



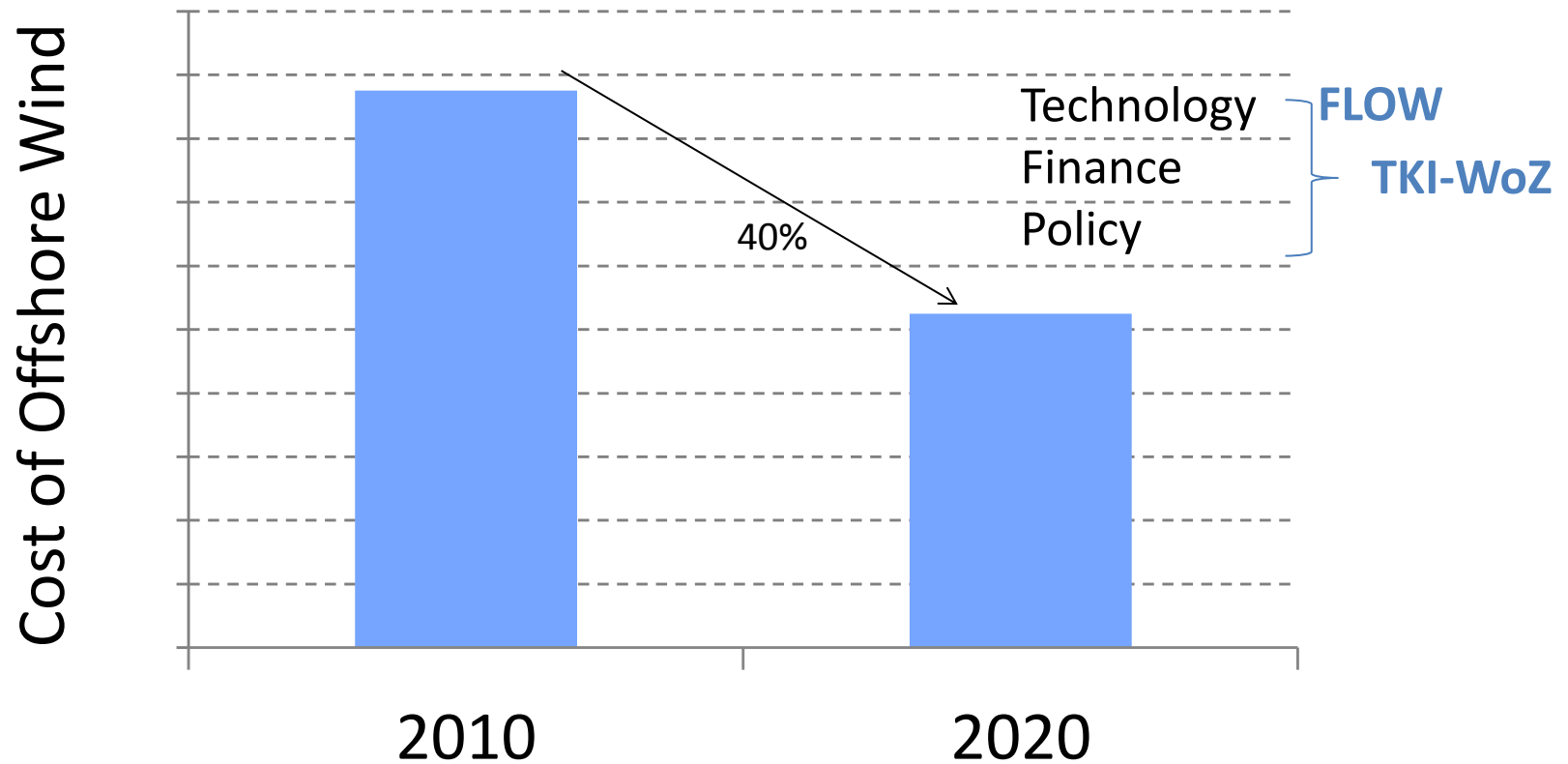
Bob Prinsen - Ecofys

Introduction FLOW/TKI Offshore Wind Cost Model

Windkracht 14

23-01-2014

Cost reduction



Objectives of the FLOW/TKI Model

1. Where are we coming from?

=> Establish **baseline** cost-of-energy for Dutch offshore wind in 2010

2. What will the future look like?

=> Cost of energy for wind farms in Dutch North Sea up to 2020

3. Where are the opportunities for cost reduction?

=> Cost reduction through technical innovation

