ANNEX 5 – MODIFICATION GROUP PAPERS

Two papers, one providing an analysis of the power flow across the Scottish Interconnector was and the other providing an impact analysis of P125, were produced by TLFMG members and presented to the TLFMG.

1. Analysis of Historical Flows on the Scottish Interconnector over Proposed Sample Settlement Periods for Approved Modification P82 Reference Year

Introduction

BSC Modification Proposal P125 'Apportionment of the Scottish Interconnector Flows to the Northern and North Western GSP Groups for the Purposes of Calculating Losses' (P125) was raised on 31 March 2003 by Scottish and Southern Energy.

P125 proposes an alternative methodology for generating Transmission Loss Factors (TLFs) for the BM Units associated with the Scottish Interconnector, on the basis that the existing methodology, introduced under BSC Modification Proposal P82, is believed to discriminate unnecessarily against such BM Units. A methodology based on 'apportioning' the metered volumes across the Interconnector between the two terminal TLF Zones[1] and then applying a composite of the two resulting TLFs to Scottish Interconnector BM Units is proposed.

One option for apportioning these metered volumes is the application of fixed sharing factors. This paper presents analysis of historical data to support the assessment of this option and the determination of suitable values for the sharing factors.

Elexon have recently consulted[2] ("the Consultation") on proposals to base the calculation of annual ex ante zonal TLFs to apply to the year 1 April 2004 – 31 March 2005, on historical data from a specified set of Sample Settlement Periods (SSPs). Under the proposed methodology the SSTs are selected as a representative subset of all settlement periods for the Reference Year October 2002 – September 2003 with, for development purposes, 2002 equivalent dates substituting those from April 2003 onwards. The SSPs comprise 6 sample periods per Load Period, with each sample period selected from a different EFA block, and the Load Periods identified in general terms as covering Working or Non-Working days within a given calendar week.

For consistency with these proposals, the following analysis is based on the set of SSPs (the "P82 SSP (proposed) data set") identified in the Consultation, with equivalent dates used for those from April 2003 onwards. Separate analysis has shown that the results from this representative subset of sample periods are consistent with similar analysis over all settlement periods in the given year.

Data

Data was obtained from the Interconnector Administrator[3] (IA) for the Scottish Interconnector, on the half-hourly flows across each Interconnector circuit[4] for all settlement periods in the year 1 April 2002 – 31 March 2003.

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[1] The two Transmission Loss Factor Zones (i.e. GSP Groups) into which the individual circuits comprising the Scottish Interconnector feed (i.e. the Northern and North Western GSP Groups).
[2] Approved Modification P82: Load Periods and Sample Settlement Periods Consultation, 11 April 2003
[3] SP Transmission Ltd
[4] STEW/ECCL 1, STEW/ECCL 2, HARK/STHA, HARK/ELVA, HARK/CHAP, HARK/CHAP-GALA

The circuit data was mapped to terminal GSP group, as indicated in Table 1, and the resulting route metered volumes for each settlement period were calculated and analysed.

This paper presents analysis based on the set of SSTs ("the P82 SSTs (proposed) data set") identified in the Consultation, with equivalent dates used for those from 1 April 2003 onwards.

Table 1

Circuit	Terminal node / Route share reference	Terminal GSP Group
STEW/ECCL 1	STEW	1 Northern
STEW/ECCL 2	STEW	1 Northern
HARK/STHA	HARK	2 North Western
HARK/ELVA	HARK	2 North Western
HARK/CHAP	HARK	2 North Western
HARK/CHAP-GALA	HARK	2 North Western

Results

1. Route shares

The relative shares of the total Interconnector metered volume along each route generally depends on the overall flows within the region, as driven by system conditions. However, consistent trends have emerged in the analysis.

Figure 1 shows a scatter plot of route share against total metered volume, with each data point based on a given representative settlement period in the P82 SSP (proposed) data set. The STEW:HARK ratio is fairly stable for moderate to large total volumes, averaging overall at 50:50, but is more volatile for lower volumes and for northern flows. Indeed, at times of low transfer in particular, it is possible for the flows at STEW and HARK to be in opposite directions, leading to extreme percentage shares of the total flow[5].

The STEW:HARK ratio is most volatile at times of circuit and plant outages, during which time the relative dominance of the two routes can reverse. In particular, the Scottish nuclear stations experienced a number of problems over the summer of 2002, and much of the volatility seen in Figure 1 can be attributed to the extensive outages on these stations.

