



Development and demonstration of the Operation & Maintenance Cost Estimator (OMCE) to estimate the future O&M costs

Dutch Offshore Wind Conference
Session “Keep on running”

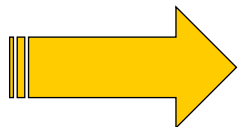
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Rotterdam, 23 January 2014

Introduction:

O&M Cost Estimator (OMCE)

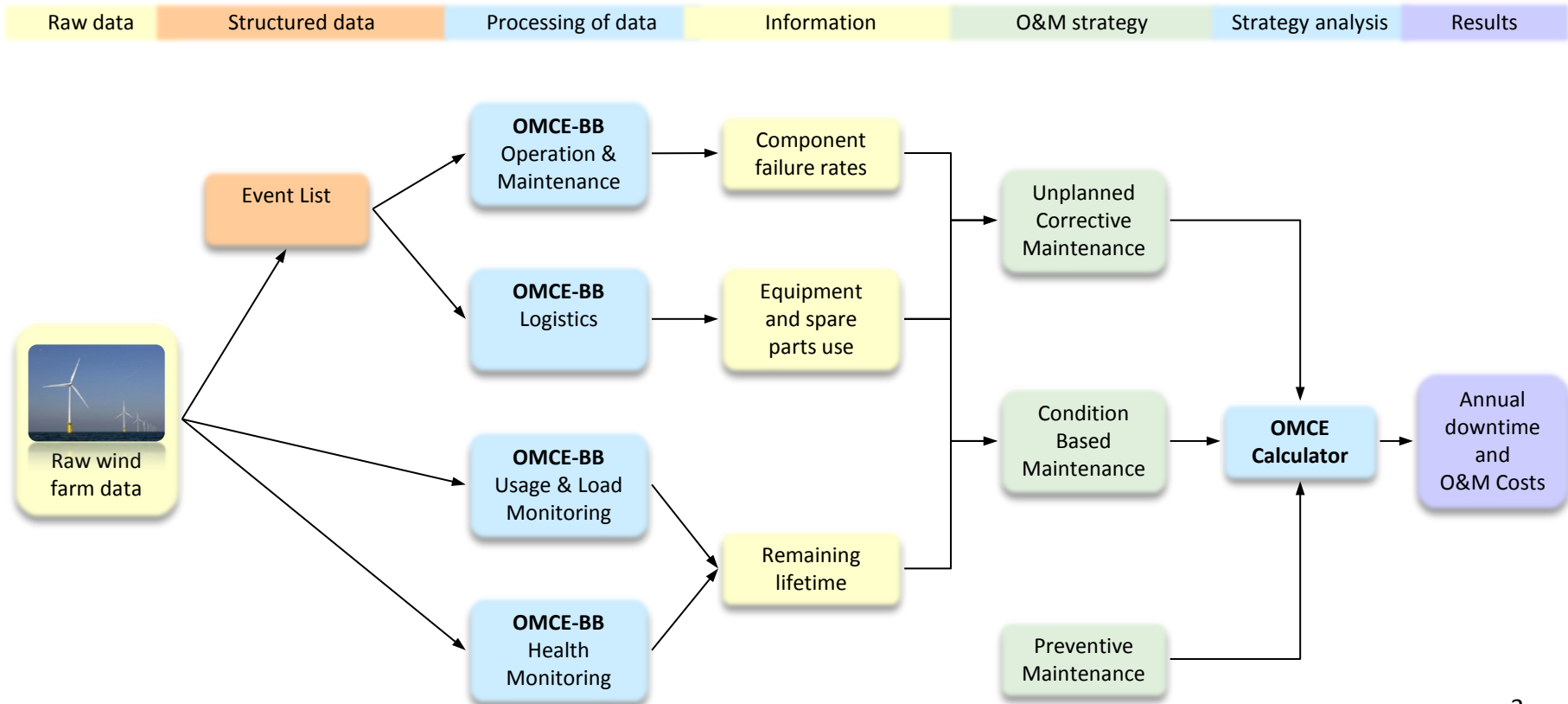


- ECN has a long experience in developing and providing training/services with OPEX Cost Modeling Tools
- Many inputs are required for O&M cost modelling
- These inputs can be derived from operational experiences
- ECN's conclusions from past experience:
 - Data from offshore wind farms is being collected, but in an unstructured way
 - Data needs to be analysed for reliability engineering and O&M optimisation (**data ≠ information!!**)
 - Operators and OEM's own the data → responsible for data collection and analysis



