Combining feed-in tariffs and tenders to support renewable electricity

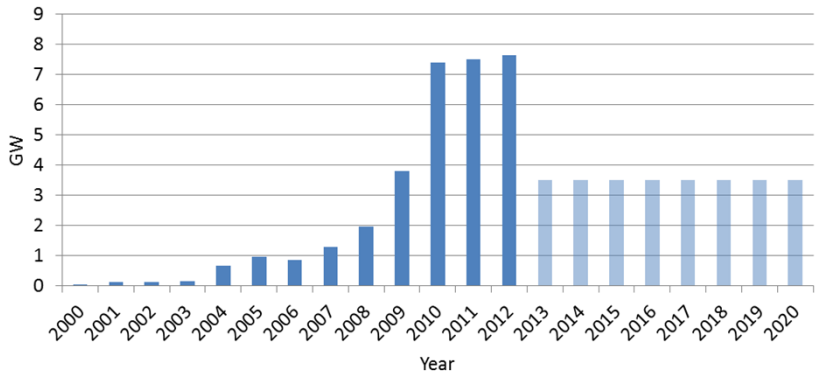
Thilo Grau
German Institute for Economic Research (DIW Berlin)
Climate Policy Department

ENERDAY Conference on Energy Economics and Technology
Dresden, 19 April 2013

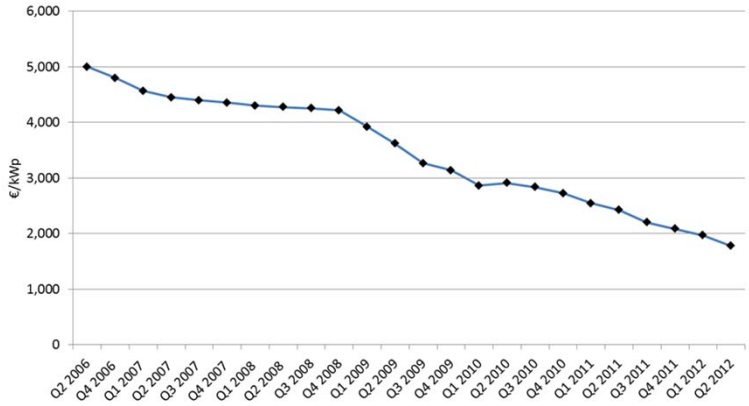
Motivation (1/2)

- Feed-in tariffs are the most common policy instrument worldwide to support renewable electricity, having been implemented by 65 countries and 27 states/provinces (REN21, 2012).
- The German feed-in tariff (FIT) for solar photovoltaics (PV) often led to an overshoot of planned annual deployment, which raised concerns about the continued suitability of feed-in tariffs to support PV deployment.

Annual PV installations in Germany 2000-2012, with targets until 2020



Average customer prices for installed rooftop PV systems up to 100 kWp, Q2 2006-Q2 2012



Sources: Data from BMU (2012), German National Renewable Energy Action Plan (2010), EEG (2012), Photon (2013), BSW-Solar (2012). Prices shown are without value added tax.

Motivation (2/2)

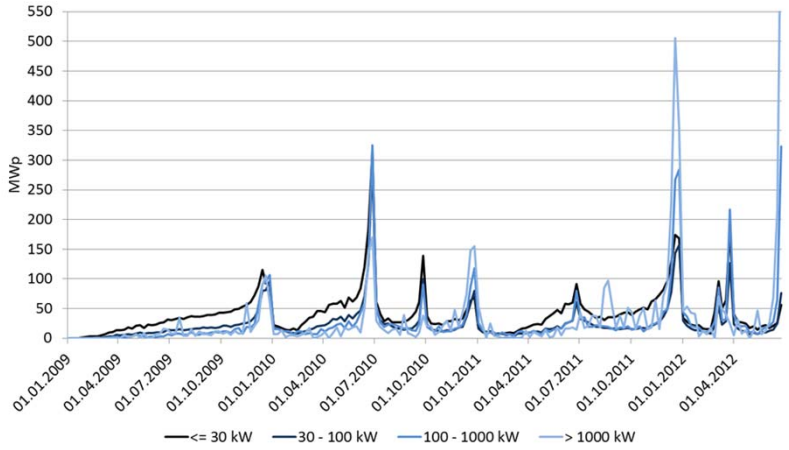
- Flexible FIT schemes with frequent tariff adjustments are able to reach deployment targets effectively for small-scale PV systems due to their short project durations (Grau, 2012).
- However, auction mechanisms may be more suitable for large PV plants (with long development times and diverse installation costs) to improve control on costs to ratepayers.

- In recent years, European countries increasingly combined feed-in tariffs for small renewable energy systems with tendering schemes for large-scale installations (e.g. France, Italy).
- Experience with auctions and competitive bidding-based schemes in Brazil, California, China, etc.
- Altmaier's interest in "Verfahrensvorschlag zur Neuregelung des Erneuerbare-Energien-Gesetzes".

- What is the optimal threshold level between flexible feed-in tariff schemes and auction-based mechanisms?

