

Report for Ofcom

A study of BT's Regulatory Financial
Statements for business connectivity
markets

25 November 2008

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Annex A: Description of systems relevant to the RFS outputs

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1 Executive summary

BT has recently restated the volumes and revenues for TISBO and AISBO services, wholesale trunk segments and technical areas in its Regulatory Financial Statement (RFS) for 2006/07 and has also applied an improved methodology to calculate the 2007/08 RFS. This report describes the findings from Analysys Mason's independent review of the statement and the supporting systems and processes. Our findings are based upon documentation provided by BT and Ofcom, interviews and discussions with BT staff, and analysis of data received from BT. Below, we summarise our conclusions under the four areas which formed our scope of work.

Assessment of the accuracy of the revised turnover calculation and supporting volume data

The approach taken by BT in making its 2006/07 restatement for TISBO services, wholesale trunk segments and technical areas appears to be reasonable, given the limited historical data available. The charts below illustrate our estimate, at a market level, of the impact of each of the changes made by BT on internal and external reported revenues. Whilst the overall impact of the restatement on external revenues is slight, we note that the impact on revenues relating only to Ofcom's charge control baskets is more significant.

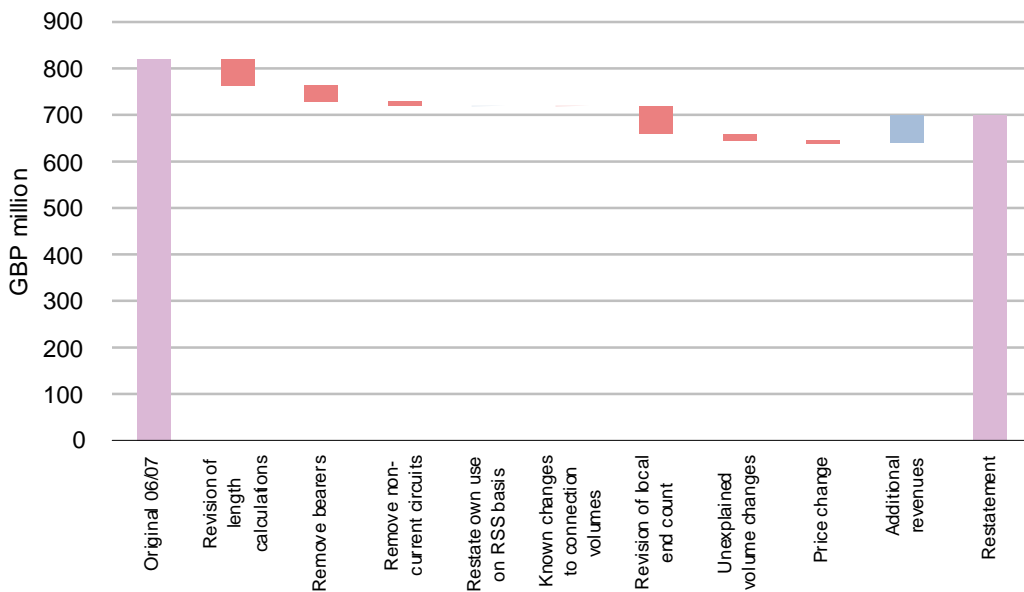


Figure 1.1: *Impact of restatement on internal revenues for all TISBO services, wholesale trunk segments and technical areas [Source: Analysys Mason]*

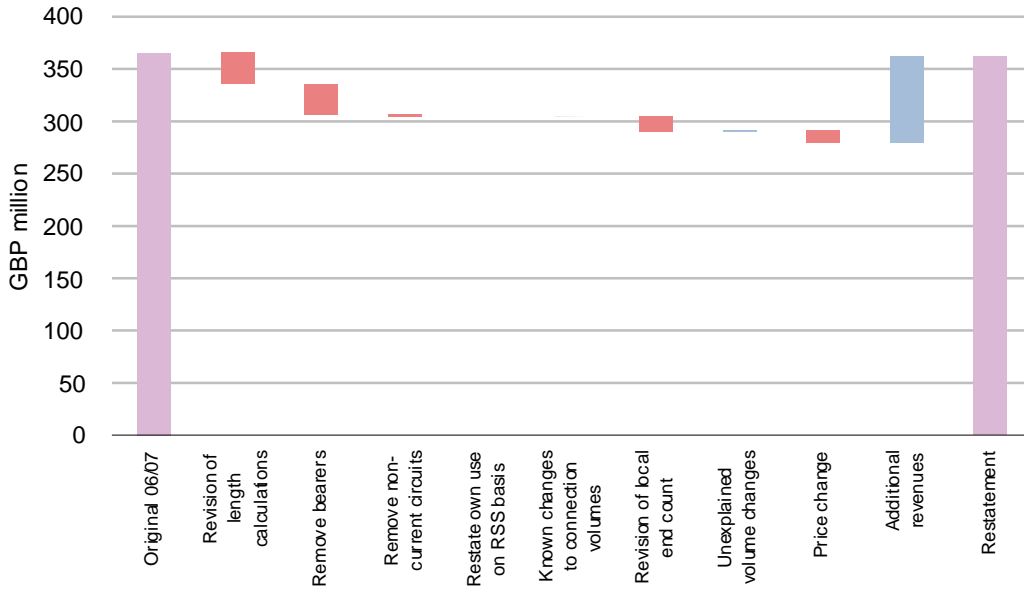


Figure 1.2: Impact of restatement on external revenues for all TISBO services, wholesale trunk segments and technical areas [Source: Analysys Mason]

It can be seen that we have been able to identify the cause of the vast majority of changes made in the 2006/07 restatement. However, some uncertainties remain about the reliability of the revised local end count, a revision that has a significant impact on revenues. We also note that we have not been able to trace in detail the reason for changes to volumes associated with 64kbit/s circuits.

The approach taken by BT in making its 2007/08 statement for TISBO services and wholesale trunk segments appears to be reasonable in most cases. However, we retain some uncertainty about the reliability of the local end count.

BT's statements for AISBO services depend upon the reliability of Openreach's systems and processes, which we have been unable to review within the timeframe of our work.

We have identified the following action points for Ofcom as a result of our work in this area:

Action	Purpose	Other comments
Request BT to provide an analysis of the nature of the circuits in COSMOSS without a 'CURR' status	To ensure that circuits are not being removed inappropriately	We doubt that improved treatment would have a major impact on volumes
Request BT to provide a reconciliation of the restatement with the original statement for 2Mbit/s volumes, accounting explicitly for the impact of SiteConnect and RBS volumes	To identify whether this is the remaining source of the discrepancy between the original and restated 2Mbit/s external connection and link volumes	Without this clarification we expect that it would be beneficial to conduct sensitivity tests on any analysis relying on these volumes and revenues

<i>Action</i>	<i>Purpose</i>	<i>Other comments</i>
Request BT to provide an analysis of how each of the different input changes to the DPCN model affected the volumes of 64kbit/s link reported. If possible BT should also cross-reference its restated external 64Kbit/s link volumes with the appropriate volumes produced using the same source as for internal 64Kbit/s links	To build confidence in the 64kbit/s internal link volumes	In the absence of such an analysis, Ofcom may wish to consider testing the impact in its leased-line charge control model of retaining the original 64kbit/s internal volumes
Request BT to update on an RSS basis the factor of 5.07 used to convert from n×64kbit/s to 64kbit/s links, or to provide evidence that such an update would not have a material impact on the restated volumes	To ensure 64kbit/s volumes are as reliable as possible	Sensitivity tests could be conducted to determine whether this is significant for Ofcom's analysis
Request BT to provide details of the clean-up conducted on archived Powerhouse data in order to provide volumes of 64kbit/s local ends	To build confidence in the revised 64kbit/s local end volumes	Ofcom may choose to rely on these volumes in the absence of further analysis if the volumes are not very significant for its purposes
Review with BT the local end calculations carried out on data from COSMOSS and CTCS, and in particular the count and type of circuits with 2, 1 or 0 local ends in each case	To build confidence in the revised local end volumes	Ofcom may choose to rely on these volumes in the absence of further analysis if the volumes are not very significant for its purposes
Request BT to calculate separate average lengths for internal and external 64kbit/s circuits and apply those to the associated link volumes in order to obtain the transmission volumes	To improve the accuracy of relative lengths for internal and external 64kbit/s circuits	Only necessary if the distinction between internal and external transmission distances for 64kbit/s circuits is material for Ofcom
Revise 64kbit/s transmission lengths downwards by 194 614 (internal) and 67 295 (external)	To reflect an error identified in BT's DPCN model	–
Work with BT to conduct a more detailed analysis of missing AISBO circuit volumes in Powerhouse in 2006/07 and 2007/08, and identify the extent to which they explain the additional revenues	To identify whether the additional revenues reported by Openreach have been allocated to appropriate AISBO services	Only necessary if the share of revenues between different AISBO services is material for Ofcom

<i>Action</i>	<i>Purpose</i>	<i>Other comments</i>
Review the systems and processes used by Openreach	To ensure that these systems are delivering reliable volume and revenue data	Ofcom may be willing to assume that these are reliable, given the fact that they have been very recently introduced and that BT Operate is willing to accept the figures reported

Figure 1.3: Summary of action points [Source: Analysys Mason]

These points are discussed in more detail in Sections 6–8.

Opinion on whether or not the recognition and measurement basis on which turnover is calculated for price control calculations and the RFSs is relevant, reliable and fit for purpose

We believe that the volumes reported in the RFS are reasonably well aligned with the revenue measure appropriate for the LLCC model. However, there are a few areas in which we recommend Ofcom to seek further clarification:

<i>Action</i>	<i>Purpose</i>	<i>Other comments</i>
Verify with BT whether circuits that have more than one associated job status in COSMOSS, including 'CURR', are included in RSS	To ensure that circuits with both 'CURR' and 'ICRE' status are included in the RSS, since both of these categories are potentially revenue-generating	Seems likely that this is the case – verification intended to supply greater level of comfort
Further investigate the source of the proportion used by BT to differentiate between network and retail own-use.	To establish whether or not the approach taken is reasonable	BT's source files provide total own-use volumes. It may be possible to conduct sensitivity tests in the LLCC model based on different assumptions about the proportion of own-use that relates to retail activities.
Clarify with BT whether circuits with resilience are counted once or twice	To ensure appropriate treatment of these circuits in Ofcom's analysis	Our working hypothesis is that AISBO circuits are counted twice and TISBO circuits are counted once

Figure 1.4: Summary of action points [Source: Analysys Mason]

This is discussed in more detail in Section 9.

Appraisal of the capability of BT's source data systems and processes together to deliver reliable volume data and recommendations for further quality improvements to the data used in setting leased-line charge controls, and changes to the regulatory financial reporting of the relevant markets

We believe that the current systems and processes, although complex, are potentially capable of delivering reliable volume data for TISBO and related services, provided that care is taken at each stage.

Within the time available for our work, we have not been able to conduct a review of Openreach's systems and processes which deliver volume data for AISBO services. We understand that a full reconciliation of this data with BT's information systems has not yet been possible.

We recommend that Ofcom consider taking the following actions to build further confidence in the systems used:

<i>Action</i>	<i>Purpose</i>	<i>Other comments</i>
Encourage BT to establish a greater dialogue between the Powerhouse designers and the RFS team	To build confidence in the reliability of the data feeds	–
Request BT to review the sources to the DPCN model, including the conversion factor of 5.07, to ensure that they are all on an RSS basis	To build confidence in the 64kbit/s link and transmission volumes	Without this review Ofcom may nevertheless choose to assume the 64kbit/s volumes are on an RSS basis, as stated by BT
Request further information from BT concerning the selection of D-codes that represent bearers, and the nature of these bearers	To build confidence that all bearer codes have been captured	Ofcom may already reasonably assume that all bearer codes have been captured – we suggest this action only because of the asymmetry between internal and external circuit bearers
Request BT to make a technical review of its CTCS procedures	To build confidence in the reliability of these procedures	We suggest this action not because of specific doubts concerning the reliability of the procedures, but because of their critical role in the overall process

Figure 1.5: Summary of action points [Source: Analysys Mason]

This is discussed in more detail in Sections 4, 5 and 10.

2 Introduction

Ofcom was informed by BT during 2008 that the internal and external turnover for a range of services covered by the Business Connectivity Market Review have previously been calculated using incorrect volume data. BT has subsequently restated the volumes and revenues in its Regulatory Financial Statement (RFS) for 2006/07 and has also applied an improved methodology to calculate the 2007/08 RFS.

Given the importance of the volume and revenue data, particularly for Ofcom's work in developing leased-line charge controls, Analysys Mason was appointed to conduct an independent review of this data. In particular, we were asked to provide:

- an assessment of the accuracy of the revised turnover calculation and supporting volume data
- an opinion on whether or not the recognition and measurement basis on which turnover is calculated for price control calculations and the regulatory financial statements is relevant, reliable and fit for purpose, including a review of the options available
- an appraisal of the capability of BT's source data systems and processes to deliver reliable volume data
- if appropriate, recommendations for further quality improvements to the data used in setting leased-line charge controls, and changes to the regulatory financial reporting of the relevant markets.

The scope includes the revised volume and revenue statements for both 2006/07 and 2007/08, including both Traditional Interface Symmetric Broadband Origination (TISBO) and Alternative Interface Symmetric Broadband Origination (AISBO) services. Our review also includes wholesale trunk segments and technical areas. However, the scope does *not* include an assessment of the cost allocation or the costs reported: it was not intended that our work replicate the audit process conducted by PWC; rather the intention was to focus more on the systems and processes used to deliver the data and to consider the significance of BT's amendments in the context of Ofcom's price control calculations.

The bulk of our work was conducted over a four-week period, during which time we were not able to definitively resolve all the issues that we identified. However, we believe that we have been able to highlight the key issues that Ofcom should bear in mind when utilising the RFS.

The remainder of this document is laid out as follows:

- Section 3 describes the information available to us initially and the methodology adopted in our work.
- Section 4 provides a description of BT's processes and systems used to derive the data for TISBO services and wholesale trunk segments. This section helps to set the context for the amendments that BT made in the course of its restatement.

- Section 5 provides a brief description of BT's processes and systems used to derive the data for AISBO services.
- Section 6 reviews BT's 2006/07 restatement for TISBO and related services.
- Section 7 reviews BT's 2007/08 statement for TISBO and related services.
- Section 8 reviews BT's 2006/07 and 2007/08 statements for AISBO services.
- Section 9 reviews the definitions of volumes used by BT in its statement, and compares this to the volumes required by Ofcom for its leased-line charge control model.
- Section 10 discusses the strengths and weaknesses of BT's processes and systems.
- Section 11 provides our conclusions and recommendations.

The report also includes an annex that gives further details of the systems used within BT to derive RFS volumes.

3 Methodology

At the outset of our work Ofcom provided us with a number of documents and emails providing information about the amendments made by BT. The key document was a report entitled *Review of Partial Private Circuits Regulatory Reporting*. That report is an attempt by BT to outline the amendments carried out to derive the 2006/07 and 2007/08 RFS for TISBO and related services. It also provides a high-level overview of the systems and processes relied on by BT.

Whilst the BT report and associated documents from Ofcom provide an introduction to the amendments made by BT, insufficient detail is presented to draw conclusions concerning the reliability of the RFS data. Our own report therefore describes in more detail the amendments made and the systems and processes followed. Our work has followed two main streams, each of which we describe in more detail below:

- assessment of the regulatory financial statements
- assessment of BT's systems and processes.

3.1 Assessment of the regulatory financial statements

BT reported that as a result of its review a number of changes were made to the figures for TISBO and wholesale trunk volume and revenues. The three most significant of these are:

- Changes due to modifications in the methodology used to calculate the length of circuits. These modifications had a significant effect due to a number of errors identified with the previously used methodology and the underlying data required by this.
- Replacement of Working Systems Size (WSS) with Revenue Systems Size (RSS) network volumes, which has the effect of significantly reducing the volumes and revenues reported. WSS includes a number of bearer circuits and non-'current' circuits, whereas RSS seeks to include only revenue-generating circuits.
- Change in the data source used for local end volumes.

These amendments are discussed in more detail in Section 6 below. Our assessment has included:

- an investigation of the process by which the amendments were made, including as far as possible a review of the methodology, assumptions and data used. This has entailed both a review of available documentation and data files, and discussions with key BT staff
- an attempt to identify the impact of each change separately on the RFS data in order to validate whether this was reasonable
- a review of year-on-year changes
- a review of the checks conducted by BT on the RFS data
- consideration of other possible checks that could be conducted.

