Peter Haigh

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SUMMARY

Peter Haigh
BA BEng MSc CEng MIET
A Chartered Engineer with the Institute of Engineering and Technology (IET).
An experienced power systems engineer with a specialism in power quality.
An external representative of the UK electricity supply industry for CIGRE and the ENA.
A published academic and experienced presenter in fields of harmonic analysis, EMT and power quality monitoring systems.
A consultant in the field of power quality and harmonics.

EXPERIENCE

Power Quality Risk Consulting 02/2016 – Present
Power System Engineering Consultant

I offer consulting services to network owners and grid-connecting projects in the field of harmonics and power quality.
I specialise in interpreting utility requirements, building models and delivering grid-connection system studies in DIgSILENT, and assessing harmonic compliance through installation of power quality monitoring and analysis of measurement data.
I am experienced at dispute resolution and compliance clarification for connection to utility networks.
I have managed and delivered the harmonics requirements for large projects including two 300 MVA datacentres.

07/2014 – 02/2016
National Grid
Senior Power System Engineer

I am a Chartered Engineer with the IET, who specialises in harmonic analysis, power quality and grid connection studies.
I represent UK utilities at CIGRE working groups for Power Quality benchmarking (CIGRE WG B4.27), and have contributed to Harmonic Modelling (CIGRE JWG UK C4/B4.38).
I contributed to the development of ER G5/5 which is redefining the industry standard for harmonic assessment in the UK.
I authored and managed the delivery of a training package in harmonic analysis and harmonic measurement.
I have experience in electromagnetic transient analysis to support incident investigation and grid code compliant connection design.
I led the specification, procurement and deployment of a £9m power quality monitoring system that gives widespread harmonic and power quality monitoring capability on the UK grid.
I delivered part of the main keynote at NI Week 2014 to an audience of 3,000 plus 20,000 via live stream. I also shared experiences on deployment of our power quality monitoring system at the Energy Technology Summit at NI Week 2014.
My other duties followed on from those of my previous role.

National Grid 03/2011 – 06/2014

Power System Engineer

I was the Lead on Power Quality for the West of England and Wales.
I performed power system studies in DIgSILENT Power Factory simulation software, of which I am an expert user.
I built models in steady-state including frequency domain effects, and authored customised DPL script to automate studies in DIgSILENT Power Factory. I also authored customised MATLAB script to process simulation data, optimising the study process and increasing process efficiency while reducing human error in the results.
I was responsible for assessing the Grid Code compliance of connections to the National Electricity Transmission System, and influencing the design and capital investment of schemes in the range of £1m to £1bn.
I provided the technical interface, support and expertise for grid integration of offshore and onshore wind energy projects; traction demand; and HVDC interconnector projects, creating technical specifications and functional specifications for network reinforcement solutions.
I delivered compliance verification involving on-site monitoring.
I led on power quality aspects of multi-million pound schemes from tender specification, through assessment, design and delivery for new technology infrastructure.
I contributed to policy development internally and externally: I defined and documented the industry process for OFTO harmonic assessment.
I was a contributing author to the ER G5/5 standard.
I co-authored a published paper "Ensuring Grid Code Harmonic Compliance for Wind Farms".
I co-sanctioned and developed a £9m Power Quality Monitoring System, including a transducer upgrading scheme which I managed delivery of.
I co-designed, developed and managed delivery of Power Quality Monitors in-house using National Instruments' (NI) kit and delivered a keynote speech about National Grid's monitoring system at the Energy Technology Summit, NI Week 2013, Austin, Texas.

National Grid 09/2009 – 02/2011

Graduate Development Programme

A graduate scheme geared around leadership and personal professional development. I completed three six-month placements across NG's Electricity and Gas businesses achieving 'above target' rating in all three roles.

EDUCATION

The University of Manchester 2011 - 2013

MSc (Distinction), Electrical Power Systems

The University of Manchester 2005 - 2008

BEng (1st class Hons), Electrical and Electronic Engineering

Newcastle University 2000 - 2004

BA (upper 2nd class Hons), Combined Arts - Philosophy Major

PUBLICATIONS

Ensuring Grid Code Harmonic Compliance of Wind Farms 11 / 2012

11th Wind Integration Workshop. Authors: Peter Haigh, Danson Michael Joseph, Joseph McCullagh

