OFFSHORE 2015 COPENHAGEN
ORGANISED BY EWEA
10 - 12 March | Bella Center Copenhagen, Denmark

Copenhagen, 10 March 2015

EERA Design Tool for Offshore wind farm Cluster (DTOC)

EERA DTOC

THE EUROPEAN ENERGY RESEARCH ALLIANCE
DESIGN TOOLS FOR OFFSHORE WIND FARM CLUSTER

Peter Hauge Madsen. Head of Department
Charlotte Hasager. Senior scientist
DTU Wind Energy

Project partners

EERA – European Energy Research Alliance

Background: The EERA JP Wind Energy was officially launched at the SET-Plan conference in Madrid in June 2010. The strategy and main activities of the JP is described in the "Strategic Action Plan" (yearly updated).

The programme vision is:
- to provide strategic leadership for the scientific–technical medium to long term   research
- to support the European Wind Initiative and the Technology Roadmap's activities on wind energy, and on basis of this
- to initiate, coordinate and perform the necessary scientific research.

Joint Programme and Sub-programmes
Wind Conditions. Coordinated by Dr. Hans Ejsing Jørgensen, DTU Wind Energy (DK)
Aerodynamics. Coordinated by Dr. Peter Eecen, ECN (NL)
Offshore Wind Energy. Coordinated by Dr. John O. Tande, SINTEF (NO)
Grid Integration. Coordinated by Dr. Kurt Rohrig, FhG IWES (DE)
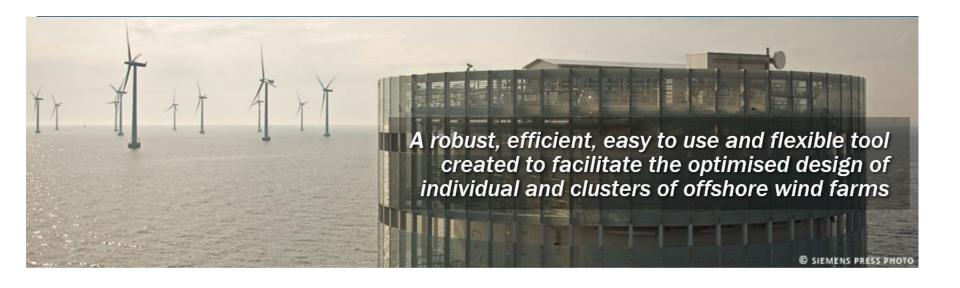**Research Facilities.** Coordinated by Dr. Pablo Ayesa Pascual, CENER (ES)
Structural design and materials. Coordinated by Dr. Denja Lekou, CRES (GR)
Wind integration – economic and social aspects. Coordinated by Prof. Poul Erik Morthorst, DTU Management Engineering

A robust, efficient, easy to use and flexible tool created to facilitate the optimised design of individual and clusters of offshore wind farms

© SIEMENS PRESS PHOTO

EERA DTOC main components

- Use and bring together existing models from the partners
- Develop open interfaces between them
- Implement a shell to integrate
- Fine-tune the wake models using dedicated measurements
- Validate final tool

Design and model selection guided by end-users

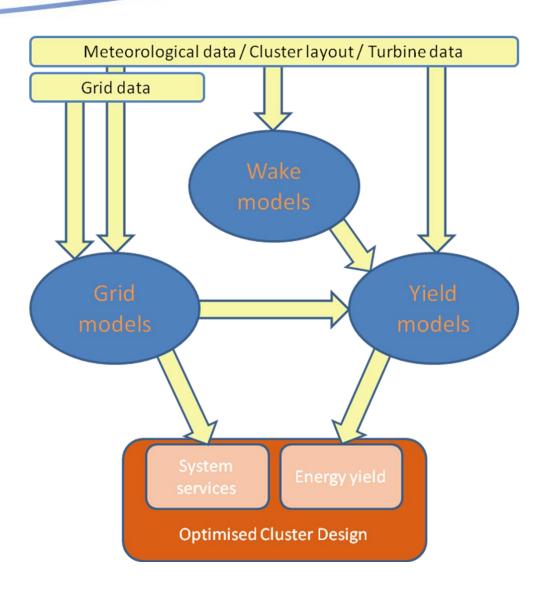Two **main user groups** were identified:

- Strategic planners
- Developers of offshore wind farms

Associated users could be:

- Consultants
- Research institutions
- Manufacturers
- System Operators

EERA DTOC concept

EERA-DTOC portfolio of models

Name	Partner	Status	Programs	Input/output	Script/GUI	Database interface	IPR	Com
CFDWake	CENER							
CorWind	Risoe DTU	Ope						
CRES-farm	CRES	Ope						
CRES--flowNS	CRES	Ope						
DWM	Risoe DTU	Ope						
ECNS	ECN	Beta						
EeFarm	ECN	Alpha						
Farm-farm interaction	ECN	Ope						
FarmFlow	ECN	Ope						
FlowARSM	CRES	Alpha						
FUGA	Risoe DTU	Ope						
NET-OP	SINTEF	Proto type						
Skiron/WAM	CENER	Ope						
TOPFARM	Risoe DTU	Beta						
UAEP	Risoe DTU							
VENTOS	UPorto	Beta						
WAsP	Risoe DTU	Ope						
WCMS	Fraunhofer	Ope						
WRF	Risoe DTU	Ope						
WRF/ROMS	CIEMAT	Ope						

EERA-DTOC portfolio of models

Name	Partner	Status	Programs	Input/ output	Script/ GUI	Database interface	IPR	Com
CFDWake	CENER							
CorWind	Risoe DTU	Ope						
CRES-farm	CRES	Ope						
CRES--flowNS	CRES	Ope						
DWM	Risoe DTU	Ope						
ECNS	ECN	Beta						
EeFarm	ECN	Alpha						
Farm-farm interaction	ECN	Ope						
FarmFlow	ECN	Ope						
FLOWACSM	CRES	Alpha						
FUGA	Risoe DTU	Ope						
NET-OP	SINTEF	Proto type						
Skiron/WAM	CENER	Ope						
TOPFARM	Risoe DTU	Beta						
UAEP	Risoe DTU							
VENTOS	UPorto	Beta						
WAsP	Risoe DTU	Ope						
WCMS	Fraunhofer	Ope						
WRF	Risoe DTU	Ope						
WRF/ROMS	CIEMAT	Ope						

Wake models

9

EERA-DTOC portfolio of models

Name	Partner	Status	Programs	Input/ output	Script/ GUI	Database interface	IPR	Com
CFDWake	CENER							
CorWind	Risoe DTU	Ope						
CRES-farm	CRES	Ope						
CRES--flowNS	CRES	Ope						
DWM	Risoe DTU	Ope						
ECNS	ECN	Beta						
EeFarm	ECN	Alpha						
Farm-farm interaction	ECN	Ope						
FarmFlow	ECN	Ope						
FlowARSM	CRES	Alpha						
FUGA	Risoe DTU	Ope						
NET-OP	SINTEF	Proto type						
Skiron/WAM	CENER	Ope						
TOPFARM	Risoe DTU	Beta						
UAEP	Risoe DTU							
VENTOS	UPorto	Beta						
WAsP	Risoe DTU	Ope						
WCMS	Fraunhofer	Ope						
WRF	Risoe DTU	Ope						
WRF/ROMS	CIEMAT	Ope						

Electrical models

10

Validation of wakes models

More than 10 wake models have been validated at Horns Rev, Lillgrund and Rødsand 2 offshore wind farms SCADA data from industry **DONG** energy **e·on** **VATTENFALL**

Lidar data at Alpha ventus **RAVE** RESEARCH AT ALPHA VENTUS and satellite data has also been used

The benchmark concludes that several models were able to handle the clustering of wind farms

Software developed

wind economy & Strategic Optimisation

based on software from partners
based on industry users requirements
Commercial spin-off

Demonstration

On-going work in three scenarios

Support by