

Office of the Adjudicator – Broadcast Transmission Services

Report for the period 1 October 2016 – 31 December 2016

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1. Background

On 11 March 2008, the Competition Commission (CC) announced its decision to allow the merger of transmission companies Arqiva and National Grid Wireless (NGW) subject to the agreement of a package of measures (undertakings) to protect the interests of their customers.

Arqiva and NGW overlap in the provision of Managed Transmission Services (MTS) and Network Access (NA) to transmitter sites and associated facilities for terrestrial television and radio broadcasters. In its final report, the CC found that Arqiva and NGW were the only active providers of MTS/NA to the UK television broadcasters. The companies were also the most significant providers of national MTS/NA to UK radio broadcasters with a combined market share of more than 85%. In both cases, prior to merger, the companies had exercised a competitive constraint on each other.

The CC concluded the merger of the two companies would lead to a “substantial lessening of competition” in broadcast transmission services, specifically in the provision of MTS/NA to television and radio broadcasters.

After consultation by the CC with Arqiva, its customers and other stakeholders, the Commission accepted certain undertakings from Arqiva on 1 September 2008.

http://webarchive.nationalarchives.gov.uk/20140402141250/http://competition-commission.org.uk/inquiries/ref2007/macquarie/pdf/notice_undertakings.pdf

The Undertakings are intended to mitigate the substantial lessening of competition by protecting existing and new customers over the terms and conditions of supply, including protection against future price rises and protection against changes in non-price related areas (such as discrimination issues and service standards).

The Undertakings provide for the appointment of an Adjudicator, as described in Appendix 1 (Adjudication Scheme) and Appendix 2 (Adjudication Rules). The main role of the Adjudicator is to determine disputes arising out of the operation of the Undertakings.

Paragraph 35 of Appendix 1 to the Undertakings requires the Adjudicator to make periodic reports to the Office of Fair Trading (now the Competition and Markets Authority), copied to Ofcom, covering the following points:

- Any Guidance issued
- Determinations in relation to Disputes
- The views of the Adjudicator about the operation of the Undertakings, the Adjudication Scheme and Adjudication Rules as well as any recommendations for amendments
- The views of the Adjudicator on the performance of Arqiva in complying with the Undertakings

This report covers the operation of the Office of the Adjudicator over the period from 1 October 2016 to 31 December 2016. This report will be published on the website of the Adjudicator (www.adjudicator-bts.org.uk) with any information that the Adjudicator regards as confidential redacted.

2. Office of the Adjudicator

2.1 Adjudicator

The Office consists of Alan Watson as Adjudicator on a 3 day/week basis. Megan Donald is Executive Assistant and Office Manager on a part time basis.

Mr Jon Butler assists the Adjudicator on an occasional basis with audit and similar tasks and is able to stand in for the Adjudicator should this be necessary.

Legal advice is provided by Mr Paul Herbert of Goodman Derrick LLP.

Office facilities and IT support are provided by Ofcom.

2.2 Budget

An operational budget for 2016/17 has been agreed at £476,872 with contingency of £470,000. Expenditure to the end of December was £275,451.30

An operational budget of £476,476 with a contingency of £470,000 has been proposed for 2017/18.

2.3 Stakeholder Meetings

During this period regular meetings and communication with stakeholders have continued and include government departments, television broadcasters and radio broadcasters, both large and small:

Confidential information redacted

2.4 Arqiva

Paragraph 35 of Appendix 1 of the Undertakings requires the Adjudicator to comment on the performance of Arqiva over this period, in relation to the Undertakings.

The performance of Arqiva continues to be generally satisfactory.

3 Disputes and Guidance

3.1 Guidance

In this period there have been no disputes requiring the use of the formal dispute procedure.

4 Publication of Reference Offers.

No new reference offers have been published in this period.

5 Reporting and Audit

5.1 Regulatory Accounts

Arqiva is obliged to produce annual accounts in accordance with the requirements set out in Paragraph 15 and Appendix 14 of the Undertakings.

The accounts for the period 1 July 2015 to 30 June 2016 have been produced and approved and are available at:

<https://www.argiva.com/documentation/regulatory/network-access-and-managed-transmission-services/Signed%20FY16%20regulatory%20accounts.pdf>

The Regulatory Accounting Principles and Methodologies (RAPAMS) which set out how the accounts are produced and are approved by the Adjudicator can be found at:

<https://www.argiva.com/documentation/regulatory/corporate/RAPM%202016%20Final.pdf>

5.2 Compliance Report

Paragraph 18.1 of the Undertakings requires Arqiva to deliver an annual report to the Office of Fair Trading (now the Competition and Markets Authority) setting out steps taken to comply with the Undertakings and details of any breaches and including steps taken to remedy them.

The 2016 report has been delivered to the CMA, Ofcom and the Adjudicator. There were no instances of non-compliance.