=> Cost reduction through optimised **finance, policy and permitting**

Approach

1. Build on what has been done in the past

2. Customize to situation

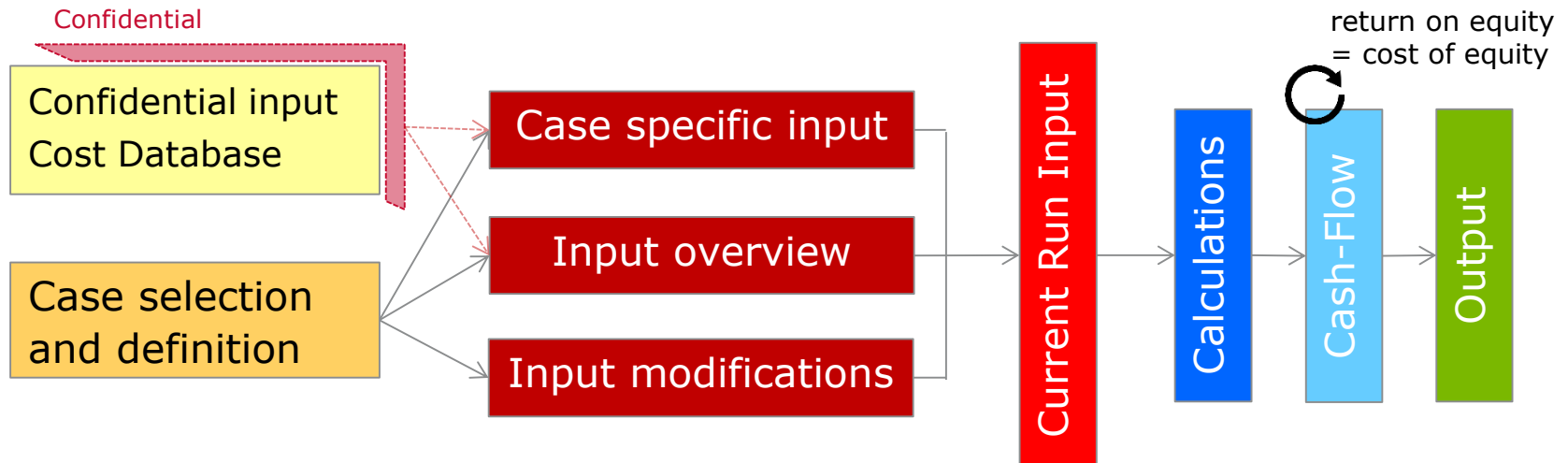
3. Incorporate

4. Implement



Definition of cost

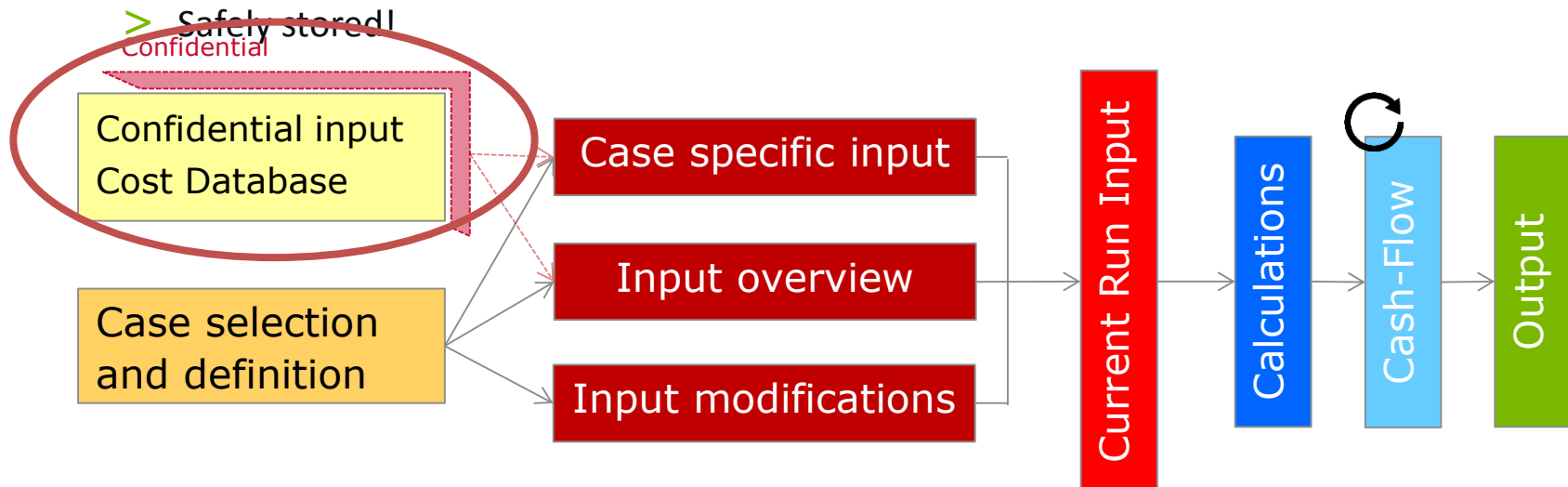
- > What cost are looking at?
 - > Point of view: Project developer
 - > Levelised Cost of Energy: The required revenue per MWh, that creates a financially interesting project for the owner/developer