Figure 2 shows the average within-day variation of the STEW share (the HARK share is its complement), based on averages over each EFA block for the settlement periods in the P82 SSP (proposed) data set. This shows that despite the above effects, the average daily profile is close to the overall average throughout the day.

2. Voltage level shares at HARK

The above results confirm that the overall average STEW:HARK ratio of 50:50 is representative of the given data set. As such it seems reasonable to use this ratio to apportion the metered volumes of the Scottish Interconnector to the two terminal zones under P125, for use in the average annual zonal loss factor methodology proposed under P82.

[5] There are also a small number of outliers which are out of range on Figure 1, corresponding to instances where the total metered volume is close to zero.

Under P82/P125, the given STEW:HARK apportionment would apply to the Scottish Interconnector metered volumes in:

- the calculation, by the TLFA, of the annual ex ante zonal TLFs for each GSP group, based on analysis of all BMU metered volumes over the P82 SSTs
- the derivation and application of the composite zonal TLF to Scottish Interconnector BMU metered volumes in settlement periods in the year 1 April 2004 – 31 March 2005

In the former case, assumptions are also required by the TLFA as to the proportional shares of the different circuits comprising the HARK route, such that the resulting HARK share can be allocated between the three different voltage nodes in the load flow model.

As such, the analysis in section 1 is extended to more detailed consideration of the transfer along the HARK route, in terms of the proportional shares of the circuit(s) at each voltage, as indicated in **Table 2**.

Table 2

Circuit	Circuit share reference	Voltage
HARK/STHA	STHA	400kV
HARK/ELVA	ELVA	275kV
HARK/CHAP	CHAP	132kV
HARK/CHAP-GALA		

Figure 3 shows a scatter plot of circuit share against total metered volume on the HARK route, with each data point based on a given representative settlement period in the P82 SSP (proposed) data set. The STHA:ELVA:CHAP ratio is fairly stable for moderate to large total volumes on the HARK route[6], averaging overall at 81:29:-10.

Figure 4 shows the average within-day variation of each circuit share, based on averages over each EFA block for the settlement periods in the P82 SSP (proposed) data set. This shows that the average daily profiles of the circuit shares for each voltage are close to their respective overall averages throughout the day.

Conclusions

Based on the above analysis, it would appear to be reasonable to use a pre-defined ratio to apportion the metered volumes of the Scottish Interconnector between the two terminal zones, for application in the average annual zonal loss factor methodology proposed under P82. A simple uniform ratio may be appropriate, based on the average STEW:HARK ratio of 50:50.

Under P125, this apportionment factor would be used in the calculation of the zonal TLFs, as well as in the application of those TLFs. In the former case, assumptions are also required as to the proportional shares of the different circuits comprising the HARK route, such that the resulting HARK share can be allocated between the various voltages.

Based on the above analysis, it would appear reasonable to apply the calculated average proportions of 81:29:-10 in allocating the resulting HARK share between the STHA:ELVA:CHAP circuits, with respective voltages 400:275:132 kV.

[6] There are also a small number of outliers which are out of range on Figure 3, corresponding to instances where the total metered volume on the HARK route is close to zero.

