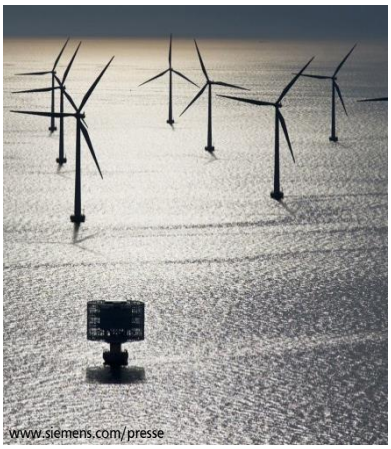
Wind & Economy - Strategic Optimisation Software

wind economy & Strategic Optimisation

- Optimising the Design of Offshore Wind Farms
- Optimised Work Flow
- Wind Climate in Wind Farm Clusters
- Large Wind Farm Wake Effects
- Economic Benchmarking
- Uncertainty Modelling & Risk Management
- GIS Integration
- Multi-User Approach
- EU-Project EERA-DTOC



overspeed GmbH & Co. KG

Contact Person

Dr. Hans-Peter (Igor) Waldl
Tel. +49 441 939400-00
h.p.waldl@overspeed.de

Overspeed GmbH & Co. KG
Im Technologiepark 4
26129 Oldenburg
Germany
info@overspeed.de

overspeed.de
wind-and-economy.com

Offshore Wind Farms Challenges

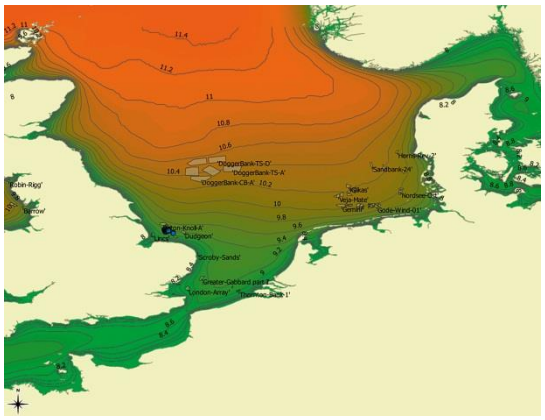
One of the most challenging tasks for wind farm developers is the optimisation of offshore wind power plants. Large offshore wind farms and wind farm clusters, such as those in the German Bight or on the Dogger bank, change the wind climate itself and make this optimisation task even more demanding. During the process of wind farm optimisation, hundreds of variations are considered and need to be managed, documented and benchmarked.

Optimised Offshore Wind Farms

Wind & Economy, our new software tool, supports your challenging work with the seamlessly integrated modelling of wind climate, large scale and localized wind farm effects, electrical loss calculations and derivation of economic key figures.
A clearly organized workflow supports you in the management of the set of all wind farm variations ever to be considered during the life time of your project. Using LCOE, the Levelized Cost of Energy, as an economic performance key indicator helps you to benchmark different approaches and select your optimised design. In addition, the detailed knowledge of the uncertainties of energy production and LCOE support the management of financial risks.
Leading edge meteorological and wind farm models, taken together with a consideration of the uncertainty of energy production and the levelized cost of energy, make your results waterproof and bankable.

Optimisation Support

Having hundreds of variations of the wind farm layout is not rare during the optimisation process of offshore wind farms. In order to support you in handling these different configuration options as efficiently as possible, we have defined a workflow which organizes many different farm variants in a development tree.
For this purpose, Wind & Economy defines farm "scenarios" consisting of wind climate, turbine types, hub height, models used to calculate the energy production, electrical grid layout and economic parameters.
These scenarios, organized in trees, help you in keeping track of your valuable work and the development process. Comparative reporting of the results from a number of scenarios supports you in selecting the right track towards your optimised wind farm.



Wind & Economy GIS map North Sea showing the wind climate

GIS Integration for Offshore Farms

Many tasks which must be performed in order to optimize offshore wind farms are well supported by Geographical Information Systems, GIS. To benefit from this approach, we have included a GIS interface into the Wind & Economy workflow as one possible frontend.

By using this approach, you will be able to

- edit turbine layout
- visualize local and large-scale wind resources and energy production
- edit turbine types and other parameters
- optimise the cable layout
- calculate electrical losses
- select grid connection options consider environmental protection areas
- include additional information such as maps of water depth, exclusion areas, shipping lanes and others into your planning work.

Innovation and Cost Reduction

Wind & Economy sets itself apart from other products with an approach thoroughly geared toward the particularities of offshore wind farms and the seamless integration of various tools into one software.
In so doing, the special requirements of offshore wind farms in comparison with those on land are taken into account:

- especially large farms and distinct shadowing effects
- inhomogeneous wind potential over the area of the wind farm
- strong influence of surrounding wind farms in wind farm clusters
- the influence of neighbouring wind farms on current modeling of the chosen farm
- possible specifications of layout geometry via the approving authorities
- high CAPEX and OPEX uncertainties and large discrepancies in the uncertainties of various costs incurred
- integration of geographical information systems

Through a detailed and systematic examination of the uncertainties in wind farm revenue as well as CAPEX and OPEX, the risk of investment in offshore wind farms is further reduced.

The implementation of our new layout software eases the design of offshore wind farms, supports the optimization of farm layout and makes the risk of an investment in offshore wind farms more transparent.

