Combining feed-in tariffs and tenders to support renewable electricity

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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

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

<table>
<thead>
<tr>
<th></th>
<th>System size (kWp)</th>
<th>Process duration (weeks)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Min</td>
<td>Avg</td>
</tr>
<tr>
<td>Residential systems</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Commercial systems</td>
<td>50</td>
<td>9</td>
</tr>
<tr>
<td>Industrial ground-mounted systems</td>
<td>2500</td>
<td>40</td>
</tr>
</tbody>
</table>

Large installations are more responsive to changing support schemes.

Large installations have significantly higher project durations.

Sources:

Feed-in tariffs vs. tenders to support renewable energies
Thilo Grau
## Tenders (TND): Main benefits and challenges relative to feed-in tariffs (FIT)

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

\[\text{WACC} = \frac{\text{equity}}{\text{total capital}} \times \text{cost of equity} + \frac{\text{debt}}{\text{total capital}} \times \text{cost of debt} \times (1 - \text{corporate tax rate})\]

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
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