A financial model to achieve cost reductions

Wind Europe Hamburg

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Presentation Content

- Industry Cost Reduction in the news recently
- Financial Models
  - Objectives/Capabilities
  - Model structure
  - General Outputs
  - Potential end-users
- Supporting LEAN system of project development using the models
- Future work
- How you can access the models

Industry Cost Reduction News

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Regional Inter-national Agreement

- 3rd of June 2016: ***Energy Ministers from 9 countries*** signed a MOU and Work Programme

https://windeurope.org/newsroom/press-releases/windeurope-welcomes-energy-ministers-deal-to-cooperate-on-offshore-wind/

https://ec.europa.eu/energy/en/news/north-seas-countries-agree-closer-energy-cooperation

Industry Cost Reduction News

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Industry Declaration

- On the same day, 11 energy companies signed a declaration saying offshore wind ***can reduce costs to €80/MWh by 2025***

http://www.offshorewindindustry.com/news/major-energy-companies-sign-offshore-wind

Industry Cost Reduction News

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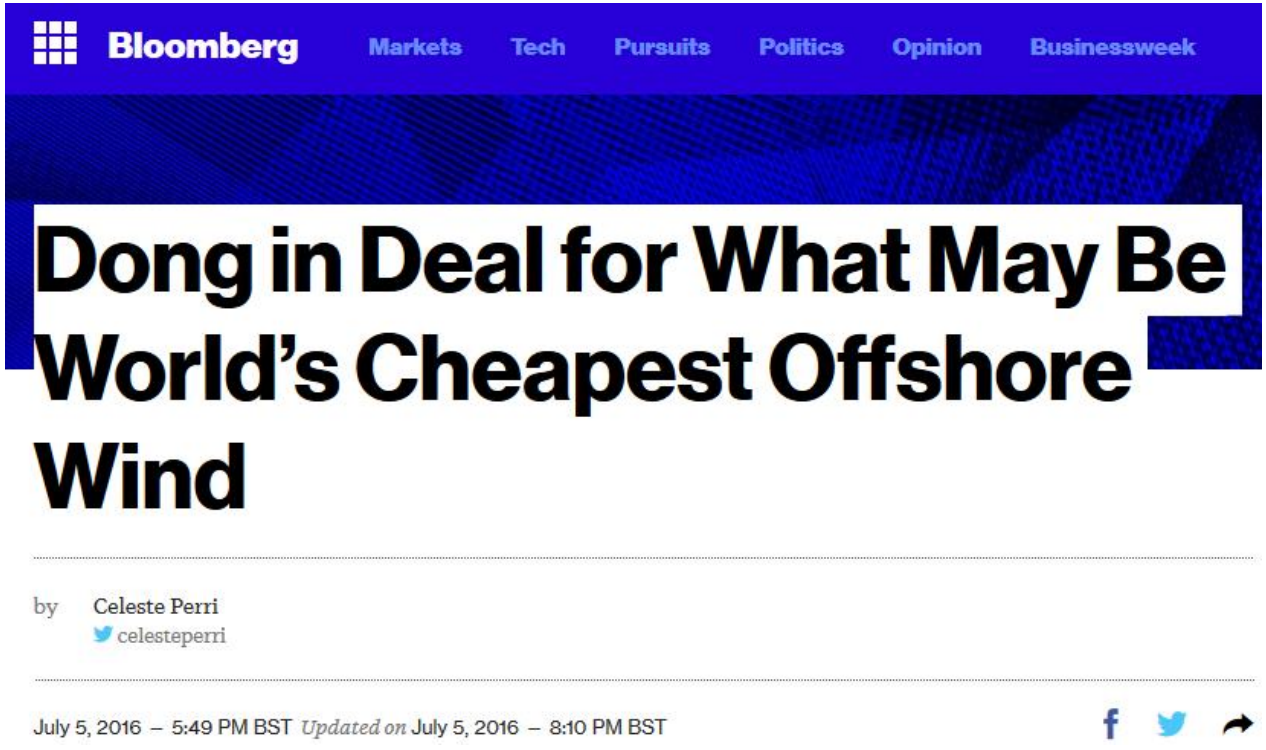
DONG Energy bid Breaks €10/kWh barrier

