

REPLI - DTU Renewable Energy Policy, Planning and Integration Advice Group

- providing research based advisory services within clean energy

$$f(x+\Delta x) = \sum_{i=0}^{\infty} \frac{(\Delta x)^i}{i!} f^{(i)}(x)$$

$$\int_a^b \epsilon \Theta$$

$$+ \Omega \int \delta e^{i\theta}$$

$$\sqrt{17}$$

$$\{2.71828182\}$$

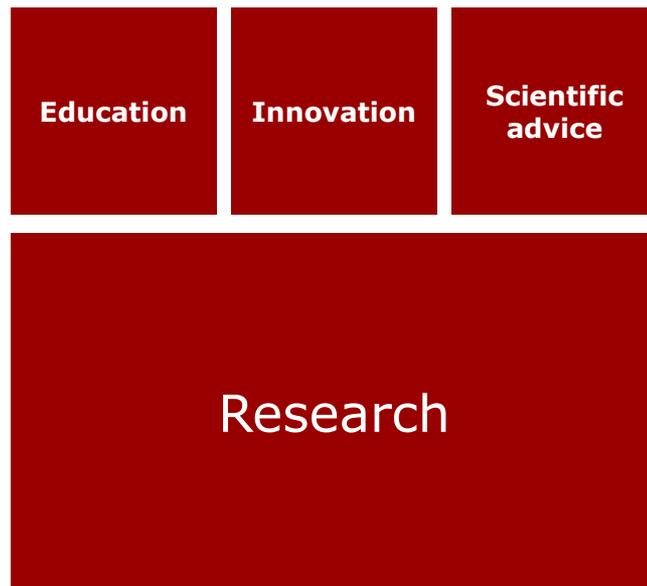
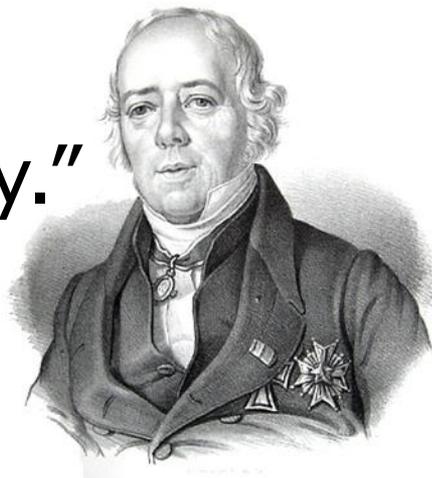
$$x^2$$

$$\Sigma! \gg$$

Our mission

“DTU will develop and create value using the natural sciences and the technical sciences to benefit society.”

H.C. Ørsted
Founder of DTU



Scientific advice

- a unique model



An integral part of Danish universities' portfolio of activities

1/5

of DTU's staff are involved with scientific advice

Our strength:

- We cover the entire chain from
- resources to system planning and implementation
 - via renewables and technical integration

The World Bank's RISE 2017 report ranked Denmark as the country with the best energy policies and regulations in the world.

Denmark is our lab.

REPLI

Research based services and competences:

DTU offers international advisory services and capacity building within:

- Energy policy & planning
- Renewable energy integration
- Variable renewables

Our clients include governments, development banks, and international organizations, and we often work in collaboration and in consortia with private sector and organizations.



Energy policy & planning - cases

Assistance to developing countries to determine their technology priorities for the mitigation of greenhouse gas emissions and adaptation to climate change.

The project is implemented by the United Nations Environment Programme and the UNEP DTU Partnership

