Auctions for Wind Energy Projects in Germany and France

Bidding Strategies in Renewable Energy Auctions

Berlin, 16 October 2018

David Heinze (dh@teamconsult.net)
Agenda

1. Bidding Strategies in Renewable Energy Auctions
2. About Team Consult
Funding for onshore wind energy in Germany is determined by pay-as-bid auctions with special privileges for Citizens‘ Energy Projects

Brief summary of the framework for German onshore wind energy auctions

- Four pay-as-bid auctions (with price limit) per year, tendered capacity 700 MW per auction
- Capacity restrictions in Northern Germany
- General requirements:
  - Official permit according to the Federal Immission Control Act
  - Financial security payment
- Implementation deadline of 2.5 years (penalties after 2 years)
- Privileges for Citizens‘ Energy Projects (“Bürgerenergieprojekte”):
  - Uniform pricing
  - Implementation deadline extended by 2 years (only 2017 auctions)
  - Bid permissible without official permit (only 2017 auctions)
- Additionally: Two cross-technology auctions (wind and solar) per year (200 MW per auction)
Timing and bidding strategy are key factors for a successful bid

1. Project development
2. Bidding time window
   - time period available to bid in one or several auction(s)
3. Bidding strategy
4. Bid price

Image credit: Sarah / Creative Stall / lastspark / Nithinan Tatah from the Noun Project
A long time window helps to optimize the trade-off between award price and award probability

Example: Two auctions, 20% success probability* with 5 ct/kWh bid, 75% chance with 3 ct/kWh bid

| Strategy A | 5 ct | 20% award | 80% no award | 20% × 5 ct/kWh = 1 ct/kWh |
| Strategy B | 3 ct | 75% award  | 25% no award  | 75% × 3 ct/kWh = 2.25 ct/kWh |
| Strategy C | 5 ct | 20% award  | 80% no award  | 20% × 5 ct/kWh + 60% × 3 ct/kWh = 2.8 ct/kWh |

* Probability generally differs for every auction. For simplification, a constant success probability is assumed in this example.
The time window is defined by internal and external factors

<table>
<thead>
<tr>
<th>Internal factors</th>
<th>External factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>● Expiration date of permits</td>
<td>● Expiration of current legal framework</td>
</tr>
<tr>
<td>● Loan commitments</td>
<td>● Changes to regulatory terms</td>
</tr>
<tr>
<td>● Options in procurement contracts</td>
<td>● Thresholds (e.g. maximum capacity/number of awards per year)</td>
</tr>
<tr>
<td>● Resource availability (e.g. construction personnel and machinery)</td>
<td>● Available auction dates</td>
</tr>
<tr>
<td>● Delivery obligations</td>
<td>● …</td>
</tr>
<tr>
<td>● ...</td>
<td></td>
</tr>
</tbody>
</table>

Negotiate for maximum flexibility

Observe and react
Depending on market environment and cost competitiveness, a customized bidding strategy can be determined

<table>
<thead>
<tr>
<th>Initial situation</th>
<th>Strategy</th>
<th>Appropriate if…</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stable market and competitive environment</td>
<td>High bid value in first auction, decrease value in next auction if necessary</td>
<td>… no immediate award is required to implement project in due time</td>
</tr>
<tr>
<td>Uncertain market and competitive environment</td>
<td>Immediate auction participation with low bid value</td>
<td>… wind park has to be operational as soon as possible</td>
</tr>
<tr>
<td>Expectation of falling cost for competitors’ projects</td>
<td>Wait and participate when competitiveness has improved</td>
<td>… one of the following can be expected:</td>
</tr>
<tr>
<td>Short time window for project implementation</td>
<td></td>
<td>● decreasing number of participants</td>
</tr>
<tr>
<td></td>
<td></td>
<td>● increasing costs of competitors</td>
</tr>
<tr>
<td></td>
<td></td>
<td>● advantages due to regulatory changes</td>
</tr>
<tr>
<td>Expectation of improving competitiveness in later auctions</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Legislative changes may be one of the factors influencing the bidding strategy

Number of bids and clearing price at the German auctions for onshore wind energy

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Other Bids</th>
<th>Number of Citizens' Energy Bids</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017</td>
<td>169</td>
<td>87</td>
</tr>
<tr>
<td>2018</td>
<td>110</td>
<td>22</td>
</tr>
<tr>
<td>2019</td>
<td>87</td>
<td>4</td>
</tr>
</tbody>
</table>

Clearing price (€ct/kWh)
- 5.78
- 4.29
- 3.82
- 5.28
- 6.28
- 6.30

July 2017: Bill passed to restrict privileges for Citizens' Energy Projects
Jan 2018: Restriction of privileges comes into effect

Source: Bundesnetzagentur, TEAM CONSULT analysis
Ideally, the own bid price is the highest bid to receive an award

- Capital expenditures
- Operational expenditures
- Cost of capital

Minimum bid price (e.g. net present value = 0) + Potential premium = Actual bid price

Available time window

Award probability, depending on
- Number of competing projects
- Cost competitiveness of own project
- Bidding strategy of competitors

low bid price $\rightarrow$ increasing profitability, decreasing probability $\rightarrow$ high bid price

- Expected electricity price
- Expected load factor
- Expected life span

Increasing profitability, decreasing probability
An analysis of the market environment helps to gauge the bid price range

Factors to consider:

- Current and future investment costs
- Costs of capital (WACC)
- Site-specific load factors
- Machine life time
- Operating costs

Average total installed costs (€\textsubscript{2016}/kW)

