

Introduction to developer Levelized cost of energy tool

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Objective of session

The objective of this session is to:

- Introduce the developer LCOE tool
- Present how it is used in FIMO
- Provide examples of how it can be used
- Present exercises to get familiar with the tool

Agenda — Introduction to developer LCOE tool

- Intro to the tool
- Link to FIMOI project
- Walk-through of the tool
 - Structure of tool
 - Data inputs
 - Calculations and results
- Summary of main features
- Exercise

Introduction to LCOE tool

- What is the purpose of the LCOE tool?
- How is it applied in the FIMO project?

Purpose of the tool

The purpose of the LCOE developer tool is to estimate the expected LCoE seen from a developer point of view. Such an LCoE will provide a baseline for the expected bids on future RE projects.

The LCoE tool has previously been used for estimating the expected tariff from the First Offshore Wind Project of India as well as several other feasibility studies around the world.

The tool works for any renewable energy technology.

The tool is Excel based and provides the user with options for loan structuring, public funding and incentives, typical PPA design features and estimation of impact of uncertainty of variable generation

The tool is available from the DEA e-learning website

The screenshot displays the LCOE developer tool interface within an Excel spreadsheet. The interface is organized into several sections:

- Navigation:** A vertical menu on the right side of the spreadsheet, divided into three main sections:
 - Main interface and output:** Contains buttons for 'Introduction' (light grey), 'User interface' (dark blue), 'Results' (yellow), and 'Finance' (light grey). Each button has a corresponding description of its function.
 - Input data:** Contains buttons for 'Technical data' (blue), 'CAPEX & OPEX' (blue), 'Exchange rate' (blue), and 'Inflation' (blue).
 - Auxiliary input:** Contains buttons for 'Sensitivity' (green) and 'Data transformation' (dark grey).
- Main Content Area:** Features a large image of wind turbines under a blue sky with the 'COWI' logo. Below the image, there is a text box containing project details:
 - Project number: A132430
 - Date: 2/6/2020
 - Created by: MHO/APHE
 - Checked by:
 - Approved by:
 - Version: 1.0
- Disclaimer:** A text box below the project details stating: "Acceptance of this model by the client is on the basis that COWI A/S or any person acting on behalf of COWI A/S is not in any way to be liable for any damage; including any investment decisions, loss of profit, loss of savings, or other incidental or consequential damage arising out of the".

Application of the tool in the FIMOI project

In the FIMOI project the tool is used for assessing expected prices of first offshore wind farms in India

Standard LCoE estimations often overlook the fact that PPA design can have a big impact on the price of renewable energy. This tool provides the user with options for investigating the impact of various standard PPA contract terms such as:

- Late commissioning penalties
- Committed generation and associated penalties
- Curtailment
- Payment terms i.e. the delay/lag in payment from delivery of energy to payment from off-taker
- Indexing
- Exchange rate risk

Navigation

Main interface and output

- Introduction: Gives an introduction to the model
- User interface: Offers the user a variety of options for customizing input parameters and main results
- Results: Offers a variety of plots of sensitivity runs
- Finance: A full financial model based annual figures including cash flows, profit loss statement and balance sheet

Input data

- Technical data: Annual gross energy production and choice of technology
- CAPEX & OPEX: CAPEX and OPEX estimates and tax rates differentiable by CAPEX categories
- Exchange rate: Time series of exchange rate
- Inflation: Time series of projected inflation

Auxiliary input

- Sensitivity: Definition of sensitivity runs and output from sensitivity runs

Data transformation sheets

- Result tables: Tables with results from sensitivity analyses, organized for use in charts
- Data transformation: Utility sheet which transform inputs for use in financial modeling. Sensitivity parameters are also included here

Walk-through of the tool

- What is the overall structure?
- Which data inputs are required?
- How are calculations performed?
- Which results (and interpretations) does the tool provide?
- How can more studies be carried out?

Summary of developer LCOE tool

The main features of the tool relevant for the FIMOJ project and the Indian context are:

- Analysis of expected developer costs for concrete projects within the wind sector
- Analysis and evaluation of main cost parameters for LCOE costs
- Sensitivity analysis of the impact of PPA contract design

The screenshot displays the COWI LCOE tool interface within an Excel spreadsheet. The interface is divided into several sections:

- Navigation:** A list of buttons for navigating through the tool's features.
 - Main interface and output:**
 - Introduction:** Gives an introduction to the model.
 - User interface:** Offers the user a variety of options for customizing input parameters and main results.
 - Results:** Offers a variety of plots of sensitivity runs.
 - Finance:** A full financial model based annual figures including cash flows, profit loss statement and balance sheet.
 - Input data:**
 - Technical data:** Annual gross energy production and choice of technology.
 - CAPEX & OPEX:** CAPEX and OPEX estimates and tax rates differentiable by CAPEX categories.
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Q&A Session on Monday, June 15

Live online Q&A session discussing:

- Possible questions from presentations and the project
- The exercises
- Brief evaluation

If you have any questions or points that are worth discussing, please send the questions in advance to keha@ens.dk

They will be aggregated and answered by the DEA!

Exercise

Question 1:

What happens if you increase CAPEX of DEMO1 by 10%?

- How much does the LCOE increase?
- Try updating the decosting chart

Question 2:

what happens if you increase the Gross AEP of DEMO1 by 10%?

- How much does the LCOW increase?
- Try updating the sensitivity plots using the update button

Thank you for listening!

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