18th November 2012

Mr Simon Bartlett
Chairperson
E.S. Cornwall Scholarship Advisory Committee
PO Box 1193
Virginia QLD 4014

Dear Simon

First Quarterly Report – E.S. Cornwall Memorial Scholarship – Alexandra Price

Please find enclosed my first quarterly E. S. Cornwall Scholarship report outlining my period of employment from the 6th August 2012 – 6th November 2012.

During my first three months with UK Power Networks working on the Low Carbon London Programme I have been involved in the design phase of a number of trials relating to electric vehicles, distributed generation and demand response. This experience has provided valuable insight into the trial design and management process of large Low Carbon Network Fund programmes.

I thank the committee for this opportunity and welcome the committee's feedback on this report and my goals for the next quarter.

Yours sincerely,

Alexandra Price

E.S. Cornwall Scholarship First Quarterly Report

6th August 2012 – 6th November 2012

By Alexandra Price

Photo reference: Utility Week, "UK Power Networks buys three electric vehicles that will take part in Low Carbon London trial", 16 Nov 2012.

Table of Contents

Introduction 4
UK Power Networks 4
Low Carbon London Programme 5
Work Placement 5
Solution Design Documents 5
Demand Response 6
Project Management 7
Future Experience 7
Professional and Personal Development 7
Conclusion 8
References 8

Introduction

My E.S. Cornwall Memorial Scholarship supported work is aimed at gaining a valuable insight into the future of the electricity industry from the work completed as part of UK Power Networks (UKPN) lead Low Carbon London Programme. In particular, I am focussing on the active network management of distributed generation, implementation of demand response and the network impacts of electric vehicles.

My tenure of the E. S. Cornwall Memorial Scholarship is from the 6th August 2012 – 5th February 2013. My six month placement is with UK Power Networks on the Low Carbon London Programme. I am based in UKPN's head office in Elephant and Castle, London, where I am working as part of the solution design authority and trial implementation teams.

UK Power Networks

There are nine distribution network operators (DNOs) in the United Kingdom who are, together, in charge of operating the 14 distribution licence areas in the UK. UK Power Networks is responsible for the operation of three of these licence areas, London Power Network (LPN), Eastern Power Network and Southern Power Network (SPN). In total, it is responsible for supplying electricity for 8 million customers, representing 28% of the customers in the UK and has a peak demand of 16.23 GW.

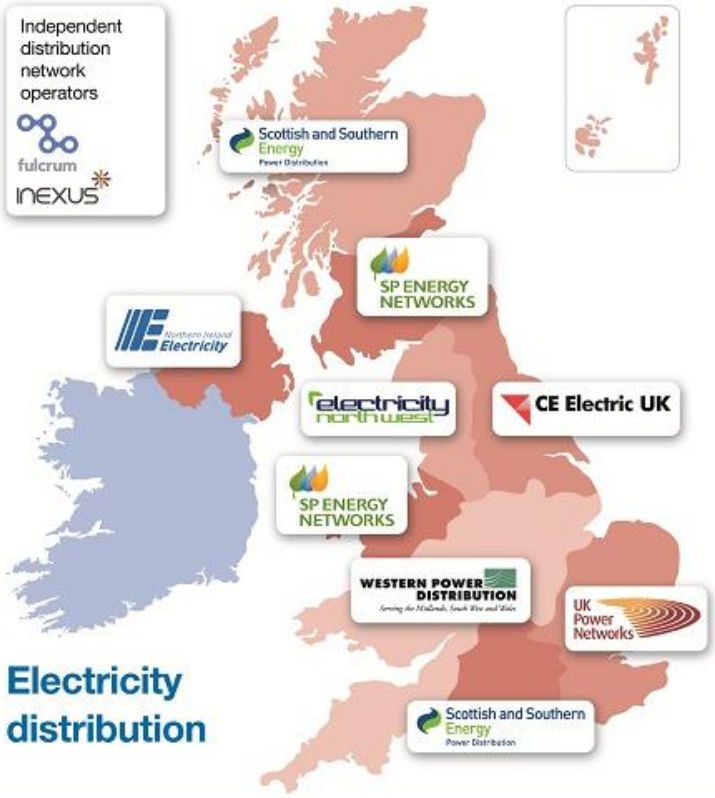

Figure 1 Distribution Network Operators in the UK

Low Carbon London Programme

The Low Carbon London Programme is an innovative programme which is designed to trial new low carbon technologies and energy tariffs in order to see how they impact consumers' energy demand behaviour. The ultimate aim of the programme is to create a national and international blueprint for a smarter future electricity network to enable the transition to a low carbon economy.