<table>
<thead>
<tr>
<th>Year</th>
<th>Germany</th>
<th>France</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>2,500</td>
<td>1,500</td>
</tr>
<tr>
<td>2010</td>
<td>2,000</td>
<td>1,000</td>
</tr>
<tr>
<td>2012</td>
<td>1,500</td>
<td>1,000</td>
</tr>
<tr>
<td>2014</td>
<td>1,000</td>
<td>1,000</td>
</tr>
<tr>
<td>2016</td>
<td>1,000</td>
<td>1,000</td>
</tr>
</tbody>
</table>

Weighted average cost of capital (WACC)

<table>
<thead>
<tr>
<th>Country</th>
<th>WACC \textsubscript{2016}</th>
</tr>
</thead>
<tbody>
<tr>
<td>Germany</td>
<td>6.0%</td>
</tr>
<tr>
<td>France</td>
<td>6.9%</td>
</tr>
</tbody>
</table>

Source: IRENA, DiaCore, TEAM CONSULT analysis
Renewable energy auctions are not a game of pure chance

A long **time window** helps to optimize the trade-off between award price and award probability.

Depending on market environment and cost competitiveness, a customized **bidding strategy** can be determined.

Ideally, the own **bid price** is the highest bid to receive an award. A market analysis helps to gauge the bid price range.
Agenda

1. Bidding Strategies in Renewable Energy Auctions
2. About Team Consult
TEAM CONSULT – Expert for the energy sector

Reliability through expertise

- Consulting for the energy sector for 30 years.
- Founded in Hamburg, office in Berlin since 2004
- Experts with background of the energy sector
- International and national projects
- Cooperative partnership with the industry on eye-level
Team Consult is a strategic business consultancy focusing on the power and natural gas/LNG sectors

<table>
<thead>
<tr>
<th>Business Unit</th>
<th>Focus</th>
</tr>
</thead>
<tbody>
<tr>
<td>NATURAL GAS</td>
<td>Natural gas business along its pipeline-based value chain, incl. procurement, transport, storage, gas-to-power, gas sales and trading</td>
</tr>
<tr>
<td>LNG</td>
<td>Importance of liquefied natural gas as global supply source, incl. new and small-scale applications (e.g. LNG as fuel in the transport sector)</td>
</tr>
<tr>
<td>ENERGY TRANSITION</td>
<td>Transition of the energy sector and design of the future energy system, in particular role of renewable and conventional power generation</td>
</tr>
<tr>
<td>ENERGY STORAGE</td>
<td>Role of new energy storage solutions (such as batteries and Power-to-X technologies) as missing element in order to reach goals of the energy transition (“Energiewende”)</td>
</tr>
</tbody>
</table>
Our consultancy services are flexibly tailored to the requirements of our clients

<table>
<thead>
<tr>
<th>Service</th>
<th>Expertise</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARBITRATION</td>
<td>Support in arbitration proceedings in different roles and with different services</td>
</tr>
<tr>
<td>STRATEGY DEVELOPMENT</td>
<td>Development of company, business unit and optimization strategies, support of cooperation agreements and investment and divestment decisions</td>
</tr>
<tr>
<td>STUDIES &amp; REPORTS</td>
<td>Conduct of market studies as well as expert reports on individual questions in the energy sector, including support on investment decisions, M&amp;A transactions and due diligence</td>
</tr>
<tr>
<td>REGULATORY MATTERS</td>
<td>Design of policy instruments and regulatory measures and assessment of the consequences of changes in regulation</td>
</tr>
<tr>
<td>TENDERING PROCEDURES</td>
<td>Energy purchase, tendering of natural gas and renewable energy</td>
</tr>
<tr>
<td>CONTRACT MANAGEMENT</td>
<td>Negotiation of new and existing contracts including price reviews</td>
</tr>
</tbody>
</table>
Team Consult’s analytical modules for the German and European energy markets

<table>
<thead>
<tr>
<th>Demand &amp; supply</th>
<th>Power &amp; heat</th>
<th>Transport &amp; distribution</th>
</tr>
</thead>
</table>
| • Demand under different policies and technologies | • Existing and future projects:  
  – Technical: fuel, capacity, efficiency, CHP, location etc.  
  – Commercial: ownership, commissioning, marginal costs etc.  
  • Merit Order and Spark Spread model  
  • Decommissioning forecast  
  • Investment models for plant expansion (capacity, storage, CHP) | • Gas TSOs & DSOs:  
  – Technical: system length, diameter, compressors, entry/exit points etc.  
  – Commercial: tariffs, revenues, investments, EBITDA, ROE etc.  
  • Absolute and specific indicators  
  • Benchmarking |
| • Medium to long-term demand:  
  – By region  
  – By segment  
  – By energy | | |
| • Medium to long-term supply (production, LNG, pipeline, PtG) | | |

<table>
<thead>
<tr>
<th>Gas storage</th>
<th>Power-to-X</th>
<th>LNG</th>
</tr>
</thead>
</table>
| • Existing and future projects:  
  – Technical: type, working gas volume, rates, filling level etc.  
  – Commercial: ownership, bookings, transport fees etc.  
  • Tariff calculator  
  • Benchmarking  
  • Storage demand model  
  • Merit order model | • Pilot project facts  
  • Investment model and sensitivity analyses (utilization, power price, investment costs etc.)  
  • Key performance indicators: NPV, ROI, IRR, LCOE  
  • Benchmarking to other storage technologies | • Existing and future projects:  
  – Technical: capacity, storage, rates, ship size etc.  
  – Commercial: ownership, terms, bookings, grid fees, port fees etc.  
  • Tariff calculator  
  • Benchmarking  
  • LNG contract data base  
  • Global and regional supply/demand |

**Gas, Power, Experience.**
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