Approach: Operation & Maintenance Cost Estimator (OMCE)

Introduction: O&M Cost Estimator (OMCE)



FLOW OMCE project

- ECN and RWE collaborate to further develop the OMCE-Concept in the scope of the Dutch FLOW R&D programme
- Main project objective:
 - Development of a baseline model of the OMCE by development of software and working procedures using data and feedback from an existing RWE wind farm.
- Project kick-off meeting at 12-04-2012 in Amsterdam
- First O&M data was made available by RWE by July 2012



Structured data collection

- Inventory of O&M data for 3 month period of RWE's Rhyl Flats wind farm:
 - List of SCADA parameters
 - Alarm list
 - Meteo and wave data
 - Monthly downtime summary reports
 - Daily work reports
 - Turbine breakdown in RDS-PP coding
 - Daily vessel reports
- Observations and results
 - ECN used supplied O&M data to manually fill Event List format => Labour intensive
 - Sufficient (92%) data available for further development of and analysis by OMCE BBs
 - Updated Event List specifications available

Event nr.		1	
Start event	[date/time]	15/02/2013 09:33	
Event type		Corrective maintenance	
Turbine ID or BOP ID		1. Turbine A	
Nr. maintenance action		1.1	
Start	[date/time]	15/02/2013 09:33	16/02/2013 08:30
End	[date/time]	15/02/2013 14:33	16/02/2013 17:00
Duration	[h]	1.05	8.50
Downtime	[h]	5.00	8.50
Type of maintenance		Inspections	Replacement (finalisation)
Weather downtime	[h]	4.00	0.00
Scada alarm code		0001	0010
Scada description		Temperature error	Turbine stopped by operator
Reported labour hours	[h]	2.00	
Crew size		2	
Access equipment		Access vessel	
- travel time (heading out)	[h]	0.75	
- travel time (return)	[h]	1.00	
- fuel consumption	[dm ³]	200	225
Second equipment		n.a.	n.a.
- travel time (one way)	[h]		
- mobilisation time	[h]		
Third equipment		n.a.	n.a.
- travel time (one way)	[h]		
- mobilisation time	[h]		
Explanations		Pitch motor overheated	Replaced pitch drive blade A
Main system ID		MDC Blade adjustment	
Component ID		GL001 Pitch drive assembly A	
Work carried out		Replacement	
Spare part in stock		Yes	
Logistic time spare part	[h]	2	
Consumables		n.a.	
# consumables			
Total labour hours	[h]	27.50	
End event		16/02/2013 17:00	
Duration event	[h]	31.44	
Downtime event	[h]	31.44	