Characteristics of large-scale PV installations

Weekly PV installations and project durations for different size categories in Germany



	System size (kWp)	Process duration (weeks)		
		Min	Avg	Max
Residential systems	3	5	7	10
Commercial systems	50	5	9	15
Industrial ground-mounted systems	2500	24	40	53

Large installations are more responsive to changing support schemes.

Large installations have significantly higher project durations.

Sources:
Grau, T. 2012. Responsive Adjustment of Feed-in Tariffs to Dynamic PV Technology Development. DIW Berlin Discussion Paper 1189.
www.pvgrid.eu (retrieved 20 January 2013).

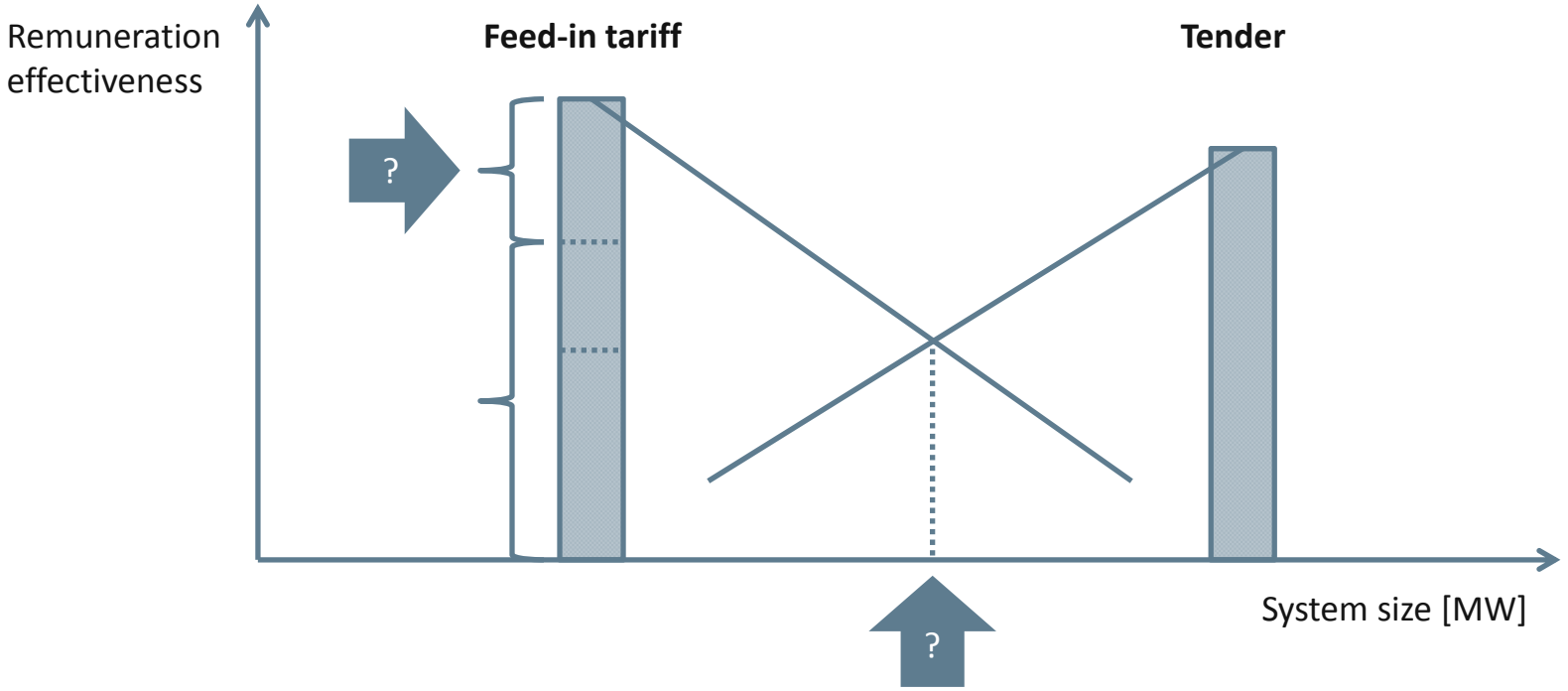
Tenders (TND): Main benefits and challenges relative to feed-in tariffs (FIT)

Benefits	**Challenges**
Market determines support levels as potential investors compete	Risks associated with project development as not all bids will be successful
Predictable outcomes	Attrition because of speculative underbidding
	Deposit (to avoid non-performance) limits competition
Control options regarding • regional supply needs • specific technologies • network expansion	Risks for supply chain in case of infrequent tenders
	Risks of market concentration

What is the optimal threshold level between feed-in tariffs and tenders?

Hypothesis: FIT remuneration is more effective and efficient for small-scale PV systems, while TND remuneration is more effective and efficient for large installations.

