

# SHE Transmission

Transmission Losses Report 2016/17

October 2017



---

# Transmission Losses Report 2016/17

---

## 1. Summary

SHE Transmission has a licence obligation to publish an annual Transmission Losses report for the previous relevant year on or before 31 October in accordance with the requirements of Special Condition 2K.4 of our licence conditions.

As laid out in our Transmission Losses Strategy published in October 2016 the actual transmission losses throughout the year are monitored by the System Operator (SO), National Grid. However, by analysing the network across a range of system snapshots at specific times across the seasons of the reporting year, SHE Transmission can estimate the transmission losses to give a comparison with the SO figures.

For the reporting year 2016/17, the SO determined that the transmission losses in SHE Transmission area in 2016/17 were 0.27TWh. This was a 4% reduction compared to 0.28TWh reported in 2015/16.

While we endeavour to minimise losses in our system through appropriate use of technology and upgrading parts of our system to operate at higher voltages and ratings, it is estimated that transmission losses will increase in our area due to significant increase in the generation connected compared to the system demand. We will continue to monitor the level of losses in our transmission system and investigate any unusual losses figures.

## 2. Introduction

SHE Transmission has a licence obligation to publish an annual Transmission Losses report for the previous relevant year on or before 31 October in accordance with

the requirements of Special Condition 2K.4 of our licence conditions. Special Condition 2K.4 requirements for the report include:

- 2K.4(a): The level of Transmission Losses measured as the difference between the units of electricity metered on entry to the transmission system and the units of electricity metered on leaving the system.
- 2K.4(b): Progress report on the implementation of Transmission Losses strategy and an estimate of the contribution to minimise Transmission Losses that has occurred as a result.
- 2K.4(c): Any changes or revisions of the Transmission Losses Strategy
- 2K.5: Description of any calculations used to estimate Transmission Losses on the transmission system.

In line with our Transmission Losses Strategy, the System Operator (SO) is responsible for determining the actual transmission losses throughout the year in SHE Transmission area. The SO determines the difference between the units of electricity metered on entry to our system and the units of electricity metered on leaving the system in each reporting year. SHE Transmission carries out annual losses studies in compliance with Special Condition 2K.4.

This report presents SHE Transmission's update on transmission losses for the financial year 2016/17. Section 3 of this report presents the results of 2016/17 losses study. Section 4 presents the progress on the implementation of our losses strategy and section 5 highlights the status of our current losses strategy as published in October 2016. Section 6 shows the calculations used to estimate transmission losses for 2016/17 in SHE Transmission area.

# Transmission Losses Report 2016/17

## 3. 2016/17 Losses

### 3.1 Losses as reported by the SO

The SO determined that the difference between the units of electricity metered on entry to SHE Transmission system and the units of electricity metered on leaving the system in 2016/17 was 0.27TWh. This was a 4% reduction in losses compared to 0.28TWh reported in 2015/16. The 2016/17 losses figures are lower than the annual average losses of 0.31TWh between 2007/08 and 2016/17 as shown in figure 1 below.

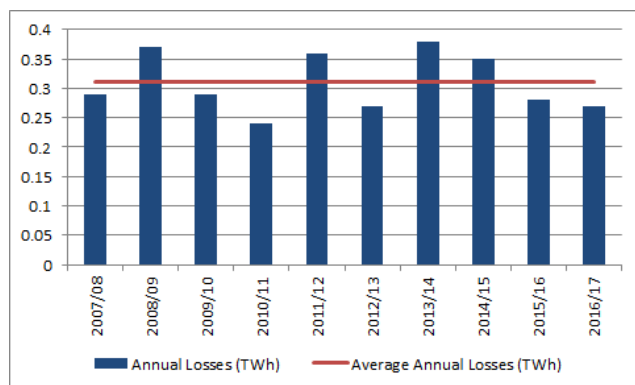


Figure 1: SHE Transmission Losses from 2007/08 to 2016/17 as reported by the SO

### 3.2 Losses estimated by SHE Transmission

In line with the losses methodology described in our Losses Strategy published in October 2016, sense-checks were carried out on the 2016/17 losses figures reported by the SO using Multiple Load Levels methodology and regression analysis. The Multiple Load Levels methodology uses a quadratic loss equation and load frequency distribution with load levels covering all the seasonal variations in the