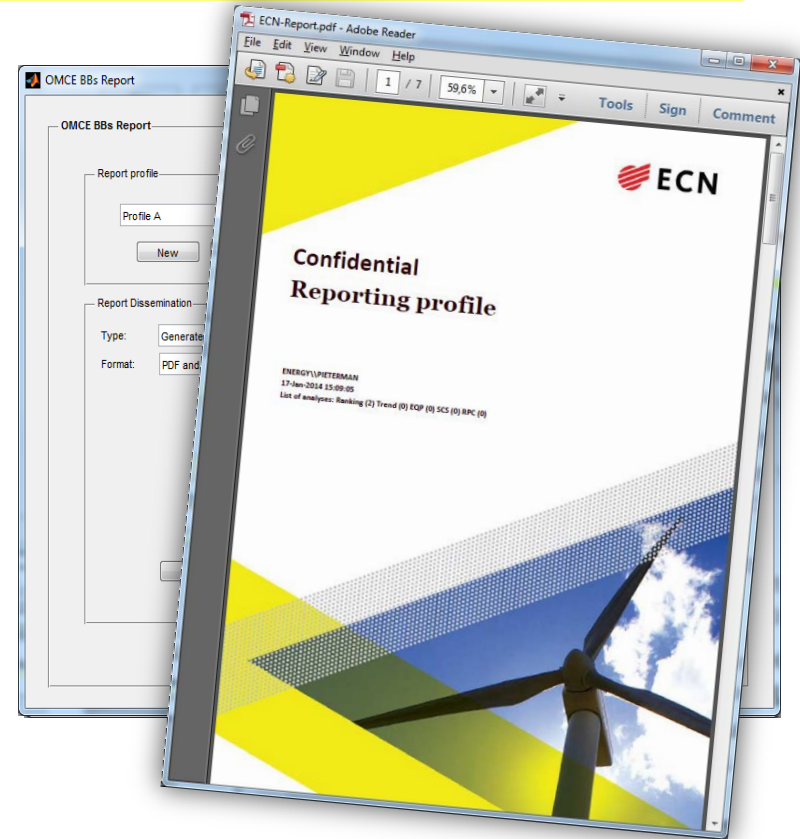
Start and definition of event

Definition of individual maintenance actions

End of event and reporting

Data analysis with OMCE BB's

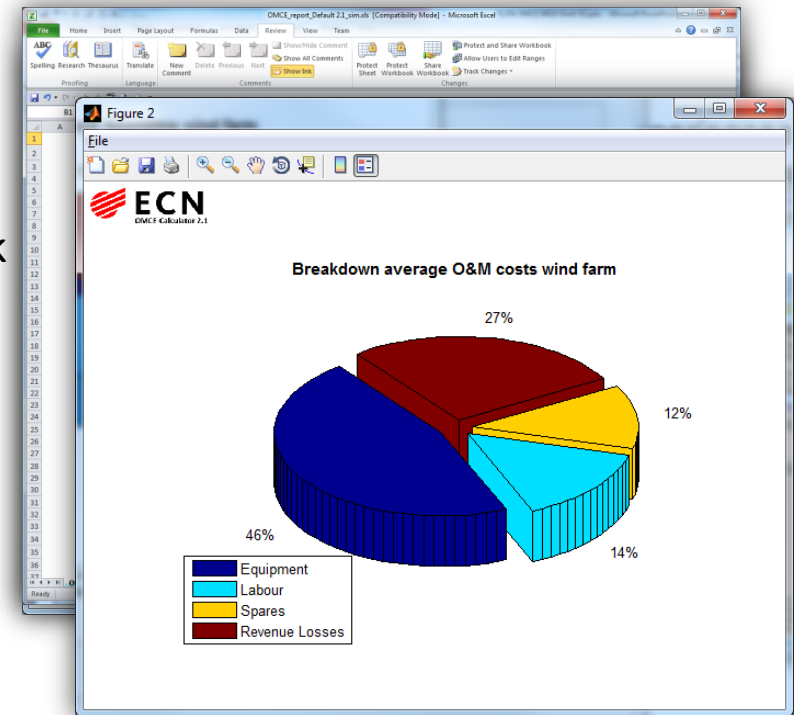
- Goal of Building Blocks is to generate:
 1. Input parameters OPEX Cost Modelling Tools
 2. Insight in failure and repair behaviour
- Based on reviewed Event List format demo versions of BB 'O&M' and BB 'Logistics' updated and verified
- Examples of Building Blocks output with Rhyl Flats data
- Created reporting module to report updated analysis results (new O&M data)



Cost Modelling: OMCE-Calculator

*Specifications based on long term experiences with **ECN O&M Tool**
> 20 licenses world wide; > 50% of European wind farms since 2005*

- Designed for analysis of O&M strategies during operational phase of wind farm
- Time domain simulation allows to better consider effect of number of vessels, stock control, yield availability etc.
- Results presented in Excel and graphs
- Updated specifications developed and (partially) implemented based feedback from RWE and demo users
- Tool is available to other parties under commercial conditions



Outlook

- Automate export maintenance data to Event List from CMMS for RWE's large offshore wind farm
- Develop and implement additional specifications OMCE-Calculator
- Implement and validate OMCE concept:
 - Analysis of expected O&M costs using generic data and assumptions
 - Obtain Event Lists with updated data at regular intervals
 - Evaluate initial input parameters by analysis of Event List data with OMCE Building Blocks
 - Update input data OMCE-Calculator and analysis of expected O&M costs



Next presentation