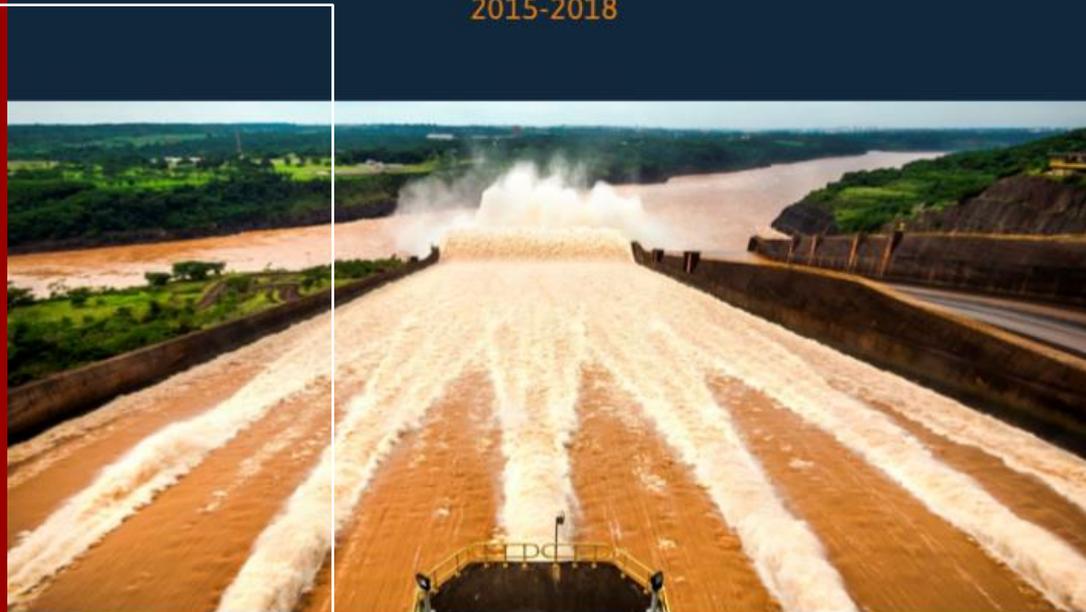
COSTUMER:

Global Environment Facility (GEF)

SUMMARY OF COUNTRY PRIORITIES

TECHNOLOGY NEEDS ASSESSMENTS

2015-2018



TNA TECHNOLOGY
NEEDS
ASSESSMENT

Energy policy & planning - cases

Balmorel model: modelling and analyses of the energy sector with emphasis on the electricity and combined heat and power sectors.

Tailor made courses made for the Danish Energy Agency

The participants will get the opportunity to work on Balmorel tailored to their own country to find the optimal future investments in energy systems.

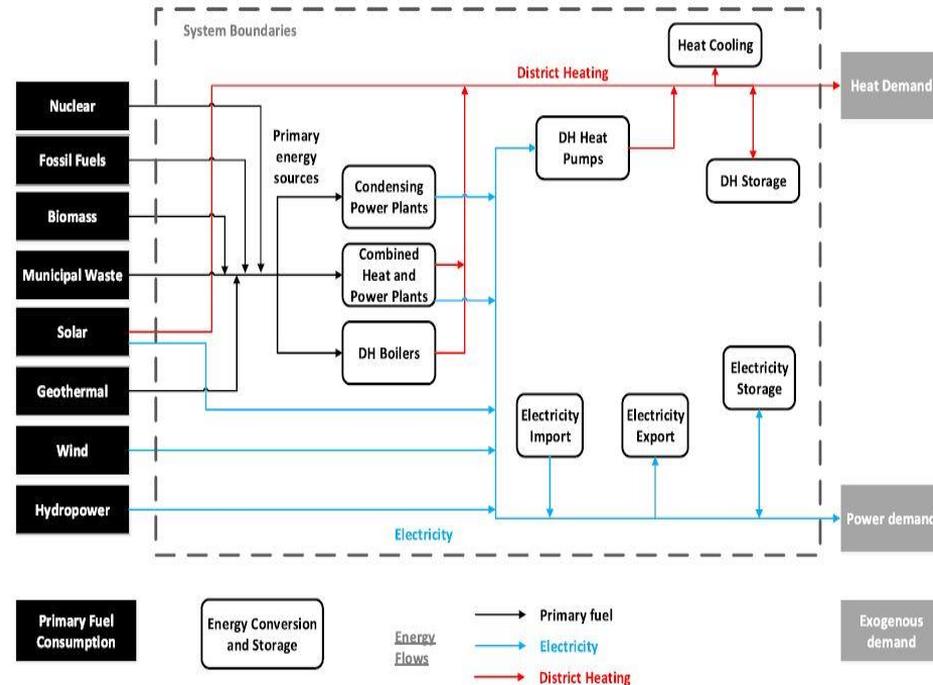


Fig. 1. Balmorel core structure.

