

# power grid improvements for the uk

Large scale integration of renewable distributed generation into the power grid has significant potential to both reduce carbon dioxide emissions and provide secure and resilient power. The current UK grid is largely a one way system with power generated in large power stations and distributed through transmission and distribution lines, with no storage capability. The current system requires power generators to provide excess generation capacity to meet peak demands.

The alternative is to develop smart grid systems which integrate power generation with the grid and with consumers through an intelligent communication system. Advanced and unique facilities based at the University of Birmingham – funded by Advantage West Midlands (AWM) and the European Regional Development Fund (ERDF) as part of the Birmingham Science City initiative - are being used to further the understanding of the operation, control and management of smart grid systems powered by energy from distributed sources.

#### The facilities comprise of the following key pieces of equipment:

- A smart power grid and real-time simulator that provides the capability to realistically simulate smart power grids with the integration of distributed power generation including wind, wave and fuel cell generation systems
- Monitoring and control capability as well as real-time information integration, monitoring, protection and closed-loop control functions

Birmingham Science City  
**ideasforlife** 

**UNIVERSITY OF  
BIRMINGHAM**

THE UNIVERSITY OF  
**WARWICK**

investing  
in your future  
European Regional Development Fund  
European Union



**A** Advantage  
West Midlands

[www.advantagewm.co.uk](http://www.advantagewm.co.uk)



change  
seed

# power grid Improvements for the uk

## The laboratory can be used for research on:

- Operation and control methods for power grids
- Control techniques for distributed energy generation and interconnection
- Controllers and protection devices and algorithms for individual components
- Technical barriers to the integration of renewable energy generated from distributed sources in to the power grid

The facility is led by Dr Xiao-Ping Zhang, Reader in Energy Distribution Systems, Head of Electrical Power Systems Research Group at the University of Birmingham. His expertise is wide-ranging including: application of power electronics such as FACTS (Flexible AC Transmission System) and CUSTOM POWER in transmission and distribution systems; technologies for smart grids; power system economics; large scale power system optimisation and planning; analysis and control of power system stability; power quality and harmonics; integration of distributed generation (embedded generation) into electrical power systems; and micro-generation and micro-grids.

Already working with companies such as E.ON, ABB, Areva, Dr Zhang is keen to develop new partnerships, particularly with local businesses from the West Midlands region.

The set up of this new facility is part of the £10.5m Energy Efficiency & Demand project, funded by AWM and ERDF under the Birmingham Science City initiative. It is a key part of a larger investment in the research infrastructure of the West Midlands region, which unites the Universities of Warwick and Birmingham in a newly-formed Science City Research Alliance (SCRA).

The Energy Efficiency and Demand project, led by the University of Warwick, sits alongside the Hydrogen project, led by the University of Birmingham, under the umbrella of the Energy Futures theme. The investment aims to develop and promote a regional hub for academic and industrial expertise in energy efficiency and demand reduction as part of the Government's mission to achieve a strong knowledge-based economy.

## For further information and business enquires, including proposals for collaboration or access to the facilities:

Dr Mike Ahearne, Business Engagement Manager for the Birmingham Science City Energy Efficiency & Demand project.  
Email: [m.ahearne@warwick.ac.uk](mailto:m.ahearne@warwick.ac.uk)  
Tel: +44 (0)24 7657 5484  
Mobile: +44 (0)7824 541173

[www.eece.bham.ac.uk](http://www.eece.bham.ac.uk)



Dr Xiao-Ping Zhang – Head of Smart Grid Facility

[www.birminghamsciencecity.co.uk](http://www.birminghamsciencecity.co.uk)

**General enquiries:**  
Sarah Keay-Bright  
Project Manager  
Research Support Services  
University of Warwick  
CV4 7AL

Email: [s.keay-bright@warwick.ac.uk](mailto:s.keay-bright@warwick.ac.uk)  
Tel: +44 (0) 247 657 5492  
Mobile: +44 (0) 7824 541135