QUB researchers are working with SONI and EIRGRID to reduce power fluctuations on the transmission system.

SPIRE 2
Storage Platform for the Integration of Renewable Energy

Ulster University

QUEEN'S UNIVERSITY BELFAST

University of Strathclyde

DUNDALK INSTITUTE OF TECHNOLOGY

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THE CHALLENGE

We need to move from the power system we have inherited, primarily powered by fossil fuels, to a new cleaner, greener power system, primarily powered by renewable energies. This transition was initially motivated in the 1970s by a fear that fossil fuels would run out, then in the 1980s and 1990s by acceptance of Global Warming and now there is also the appreciation of air quality for human health. During this time the cost of renewable energy technology has fallen so much that they can compete financially with legacy technologies.

However, incorporating renewable technologies can prove challenging as they need to replace services that are provided by fossil fuel power stations. These services can be considered under oscillation dampening, fast power response and reserve power. These problems are solved by having stored energy that can be released to address power imbalances, something wind turbines and solar panels usually cannot do. The technologies investigated and the research undertaken is intended to meet the power industries triple bottom line, reduce cost, improve power system security and deliver on environmental goals.

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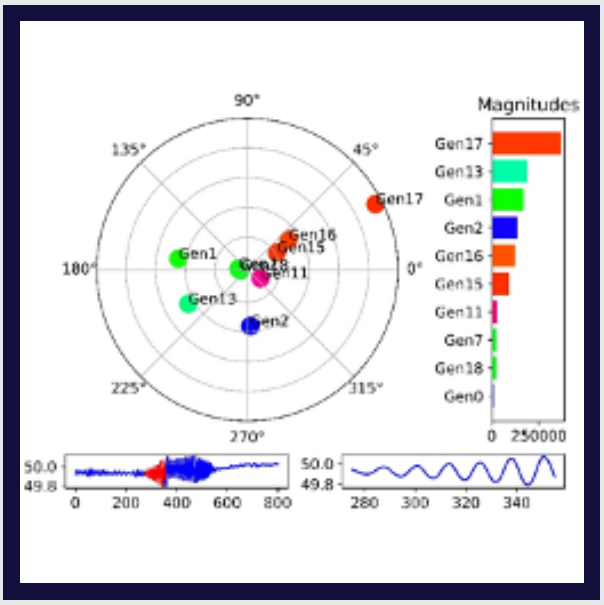
THE RESEARCH

In Queen's University Belfast, in collaboration with SONI and EirGrid, we investigate the use of grid connected battery energy storage systems (BESS). Our aim in the short term is to demonstrate how BESS can be used to create a more efficient, reliable and economic power system. Our aim in the medium term is to help incorporate more renewable energy, ideally to a point where all our electrical energy is coming from renewable sources. The Irish power system is already pushing the boundaries in this field and can demonstrate to the rest of the world what can be done.

THE CONCEPT



High precision devices are used to measure the power from power stations, wind farms and BESS. These devices are very accurate and report 50 times per second. The data from these devices are being used to determine which generators are causing problems and how quickly generators can respond. This analysis has applications for historical analysis and real-time control.

The measurement data are also used to develop highly accurate computer models of the power system. These models can be used to investigate how the system might respond as renewable generation increases. BESS are also developed and deployed in the models, in this environment they can demonstrate their potential use at scale.

THE IMPACT

Our research on oscillations on the Irish power system continue to suggest that they are caused by conventional power stations and not by wind farms, as is often suspected. Work in this field continues to demonstrate how useful BESS will be in reducing oscillations on the Irish power system. Our research is also presenting new ways that BESS can respond incredibly quickly to replace a generator when it becomes unexpectedly disconnected. We continue to seek out the challenges slowing the deployment of renewable energy on the transmission system, so we can meet climate change goals. The incorporation of more renewable energy lowers costs and emissions from power stations while the technology being investigated will improve the stability of the power system, reducing blackouts and their associated economic and social impact.

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