Redefining the cost debate: The concept of society’s cost of electricity

November 2014
Power generation from CO₂ free sources must also be affordable

LCOE 2013
- Cost reduction
- CO₂-price
+ Fuel prices

= LCOE 2025

2013¹)
- 79 €/MWh
- 63 €/MWh
- 60 €/MWh
- 138 €/MWh
- 81 €/MWh
- 145 €/MWh

2025²)
- 79 €/MWh
- 80 €/MWh
- 67 €/MWh
- 100 €/MWh
- 55 €/MWh
- 95 €/MWh

¹) Based on an increased CO₂-certificate price of 10 Euros per t CO₂
²) Based on an increased CO₂-certificate price of 32 Euros per t CO₂
Costs of offshore wind will be significantly lower at the end of this decade

- **Turbines**
  - Reduce component cost
  - Drive scale effects and industrialization
  - Increase energy production efficiency

- **Foundations**
  - Standardize offshore foundation design
  - Industrialize manufacturing process

- **Grid connection**
  - Reduce complexity of grid connection
  - Innovative grid connection solutions

- **Operation & Maintenance**
  - Increase turbine component quality
  - Reduce O&M hours and frequency of visits

- **2013**
  - 14.5 Ct/kWh

- **2020**
  - <10 Ct/kWh
Today, LCoE is a too narrow approach to find a society’s optimal energy mix

**Levelized Cost of Electricity (LCoE)**

\[
LCoE = \frac{\text{Lifetime Electricity Production}}{\text{Technology}} - \left[ \text{Reduce cost of products} + \text{Improve processes} + \text{Partnering} + \text{Service} \right] + \text{CAPEX (incl. BoP)} + \text{OPEX} + \text{FUEL} \]

**Total-economy costs and benefits of energy production, so called Society’s Cost of Electricity (SCoE)**

- External costs
- Environmental impact
- Geopolitical risks
- Employment effects
- Transmission needs
- Variability costs
A realistic price of CO\textsubscript{2} emissions would make the true social cost of coal utilization more transparent

A fair price would be at 40 Euros per ton CO\textsubscript{2}

Current and expected price of CO\textsubscript{2}-certificates\textsuperscript{1,2)} do not reflect the effects of climate change

1) Calculation based on supposed CO\textsubscript{2}-certificate price of 10 Euros per t of CO\textsubscript{2}; current price is at 4 Euros per t of CO\textsubscript{2}
2) IHS CO\textsubscript{2}-certificate price prognosis 2025: 32.3 Euro per t CO\textsubscript{2}
In Germany conventional sources of energy do get hidden subsidies and support

- Hidden subsidies currently distort the cost perception - and LCoE of conventional sources of energy look lower than they are
- In a majority of cases they are tax financed and therefore are real costs

### Hidden Subsidies

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<th>Source</th>
<th>2010 Subsidies</th>
<th>2018 Subsidies</th>
<th>Notes</th>
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<tbody>
<tr>
<td>Energy Production</td>
<td>47.4 €/MWh</td>
<td>43.7 €/MWh</td>
<td>* Subsidies will expire until 2018</td>
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<td>Insurance Costs</td>
<td>0.4 €/MWh</td>
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Variability: offshore wind utilisation with lower cost for residual power

- Wind energy is feeding power to the grid more consistently and therefore has lower variability costs than e.g. PV.
- Offshore wind is even more reliably generating electricity than onshore wind and therefore needs even less residual power.

### Energy yield

The annual energy yield of offshore wind is **1.5 times** higher than that of onshore wind and **4 times** higher than that of PV.

### Cost of residual power

- 15.5 €/MWh
- 14.5 €/MWh
- 13.6 €/MWh
Offshore wind adds to employment creation – added value in all regions of the country

Investment in wind energy pays off

1 > 21,000

billion new jobs for one year

For every billion Euros invested in wind power 21,000 new jobs for a year are created in the EU.

Direct, indirect and induced employment.

90% of added value in Germany happens in small and mediums sized companies

Share of GER Federal States in regional added value in % (manufacturing, 2010)

1) Source: Ernst&Young 2012
2) Source: PWC 2012 for Germany
Geopolitical risk: Renewable energies have no fuel costs

Offshore wind is a natural hedge against volatile costs of fossil energy sources

* Based on 2-years-future price of fossil fuels (versus 30 years runtime of a power station)
From a macroeconomic perspective wind energy with natural gas as back-up is the least expensive option.

LCOE 2013
- Cost reduction
- CO₂-Price
+ Fuel cost

= LCOE 2025
+ Subsidies
+ Transmission
+ Variability

= LCOE 2025
+ System costs
+ Social impact
- Employment effects
+ Geopolitical risks

= SCOE 2025