



## Leased Line Charge Control – Regulation Models

Review of regulation models

March 2013

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26 March 2013

The Office of Communications (Ofcom)  
Riverside House  
2a Southward Bridge Road  
London  
SE1 9HA

Dear Sirs

## Leased Line Charge Control - Regulation Models

In accordance with the Master Service Agreement 2009 between Ernst & Young and The Office of Communications, and under Purchase Order number [●] (including the addendum letter dated 25 March 2013) we planned and performed a set of test procedures, using reasonable skill and care, in the context of your requirements, of certain financial models (the “**Models**”, as defined below). The scope and limitations to the scope of our work are set out below.

### Introduction

Ofcom is currently undertaking a review of the leased line market in the UK. Where significant market power is found to be present, Ofcom will impose remedies to that market. One of the remedies Ofcom proposes is a charge control.

Ofcom have been developing the charge control in parallel to the market review. Part of this work involves developing a charge control model which brings together:

- ▶ Ofcom’s forecasts and projections of market revenues, costs and volumes;
- ▶ the policy approaches Ofcom intends to adopt; and
- ▶ any sensitivity analysis based on the input assumptions.

Ofcom will use the underlying results to inform their final decision for the charge controls. The modelling analysis is therefore a central part of their work.

A number of regulation models (the “**Models**”) have been developed by Ofcom to support the charge control modelling analysis. The main purpose of the Models is to take the raw data that Ofcom receives from BT (the “**Regulated entity**”) and to process this data via a series of regulation models in order to arrive at the appropriate assumptions and data to include in the charge control model.

## Scope and limitations of our work

### Scope of work

You asked us to undertake certain agreed procedures in relation to the Models to assist you in determining whether the Models have been constructed appropriately, in so far as their logical integrity and arithmetic is concerned.

### Procedures

You asked us to perform the procedures shown in the table below.

- |                                     |   |
|-------------------------------------|---|
| <i>Formula inspection</i>           | ▶ Review the Models' formulae on a line-by-line basis to assess the Models' logical integrity and arithmetical accuracy.  |
| <i>Inspection of changes made</i>   | <ul style="list-style-type: none"><li>▶ In respect of files (1) and (8), the testing was limited to just those elements of each Model that have changed from a previous version, in isolation from any other work that may have been performed on these models.</li><li>▶ The files used to identify what changes had been made were: [●] (in respect of file 1) and [●] (in respect of file 8).</li><li>▶ Each formula change identified was reviewed for its logical integrity.</li></ul>   |
| <i>Inspection of external links</i> | <ul style="list-style-type: none"><li>▶ You asked us to confirm that the external links had been set up appropriately within the models. We have defined a <i>Linking</i> model as the file containing the external links, and the <i>linked</i> model is the file being linked to. A <i>link relationship</i> is defined as the links that exist between one Linking model and one Linked model (and therefore a single Linking model can have several link relationships).</li><li>▶ You asked us to identify the location of external links within a Linking model. If the Linked model identified is within the overall list of Models, we were to perform the following tests on the link relationship:<ul style="list-style-type: none"><li>• Test that the data labels match in both the Linking and Linked to ensure the relevant data items have been linked to.</li><li>• Test that the complete data range in the Linked model has been included within the Linking model. If additional rows are found in the Linked model that have not been included these were to be raised as an exception in order to confirm with you the appropriateness of this.</li><li>• Test that the overall number of cells being linked to is consistent between the Linking and Linked models.</li><li>• Test that the values of the external links in the Linking model agrees to the values contained in the Linked model.</li></ul></li><li>▶ If the Linked model is not included within the overall list of Models, then it was deemed out of scope for this exercise and no further work was to be performed and that link into the Linking model will be treated as an assumption for the purpose of our review.</li><li>▶ You asked us to prepare a link relationship matrix showing the number of external links that occur between the different models (both in and out of scope) so that you could validate the contents of the matrix so that it was in line with your expectations.</li></ul> |

### ***Limitations to the scope of our work***

Our scope of work in relation to the Models was limited to the review procedures outlined above. In particular, our review was limited as follows:

1. We have not been required to express any opinion on the validity of the assumptions, commercial risks associated with the project, nor on the possibility of any financial projections being achieved.
2. We have not made any recommendations to Ofcom, nor have we advocated a particular approach, methodology or strategy that Ofcom should follow.
3. We have not considered comments included in cell notes embedded in the Models, to ensure that they are consistent with the Models.
4. Our review focused only on the contents of the Models as presented to us.
5. Our review focused only on those Models listed below, and only at the time of presentation to us, and for however long we required to complete our review on each individual model. Should subsequent updates to data or logic occur in any of the Models after our review concluded then we have not been instructed by you, nor have we attempted to update our test procedures in lieu of these changes.
6. Our review considered only those links we identified that connected two models included in the Models (as listed below). We were not required to assess whether these links were updated in a specific order, should such an order exist. Any links to models outside the Models we treated as model assumptions for the purpose of our review.
7. We did not test or assess any macros included in the Models.