5.3 The Undertakings

The Adjudicator believes that the Undertakings, the Adjudication Scheme and Adjudication Rules are satisfactory at the present time and that no changes are needed.

5.4 Information Security Strategy

Paragraph 16.2 of the Undertakings requires Arqiva to produce an Information Security Strategy which defines the measures to be taken to ensure that confidential information held in one part of the company cannot be used by another for commercial advantage.

The Information Security Strategy can be found at:

<http://www.arqiva.com/documentation/corporate/arqiva-information-security-strategy-version-1.0.pdf>

The Adjudicator commissioned an independent audit of the strategy and the final audit report was published during May 2011.

<http://www.adjudicator-bts.org.uk/documents/AuditArqivaInformationSecurityStrategyMarch2011.pdf>

An audit of the information security strategy has commenced and the report will be published in the next quarterly report.

6 Planned future activity

6.1 Guidance

The Adjudicator has previously issued guidance covering Paragraphs 6 and 9-12 of the Undertakings. The Adjudicator considers that no further guidance is currently required in relation to Paragraph 6 of the Undertakings.

At present the Adjudicator is of the opinion that no Guidance is required in relation to Paragraph 3 of the Undertakings. Application of, and compliance with, this paragraph will be monitored and Guidance issued at a later date if necessary.

The Adjudicator holds a series of documents produced by Ofcom which cover detailed guidance for the production of reference offers. Some of this is specific to the now historic High power DTT reference offer and so the Adjudicator has now prepared and published a summary document which covers the aspects which constitute current guidance.

<http://www.adjudicator-bts.org.uk/guidance.htm>

6.2 Audits

The Adjudicator had planned two audits for 2016. The first, as noted above, was to audit the revised Information Security arrangements following an Arqiva reorganisation. This was delayed to allow focus on the second audit below but is now in progress.

The second was to audit some sample sites from the KEEP database. This database records the occupancy of sites (antennas, etc) and is the basis for dividing costs when calculating the Network Access charge.

Six sites were audited by Jon Butler on behalf of the Adjudicator. The audit covered a comparison of what antennas were on the structures compared with the KEEP record, the allocation of floor space to users and a comparison of agreed electricity consumption with equipment consumption. Both broadcast antennas and those used for telecommunications (non-broadcast applications) were checked as the allocation of charges is across all occupiers, not just broadcast.

The result from the initial audit was:

- broadcast antennas were substantially correct,
- there were significant discrepancies in the records relating to telecommunications antennas
- allocation of floor space was reasonable
- allocation of electricity consumption was reasonable with some discrepancies to investigate.

As a result of the audit findings, the Adjudicator requested some further work on the impact of the discrepancies in telecommunications antennas on broadcast customers. The result of this analysis was that the financial impact was very small and largely netted out, (between antennas present, but not recorded and those recorded, but not present).

The Adjudicator requested an audit of a further sample of six sites which has also revealed a similar pattern. Arqiva have now commenced a project to review and improve the recording process and to improve the data accuracy.

The electricity discrepancies noted above have had a satisfactory explanation.

The reports of these two audits are at Annex A and B with minor redactions to preserve customer confidentiality.

A further KEEP audit is planned for mid/late 2017 and, depending on findings, may become an annual event.

6.3 700 MHz clearance.

The Adjudicator has no formal role in the 700MHz clearance programme but some aspects will come within the remit.

Audit of Arqiva site records undertaken in March 2016

Version No	Date	Modified by	Notes
0.1	20/4/16	J Butler	First draft for comment
0.2	10/5/16	J Butler	Updated following comments from Arqiva
0.2 Redacted	10/5/16	J Butler	Updated following comments from Arqiva
1.0 Redacted	20/5/16	J Butler	Adjudicator & Arqiva redactions final

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1. Purpose

The purpose of this document is to set out the findings from an audit of a selection of Arqiva's sites for the purposes of;

- 1.1. Comparing all antenna systems observed on Arqiva's masts and structures to the information recorded in Arqiva's electronic database (the KEEP database).
- 1.2. Comparing selected equipment floor space and electricity usage to site observations

2. Introduction

2.1. Antenna Systems

Arqiva use a database system called KEEP to maintain site infrastructure records. The KEEP database records a variety of site data which includes information relating to the height, type and location of antenna systems. Antenna information from KEEP is used to determine the loading which the antenna system places upon the site mast or tower. This loading (windloading) is used to calculate the charges to the users of the antenna systems.

Some of the elements of the charges to broadcasters are based on the percentage wind load on the structure of the antennas delivering the broadcasters service. The relevant elements of the charges to Arqiva's broadcast customers are influenced by all antennas on a structure irrespective of whether the antenna is for a broadcast service or something else. As such, the accuracy of all antenna records are considered in this audit.

The accuracy of the KEEP records in regard of antenna type and antenna height is the subject of this report for all antennas at a selection of sites. The accuracy of the KEEP records will be established through visual site inspection and from analysis of photographs taken at the time.