reporting year to establish a load-loss relationship. The quadratic loss factor equation was derived by using Siemens PTI's Power System Simulation for Engineering (PSS/E) version 33 software and Microsoft Excel regression analysis of the PSS/E results is shown below: -

$$\text{Loss factor} = -0.0112 + 0.632L - 0.0098L^2$$

Where  $L$  is the load level in per unit of annual peak demand

Using the system peak demand and the load frequency distribution for the annual load data for the reporting year, the 2016/17 transmission losses in SHE Transmission area were estimated as 0.28TWh using the loss factor equation as shown in table 1 below. The estimated losses figures are comparable to the 0.27TWh losses figures reported by the SO.

Table 1: Estimated Annual Losses for 2016/17

% of System Peak Demand	Load Level in per unit	Hours of Occurrence	Losses (TWh)
90-100	0.95	5	0.0003
80-90	0.85	94	0.0054
70-80	0.75	645	0.0320
60-70	0.65	1794	0.0745
50-60	0.55	2902	0.0964
40-50	0.45	2326	0.0572
30-40	0.35	961	0.0150
20-30	0.25	23	0.0001
10-20	0.15	0	0.0000
0-10	0.05	10	0.0001
<b>Total</b>		<b>8760</b>	<b>0.2809</b>

# Transmission Losses Report 2016/17

## 4. Strategy Implementation

While we endeavour to minimise losses in our system through appropriate use of technology and upgrading parts of our system to operate at higher voltages and ratings, transmission losses are sensitive to changes in generation, demand and network topology. We will continue to monitor the level of losses in our transmission system and investigate any unusual losses figures. Figure 2 below gives a forecast of the peak demand losses in SHE Transmission area at the time of system peak demand over the next five years.

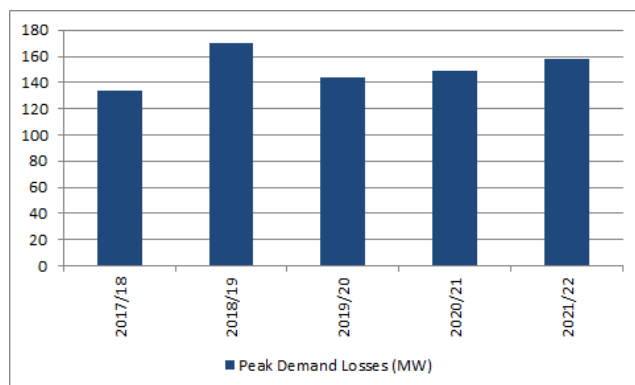


Figure 2: SHE Transmission Peak Demand Losses

### 4.1 Load-related Reinforcement Projects

The impact of losses is still a consideration when carrying out option assessment for the new system expansion and reinforcement projects currently under development.

In 2016/17, there was the completion of transmission overhead line reinforcement works from Fort Augustus to the Skye Tee on the Fort Augustus to Fort William 132kV double circuit tower line. While this new overhead line

circuit reduces the loading on the Fort Augustus to Fort William 132kV double circuit tower line, the impact on losses may not be significant due to construction outages on the Fort Augustus – Fort William 132kV double circuit tower line which increases the loading on the remaining 132kV circuit in service. It is also a relatively small part of the overall system.

