MEDOW

MULTI-TERMINAL DC GRID FOR OFFSHORE WIND

Newsletter
December 2014
Issue 1

Welcome

Network update

Join us on **Facebook** & **LinkedIn**

Have an HVDC, power electronics or wind power conference, workshop or symposium to promote? Let us know for publication on our website and next newsletter!

Welcome to the first newsletter of the European MEDOW project!

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'.

In MEDOW, 17 early career researchers work with staff from 11 industry and academic partner organisations with collective expertise on the manufacturing, design, operation and control of multi-terminal DC grids.

Now that the project is well underway and nearly all of our researchers are in post, we have stepped up our dissemination and communication activities so as to help us engage with audiences within the research community and beyond.

This is the first of our 'public' newsletters which will be sent to people who have asked to receive updates or have participated in MEDOW events, and organisations which we think might be interested in our work. Please pass the newsletter to those who you think will be interested and ask them to contact me to join the mailing list.

A newsletter will be issued 3-4 times per year and will aim to communicate not only news from MEDOW but also news of interest to the wider research community and the public, so contact me if you have news from the DC grids, HVDC, offshore wind, power electronics or renewable energy communities that can be included in the next issue.

With best wishes,
Cath Roderick
MEDOW Project Officer
RoderickCH@cardiff.ac.uk

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PEOPLE

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Training and Events

Want to take part?

Email Cath Roderick
RoderickCH@cardiff.ac.uk

MEDOW is funded by the Marie Curie Actions programme of the Seventh Framework Programme of the European Union.

Marie Curie projects have a focus on people. Therefore, as an 'Initial Training Network', we aim to give our researchers wide-ranging training in the technical and supporting skills that they need to embark upon successful and productive research careers in the private sector as well as in academia.

Whenever possible, our 'network training activities' will be open to researchers from outside the network so as to ensure that as many people as possible benefit from the project.

Our next network meeting will take place in Brussels and Leuven (Belgium) in January 2015.

The following activities are open to researchers from outside the network:

Monday 19 January (Leuven)

Time & Project management for Researchers

Tuesday 20 January (Brussels)

Industry day with Elia System Operator, including talks from key staff members and a technical site visit.

Thursday 22 January (Leuven)

Assembly Meeting—MEDOW work packages will present their objectives and results.

Lecture on recent developments in HVDC by Dr Norman MacLeod of Parsons Brinckerhoff

Friday 23 January (Leuven)

Seminars on topics related to DC grids from the MEDOW Experienced Researchers.

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Why offshore wind?

Wind power is well established throughout Europe as source of clean, renewable electricity. We need to generate more of it in order to help us to decarbonise the power system and to become less reliant on expensive imported fossil fuels: in 2012, over half of the energy that the EU consumed had been imported from outside the Union. It's expected that a large number of new wind farms will be installed offshore, where wind speeds are higher and the turbines are less intrusive than they are on land. As offshore wind power is generated a long way from where it ends up being used, we need to find more efficient ways of connecting these wind farms to the mainland so that electrical power can be transported over long distances and fed into the onshore grid. Increasing our use of wind power will also support the future electrification of heating and transport as we'll be able to run them using low carbon electricity rather than gas or oil. Given that heating and transport represent a significant proportion of the country's energy use, this could make a big difference to both carbon emissions and reliance on fuel imports.

Why do research on DC grids?

The MEDOW project is investigating DC (direct current) grids for transmitting offshore wind power: DC is more efficient than AC transmission – less of the power gets lost along the way – but we need to develop a grid, rather than rely on single point-to-point connections, as grids are the best way to balance supply and demand of electrical power and to ensure reliability of the system when something goes wrong. MEDOW researchers are working on the technology that we hope will form the basis of a future European 'supergrid', a pan-European electricity transmission network which will support the integration of large-scale renewable energy, facilitate a single European electricity market and allow us to export sustainable energy technology and create skilled new jobs.

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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 Engenharia e Sistemas
- Katholieke Universiteit Leuven
- Elia System Operator
- Danmarks Tekniske Universitet
- China Electric Power Research Institute
- National Grid (Associated Partner)

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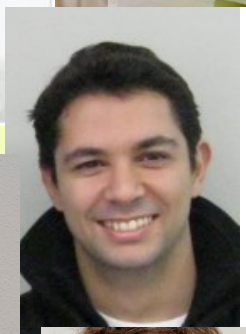
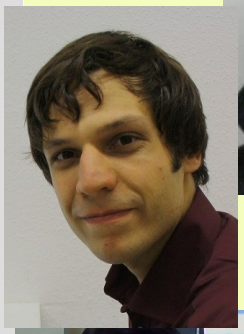
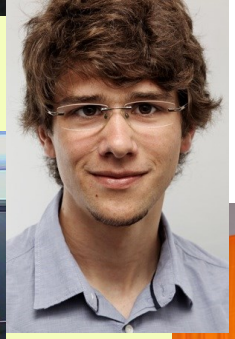
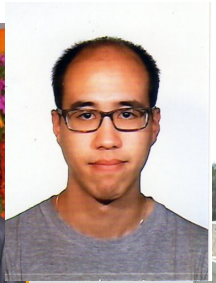
The Recruited Researchers






An international group!

