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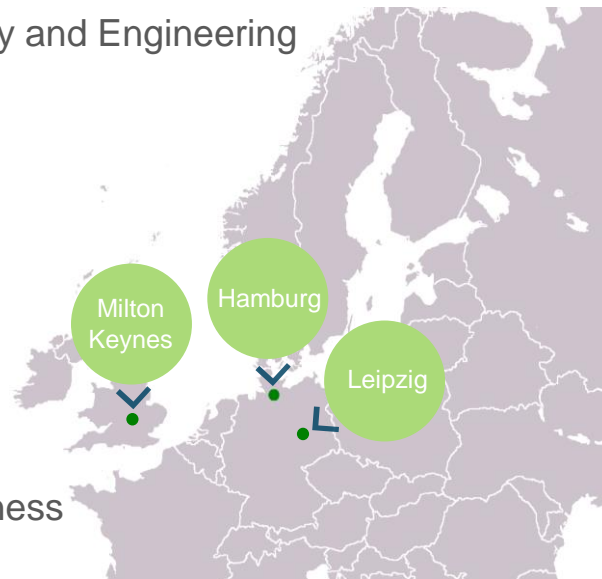
How to utilize lessons learned from O&M

The O&M Based Approach to Project Development
- Thinking from the End in Order to Generate LCOE Optimised Projects

Florian Stüwe, October 6th 2021,
Intersolar Munich

greentech is a key-player in the European PV service landscape

- Specialist for PV Services: O&M, Asset Management, Advisory and Engineering
- 7 MEUR revenue in 2020
- >800 MWp of PV plants under management
- Proven market expert and one of the biggest independent service providers across Germany and Europe:
 - Experienced management and a qualified team of 75
 - Modular and comprehensive service portfolio
 - High degree of innovation, processual and IT-driven business
 - Active in 10 countries

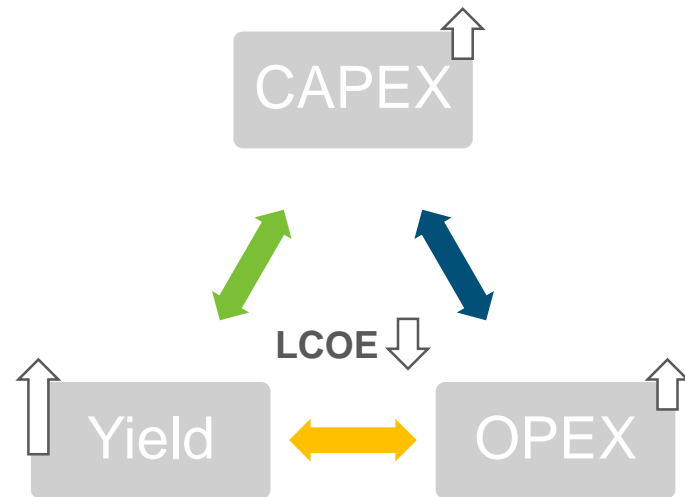


O&M knowledge has a major impact on LCOE

Considerations and relevance for PV and O&M

- 3 variable elements to LCOE with high interdependencies
- Out of all renewable energy sources (in Germany¹), **PV** has
 - by far **lowest OPEX** overall and
 - **highest LCOE sensitivity** regarding variation in OPEX

Optimising **LCOE as a whole, instead of individual elements**, by utilizing O&M experience



Often, the steps of the PV value chain are not integrated

General challenges and risks from project development to operations

| | Project Development | Design | Construction | Operation |
|--------------|--|--------|--------------|-----------|
| Situation | <ul style="list-style-type: none">▪ Not all risks are identified as such▪ Risk factors are incorrectly assessed▪ Risks might be ignored or outsourced | | | |
| Complication | <ul style="list-style-type: none">▪ Risk propagation / fault transfer through following project stages▪ Lack of transparency during Due Diligence & commissioning▪ Financial risks are mostly borne by investors or O&M provider | | | |
| Resolution | <ul style="list-style-type: none">▪ Identify & recognize possible risks already during PD and ongoing phases▪ Gain transparency about risks and shift the horizon forward▪ Solve issues collectively and at an early stage | | | |