3.2 Assessment of BT's systems and processes

The documentation provided by BT highlighted some of the key databases and information flows, from which we were able to identify an initial list of databases and processes to review. We then set up meetings with the key staff associated with these. At these meetings we sought to gain an understanding of:

- relevant information flows
- processes for entering, validating and updating information
- processes for extracting data
- processes for transferring data between different environments
- checks conducted on the data held and the output delivered.

Given the complexity of the systems and processes used by BT it was necessary to piece together the overall information flows by talking to a number of different people, each responsible for a part of the overall process.

4 Description of BT's processes and systems for TISBO and related services

In order to derive volumes and revenues for the RFS, BT must extract and process data from its internal systems. There are an extremely large number of systems used within BT, with more than a dozen being relevant to the process of deriving figures for TISBO services and trunk segments. Certain processes in the derivation of these figures are undertaken by additional systems and/or databases that have been put in place for this express purpose. This leads to a complex process involving several teams and departments across BT. Analysys Mason has conducted a series of interviews with BT staff in order to gain an understanding of the systems involved and the processes that link them together to arrive at the RFS outputs. The purpose of this section is to describe the systems that serve as the backbone for these processes in more detail.

We understand that some of systems and processes described here may also have been, or continue to be used to derive figures for AISBO services. However, this section deals exclusively with their use to derive figures for TISBO and wholesale trunk services.

4.1 Overview of systems and processes used to derive the RFS

4.1.1 Overview of processes

BT's processes for deriving the necessary outputs for the RFS can be categorised into three broad *operational* processes and four broad *management* processes, as shown below in Figure 4.1.

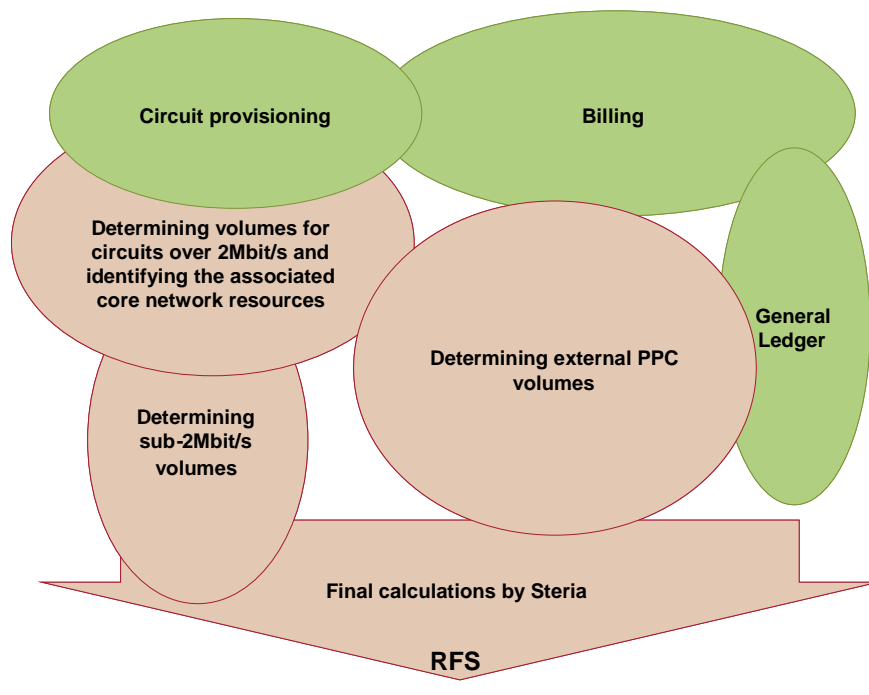


Figure 4.1: Broad processes for deriving the outputs relevant to the TISBO markets for the RFS [Source: Analysys Mason]

The three operational processes (coloured green in Figure 4.1) allow BT to:

- build, revise, repair or de-activate circuits through the *circuit provisioning* system
- monitor and invoice charges through the *billing* systems
- post-process billing information in the *General Ledger* for accruals and reporting purposes.

The three management processes (coloured light brown in Figure 4.1) are the means to determine:

- TISBO circuits over 2Mbit/s and apportion the core network to circuits and trunk services
- sub-2Mbit/s TISBO circuits
- external PPC volumes.

In the final process, BT provides its own outputs to an outsourcing company called Steria, which processes it in order to generate the RFS. Its role and the processes used are outlined in Section 4.3.4 below.

4.1.2 Overview of systems

There are an extremely large number of systems and databases within BT, some of which are summarised in BT's Detailed Attribution Methods (DAM) document. A subset of these are relevant to the derivation of RFS outputs related to the TISBO and wholesale trunk markets. These have system owners and users spread across departments throughout BT. These systems are summarised below in Figure 4.2.

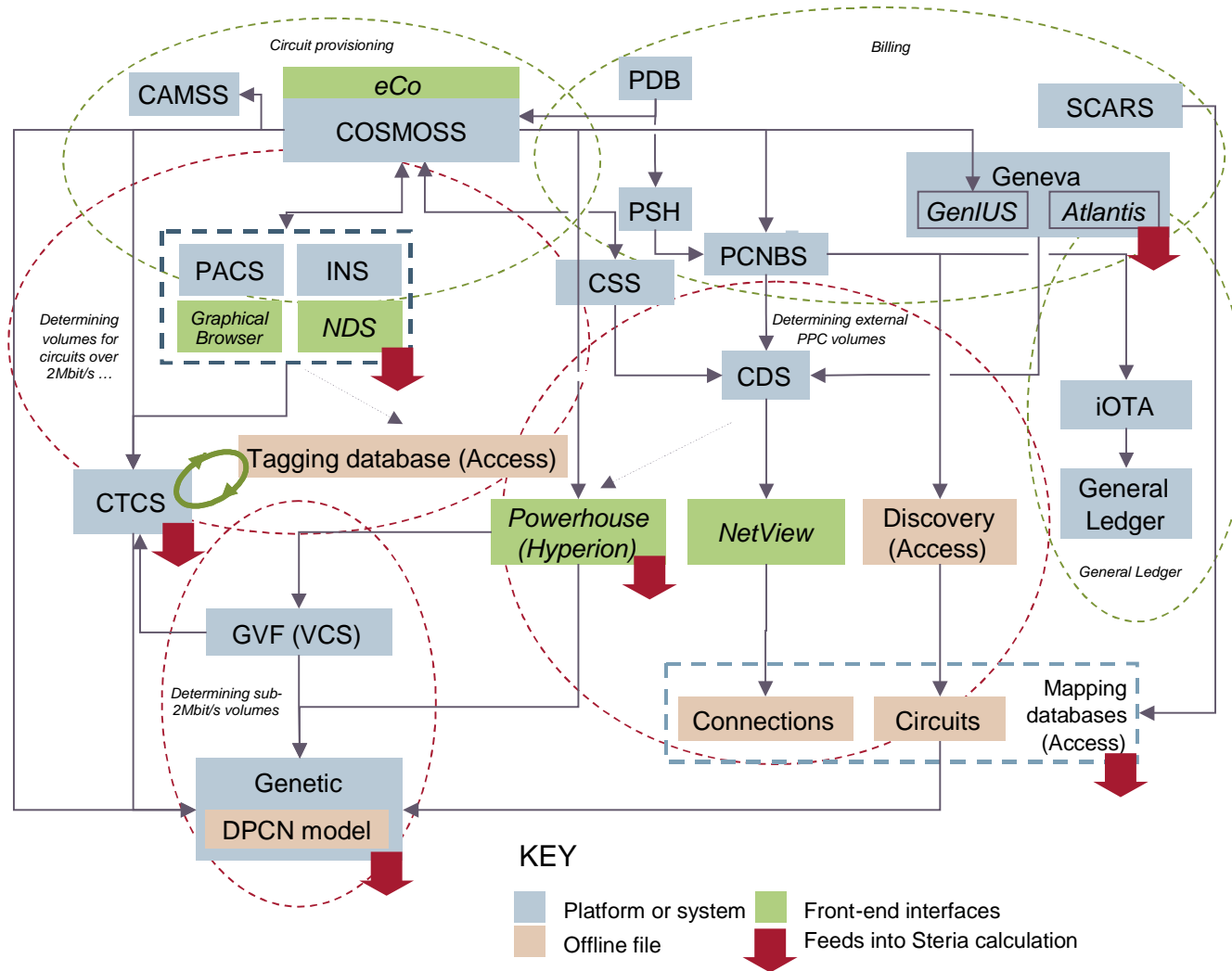


Figure 4.2: Systems used within BT to derive the RFS volumes for the TISBO and wholesale trunk markets [Source: Analysys Mason, BT]

The ellipses in Figure 4.2 correspond to the processes summarised in Figure 4.1, and approximately group the systems according to the main process that they are used for. A brief description of each of these systems is provided in Annex C.

These processes originally determined network volumes on a WSS basis. As part of the re-statement for the 2006/07 financial year and thereafter, they have been refined in order to derive RSS network volumes, which seeks to include only revenue-generating circuits. At a coarse level, defining RSS is a reconciliation between a small number of primary systems:

- *COSMOSS*: a billing-oriented operations system that is used to organise circuit provisioning
- *CTCS*: a network-oriented management system that understands how circuits are routed in the network
- *PCNBS/GENEVA*: the two billing systems currently used by BT for TISBO and wholesale trunk products.

BT has attempted this reconciliation using the management processes described above, with the operational processes providing necessary data. This is done by:

- Using *COSMOSS* to identify active circuits and determine which are currently being billed for using *PCNBS/GENEVA* in order to determine external PPC volumes.
- Identifying the network elements used to route each of these circuits using data contained within *PACS/INS* transferred into *CTCS*.
- Determining the number of circuit connections using *Powerhouse*.
- Aggregating the circuit volumes of sub-2Mbit/s circuits and trunk distance within *GENETIC*.
- Cross-checking the external revenue calculations against the *General Ledger*.

Across these systems, *CTCS* provides most of the information related to the distribution, trunk and transmission networks for circuits for 2Mbit/s and above, whilst *GENETIC* provide links data for sub-2Mbit/s circuits. *Powerhouse* and *COSMOSS* are the primary sources for connection volumes.

4.2 Overview of key systems in the operational processes

In this section we briefly describe the most important systems for the processes shown in Figure 4.2 above, namely:

- *COSMOSS* in the network provisioning system
- *PACS* and *INS* in the network provisioning system
- *PCNBS* and *GENEVA* in the billing system.

4.2.1 Network provisioning – COSMOSS

The Customer Oriented System for the Management Of Special Services (COSMOSS) is the ordering system for (theoretically) all circuits in the BT network. It is a fundamental system to this entire exercise, with feeds into several other systems.

COSMOSS receives circuit details from the end-user, pricing data from the Portfolio Database (PDB) and routeing data from PACS and INS. It outputs into particular information boxes in BT's data warehouses in the form of raw data dumps to several systems, including:

- a daily feed of all circuits which need billing to PCNBS and GENEVA
- a list of circuits to be added or removed from the network to INS or PACS, so that the databases of network inventory can be updated
- information on current circuits to Powerhouse and CTCS.

An end-user request for a *job* can be written into COSMOSS and a number of different statuses are associated with jobs on a circuit, namely:

- ISSU – in course of provision
- CURR – current
- ICCE – in course of cessation
- ICRE – in course of re-arrangement
- CEASED – ceased circuits.

4.2.2 Network provisioning – PACS/INS

The Planning Assignment and Configuration System (PACS) and the Integrated Network System (INS) perform equivalent functions for the SDH and PDH platforms respectively. Both are operations systems that contain a detailed inventory of the assets and network elements related to their respective platforms, and routeing information for circuits using these platforms. PACS and INS are used to feed the CTCS for routeing data regarding SDH and PDH respectively.

4.2.3 Billing and General Ledger – PCNBS and GENEVA

The Private Circuits New Billing Information System (PCNBS) is the main billing system for retail private circuits. Most PPC products are currently billed using PCNBS, although they are to be imminently migrated to a new billing system called GENEVA. GENEVA has several platforms, including GENEVA Integrated Universal Solution (GenIUS) for BT Wholesale products and Atlantis for Openreach products.

As a billing system, PCNBS takes input from COSMOSS and the pricing database PDB and then outputs data to a number of management systems. In particular, PCNBS has a direct feed through

to Powerhouse, containing the information about the billing account and the circuit status. GenIUS will use exactly the same feeds as PCNBS.

4.3 Overview of key systems in the management processes

As stated earlier in this section, the three main management processes for deriving the outputs needed to generate the RFS determine:

- circuits over 2Mbit/s and identification of associated core network resources
- circuits under 2Mbit/s
- external PPC volumes.

For these processes, CTCS is the central system for determining circuits of 2Mbit/s and above, and GENETIC is its (simpler) equivalent for sub-2Mbit/s circuits.

The remainder of this section briefly summarises:

- CTCS and how it prepares data for ASPIRE
- the Powerhouse system
- the relevant part of the GENETIC system
- the calculations completed to determine the external PPC volumes
- the final processing.

4.3.1 Circuits of 2Mbit/s and above – CTCS

The Core Transmission Costing System (CTCS) is a database in Oracle which is used purely for regulatory accounting and uses Structured Query Language (SQL) to process its data. CTCS has previously been used to identify how circuits over 2Mbit/s are provisioned within the network in WSS terms. For the re-statement and moving forward, circuits within CTCS have been further sifted using a 'Tagging database' to identify RSS. This sifting includes the removal of non-current circuits, bearers and own-use circuits.

CTCS takes circuit data from COSMOSS and routing data from PACS/INS: it also uses COSMOSS as a cross-reference to identify all revenue-generating circuits and hence derive RSS. CTCS outputs links, trunk, distribution and transmission network volumes for both internal and external circuits over 2Mbit/s and most of these outputs are passed directly for processing by the ASPIRE software. CTCS also derives trunk volumes for sub-2Mbit/s circuits, by isolating the 2Mbit/s bearers in the network. These are sent to GENETIC.

4.3.2 Circuits of 2Mbit/s and above – Powerhouse

Powerhouse is an Online Analytical Processing (OLAP) front end, for a set of Oracle tables. Powerhouse itself is not a calculation engine. There are two weekly data feeds from COSMOSS and a monthly feed from the billing systems.

Powerhouse has a remit to provide volume data only as a management information system (MIS). Powerhouse could also be endowed with circuit length data, but its remit does not extend to including route data. We understand that all PPCs and private circuits are captured in the system.

Originally, Powerhouse was used to obtain WSS internal connections for the RFS. It is now used to provide the RSS equivalents. 'WSS' in this context is effectively the feed of circuits from COSMOSS, whereas 'RSS' is effectively the feed from the billing system.

4.3.3 Circuits under 2Mbit/s – GENETIC

The Digital Private Circuit Network (DPCN) is the part of BT's network used for sub-2Mbit/s circuits. The DPCN is monitored by a system called Generic Network Implementation and Control (GENETIC).

For the purposes of the RFS, the link rental volumes for sub-2Mbit/s circuits are gathered into a simple model from several sources including Powerhouse and COSMOSS. This model captures both internal and external rental volumes, and implicitly assumes that the sources are expressing volumes in RSS terms. Those links which are $n \times 64\text{ kbit/s}$ are converted into 64kbit/s equivalents, using a factor of 5.07. This factor was calculated by the GENETIC team in September 2006 using WSS volumes, and does not distinguish between external and internal volumes. BT does not believe that the impact of failing to update this factor on an RSS basis is material.

In order to derive trunk volumes for sub-2Mbit/s circuits, the 2Mbit/s bearers in CTCS are extracted and the average radial length of these links is calculated. This calculation was originally completed in WSS but has since been updated to RSS. This average is then used to split the trunk distance between the products.

4.3.4 Determining external PPC volumes

External PPC volumes require the calculation of both connections for the financial year and circuit volumes at the mid-point of the year. Connections are derived by looking at provisioning job volumes from COSMOSS, cross-referenced with PCNBS. Circuit volumes are calculated using a snapshot from COSMOSS.