### 4.2 Non-load Related Asset Replacement Projects

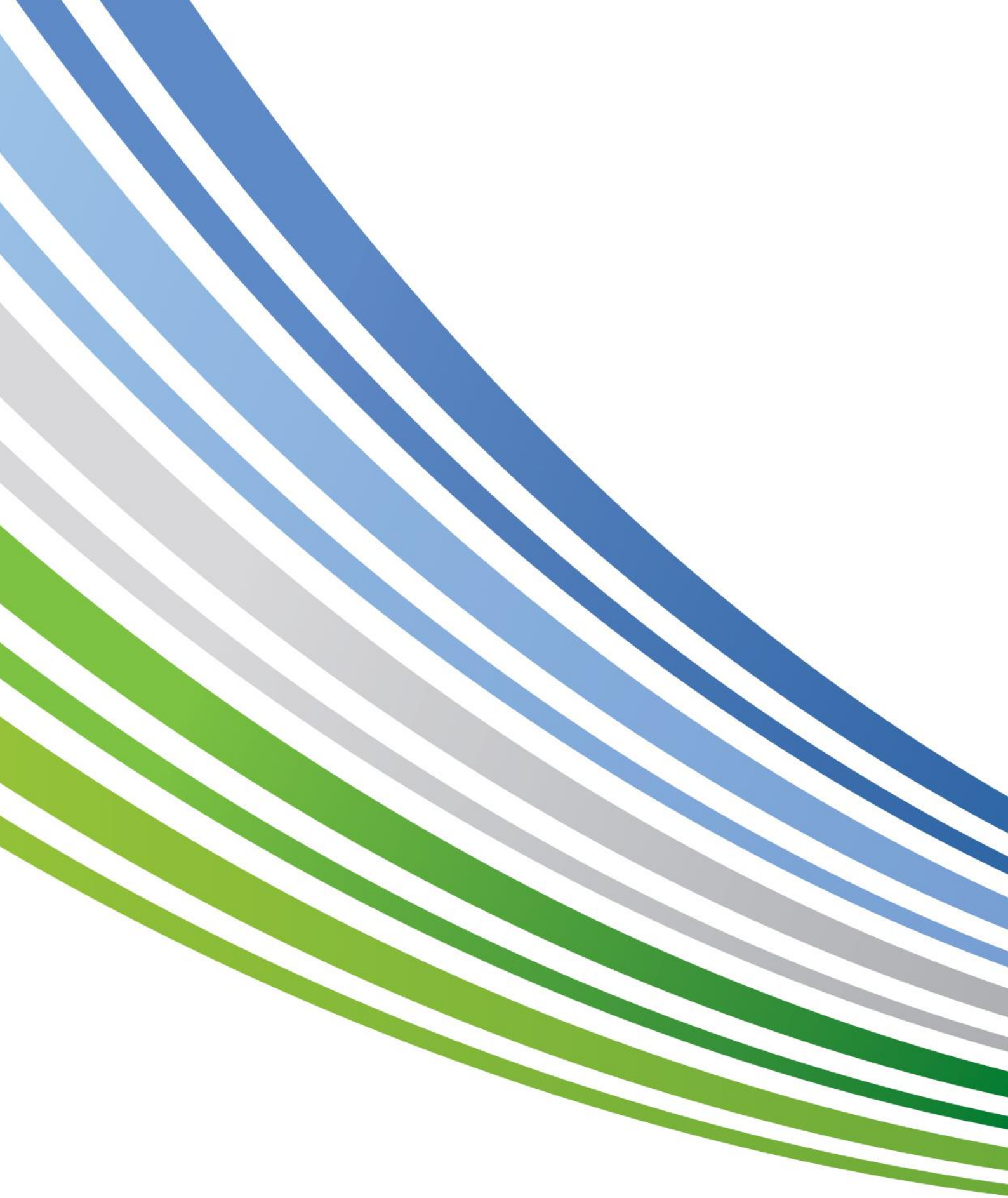
There were no transformers or conductors replaced under the non-load related asset replacement programme in 2016/17 that were in operation long enough for losses consideration during the reporting year.

### 4.3 Equipment Specification and Procurement

Whole lifetime costs are considered through capitalised loss values for efficient and economic designs as part of our investment decisions, specifications and procurement of transformers, conductors, materials and equipment.

## 5. Changes to our Losses Strategy

We are not proposing any revision to our Transmission Losses Strategy, as published in October 2016. The current methodology provides us with losses estimates which are comparable to the losses figures reported by the SO. For the avoidance of doubt, the accuracy of the losses figures remains the responsibility of the SO.



## Issue Revision (no 1.0 – October 2017)

Scottish and Southern Electricity Networks is a trading name of: Scottish and Southern Energy Power Distribution Limited Registered in Scotland No. SC213459; Scottish Hydro Electric Transmission plc Registered in Scotland No. SC213461; Scottish Hydro Electric Power Distribution plc Registered in Scotland No. SC213460; S+S Limited Registered in Scotland No. SC214382 (all having their Registered Offices at Inveralmond House 200 Dunkeld Road Perth PH1 3AQ); and Southern Electric Power Distribution plc Registered in England & Wales No. 04094290 having its Registered Office at 55 Vastern Road Reading Berkshire RG1 8BU which are members of the SSE Group

[www.ssen.co.uk](http://www.ssen.co.uk)