Cost of Energy – R&D prioritization

E W TE
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The world is in a fundamental transformation.
We face major challenges …

- Increasing energy demand
- Diminishing resources
- Climate change
... and we also have an answer.
Energy from wind power is still seen as expensive.

Subsidies won’t last forever.
We want to speed up the reduction of cost of energy - R-evolution will be the “time machine” needed

**“Business as usual” scenario**

- Historical scenario: -40% per decade.
- > 15 years to reach wholesale parity

**R-evolution as a “time machine”**

- R-evolution scenario: -40% in less than a decade.
- < 10 years to reach wholesale parity

Note: Past and planned LCOE development of SWP’s portfolio
Onshore will meet the LCoE target sooner than Offshore

**E W LCoE development Europe, in ct / kwh**

<table>
<thead>
<tr>
<th>Year</th>
<th>Onshore LCoE, typical projects at 6.8m/s</th>
<th>Offshore LCoE, selected projects at actual wind speed (7 to 9 m/s)</th>
<th>Cost of electricity, example EEX (Leipzig spot market)</th>
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<tbody>
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1) Discounted with country specific WACC (financing cost)

**Levelized Cost of electricity (LCoE), in ct / kWh**

\[ \text{LCoE} = \text{CAPEX (incl. BoP)} + \text{OPEX} + \text{FUEL} + \text{Lifetime Electricity Production} \]

~2/3 of market is LCoE driven, share is increasing
However, the CAPEX challenges faced Onshore and Offshore are different

Aspects determining the Balance of Plant (BOP) are outside of Siemens Wind Power’s scope of supply – such as foundations, substations, cable supply, and project costs. Improvements of the BOP costs are also addressed in the R-evolution program.
And we need to use all available levers to bring the cost of energy down to meet our target.

\[ \text{LCoE} = \text{CAPEX} + \text{Other CAPEX} + \text{OPEX} \]

- **Reduce Capital Expenditures (CAPEX)** (e.g., lower weight, less components)
- **Reduce other CAPEX outside Siemens scope** (e.g., Offshore foundations, Grid access)
- **Reduce Operating Costs (OPEX)** (e.g., lower maintenance through higher reliability)
- **Increase lifecycle energy output** (e.g., higher efficiency, longer lifetime)
Offshore Sites conditions is increasing the need for technology developments to bring down the cost of Energy
Market requirement defines product targets for R&D New Product Development projects and drives technology development accordingly

### Technology Roadmap

Focus:
- Enable LCOE trajectory
- Mature technologies for introduction in product development projects

Horizon: 2-10 Years

Technologies differentiate based on:
- development possibilities LCC
- Risk profile Maturity/development steps

### Product Roadmap

Focus:
- Market requirement / fit
- LCOE reduction
- Product risk profile
- Introductions from Technology roadmap

Horizon: 5 Years

### Business Plan

Focus:
- Market Requirements
- Customer Business cases
But we also need the support of society to reach our target

- Stable market conditions
- Reliable policy framework
- Financial support throughout the decade
- Grid access
- Lean permitting procedures
If R-evolution succeeds, electricity from wind would be cost competitive, and the future of energy would be different.

Predicted world electricity generation

– Current development –

Source: “New Policies Scenario” Electricity Generation (TWh) IEA-World Energy Outlook, 2010

– Cost competitiveness of wind power –
Bringing the costs of energy down will change the discussion.

From: “How can we afford it?”
To:
“How can we afford not to?”