Abstract—The prevalence of cabled infrastructure associated with wind farms, combined with the surge in power-electronic interfaces in wind turbines and reactive power plant, has highlighted the pervasive nature of harmonics on electricity networks. Insufficient consideration is given to the effects of harmonics through the low prioritisation of power quality in the Front-End Engineering and Design (FEED) and a lack of awareness of the obligations of the respective parties involved. The resulting designs are incompatible with the requirements of the relevant Grid Codes. This can lead to delays, commercial exposure, restricted network access and subsequent loss of revenue. The obligations of the Transmission Owner (TO), System Operator (SO), and wind farm developer are discussed with respect to Grid Code requirements and the responsibilities of each party in ensuring compliance. The technical aspects of assessing harmonic compliance are described in the context of the design considerations which are made at the various stages of the project development. These include the shift in resonances within the host network, the modification of existing harmonic distortion, and the propagation of injected harmonics into the network and through to the EHV, HV and MV substations. The ensuing challenges associated with ensuring compliance through filter design are discussed in the context of relevant international standards, including UK ER G5/4-1, IEEE 519, EN 50160 and IEC 61000-3-6. Results indicate that shifts in resonances are more problematic, compared to the propagation of injected harmonics: Injected harmonics are readily absorbed through local filtering and thus the emissions are typically low; in contrast, the effects of shifts in resonances must be transferred back to the point of common coupling, resulting in complex local filtering. Early selection by the developer of appropriate transmission infrastructure and technology can lower the filtering requirement.

Energy Summit Keynote: National Grid—Developing, Monitoring, and Understanding the UK's Transmission Network 08 / 2013

National Instruments NI Week. Authors: Peter Haigh, Danson Michael Joseph. http://www.ni.com/niweek/energy-summit/

National Grid has developed a system to measure, collate, and analyse the electrical performance of the transmission network. It comprises 110 NI cRIO-9082 systems permanently installed at selected substations and 25 portable NI cRIO-9024 and cRIO-9113 systems that measure sites not covered by the permanent installations. The data is sent to a central server via Ethernet and mobile networks and presented to the user as a web application. This presentation described the need for and the requirements of the system along with the architecture which enables National Grid to overcame the limitations of dedicated power quality monitors using the NI CompactRIO platform.

Implementation of Remote-Node Assessment of the Impact of Resonant Plant on Harmonic Compliance 09 / 2013

The University of Manchester. Author: Peter Haigh

National Grid Electricity Transmission has observed that harmonic compliance can be affected by the addition of resonant plant to the transmission system. This effect has been found at nodes remote from the point of connection of the new resonant plant. Engineering Recommendation G5/4-1, the applicable standard for the National Electricity Transmission System, is being reviewed and one proposed change is that for addition of resonant plant, the transmission owner must conduct an assessment to ensure compliance that considers all affected nodes. A methodology for assessment of resonant plant is developed and tested through calculation of the modification to the existing harmonic background using the full frequency-dependent Great British system model. The need to consider the full bus impedance matrix is demonstrated, and

two contrasting theoretical methods to account for network impedance variation are described, applied and critically appraised.

Deploying a Substation Platform for Transmission Network Monitoring 08 / 2014

National Instruments NI Week. Authors: Danson Michael Joseph, Peter Haigh CEng MIET.

http://prezi.com/y67x7nyfmkg /deploying-a-substation-platform-for-transmission-network-mon/

The power quality monitoring system has progressed to deployment stage. This presentation shares experiences and learning in the practical aspects of deployment of a large monitoring system to the transmission system.

Investigation into Oversheath Failure of a 275 kV Cable 06 / 2015

International Conference on Power Systems Transients. Authors:

Dr Forooz Ghassemi, Peter Haigh. http://www.ipstconf.org/papers/Proc IPST2015/15IPST089.pdf

Abstract—A lightning event caused a 275 kV cable, which was part of a composite overhead line-cable circuit, to fail. ATP-EMTP package was used to model the network around the cable. It was found that a lightning event with current magnitude of 24 kA, striking the tip of the transmission line tower adjacent to the Cable Sealing End (CSE), can result in an increase to the sheath voltage with respect to the substation earth mat that exceeds the recommended limit. The study confirms that the Sheath Voltage Limiter (SVL) rating should not be exceeded and that the SVLs should remain intact. The finding of the study is in line with the site inspection report. Recommendations are made to reduce the sheath voltages during lightning and switching transient events. The recommendations include changing the sheath earthing arrangement by moving the SVLs to the cable entry points and earthing the sheath at the existing junction box. It is shown that the earth mat inductance around the CSE and earthing points can be reduced by using appropriate earthing rods. It is also suggested that high quality earthing straps are used to ensure a good connection to earth.

A Transmission Utility Approach to Electromagnetic Transient Analysis 06 / 2015

International Conference on Power Systems Transients. Authors: Peter Haigh, Asim Khursheed, Dr Forooz Ghassemi, Fabian Moore, Jinsheng Peng, Kenneth Smith, Denis Kho Tiong Aik. http://www.ipstconf.org/papers/Proc IPST2015/15IPST149.pdf

Abstract—National Grid Electricity Transmission (NGET) is constructing a number of reinforcements and extensions to the transmission network in the London area: installing new cable circuits and transformers. To support this, a number of Electromagnetic Transient (EMT) studies need to be conducted. A collaborative approach was employed by NGET for delivery of these studies whereby NGET commissioned a consultancy to assist with development of a regional model, to an agreed engineering specification, that was suitable for a variety of study types. This paper presents the model development, an example case study of the model's use by NGET and the lessons learned in the collaboration.