

Newsletter
May 2016
Issue 6

Welcome

Welcome!

The MEDOW (Multi-Terminal DC Grid for Offshore Wind) project is investigating DC (direct current) grids for transmitting offshore wind power. MEDOW researchers are working on the technology that we hope will form the basis of a future European 'supergrid'.

The newsletter is issued 3-4 times per year and aims to communicate not only news from MEDOW but also news of interest to the wider research community and the public.

Dates for your diary:

Project Open Day, Cardiff, Friday 08 July 2016

7th Annual HVDC Doctoral Colloquium, Universidade do Porto, 14—16 September 2016

Details of these activities will soon be published on the project [website](#).

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Recent Event

Friend of the Supergrid and MEDOW Special Session at IEEE EnergyCon 2016

04—08 April 2016, KU Leuven hosted a highly successful IEEE International Energy Conference. The Conference Chair was MEDOW's Professor Dirk Van Hertem.

Report by Alejandro Bayo Salas, Elia System Operator

EnergyCon 2016 welcomed more than 350 participants of 67 nationalities for a week of widespread topics related to power systems including transmission and distribution, markets, ICT integration and energy conversion.

The conference participants had the chance to attend to four tutorials, six panel sessions, two keynote sessions (Prof. Goran Strbac, Imperial College London, and Jos Delbeke, Director-General of the European Commission's DG Climate Action) and a total of 280 papers of original research spread over 48 sessions.

MEDOW, alongside Friends of the Supergrid, hosted a day-long special session. A mixed audience of people from industry, utilities, academia and policy benefitted from the special session's complete focus on the integration of offshore resources and the development of the HVDC grid.

The first session of the day presented the current state-of-the-art and future challenges of OWF connection. Bart Embrechts and Brunet Pascal from Engie-Fabricom presented the current design status of offshore platforms using AC transmission and the developments taking place in order to decrease their volume and cost. Chris Veal (Transmission Investment) explained the procedure for becoming an offshore transmission operator and its economic feasibility. And finally, Nicolaos Cutululis (DTU Wind) introduced different strategies for the provision of ancillary services from wind farms..

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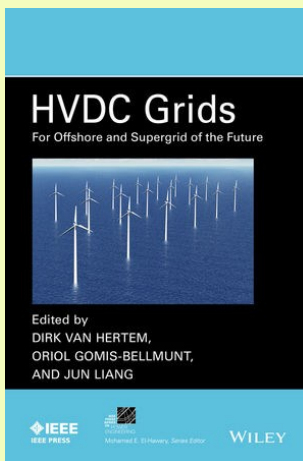
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The second session dealt with the need for and development of a HVDC grid in Europe. During the session, Norman Macleod (PB) and Frank Schettler (Siemens) presented the technology roadmap for the construction of the DC grid and the needs and current draft technical specification for the integration of the HVDC network respectively. From the utility side, Mart van der Meijden (TenneT-Netherlands) introduced the current HVDC projects in the Netherlands and detailed their capability to be updated as the converter stations for the future multi-terminal DC connection. Finally, Ronnie Belmans (EnergyVille-KU Leuven) and Marta Navarrete (FOSG) coincided in pointing out regulation as the main barrier for building the North Sea DC network and the need for taking risks. To sum up, all speakers agreed that the technical challenges are being solved or they will be reached in the future but that regulatory issues and different interests among countries are still seen as the main hurdles to start building such a grid. The panellists agreed that it is not a dream but a need and the solution for the decarbonisation of the European energy sector. It was also recognized that the sometimes conservative power industry needs to invest in projects of higher risk in order not to further delay developments and for Europe to stay ahead as technology leaders.

The afternoon session presented the outcomes from the MEDOW project in the form of presentations of the work of the technical work packages and, afterwards, a presentation by all ESRs of their own posters during a poster session which also featured a discovery of Belgian beers.

The active participation, contributions and discussions by all attendees made the conference a success and allowed them to widen their knowledge - theoretical and practical-, network and receive a lot of feedback on their current work. The next EnergyCon will take place in 2018.

New book!



HVDC grids: for offshore and supergrid of the future

Three MEDOW supervisors have edited a new book which also contains chapters written by project researchers.

Editors: Dirk Van Hertem, Oriol Gomis-Bellmunt, Jun Liang
ISBN: 978-1-118-85915-5
528 pages
March 2016, Wiley-IEEE Press
Details [online](#)

This book presents the advantages, challenges, and technologies of High Voltage Direct Current (HVDC) Grids

This book discusses HVDC grids based on multi-terminal voltage-source converters (VSC), which is suitable for the connection of offshore wind farms and is a possible solution for a continent wide overlay grid. "HVDC Grids: For Offshore and Supergrid of the Future" begins by introducing and analyzing the motivations and energy policy drives for developing offshore grids and the European Supergrid. HVDC transmission technology and offshore equipment are described in the second part of the book. The third part of the book discusses how HVDC grids can be developed and integrated in the existing power system. The fourth part of the book focuses on HVDC grid integration, in studies, for different time domains of electric power systems. The book concludes by discussing developments of advanced control methods and control devices for enabling DC grids.