2.2. Floor Space and electricity

Arqiva charge broadcast customers for equipment floor space (accommodation) and electricity usage through various methodologies. These methodologies are set out below.

Use of floor space or accommodation at transmitter sites may be charged using the following methodologies;

- 1) Through a published rate card system
- 2) Through a system of shared attribution which includes costs relating to the asset value of the accommodation, maintenance costs, rent and rates

This audit only reviews accommodation charged using a rate card based on the floor space allocated to the customer.

Arqiva provided a slide pack describing accommodation usage and charging. In this slide pack Arqiva note the following in regard of rate card accommodation;

- ▶ *Generally for smaller customer requirements, where the use of accommodation for a single service can be identified, a different approach using a rate card can be followed. This*

addresses the floor space needed for the transmitter and any programme input equipment as well as a share of the space needed for a combiner or transmitter output filter.

- ▶ *There is also a recognition of the need for access to the customer equipment for maintenance from several sides around the equipment. This prevents the installation of other equipment on some sides immediately adjoining the customer equipment.*

This method of floor space allocation was taken into account during site observations.

Electricity use may be charged to Arqiva's customers using the following measurement methodologies. In all cases the electricity is charged as a pass through cost.

- 1) By measuring actual electricity use on dedicated meters
- 2) By estimating the electricity use based on similar equipment at a similar site
- 3) By measuring the electricity use of the customer's equipment for a limited time and extrapolating over the period

This audit only reviews un-metered electricity use, methods 2 and 3 above.

3. Analysis methodology

Six sites were selected for testing, two DTT main stations (top 50), two smaller DTT 6 mux sites and two relay sites. The following sites were selected;

DTT Main Stations (top 50): Mendip and Wenvoe

DTT smaller 6 Mux: Bristol Kings Weston and Pontypool

DTT Relays; Machen Upper and Pontypridd UHF

Each site has one structure with the exception of Wenvoe and Pontypridd which have two. Antenna records were supplied for all eight structures.

Arqiva provided the following records and information in advance of the site visits.

- 3.1. **Antennas:** A full set of KEEP records for each of the sample sites. The KEEP records are compared to site observations and photographs taken from the ground.
- 3.2. **Floor space (accommodation):** Arqiva provided a list of broadcast customers who rely on rate card charges including the allocated floor space (in m²) used to calculate the charge to each customer.
- 3.3. **Electricity:** Arqiva provided a list of broadcast customers who rely on un-metered electricity charges including the electricity usage (in kW) used to calculate the charge to each customer.
- 3.4. **Information:** Arqiva provided slide packs describing the methodology for electricity and accommodation charges. A glossary of terms was also provided.

Each site was visited by Jon Butler as the representative of the Adjudicator accompanied by Adrian Giblin as representative from Arqiva. Each structure was photographed by the representative of the Adjudicator at various locations distant from the mast in order to aid identification and to provide an

audit record. The customer accommodation was observed and the floor space compared to the Arqiva records supplied in 3.2. The customer equipment type was observed and compared to the records supplied in 3.3.

4. Audit Questions

At each transmitter site the following questions were addressed;

- 4.1. Do the KEEP records from 3.1 show an antenna system at a location on the mast or tower which is reasonably consistent with site observation?
- 4.2. Is the size of the customer's accommodation reasonably consistent with the details set out in 3.2
- 4.3. Can the customer's equipment type reasonably consume the electrical power set out in 3.3

The audit questions are addressed through reasonable estimation rather than precise measurement. Antennas are observed from ground level and heights are estimated relative to the structure and other antennas. Accommodation floor space is estimated and compared to the records provided by Arqiva. Electricity usage is not measured, assessment is based on a professional opinion of whether the stated usage is reasonable for the equipment type.

5. Schedule

Each site was visited according to the schedule as set out below, Wenvoe was used as a base to analyse results. In addition, three follow up sessions were held at Arqiva's offices at Crawley Court.

- 14 March 2016: Mendip and Bristol Kings Weston
- 15 March 2016: Wenvoe
- 16 March 2016: Machen Upper and Pontypridd UHF
- 17 March 2016: Pontypool
- 4, 7 and 28 April 2016: Crawley Court follow up analysis

6. Identification

Antennas were identified at ground level using the Arqiva KEEP schedule of height, type and orientation to aid identification. Exact measurements were not possible but heights and orientation were considered relative to other antennas on the structure. At the time of the visits the weather was clear and mostly sunny. Photographs were taken using an interchangeable lens camera with a telephoto lens. Annex 1 contains a sample of photographs. All photographs and records have been supplied to Arqiva.

Arqiva supplied a glossary of terms to aid antenna identification from the schedules. This is attached as Annex 2.