Apparently small items can lead to substantially higher LCOE

Use case: landscape management

| | Project Development | Design | Construction | Operation |
|--------------|---|--------|--------------|-----------|
| Issue | <ul style="list-style-type: none">▪ Mowing prohibited between March and September▪ Cuttings to be disposed outside the plant, sheep grazing not allowed | | | |
| Complication | <ul style="list-style-type: none">▪ Module edges at a low height above ground & use of diagonal brace substructure▪ Invasive, high growing natural vegetation (instead of overseeding)▪ No consideration of expected losses in yield assessment | | | |
| Result | <ul style="list-style-type: none">➤ Non-negotiable constraints for operational phase➤ Misleading financial model, caused by additional OPEX and high risks concerning<ul style="list-style-type: none">▪ performance loss (shading)▪ operational safety (fire hazard)▪ component damaging (hotspots) | | | |

Apparently small items can lead to substantially higher LCOE

Use case: landscape management impressions



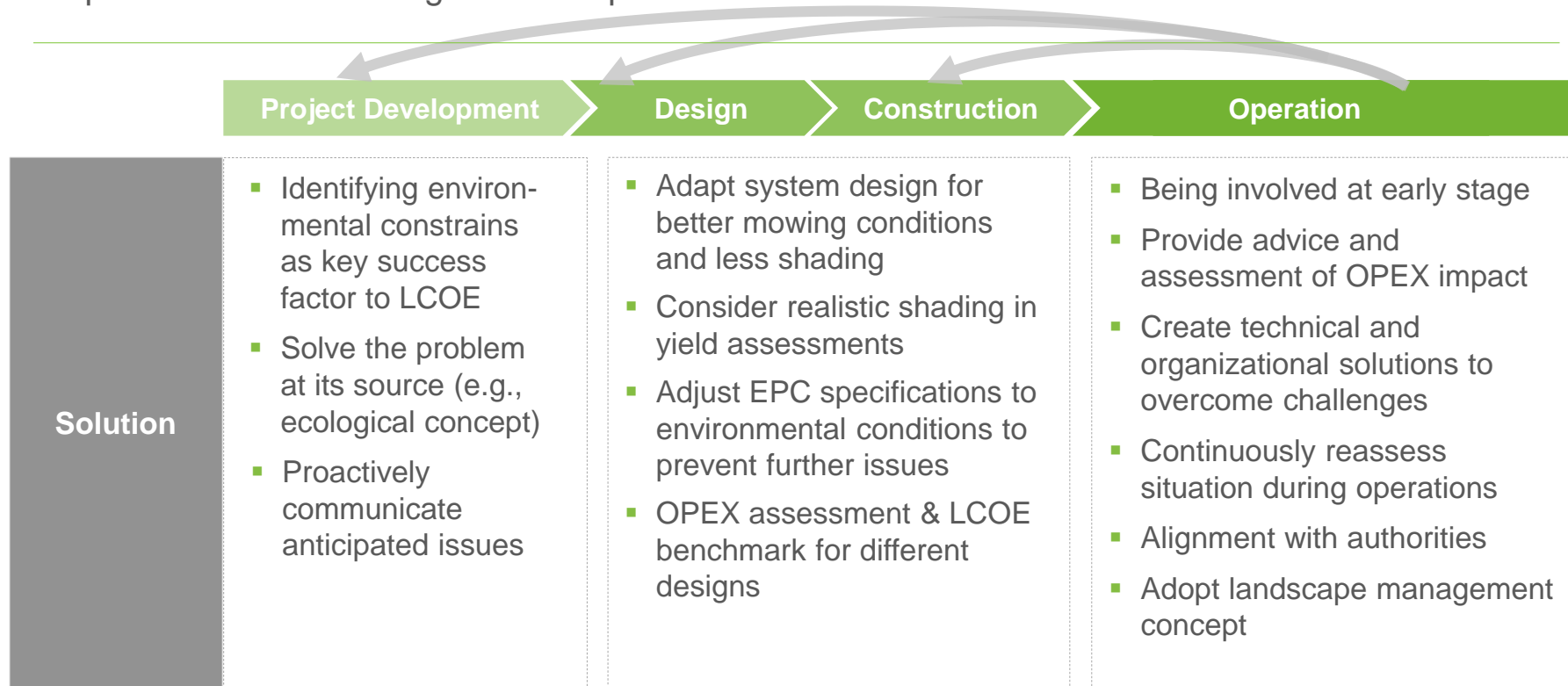
+15% O&M costs

-4% Yield

LCOE increase by ~8%

An integrated approach could have saved costs and effort

Impact of O&M Knowledge on each part of the value chain



The integrated approach is already important and will be even more

Prepare yourself for new challenges...



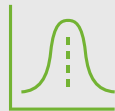
**New PPA &
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