The book presents the technology of the future offshore and HVDC grid and explains how offshore and HVDC grids can be integrated in the existing power system. It provides the required models to analyse the different time domains of power system studies: from steady-state to electromagnetic transients.

This book is intended for power system engineers and academics with an interest in HVDC or power systems, and policy makers. The book also provides a solid background for researchers working with VSC-HVDC technologies, power electronic devices, offshore wind farm integration, and DC grid protection.

MEDOW in Beijing

Cinergia's Abel Ferreira visits Beijing for collaboration

In February, ESR Abel Ferreira flew to Beijing to spend some time at MEDOW partner China Electric Power Research Institute (CEPRI) in order to carry out some collaborative work on models of modular multilevel converters (MMC) with MEDOW postdoc researcher Agustí Egea, and former MEDOW postdoc fellow Qing Mu.



CEPRI is a multi-disciplinary and comprehensive research institute directly affiliated to the State Grid Corporation of China (SGCC). Work at CEPRI includes extra/ultra high voltage power transmission, operation of large power grids, power system simulation, grid automation and power electronics technology.

Learn about the
European Union's relationship
with China on the [EU website](#)



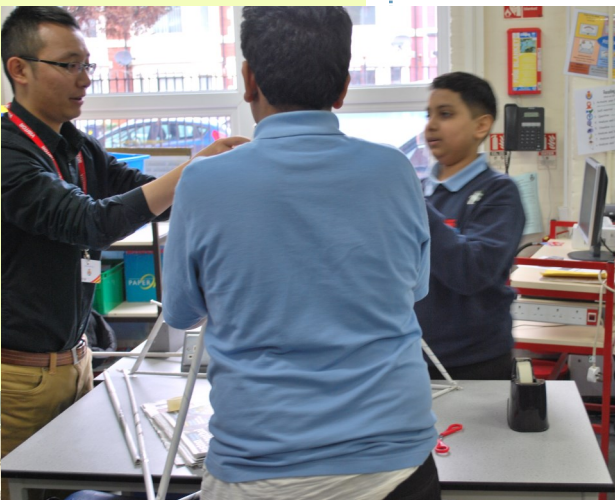
Public outreach

School students

In March, for a third time, MEDOW researchers in Cardiff visited a local school, Cathays High, as Marie Curie Ambassadors to help students learn about science. The involvement of researchers in this kind of activity helps young people to learn more about scientific studies and careers and will hopefully inspire and encourage more of them to consider this as an option for their own future!

General public

In early May, Cardiff ESRs presented the project to the Science & Technology Group of the University of the Third Age which is an organization for older people who want to stay active in learning and up-to-date with the latest science news. A lively debate on renewable energy followed!



Farewell!

We have said au-revoir to our final two postdoctoral researchers, Agustí Egea-Alvarez and Domenico Ricchiuto

Both Agustí and Domenico have gone on to take up roles in the private sector. The MEDOW project would like to say a big thank you and goodbye!

We hope to see them again soon!

Right: Agustí presents MEDOW to a group of local school students in Barcelona in December 2015



Left: Agustí (second from left) and Domenico (sixth from left) join MEDOW and DTU Wind researchers on a visit to Middelgrunden offshore wind farm near Copenhagen in June 2015

Results

Research outputs

International Exhibition & Conference for Power Electronics, Intelligent Motion, Renewable Energy & Energy Management, PCIM2016, 10—12 May 2016, Nuremberg

A Fast Methodology for Solving the Power Flow in Hybrid AC/DC Networks: The European North Sea Supergrid Case Study (Rodrigo Teixeira-Pinto)

IEEE International Energy Conference EnergyCon 2016, 04-08 April 2016, Leuven

Coordinated Fast Primary Frequency Control from Offshore Wind Power Plants in MTDC System (Jayachandra Naidu)

Application of DC Choppers in HVDC Grids (Robert Renner co-author)

**Book: HVDC Grids: For Offshore and Supergrid of the Future
ISBN: 978-1-118-85915-5, Wiley-IEEE Press (March 2016)**

*HVDC Technology Overview
(Gen Li, Chuanyue Li (CU), Dirk Van Hertem (KU Leuven))*

*Power Systems Operations with HVDC Grids
(Dirk Van Hertem, Robert Renner (KU Leuven), Johan Rimez (Elia System Operator))*

*Control Principles of HVDC Grids
(Jef Beerten (KU Leuven), Agustí Egea-Alvarez (CEPRI), Til Kristian Vrana (SINTEF))*

*Real Time Simulation Experiments of DC Grids
(Oluwale Daniel Adeuyi, Marc Cheah (CU))*

*DC Grid Power Flow Control Devices
(Chunmei Feng (Imperial College London), Sheng Wang, Qing Mu (CU))*

**Take a look at the full list on our
dissemination webpages at**

www.medow.engineering.cf.ac.uk

Communication

So in which other ways does MEDOW communicate its work?

