KIC InnoEnergy

The Leading Engine for Innovation and Entrepreneurship in Sustainable Energy

DELPHOS

by KIC InnoEnergy

Tracking the impact of innovation on the levelised cost of energy

Methodology note

How technology innovation is anticipated to reduce the cost of energy from renewable energy power plants

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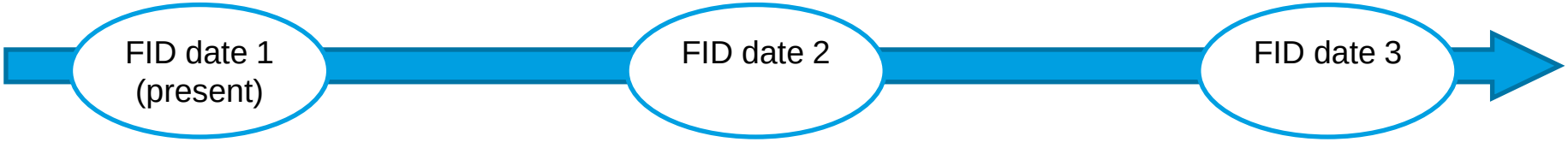
Methodology: baseline scenarios

- The Delphos model studies **baseline scenarios** under different Final Investment Decision (FID) dates

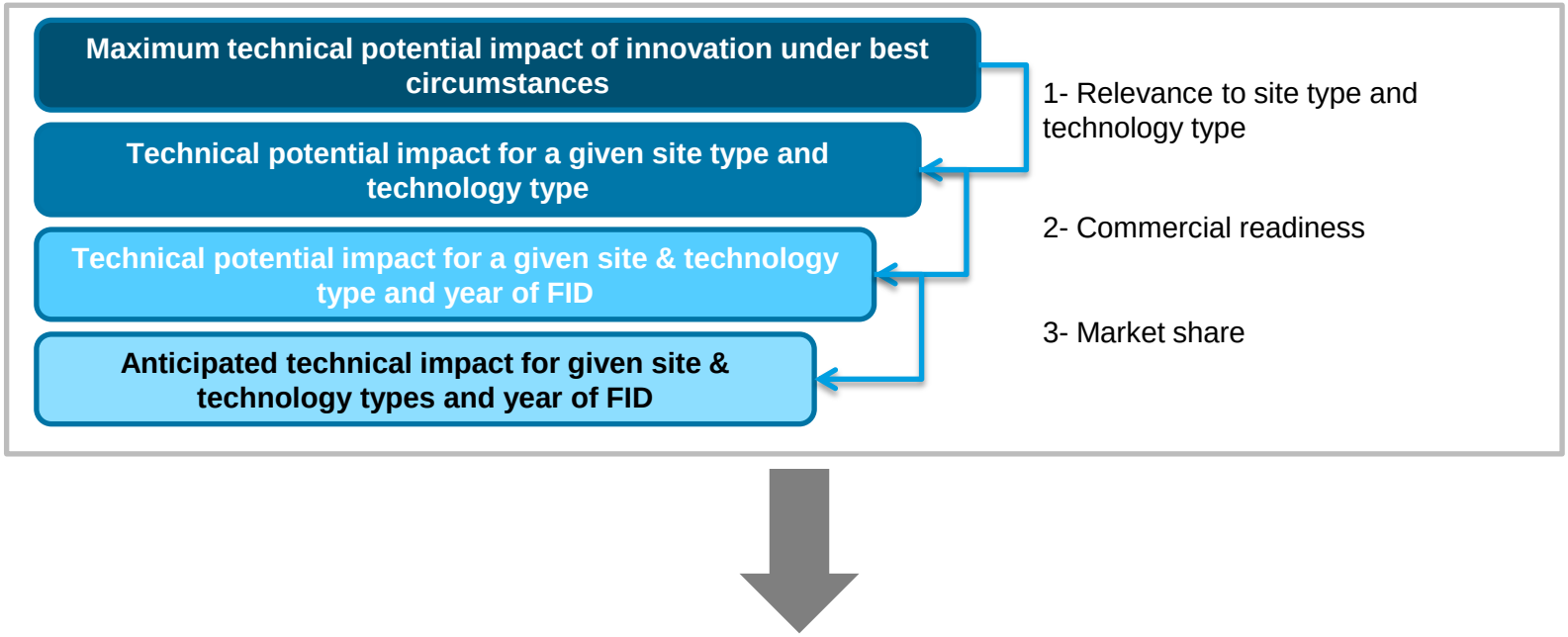


- Baseline scenarios correspond to **plant types** representative of average European installations.

"Project elements" in FID 1	
CAPEX	= Up to 5 possible sub-category
OPEX	= Up to 2 possible sub-category
AEP	= Include Gross AEP & losses

Methodology: modelling of the impact of innovations

For each innovation:



Impact / adjuster	Range	Value / formula
Maximum technical potential impact	[-100%;100%]	a%
1- Relevance to site type and tech type	[0;100%]	b%
2- Commercial readiness at FID date	[0;100%]	c%
3- Market share for Tech type at FID date	[0;100%]	d%
Anticipated impact	[-100%;100%]	a x b x c x d %

