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Mr Simon Bartlett
Chairperson
E S Cornwall Scholarship Advisory Committee
P O Box 1193
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Dear Mr Bartlett

**E S Cornwall Memorial Scholar – Aidan Roberts
First Quarterly Report**

Please find enclosed the first quarterly report for the E S Cornwall Memorial Scholarship for 2008-2010 which is a requirement set out in the scholarship rules (6).

The points of interest for the quarter are the Worst Served Customer policy development, review of existing Distributed Generation and innovation incentives, Scottish & Southern Energy stakeholder engagement seminar, visit of Western Power Distribution Central Contact Centre & South West Control Centre and a presentation of the Long-Term Energy Network Scenarios report.

I would welcome the committee's feedback and advice on the report, particularly concerning my proposed goals for the next quarter.

Yours faithfully,

Aidan Roberts

Enclosures: E S Cornwall 2009-10 Quarterly Report 1

1. Introduction

My tenure of the E. S. Cornwall Memorial Scholarship is currently from October 2007 through to October 2009. The purpose of the proposed program is to gain experience in the areas of Smart Networks and Distributed Generation. In particular, I hope to gain an understanding of how these areas will impact and/or enable network operation & planning, energy & demand management, metering and carbon emissions. The proposed program is designed to give me experience with a regulator, a consultancy/research facility, a technology provider and a distribution network operator.

This report is the first of 6 quarterly reports required under the rules of the scholarship. The period of employment reported on is September 29th to December 31st which covers the first half of a planned 6 month placement.

My current placement is with Ofgem, the Office of Gas and Electricity Markets. The main objective of this placement is to gain regulatory experience with a particular interest in policies surrounding Smart Networks and Distributed Generation.

2. OFGEM

General Information

Ofgem is the regulator for Gas and Electricity within the United Kingdom. As a regulator, Ofgem's primary objective is to protect the interests of consumers, present and future, wherever appropriate by promoting effective competition. Ofgem is also required to ensure energy demands are met, secure long term energy supply and contribute to the achievement of sustainable development. Ofgem must also have regard to the effect of energy-related activities on the environment which has become increasingly important in recent years. Ofgem is also obligated to have regard to social and environmental guidance issued by the Secretary of the State.

Whilst promoting efficiency and economy, Ofgem must also ensure that all of license holders can finance their license obligations. Ofgem issues licences and enforces license conditions for Generators, Transmission Network Operators, Distribution Network Operators and Suppliers. The structure of the UK Electricity Market is as follows:

- [Over 30] generators
- 1 Transmission Network Operator (TNO)
- 7 Distribution Network Operators (DNO) operating 14 distribution areas
- [7] Major Suppliers

Ofgem is funded through license fees recovered from these regulated companies. The map below shows the Great Britain distribution network licence areas.



Ofgem regulates the UK industry through price controls which cover 5 year periods. An RPI-X regime is used in order to encourage cost efficiency. This regime caps the expenditure growth at a given percentage (X) below the retail price index (RPI). Currently, the growth is capped at 3 per cent below RPI. The year 2010 is the 20th anniversary for electricity regulation and to mark this Ofgem is currently undertaking a review under the "RPI@20 Project". The project is aimed at reviewing the effectiveness and appropriateness of the current regime for regulation of monopoly energy networks.

Work Experience

In my initial discussions with Ofgem, I was offered a place in the Technical Directorate reviewing the policies associated with my areas of interest as part of DPCR5. Unfortunately, just prior to my arrival, the Ofgem underwent a major restructure and the Technical directorate was reduced to a couple of Technical Advisors. I was given a position with the Quality of Service team and I accepted the position with the understanding that I would still gain regulatory experience and would still also be involved with my areas of interest. My work to date has provided me with valuable experience in policy development which is consistent with the objectives of my placement. I have been able to gain access to information regarding Smart Networks and Distributed Generation policy but I have not been directly involved with the review of these policies.