- A month later, DONG Energy announced that they have bid for the Dutch Borssele site with € 7.27/kWh (excluding transmission costs)


Bloomberg Markets Tech Pursuits Politics Opinion Businessweek

Dong in Deal for What May Be World's Cheapest Offshore Wind

by Celeste Perri
celesteperri

July 5, 2016 – 5:49 PM BST *Updated on* July 5, 2016 – 8:10 PM BST

http://www.dongenergy.com/en/media/newsroom/news/articles/dong-energy-wins-tender-for-dutch-offshore-wind-farms

http://www.bloomberg.com/news/articles/2016-07-05/dong-energy-win-what-may-be-world-s-cheapest-offshore-wind-deal

Financial models: Objectives/Capabilities

Models:

- Develop detailed financial models which can be used to provide input in FEED stage decision making
- Project phase models which can be used independently
  - Installation phase
  - O&M phase
  - Decommissioning phase

Required analysis capabilities:

- Analyse and compare different logistics strategies and technologies (through sensitivity analysis and scenarios testing) for their cost reduction potential
- Particularly:
  - Innovative vessels for installation and O&M
  - New sub-structure designs – fixed and floating

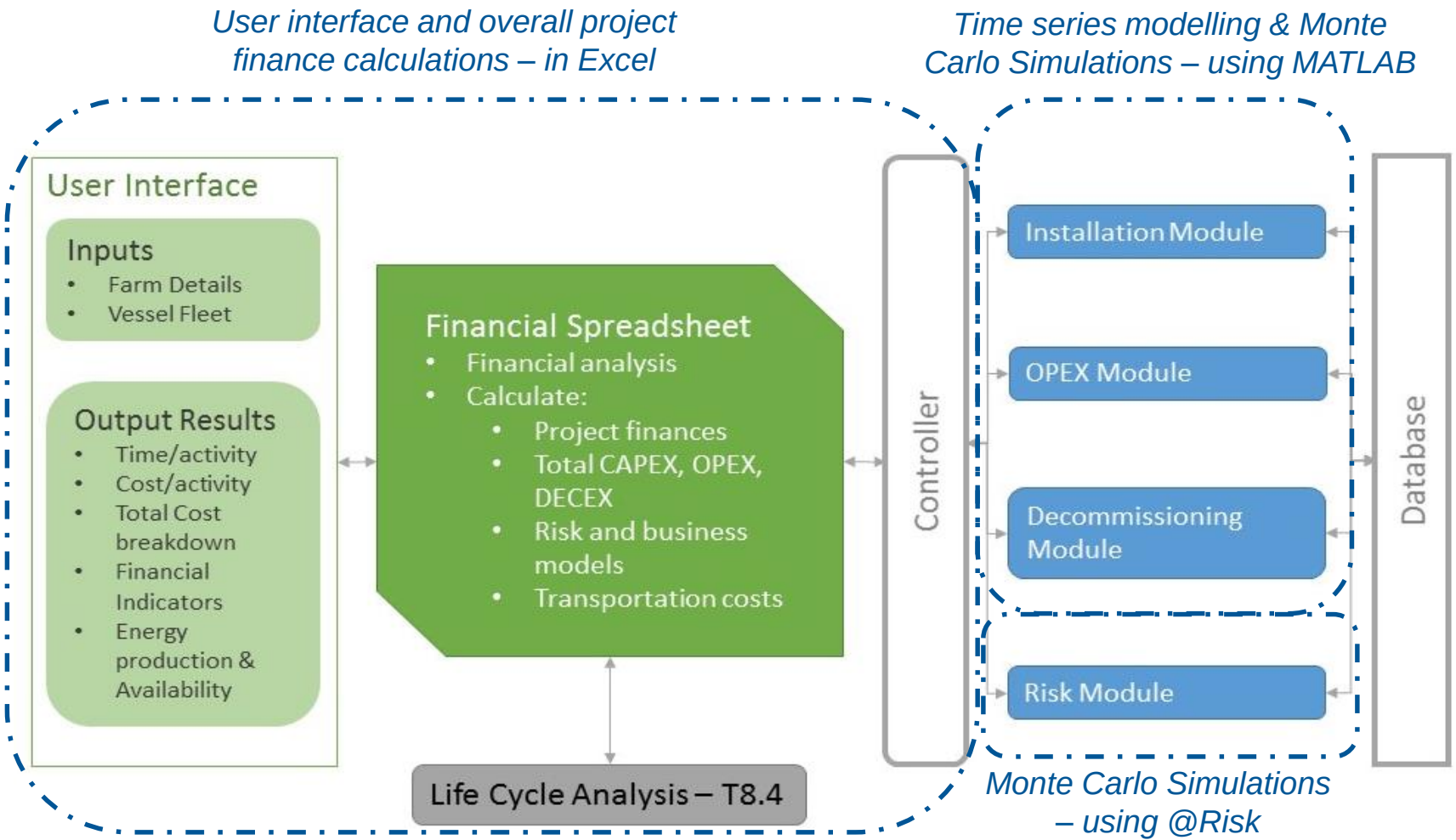
Financial Models: Structure

- Excel cash flow sheet with a number of user data entry sheets and editable databases
- Detailed simulation of the Installation, O&M and Decommissioning phases
- Using Excel interface; with MATLAB software for Monte Carlo simulations

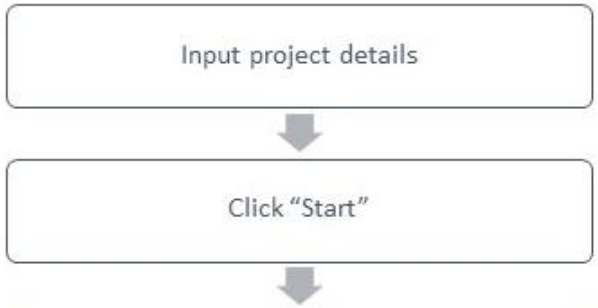
- Model is:
  - non-proprietary (currently)
  - unbiased, independent
  - financial assessment tool
  - for use by numerous potential users
  - In an accessible software
  - Developed by engineers for engineers and project managers