Figure 1

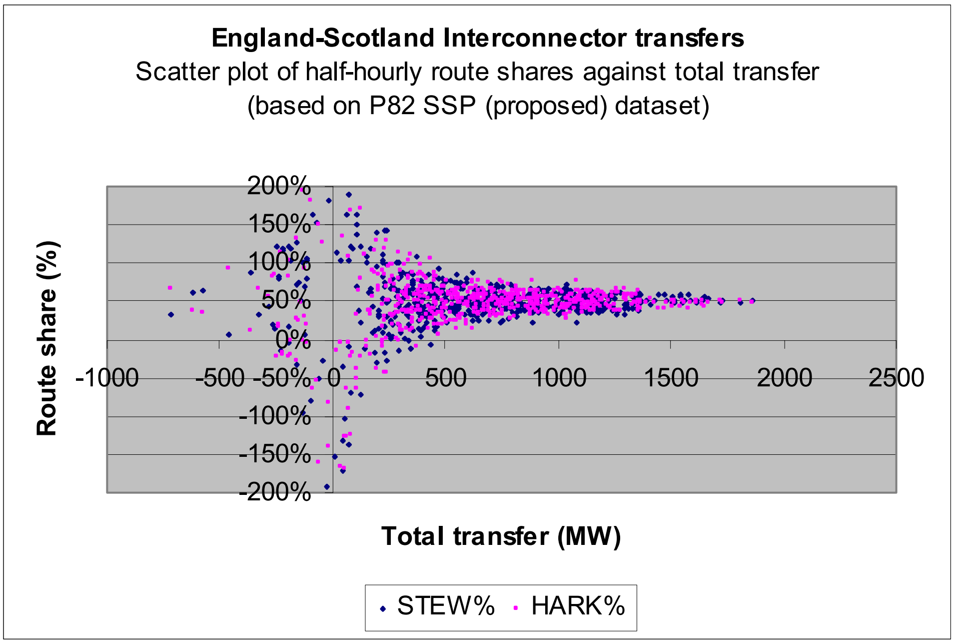


Figure 2

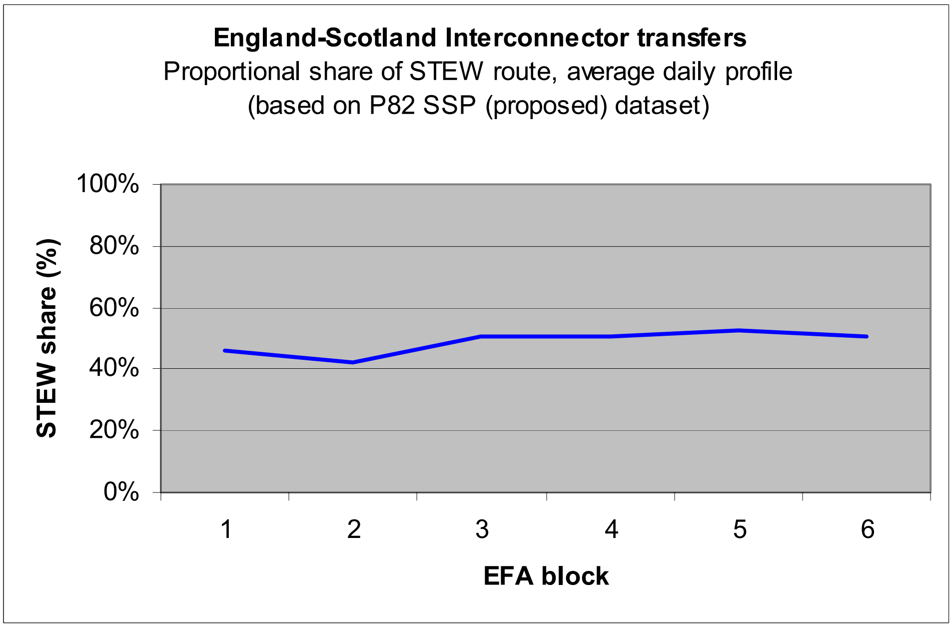


Figure 3

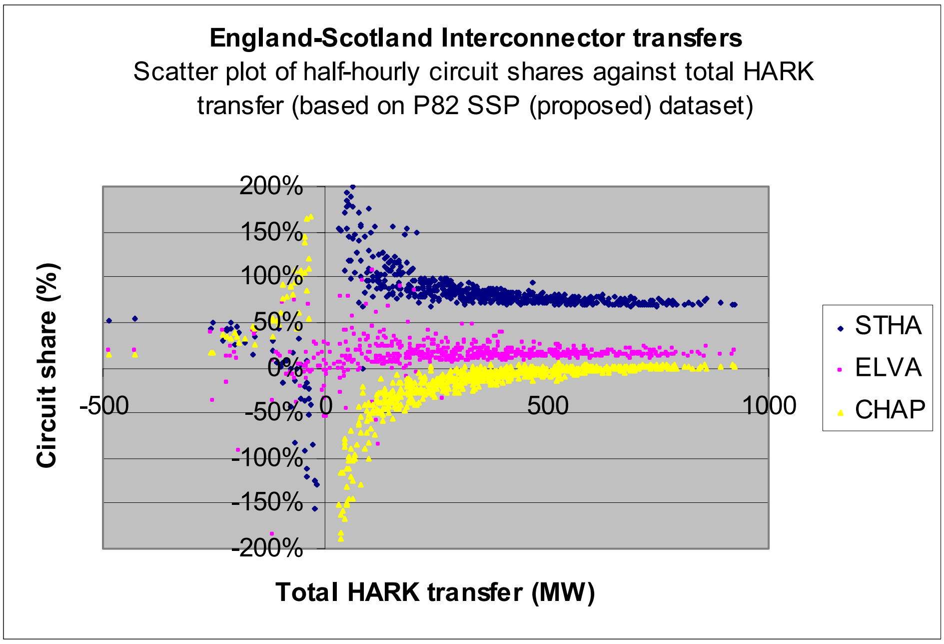
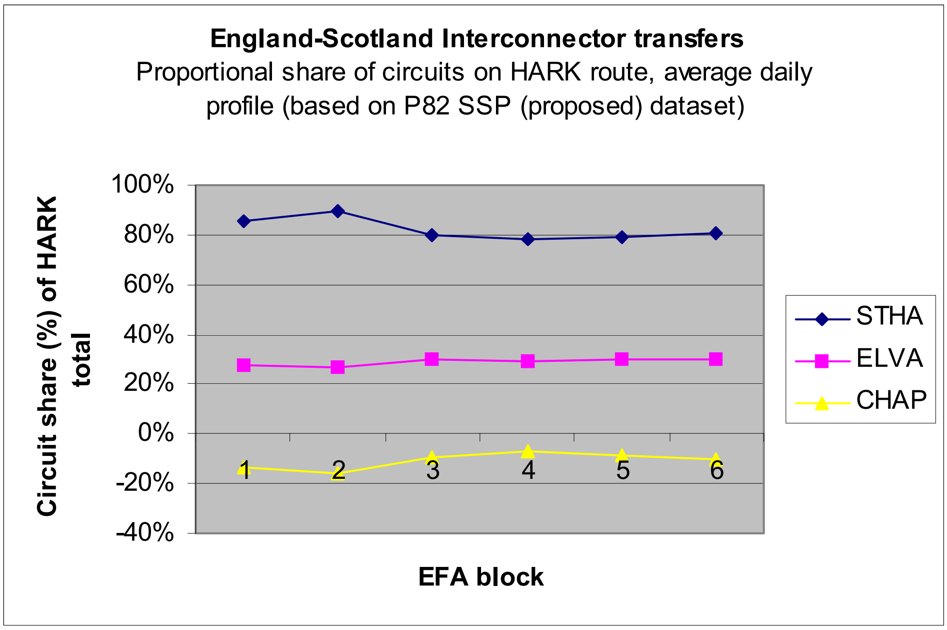


Figure 4



2. Impact Analysis

Illustrative Impact of P125

		P82 Zone 0 (13) TLM	P125 Zone 1	P125 Zone 2	Total P125 for Zone 0 Nodes	Difference between P82 and P125
P82 Methodology						
PTI Winter Peak TLM	Factor	0.97658	0.98045	0.98314		
Total Generation	MWh	6,329,442				
Loss Adjusted Generation	MWh	6,181,206				
Losses Volume	MWh	- 148,236				
Cost of Losses	£	- 2,520,004				
P125 Illustration						
Zone 1: Zone 2 50:50 Weighted Average TLM	Factor		0.981795	0.981795		
P125 Apportionment of Generation	MWh		3,164,721	3,164,721	6,329,442	
Loss Adjusted Generation	MWh		3,107,107	3,107,107	6,214,215	
Losses Volume	MWh		-57,614	-57,614	-115,227	
Cost of Losses	£		-979,434	-979,434	-1,958,867	
Difference P82 - P125						
Cost Reduction for Zone 0	£					- 561,137
% of Unadjusted Losses	%					22.3%
Cost increase in Zone 1	£					280,568
Cost increase in Zone 2	£					280,568

Note - Based on Average Generation for 2002/03, Winter Peak TLMs

Reference Price	£/MWh	17.00
Zone 1	%	50%
Zone 2	%	50%

Notes and Assumptions

Provides an illustration of the potential impact of P125

Based on Scottish interconnector BMU generation April 2002 - March 2003

Assumes PTI Winter Peak TLMs apply for the entire year

P125 apportionment of Interconnector generation to Zones 1 and Zone 2

Single weighted average TLM for Scottish BMUs derived from Zone 1 and Zone 2