4.3.5 Final processing

BT has outsourced the generation of the RFS reports to a company called Steria Limited. The data from the various systems are fed into four separate models as shown below:

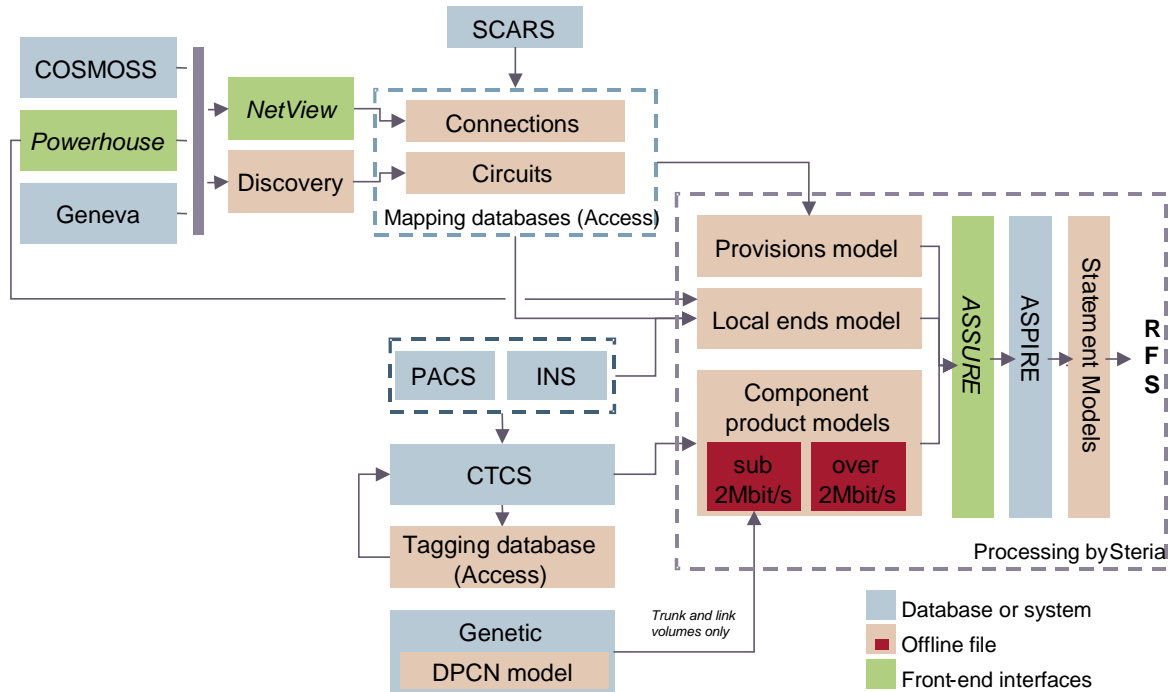


Figure 4.3: Diagram of final processing

These models perform the role of an aggregator more than a calculation engine; they feed into the ASSURE interface (Accounting Separation Secure Repository Environment), which reformats the data submitted by BT and performs certain data validation checks. These tables then feed into the ASPIRE software, which uses volumes as part of its cost allocation process and revenue calculation. Output from ASPIRE is then fed into statement production models to be collated into RFS format.

Local end factors are used which account for the variation in local ends per circuit for different types of product (e.g. a BT Retail private circuit has two local ends, whilst an external PPC has one).

The own-use circuits identified within the Powerhouse, CTCS and DPCN processes (in the case of 2Mbit/s and above and sub-2Mbit/s respectively) are further sub-divided between *network* own use and *retail* own use, based on an input calculated using previously apportioned computing costs split between network and retail entities. For the 2006/07 statement, this input was 44% network own use and 56% retail own use, and the same split was applied to all bandwidths.

4.4 Checks and controls used by BT

In addition to the checks described above in Section 4.2, we have identified some checks and verification processes completed by BT. Year-on-year comparisons are made of the outputs and auditing obligations mean that any material charges must be identified, explained and documented. This change can be defined based on either a percentage or absolute tolerance, depending on the department. For example, within CTCS, the tolerance is up to a 5% percentage change in revenues year-on-year.

Within BT, an 'evaluator' for each product is appointed, whose responsibility is to verify the inputs being provided for final processing. The period of evaluation is from March to June. A single evaluator has now been appointed for PPCs for this purpose for the financial year 2008/09 and thereafter.

The models used in the final processing are also reviewed. Queries brought up through this process may require returning to the original billing data.

BT also make a comparison between the General Ledger and the P×Q calculation within ASPIRE. Specifically, this takes the externally reported revenues from the General Ledger system and compares it against the total revenue across all products calculated on a product by product basis by *Product price × year-average volumes*.

5 BT's 2006/07 restatement for TISBO and related services

5.1 Introduction

Following publication of BT's 2006/07 RFS, a number of issues were identified relating to the accuracy of the volume and revenue figures for TISBO and related services. Consequently, BT has undertaken work to restate these figures. This work does not form part of BT's normal systems and processes, although these have been revised so that the 2007/08 statement is based on the corrected methodology. We have identified the following changes that BT has made to the volume and revenue figures in its original 2006/07 statement:

- revision of length calculations
- replacement of WSS with RSS, including removal of bearers, removal of non-current circuits and restatement of own-use circuits on an RSS basis
- changes to connection volumes, including disaggregation by bandwidth and correction of a misidentification of 64kbit/s circuits as 2Mbit/s
- revision of local end count
- other volume changes that we have not been able to explain in detail
- price changes
- reporting of additional revenues, including third-party infrastructure revenues, excess construction charges (OSP) and protected path revenues.

The charts below illustrate our estimate of the impact of each of the changes made by BT on internal and external reported revenues.

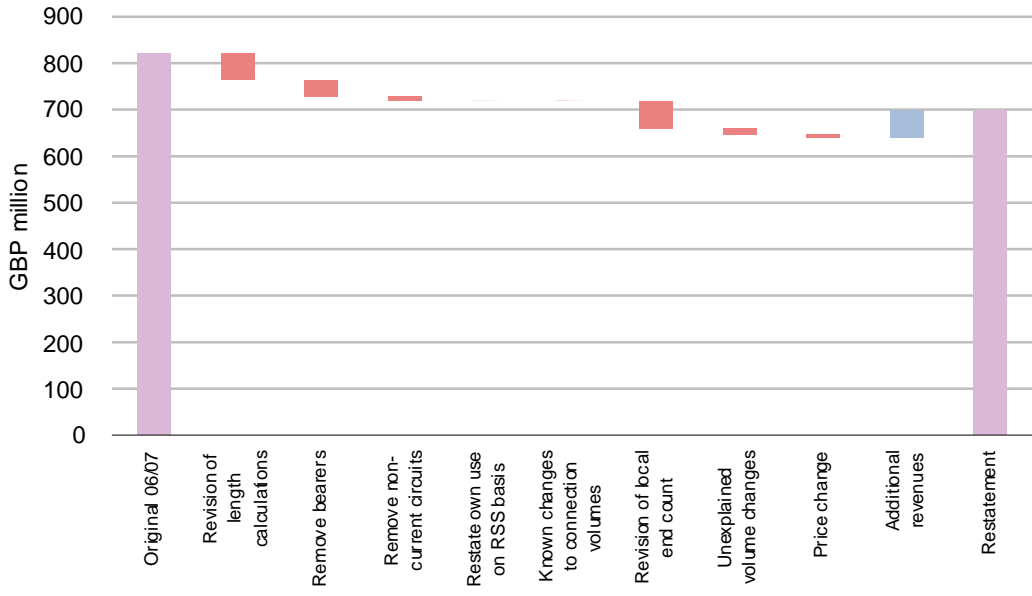


Figure 5.1: Impact of restatement on internal revenues for all TISBO services, wholesale trunk segments and technical areas [Source: Analysys Mason]

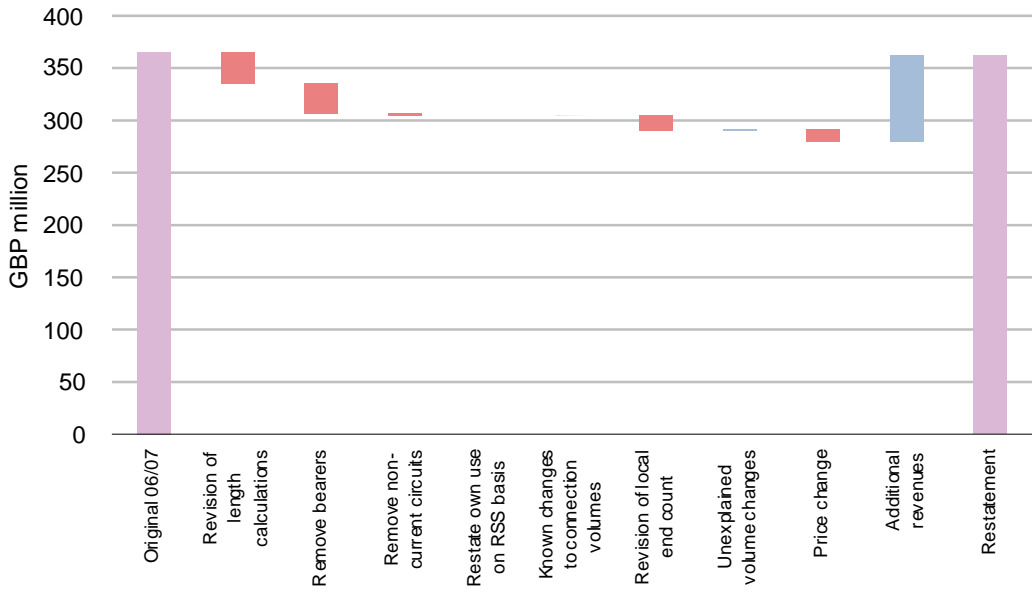


Figure 5.2: Impact of restatement on external revenues for all TISBO services, wholesale trunk segments and technical areas [Source: Analysys Mason]

Overall, internal revenues fall by 15%, whilst external revenues fall by just 1%. The relative scale of each of the adjustments to internal and external revenues is discussed in Section 5.2 below.

The impact on both internal and external revenues is more significant if we consider only those services relevant to the Ofcom charge control baskets.¹ In addition to the exclusion of revenues relevant to Site Connect, Radio Backhaul Services (RBS) and technical areas, the additional revenues do not apply to the baskets. The impact is illustrated in the two charts below.

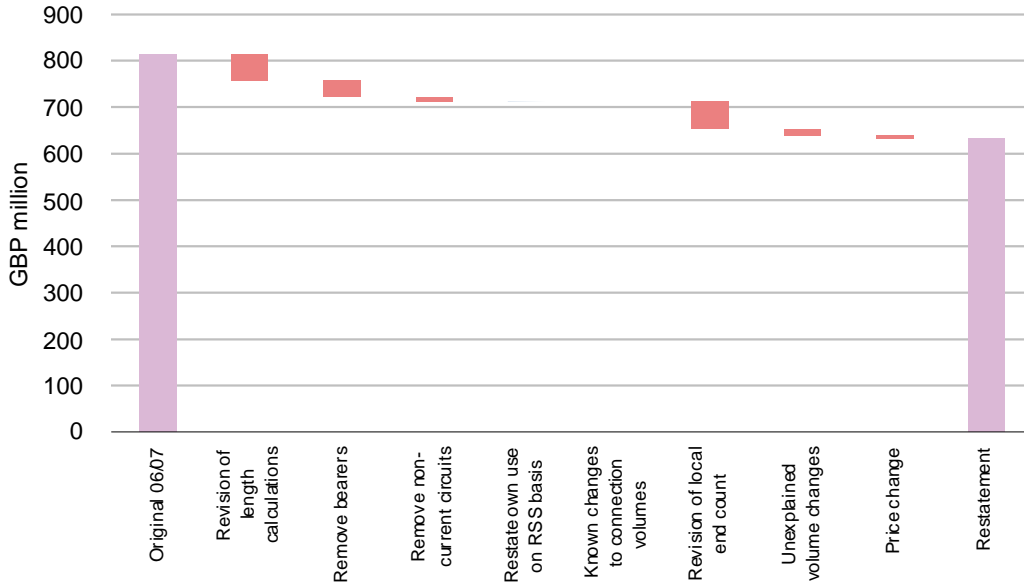


Figure 5.3: Impact of restatement on internal revenues for services relevant to TISBO charge control baskets [Source: Analysys Mason]

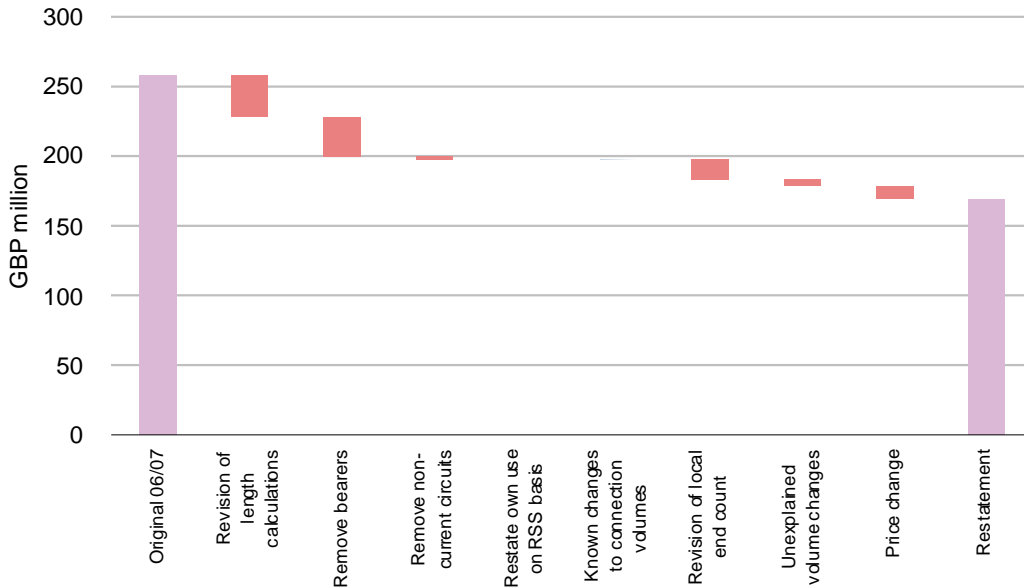


Figure 5.4: Impact of restatement on external revenues for services relevant to TISBO charge control baskets [Source: Analysys Mason]

¹ We include the local end adjustment in our view of Ofcom's charge control basket

For each amendment, we discuss below the methodology used, including the key assumptions made. We also provide an estimate of the impact on revenue; in most cases this is provided on the basis of the impact on charge control baskets since we believe that internal and external revenues are more closely comparable in this case.

5.2 Review of BT's amendments

In its work to restate its volume and revenue figures for TISBO and related services, BT separated its review of internal and external revenues into two streams and used a combination of existing datasets and new analysis to arrive at what it considers to be revenues with an improved level of accuracy. Volumes were taken from a number of sources, as shown in Figure 5.5 below. A number of these sources were different from those used in BT's original RFS, and this is discussed below. As in the original statement, prices were sourced from the carrier price list (CPL), and in the majority of cases revenue was calculated on a simple $P \times Q$ calculation.

	<i>Internal volumes</i>	<i>External Volumes</i>
64kbit/s connections	Powerhouse	COSMOSS
64kbit/s links	DPCN	DPCN
64kbit/s transmission/trunk	DPCN	DPCN
64kbit/s local ends	Various	COSMOSS
2Mbit/s and above connections	Powerhouse	COSMOSS
2Mbit/s and above links	CTCS	CTCS
2Mbit/s and above transmission	CTCS	CTCS
2Mbit/s and above trunk	CTCS	CTCS
2Mbit/s and above local ends	CTCS	COSMOSS

Figure 5.5: Sourced of internal and external volumes [Source: BT]

BT has attempted to validate its methodology by comparing the restated external revenues with the actual billed revenues and demonstrating a reasonably close match. It believes that since a very similar methodology was adopted to that used for external revenues, then the results are also reliable for internal circuits. We discuss the possibility of conducting further cross-checks in Section 5.4.1 below.

5.2.1 Revision of length calculations

In preparing its original statement for 2006/07, BT used CTCS to calculate lengths for circuits of 2Mbit/s and above, based on the locations of the terminating ends (customer sites) rather than the locations of the local serving exchanges (LSEs). This methodology was used prior to 2004 when it was necessary to calculate the entire route length. This approach was not amended subsequently, since until recently the LSE information was unavailable and it was assumed that terminating ends

were just as likely to be closer together than the LSEs, as they were likely to be further apart. On this assumption, measuring the distance between terminating ends provides a good proxy for the distance between LSEs.

However, in the course of revising the CTCS analysis for the restatement, BT decided to amend its methodology so that the distance between LSEs is now measured directly based on the locations of the LSEs. We would expect such a change in methodology to have only a minor impact on results. However, while implementing this change BT identified some errors, both in the previously used methodology and in the underlying data. As a result, the impact of revising the methodology has been significant.

In particular, BT found that the approach of using the distance between terminating ends as a proxy for distance between LSEs is flawed when both local ends are connected to the same local serving exchange. In this case the methodology returns a non-zero distribution and trunk length when it should be zero. The methodology also appears to result in an overestimate of circuit length when the customer site is a significant distance away from the LSE compared to the distance between the two LSEs. Furthermore, BT identified some data errors in the locations of certain customer sites. These errors would not be expected to apply to the locations of LSEs.

The change in methodology also affects the length of 64kbit/s circuits, since this length is based on the length of 2Mbit/s bearers supporting $n \times 64\text{kbit/s}$ circuits.