7. Summary of findings – Report versions

The representative of the Adjudicator has initially produced this report in draft form (version 0.xx) summarising the findings and noting any discrepancies or observations regarding the accuracy of the Arqiva records compared to site observations. The draft report is shared with Arqiva who may comment upon factual accuracy prior to final issue. The final version has document reference 1.xx and includes Arqiva’s response to the findings. The Adjudicator will be responsible for any actions following production of this report.

8. Summary of findings – Results

Tables showing results are contained in Annex 3 to this document. There were over 600 antenna observations and only those where the observation was inconsistent with Arqiva’s records are contained in Annex 3. The full list with comments has been provided to Arqiva.

8.1 Antennas: Do the KEEP records from 3.1 show an antenna system at a location on the mast or tower which is reasonably consistent with site observation?

Arqiva provided a schedule of 564 antennas across the six sites (eight structures). Site observations showed an additional 38 antennas which were not recorded in the schedules. The results below relate to the sum of these antennas, 602 antennas in total.

Of the 602 antennas in total:

- 421 results were recorded as reasonably consistent with the Arqiva records
- 128 results were recorded as not reasonably consistent with Arqiva records
- 53 results were recorded as observations

Of the 421 ‘reasonably consistent’ results

Antennas were observed on the structure at a height and location which was reasonably consistent with the KEEP records.

Of the 128 ‘not reasonably consistent’ results:

- 53 antennas are recorded in the schedule as installed but were not observed on the mast or structure (47 wireless, 4 broadcast and 2 others)
- 48 antennas were observed on the structure and are not in the schedule (32 SHF dishes plus dipoles, yagis, collinear)
- 27 antennas had data in the schedule which was inconsistent with observations, as example; incorrect antenna type, bearing, height, leg

Of the 53 observations:

These were generally observations where the antenna may or may not have been on the structure and is described as redundant or remove. There appeared to be inconsistency between description and presence on the structure.

A breakdown of the ‘not reasonably consistent’ results is shown below:

Breakdown of 'Not Reasonable' by cause and category	Total	Wireless	Broadcast	Blank
In schedule as installed and not observed on mast or structure	53	47	4	2
Observed on mast or structure and not in schedule as installed or missing from schedule	48	-	-	-
Schedule data not consistent with observation	27	25	2	0
TOTAL	128			

8.2 Accommodation

Is the size of the customer's accommodation reasonably consistent with the details set out in 3.2?

Arqiva provided details of the square metre accommodation for four services at two sites which is charged using a rate card.

Of the 4 samples;

- 4 were recorded as reasonably consistent
- 0 were recorded as not reasonably consistent

The space occupied by and associated with the transmitter and any associated equipment was estimated and compared to the schedule provided by Arqiva. All the services in the Arqiva schedule occupied floor space which is reasonably consistent with the Arqiva schedule. Full details are provided in Annex 4.

8.3 Electricity usage

Can the customer's equipment type reasonably consume the electrical power set out in 3.3?

Arqiva provided details of 26 different customer systems which meet the test criteria. The details include the equipment type, annual power consumption, transmitter power and service type. The electricity consumption was considered against the equipment type and power, and in all cases bar one the consumption was considered reasonable.

Of the 26 samples;

- 25 were recorded as reasonable
- 1 was recorded as not reasonable

The exception was COM4 at Bristol Kings Weston. The Arqiva schedule shows an annual consumption of 20kWh for COM4 whereas the schedule shows the PSB's (which use the same equipment and have a similar power output) with an annual consumption of 20kWh. The Arqiva schedule notes that the consumption is matched. Arqiva note that *"The consumption separately agreed with each broadcaster is based on the aggregate of a number of different groups of sites across a range of power levels resulting in different agreed consumption."*