Input data set

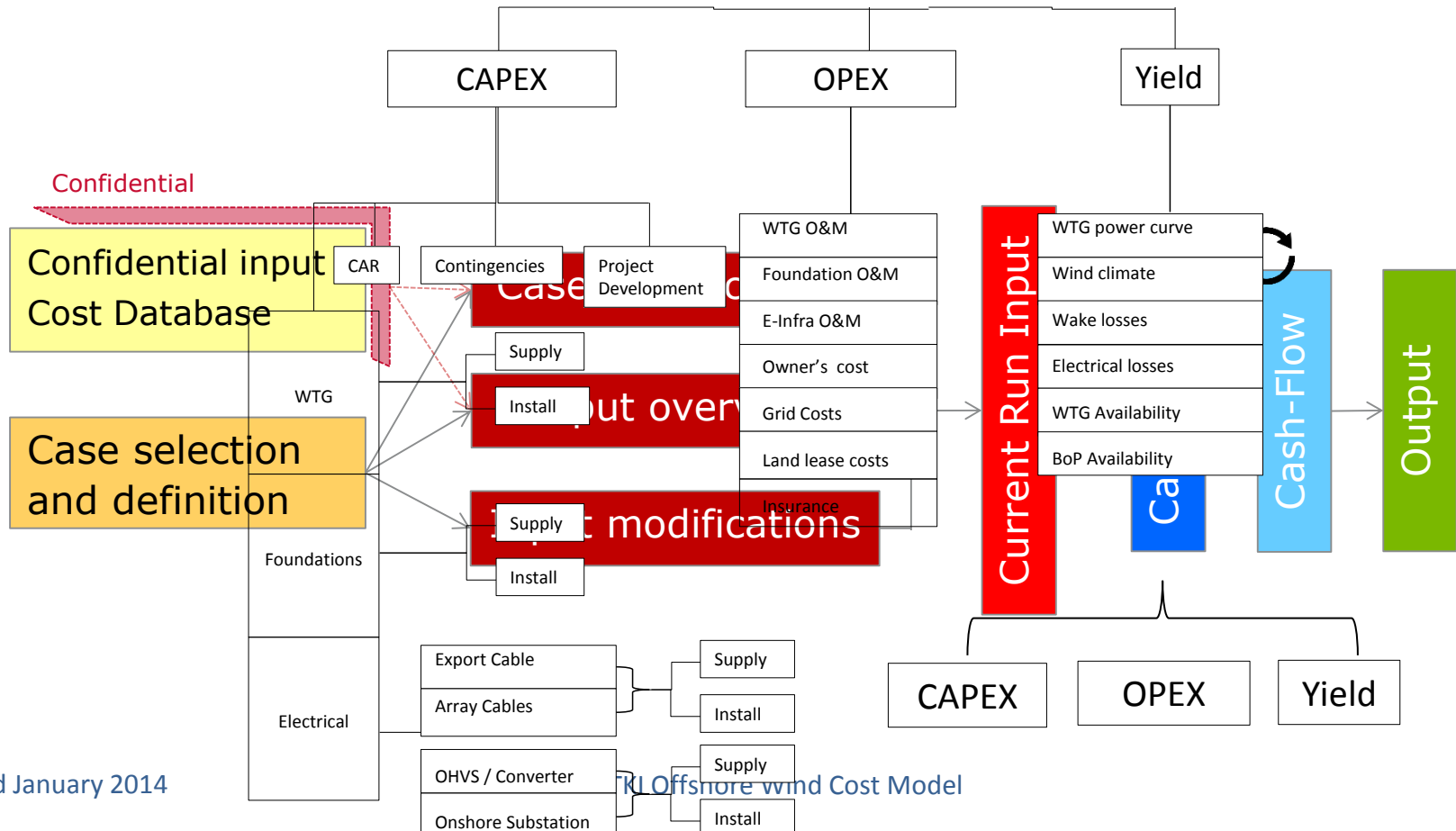
> Establishing the data set

- > Market information from FLOW partners
- > Public data
- > Stored in cost database => price indexation
- > Fed into model through aggregation, averaging, scaling laws
- > Safely stored!
Confidential

