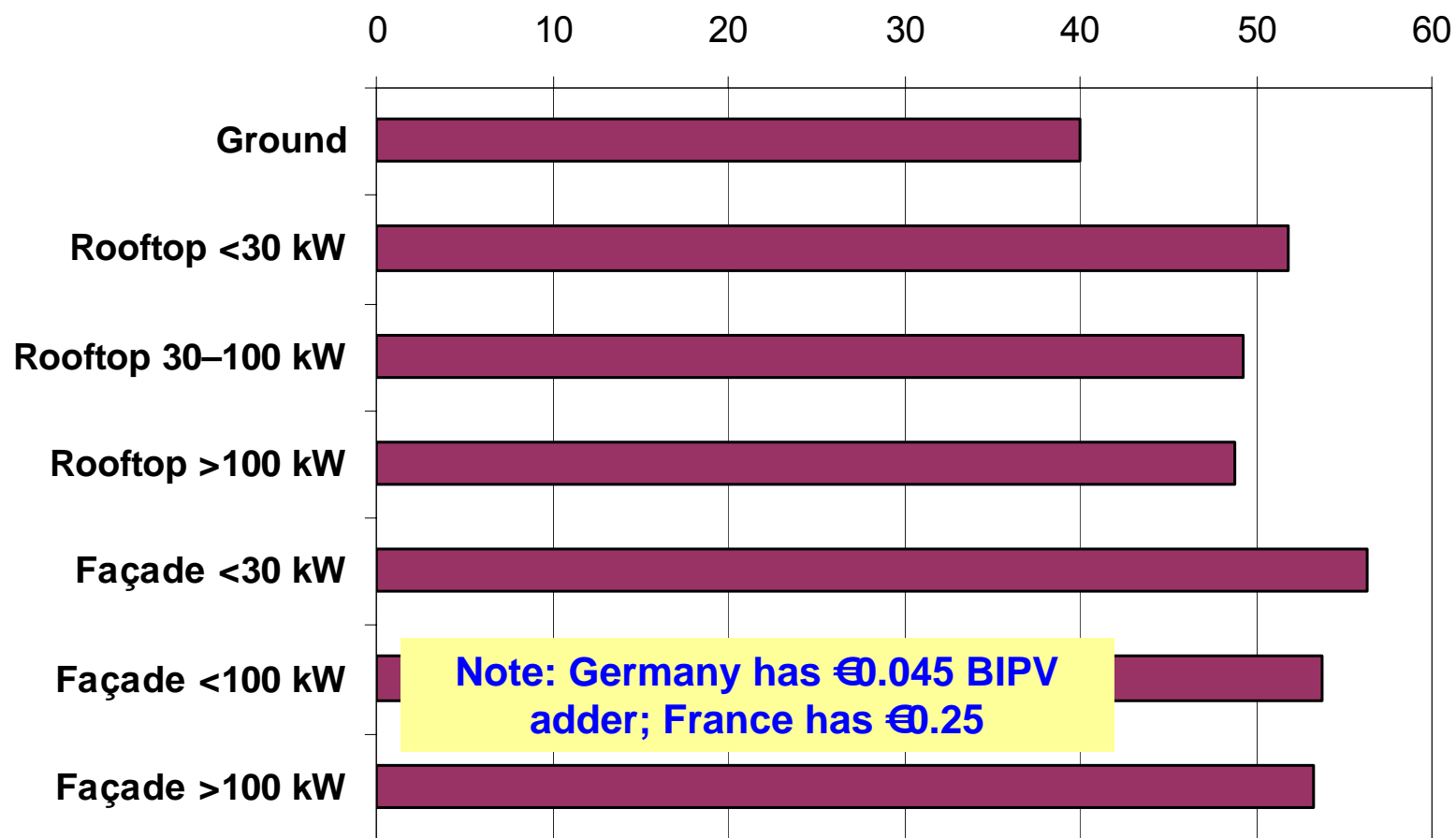
### Cyprus Wind FIT



# By market segment / location

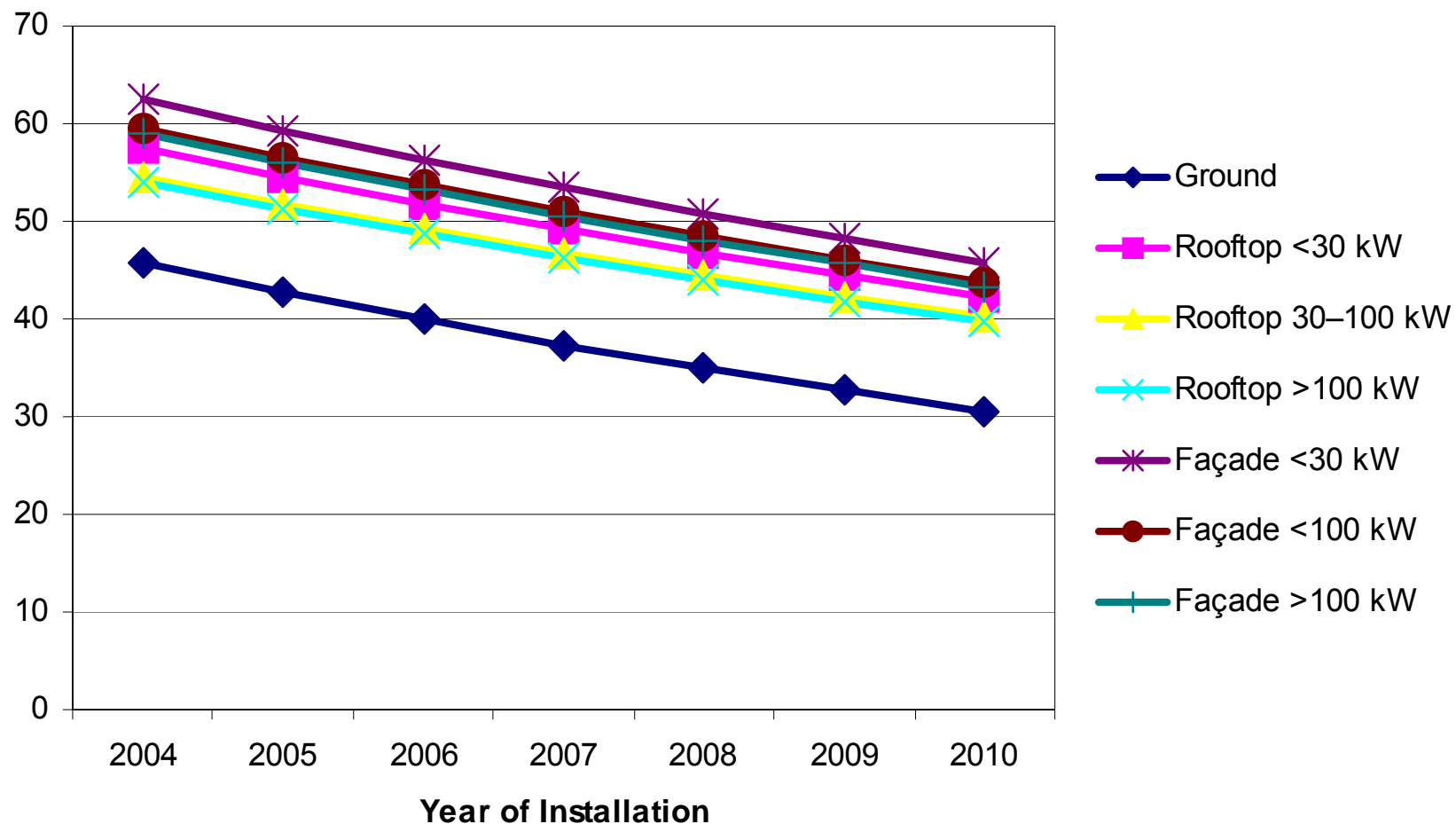


### German PV FIT (2006): €/kWh



# By installation year (degression)

### German PV FIT: €c/kWh



# European PV market response



- Large rooftops
- Ground-mount, MW-scale
- Often not co-located with load



# Does FIT always work?



- “If enacted, [South Australia Premier] Rann’s proposal would place Australia at the bottom of countries offering feed-in tariffs worldwide.”
  - \$US 0.39/kWh for 5 years reasonable
  - Only for excess kWh sold to utility show-stopper
  - <10kW single-phase; <30kW three-phase narrow market segment
  - 10,000 customers total small market cap
- Conclusion: don’t bother

# Is Feed-In Tariff silver bullet ?



Rebates

Performance-  
Based  
Incentives

Feed-In  
Tariff

RPS / RECs

Tax Credits

**None are perfect**

**All have pros and cons**

Many good attributes not uniquely attributable to FIT:

- High incentive levels (any)
- Production-based, not capacity based (also PBI, RPS)
- Financeable contract obligations (any)
- Predictable, long-term program (any)
- Incentive degression by year (any)
- No market or budget cap (any, e.g. federal ITC)
- Easy to incentivize segments, e.g., technology, size, customer class (any)
- Low administrative costs (most; RPS harder)
- Rate impact spread over time (PBI, RPS)

## Pros

- Easy to capture aforementioned benefits
- Bandwagon effect: “It worked over there...”
- Might be politically easier to tap into new funding source
- Avoids bypass – perhaps easier rate design
- Supports creation of financing market

## Cons

- May be illegal violation of PURPA
- Challenging transition to grid parity; net metering preferred
- Could have complications at end of FIT term
- Doesn't mesh well with PPAs
- Missing customer benefits of reduced bill and customer control
- Potential tax, insurance complications from utility side of meter

- Capture best attributes of European programs in any incentive structure
  - Incentive levels driven by customer economics
  - Production-based incentives
  - Financeable contract obligations (< 20-year term for US)
  - Predictable, long-term program
  - Incentive depression (by year or capacity bucket)
  - No market or budget cap
  - Targeted incentives, e.g., technology, size, customer class
  - Low administrative costs
- Other structures preferred (PBI or RECs for large; rebates for small)
  - Customer side of meter has smoother transition to grid parity and intangible customer benefits (reduced bill and customer control)
  - Easier to incorporate with PPAs
  - Avoids potential PURPA conflict

OK to mix -- if simple



✓ Rebate / PBI / RPS / FIT + federal ITC

X FIT + RPS

# Conclusions



- Feed-in tariff created successful markets
- Emulate best FIT attributes into PBI / RPS / rebate