In performing our review, we have taken account of explanations and information provided to us by Ofcom in relation to the intended operation of the Models.

### ***Base case and sensitivity cases***

The Model's base case shall be the input configuration of the Model in the form in which it is provided to us, subject to the operation of macros or other automated adjustments required for the Model's operation. A sensitivity case is a variation to the base case input configuration.

### ***Software defects and known model defects***

We looked at the contents of the Model in the file format in which it was provided to us. However, we did not carry out any enquiry into, or review of, the software within which the Model operates (such as, for example, Microsoft Excel). Accordingly, we shall have no responsibility for the consequences of any inherent defect in such computer software programmes.

## **The models**

### ***Models' objective***

The models listed below were developed to feed information from source data into the RPI-X model (file 1). The objective of the RPI-X model, for the purposes of our review, is to generate the following key outputs:

- (i) projected costs summarisation using appropriate cost overlays;
- (ii) projected service volumes and revenues of the Regulated Entity;

- (iii) a calculation of the average annual price change that can be applied by the Regulated Entity under the charge control (the 'X').

### **Files reviewed**

We have been asked to perform certain test procedures on 40 models in total. Within this report, the models listed below are collectively referred to as the “**Models**”. Each file was developed by Ofcom.

	<i>Name of file reviewed</i>	<i>Date of file</i>	<i>Size of file (kb)</i>
1	[●]	24/1/2013	22,231
2	[●]	18/1/2013	5,512
3	[●]	18/1/2013	17,723
4	[●]	18/1/2013	1,509
5	[●]	18/1/2013	357
6	[●]	18/1/2013	119
7	[●]	18/1/2013	21
8	[●]	18/1/2013	870
9	[●]	18/1/2013	337
10	[●]	18/1/2013	94
11	[●]	18/1/2013	383
12	[●]	18/1/2013	145
13	[●]	18/1/2013	18
14	[●]	18/1/2013	239
15	[●]	28-Jan-13	1,011
16	[●]	28-Jan-13	864
17	[●]	28-Jan-13	27
18	[●]	28-Jan-13	393
19	[●]	28-Jan-13	10,671
20	[●]	28-Jan-13	356
21	[●]	28-Jan-13	126
22	[●]	28-Jan-13	219
23	[●]	29-Jan-13	157
24	[●]	28-Jan-13	2,323
25	[●]	29-Jan-13	1,353
26	[●]	29-Jan-13	807
27	[●]	29-Jan-13	1,265
28	[●]	29-Jan-13	3,507
29	[●]	29-Jan-13	302
30	[●]	29-Jan-13	187
31	[●]	29-Jan-13	216
32	[●]	29-Jan-13	45
33	[●]	29-Jan-13	24
34	[●]	29-Jan-13	22

<i>Name of file reviewed</i>	<i>Date of file</i>	<i>Size of file (kb)</i>
35 [●]	29-Jan-13	903
36 [●]	29-Jan-13	25
37 [●]	29-Jan-13	16
38 [●]	29-Jan-13	1,286
39 [●]	29-Jan-13	9,933
40 [●]	29-Jan-13	620

It should be noted that for model 15, only the following worksheets were included within the scope of this review, rather than looking at the whole model:

- ▶ [●]
- ▶ [●]
- ▶ [●]

## Procedures and findings

We performed certain procedures on the Models, in three parts:

1. Review of formulae
2. Review of model changes
3. Review of model links

The review procedures we followed, and our findings therefrom, are summarised below.

### (1) Review of formulae

#### *Review of formulae - procedures*

- ▶ We reviewed all of the formulae contained within each of the Models, save for Files 1 and 8, which were excluded from the formula review.
- ▶ For each formula, we assessed its logical integrity and arithmetic.
- ▶ Any errors identified or clarifications required were presented to you for your comment. Where changes were required to be made to the models, these were made by you and then re-reviewed by us to confirm that the change had been made in accordance with our original finding.
- ▶ We reviewed any explanations provided by you to our queries to assess their reasonableness based upon our understanding of the Models' operations and significance to the overall outcomes.

### (2) Review of model changes

#### *Review of model changes - procedures*

- ▶ For model files 1 and 8, we performed a comparison between the two presented versions of each model using spreadsheet comparison software. The output of this software is a list of formulae changes between the two versions of each model as presented to us.