Electricity Distribution Price Control Review (DPCR5)

Ofgem is currently reviewing the electricity distribution price controls. These price controls will cover the period from March 2010 to March 2015. In March 2008, Ofgem released an Initial Consultation Document (ICD). The ICD outlined Ofgem's proposals for changes to the current price controls and sought responses from all stakeholders. The responses to this document were used to help guide the Policy Document that was released in early December 2008. The December Policy Document will be open for consultation until February 2009. The responses from this document along with ongoing consultation with stakeholders will help to deliver the final proposals for DPCR5 which is due for publication in December 2009.

Worst Served Customer Policy

The majority of my work to date has been involved with developing the Worst Served Customer (WSC) Policy. This policy was aimed at improving performance for those customers receiving below average reliability.

The current Distribution Price Control (DPCR4) policy for improving network performance is the IIS (Interruption Incentive Scheme). The IIS is aimed at encouraging DNOs to improve the reliability of supply for their customers. Targets were set around their reliability indices (CI – customer interruptions and CML – Customer Minutes Lost) and rewards/penalties were paid for over/under performance against these targets. So far, this scheme has been successful at improving the average reliability across all customers; however, it has not been successful at improving the reliability for those customers experiencing the worst network performance. These “worst served” customers have seen no improvement and in some cases a decline in performance.

The major tasks for worst served customers were:

- liaise with internal/external stakeholders with regard to WSC
- investigate and suggest a definition for the WSC
- investigate various mechanisms to improve network performance for the WSC:
 - Tightening of 2 existing Guaranteed Standards of Performance
 - Introduction of a new Guaranteed Standard

- Performance Based Incentive
- Defined Allowance
- Defined Allowance with Performance based Incentive
- write the WSC section for the December Policy Document ¹
- write the Appendix and complete an Impact Assessment on the WSC Policy for the December Policy Document supplementary appendices ²,

The intent of the WSC policy was to encourage DNOs to invest in projects that would improve the network performance for WSC. Part of the policy development involved deciding how non-network solutions should be funded under this scheme or if they should only be funded under existing schemes. Although no additional funding was allowed under the WSC policy specifically for non-network solutions, DNOs are able to fund non-network solutions under this scheme provided they target WSC.

To date there has not been a mechanism in place that targeted the WSC. Therefore, I have been given first-hand experience in policy development and also gained an insight into the considerations/stages that are involved with developing a policy from the ground up.

Exceptional Events

I also spent some time reviewing exceptional event claims. DNOs in the UK are allowed to remove the impact of certain exceptional events from their overall network performance indices, provided they pass a certain threshold. These events can be due to “severe weather” events or “one-off” exceptional events. If the DNOs submit an exceptional event claim within 14 days of the event, Ofgem will enlist an independent examiner to investigate the claim and submit a report.

During my time at Ofgem I reviewed three exceptional event reports. One claim of particular note involved a request to exclude the impact of faults that happened after an event that passed the “severe weather” threshold. Ordinarily, all weather related faults that occur within a 24 hour period after the threshold is passed, are excluded. The DNO in question distributes electricity in a coastal area. During severe weather salt water is often deposited on the equipment. The faults in question were flashovers that were caused by salt accretion on insulators. The faults were found to be a direct result of severe weather but had a delayed impact which meant that they occurred outside the

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<http://www.ofgem.gov.uk/Networks/ElecDist/PriceCtrls/DPCR5/Documents1/POLICY%20PAPER%20DOCUMENT%20File%20problem%20use%20this%20one%2020081126%20PR.pdf>

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<http://www.ofgem.gov.uk/Networks/ElecDist/PriceCtrls/DPCR5/Documents1/POLICY%20PAPER%20APPENDICES.pdf>

defined 24 hour period. After examination, these faults were also excluded from the DNOs reported performance.

DG Incentive, Registered Power Zone (RPZ) & Innovation Funding Incentive (IFI)

Although my work to date has not been directly involved with my areas of interest it has provided valuable regulatory experience. In addition, I have been granted access to information relevant to my areas of interest. Three schemes of particular interest are discussed below.