The impact of the change is to reduce the internal revenues due to transmission, distribution and trunk segments by 7%, and the external revenues by 12% on a charge control basket level. Within the time available we have not been able to identify the reason for this discrepancy, but note that it could reasonably be related to the relative levels of error in the location data for customer sites.

It should be noted that in reviewing the file that carries out the calculation on 64kbit/s lengths, we identified a small error in the average length of 64kbit/s links used for the restatement, which was taken to be 25.25km per link instead of 24.66km per link. This led to an overstatement of 194 614km for the total length of internal 64kbit/s circuits, and 67 295km for external 64kbit/s circuits (in both cases 2.3% of the total length reported). We have not included the impact of this within our analysis above.

5.2.2 Replacement of WSS with RSS

A key amendment made by BT was a replacement of what it terms Working System Size (WSS) with Revenue System Size (RSS). Specifically this involved the removal of:

- **Bearer circuits:** circuits that are solely used to provide other private circuits, are not charged for by BT Wholesale and are therefore non-revenue-generating.
- **Non-current circuits:** circuits without a 'CURR' status flag in COSMOSS – these might include circuits in course of provision, ceased circuits, and potentially others.

The amendment affects the CTCS analysis, which normally drives the count of links, trunk and distribution km for circuits of 2Mbit/s and above, for both internal and external circuits. This analysis also provides input to the count of 64kbit/s circuits. In particular, the volumes of certain excluded 2Mbit/s bearers now feed into the DPCN analysis, which treats the bearers as $n \times 64\text{kbit/s}$ circuits, using (as for other $n \times 64\text{kbit/s}$ circuits) a multiplier of 5.07 to convert them into 64kbit/s equivalents.

In order to make the restatement, we understand that BT was able to identify an archived data dump which contained all the information necessary for the CTCS analysis. It first re-ran the original analysis on this data, and confirmed that the same output was obtained. BT then amended the analysis in order to remove the circuits identified above.

Bearer circuits were identified by means of D-codes (retail-orientated codes used within BT as the most granular code for its various products).

Information from COSMOSS was used to identify those circuits with a 'CURR' status, and all other circuits were discarded. BT has not carried out an analysis of the non-current circuits discarded at this stage, but believes them to consist mainly of ceased circuits.

We understand that the original statement already excluded some types of **own-use circuits** from the total circuit volumes. Own-use circuits are those used by BT to support its own network activities, and are identified as those flagged by the systems as both internal and providing a connection between two BT sites. Own-use circuits are sub-divided into *network* own use and *retail* own use, and it is the former type of circuits that were excluded from the count of internal circuit volumes in the original statement. The split between the two types was based on an input from Steria. For the 2006/07 statement, this proportion was 44% network own use and 56% retail own use, and the same split was applied to all bandwidths.

Network own-use circuits continue to be excluded from the count of internal circuit volumes in both BT's original statement and its restatement, but these have been recalculated on an RSS basis as part of the restatement process. BT continues to use the same 56% proportion in calculating the number of own-use circuits that are for retail use.

BT has provided an analysis of the circuits excluded in the move from WSS to RSS for 2Mbit/s and above. The volume of circuits affected is summarised in the table below:

<i>Link</i>	<i>Bearer</i>	<i>Non-current</i>
Internal 2Mbit/s	3%	2%
Internal 34/45Mbit/s	5%	1%
Internal 140/155Mbit/s	19%	1%
Internal 622Mbit/s	<5%	<1%
External 2Mbit/s	15%	2%
External 34/45Mbit/s	–	2%
External 140/155Mbit/s	89%	<1%

Figure 5.6: Impact of move from WSS to RSS in 2006/07 [Source: BT]

It is notable that the majority of bearers were flagged as external. BT believes that this is because they relate mainly to Points of Handover and migrated former retail circuits. This seems plausible.

The impact of the removal of bearers is to reduce the internal revenues by 4% and the external revenues by 11% on a charge control basket basis. The removal of non-current circuits reduces revenues by 1% for both internal and external circuits. This includes an estimate of the impact not only on link volumes but also on local end and distribution/trunk volumes.

5.2.3 Changes to connection volumes

BT identified two changes to the connection volumes:

- **Disaggregation of connection volumes by bandwidth:** In preparing its original 2006/07 RFS, BT incorrectly identified both internal and external 34/45Mbit/s and 140/155Mbit/s connections as 2Mbit/s connections. BT has corrected this mistake by correctly identifying 34/45Mbit/s and 140/155Mbit/s connections in Powerhouse.
- **Correction of error in calculation of external 64kbit/s connections:** BT informs us that there was an error in the original volume calculation for external 64kbit/s connections. This has now been corrected, although exact details of the original calculation have not been provided.

The combined impact of these changes is less than 0.1% of revenues at a charge control basket level.

5.2.4 Revision of local end count

Historically, BT used Powerhouse to derive circuit volumes which then fed into Steria's calculation of local end volumes. However, we understand that Powerhouse only contains information for the most recent financial year and that archived data was not available on an RSS basis. For the 2006/07 restatement it was therefore necessary to use an alternative source. Three different methods were used:

- **For external local ends:** circuit volumes used by Steria to calculate local end volumes were sourced directly from COSMOSS. Since COSMOSS provides the feed to Powerhouse, BT considers that this provides a reliable view of external local end volumes, and it has subsequently used COSMOSS as the data source for this purpose in 2007/08.
- **For internal local ends of 2Mbit/s and above:** circuit volumes used to calculate internal local end volumes were sourced from CTCS, since COSMOSS does not directly identify the internal circuits that are part of the relevant PPC market. BT then conducted an analysis of these links by P-Code and applied to each a weighting of either 2, 1 or 0 local ends per link. We understand that this analysis also accounted for circuits without a main link (i.e. with both local ends connected to the same local serving exchange).
- **For internal local ends of sub-2Mbit/s:** an alternative source could not be identified by BT and therefore a clean-up exercise was attempted on the original WSS volumes to derive the volume of local ends.

Given the lack of archived RSS data in Powerhouse BT's approach seems reasonable. However, we are surprised by the impact of the changes: at a charge control basket level, internal revenues are reduced by 7%, and external revenues by 6%. Our earlier analysis of the impact of replacing WSS with RSS already accounted for a simple estimate of the knock-on impact on local end volumes – we would therefore have expected only a small further change in volumes.

The significant impact on revenues from this change suggests that either there was an error in the original data, or that there is an error in the restated data. In Section 5.4.1 below we discuss sanity checks on the local end count, and conclude that the restated volumes appear more reasonable. However, we have not been able to investigate the differences in more detail within the time available to us, and this therefore remains an area of uncertainty.

5.2.5 Other volume changes that we have not been able to explain in detail

There are a number of volume changes that we have not been able to associate with one of the specific changes noted above. These include:

- Reduction in internal 64kbit/s link volumes of ~115 000 (26%). This is likely to be driven at least partly by the move from WSS to RSS but we have been unable to verify the causes in detail. BT informs us that there has been a change of source for these internal link volumes.
- Reduction in internal 64kbit/s transmission lengths of ~1 470 000km (14%) and increase in external 64kbit/s transmission lengths of 370 000km (14%). The reduction in internal lengths is likely to be linked to the reduction in link volumes noted above. Other changes may be due to the move from WSS to RSS, but we have been unable to verify this in detail.
- Reduction in 2Mbit/s external connection volumes of ~2000 (13%). This may be driven by the exclusion of SiteConnect volumes from the restatement.

- Increase in 2Mbit/s RBS connection volumes of ~2500 (over 100%).
- A remaining discrepancy in 2Mbit/s link volumes (~1400 more internal and ~1500 fewer external links). The change in external volumes may be driven at least partly by the exclusion of SiteConnect volumes.
- Some remaining discrepancies in external 2Mbit/s transmission and distribution volumes. This may again be related to the exclusion of SiteConnect volumes.

The combined impact of these volume changes on revenues is a 2% reduction of both internal and external revenues at a charge control basket level.

5.2.6 Price changes

A number of minor changes to average prices were also made by BT in making its 2006/07 restatement. The most significant changes are:

- **Reduction in the price of 2Mbit/s connection:** We understand that the revised prices are due to the removal of charges for spare capacity from these connections and the use of RBS rather than PPC prices for the RBS products.
- **Accounting for CLZ discounts:** BT's original 2006/07 RFS did not account for the discount it applies to the local ends it provides in the central London zone (CLZ). For external revenues, BT was able in its restatement to identify the circuits to which the discount should apply and calculate it accordingly. For internal revenues, BT has not adjusted for the CLZ discount in its restatement, stating that it was not possible to identify the relevant circuits given the existing internal volume datasets available for historic 2006/07 data.

The combined impact of these price changes on internal revenues is a GBP6 million reduction, and on external revenues is a GBP9 million reduction. BT estimates that also accounting for CLZ discounts in internal revenues would be likely to further reduce these revenues by between GBP5 million and GBP10 million.

5.2.7 Reporting of additional revenues

BT has reported additional revenues in a number of areas:

- **Inclusion of third-party infrastructure revenues:** The original 2006/07 RFS excluded third-party infrastructure revenues, and BT included these in its 2006/07 restatement. For *external* third-party infrastructure revenues, BT used the total revenue amounts recorded in its billed ledger. For *internal* revenues, BT used a $P \times Q$ calculation. BT sourced volumes from its internal management reports, and used a set of prices mapped from external pricing using product codes.

- **Inclusion of excess construction charges:** The original 2006/07 RFS excluded excess construction charges (OSP), and BT has included these in its restatement. Excess construction charges were taken from Openreach's financial accounts and apportioned on the basis of connection volumes. The rationale is that excess construction charges are independent of circuit bandwidth, which seems reasonable.
- **Disaggregation of circuits with protected path:** The original 2006/07 RFS did not differentiate between standard circuits and circuits with protected path (which require enhanced maintenance). BT has now separated out these circuits for the purposes of calculating revenues derived from them; this was carried out in CTCS.

The combined impact of these changes is an increase in internal revenues of GBP60 million and an increase in external revenues of GBP83 million.

5.3 Other issues

In its restatement of its 2006/07 RFS, BT has continued to use spot volumes as of September 2006 to calculate both internal and external revenues. This does not present a difficulty when growth or decline in volumes is reasonably uniform across the year, but BT believes that this may account for some of the outstanding minor differences between the reported external revenues and the actual billed revenues.

We note that in converting $n \times 64\text{ kbit/s}$ circuits into 64kbit/s equivalents, an historically calculated factor of 5.07 has continued to be used. However, despite the fact that this factor is based on WSS circuits, BT does not believe that the impact of this is material. We have not been able to validate this belief within the timeframe available. In addition, for $n \times 64\text{ kbit/s}$ circuits BT has used the 64kbit/s price rather than calculate the revenues on a disaggregated basis. This is likely to introduce only a small error in the revenues.

5.4 Review of BT's outputs

5.4.1 Sanity checks on the revised regulatory financial statements

We have carried out two main sanity checks on BT's restated RFS as a means of validating or invalidating the volume adjustments from the original TISBO statement, namely (a) average number of local ends per link, and (b) average circuit length. These are discussed below. We have also discussed with BT the possibility of carrying out sanity checks based on downstream (i.e. retail) or upstream volumes (based on PPC inputs from Openreach).

- In the case of retail checks we understand that BT considered this in some detail at an early stage of the restatement, but the approach was found to be too complex. In particular, BT notes that its management accounts use an internal trading model based on average end-to-end circuits and do not have a breakdown of the services reflected in the RFS. Therefore, BT has

not been able to construct a robust check or control to compare the calculation of RSS volumes in the RFS with BT's downstream consumption in the internal trading model. We have not been able to investigate this issue in detail within the timeframe of our work.

- In the case of checks of inputs from Openreach, we understand that the use of a different basis of trading in the Openreach and in the BT accounts means that figures are not easily comparable. Again, we have not been able to investigate this issue in detail within the timeframe of our work.

Average local ends per link

We have compared the ratio of local ends per link in BT's original statement with the same ratio in the restatement. For external circuits we would expect this ratio to be close to 1, reflecting the fact that external PPCs each have 1 local end (although we note that a local end still exists for circuits without a main link). For internal circuits, we understand from BT that product managers would expect to see a ratio of 1.2 to 1.6 local ends per link.

We have estimated the implied number of local ends per link for the links which have been excluded as a result of the WSS-to-RSS adjustment, on the hypothetical assumption that the change in link and local end volumes is entirely attributable to this adjustment, although we know that in fact there were other significant changes to the numbers arising from the change in data source, as described in Section 6.2.8 above. These comparisons are shown in Figure 5.7 below.

		<i>Original RFS (local ends/link)</i>	<i>Restated RFS (local ends/link)</i>	<i>Excluded circuits (implied local ends/link)</i>
64kbit/s	Internal	0.40	0.37	0.49
64kbit/s	External	0.19	0.24	No movement in link volumes
2Mbit/s	Internal	2.53	1.63	32.09
2Mbit/s	External	1.35	0.97	2.90
34/45Mbit/s	Internal	1.45	1.22	4.83
34/45Mbit/s	External	1.60	0.89	59.08
140/155Mbit/s	Internal	0.45	0.67	(0.41)
140/155Mbit/s	External	0.83	0.98	0.82

*Figure 5.7: Comparison of average number of local ends per link in original and restated statements
[Source: BT, Analysys Mason]*

We make the following observations:

- The ratios for 64kbit/s circuits may be plausible since circuits are likely to be aggregated in the local end.

- For external 2Mbit/s and 140/155Mbit/s circuits, the number of local ends per link in the restated RFS is close to the expected ratio of 1, indicating that the relevant volumes are reasonably accurate.
- For internal 2Mbit/s circuits the ratio of 1.63 local ends per link indicates that the restatement has improved the reasonableness of this measure, although the ratio is right at the upper end of the expected range.
- For external 34/45Mbit/s circuits, the decrease in this ratio from 1.60 to slightly below 1 indicates that in the restated RFS the relevant volumes have a much improved level of accuracy.
- For internal 140/155Mbit/s links, the ratio of local ends to links indicates that either the restated link volumes or the local end volumes may not be accurate.

Average circuit length

In the light of the new methodology used to determine circuit lengths and the movement from using circuit volumes on a WSS basis to using circuit volumes on an RSS basis, it is possible to compare the average length per circuit for original volumes, for the restated volumes and for the circuits that have been excluded as a result of the WSS-to-RSS adjustment. Figure 5.8 below shows this comparison.

The methodology used to determine 64kbit/s circuit lengths does not permit such an analysis.

		<i>Original RFS (km/link)</i>	<i>Original RFS including own-use</i>	<i>Impact of revision of length calculations</i>	<i>Impact of WSS to RSS shift</i>	<i>Bearer extracted (km/link)</i>	<i>Non-current extracted (km/link)</i>	<i>Own-use extracted (km/link)</i>	<i>Restated RFS (km/link)</i>
Average distribution length									
64kbit/s	Internal	23.6	23.6	No data	No data	No data	No data	No data	25.3
64kbit/s	External	23.6	23.6	No data	No data	No data	No data	No data	25.3
2Mbit/s	Internal	12.5	12.5	(24.7%)	(4.0%)	(24.7%)	7.1	23.6	9.3
2Mbit/s	External	12.5	12.5	(30.4%)	(7.8%)	(30.4%)	6.4	n/a	9.6
34/45Mbit/s	Internal	14.8	14.8	(19.7%)	(7.5%)	(19.7%)	20.5	9.8	11.8
34/45Mbit/s	External	13.0	13.0	(23.0%)	(1.0%)	(23.0%)	8.5	n/a	10.0
140/155Mbit/s	Internal	13.6	13.5	(26.3%)	(16.5%)	(26.3%)	2.9	10.5	9.9
140/155Mbit/s	External	7.3	7.3	(43.9%)	(37.9%)	(43.9%)	21.0	n/a	12.2
Average trunk length									
2Mbit/s	Internal	15.8	16.3	(8.3%)	(6.4%)	(8.3%)	16.9	65.8	14.5
2Mbit/s	External	9.5	9.5	(32.5%)	(8.8%)	(32.5%)	5.4	n/a	7.0
34/45Mbit/s	Internal	19.3	19.6	(3.0%)	(6.5%)	(3.0%)	19.7	32.6	19.5
34/45Mbit/s	External	12.8	12.8	(13.0%)	(1.0%)	(13.0%)	8.2	n/a	11.2
140/155Mbit/s	Internal	22.5	23.3	(9.3%)	(20.2%)	(9.3%)	41.4	67.9	20.9
140/155Mbit/s	External	6.4	6.4	(6.7%)	(59.3%)	(6.7%)	0.0	n/a	19.8
Average combined length									
2Mbit/s	Internal	28.3	28.9	(15.4%)	(5.4%)	(15.4%)	24.0	89.4	23.8
2Mbit/s	External	21.9	21.9	(31.3%)	(8.2%)	(31.3%)	11.8	n/a	16.6
34/45Mbit/s	Internal	34.1	34.4	(10.2%)	(6.9%)	(10.2%)	40.2	42.4	31.2
34/45Mbit/s	External	25.8	25.8	(18.0%)	(1.0%)	(18.0%)	16.8	n/a	21.1
140/155Mbit/s	Internal	36.1	36.8	(15.5%)	(18.8%)	(15.5%)	44.3	78.4	30.7
140/155Mbit/s	External	13.8	13.8	(26.6%)	(47.8%)	(26.6%)	21.0	n/a	32.0

Figure 5.8: Comparison of average circuit lengths [Source: BT]

It can be seen that the change in methodology for calculating lengths is in most cases more significant than the WSS-to-RSS shift. In addition we make the following observations about the circuits extracted:

- Bearers are on average shorter than other circuits – this is consistent with the view that these take the form of links in the network rather than end-to-end circuits.
- There is no systematic difference between the lengths of internal and external bearers. The high levels of variance for 140/155Mbit/s bearers may reasonably be explained as due to the small volumes of these bearers.
- Non-current circuits have consistently higher trunk lengths than the RSS average for internal circuits, and lower-than-average trunk lengths for external circuits. This systematic difference

is slightly surprising, but could for example be partly driven by CPs cancelling the shorter PPCs that are likely to occur in more competitive areas such as Central London.