There are a number of different trial areas in the programme:

- Smart metering
- Time of use tariffs
- Demand response
- Distributed generation
- Electric vehicles
- Heat pumps and small scale embedded generation

For further information regarding the current status of the trials, see the Low Carbon London June 2012 report [1]. The next progress report will be published December 2012.

Work Placement

I have completed a variety of tasks during the first three months of my placement with Low Carbon London with the aim of getting a broad overview of the program. Specifically, my tasks have included:

- Revising and updating solution design documentation;
- Investigating and producing a report on the barriers, issues and challenges to implementing demand response within distribution network operators; and,
- Project management tasks for active network management of distributed generation, demand response and electric vehicle trials.

Solution Design Documents

The Low Carbon London bid submission to Ofgem included a list of use cases which provided a summary of the anticipated activities, outcomes and learning points for each of the eight trial groups. When work on the projects began, trial hypotheses were developed for each use case to provide direction and clear intent for each trial (Figure 2). The hypotheses are then logically grouped into Trial Description documents which describe a single trial in detail to ensure that all elements have been considered to enable successful analysis of the agreed hypotheses. The hypothesis test approaches are documents which provide a summary, guide and completeness check for the design and analysis for each trial. A hypothesis test approach includes detail of the scope of the trial, high-level test approach, proposed duration, participant, equipment and data requirements, partner responsibilities, and anticipated deliverables.

Due to the innovative nature of the programme, Low Carbon London's scope had evolved over time and the solution design documentation needed to be updated to reflect changes brought about by factors including the availability of participants, equipment and data types. One of the first tasks I received was reviewing existing draft hypothesis test approaches (some of which were drafted by 2011 E.S. Cornwall Scholar Donald McPhail), and update them based on program progress. As part of

this process, I also reviewed and updated the list of existing hypotheses and trial descriptions. In some cases, the hypotheses were removed as that particularly component of the trial was no longer in scope. I also updated the LCL Programme Dependency Management Tool which Donald McPhail had developed and hypothesis breakdown spreadsheet. The LCL Programme Dependency Management Tool provided a mapping between documents within the solution design (Figure 2), products (project tasks) and Successful Delivery Reward Criteria (SDRC). SDRC are key milestones and outputs which indicate the programme is being completed successfully; the timely completion of SDRC is linked to additional reward funding from Ofgem. The hypothesis breakdown spreadsheet provides a detailed description of each hypothesis and mappings to trials.

These review and update activities allowed me to gain a broad overview of all trial areas in the programme and understand the scope of each trial. I also gained an appreciation of the solution design structure and dependencies between components. Low Carbon London is a very diverse programme and having a clearly defined structure and process is imperative to ensuring the programme stays on track, trials are carried out, and outputs are delivered. Having had limited program and project management exposure previously, this activity was somewhat overwhelming at first, but I feel I have greatly increased my knowledge of programme management and I look forward to continuing to develop my understanding and skills in the second quarter.