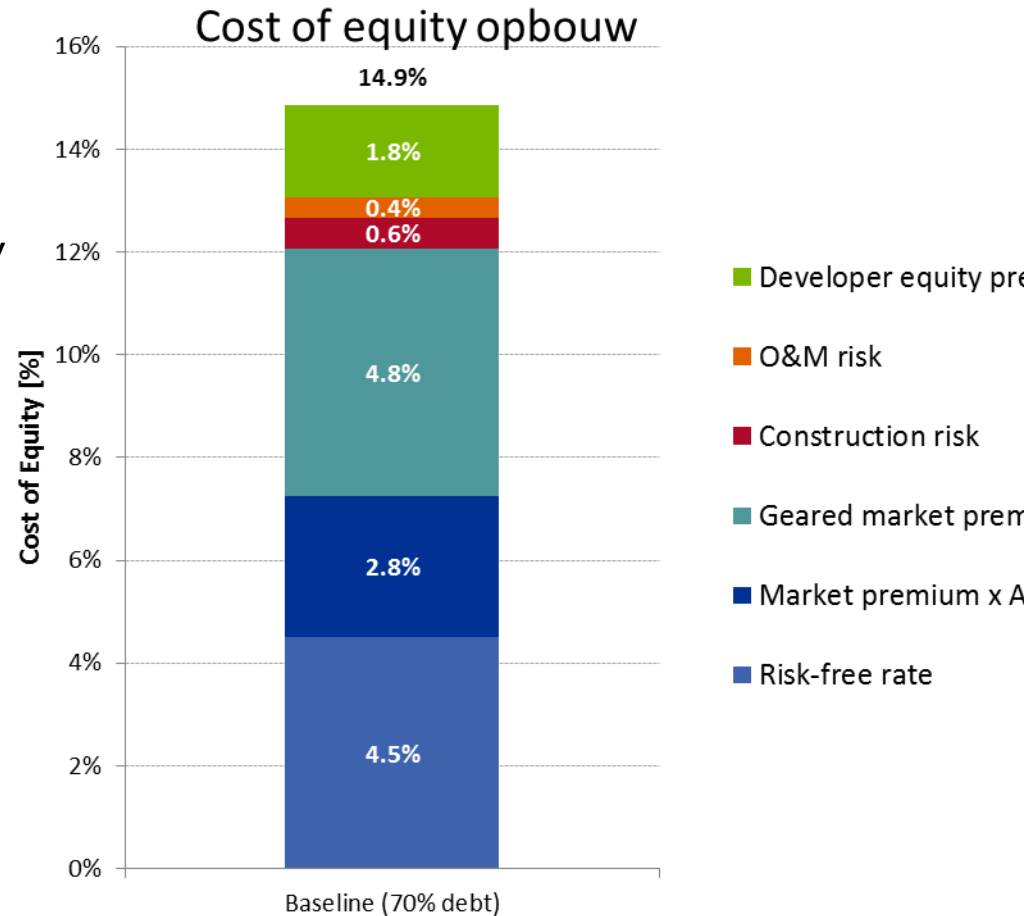


Technical innovation

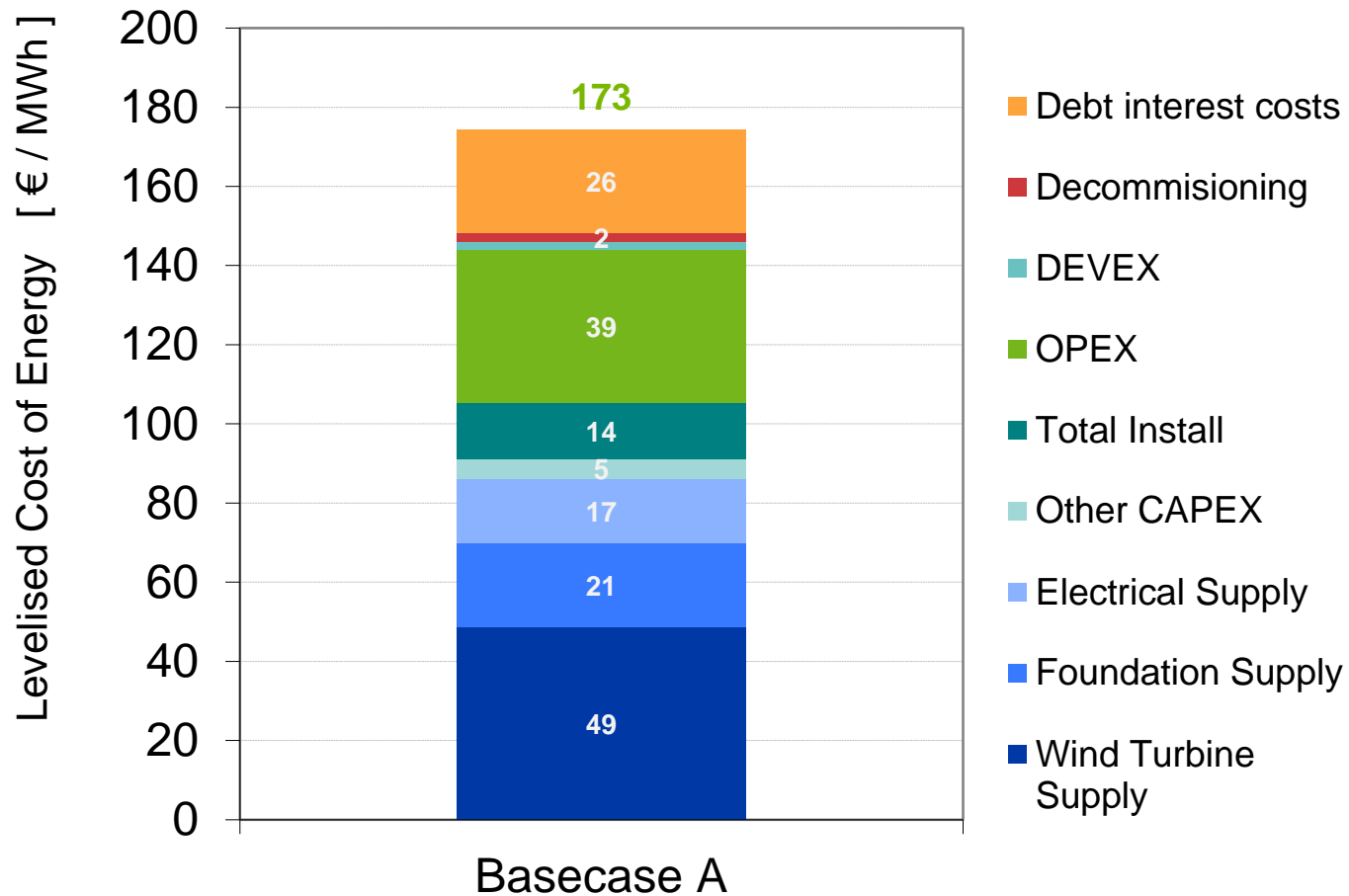
- > Calculation of impact of technical innovation
 - > Establish a baseline
 - > Level of detail cost calculations



- > Flexibility in financing
 - > Balance vs. project finance
 - > Terms and rates
 - > Detailed look at cost of equity
- > Flexibility in cash flow
 - > 3 phases
 - > Timing of cost/revenue!