Financial Model Structure

Progress & Results: Financial model



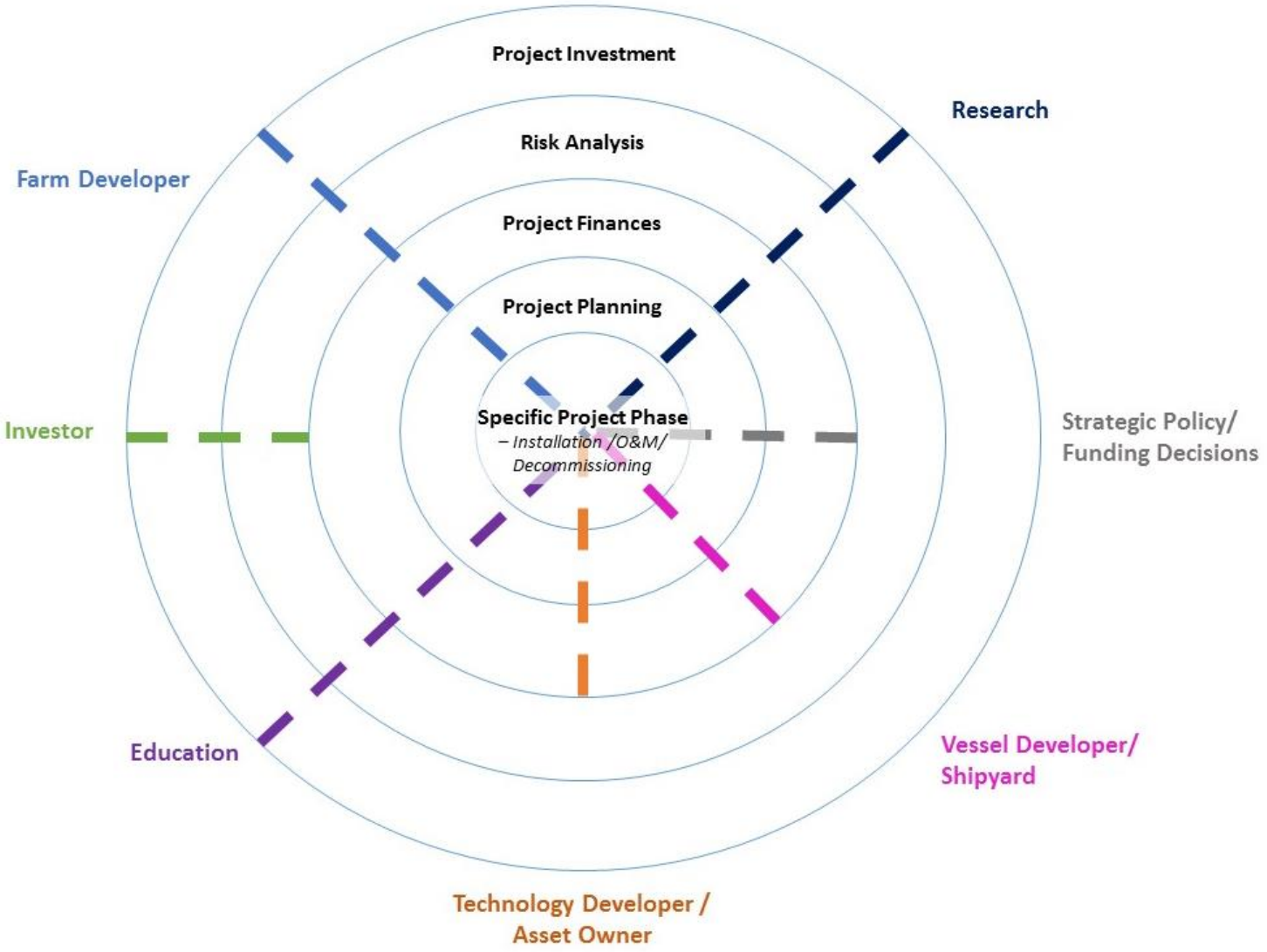
Financial Models: Step-by-step use



Model outputs

- Annual cashflow sheet
- Summary project finances (NPV, IRR, LCOE, etc.)
- Summary data (time and cost) for each project phase:
  - Installation
  - Operation and maintenance
  - Decommissioning
- Detailed data for each project phase
  - E.g. distance travelled and fuel costs for each vessel and activity type
  - Time spent in transit, weather delay times, etc.

Financial Models: Potential End Users



Supporting LEAN project development

- The primary purpose of the LEANWIND project is to look at how, by ***addressing the full life cycle of a project in a LEAN manner, cost savings can be found***.

LEAN principles dictate that ***time and productivity efficiencies will lead to cost savings when the main focus is on improving quality***.