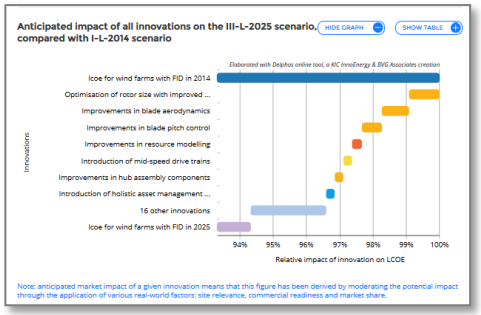
Methodology: simple LCOE calculation

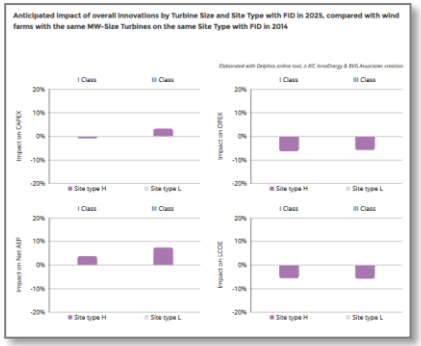
FID date 1 (present)		FID date 2		FID date 3
"Project elements" in FID 1	Impact of innovation	**"Project elements" in FID 2**	Impact of innovation	**"Project elements" in FID 3**
$CAPEX_{FID1}$		$CAPEX_{FID2}$		$CAPEX_{FID3}$
$OPEX_{FID1}$		$OPEX_{FID2}$		$OPEX_{FID3}$
AEP_{FID1}		AEP_{FID2}		AEP_{FID3}

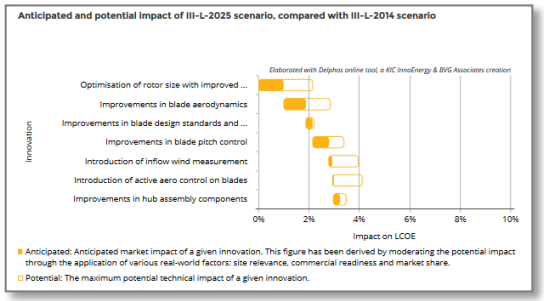
$$LCOE_{FIDx} = \frac{capex_{FIDx} + opex_{FIDx} + generic\ wacc}{Net\ AEP_{FIDx}}$$

In this step the results only focus on % of variation of those values in time, no absolute values.

Results: **all relative value calculations** (all graphs in the *outputs results window* use this methodology except the first one).







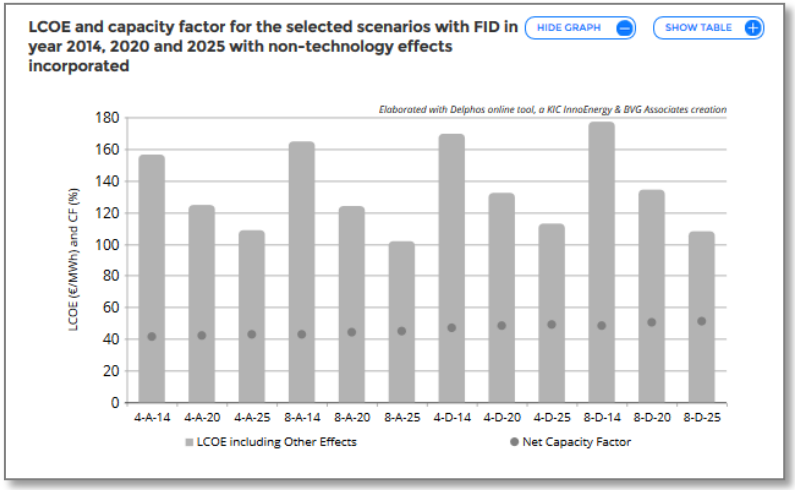
Methodology: complete LCOE calculation

Complete LCOE calculation includes non technology effects to give a full, real picture of LCOE evolution through time.

For example for year 2025:

$$LCOE_{FIDx} = \frac{capex_{FIDx} + opex_{FIDx} + specific\ wacc_{FIDx}}{energy_{FIDx}} \times non\ technology\ effects_{FIDx}$$

Results: methodology used for **absolute value calculations** only for the first graph of the *output results window.*



Glossary

AEP.	Annual energy production.
Anticipated impact.	Term used in this methodolgy to quantify the anticipated market impact of a given innovation. This figure has been derived by moderating the Potential impact through application of various real-world factors or adjusters.
Baseline.	Term used in this methodology to refer to ‘today’s‘ technology, as would be incorporated into a project.
CAPEX.	Capital expenditure.
FID.	Final investment decision, defined here as that point of a project life cycle at which all consents, agreements and contracts that are required in order to commence project construction have been signed (or are at or near execution form) and there is a firm commitment by equity holders and in the case of debt finance, debt funders, to provide or mobilise funding to cover the majority of construction costs.
Generic WACC.	Weighted average cost of capital applied to generate LCOE-based comparisons of technical innovations across Scenarios.
LCOE.	Levelised cost of energy, considered here as pre-tax and real in end 2013 terms.
OPEX.	Operational expenditure.
Other Effects.	Effects beyond those of wind farm innovations, such as supply chain competition and changes in financing costs. Also called Non technology effects.
Potential impact.	Term used in this methodology to quantify the maximum potential technical impact of a given innovation. This impact is then moderated through application of various real-world factors.
Scenario.	A specific combination of Site Type, Technology Type and year of FID.
Site Type.	Term used in this methodology to describe a representative set of physical parameters for a location where a project may be developed.
Specific WACC.	Weighted average cost of capital associated with a specific Scenario. Used to calculate real-world LCOE incorporating Other Effects.
Technology Type.	Term used in this methodology to describe the technology available at the relevant scale to allow project development.
WACC.	Weighted average cost of capital, considered here as real and pre-tax.

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