Typical output



Specifics of model related to Dutch Wind Farms

- > Dutch specific elements necessary for FLOW objectives
 - High share of confidential cost and technical data from Dutch industry players
 - Wind farm definitions based on Dutch concession areas
 - Development cost: dependent Dutch permitting scheme
 - Electrical infrastructure: fully in scope owner
 - Finance and tax conditions typical of Dutch OFW projects



- > Possible to implement different country cases, using the FLOW/TKI model as a basis

Recent applications

FLOW:

- Cost reduction through innovative tech. projects

TKI – EZ:

- Impact of policy instruments on the cost of energy

http://www.tki-windopzee.nl/files/2013-11/20131028_MEM_TKI_Eindrapportage%20financierings-%20en%20beleidsopties%20wind%20op%20zee_FINAL.pdf

TKI – NWEA:

- Impact of permitting on the cost of energy

Near future: Web-based version of model

Examples: overview

I – Technical Innovation

- > Internal array cables

II – Policy instrument

- > Front-loading subsidy

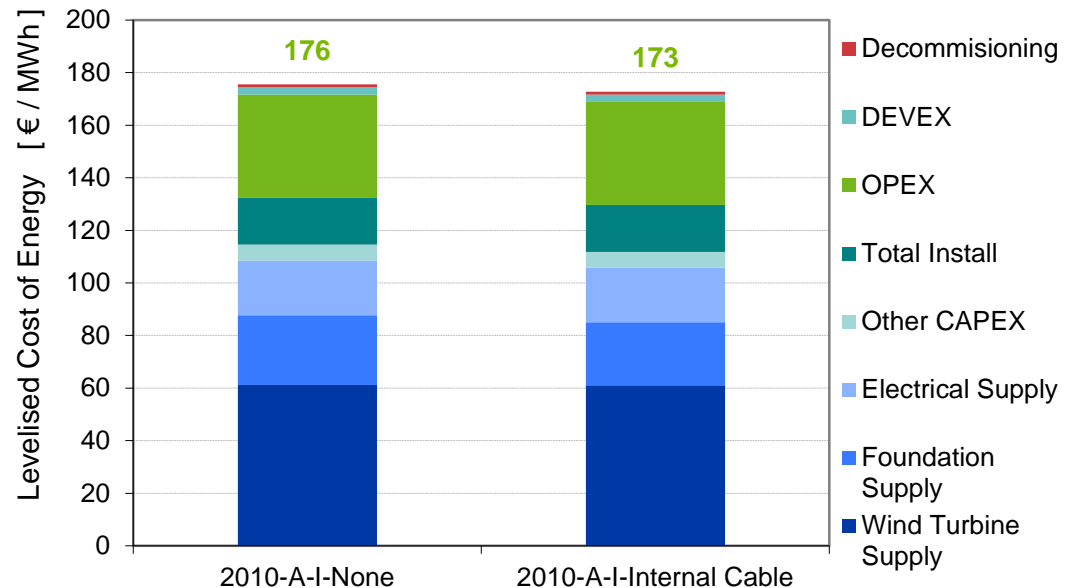
III – Permitting scheme

- > Revision of piling restriction