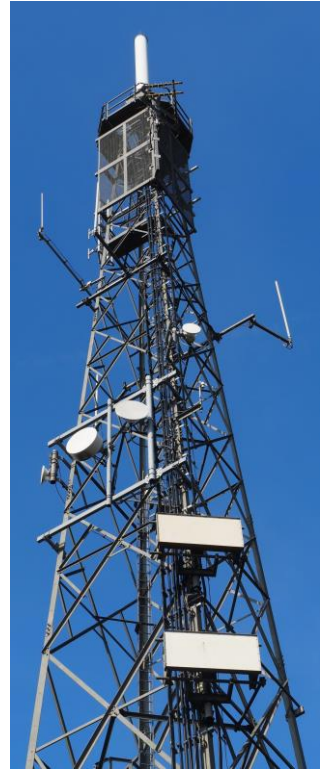
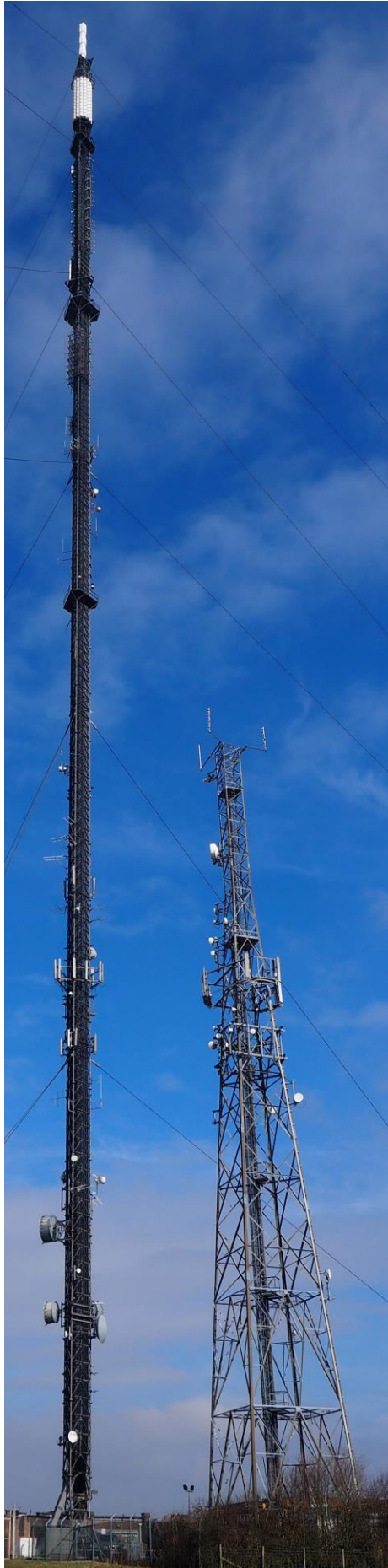
9. Arqiva response to audit findings

Arqiva provided the following response:

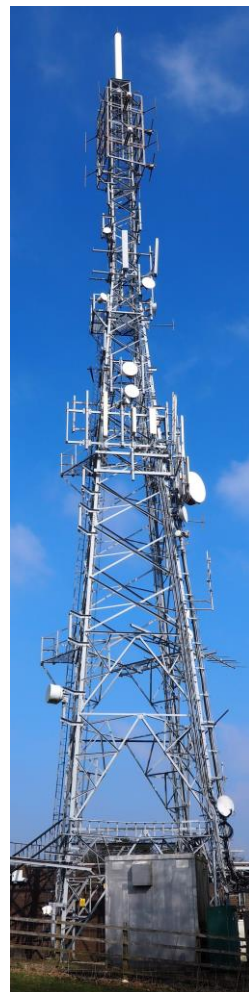
Arqiva acknowledges the results of the audit. Initial analysis of the impact of the results on the sample sites gives a variation to Site Apportionment which Arqiva considers is not material for broadcast customers.

Arqiva is putting in place an action plan to address the findings of the audit and engaging with the Office of the Adjudicator to report on the progress of the actions.

Annex 1: Sample of site photographs



Clockwise from the left;
Mendip, Wenvoe,
Pontypridd, Bristol KW
Machen Upper, Pontypool.



Annex 2: Glossary of related terms used in the Arqiva schedule

4L Cardioid	Four Lambda Cardioid where lambda relates to the wavelength of the services being transmitted.
8L Cardioid	Eight Lambda Cardioid
16L Cardioid	Sixteen Lambda Cardioid
DR	Digital Radio
GPRS	General Packet Radio Service
MHA	Mast Head Amplifier
ODU	Outdoor Unit
PCN	Personal Communications Network
RCU	Remote Control Unit
TETRA	Terrestrial Trunked Radio

Latest Antenna Status Explanation

Installed	Antenna in use – included in Site Apportionment
Planned	Antenna expected to be installed – not included in Site Apportionment
Redundant	Antenna not in use – not included in Site Apportionment
Reserved	Antenna expected to be installed – included in Site Apportionment
Remove	Used to highlight antennas for removal and may be used with an Installed or a Redundant antenna.

Feeders

A feeder is usually associated with an antenna.

Where a broadcast antenna is constructed from a number of separate dipoles, panels or other discrete elements, the group of antennas that comprise the whole antenna system will be captured within Keep as a number of elements.

Each antenna entry may have multiple tiers in the Keep antenna entry.

A five-around antenna system of eight tiers will have five antenna entries, (usually one per bearing), and eight panels in the individual entry on that bearing stacked above each other.

For such an antenna system, there will be only one or two feeders. These are associated with the antenna entry for one bearing and no feeders are associated with the remaining antennas in the system on other bearings.

An example of this is:

Mendip S1 DTT antenna, (DT_MEN_01), - 10 tiers of panels on 5 faces

Antenna ID	Antenna Type	Antenna Quantity	Feeder Quantity
258319	UHF DTT Panel	10	2
258321	UHF DTT Panel	10	0
258322	UHF DTT Panel	10	0
258326	UHF DTT Panel	10	0
258327	UHF DTT Panel	10	0

Antenna Leg Designation

Each structure will have each leg of the structure designated with a letter starting from A. Any face of the structure may be defined as being between two adjacent legs such as AB and CA.