- Own-use circuits have a very significantly higher trunk length than other circuits. In general, other internal circuits also have a higher trunk length than external circuits. This seems reasonable given that other CPs will have an incentive to use as little as possible of BT's trunk, in order to reduce costs. No such incentive applies to own-use circuits, and the incentive is likely to be weaker for retail products delivered using other internal circuits.

5.4.2 Comparison of original and restatement

To order to assess the reasonableness of BT's restated revenues and volumes, we have attempted to track the movement of circuit volumes, line by line, in parallel with the changes BT has highlighted in its report and in discussions with us. In the following, we have tracked these changes individually for internal and external volumes, separated into the categories listed in Figure 5.9 below, and separating out for SiteConnect (SC) in the case of 2Mbit/s circuits.

64kbit/s	2Mbit/s	34/45Mbit/s	140/155Mbit/s	But not
Connections	Connections	Connections	Connections	Third-party revenues
Links	Links	Links	Links	OSP
Local ends	Local ends	Local ends	Local ends	Protected path
Transmission	Distribution	Distribution	Distribution	RBS
	Trunk	Trunk	Trunk	
	SC Connections			
	SC Links			

Figure 5.9: Lines in BT's restatement that have been tracked [Source: Analysys Mason]

We have not tracked the restated volume movement of third-party revenues, excess construction charges (OSP) or protected path circuits, because of the straightforward nature of the changes involved, as discussed above. Nor have we tracked the movement in RBS as this has not been very significant, there has been limited time available, and the fact that it lies outside Ofcom's intended price control.

In order to model the impact of the WSS-to-RSS change, we have used the analysis of 2006/07 WSS-to-RSS changes provided by BT. The tables on the following pages summarise our results, grading issues as either of low concern (labelled as "LC"), or meriting further investigation (labelled "I").

Connection

Figure 5.10 and Figure 5.11 detail the impact of BT's restated volumes on its TISBO connection revenues, the reasoning behind the restatement, and Analysys Mason's comment on the legitimacy of that reasoning.

We note that BT does not believe the switch from WSS to RSS to have had an impact on the connection volumes and revenues since these were already stated on an RSS basis.

Figure 5.10: Below-8Mbit/s connections: review of restated 2006/07 volumes and revenues [Source: BT/Analysys Mason]

	Original volume	Restated volume	Restated revenue difference	Explanation given by BT	Comment by Analysys Mason	Grade
64kbit/s						
			GBP mn			
Internal	2504	–	–	No change	Rationale appears reasonable given that the original error in the calculation of external volumes was isolated from internal volumes	LC
External	2253	3317	0.5	Entire change due to correction in original volume calculation, which we have been informed was incorrect – exact details of the original calculation have not been confirmed	Rationale seems possible but we have been unable to validate it	LC
2Mbit/s						
Internal	9399	9182	(6.9)	34/45Mbit/s and 140/155Mbit/s split out	Reduction in 2Mbit/s connections closely matches increase in 34/45Mbit/s and 140/155Mbit/s connections	LC
External	14 767	12 504	(14.1)	34/45Mbit/s and 140/155Mbit/s split out. SiteConnect connections excluded in the restatement	Within the time available we have not been able to confirm whether the exclusion of 2Mbit/s SiteConnect connections is responsible for the remaining fall in standard external 2Mbit/s links (after accounting for other known changes). We therefore consider this to be an area of uncertainty	I
SC 2Mbit/s						
External	Not published	Not published	16.0	Separated out from standard 2Mbit/s connections	SiteConnect revenue is sourced directly from BT's billing systems and is likely to be reliable	LC

* Note: For internal and external 2Mbit/s connections, there are additional negative revenue adjustments of GBP6.4 million and GBP8.7 million respectively, due to price changes.

Figure 5.11: Above-8Mbit/s Connections: Review of Restated 2006/07 Volumes and Revenues [Source: BT, Analysys Mason]

	<i>Original volume</i>	<i>Restated volume</i>	<i>Restated revenue difference</i>	<i>Explanation given by BT</i>	<i>Comment by Analysys Mason</i>	<i>Grade</i>
34/45Mbit/s						
Internal	0	159	0.3	Initially recognised as 2Mbit/s connections	Closely matches decrease in 2Mbit/s connections	LC
External	0	276	0.5	Initially recognised as 2Mbit/s connections	In light of BT's explanation, we do not consider this to be an area of concern.	LC
140/155Mbit/s						
Internal	0	45	0.1	Initially recognised as 2Mbit/s connections	Closely matches decrease in 2Mbit/s connections	LC
External	0	23	0.0	Initially recognised as 2Mbit/s connections	In light of BT's explanation, we do not consider this to be an area of concern.	LC

* Note: The revenue difference stated is after any price restatements. However, there are no revenue effects due to price restatements for 34/45Mbit/s and 140/155Mbit/s connections.

For areas that we have identified as of low concern, we do not believe it necessary to investigate further, unless the change is significant for Ofcom's leased-line charge control.

In view of the discrepancy of approximately 2000 in the number of 2Mbit/s connections, we recommend that Ofcom asks BT to provide an analysis of the impact of excluding SiteConnect volumes from the original statement, showing the interaction with other changes made to the restated volumes. Without this clarification, we expect that it would be beneficial to conduct sensitivity tests on any analysis relying on these connection volumes and revenues.

Links

Figure 5.12 and Figure 5.13 detail the impact of BT's restated volumes on its TISBO link revenues, the reasoning behind the restatement and Analysys Mason's comment on the legitimacy of that reasoning.

Figure 5.12: Links: Review of restated 2006/07 volumes and revenues [Source: BT, Analysys Mason]

	Original volume	Restated volume	Restated revenue difference	Explanation given by BT	Comment by Analysys Mason	Grade
			GBP mn			
64kbit/s						
Internal	444 226	329 376	(8.0)	Change in source for internal 64kbit/s circuits	In its 06/07 restatement, BT has used a different source for a large proportion of its internal 64kbit/s volumes compared to its original 06/07 statement. The large decline in volumes this change creates is reasonable given the shift from a WSS-basis to a RSS-basis. However, as the source remains different to that of external circuits we retain some uncertainty as to its reliability. In addition, the volumes continue to rely on a conversion factor from n×64kbit/s links of 5.07 which is not RSS-based (although BT does not consider this will have a material impact)	I
External	113 894	113 894	–	No change due to previously being on an RSS basis	The source of external volumes has continued to be PCNBS (an RSS-based billing system), and therefore it would appear reasonable that external volumes are unchanged. In addition, the volumes continue to rely on a conversion factor from n×64kbit/s links of 5.07 which is not RSS-based (although BT does not consider this will have a material impact).	LC
2Mbit/s						
Internal	101 908	98 882	(1.4)	Decrease due to move from WSS to RSS basis	After accounting for the WSS to RSS move there remains an unexplained increase in internal links of 2398. This is in contrast to an unexplained decrease in external links	I

	<i>Original volume</i>	<i>Restated volume</i>	<i>Restated revenue difference</i>	<i>Explanation given by BT</i>	<i>Comment by Analysys Mason</i>	<i>Grade</i>
External	51 422	41 131	(4.8)	Decrease due to move from WSS to RSS basis and removal of SC links.	The volume of SiteConnect links provided by BT is significantly in excess of the remaining fall in standard external 2Mbit/s links (after accounting for the WSS-to-RSS adjustment and the splitting out of 34/45Mbit/s and 140/155Mbit/s links). In addition, the external revenue is now below proxy billed revenue (GBP19.2 million versus GBP21.8 million). We therefore consider that this would benefit from further investigation	I
SC 2Mbit/s						
External	–	Not published	23.3	Separated out from standard 2Mbit/s connections	SiteConnect revenue is sourced directly from BT's billing systems and is likely to be reliable	LC

Figure 5.13: Links: Review of restated 2006/07 volumes and revenues [Source: BT, Analysys Mason]

	Original volume	Restated volume	Restated revenue difference	Explanation given by BT	Comment by Analysys Mason	Grade
34/45Mbit/s						
			<i>GBP mn</i>			
Internal	3638	3406	(0.5)	Decrease due to move from WSS to RSS basis	Given the 06/07 WSS-to-RSS adjustment provided by BT closely matches the decline in volumes, we do not consider this to be an area of concern	LC
External	1066	1053	0.0	Decrease due to move from WSS to RSS basis	Given the 06/07 WSS-to-RSS adjustment provided by BT closely matches the decline in volumes, we do not consider this to be an area of concern	LC
140/155Mbit/s						
Internal	3632	2903	(7.7)	Decrease due to move from WSS to RSS basis	Given the 06/07 WSS-to-RSS adjustment provided by BT closely matches the decline in volumes, we do not consider this to be an area of concern	LC
External	418	46	(3.9)	Decrease due to move from WSS to RSS basis.	Given the GL revenue aligns with the billed revenue amount and the 06/07 WSS-to-RSS adjustment provided by BT closely matches the decline in volumes, we do not consider this to be an area of concern	LC

In relation to the areas of uncertainty we have highlighted, we recommend that Ofcom asks BT to:

- Provide an analysis of how each of the changes in the inputs to the DPCN model affected the volumes of 64kbit/s link reported. If possible, BT should also cross-reference its restated external 64kbit/s link volumes with the appropriate volumes produced using the same source as for internal 64kbit/s links. In the absence of such an analysis, Ofcom may wish to consider testing the impact in its leased-line charge control model of retaining the original 64kbit/s internal volumes.
- Update the 5.07 conversion factor on an RSS basis, or provide quantitative evidence that the update would not have a material impact.
- Provide a reconciliation of the restatement with the original statement for 2Mbit/s link volumes, accounting explicitly for the impact of SiteConnect and RBS volumes. Without this clarification, we expect that it would be beneficial to conduct sensitivity tests on any analysis relying on these connection volumes and revenues.

We understand that Ofcom may already possess a breakdown of RBS link volumes, though these figures are not published by BT for reasons of commercial confidence.

Local ends

The tables below detail the impact of BT's restated volumes on its TISBO local end revenues, the reasoning behind the restatement and our comments on the legitimacy of that reasoning.

Figure 5.14: Below-8Mbit/s local ends: Review of restated 2006/07 volumes and revenues

	Original volume	Restated volume	Restated revenue difference	Explanation given by BT	Comment by Analysys Mason	Grade
64kbit/s						
			GBP mn			
Internal	177 379	121 106	(13.9)	Change due to WSS-to-RSS movement	As BT has not provided any information to substantiate this movement, and due to the scale of the impact involved, we consider this to be an area that should be investigated further	I
External	21 262	27 214	1.9	Change due to WSS-to-RSS movement	As for internal 64kbit/s local ends, we consider this to be an area that should be investigated further	I
2Mbit/s						
Internal	258 271	161 153	(58.4)	Change due to WSS-to-RSS movement	At 1.63 local ends per link, down from 2.53, the figure is closer to the expected range of 1.2 to 1.6 local ends per link. However, as BT has changed the source it uses for local ends (see Section 5.2.4) and the ratio is right at the upper limit of the expected range, we continue to consider this an area of uncertainty	I
External	69 669	39 796	(23.9)	Change due to WSS-to-RSS movement	Revised figure deflates the revenues to match the billed revenue amount of GBP30.6 million and GBP27.2 million respectively) and implies a figure of close to 1 local end per link	LC

Figure 5.15: Above-8Mbit/s local ends: Review of restated 2006/07 volumes and revenues

	Original volume	Restated volume	Restated revenue difference	Explanation given by BT	Comment by Analysys Mason	Grade
34/45Mbit/s						
			GBP mn			
Internal	5267	4146	(2.8)	Change due to WSS-to-RSS movement	As it produces 1.22 local ends per link, down from 1.45, it is within the expected range of 1.2 to 1.5 local ends per link, and we do not consider this is to be an area of concern	LC
External	1703	935	(2.6)	Change due to WSS-to-RSS movement	As it produces 0.89 local ends per link (somewhat less than the expected 1) we consider this to be an area worth further investigation	I
140/155Mbit/s						
Internal	1643	1945	3.7	Change due to WSS-to-RSS movement	As it produces 0.67 local ends per link, well outside the expected range, we consider this to be an area worth further investigation	I
External	349	45	(4.7)	Change due to WSS-to-RSS movement	As it produces 0.98 local ends per link and closely matches the billed revenue, we do not consider this to be an area of concern	LC

We are uncertain as to the reliability of the number of local ends reported, given the complete change in the data source and the surprising ratio between local ends and links in some cases. A closer examination of BT's analysis may alleviate concerns in this area, but we have not been able to do this within the timeframe of our work. We therefore recommend that Ofcom:

- requests BT to provide details of the clean-up conducted on archived Powerhouse data in order to provide volumes of 64kbit/s local ends
- reviews with BT the local end calculations carried out on data from COSMOSS and CTCS, and in particular the count and type of circuits with 2, 1 or 0 local ends in each case.

Distribution

The figures below detail the impact of BT's restated volumes on its TISBO transmission and distribution revenues, the reasoning behind the restatement and our comments on the legitimacy of that reasoning.

Figure 5.16: Below-8Mbit/s distribution: review of restated 2006/07 volumes and revenues [Source: BT, Analysys Mason]

	Original volume	Restated volume	Restated revenue difference	Explanation given by BT	Comment by Analysys Mason	Grade
64kbit/s						
			GBP mn			
Internal	10 499 964	8 317 050	(8.4)	WSS-to-RSS adjustment	Average circuit length increased from 23.6 to 25.2 km per link, offsetting the fall as a result of the WSS-to-RSS movement. As this increase of 6.8% is averaged over both internal and static external link volumes, we are uncertain as to the reliability of the restatement.	I
External	2 692 061	2 875 930	0.7	WSS-to-RSS adjustment	BT has applied the same revised average length per circuit for both internal and external circuits. As no change occurs in the volume of external 64kbit/s links as part of the restatement, we are uncertain as to the reliability of the change.	I
2Mbit/s						
Internal	1 271 504	920 668	(16.6)	Revision of length calculations and move from WSS to RSS	Change has been fully explained by BT	LC
External	641 421	395 874	(11.6)	Revision of length calculations and move from WSS to RSS	We have been unable to fully reconcile the change in reported distances with the explanation provide by BT; we believe that the remaining discrepancy may be related to SiteConnect and/or RBS but have been unable to verify this within the timeframe of our work.	I

Figure 5.17: Above-8Mbit/s distribution: Review of restated 2006/07 volumes and revenues [Source: BT, Analysys Mason]

	Original volume	Restated volume	Restated revenue difference	Explanation given by BT	Comment by Analysys Mason	Grade
34/45Mbit/s						
			GBP mn			
Internal	53 937	40 096	(6.2)	Revision of length calculations and move from WSS to RSS	Change has been fully explained by BT	LC
External	13 850	10 915	(1.5)	Revision of length calculations and move from WSS to RSS	Change has been fully explained by BT	LC
140/155Mbit/s						
Internal	49 309	28 622	(25.2)	Revision of length calculations and move from WSS to RSS	Change has been fully explained by BT	LC
External	3070	559	(3.1)	Revision of length calculations and move from WSS to RSS	Change has been fully explained by BT	LC

As discussed in sections 5.2.1 and 5.2.2 above, BT states that the change in lengths reported for circuits of 2Mbit/s and above is due to a change in methodology and the removal of circuits in the switch from WSS to RSS. This appears reasonable.