- ▶ We reviewed each change to assess its logical integrity and arithmetic.
- ▶ We discussed with you an outline understanding of the nature of the changes. When testing the formulae changes we assessed whether the change was in line with the explanations you had provided.
- ▶ Any errors or queries we identified were presented to you for your comment. Where changes were required to be made to the models, these were made by you and then re-reviewed by us to confirm that the change had been made in accordance with our original finding.
- ▶ We also reviewed any explanations provided by you to our queries to assess their reasonableness based upon our understanding of the models' operations and significance to the overall outcomes.

### **(3) Review of model links**

#### *Review of model links - procedures*

- ▶ For each model in the "Models", we identified the external links that existed between models and identified the files that these models linked to.
- ▶ We compiled a link relationship matrix that listed the number of links found between each model. We provided you with a copy of this relationship matrix which enabled you to validate the files being linked to.
- ▶ Where we identified model links to files or models not included in the "Models" we treated these links and formulae as model assumptions for the purpose of our review and no further work was undertaken.
- ▶ For the links found between models, we performed the following procedures:
  - We tested that the data labels for the external link cells were consistent between the Linking model and Linked model.
  - We tested that the full data range from the Linked model was included in the Linking model's range, to ensure that no related data sets had been excluded.
  - We tested that the same number of cells were found in each linked block of cells in both the Linked model and the Linking model.
  - We tested that the same values appeared for each linked block of cells in both the Linked model and the Linking model.
- ▶ Any errors found or queries encountered were presented to you for your comment, and where changes were required to be made to the Models, these were made by you and then re-reviewed by us to confirm that the change had been made in accordance with our original finding.

We also reviewed any explanations provided by you to our queries to assess their reasonableness based upon our understanding of the models' operations and significance to the overall outcomes.



## Findings and conclusion

### Review of formulae - findings

	findings	findings resolved*	findings outstanding	
Issues found requiring a change to a model	24	24	0	* Resolved findings are those that were discussed and explained by Ofcom or where the model was corrected in response to the finding
Other queries and findings raised	110	110	0	
<b>Total</b>	<b>134</b>	<b>134</b>	<b>0</b>	

### Review of model changes – findings

	findings	findings resolved*	findings outstanding	
Issues found requiring a change to a model	10	10	0	* Resolved findings are those that were discussed and explained by Ofcom or where the model was corrected in response to the finding
Other queries and findings raised	36	36	0	
<b>Total</b>	<b>46</b>	<b>46</b>	<b>0</b>	

### Review of model links - findings

	findings	findings resolved*	findings outstanding	
Issues found requiring a change to a model	47	47	0	* Resolved findings are those that were discussed and explained by Ofcom or where the model was corrected in response to the finding
Other queries and findings raised	52	52	0	
<b>Total</b>	<b>99</b>	<b>99</b>	<b>0</b>	



Based on the review procedures shown above, we are not aware of any matters which came to our attention in the course of our review to indicate that the Models have not been constructed appropriately, in so far as their logical integrity and arithmetic are concerned, so as to materially achieve the objectives described above under the base case assumptions, except for our comments in appendix 1.

Yours faithfully

*Ernst & Young LLP*

Ernst & Young LLP

# Appendix 1 – Matters arising from the test procedures

## Comments relating to external links

We note that there are 88 separate files that are referred to in the external links contained within the Models. We have not performed any test procedures on files not included within the list of 40 Models, and we note your comments that the majority of these files are there for historical consistency purposes.

We note also that there are approximately 847,000 cells containing external links throughout the Models, and that these external links define 105 discrete relationships between different files (we define a relationship where one model is linked to another model). The relationships between the different models is complex, and the order in which the models are updated in relation to each other could have a bearing on the output values in each model.

Our work has looked specifically at the consistency of links between any two pairings of models. We have not reviewed the process methodology that determines these bilateral links, the order of these links or otherwise.

As part of our work in identifying and validating the external links within the Models and of the relationships between them, you confirmed that you were comfortable with the relationship definitions that existed between the different models.

## Use of external links within formulae

We note a large number of instances where ranges of external links are being used within LOOKUP formulae within some of the models. In general, these LOOKUPS appear to be working as expected, but best practice would suggest that only one external link is used in each formula, and that separate external link areas are created that can then feed into the formulae as required. We note that some of the LOOKUP formulae may not work if the externally linked files are not open at the same time, reducing the ability to use the model on a standalone basis.

## General comment on the state of the models

We note that there were many instances of #REF! errors within the Models indicating that areas of the Models had been deleted. These instances were not found to impact on the models' results. From our discussions with you, we understand that the #REF errors concern historical areas of the models had been deleted but the #REF! errors were retained to maintain a consistent structure within the Model and relate to redundant calculations within the Models.