Registered Power Zone Annual Report

Scottish Hydro Electric Power Distribution

Southern Electric Power Distribution

for period 1 April 2006 to 31 March 2007

Contents

1. Executive Summary……..……...3

2. Introduction……3

3. Scope…….……...4

4. Current Registered Power Zones……..…5

5. Potential Registered Power Zones……6

6. Scottish Hydro Electric Power Distribution Report…..……...8

1. Executive Summary

One RPZ scheme was registered in the Scottish Hydro Electric Power Distribution (SHEPD) area in 2005/06. Additional potential schemes were considered in 2006/07 and further work is continuing on evaluating these opportunities.

2. Introduction

As part of the recent Distribution Price Control Review (DPCR) effective from 1 April 2005, Ofgem (the regulatory body for the energy industry) introduced two new incentives: the Innovation Funding Incentive (IFI) and Registered Power Zones (RPZ). The primary aim of these two incentives is to encourage the distribution network operators (DNOs) to apply innovation in the way they pursue the technical development of their networks. A Good Practice Guide (Engineering Recommendation G85) has been produced by the DNOs that is available free of charge via the Energy Networks Association's website: www.energynetworks.org.

RPZs are focused specifically on the connection of generation to distribution systems. The estimates made by DNOs as part of the DPCR process indicated that some 10GW of generation could be connected in the next five years. This generation could connect at all distribution voltage levels bringing new system design and operating challenges.

RPZs are therefore intended to encourage DNOs to develop and demonstrate new, more cost effective ways of connecting and operating generation that will deliver specific benefits to new distributed generators (DG) and broader benefits to consumers generally. The RPZ incentive applies from April 2005 and, at present, this excludes DG applications processed prior to this date.

This report covers activities in the period from 1 April 2006 to 31 March 2007. It will be published on SSE's website www.scottish-southern.co.uk in the Energy System's area along with SSEPD's IFI report. The reports will also be available on Ofgem's website www.ofgem.gov.uk

3. Scope

This document covers the two electricity distribution licensees within SSE Power Distribution (SSEPD):

Scottish Hydro Electric Power Distribution plc (SHEPD) and
Southern Electric Power Distribution plc (SEPD).

The SHEPD area is seeing a higher level of DG activity and is consequently more active in developing innovative solutions in this field. As there is no completed or current RPZ development activity in the SEPD licence area, there is no report for the SEPD area in this reporting period.

4. Current Registered Power Zones

Earlier work with the University of Strathclyde resulted in Ofgem registering our application for the Orkney network in 2005/2006 as SSEPD's first Registered Power Zone.

The considerable renewable energy resource on the Orkney Isles has attracted significant levels of wind farm and marine development such that the connection of further renewable energy generation output is constrained by the capacity of the distribution network. The active network management (ANM) scheme, which is being developed by SSEPD and the University of Strathclyde, will make better use of the existing infrastructure thereby providing a lower cost alternative to network upgrading and reinforcement works. The active management scheme is expected to realise a total of 62MW or more of generator connected capacity onto the Orkney network. Currently 47MW is already contracted on a firm or non-firm basis and a further 15MW of new non-firm generation (NNFG) output could be allowed onto the network by the active management scheme.

This concept is being developed as an IFI project and closed loop trials were run on the Orkney distribution network during 2006. Significant information was gained from the trials and the results have been analysed. The key outcomes from this analysis have been the verification of the control logic which regulates the output of the participating NNFG and an understanding of the response of this DG. Additional analysis of wind farm behaviour on Orkney has been carried out by the University of Strathclyde to further develop the design of the scheme.

Other key outcomes of this year's work have been the development of logic design rules for the full ANM scheme and creation of a generator constraint analysis tool - Gen CAT – to calculate the expected curtailment of NNFG connecting to the scheme. This tool has been used to analyse each potential NNFG connection to provide an indication of the level of curtailment the applicant would experience if they were the first NNFG to be connected under the scheme. Further studies will be carried out as willing generators commit to connect to the ANM system.

Although further work will be necessary to develop the full ANM scheme, the key outcomes of the work to date represent significant progress in this field. If the scheme proves to be successful there will be scope to repeat this innovation in other locations and to evaluate the development of variations based on the Orkney ANM scheme.