In order to build confidence in the revised external 2Mbit/s distances, we recommend that Ofcom request BT to provide a reconciliation of the restatement with the original statement for 2Mbit/s distribution volumes, accounting explicitly for the impact of SiteConnect and RBS volumes. Without this clarification, we expect that it may be beneficial to conduct sensitivity tests on any analysis relying on these distribution volumes and revenues.

If the distinction between internal and external transmission distances for 64kbit/s circuits is material to Ofcom's leased-line charge control model, we also recommend that it asks BT to calculate separate average lengths for internal and external 64kbit/s circuits, and apply those to the associated link volumes in order to obtain the transmission volumes.

Trunk

The figures below detail the impact of BT's restated volumes on its wholesale trunk segment revenues, the reasoning behind the restatement and Analysys Mason's comment on the legitimacy of that reasoning.

Figure 5.18: Below-8Mbit/s Trunk: Review of restated 2006/07 volumes and revenues [Source: BT, Analysys Mason]

	Original volume	Restated volume	Restated revenue difference	Explanation given by BT	Comment by Analysys Mason	Grade
64kbit/s						
			GBP mn			
Internal	N/a	N/a	N/a	Included in transmission volumes	N/a	N/a
External	N/a	N/a	N/a	Included in transmission volumes	N/a	N/a
2Mbit/s						
Internal	1 612 447	1 430 803	(18.6)	Revision of length calculations and move from WSS to RSS	Fully explained by BT	LC
External	487 045	286 285	(20.5)	Revision of length calculations and move from WSS to RSS	We have been unable to fully reconcile the change in reported distances with the explanation provide by BT; we believe that the remaining discrepancy may be related to SiteConnect and/or RBS but have been unable to verify this within the timeframe of our work.	I

Figure 5.19: Above-8Mbit/s Trunk: Review of restated 2006/07 volumes and revenues [Source: BT, Analysys Mason]

	<i>Original volume</i>	<i>Restated volume</i>	<i>Restated revenue difference</i>	<i>Explanation given by BT</i>	<i>Comment by Analysys Mason</i>	<i>Grade</i>
34/45Mbit/s						
	<i>GBP mn</i>					
Internal	70 232	66 298	(2.2)	Revision of length calculations and move from WSS to RSS	Fully explained by BT	LC
External	13 658	11 744	(1.1)	Revision of length calculations and move from WSS to RSS	Fully explained by BT	LC
140/155Mbit/s						
Internal	81 799	60 573	(5.5)	Revision of length calculations and move from WSS to RSS	Fully explained by BT	LC
External	2682	913	(0.5)	Revision of length calculations and move from WSS to RSS	Fully explained by BT	LC
622Mbit/s						
Internal	13 482	12 248	(1.5)	Revision of length calculations and move from WSS to RSS	No reconciliation provided by BT for the impact of revising the length calculation but scale of unexplained change plausible	LC
External	-	-	-			

As discussed in sections 5.2.1 and 5.2.2 above, BT states that the change in lengths reported for these types of circuits is due to a change in methodology and the removal of circuits in the switch from WSS to RSS. This appears reasonable.

Summary of differences between internal and external circuits

In the table below we summarise the differences in changes to the internal and external circuit volumes and provide comments on the reasons given for the differences.

	<i>Change for internal circuits</i>	<i>Change for external circuits</i>	<i>Comments by Analysys Mason</i>
Connections			
64kbit/s	no change	47%	BT states that the correction to the calculation of external volumes does not apply to internal volumes
2Mbit/s	-2%	-15%	Both changes are driven by the splitting out of incorrectly identified 34/45Mbit/s and 140/155Mbit/s circuits. The larger external change is probably driven by the removal of SiteConnect volumes
34/45Mbit/s	zero in original	zero in original	Both affected by disaggregation from 2Mbit/s
140/155Mbit/s	zero in original	zero in original	Both affected by disaggregation from 2Mbit/s
Links			
64kbit/s	-26%	no change	Internal volumes were affected by the implementation of WSS-to-RSS change on 2Mbit/s bearer circuits . External volumes were already on an RSS basis.
2Mbit/s	-3%	-20%	Both are affected by the switch from WSS to RSS. This is more significant for external circuits since most of the bearers removed were external.
34/45Mbit/s	-6%	-1%	Both are affected by the switch from WSS to RSS, which is more significant for internal circuits
140/155Mbit/s	-20%	-89%	Both are affected by the switch from WSS to RSS, which is much more significant for external circuits
Local ends			
64kbit/s	-32%	28%	For both internal and external volumes, BT has stated that the decline was driven by the WSS-to-RSS adjustment. For external circuits a new data source was also used; for internal circuits a clean-up was conducted on the original data source
2Mbit/s	-38%	-43%	Combined impact of move from WSS to RSS and change in source for local end volume count in both cases
34/45Mbit/s	-21%	-45%	Combined impact of move from WSS to RSS and change in source for local end volume count in both cases. It is not clear why external circuits should be affected more by the source change than internal circuits
140/155Mbit/s	18%	-87%	Combined impact of move from WSS to RSS and change in source for local end volume count in both cases. Differential impact similar to differential impact on links

Distribution			
64kbit/s	-21%	7%	A small decline in both internal and external volumes results from a fall in the average circuit length assumed for 64Kbit/s circuits. The decline in internal volumes was further driven by a decline in internal link volumes. However, the full cause of the changes is not well understood by us
2Mbit/s	-28%	-38%	The WSS-to-RSS adjustment affects the external more than the internal distribution lengths (most of the bearers removed are external). The further change due to BT's revision of its circuit length calculation has a roughly equal effect on both internal and external volumes
34/45Mbit/s	-26%	-24%	The WSS-to-RSS adjustment affects the internal slightly more than the external distribution lengths (there are no external 34/45Mbit/s bearers). The further change due to BT's revision of its circuit length calculation has a roughly equal effect on both internal and external volumes
140/155Mbit/s	-42%	-82%	The WSS-to-RSS adjustment affects the external more than the internal distribution lengths. The small further change due to BT's revision of its circuit length calculation has a roughly equal effect on both internal and external volumes
Trunk			
2Mbit/s	-11%	-31%	The WSS-to-RSS adjustment affects the external more than the internal trunk lengths (most of the bearers removed are external). The further change due to BT's revision of its circuit length calculation affects external trunk lengths more than internal trunk lengths
34/45Mbit/s	-6%	-14%	The WSS-to-RSS adjustment affects the internal slightly more than the external trunk lengths (there are no external 34/45Mbit/s bearers). The further change due to BT's revision of its circuit length calculation affects external trunk lengths more than internal trunk lengths
140/155Mbit/s	-26%	-66%	The WSS-to-RSS adjustment affects the external more than the internal trunk lengths. The further change due to BT's revision of its circuit length has a roughly equal effect on both internal and external volumes
622Mbit/s	-9%	zero in both	–

Figure 5.20: Differences in changes to the internal and external circuit volumes [Source: BT, Analysys Mason]

5.4.3 Comparison of restatement with billed revenues

We have also used the comparison between external billed and external restated revenues to further assess the reasonableness of the restatement. We have excluded the revenue impact from restated volume movement of third-party revenue, excess construction charges (OSP), and protected path circuits, because of the straightforward nature of these changes. We have also not tracked the movement in RBS as this has not been high priority given the time available.

	<i>Billed (GBP mn)</i>	<i>Restated (GBP mn)</i>	<i>Restatement change.</i>	<i>Our comments</i>
Connections				
64kbit/s	1.7	1.7	Correction of 64kbit/s connection calculation	Now matches billed
2Mbit/s	21.1	21.4	SC, 34/45Mbit/s and 140/155Mbit/s connections split out of 2Mbit/s standard	Now closely matches billed
SC 2Mbit/s	16.0	16.0	SC connection volumes split out of standard 2Mbit/s	Sourced from billed revenues
34/45Mbit/s	0.5	0.5	34/45Mbit/s connection volumes split out of standard 2Mbit/s	Now matches billed
140/155Mbit/s	0.0	0.0	140/155Mbit/s connection volumes split out of standard 2Mbit/s	Now matches billed
Links				
64kbit/s	4.1	8.0	No change in external 64kbit/s link volumes or prices.	Internal volumes fell 25% due to the adjustment. We would expect a similar fall in external revenues, which would also be more consistent with billed revenues.
2Mbit/s	21.8	19.2	Links extracted as a result of the WSS-to-RSS adjustment.	In comparison to the 2007/08 WSS-to-RSS adjustment, which indicates a larger decline in volumes (~10%) in addition to SC links split out, the fall below billed revenue constitutes an area of concern.
SC 2Mbit/s	23.3	23.3	SC connection volumes split out of standard 2Mbit/s.	Sourced from billed revenues
34/45Mbit/s	3.3	3.3	Links extracted as a result of the WSS-to-RSS adjustment.	Now closely matches billed.
140/155Mbit/s	0.6	0.5	Links extracted as a result of the WSS-to-RSS adjustment.	Now closely matches billed.
Local ends				
64kbit/s	7.9	8.8	Change due to WSS-to-RSS movement	Revenue increased from GBP7.0 million – some concern with overstatement given that link revenues also appear high
2Mbit/s	27.2	30.6	Change due to methodology change for local end count and WSS-to-RSS movement	Not very close match with billed
34/45Mbit/s	3.5	3.3	Change due to methodology change for local end count and WSS-to-RSS movement	Now closely matches billed revenue
140/155Mbit/s	0.8	0.7	Change due to methodology change for local end count and WSS-to-RSS movement	Closely matches the billed revenue

	<i>Billed (GBP mn)</i>	<i>Restated (GBP mn)</i>	<i>Restatement change.</i>	<i>Our comments</i>
Distribution				
64kbit/s	11.9	11.0	Revision of length calculations and move from WSS to RSS	Revenue rise from GBP10 million is driven by static circuit volumes but changing average circuit length. This discrepancy presents an area of concern despite moving closer to the billed revenue amount.
2Mbit/s	24.2	18.7	Revision of length calculations and move from WSS to RSS	Down from GBP30 million – the decrease may be too large as it brings the revenue below billed revenue
34/45Mbit/s	5.9	5.1	Revision of length calculations and move from WSS to RSS	Down from GBP7 million – the decrease may be reasonable given BT's explanation.
140/155Mbit/s	0.8	0.7	Revision of length calculations and move from WSS to RSS	Closely matches billed revenue
Trunk				
2Mbit/s	32.0	29.3	Revision of length calculations and move from WSS to RSS	Down from GBP50 million – the decrease may be reasonable given BT's explanation
34/45Mbit/s	7.4	6.5	Revision of length calculations and move from WSS to RSS	Down from GBP8 million – the decrease may be reasonable given BT's explanation
140/155Mbit/s	0.3	0.2	Revision of length calculations and move from WSS to RSS	Down from GBP1 million – the decrease may be reasonable given BT's explanation

Figure 5.21: Comparison of restatement and billed [Source: BT, Analysys Mason]

5.5 Conclusions

The approach taken by BT in its 2006/07 restatement appears to be reasonable, given the availability of data. However, there are a number of outstanding areas that we have not been able to address within the timeframe of our work and which we would wish to highlight:

- There has not been an analysis of all of the circuits excluded in the move from WSS to RSS. In particular, we believe that it would be useful to determine the nature of the circuits in COSMOSS without a 'CURR' status.
- The changes to 64kbit/s volumes has not been analysed by BT in detail.
- The local end calculation has been significantly revised, and a more detailed comparison of this method with the usual method used may be desirable in order to provide more reassurance that the revision is accurate. In particular, the number of local ends appears to be inconsistent with the number of links for internal 34/45Mbit/s and 140/155Mbit/s circuits.

- The impact of SiteConnect and RBS volumes is not transparent.
- BT continues to use a factor of 5.07 to convert from $n \times 64\text{ kbit/s}$ to 64 kbit/s links, and this is not on an RSS basis (we do note that BT considers this not to be material).

5.6 Summary of action points

We recommend that Ofcom consider taking the following actions:

<i>Action</i>	<i>Purpose</i>	<i>Other comments</i>
Request BT to provide an analysis of the nature of the circuits in COSMOSS without a 'CURR' status	To ensure that circuits are not being removed inappropriately	We doubt that improved treatment would have a major impact on volumes
Request BT to provide a reconciliation of the restatement with the original statement for 2Mbit/s volumes, accounting explicitly for the impact of SiteConnect and RBS volumes	To identify whether this is the remaining source of the discrepancy between the original and restated 2Mbit/s external connection and link volumes	Without this clarification we expect that it would be beneficial to conduct sensitivity tests on any analysis relying on these volumes and revenues
Request BT to provide an analysis of how each of the different input changes to the DPCN model affected the volumes of 64kbit/s link reported. If possible it should also cross-reference its restated external 64Kbit/s link volumes with the appropriate volumes produced using the same source as for internal 64Kbit/s links.	To build confidence in the 64kbit/s internal link volumes	In the absence of such an analysis Ofcom may wish to consider testing the impact in its leased-line charge control model of retaining the original 64kbit/s internal volumes
Request BT to update on an RSS basis the factor of 5.07 used to convert from $n \times 64\text{ kbit/s}$ to 64 kbit/s links, or provide evidence that such an update would not have a material impact on the restated volumes	To ensure 64kbit/s volumes are as reliable as possible	Sensitivity tests could be conducted to determine whether this is significant for Ofcom's analysis
Request BT to provide details of the clean-up conducted on archived Powerhouse data in order to provide volumes of 64kbit/s local ends	To build confidence in the revised 64kbit/s local end volumes	Ofcom may choose to rely on these volumes in the absence of further analysis if the volumes are not very significant for its purposes
Review with BT the local end calculations carried out on data from COSMOSS and CTCS, and in particular the count and type of circuits with 2, 1 or 0 local ends in each case	To build confidence in the revised local end volumes	Ofcom may choose to rely on these volumes in the absence of further analysis if the volumes are not very significant for its purposes

<i>Action</i>	<i>Purpose</i>	<i>Other comments</i>
Request BT to calculate separate average lengths for internal and external 64kbit/s circuits and apply those to the associated link volumes in order to obtain the transmission volumes	To improve the accuracy of relative lengths for internal and external 64kbit/s circuits	Only necessary if the distinction between internal and external transmission distances for 64kbit/s circuits is material to Ofcom
Revise 64kbit/s transmission lengths downwards by 194 614 (internal) and 67 295 (external)	To reflect an error identified in BT's DPCN model	

Figure 5.22: Summary of action points [Source: Analysys Mason]

6 BT's 2007/08 statement for TISBO and related services

For 2007/08, BT has increased the granularity in its reporting in certain areas, with the aim that its normal systems and processes should provide the appropriate output needed for the RFS. The 2007/08 statement has therefore been prepared on the basis of these revised systems.

6.1 Review of the revisions made to the systems

For each of the amendments related to the 2006/07 restatement we summarise how this is accounted for in deriving the 2007/08 figures:

<i>Amendment</i>	<i>How accounted for in 2007/08</i>
Revision of length calculations	Same CTCS analysis applied as for 2006/07 restatement
Replacement of WSS with RSS	Same CTCS analysis applied as for 2006/07 restatement with the exception that external link volumes are now derived from the billing systems in order to include only billed circuits
Disaggregation of connection volumes by bandwidth	BT has increased granularity of reporting to separate out connection volumes by bandwidth
Misidentification of 64kbit/s circuits as 2Mbit/s	Same CTCS and DPCN analysis applied as for 2006/07 restatement
Revision of local end count	External volumes are sourced from COSMOSS as for the restatement. BT has reverted to using the Powerhouse data for internal volumes
Revision of prices	Revised prices are used in the same way as for 2006/07 restatement
Inclusion of third-party infrastructure revenues	BT has increased granularity of reporting to separate this out
Inclusion of excess construction charges (OSP)	Same approach as applied for 2006/07, based on sharing total revenues between all connections
Disaggregation of circuits with protected path	BT has increased granularity of reporting to separate out circuits to which protected path applies

Figure 6. 1: *Summary of how amendments have been accounted for in 2007/08 [Source: BT, Analysys Mason]*

We also note that whilst SiteConnect volumes were excluded from the external volumes reported in the 2006/07 restatement, they are included in the 2007/08 statement.

The approach used by BT seems reasonable.