During the consultation phase of DPCR4, Ofgem developed a framework to accommodate an expected increase in the amount of DG connected to distribution networks. It was believed that the proposed government targets on the proportion of connected renewable generation and the green-house gas (GHG) emissions would drive the increase in connected DG. Currently, DNO activities are responsible for around 1.3 per cent of the total GHG emissions in Great Britain. Electricity losses account for around 97 percent of these emissions.

With the development of the SmartGrid platform, the framework was also developed to help encourage both innovative thinking and investment in research and development. The aim was to encourage DNOs to develop new ways of operating potential networks of the future. In the Strategic Deployment Document for Europe's Electricity Networks of the Future, SmartGrid is defined as "an electricity network that can intelligently integrate the actions of all the users connected to it – generators, consumers and those that do both – in order to efficiently deliver sustainable, economic and secure electricity supplies".

In DPCR4, Ofgem introduced a DG incentive to encourage DNOs to undertake the investment required to connect DG in an efficient and economic manner and to be more proactive in responding to connection requests. The DG incentive was based on a shared/reinforcement cost of £50/kW that would be incurred by the DNO as a result of the forecast DG connections.

During the initial consultation for DPCR5 it was reported that the DG incentive did not work as well as was expected. This was supported by the current volume of connected DG being significantly less than was forecast. Feedback from industry suggests that the initial forecasts were overambitious and that difficulty in getting planning permission for the development was also a major problem. A joint review³ by BERR and Ofgem identified a number of additional barriers to DG.

As a result of the reviews findings and consultation with industry, Ofgem plans to amend the DG incentive for DPCR5 to try and overcome some of the barriers that currently exist.

Along with the DG incentive, the RPZ mechanism was also introduced in DPCR4 to encourage DNOs to develop and demonstrate new and more efficient ways of connecting and operating DG on their networks. The RPZ provides a further incentive of £3/kW/year

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<http://www.berr.gov.uk/files/file39025.pdf>

(on top of the DG incentive) for a 5 year period commencing on the registered connection date.

For the project to be registered as a RPZ, the project must involve the connection of new generation or the incremental increase in an existing generator. The projects must also follow the Good Practice Guide (GPG)⁴ and the Regulatory Instructions and Guidance (RIGs)⁵. The level of innovation is assessed in terms of 4 criteria: new equipment used, novel system design/topology, novel approaches to system operation/control, and enhanced quality/security of supply. The projects are also defined in terms of their degree of innovation, i.e. a "Significant Innovation", a "Technological Substitution" or a "Radical Innovation". To date in DPCR4, only four RPZs have been successfully registered by three different DNOs. These projects are summarised at the end of this section.

It has been proposed that the RPZ scheme maintains the current time limits associated with registration (until March 2010) and commissioning (until March 2012). Beyond these dates, Ofgem expects these schemes to be funded as part of broader innovation initiatives proposed for DPCR5.

Along with the RPZs, the Innovation Funding Incentive (IFI) was developed to encourage innovation, research and development. The IFI allows a DNO to spend up to 0.5% of its combined Distribution revenue on eligible IFI projects and is allowed to recover 80% of these costs as outlined in their license conditions. The IFI has been committed to continue until the end of DPCR5. During DPCR5, the IFI is intended to be purely for research and development. A new innovation mechanism is being developed to overcome the high risk associated with DNOs implementing projects that provide more flexibility in terms of future network scenarios.

Summary of existing RPZs

1. Central Networks (CN) – Skegness & Fens – "Technical Substitution"

The amount of renewable generation that was requesting connection in a particular Skegness & Fens network area exceeded the capacity of the two existing 132kV (227MW) circuit. There was 191MW of existing wind generation in the area and a further 77.5MW formal requests for connection. CNs RPZ application for this area proposed the development of control system that maximised the output of generation without exceed the circuit ratings.

