

IPID4all Doctorate Research Exchange with Dr. Thilo Kilper, NEXT ENERGY, University of Oldenburg

Feedback report

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An Innovative Control Approach to Improve PV
Integration into Remote Electricity Networks*

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Introduction

I had a wonderful experience during my research exchange stay at the NEXT ENERGY | EWE-Forschungszentrum für Energietechnologie e. V., University of Oldenburg. My host supervisor, Dr. Thilo Kilper and his research group are currently involved in collaborative research with my PhD supervisory team at Murdoch University and Thomas Schmidt, PhD student from the Solar Energy Meteorology Group at the University of Oldenburg on PV integration in remote electricity networks. I conducted research with my host supervisor, Dr. Thilo Kilper & his research group and the Solar Energy Meteorology Group of the university.

Research Undertaken

Being a variable source of electricity generation, solar photovoltaic (PV) systems impose various challenges on the operation and maintenance of conventional electricity networks. Specifically, remote area electricity networks (commonly referred to as 'remote electricity networks') being susceptible primarily due to their limited generation capacity and spinning reserve, which are likely to be critically affected by the variability of PV generation. Development of robust control mechanisms incorporating PV forecasting technology, network equipment and ancillary services provided by inverter coupled generation systems has been suggested to enhance the operational stability and reliability of electricity supply. The research undertaken was to:

- study and analyse the technical complexities due to higher levels of PV penetration into remote electricity networks and
- to develop an innovative control mechanism using short-term PV forecasting technology, controllable storage systems and real-time measurement methods.

Hence, the research tried to:

- address improved PV integration into remote electricity networks and
- contribute to limit the associated GHG emission by displacing high-cost fossil-fuel based electricity generation.

This collaborative research outcome is highlighted in the article, "Solar short-term forecasts for predictive control of battery storage capacities in remote PV-diesel networks" to be presented at the World Renewable Energy Congress XVI, Perth, Australia in February, 2017.

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Personal Experience

The IPID4all doctoral research exchange programme opens the door to foreign researchers worldwide to explore the research excellences that Germany showcases and to avail the opportunity to work with some of the best research groups in German universities. Working with the researchers from the University of Oldenburg was a brilliant and fruitful experience for me. Their expertise in my particular research field and interest in application-oriented research provided an excellent basis for developing and expanding my proficiency that helped me to acquire more knowledge to accomplish some objectives of my doctoral research. Last but not the least; being a travel enthusiast, getting the chance to familiarise with German people and their native culture and tradition was a big achievement for me. This exchange programme opportunity opened the window of vast horizon to me to witness the rich European culture, history and their heritage. I availed the opportunity to travel to some ancient sites in Germany to witness the tremendous history and evolution of human civilisation and the natural beauty of the country. Hence, I graciously acknowledge the support from DAAD with funds from BMBF and the University of Oldenburg and NEXT Energy for choosing me to take part in the exchange programme.

Future collaboration / Outlook

- a) Enhance collaboration between Murdoch University School of Engineering and Information Technology, NEXT Energy and the Solar Energy Meteorology Group at the University of Oldenburg in the following areas:
 - Short-term solar forecasting and its application in remote electricity networks' control
 - Power system simulation and control design in remote electricity networks
- b) Collaborative publications in high ranked journals

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