Example I: Technical innovation

Internal array cables

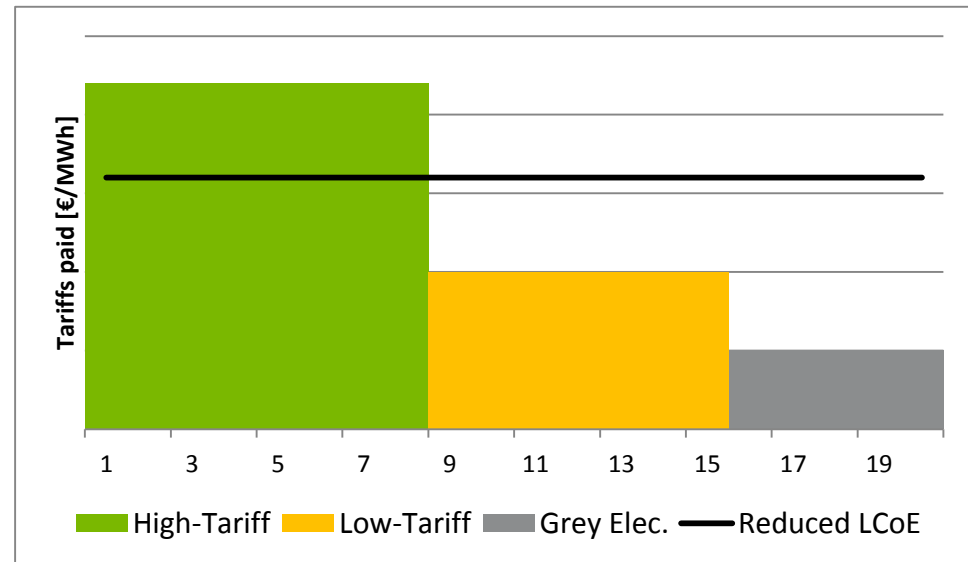
- Current industry standard: External J-tubes
- Alternative solution: internal cable routing
- Benefits:
 - Reduce secondary steel
 - Reduce wave loading
- Result:
 - Reduction: -2%



Example II: Policy instrument

Front-loading subsidy scheme

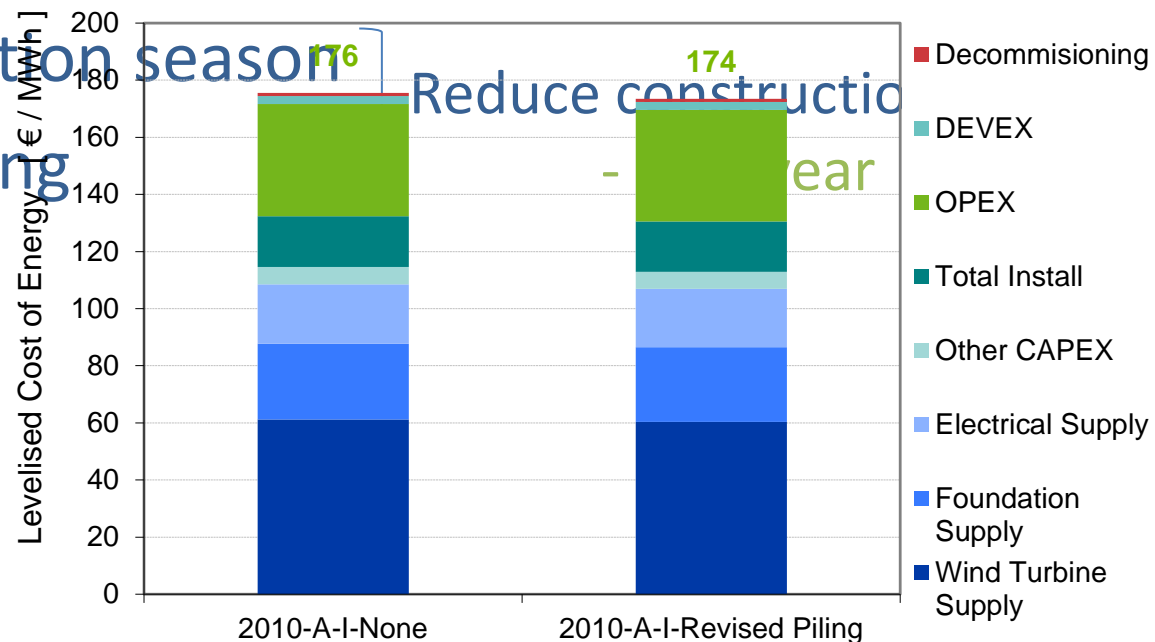
- Analogous German Stauchungsmodell
- High discount rate: early revenues weigh high
- Front loading increases Net Present Value revenues
- Reduces cost of energy
- Result:
 - Reduction: 4-8%



Example III: Permitting scheme

Revised piling restrictions

- Monopile installation season curtailed
- Alternative solution: noise restriction & mitigation
- Benefits
 - Optimal installation season
 - Optimise planning
- Result:
 - Reduction: -1%



Take-away message

- > Established cost model on foundation of **industry data**
- > **Wide range of uses: technical, financial, policy**
- > **Web version publicly available in future**

Thank you

Please contact us for more information

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