At the time of writing, we have all 12 of our Early Stage Researchers (ESRs; PhD level) and 2 of our Experienced Researchers (ERs; post-doc) in post.

Of the 3 other ERs, 2 are in the recruitment process (Cardiff University and China Electric Power Research Institute) and the third, to be based at Alstom Renovables, is currently advertised—search for 'MEDOW' at the EC's research jobs portal: http://ec.europa.eu/euraxess/index.cfm/jobs/index

Our researchers some from all over the world and so our consortium is a very international group! They are from: Spain, Germany, Brazil, India, China, Portugal, Pakistan and Iran - thanks to the flexibility and inclusivity of the Marie Curie programme!

See more at www.medow.engineering.cf.ac.uk

Recent appointments

Sahar Pirooz Azad joined MEDOW as Experienced Researcher at KU Leuven in Autumn 2014. Prior to joining us, Sahar was working in the group of Prof Reza Iravani at the University of Toronto.

Rodrigo Teixeira Pinto is working as Experienced Researcher at CITCEA-UPC and joins MEDOW from TU Delft.

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Women in Engineering

European Association for Women in Science, Engineering & Technology (WiTEC)
www.witec-eu.net/

Women's Engineering Society
www.wes.org.uk/

Sahar Pirooz Azad

The Marie Curie funding programme is about people, and building Europe's research capacity through recruiting talented early career researchers irrespective of age, nationality or gender.

You will notice that, so far, MEDOW has only one female researcher. This is somewhat a reflection of the demographic of people working in the field of electrical engineering!

In the EU, only one in every six engineers is a women. So what can we do to encourage more young women to undertake engineering studies and careers?

Although electrical engineering is a largely male-dominated sector, MEDOW ER Sahar does not feel that she has seen barriers for women to succeed in this field: "It is challenging to work in such an environment, but it makes you stronger and you can benefit from the qualifications and skills of your colleagues."

Her advice to young women considering their future choices is not to be scared of the challenges that they will face in this career: "Just go after what you are passionate about and all the difficulties will gradually fade away. Girls who are not sure whether they will like engineering or not should just give it a shot, by attending a summer course, going to a science camp, talking to engineers, or simply going to an engineering department of a university and talking to the engineering students."

"Young women often think that they don't have any passion for engineering and the sciences but that's not necessarily true: if you get involved in some engineering related activities and learn about various engineering careers, you will be amazed of how much you will enjoy it!"

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Results

Research outputs

MEDOW researchers have already begun to disseminate their research findings in a variety of ways.

Events at which MEDOW researchers have presented their work include:

13th International Workshop on Large-Scale Integration of Wind Power into Power Systems as well as on Transmission Networks for Offshore Wind Power Plants
Berlin, Germany, 11-13 November 2014

3rd Renewable Power Generation Conference (RPG™)
Naples, Italy, 24-25 September 2014

The 16th European Conference on Power Electronics and Applications, EPE '14 ECCE EUROPE, Lappeenranta University of Technology, Finland, 26 – 28 August 2014

5th Annual HVDC PhD Colloquium, Imperial College London, 09 – 11 July 2014

3rd International Conference on Smart Grid and Green IT Systems (SMARTGREENS) Barcelona, 4-5 April 2014

MEDOW also plans to participate actively in future large international conferences, including:

11th International Conference on AC and DC Power Transmission (IET ACDC 2015), 10 - 12 February 2015, Birmingham, UK

7th Conference on Power Electronics and Applications (EPE'15-ECCE Europe), 8-10 September 2015, Geneva, Switzerland

Take a look at the full list on our dissemination webpages at www.medow.engineering.cf.ac.uk

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Research outputs

In September 2014, Marc Cheah presented a paper on *Permanent Magnetic Synchronous Generator for Wind Turbines: Modelling, Control and Inertial Frequency Response* at the 49th International Universities' Power Engineering Conference, UPEC 2014:

Offshore wind power generation is expected to increase in the following years, but there are still some economic and technical challenges to overcome. Because of difficult access to offshore facilities the reduction of maintenance is an essential point . The use of Permanent Magnet Synchronous Generators (PMSG) is considered a suitable option. These generators along with full-rated Voltage Source Converters (VSC) are expected to provide ancillary services for the onshore AC grid. Particularly, Inertial Frequency Response is an interesting option considering the stored kinetic energy in the rotor of the wind turbines.

In Marc's paper a description of the model and control system of a PMSG using full-rated VSC were reviewed and their Inertial Frequency Response capability presented. At the end, simulation and experimental tests results were shown in order to compare these two different options and analyse their viability.