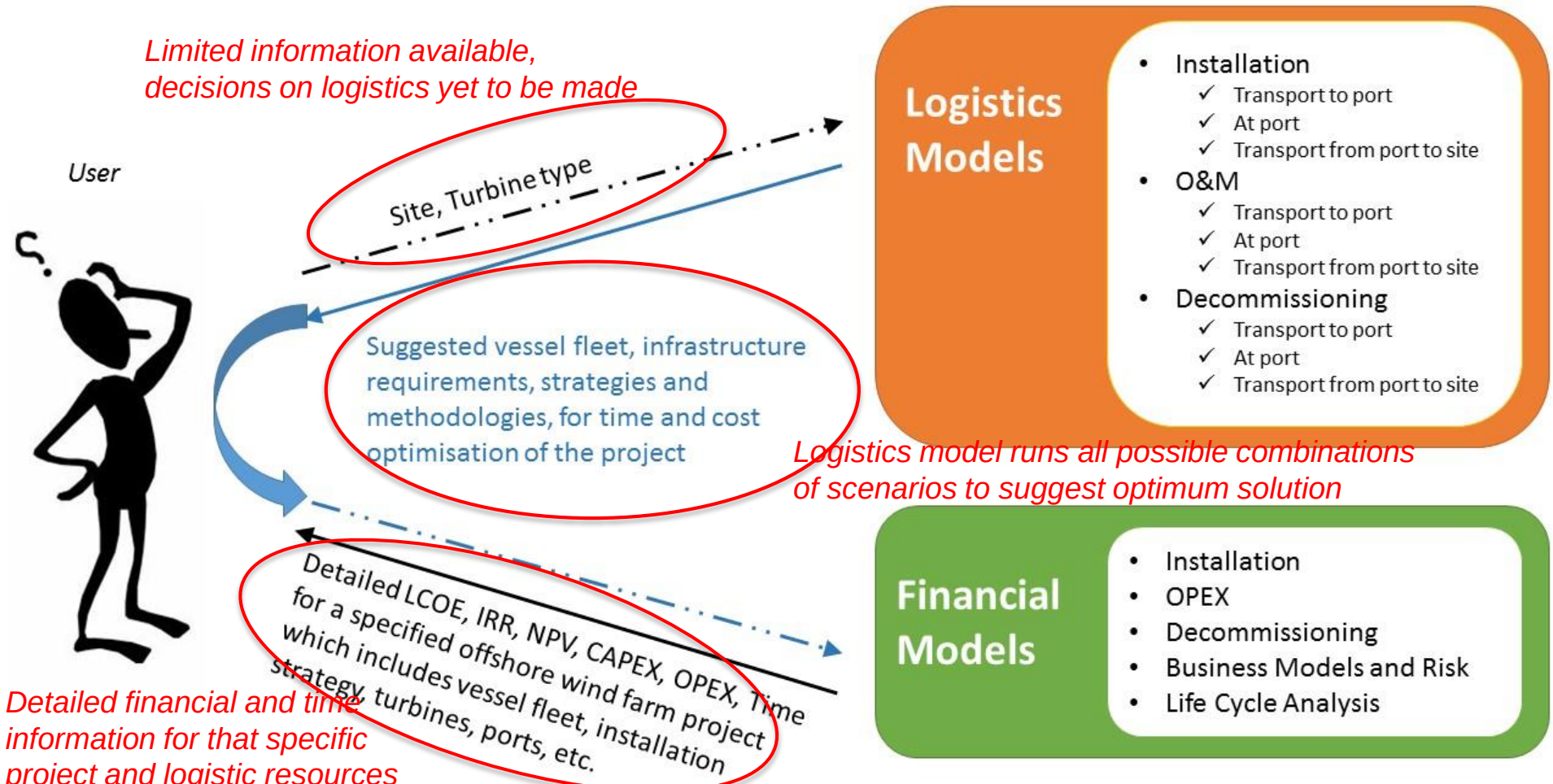
- Therefore, the financial model provides **detailed time and cost assessments** of each major phase in a project - i.e. installation, operations and decommissioning - which input to a broader full project assessment

- The financial models can be used with full life cycle logistics optimisation models

Supporting LEAN project development

Use of Financial with Logistics optimisation models:

- Financial and Logistics models will be used together at the start of next year



Next Steps: Further development

The next steps for the financial model include:

1. integration with the logistics models.
2. validation together with the logistics models
3. Analysis of the technologies developed in the LEANWIND project.
4. Provide input to the Environmental Life Cycle Assessment models

Initial results and analysis expected in Spring next year

Next Steps: Planned Analysis

Using LEANWIND representative sites:

Installation Phase:

- Floating wind platforms:
  - Modelling possible installation strategies impacts on costs and power production for exposed and benign sites
- Float-out installation of jacket structures and gravity base foundations
  - Compare to “standard” craned vessel installation methods for time and cost implications
- Use of larger WTIV (wind turbine installation vessels) – potentially DP or a jack-up to look at the impact on cost and time
- Consider the use of a second port for one primary component e.g. foundations
- …

Next Steps: Planned Analysis

O&M Phase:

- Impact on time and cost with use of motherships, remote presence maintenance systems, helicopters, etc.
- Use of larger CTVs (crew transfer vessels) with improved access limits offshore
- Floating wind platforms: Modelling possible O&M strategies impacts on costs and power production for exposed and benign sites
- …

Decommissioning:

- Time series modelling of the decommissioning process
- Considering recycling, staged decommissioning, etc
- Challenge the current generic assumptions when calculating decommissioning costs
- …

Financial Models: Access/Use

Available for use by contacting the relevant project partners:

- In the first instance: contact leanwind@ucc.ie

- Currently working with a number of major industry organisations (internal and external to the project) interested in collaborating with LEANWIND to use the models to assess their innovations in foundation and vessel technologies.