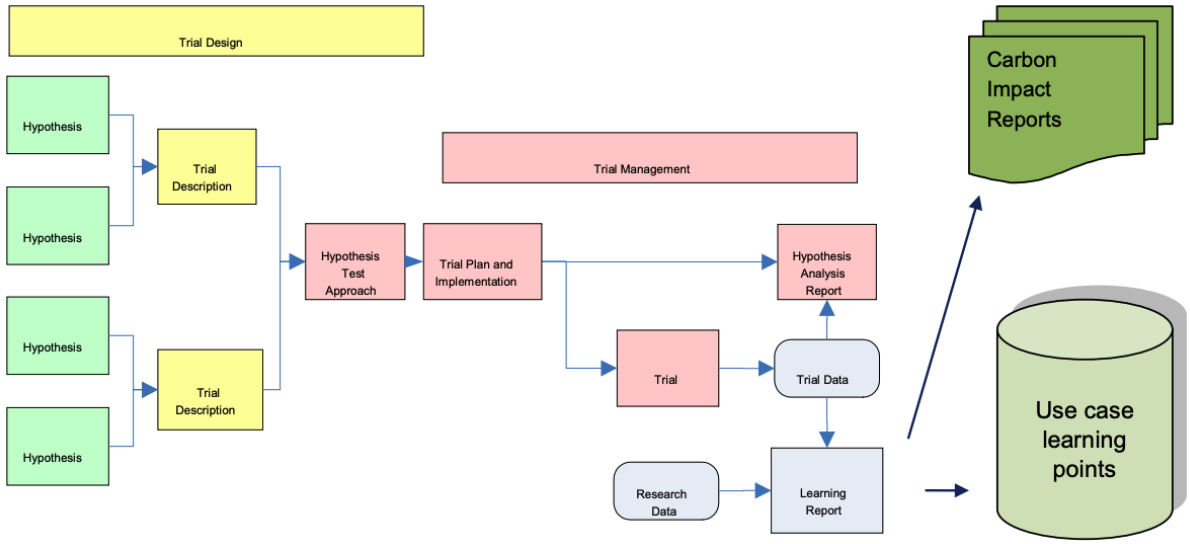

Figure 2 Low Carbon London Program Solution Design

Demand Response

A key driver for the demand response component of the Low Carbon London Programme is the load density of London. There is a particular area of London called the Square Mile (City of London) which has a huge electrical demand in a very small area. Apart from the Square Mile being largely fault level constrained, one of the challenges UK Power Networks face is that there is physically no space available in the ground for additional power cables to be run. This limitation has forced UKPN to innovate and explore active network management solutions such as demand response. Ofgem are also actively encouraging Distribution Network Operators to investigate demand response opportunities to resolve network load limitations, particularly those in densely populated areas like London.

During my first three months I have completed a significant amount of work in the demand response space including analysing historical substation demand, the 2012 Low Carbon London summer demand response trial outputs, and writing reports on barriers, issues and challenges to demand response from a Distribution Network Operator perspective. In developing this report, I spoke to people from a number of areas in the business and listened to their ideas and concerns surrounding distribution network operator managed demand response. The information I have gathered will form the basis for an internal learning event we are holding later this month.

This task has allowed me to gain a better understanding of demand response commercial arrangements and how they fit into the UK's regulatory framework. Having worked for the Australian Energy Market Operator (AEMO) in the past, I have also able to compare and contrast the rules and regulations surrounding frequency and balancing ancillary services managed by National Grid with the ancillary services markets that AEMO operates. I am currently in the process of finalising my report and hope to provide a more detailed summary of my demand response findings in my final quarterly report.

Project Management

I have also been involved in project management tasks for active network management of distributed generation, demand response and electric vehicle trials. I assisted the electric vehicle workstream leads in discussions with potential end user and charging point participants about trial opportunities based on the available electric vehicle arrangements and charging locations. I also participated in discussions with potential active network management trial participants who have distributed generation, aggregators and active network management technology providers. This arrangement is reasonably complex as it is a multi-party arrangement between UKPN, aggregators distributed generation owner. I also assisted in preparing the December 2012 progress report which will be provided to Ofgem next month.

Future Experience

In my final three months on the Low Carbon London programme I will be assisting with final preparations for many of the trials which will be fully operational in January. In addition, I will be helping develop an analysis framework for the distribution network impact reports and finalising the trial design for the detailed power quality and voltage monitoring aspects of the trials.

Professional and Personal Development

There have been a number of opportunities for professional development during my placement so far. I have attended several talks organised by the Institution of Engineering Technology (IET), Royal Society and Royal Institution. I also attended the Fullers' Annual Energy Lecture which was presented by David MacKay, Chief Scientific Advisor to the Department of Energy and Climate Change which provided a very enlightening and somewhat contentious future of the UK's energy policy and its impact on climate change. At the suggestion of 1957 E.S. Cornwall Scholar, Col Morwood, I have also taken the opportunity to visit and explore Savoy Place, the home of the IET.

Just prior to commencing my placement I was also able to take advantage of my UK residency to purchase last minute tickets to several London Olympic events including a semi-final women's field

hockey game between the Netherlands and New Zealand which was fantastic to watch. I also completed the Whizz-Kidz Neon Nightwalk which was a 10-mile charity walk around London with several colleagues from UKPN which was a great opportunity to see different parts of London.

Conclusion

My first three months working on the Low Carbon London programme have been a steep learning curve, but I have really enjoyed my time so far. The team is quite young and dynamic, and they have been great helping me settle in and see plenty of London. I am so grateful to the scholarship committee for this opportunity and I welcome any feedback on my report.

References

UKPN. "Low Carbon London: Project Progress Report". 15 June 2012. http://www.ofgem.gov.uk/Networks/ElecDist/lcnf/stlcnp/year1/low-carbon-london/Documents1/Low%20Carbon%20London%20June%202012%2015%20June%202012.pdf