BT has provided us with an analysis of local end count using the COSMOSS or Powerhouse data (as reported in the RFS) and using the alternative methodology using CTCS as for internal circuits in the 2006/07 restatement. This shows a significant discrepancy in results, as summarised below:

<i>Local end*</i>	<i>Powerhouse-generated volumes</i>	<i>CTCS-generated volumes</i>
2Mbit/s non-CLZ	130 647	144 849
2Mbit/s CLZ	18 811	19 890
34/45Mbit/s	3844	4680
140/155Mbit/s	2120	1596

* Note there is not a CTCS source for the 64kbit/s local end count, since CTCS deals only with circuits of 2Mbit/s and above

Figure 6.2: *Local end volumes generated from different data sources [Source: BT]*

This comparison indicates that either the CTCS analysis is unreliable for 2006/07 or that the Powerhouse data is unreliable (or possibly both). We discuss in Section 7.2 the fact that the ratio of local ends to links seems more plausible using the Powerhouse data, but we remain concerned that the two methods should give such significantly different results.

We note that in converting $n \times 64\text{kbit/s}$ circuits into 64kbit/s equivalents, the factor of 5.07 has continued to be used in 2007/08. BT states that revising this factor would not have a material impact.

6.2 Comparison with 2006/07 restatement

We have compared the 2007/08 statement with the 2006/07 restatement to identify any areas where there has been a significant change. Due to our uncertainty as to whether the restated local end and transmission volumes in the 2006/07 restatement are reasonable, we have analysed the difference between the associated volumes included in BT's original statement, in its restatement of the 2006/07 RFS and its published 2007/08 RFS volumes. The tables on the following pages summarise our findings. As before, issues are graded as either of low concern (labelled as "LC"), or meriting further investigation (labelled "I").

Figure 6.3: Below-8Mbit/s local ends: comparison of restated 2006/07 volumes with published 2007/08 volumes [Source: BT, Analysys Mason]

	<i>Original 2006/07 RFS volume</i>	<i>Restated 2006/07 RFS volume</i>	<i>Published 2007/08 RFS volumes</i>	<i>Explanation given by BT</i>	<i>Comment by Analysys Mason</i>	<i>Grade</i>
64kbit/s						
Internal	177 379	121 106	90 845	Internal demand shifting to higher bandwidths.	It does appear reasonable that BT has falling demand for internal 64kbit/s circuits, either because of falling retail market share or a shift in retail demand towards higher bandwidths	LC
External	21 262	27 214	17 606	External demand shifting to higher bandwidths.	More rapid decrease than for internal circuits, but this does not appear unreasonable	LC
2Mbit/s						
Internal	258 271	161 153	164 739	No explanation received.	Small change plausible	LC
External	69 669	39 796	55 047	Increasing external demand for 2Mbit/s circuits.	It appears reasonable that there is growing external demand for 2Mbit/s circuits	LC

Figure 6.4: Above-8Mbit/s local ends: comparison of restated 2006/07 volumes with published 2007/08 volumes [Source: BT, Analysys Mason]

	<i>Original 2006/07 RFS volume</i>	<i>Restated 2006/07 RFS volume</i>	<i>Published 2007/08 RFS volume</i>	<i>Explanation given by BT</i>	<i>Comment by Analysys Mason</i>	<i>Grade</i>
34/45Mbit/s						
Internal	5 267	4 146	4 680	No explanation received.	Small change plausible	LC
External	1703	935	1218	Increasing external demand for 34/45Mbit/s circuits.	It appears reasonable that there is growing external demand for 34/45Mbit/s circuits	LC
140/155Mbit/s						
Internal	1643	1945	1596	No explanation received.	We would question whether falling demand for internal 140/155Mbit/s circuits is reasonable. Our concern over the number of local ends persists, with a worsening of the ratio from the restated value of 0.67 to the 2007/08 value of 0.45.	I
External	349	45	85	Increasing external demand for 140/155Mbit/s circuits.	It appears reasonable that there is growing external demand for 140/155Mbit/s circuits, although the scale of the increase is surprising	LC

Figure 6.5: Below-8Mbit/s transmission: comparison of restated 2006/07 volumes with published 2007/08 volumes [Source: BT, Analysys Mason]

	<i>Original 2006/07RFS volume</i>	<i>Restated 2006/07RFS volume</i>	<i>Published 2007/08RFS volume</i>	<i>Explanation given by BT</i>	<i>Comment by Analysys Mason</i>	<i>Grade</i>
64kbit/s						
Internal	10 499 964	8 317 050	6 653 640	Internal demand shifting to higher bandwidths.	It does appear reasonable that BT has falling demand for internal 64kbit/s circuits, either because of falling retail market share or a shift in retail demand towards higher bandwidths. We note that transmission km are falling slightly more rapidly than link volumes	LC
External	2 692 061	2 875 930	2 406 809	External demand shifting to higher bandwidths.	Less rapid decline in transmission than for internal circuits despite more rapid decline in link volumes is surprising. We must assume that the ceased circuits were all short in length.	I
2Mbit/s						
Internal	1 271 504	920 668	904 552	No explanation received.	Small change plausible although we are surprised that transmission km has declined whilst link volumes increase	I
External	641 421	395 874	541 554	Increasing external demand for 2Mbit/s circuits.	It appears reasonable that there is growing external demand for 2Mbit/s circuits	LC

Figure 6.6: Above-8Mbit/s transmission: comparison of restated 2006/07 volumes with published 2007/08 volumes [Source: BT, Analysys Mason]

	<i>Original 2006/07 RFS volume</i>	<i>Restated 2006/07 RFS volume</i>	<i>Published 2007/08 RFS volume</i>	<i>Explanation given by BT</i>	<i>Comment by Analysys Mason</i>	<i>Grade</i>
34/45Mbit/s						
Internal	53 937	40 096	42 080	No explanation received.	Small change plausible	LC
External	13 850	10 519	13 575	Increasing external demand for 34/45Mbit/s circuits.	It appears reasonable that there is growing external demand for 34/45Mbit/s circuits	LC
140/155Mbit/s						
Internal	49 309	28 622	30 783	No explanation received.	Transmission km decline despite an increase in links. This is surprising	I
External	3070	559	2097	Increasing external demand for 140/155Mbit/s circuits.	It appears reasonable that there is growing external demand for 140/155Mbit/s circuits, although the scale of the increase is surprising, and far in excess of the increase in link volumes	LC

Our main points of concern are that the changes in link volumes and transmission km do not appear to be consistent in all cases. However, this may indicate unreliability in the 2006/07 restatement rather than in the 2007/08 statement. Further investigation would be necessary in order to determine whether or not this is the case.

6.3 Other checks on the revised statement

As for the 2006/07 data, we have examined the implied local ends per link and average transmission length per link. We have also compared the impact of the switch from WSS to RSS between 2006/07 and 2007/08.

Local ends per link

The table below shows the average number of local ends per link.

		<i>Original 2006/07</i>	<i>Restated 2006/07</i>	<i>Published 2007/08</i>
		<i>RFS (LE/link)</i>	<i>RFS (LE/link)</i>	<i>RFS (LE/link)</i>
64kbit/s	Internal	0.40	0.37	0.33
64kbit/s	External	0.19	0.24	0.18
2Mbit/s	Internal	2.53	1.63	1.79
2Mbit/s	External	1.35	0.97	0.93
34/45Mbit/s	Internal	1.45	1.22	1.48
34/45Mbit/s	External	1.60	0.89	0.98
140/155Mbit/s	Internal	0.45	0.67	0.53
140/155Mbit/s	External	0.83	0.98	0.56

Figure 6.7: Comparison of average local ends per link [Source: Analysys Mason]

For external circuits, the average number of local ends per link remains close to 1 in 2007/08 with the exception of 140/155Mbit/s external links. BT states that the figure is lower in this year due to the inclusion of SiteConnect.

The 1.79 local ends per link looks implausibly high for 2Mbit/s internal circuits, although we note that using the CTCS source for 2Mbit/s local ends would result in an even higher ratio.

Average circuit length

The table below shows the average transmission length per link.

		<i>Original 2006/07</i>	<i>Restated 2006/07</i>	<i>Published 2007/08</i>
		<i>RFS</i>	<i>RFS</i>	<i>RFS</i>
		<i>(km/link)</i>	<i>(km/link)</i>	<i>(km/link)</i>
64kbit/s	Internal	23.6	25.3	24.5
64kbit/s	External	23.6	25.3	24.5
2Mbit/s	Internal	12.5	9.3	9.8
2Mbit/s	External	12.5	9.6	9.1
34/45Mbit/s	Internal	14.8	11.8	13.3
34/45Mbit/s	External	13.0	10.0	10.9
140/155Mbit/s	Internal	13.6	9.9	10.3
140/155Mbit/s	External	13.8	12.2	13.7

Figure 6.8: Comparison of average circuit lengths [Source: Analysys Mason]

We are surprised to see that the length of internal 2Mbit/s links has increased whilst the length of external 2Mbit/s has decreased, but not by a very significant margin.

6.4 Conclusions

The approach taken by BT in its 2007/08 statement appears to be reasonable, although we are uncertain whether the reported local end volumes are reliable. We would recommend a more detailed review of the methodology used in order to build confidence in these figures .

Looking at the changes in reported volumes between the 2006/07 restatement and the 2007/08 statement, there are several cases where the change in transmission km does not seem to be consistent with the change in link volumes. Therefore, it is hard to see how the volumes reported for each year can be reliable to the same degree of accuracy, and this casts some doubt on the 2006/07 restatement.

We are surprised by the high ratio of local ends to links for 2Mbit/s internal circuits, and believe that it may be worthwhile to conduct some detailed analysis to determine why this is so high.

6.5 Summary of action points

Some of the action points recommended in light of the 2006/07 restatement are also relevant for the 2007/08 statement, as summarised in the table below.

<i>Action point</i>	<i>Purpose</i>	<i>Other comments</i>
Request BT to provide an analysis of the nature of the circuits in COSMOSS without a 'CURR' status	To ensure that circuits are not being removed inappropriately	We doubt that improved treatment would have a major impact on volumes
Request BT to update on an RSS basis the factor of 5.07 used to convert from n×64kbit/s to 64kbit/s links	To ensure 64kbit/s volumes are as reliable as possible	Sensitivity tests could be conducted to determine whether this is significant for Ofcom's analysis
Review with BT the two different local end calculations carried out on data from COSMOSS and CTCS, and in particular the count and type of circuits with 2, 1 or 0 local ends in each case.	To build confidence in the revised local end volumes and to ensure that the most reliable source is now being used	Ofcom may wish to rely on these volumes in the absence of further analysis if the volumes are not very significant for its purposes
Request BT to calculate separate average lengths for internal and external 64Kbit/s circuits and apply those to the associated link volumes in order to obtain the transmission volumes.	To improve the accuracy of relative lengths for internal and external 64kbit/s circuits	Only necessary if the distinction between internal and external transmission distances for 64kbit/s circuits is material to Ofcom

Figure 6.9: Summary of action points [Source: Analysys Mason]

7 BT's AISBO statement

In this section we summarise our findings relating to BT's 06/07 restatement and 07/08 statement for AISBO services. We have not been able to speak with relevant Openreach staff within the timeframe of our project. Our comments in this section are therefore based only upon very limited documentation and on discussions with a Global Services staff member who had been responsible for allocating costs charged by Openreach to appropriate BT lines of business.

The introduction of systems within Openreach to record and bill for Ethernet circuits resulted in a discrepancy being identified between the volume of circuits and associated revenues reported by Openreach and the volume of circuits reported by Powerhouse. In particular, Openreach recorded approximately 26 000 circuits, whilst Powerhouse reported approximately only 21 000 circuits. It was not known at the time whether this was because the circuits were missing from COSMOSS, were wrongly labelled, or if there was some other reason such as different treatment of circuits in course of provision. BT reports that its investigations identified the majority of circuits, in three different categories:

- ~3000 IP Clear circuit bearers, for which WES is an input
- ~750 circuits with resilience, which were each counted once by BT Global Services but twice by Openreach. Of these, most were, at the time, also thought to relate to IP Clear. For the purposes of simplification it was assumed that they all related to IP Clear. However, BT has subsequently identified that not a significant proportion (perhaps 50%) did not relate to IP Clear
- ~1000 other circuits which were assumed to relate to own-use.

BT informs us that each of the 3000 IP Clear circuit bearers also had an associated circuit utilising the bearer, and that the circuit itself had not been counted either by BT Global Services.

The restated volume information that BT provided to Ofcom indicates approximately 3700 additional WES10, WES100 and WES1000 circuits. We assume that this relates to the 3000 IP Clear circuit bearers and 750 circuits for resilience, and that the other 1000 circuits are not included in the restated 06/07 volumes.

Additional revenues of GBP46 million were also claimed by Openreach compared to the costs calculated by BT Global Services. These additional revenues were charged to lines of business within BT in proportion to the volume of the additional circuits identified. Hence approx 1000/4750 of the costs were allocated to general overheads and 3750/4750 of the costs allocated pro-rata to all the other IP Clear circuits. However, we do not believe that BT has attempted to reconcile the overall revenues claimed by Openreach with the costs calculated by Global Services. It is therefore quite possible that the additional revenues do not relate entirely to the additional circuits identified.

The total revenues to Openreach associated with all these circuits is reported in the Regulatory Financial Statements.

The additional costs were calculated on a quarterly basis up until Q3 0708, with an assumed growth profile in 06/07 matching that of the growth profile in 07/08. Going forward, the costs are calculated on a monthly basis.

We understand that whilst some work has been conducted to clean up the Powerhouse data, there remains a discrepancy between the volumes and revenues reported by Openreach and the volumes reported by Powerhouse. A 'top-up charge' is therefore applied to all the additional volumes in order to account for the additional revenues to Openreach. This is applied on a monthly basis by BT Operate and we understand that there is now a better understanding of the circuits affected so that the charge can be directed to these. We believe that this top-up charge currently amounts to more than GBP25 million a year.

We recommend that Ofcom consider taking the following actions:

<i>Action point</i>	<i>Purpose</i>	<i>Other comments</i>
Work with BT to conduct a more detailed analysis of missing volumes in Powerhouse in 06/07 and 07/08 and identify the extent to which they explain the additional revenues	To identify whether the additional revenues reported by Openreach have been allocated to appropriate AISBO services	Only necessary if the share of revenues between different AISBO services is material for Ofcom
Review the systems and processes carried out by Openreach	To ensure that these systems are delivering reliable volume and revenue data	Ofcom may be willing to assume that these are reliable given the fact that they have been very recently introduced and that BT Operate is willing to accept the figures reported

Figure 7.1: Summary of action points [Source: Analysys Mason]

8 Review of definitions used

In this section we provide our understanding of the volume definitions used in practice by BT in its RFS, and highlight issues which may be of concern to Ofcom in relation to the use of this volume data for the leased-line charge control.

8.1 Activity level of circuits included

As described in Section 4 above, COSMOSS provides the key data source for BT's volume statement for TISBO services. In that section we highlighted a number of different statuses associated with jobs on a circuit, namely:

- ISSU – in course of provision
- CURR – current
- ICCE – in course of cessation
- ICRE – in course of re-arrangement
- CEASED – ceased circuits.

It is our understanding that WSS does not include circuits flagged as CEASED (potentially a very large number), but may include circuits flagged in any of the four other ways. In contrast, RSS only includes circuits flagged as CURR. We have not been able to ascertain whether circuits which have more than one associated job status, including CURR, are included in the RSS or not, but believe this to be likely.

Ofcom may wish to consider seeking further clarification from BT concerning whether circuits that have more than one associated job status in COSMOSS, including CURR, are included in RSS. We consider it to be appropriate for circuits with both CURR and ICRE status to be included in the RSS, since both of these categories are potentially revenue-generating.

Internal and external TISBO circuits are treated in an identical way in the analysis of activity level. A small number of TISBO circuits, mainly those associated with CCTV services, are not adjusted to account for activity level. We do not consider this to be significant based on the current volume of circuits affected

We understand that the volume of AISBO circuits is derived primarily from Openreach's source data systems, and are necessarily active circuits since Openreach is making a charge for each of them.

8.2 Treatment of bearer circuits

As described in Section 4, TISBO bearer circuits are included in WSS but are explicitly excluded from RSS by removing all circuits labelled with D-codes associated with bearers. Since bearers are not revenue-generating circuits, we consider this to be appropriate.

The majority of bearer circuits that have been identified by BT are external bearers. BT explain that this is due to the fact that a number of bearer circuits are associated with points of handover or exist as a result of migration from retail.

For AISBO circuits, the costs associated with bearers are included but as far as we have been able to identify, bearer volumes are not included – only the volumes of circuits running over them.