There are additional designations used, either where the antenna is at the top of the structure or for structures that do not have legs such as steel or concrete cylinders.

The following description is used in Keep:

Antenna Leg denotes the mounting position of the antenna on the structure. Codes referencing the structure legs are used for towers (i.e. A, B and C for triangular towers - A, B, C and D for square towers - leg A is always the first leg east of True North).

Examples:

- A (antenna located on leg A),
- AB (antenna located at the centre of face AB),
- ABR (antenna located along the right half of face AB),
- ABL (antenna located along the left half of face AB).
- A number of other codes identify alternative mounting locations:
- AXI (antenna on top of the tower located centrally),
- TOP (antenna on top of the tower offset from centre),
- WAL (antenna located on a wall or building),
- P (antenna located on a pole or other cylindrical structure),
- ALL (antenna located on a triangular/delta frame),
- TOR (antenna located on a circular/toroid frame) and
- PLT (platform signifier).

An antenna may have a bearing on which it is pointed, but this may not apply to some antennas such as omni-directional antennas. These antennas may be given a bearing of 0 degrees or 360 degrees.

Annex 3: Antenna observations



Annex 4: Accommodation results from observations



Annex 5: Electricity consumption results from observations



Audit of Arqiva site records undertaken in June 2016

This redacted version of the report removes information which is commercially sensitive to Arqiva.



Version No	Date	Modified by	Notes
0.1	15/9/16	J Butler	First draft for comment
1.0	27/9/16	J Butler	Final version
1.0R	27/9/16	J Butler	Redacted final version, ✂ indicates redaction
1.0R1	30/9/16	J Butler	Additional redactions from Arqiva

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1. Purpose

The purpose of this document is to;

1.1. Set out the findings from the second audit of a selection of Arqiva's sites undertaken in June 2016, for the purposes of;

1.1.1. Comparing all antenna systems observed on Arqiva's masts and structures to the information recorded in Arqiva's electronic database (the KEEP database).

1.1.2. Comparing selected equipment floor space and electricity usage to site observations

The findings are summarised in section 9 of this document

1.2. To provide Arqiva's responses to questions raised by the findings of this audit and Arqiva's impact analysis of the antenna discrepancies. These are set out in section 10 of this document.

2. Summary

- 1) The transmitter site observations in this June 2016 audit showed a similar number of discrepancies to Arqiva's KEEP records when compared with the previous audit in March 2016. In this June 2016 audit there were 734 site observations which were compared to Arqiva's KEEP records. Of these, 520 were recorded as reasonably consistent with observations, 128 were not reasonably consistent and 86 were recorded as observations.
- 2) Arqiva provided satisfactory responses to questions raised during the audit.
- 3) Arqiva have analysed the antenna records discrepancies and have calculated the potential impact on customer charges through changes to the apportionment calculations. The following comments have been extracted from Arqiva's analysis to provide a summary.
 - a) The changes lead to both small increases and small decreases to charges per site per service
 - b) The analysis of the discrepancies is site specific and does not result in common changes that can be implemented more widely across further sites. Furthermore, in the normal course of business the number of sharers increases and decreases over time.
 - c) As a result, Arqiva will implement the corrections for the specific sites already identified and will also follow up other on-going initiatives that will review and update the Keep data.
 - d) For the services on the sample sites the changes to charges for the customers are being implemented under the terms of the relevant customer contract.

3. Introduction

The first site audit was undertaken in March 2016 at 6 transmitter sites in the West Country and South Wales. This included the identification of 602 antennas, reviewing electricity usage of 26 transmitter systems and the accommodation allocated to 4 transmitter systems.

The findings and results from this first audit were that;

- I. Of the 602 antennas, 421 were recorded as reasonably consistent with the Arqiva records, 128 were recorded as not reasonably consistent with Arqiva records and 53 were recorded as observations
- II. Of the 26 systems considered for electrical usage, 25 were considered reasonably consistent with Arqiva records and 1 was considered unreasonable¹
- III. Of the 4 systems considered for accommodation allotment, all 4 were considered reasonably consistent with Arqiva records.

The representative of the Office of the Adjudicator BTS produced a report² of these findings and Arqiva provided a written response. Arqiva's response acknowledged the findings in the audit report and they committed to implement an action plan to address the findings.

Arqiva produced an action plan dated 13 May 2016 which includes, but is not limited to:

1. Investigating the causes for the data inconsistencies including people, processes and systems
2. Considering more site audits to determine whether the sample is representative across the Arqiva portfolio.
3. Implementing a plan to correct the inconsistencies including timescales, deliverables, reporting, communications and measurement.
4. Informed by 1-3 above, proposals for subsequent audit activity covering the wider Arqiva Broadcast site portfolio based on an appropriate site selection criteria and for follow up monitoring

Item 2 above considers more site audits, which the Adjudicator agreed to, and this report summarises the outcomes of this second set of site audits.