Draft analytic framework:



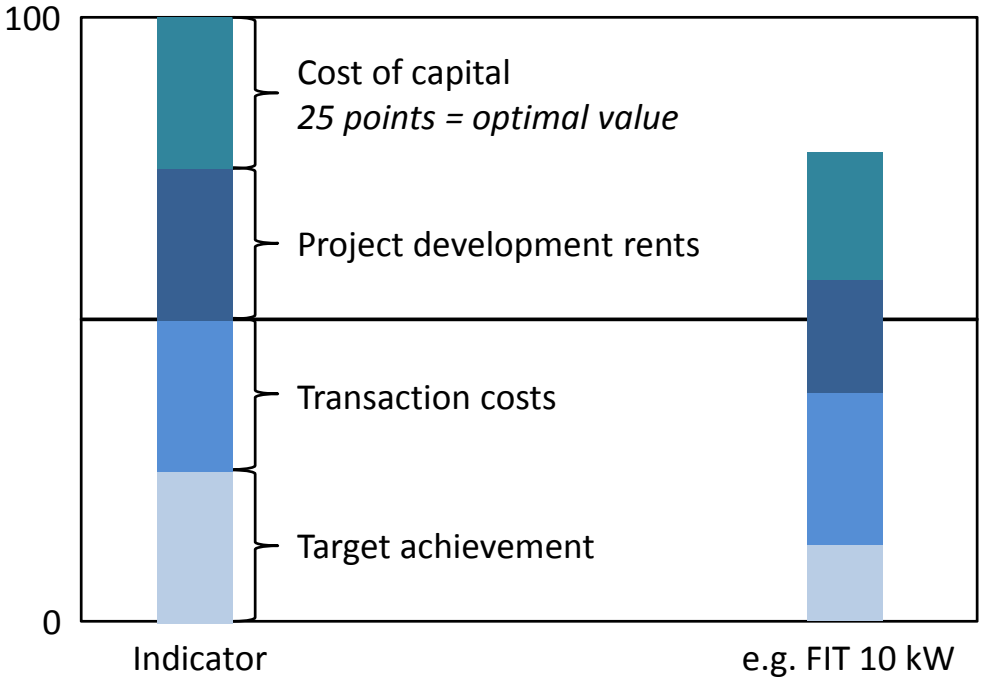
Analytic framework

Remuneration Status Indicator with four sub-indicators:

1) Cost of capital
2) Project development rents
3) Transaction costs
4) Target achievement

Cost effectiveness

Deployment effectiveness



- The indicator can be determined for different remuneration schemes and project sizes.
- The sub-indicators are considered to be equally relevant (25% weightings).
- The higher the value of the indicator, the higher the effectiveness of PV remuneration.

Cost of capital (1. sub-indicator)

Weighted average cost of capital:

$$WACC = \frac{equity}{total\ capital} * cost\ of\ equity + \frac{debt}{total\ capital} * cost\ of\ debt * (1 - corporate\ tax\ rate)$$

Interviews with project developers to determine for FIT and TND remuneration across project sizes:

- Financing shares of equity and debt across project stages (development, construction, operation)
- Average costs of equity and debt
- Leverage ratio of equity

Project development rents (2. sub-indicator)

- Current PV FIT design in Germany: Since November 2012, degression levels depend on deployment, are adjusted every three months and implemented on a monthly basis (for all system sizes).
- Time lag needed by the Federal Network Agency to determine deployment and corresponding degression levels.
- Therefore, large-scale projects (due to longer project durations) imply a higher uncertainty about module prices and FIT levels at project completion time → overfunding costs increase with system size.

Interviews with project developers to determine across remuneration schemes and project sizes:

- Average returns beyond the break-even point
  - because the FIT was set too high
  - because of a lack of competition for tenders
- Range of IRRs experienced for different equity debt shares

Transaction costs (3. sub-indicator)

- Tenders imply several transaction costs in comparison to FITs.
- For FITs, the sub-indicator is assumed to be constant across project sizes.
- For TNDs, the sub-indicator focuses on two dimensions:
  - Costs for collaterals (to avoid non-delivery)
  - Costs incurred by bidders that subsequently fail to win in the tender

Interviews with project developers to determine across project sizes:

- Project stage at which collateral costs are usually posted.
- Time period of collateral costs being deposited.
- Cost effectiveness of projects from bidders that fail to win in the tender.

Target achievement (4. sub-indicator)

- The optimal policy cost shall correspond to supporting the annual PV deployment target corridor defined by the German government (between 2.5 GW and 3.5 GW).
- Excess deployment leads to larger monetary costs, while undershooting the corridor leads to larger environmental costs.
- For the German FIT, large-scale systems (due to longer project durations) lead to higher uncertainty about project completion times and therefore imply a higher risk of excess deployment.

Interviews with project developers to determine across project sizes:

- Cases in which tenders did not achieve target deployment and their reasons
- Differences concerning process duration and waiting time across project stages for FIT and TND remuneration

Thilo Grau
German Institute for Economic Research (DIW Berlin)
Climate Policy Department
Mohrenstr. 58 | 10117 Berlin | Germany
Tel: +49 (0)30 89789 473
tgrau@diw.de

DIW BERLIN