Energy policy & planning - cases



The Danish Energy Agency Country Programs and Projects

Technical assistance combined with policy dialogue, in promotion of Renewable Energy (RE) and Energy Efficiency (EE) – aiming for low carbon development and reduced CO2 emissions.

Partner countries in the program: Ukraine, Tyrkey, Indonesia, Ethopia, Energy Governance Partnership (Germany, UK and USA), China Thermal Power Transition project and Vietnam

Consortium:

EA Energianalyse (lead), Cowi, Viegand og REPLI/DTU



Renewable energy integration - cases

Supporting sustainable mini-grid development and production of wind turbines in Kenya

With the objective to reduce poverty and stimulate economic growth in rural Kenya, the project aims to develop a market for low-cost, partly locally produced wind turbines for rural electrification.

Outcomes of the project:

- local jobs in manufacturing, assembly, installation, operation and management of low cost turbines in mini-grids;
- established local business for manufacturing parts of small modern wind turbines;
- and reduced cost of electricity provided by mini-grids, benefiting disadvantaged communities.

COSTUMER:

Danida Market Development Partnerships



Renewable energy integration - cases

Capacity building

Training – power quality of wind turbines

COSTUMER:

China Electric Power
Research Institute (CEPRI)

CEPRI staff training

- Power quality issues of wind turbines
- Modelling of wind power for power system studies

Services Provided by DTU:

- Preparation of training in power quality and modelling (in Denmark)
- 1 week training of CEPRI staff in Beijing

Variable renewables - cases



The Wind Atlas for South Africa - WASA

The WASA has made cutting edge results and is a model for other projects worldwide such as the WB ESMAP wind mapping programme. The results of WASA include:

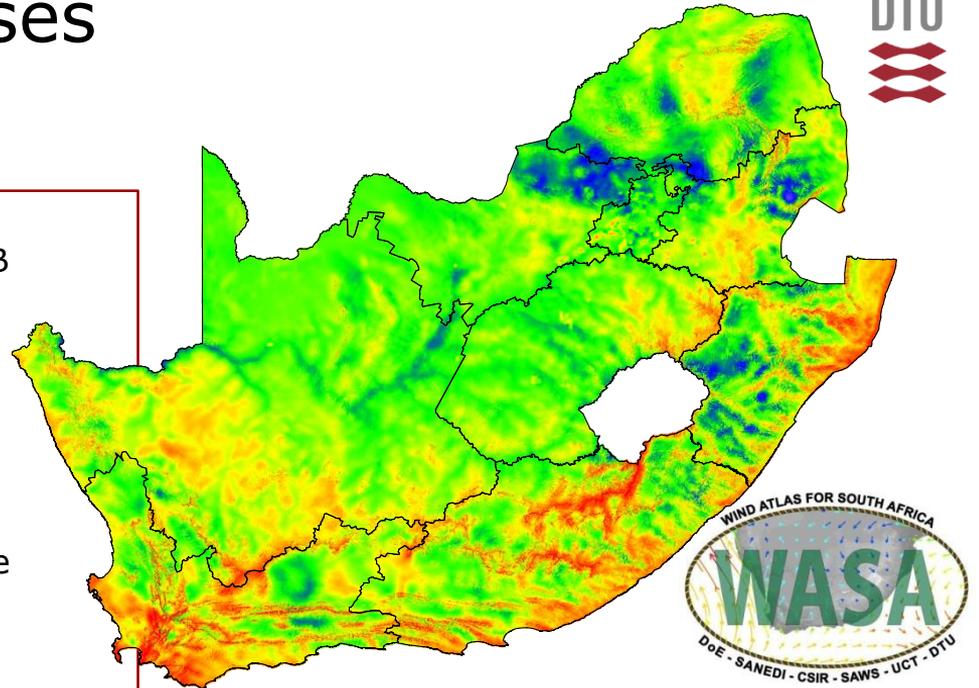
- The first Verified Numerical Wind Atlas using the dynamic mesoscale modelling tool WRF according to the Wind Atlas Method (2014 updated 2017)
- The first High-resolution wind resource map (2014 updated 2017)
- The first Extreme Wind Atlas based on mesoscale modelling (2014)

Further project info: www.wasaproject.info

Online graphics and data: www.wasa.csir.co.za

COSTUMER:

South African National Energy Development Institute (SANEDI)



Collaboration with South African institutions and universities.