The project was considered to meet the novel system operation/control criteria and included Active export control, Real time load measurement and Dynamic circuit ratings. CN developed novel software that extended the functionality of their existing ENMAC system. The scheme uses real time measurement of current and voltage in all circuit

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http://www.energynetworks.org/engineering/pdfs/engdocs/ENA_ER_G85_Issue_2_%285.12.07%29.pdf

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[http://www.ofgem.gov.uk/Networks/ElecDist/PriceCtrls/RevandPrice/Documents1/DG%20Rigs%20v2%2012%20\(for%20publication\).pdf](http://www.ofgem.gov.uk/Networks/ElecDist/PriceCtrls/RevandPrice/Documents1/DG%20Rigs%20v2%2012%20(for%20publication).pdf)

elements to action generation groups according to predefined thresholds. The system also uses real time ambient temperature and load readings to determine the dynamic circuit ratings and hence the available generation capacity (dynamic circuit rating minus the current load). The cost of this solution was much less than the cost of the alternatives, re-conductoring the existing circuits or establishing a new circuit.

2. Scottish & Southern Energy (SSE) – Ornkey – “Radical Innovation”

Two submarine 33kV cables restricted the addition of new generation on to the Ornkey islands network. SSE proposed an Active Network Management scheme to limit the power output of additional generation to match the available export capacity of the submarine cables.

The Active Network Management approach would allow additional generation to be connected within peak demand times without experiencing excessive constraint. The scheme monitors network power flows to determine network capability thresholds, identifies appropriate network actions, controls generation power output, monitors generator response (and failure to respond) and also responds to faults/failures on both the power network and communications systems.

3. EDF Energy Networks (EPN) – Martham Primary – “Significant Innovation”

The Martham Primary substation originally had around 3.8MW of wind generation connected and the circuits in this area frequently suffered from voltage rise. EDF and United Utilities (now Energy North West) developed GenVAC as a solution to this problem.

GenVAC accounts for the voltage contribution from the existing generators and biases the target voltage of the tap changers at the substation. It adjusts the voltage at the substation to maximise the output of the connected generators. This innovation improved voltage on the network and also allowed the connection of additional generation.

4. EDF Energy Networks (EPN) – Steyning Primary – “Significant Innovation”

Following the success of the Martham Primary RPZ, EDF submitted a similar scheme for the Steyning Primary substation. Steyning Primary substation supplies a Quarry landfill gas generation site. This site had been experiencing nuisance tripping due to high volts during lightly loaded periods. In addition, the generator operator had an excess supply of landfill gas which it could not store and was forced to flare into the environment.

A second generation of the GenVAC system was developed and installed at Steyning Primary. This solution was able to solve the nuisance tripping by controlling the voltage and also allow the connection of an extra 1MW of generation.

Other Experience

SSE – Control Centre / Contact Centre Visit

My first external visit was to the Control Centre/Contact Centre for Scottish and Southern Energy (SSE). SSE operates two distribution network areas, the northern half of Scotland (SSE – Hydro) and the south-western corner of England (SSE – Southern). The contact centre was the central contact centre for both Hydro and Southern whilst the control centre was primarily for the Southern network although it was also available as a backup control centre for the Hydro network.

In DPCR4, customer satisfaction with DNOs was measured through the Telephony Incentive Scheme. One of the proposed changes for DPCR5 was to include a wider measure of customer satisfaction. In response to the proposed wider measure, SSE had developed a set of questions to be directed at customers in an attempt to gauge their overall satisfaction with a variety of dealings with the DNO. The primary purpose of the visit was to gauge the effectiveness of the survey in practice. Whilst my colleagues listened into the telephone surveys, I was given tour of the Control centre and was able to talk to one of the system controllers. I was quite impressed with the level of intelligence in their network, in particular their use of a real time distribution management system that included the 11kV network.