As a Marie Curie project, MEDOW has communication high on its agenda. We aim to communicate with as wide a variety of people as possible so as to share our work, to increase its impact and to let European taxpayers know how their money is being spent! We are keen to find news ways of sharing our project news, so do get in touch with us if you can help!

Public outreach

We have already taken part in a number of activities with people outside the research community including participating in a renewable energy and science project days at a school in Cardiff and hosting a group of Spanish and Swedish school students at a workshop on 'HVDC Towards the Future' in Barcelona.



MEDOW in One Minute

Take a look at our bite-size explanation of MEDOW and life as a Marie Curie researcher on Youtube.



Facebook

<https://www.facebook.com/medowproject>

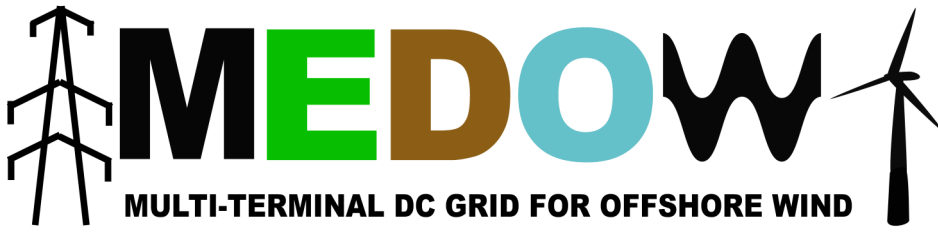
LinkedIn

Group: 'MEDOW'

In the press

Articles on MEDOW have targeted a wide range of audiences in [renewable energy news-site reNews](#), Spanish site [Smart Grids Info](#), in the [national newspaper of Wales](#) and on [OffshoreWind.biz](#)





MEDOW Consortium

Members and roles

MEDOW is co-ordinated by Cardiff University and has four other university partners, five private sector partners and one associate partner.

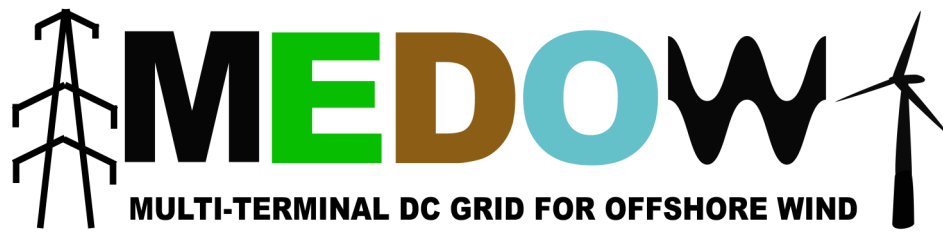
Collectively, staff from the partners organisations have the wide-ranging experience and expertise to provide the appointed researchers with broad-ranging training in DC grid technologies.

All partners will host at least one researcher, and associate partner National Grid will provide training and steering to the consortium.

MEDOW partners:

-  Cardiff University (Co-ordinator)
-  Universitat Politècnica de Catalunya
-  Control Intel.ligent de l'energia
-  Alstom Renovables España
-  Universidade do Porto
-  EFACEC
-  Katholieke Universiteit Leuven
-  Elia System Operator
-  Danmarks Tekniske Universitet
-  China Electric Power Research Institute
-  National Grid (Associated Partner)





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Useful Information

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A DC grid based on multi-terminal voltage-source converter is a newly emerging technology, which is particularly suitable for the connection of offshore wind farms. Multi-terminal DC grids will be the key technology for the European offshore 'supergrid'.

The project's anticipated achievements will greatly contribute to integrating offshore wind power into the onshore AC grids of European countries and to the European 'supergrid'.

Read more about supergrid at friendsofthesupergrid.eu

MEDOW offers a development path to researchers across Europe in the area of DC grids, in addition to fostering greater ties between industry and academia in this key development area.

The MEDOW project has received funding from the Seventh Framework Programme of the European Union under grant agreement number 317221.

www.medow.engineering.cf.ac.uk



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