Variable renewables - cases

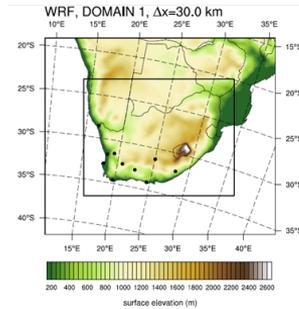
CorWind software

The need for reserves in the South African electrical power system

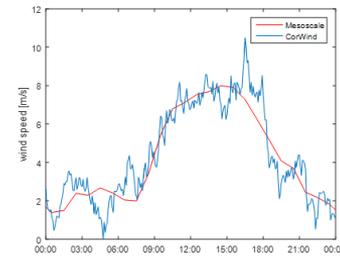
The need for flexibility is estimated via the Corwind model that simulates wind and PV variability

Uses of variable RES generation time series:

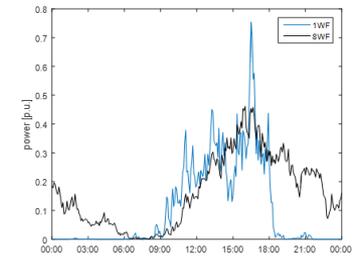
- Energy system planning
- Network development planning
- Power system reliability - adequacy
- Needs for reserves



CorWind software developed at DTU Wind Energy



Add wind speed fluctuations



Wind to power (and smoothening)

Partners:

Ea Energy Analysis (DK)
EOH Enerweb (SA)
DTU (DK)
Grid operators (TSOs):
Energinet.dk (DK)
ESKOM (SA) [end user]

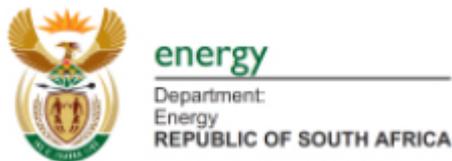
Grid operators

(TSOs):
Energinet.dk (DK)
ESKOM (SA) [end user]

Funding:

Danish Support to RE development in SA

Some of our costumers



Danida

UDENRIGSMINISTERIET
*Ministry of Foreign Affairs
of Denmark*

C-EPRI



Danida Fellowship Centre

- sustaining development through research and learning

Who are we?



DTU Electrical Engineering

- Digital Energy Solutions
- Interconnected Energy System
- Optimized Electric Energy Technologies

DTU Management Engineering

- Systems analyses
- Operation management
- Energy technology knowledge.

DTU Wind Energy

- Integration and control of wind energy in power systems
- Offshore wind power plants and grids
- Wind farm operation
- Planning and development of wind farms

DTU Compute

- Time series analysis
- Forecasting
- Control
- Optimization

DTU Energy

- Energy conversion and storage technologies to achieve better energy system analyses.
- Interaction between electricity, biomass and gas systems

We bring together the required specialist competences necessary to provide reliable, affordable, tailor made and sustainable solutions to our partners.

Office for Innovation and Sector Services

Framework for DTU's public sector consultancy and coordination of central efforts.

Contact: Ulla Høeberg Jørgensen, uhoej@dtu.dk



REPLI

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www.repli.dtu.dk



REPLI - DTU Renewable Energy Policy, Planning and Integration Advice Group

REPLI provides research-based advisory services and capacity building within integration of intermittent renewable energy sources. Our advisory services range from technology choices to policy advice and implementation. We are the leading university in Europe with regard to energy. We cooperate closely with the energy sector in Denmark - the world's top country in sustainable energy supply. We provide state-of-the-art and timely services in close dialogue with our clients.

ADVISORY PROJECTS

- > Policy planning & implementation projects
- > Renewable energy integration projects
- > Variable renewables projects

CAPACITY BUILDING

- > Capacity building in policy & implementation
- > Capacity building in renewable energy integration
- > Capacity building in renewables

DOWNLOAD INFOSHEET

[Click here to download infosheet on REPLI](#)