Scottish & Southern Energy (SSE) – Stakeholder Engagement Seminar

In November, I was asked to attend a stakeholder engagement seminar on behalf of my line manager. The seminar was run by SSE representatives and included other attendees from local authorities, the National Farmers Union, developers, environmental groups and a few SSE customers. The DNOs are required to hold these seminars along with other activities as part of Ofgems plan to promote stakeholder engagement.

The seminar gave me an insight into the different perspectives of the attending stakeholders. In particular, the discussions during the feedback session highlighted to me the contrasting priorities between different groups.

Introduction to Regulation – Internal Course run by City University London

Various courses are run internally as part of Ofgems personnel development program. I attended an introductory course run by the City University on Regulation. The course gave me an overview of Network Regulation and the Gas and Electricity Markets. It also covered Competition, Information and Incentives, types of price controls and issues of Financial Viability.

Presentation on Long-Term Electricity Networks Scenarios (LENS)⁶

In response to the Government's Energy Review (May 2006), Ofgem stated that it was willing to play a role in publishing reports that would set out long term perspectives on the network sectors. Our directorate was given the opportunity to attend an internal presentation/discussion of Ofgems LENS project. The LENS project is part of this

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<http://www.ofgem.gov.uk/Networks/Trans/ElecTransPolicy/lens/Documents1/20081107Final%20Report.pdf>

commitment and sets out a range of scenarios that could arise as a result of Government policy and market development. The scenarios aim to capture the range of challenges that networks will face and how they networks could change in order to meet, for example, renewable and climate change targets.

This presentation was useful in providing a high level overview of potential network scenarios. It also highlighted how difficult it is to predict what the future network would look like with any certainty and how long term planning should cover a variety of likely scenarios.

Looking Forward

The two major objectives of this placement were to gain regulatory experience and to gain exposure to the policies related to my area of interest. My work experience to date has given me a fair understanding of policy development in a regulatory environment and reviewing the subsequent responses to the December policy document will help to round off this experience. Over the next quarter I also hope to get a greater understanding of other departments, in particular the Costing and Environment teams to give myself a broader understanding of their interactions.

Now that the December Policy Document has been published there will be more time to investigate my areas of interest more thoroughly. I have asked for more hands on involvement with the review and/or development of RPZ, IFI, DG incentive and the broader innovation schemes. The details of my involvement are to be confirmed when my Line Manager returns from annual leave. Some of the tasks that I hope to complete over the next quarter include:

- Review performance of schemes funded under DG incentive and/or RPZ scheme
- Review of IFI expenditure
- Review responses to the December policy document regarding DPCR5 proposals for DG incentive, IFI, and RPZ
- Review of broader Innovation Incentives proposed for DPCR5
- Review of Installed Smart Meters & advanced metering architectures
- Review of Demand & Energy Management schemes

These tasks should help to fulfil the other major objective for this placement.

In January I will also be participating in the Quality of Service Working group. The focus of this meeting will be to get feedback from the DNOs regarding the December policy document. However, one of the DNO representatives has asked to use this meeting to open discussions on Smart Meters. In particular, the topics to be discussed are:

- Meter specification
- Communications requirements / costs
- Additional benefits gained over the >99% accurate connectivity approach currently used

- Costs / benefits balance
- Dual system operation at 2015 (Smart meters & connectivity)

The working group consists of representatives from each DNO and should provide a good opportunity to hear the various approaches use throughout Great Britain.

Over the next quarter I also hope to strengthen contacts with DNOs and visit as many as possible. Currently, I have a two day visit planned to Western Power Distribution in Cardiff, Wales in late January 09. The focus of this visit is to get a tour of all aspects of their operations. Whilst there, I also aim to review any projects involving DG, Smart Meters or Demand/Energy Management.

Lastly, I also plan to attend another internal course offered by Ofgem, Introduction to Finance. The course is designed to provide an overview of finance at Ofgem and the framework in which Ofgem operates. This course should give me an awareness of corporate governance and an understanding of how Ofgem receives its funds. I should also gain an appreciation of the role and importance of delegated authorities and the duties and responsibilities of public accountability.