More...

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In September 2014, Ataollah Mokhberdoran presented a paper *A Review of HVDC Circuit Breakers* at the 3rd IET Renewable Power Generation Conference (RPG™):

The increasing interest in development, operation and integration of large amount of renewable energy resources like offshore wind farms and photovoltaic generation in deserts leads to an emerging demand on development of multi-terminal high voltage direct current (MTDC) systems. Due to preformed studies, voltage source converter based HVDC (VSC-HVDC) system is the best option for realising future multi-terminal HVDC system to integrate bulk amount of energy over long distances to the AC grid. The most important drawback of VSC-HVDC systems is their need for fast HVDC circuit breakers.

Ataollah's paper aimed to summarise, analyse and compare HVDC circuit breakers technologies and to make recommendations for improvement of circuit breakers.

More...

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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 project day' 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 out 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 recently targeted a wide range of audiences in renewable energy news-site re-News, in the national newspaper of Wales and on OffshoreWind.biz

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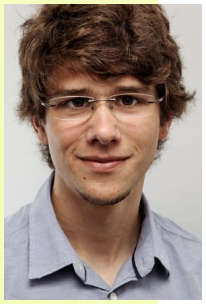
Training

MEDOW is an Initial Training Network.

At the moment, there is a lack of operational experience and of skilled engineers in DC grids in Europe. Therefore, as an Initial Training Network, MEDOW aims not only to address technical challenges but also to train and develop promising early-career researchers. This will help to form a pool of expertise in the field and to develop researchers with the technical and transferrable skills, private sector experience and established network of contacts which will give them the opportunity to undertake successful research careers with impact in a field which is shaped by industry demand. This will help directly to address the current and future skills shortage in power and energy engineering.



MEDOW researchers do not only receive technical training! In September, ESR Kevin Schönleber took part in an unusual kind of training….

Training on working and rescue at height 1-4 September 2014, Pamplona, Spain

“A proactive environment, health and safety (EHS) attitude is one of the most important topics in the power industry especially in the wind industry. At my host company Alstom Wind, every access to a wind turbine is backed up with proper training on EHS in advance. In order to visit wind turbine prototypes during my time as Marie Curie ESR fellow, I received a 4-day training at the beginning of September at a dedicated training center for wind turbine access in Pamplona, Spain.

During those four intensive days both theoretical and practical training for works in altitude were provided: first aid, security and risks in wind farms and turbines, use of personal protection equipment, emergency descents with different systems and correct use of elevators inside the wind turbine.

The training offered me a very practical hands-on preparation for accessing wind turbines in the future. In my opinion this is a very special training for a PhD student used to work on modeling and simulation in a regular office. As fellow of an industrial partner in Medow I will have the unique possibility to see the interior of a new prototype of the Alstom Haliade offshore wind turbine. I am expecting that this future training will expand my knowledge about wind turbine systems in a real environment. My personal highlight was descending from the simulation tower of 20m of height with a rope which is slightly thicker than a shoestring.”

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Developing networks

One of the purpose of an Initial Training Network is to give the early career researchers opportunities to develop professional networks and make contacts in both academic and the private sector.
MEDOW researchers are therefore encouraged to collaborate with a variety of other researchers.

In September, ESR Tibin Joseph attended a residential course on 'Communication for Collaboration' offered by the GW4 consortium (Cardiff University, University of Bath, University of Bristol, University of Exeter). As a result of the session, Tibin has produced a collaborative report with Daniel Lewis, a PhD student at the University of Bristol.

Offshore Wind Energy Transmission with Multi-Terminal High Voltage DC grids (MT-HVDC)and Fuzziness

FUZZY logic has developed extensively ever since its inception by Zadeh. Though the effectiveness of fuzzy logic has been proven in many instances in industry, the use of fuzzy logic in electrical power systems is still not widespread. One of the reasons for this limited application in the power system area could be the need for subjective and possibly unreliable (due complexities and nonlinearities involved) expert advice. In terms of robustness and relatively simple implementation and design, fuzzy logic has many advantages. It suffers, though, from one major criticism. The design of fuzzy logic controllers (FLCs) depends heavily on experience namely, the experience of a human expert/operator. This means that the design process is largely dependent on having a priori information about the system behavior.
But the application of FLC in power system is getting widespread increase due to its adaptability with high nonlinearities, and applicability in systems where model is unknown or even mathematically complex. Power system is such a highly nonlinear system and with the increased integration of Renewable Energy Sources (RES) like wind, solar PV etc.), the control of the system operations becomes increasingly difficult and the use of a nonlinear controllers like FLC are gaining wide spread applications.

Full report...

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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.

Deadline for contributions to next newsletter:

27 February 2015

Find us on Facebook

www.medow.engineering.cf.ac.uk

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