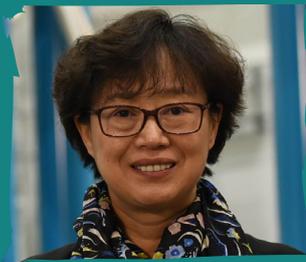


Evolution of Transformer-based AC Electrical Power Systems to Smart Grids

Professor Zhongdong Wang

Tuesday, 27 October 2020



Abstract:

Modern society is dependent on flexible electrical energy, available on demand, at an affordable social and environmental cost. Today, most of our electrical energy is produced by converting the carbon stored in coal or natural gas into heat energy and then via turbines and synchronous generators into 50Hz electricity. To address the challenges of climate change, technologies are developed to reduce our reliance on 'pre-historic' solar energy stored in fossil fuels, and to exploit 'real time' solar energy available via wind, waves, photovoltaic, solar thermal, bio-mass and hydro. To incorporate these green, but often intermittent energy resources, the current transformer-based AC electrical power systems will have to become more resilient and 'smarter'. Transmission and distribution networks consist of substation nodes interconnected through lines and cables.

The ultimate goals of any system operator are to maximise the remaining life of existing networks under the ever changing

generation and demand scenarios without increasing the failure rate. Power transformers convert one voltage to another, and are the most important primary asset in a substation. Real time condition monitoring and prognostic asset management maintain the resilience of our electricity supply and minimise failures. In the University of Exeter, electrical engineering is working with data sciences and AI, to take advantage of our increasing modelling and simulation capability, including research into "digital twins" of devices such as transformers.

This is a part of the digitisation process which allows real time information flow between manufactures, utilities, the suppliers and the consumers of electricity, and reduces our energy costs.

Presented by: Professor Zhongdong Wang, Professor of Electrical Power Engineering

PVC and Executive Dean of College of Engineering, Mathematics and Physical Sciences University of Exeter