Spin-off from currenct research

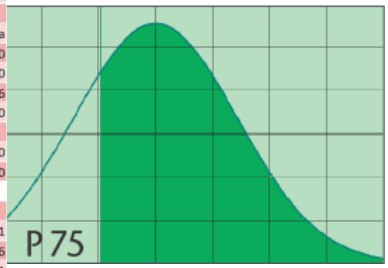
The Wind & Economy software is a spin-off of the EU funded R&D project DTOC, the Design Tool for offshore Wind Farm Cluster. This project, initiated and led by the European Energy Research Alliance (EERA), brings models from leading edge research together with the practical needs and experiences of high-impact industry partners.

DTOC Energy Production Report

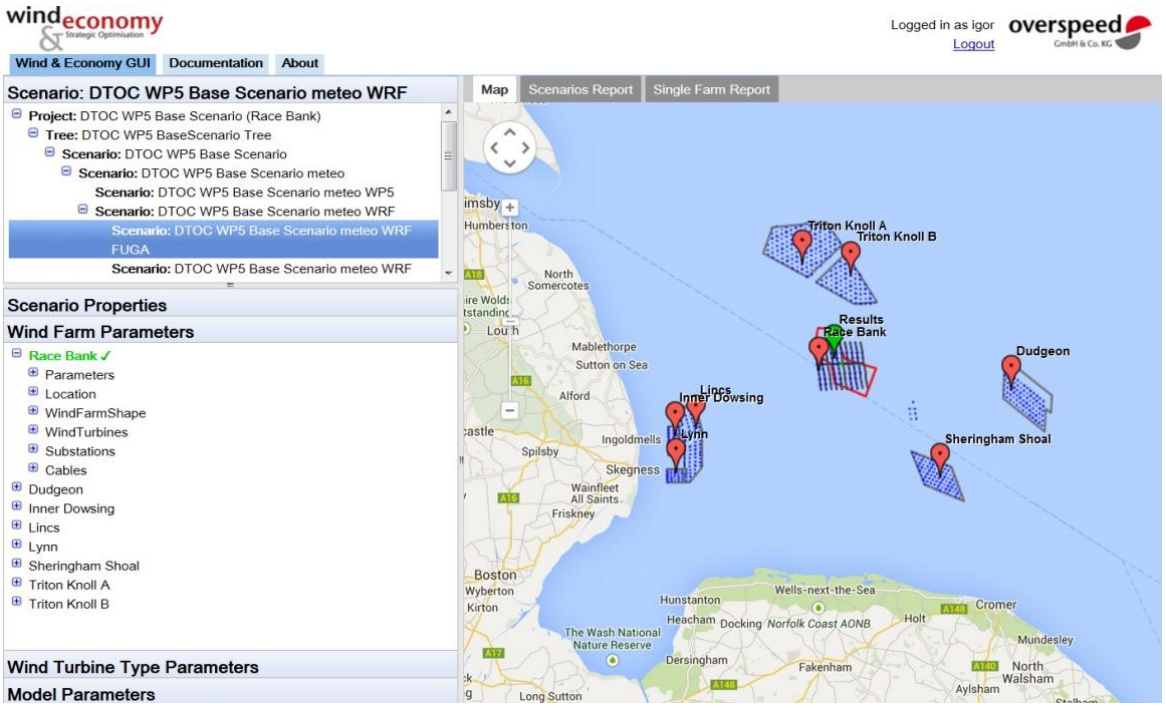
EON, 2014 Reference LCOE: 13.5 ct/kWh
Reference Scenario: BWII - WAsP

	Scenario Shortname	BWII - WAsP *	BWII - FLaP	BWII - WAsP 100m
Comment		Calculations with WAsP	Calculations with FLaP	Calculations with WAsP, hub height: 100m
	Last Update	2014.04.22 14:30	2014.04.22 16:30	2014.04.23 11:05
Turbines				
	Turbine Manufacturer	Areva	Areva	Areva
	Turbine Type	M5000	M5000	M5000
	Nominal Power [kW]	5000	5000	5000
	Rotor Diameter [m]	116	116	116
	Hub Height [m]	90	90	100
Farm				
	Number of Turbines	80	80	80
	Nominal Power Wind Farm [MW]	400	400	400
Results				
	AEP Gross [GWh/a]	1'758.2	1'747.6	1'846.1
	AEP Farm [GWh/a]	1'613.8	1'600.9	1'702.6
	AEP Net [GWh/a]	1'495.0	1'483.1	1'577.1
	Capacity Factor [%]	46.1%	45.7%	48.6%
	Wind Farm Efficiency	91.8%	91.6%	92.2%
	Availability	96.0%	96.0%	96.0%
	Electrical Losses	3.50%	3.50%	3.51%
	LCOE [Cent/kWh]	13.5	13.4	14.2
	LCOE [%]	+100.00%	+99.20%	+105.50%
	delta LCOE [%]	+0.00%	-0.80%	+5.50%

Uncertainty	Value
Anemometer uncertainty	2.40%
Anemometer installation/incident flow	1.00%
Long-term correlation	2.10%
alancing	5.00%
n representativeness	3.00%
on method (extrapolation)	4.30%
nd variability (1 year)	1.80%
nd variability (10 years)	3.60%
ertainty	8.94%



Left: Wind & Economy Energy Production Report;
Right: Contributions to production uncertainty (above) and probability distribution of energy production, depending on uncertainty, P75 value (below)



Wind & Economy web GUI showing one selected wind farm scenario