3.1. Antenna Systems

Arqiva use a database system called KEEP to maintain site infrastructure records. The KEEP database records a variety of site data which includes information relating to the height, type and location of antenna systems. Antenna information from KEEP is used to determine the loading which the antenna system places upon the site mast or tower. This loading (windloading) is used to calculate the charges to the users of the antenna systems.

¹ When compared to similar equipment, the recorded electrical consumption for one system at Bristol KWH appeared unreasonably high. However, this was satisfactorily explained during the June 2016 audit tests.

² Final report v1.0 dated 20 May 2016 and issued to the Adjudicator and Arqiva

Some of the elements of the charges to broadcasters are based on the percentage wind load on the structure of the antennas delivering the broadcasters service. The relevant elements of the charges to Arqiva's broadcast customers are influenced by all antennas on a structure irrespective of whether the antenna is for a broadcast service or something else. As such, the accuracy of all antenna records are considered in this audit.

The accuracy of the KEEP records in regard of antenna type and antenna height is the subject of this report for all antennas at a selection of sites. The accuracy of the KEEP records will be established through visual site inspection and from analysis of photographs taken at the time.

3.2. Floor Space and electricity

Arqiva charge broadcast customers for equipment floor space (accommodation) and electricity usage through various methodologies. These methodologies are set out below.

Use of floor space or accommodation at transmitter sites may be charged using the following methodologies;

- 1) Through a published rate card system
- 2) Through a system of shared attribution which includes costs relating to the asset value of the accommodation, maintenance costs, rent and rates

This audit only reviews accommodation charged using a rate card based on the floor space allocated to the customer.

At the time of the March 2016 audit, Arqiva provided a slide pack describing accommodation usage and charging. In this slide pack Arqiva note the following in regard of rate card accommodation;

- ▶ *Generally for smaller customer requirements, where the use of accommodation for a single service can be identified, a different approach using a rate card can be followed. This addresses the floor space needed for the transmitter and any programme input equipment as well as a share of the space needed for a combiner or transmitter output filter.*
- ▶ *There is also a recognition of the need for access to the customer equipment for maintenance from several sides around the equipment. This prevents the installation of other equipment on some sides immediately adjoining the customer equipment.*

This method of floor space allocation was taken into account during site observations.

Electricity use may be charged to Arqiva's customers using the following measurement methodologies. In all cases the electricity is charged as a pass through cost.

- 1) By measuring actual electricity use on dedicated meters
- 2) By estimating the electricity use based on similar equipment at a similar site
- 3) By measuring the electricity use of the customer's equipment for a limited time and extrapolating over the period

This audit only reviews un-metered electricity use, methods 2 and 3 above.

4. Analysis methodology

Six sites were selected for testing antennas, two DTT main stations (top 50), two smaller DTT 6 mux sites and two relay sites. The following sites were selected;

DTT Main Stations (top 50): Caradon Hill and Hannington

DTT smaller 6 Mux: Plympton and Salisbury

DTT Relays; Marlborough and St Thomas (Exeter)

Each site has one structure with the exception of Plympton which has two. Antenna records were supplied for all seven structures.

Electrical power use was considered at 5 sites and across 30 TV and radio broadcast systems. The sites selected were Caradon Hill, Beacon Hill, Plympton, Exeter St Thomas and Stockland Hill.

Equipment accommodation use was considered at 6 sites and across 8 broadcast radio systems. The sites selected were Beacon Hill, Blunsdon, Exeter St Thomas, Marlborough, Plympton and Stockland Hill.

Arqiva provided the following records and information in advance of the site visits.

- 4.1. **Antennas:** A full set of KEEP records for each of the sample sites. The KEEP records are compared to site observations and photographs taken from the ground.
- 4.2. **Floor space (accommodation):** Arqiva provided a list of broadcast customers who rely on rate card charges including the allocated floor space (in m²) used to calculate the charge to each customer.
- 4.3. **Electricity:** Arqiva provided a list of broadcast customers who rely on un-metered electricity charges including the electricity usage (in kW) used to calculate the charge to each customer.
- 4.4. **Information:** Arqiva had previously provided slide packs describing the methodology for electricity and accommodation charges. A glossary of terms was also provided.

Each site was visited by Jon Butler as the representative of the Adjudicator accompanied by Adrian Giblin as representative from Arqiva. Each structure was photographed by the representative of the Adjudicator at various locations distant from the mast in order to aid identification and to provide an audit record. The customer accommodation was observed and the floor space compared to the Arqiva records supplied in 4.2. The customer equipment type was observed and compared to the records supplied in 4.3.

