

Owner's Engineer for WPD's Harmonic Mitigation Project

National Grid Electricity Distribution's Network Innovation Allowance (NIA)-funded harmonic mitigation project is aimed to develop a new solution for the management of harmonic levels in electricity distribution networks. This includes creating an algorithm to control the existing distributed generation inverters that will be delivered by Swansea University. The scope of PSC's work is to perform technical reviews of the power system models and all work done by Swansea University. PSC will also provide expert advice and direction on the execution of technical stages within the project's various work packages.

Challenge

Zero emission targets are driving an increased integration of renewable energy sources using power electronic converter technology. One of the disadvantages of using power electronic converter technology is the generation and emission of unwanted harmonic. The level is expected to increase and therefore can become a challenge for Distribution Network Operators (DNOs) if not managed properly. Existing solutions for managing harmonics, usually in the form of passive shunt filters, are not suitable for dynamic networks with varying operating conditions and can be very expensive.



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Client	National Grid Electricity Distribution	nationalgrid
Country	UK	
Year	2019	

Therefore, it is important to find alternative solutions that can mitigate and be able to manage harmonic levels in the network in a cost-effective way. To investigate a solution to this, National Grid has undertaken this project to develop a control algorithm that can improve the network's harmonic levels by utilising spare capacity in existing distributed generation inverters.

PSC advantage

PSC brings extensive experience in modelling, analysing and managing harmonic issues at the system and individual customer network levels. PSC's experience covers a large selection of standards used worldwide as applied to many different systems, both transmission and distribution. PSC also provided the expertise that initiated and led the review and revision of modelling aspects of harmonics at an international level.

Project solution

PSC was engaged by National Grid as external experts on harmonic modelling, analysis and emission limit specification to review their internal harmonic distortion assessment policy and application. PSC reviewed their approach to modelling and analysis and identified potential improvement opportunities in the overall process. Following this, PSC was tasked to perform technical reviews of the power system models used and all work done by Swansea University in the execution of National Grid's harmonic mitigation project.

The project will provide an alternative to existing solutions that are either very expensive or not suitable for the dynamic nature of modern networks. As part of this work, power system studies will be performed so that an algorithm will be developed, tested and implemented by Swansea University to control existing distributed generation inverters in order to improve the network's harmonic levels. The initial major review is on active filter design and algorithm including documentation, code and study results with the use of a single inverter and then moving into multiple inverters.