5. Potential Registered Power Zones

In the SHEPD area, considerable amounts of renewable generation are in the process of being connected to our network. However, network constraints have become apparent in many geographic areas which currently limit the amount of generation we can connect until extensive transmission reinforcements are completed. We believe ANM systems and other methodologies can be developed to allow more generation to be connected. SSEPD are progressing solutions to reduce the impact of these constraints.

SSEPD is giving consideration to the evolution of innovative solutions to facilitate the connection of new renewable generation on two distribution networks which are experiencing considerable interest from renewable energy developers, including a number of community schemes.

The two potential RPZs currently under consideration are:

1. **Shetland Isles**

The Shetland Isles electricity network is an island power system with no existing connection to the national grid. Generation is located in three places – Lerwick Power Station (diesel), Sullom Voe Terminal (gas turbine), and Burradale Wind Farm - and, as an island network, all variations in system demand must be met by these three generating stations. Although there is some interest from developers to connect further renewable generation within the Shetland Isles, previous technical studies have shown that there is no further scope for the firm connection of renewable generation. This is due to system stability issues rather than network capacity. However, it was considered that it may be feasible to allow the connection of an amount of non-firm DG, for example at times of higher demand.

A detailed technical study has been carried out with the University of Strathclyde in 2006/07 with the aim of determining the level of new non-firm generation, if any, which could be connected. The results of this study are currently being assessed. However, early indications are such that this is unlikely to be viable for development as an RPZ.

This study addressed the technical and economic implications of incorporating an energy storage system (ESS) onto the Shetland Island network. Three main areas were investigated to clarify whether or not an ESS could be feasible for the Shetlands. Voltage support, frequency regulation and energy balancing were the focus with consideration given to various rated sizes and capacities of ESS and increased levels of DG.

SSEPD has future plans to install a sub-sea DC link from the Shetland Isles network to the UK mainland. The HVDC link is associated with the development of large scale renewable generation on Shetland. The impact of this mainland link would radically change the characteristics of the network and the expectation would be that the voltage, frequency and energy balancing issues would be eliminated.

2. **Western Isles**

The Western Isles distribution network consisting of Lewis/Harris and the Uists is connected to the transmission system via two separate 33kV subsea cables. This interconnection, commissioned in 1990, was designed to meet customer demand and reduce the dependency on diesel generation rather than to cater for the present challenge of exporting large amounts of generation to the mainland. Connection of generation to this network requires consideration to be given to four significant aspects: thermal rating of the circuits; voltage rise; voltage step changes; and the effects of machine starting currents. Due to the length of the circuit connecting the Western Isles to the transmission system, relatively small changes in demand or generation levels can cause noticeable changes to voltage levels.

Currently, two significant transmission schemes are under consideration which will affect the Western Isles distribution network; a high capacity DC link to the Western Isles and a second 132kV circuit to Skye from the mainland.

Both these transmission reinforcements will provide scope for connecting further renewable generation but due to the scale of these projects they will take a significant amount of time to construct and local distribution network constraints may also restrict the commercial viability or capacity of DG connections. As this situation is similar to the Orkney Isles the work on the Orkney RPZ active management system is being used to inform consideration of the development of a scheme which takes account of the critical aspects of the the Western Isles network. As the design challenges are different from those presented by the Orkney network the Western Isles development work is likely to be the subject of a separate IFI project.

We anticipate that we will be seeking Ofgem approval for an RPZ in this area during 2007/08.

Section 6

Scottish Hydro Electric Power Distribution

RPZ Report

for period

1st April 2006 – 31st March 2007

Scottish Hydro Electric RPZ Report April 2006 – March 2007

Name of RPZ	Orkney Active Distribution Network Management
DG Capacity	Expected to be about 15 MW (0 MW connected in 2006/07)
Starting Year	2005/06
Description of project and technical details.	New generators accepted under the RPZ scheme will be instructed to limit their output to match the available export capacity to the mainland grid. Available capacity will be derived from real time network measurements and will depend upon the level of Orkney demand and output of existing generation
Expenditure for financial year	£123,000
Type(s) of innovation involved	Radical
Status (planned, under construction, operational) and operational starting year	Under construction – expected to be operational in 2007/08
Connection cost	Of the order of £200,000 is expected
Expected benefit to customers when project was registered	Ability to connect an additional 15 MW of new renewable generation to the Orkney Distribution network