8.3 Treatment of own-use circuits

BT identifies TISBO circuits that are own-use based on these being both internal and providing a connection between two BT sites. This category is then further sub-divided between network own use and retail own use based on a proportion sourced from Steria (44% network own use in 2006/07 and 43% in 2007/08). Network own use circuits are excluded from the RFS whilst retail own use circuits are included in the count of internal circuit volumes.

This appears a reasonable approach to take in principle. The timeframe for our work has not permitted us to investigate in detail the source of the input proportion provided by Steria, but we understand from BT that it reflects the cost allocation of such circuits. It seems slightly surprising that the volume of circuits should not itself be an input to that cost allocation, and that BT was not able to identify directly the circuits supporting retail activities. This is therefore an area that may warrant further investigation.

For AISBO circuits, we understand that the cost of own-use circuits is allocated to group overheads and that volumes of own-use circuits are not included in the RFS. We have not been able to identify whether these own-use circuits are network or retail own-use.

8.4 Treatment of spare capacity

Spare capacity is not captured explicitly within COSMOSS and is therefore not included by BT in the WSS or RSS volumes for TISBO services or trunk segments. For AISBO services, all the capacity delivered is charged for by Openreach but it seems very unlikely that this would include non-chargeable spare capacity.

8.5 Treatment of non-standard circuits

For AISBO circuits it seems apparent from the analysis conducted as part of the restatement that circuits provided for resilience are included separately in the volumes of circuits reported in the RFS. We doubt that this is the case for TISBO services. In principle, all revenue-generating circuits are included in COSMOSS, but since the AISBO circuits with resilience appear to be counted only once in COSMOSS, it is likely that the TISBO circuits with resilience are also counted only once.

BT has provided separate connection volumes for RBS but only revenue figures for rentals. We understand that this is due to the commercial sensitivity of the information, and that BT does not include RBS volumes within any of the standard volumes that it reports.

BT has not provided separate volumes for SiteConnect connections or links. We understand that these are excluded from the 2006/07 restatement but are included in the 2007/08 statement.

8.6 Year average measure

For TISBO services, volumes are stated at mid-year spot values. This does not present a difficulty when growth or decline in volumes is reasonably uniform across the year, but may do so future, for example if volumes decline rapidly. We understand that BT considers the current approach to be appropriate provided that the calculated external revenues match reasonably closely to the external billed revenues.

Information from the revenue assurance team does not indicate any significant variances in circuit volumes across the year.

For AISBO services a $P \times Q$ calculation is carried out based on monthly volumes. We are unsure whether the volumes reported in the RFS for AISBO services are year-average or spot-volumes.

8.7 Conclusions

We summarise below our understanding of whether certain circuits are included in the revised volume statement, compared against Ofcom's view of whether circuits should be included in the revenue calculation appropriate for the leased line charge control model. It can be seen that the way in which BT has attempted to count circuits in its RFS aligns with the way in which Ofcom requires volumes for its LLCC.

<i>Type of PPC circuit</i>	<i>Appropriate for LLCC revenue measure?</i>	<i>Included in RFS volume measure?</i>	<i>Comments</i>
External circuits	Yes	Yes	Externally billed circuits are included
Internal (retail)	Yes	Yes	BT attempts to include these by retaining a proportion of own-use circuits within the count of internal circuit volumes
Internal – (network)	No	No	BT excludes bearers and a proportion of own-use circuits that are deemed to relate to network activities
Spare – PPC specific	No	No	This includes spare capacity in bearers, which is excluded
Spare – general use	No	No	Not recorded in COSMOSS at all
Ceased circuits	No	No	Not recorded as 'CURR' in COSMOSS

Figure 8.1: Comparison of LLCC and RFS revenue measures [Source: Ofcom, Analysys Mason]

In addition, we note that circuits with resilience appear to be counted twice in the case of AISBO circuits, but may only be counted once in the case of TISBO circuits.

8.8 Summary of action points

We recommend that Ofcom consider taking the following actions:

<i>Action</i>	<i>Purpose</i>	<i>Other comments</i>
Verify with BT whether circuits that have more than one associated job status in COSMOSS, including CURR, are included in RSS	To ensure that circuits with both CURR and ICRE status are included in the RSS, since both of these categories are potentially revenue-generating	Seems likely that this is the case – verification intended to supply greater level of comfort
Further investigate the source of the proportion used by BT to differentiate between network and retail own-use.	To establish whether or not the approach taken is reasonable	BT's source files provide total own-use volumes. It may be possible to conduct sensitivity tests in the LLCC model based on different assumptions about the proportion of own-use that relates to retail activities.
Clarify with BT whether circuits with resilience are counted once or twice	To ensure appropriate treatment of these circuits in Ofcom's analysis	Our working hypothesis is that AISBO circuits are counted twice and TISBO circuits are counted once

Figure 8.2: Summary of action points [Source: Analysys Mason]

9 Strengths and weaknesses of BT's processes and systems

As described in Section 4, we have reviewed the systems used by BT in order to derive the volumes and revenues found in the RFS. This section highlights areas of potential weakness.

9.1 Adequacy of current systems and processes

We have identified some issues with the processes and systems, particularly for COSMOSS, GENETIC, Powerhouse and CTCS. These are described below.

9.1.1 COSMOSS

Completeness of the inventory held by COSMOSS

We understand that not all circuits provided by BT are identifiable in COSMOSS. For instance BT has been unable to isolate 2000–3000 circuits used for:

- CCTV
- broadcasting services²
- Kilostream PPC
- inter-ATM links.

A number of circuits are also identifiable in the PACS database that are not in COSMOSS. These discrepancies may be due to the circuits not being entered on this system, or because they have been entered using the wrong product code. However, if the wrong product is entered for provisioning, then this should be picked up by the staff responsible for executing the job. This circuit would then be cancelled and set up again in COSMOSS as a new circuit (with a new circuit ID) with a new job.

Since there is no filtering against active circuits in COSMOSS for these products, there is a risk that non-active circuits are included. Only a small number of circuits are currently affected (<1% of the total), but this could grow in future.

We also understand that there are examples where a circuit can be entered twice into COSMOSS: e.g. Featurenet products. The first entry creates a job to put the circuit in the network, whilst the second entry creates a job to put it in the billing system. The PSIDs of the two entries are normally unrelated. However, since the volumes concerned are small, we do not consider this to be an area of significant concern.

² We understand that broadcasting services may not always be included on COSMOSS since they do not always use the electronics provided by BT on their cables. They also use mobile electronics. However, these circuits comprise less than 1% of the total circuits.

Bearer terminology

We understand that the term bearer has a different meaning depending on whether the customer (through COSMOSS) or BT (from the perspective of CTCS) is using the term. This is illustrated in Figure 9.1 below.

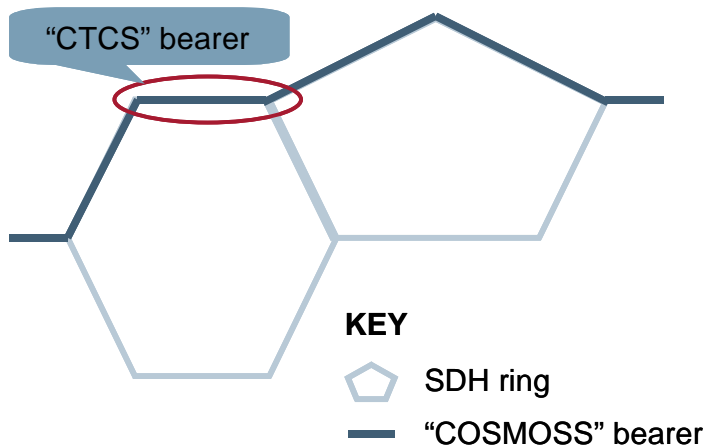


Figure 9.1: Illustration of the difference of a bearer in COSMOSS versus a bearer in CTCS [Source: BT]

Some products in COSMOSS include the word 'bearer' in their product description, such as certain inter-ATM links. However, these "COSMOSS bearers," which are links between two ends, are in fact using several circuits in the network when viewed from the perspective of CTCS. These circuits may include not only "CTCS bearers," but also other circuits such as line systems. Furthermore, these CTCS bearers may be used by other lines.

We believe that CTCS has acknowledged this distinction, since the set of objects defined as bearers are not just those whose description contain the word 'bearer,' but that rather have been identified through discussion with product managers throughout BT. It is worth highlighting this distinction, but we do not believe that it presents a problem.

9.1.2 GENETIC

As described in Section 4.3.3, GENETIC has a single Excel workbook that brings together volumes for the sub-2Mbit/s products in the DPCN, from multiple sources (at least five separate systems and departments). This is a point for concern since the workbook implicitly assumes that all sources provide RSS volumes, but we have been unable to identify any explicit verification of this fact.

There are also two key parameters involved in deriving the outputs:

- the average length of 2Mbit/s bearers, calculated using data from CTCS and used to derive transmission lengths for 64kbit/s circuits
- the multiplier of 5.07 used to convert $n \times 64\text{kbit/s}$ circuits into 64kbit/s equivalents.

As already highlighted in Sections 6 and 7, we believe that the multiplier of 5.07 does not reflect current RSS circuits.

9.1.3 Powerhouse

Originally, Powerhouse was used to obtain WSS internal connections for the RFS. It is now used to provide the RSS equivalents. 'WSS' in this context is effectively the feed of circuits from COSMOSS, whereas 'RSS' is effectively the feed from the billing system. Within the timeframe of our work we have not been able to identify whether there is a difference between this definition of RSS and the one used by CTCS, but we would expect any difference to be small.

The validity of the outputs from Powerhouse is dependent on:

- the product codes being set up correctly – if a code is not set up correctly, then multiple products can be reported against one product code
- the interpretation of the data – for example, orders in hand from COSMOSS are treated as negative circuits, leading to negative volumes being reported for some product codes.

Our understanding is that the Powerhouse design team have to date had little interaction with the team responsible for compiling the RFS. The particular cubes in Powerhouse for the TISBO, wholesale trunk, and AISBO markets have the potential to be enhanced, provided there is an exchange of information between the Powerhouse designer and the prospective users. For example, this may require a re-design of the product codes, since Powerhouse can look at data at a product-code granularity. We recognise, of course, that this is limited by Powerhouse being unable within its defined scope to have capabilities beyond that of an MIS.

9.1.4 CTCS

CTCS has a higher level of transparency and replicability than some other systems due to the recording of the SQL code used. In addition, the Tagging database contains an indexed set of queries that make the process of tagging replicable as well.

However, the CTCS analysis is a critical process that relies on one individual at BT. Moreover, technical aspects of the work have not been reviewed, although the output has been reviewed, as part of the standard auditing process. A report must be written for the auditors documenting the reasons for all year-on-year changes greater than 5%.

We recognise from our discussions with BT that CTCS is agnostic as to whether a circuit is external or internal, and hence the methodological changes that are employed are likely to be consistent with both types of circuit. However, there is an asymmetry in the bearers that are sifted out. The external bearers are well-defined, but their internal equivalents require judgement. It is important that this list is correct in order to remove the right number of circuits. In addition, it will

need to be communicated within BT whether the definition of bearers requires review, so that the Tagging database can be updated to remove these circuits as well.

9.2 Review of proposed changes to BT's systems

BT is expecting to overhaul and/or replace many of its systems by 2010 or soon after. In particular, we understand that COSMOSS (a central system to these calculations) may be replaced within the next few years.

Based on our understanding of the migration from PCNBS to GENEVA, the two have already operated in parallel for some time. That is, GENEVA has been generating dummy bills for those PPCs on PCNBS as a way of validating the migration process. In addition, we understand that the data feeds from PCNBS to other systems should also be seamlessly migrated onto GENEVA. In the particular case of Powerhouse, this was verified by both the Powerhouse and GENEVA representatives.

It should be noted that it is in BT's own commercial interests to migrate or improve operations-centric systems (e.g. billing systems) efficiently, since they have a direct impact on the business. However, the RFS calculations also involve management-centric systems (e.g. Powerhouse) which can receive less attention or funding.

We understand that BT has a target of having separate systems for regulatory accounting for Openreach and the rest of BT by 2010. This may increase the number of systems feeding the RFS calculations, since parallel data will be required from both sides of the separation. However, it may also increase the possibility of cross-checking output. Careful management of the migration will be required in order to maintain the integrity of data being supplied for the derivation of the RFS.

We have noted that BT have recently appointed an individual as an 'evaluator' specifically for the PPC product range. We agree that this should help aid in the review of the validity of the data being provided.

9.3 Recommendations

Based on our review of the systems used by BT for the derivation of the RFS, we would make the following recommendations:

- A greater dialogue should be established between the Powerhouse designers and the RFS team, to determine whether the cubes could be enhanced to improve their capture of circuit volumes without incurring unreasonable cost.
- The multiple sources to the DPCN model owned by the GENETIC team should be reviewed to ensure that they are all RSS.

- In addition, the conversion factor of 5.07 for n×64Mbit/s circuits to 64kbit/s equivalents should be revised for future statements using RSS circuits.
- Ofcom and BT should agree on the definition of bearers. It is this choice that introduces asymmetry between the treatment of internal and external circuits in CTCS.
- Although we acknowledge the transparency of the procedures that occur within CTCS, it would be sensible to have a technically-focused review of the process.

9.4 Summary of action points

We recommend that Ofcom consider taking the following actions:

<i>Action</i>	<i>Purpose</i>	<i>Other comments</i>
Encourage BT to establish a greater dialogue between the Powerhouse designers and the RFS team	To build confidence in the reliability of the data feeds	
Request BT to review the sources to the DPCN model, including the conversion factor of 5.07 to ensure that they are all on an RSS basis	To build confidence in the 64kbit/s link and transmission volumes	Without this review Ofcom may nevertheless choose to assume the 64kbit/s are on an RSS basis as stated by BT
Request further information from BT concerning the selection of product codes that represent bearers and the nature of these bearers	To build confidence that all bearer codes have been captured	Ofcom may already reasonably assume that all bearer codes have been captured – we suggest this action only because of the asymmetry between internal and external circuit bearers
Request BT to make a technical review of its CTCS procedures	To build confidence in the reliability of these procedures	We suggest this action not because of specific doubts concerning the reliability of the procedures, but because of their critical role in the overall process

Figure 9.2: Summary of action points [Source: Analysys Mason]

Annex A: Description of systems relevant to the RFS outputs

<i>System</i>	<i>Description (and meaning if applicable)</i>
Atlantis	The billing portal onto GENEVA for Openreach products
CAMSS	The Customer Assisted Maintenance for Special Services is the repairs system for circuits
CDS	The Central Data Storage is a data warehouse containing volume data for private Circuits and Public Switched Telephone Network (PSTN) lines.
COSMOSS	The Customer Oriented System for the Management Of Special Services (COSMOSS) is the ordering system for circuits in the BT network
CSS	The Customer Services System is a billing system, storing data on a customer basis
CTCS	The Core Transmission Costing System is a network cost-focused database used for regulatory accounting purposes: it focuses on circuits over 2Mbit/s
Discovery	An database in Microsoft Access intended to allow the fast extraction of certain information from PCNBS
DPCN model	An Excel workbook used by GENETIC to aggregate sub-2Mbit/s circuit volumes
eCo	The electronic Communications ordering system acts as the user interface for customers to enter orders into COSMOSS
General Ledger	The General Ledger records financial transactions on a historic cost basis
GENETIC	Generic Network Implementation & Control
GENEVA	The new billing platform for BT. It uses separate portal for Wholesale (GenIUS) and Openreach products (Atlantis)
GenIUS	The Geneva Integrated Universal Solution is the billing portal for Wholesale products
Graphical Browser	This allows a PACS user to specify a circuit and view a diagram of the assets associated with the routing of the circuit
GVF (VCS)	Group Volume Forecasting (formerly Volume Control Schedule); provides forecasted and actual product volumes
INS	The Integrated Network System is the inventory of network elements related to PDH, routing information for PDH circuits and information on all the cabling links
iOTA	The iOTA Financial Turnover calculates revenue inputs for the General Ledger using data from the billing systems
NDS	Network Decision Support is used to pull out information on the PDH cable and multiplexers for all circuits from INS
NetView	This is a front-end interface onto the CDS, which can be used to extract data on circuit volumes
PACS	The Planning Assignment and Configuration System is the inventory of network elements related to SDH and routing information for SDH circuits
PCNBS	The Private Circuits New Billing Information System (PCNBS) is the main billing system for retail private circuits
PDB	The Portfolio Database contains pricing data that feeds into COSMOS
Powerhouse	This is an front-end interface (in Hyperion) used to provide circuit volumes
PSH	The Price Service Handbook also contains pricing, in particular changes over time
SCARS	The Sales Contribution and Revenue Analysis System is a revenue recording system, containing details of all billing accounts
Tagging database	This is used in CTCS to relate codes internal to CTCS (brick products) to circuits