- Post-LEANWIND Project: model developers are ensuring ongoing use and access to the models
- Project partners will receive executable versions (not editable)

Thank You

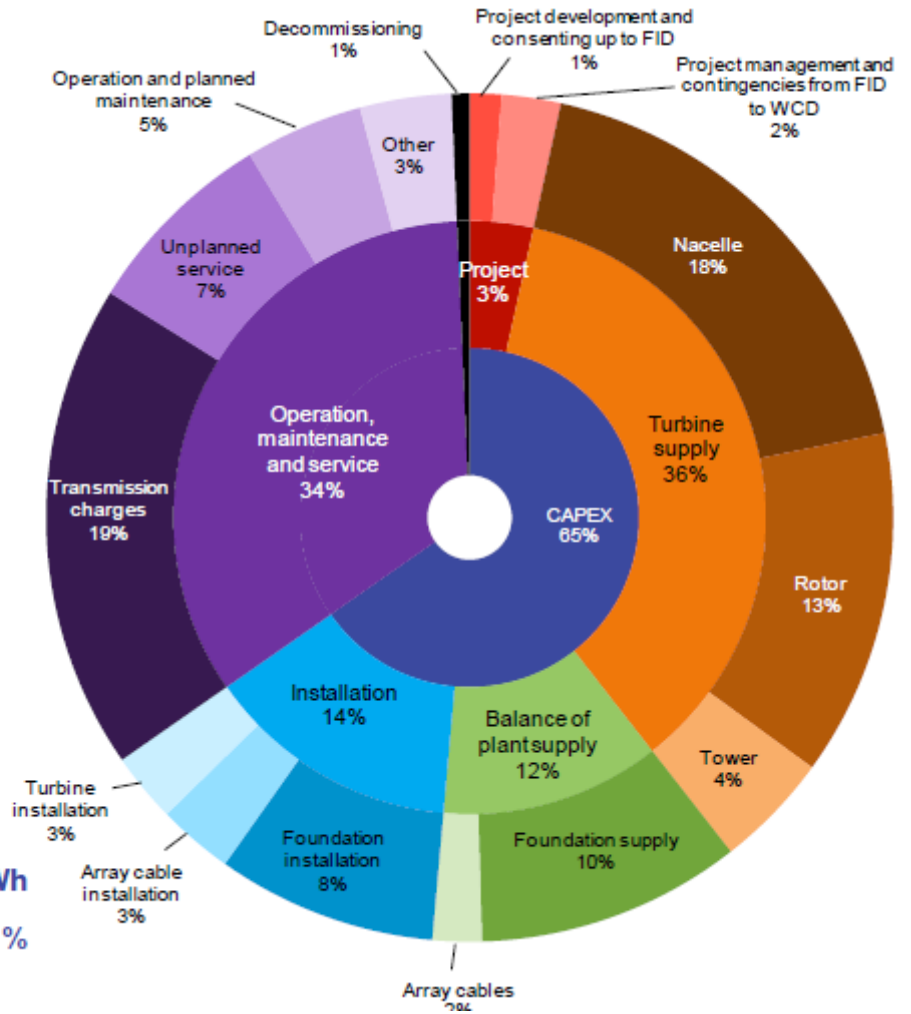
- Questions welcome

Financial models: Objectives/Capabilities

Cost reduction expected through:

- Technological innovations
  - Offshore wind cost reduction pathways reports
  - BVG 2013 report “Offshore wind: Industry’s journey to £100/MWh”

- Supply Chain improvements
  - BVG analysis shows supply chain innovation will continue to play a significant role in cost reduction, especially as economies of scale are realised as project pipelines increase in scale and certainty.
    (BVG e-newsletter September 2016)



Ref: BVG Associates, 'Offshore wind: Industry's journey to £100/MWh,' May 2013

Assumptions:

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Some relevant higher level assumptions:

- LCOE is calculated as the sum of costs (OPEX, CAPEX, DECEX) over the lifetime of the project, divided by the sum of electricity generated during the project lifetime. (This is based on the NREL formula)
- Taxation is **not** included in the LCOE calculation
- Financial calculations assume a **single currency** is used throughout the project lifecycle, there is no treatment of currency conversion costs
- **Loss of revenue due to grid constraints** is only included through a percentage factor inputted by the user and used in the calculation of the energy production in the OPEX module.
- Loss of revenue from **grid operator curtailment is not considered** in the model
- **Energy production is relatively simplistic**
  - The model takes a wind turbine power curve and uses annual wind speed data to calculate power production using a user defined wake effects loss and electricity distribution loss. This limits the analysis that can be carried out on the effects of energy cost.