5. Audit Questions

At each transmitter site the following questions were addressed;

- 5.1. Do the KEEP records from 4.1 show an antenna system at a location on the mast or tower which is reasonably consistent with site observation?
- 5.2. Is the size of the customer's accommodation reasonably consistent with the details set out in 4.2
- 5.3. Can the customer's equipment type reasonably consume the electrical power set out in 4.3

The audit questions are addressed through reasonable estimation rather than precise measurement. Antennas are observed from ground level and heights are estimated relative to the structure and other antennas. Accommodation floor space is estimated and compared to the records provided by Arqiva. Electricity usage is not measured, assessment is based on a professional opinion of whether the stated usage is reasonable for the equipment type.

6. Schedule

Each site was visited according to the schedule as set out below. In addition, follow up sessions were held at Arqiva's offices at Crawley Court.

- 7 June 2016: Hannington
- 10 June 2016: Salisbury, Marlborough and Blunsdon
- 20 June 2016: Caradon Hill
- 21 June 2016: Plympton and Beacon Hill
- 22 June 2016: Exeter St Thomas and Stockland Hill

7. Identification

Antennas were identified at ground level using the Arqiva KEEP schedule of height, type and orientation to aid identification. Exact measurements were not possible but heights and orientation were considered relative to other antennas on the structure. At the time of the visits the weather was clear and often sunny. Photographs were taken using an interchangeable lens camera with a telephoto lens. Annex 1 contains a sample of photographs. All photographs and records have been supplied to Arqiva.

Arqiva supplied a glossary of terms to aid antenna identification from the schedules. This is attached as Annex 2.

8. Summary of findings – Report versions

The representative of the Adjudicator has initially produced this report in draft form (version 0.xx) summarising the findings and noting any discrepancies or observations regarding the accuracy of the Arqiva records compared to site observations. The draft report is shared with Arqiva who may comment upon factual accuracy prior to final issue. The final version has document reference 1.xx and includes Arqiva's response to the findings. The Adjudicator will be responsible for any actions following production of this report.

9. Summary of findings – Results

Tables showing results are contained in Annex 3 to this document. There were 759 antenna observations and only those where the observation was inconsistent with Arqiva’s records are contained in Annex 3. The full list with comments has been provided to Arqiva.

9.1 Antennas: Do the KEEP records from 4.1 show an antenna system at a location on the mast or tower which is reasonably consistent with site observation?

Arqiva provided a schedule of 741 antennas across the six sites (seven structures). The schedule included 25 antennas which were either wall mounted or at 0m and not on the structure. These were excluded from the audit observations. Site observations showed an additional 18 antennas which were not recorded in the schedules. The results below relate to the sum of the antennas mounted on the structures, 734 antennas in total.

Of the 734 antennas in total:

- 520 results were recorded as reasonably consistent with the Arqiva records
- 128 results were recorded as not reasonably consistent with Arqiva records
- 66 results were recorded as observations

Of the 520 ‘reasonably consistent’ results

Antennas were observed on the structure at a height and location which was reasonably consistent with the KEEP records.

Of the 128 ‘not reasonably consistent’ results:

- 46 antennas are recorded in the schedule as installed but were not observed on the mast or structure (41 wireless and 5 broadcast)
- 59 antennas were observed on the structure and are not in the schedule (43 SHF dishes plus cellular antennas and others)
- 23 antennas had data in the schedule which was inconsistent with observations, as example; incorrect antenna type, bearing, height, leg (22 wireless and 1 broadcast)

Of the 53 observations:

These were generally observations where the antenna may or may not have been on the structure and is described as redundant or remove. There appeared to be inconsistency between description and presence on the structure.

A breakdown of the ‘not reasonably consistent’ results is shown below:

Breakdown n of 'not reasonably consistent' by cause and category	Total	Wireless	Broadcast
In schedule as installed and not observed on mast or structure	46	41	5
Observed on mast or structure and not in schedule as installed or missing from schedule	59	-	-
Schedule data not reasonably consistent w ith observation	23	22	1
TOTAL	128		

9.2 Accommodation

Is the size of the customer's accommodation reasonably consistent with the details set out in 4.2?

Arqiva provided details of the square metre accommodation for eight services at six transmitter sites which are charged using a rate card.

Of the 8 samples;

- 8 were recorded as reasonably consistent
- 0 were recorded as not reasonably consistent

The space occupied by and associated with the transmitter and any associated equipment was estimated and compared to the schedule provided by Arqiva. All the services in the Arqiva schedule occupied floor space which is reasonably consistent with the Arqiva schedule. Full details are provided in Annex 4.

9.3 Electricity usage

Can the customer's equipment type reasonably consume the electrical power set out in 4.3?

Arqiva provided details of 30 different customer systems which meet the test criteria. The details include the equipment type, annual power consumption, transmitter power and service type. The electricity consumption was considered against the equipment type and RF power, and in all cases bar one the consumption was considered reasonable.

Of the 30 samples;

- 29 were recorded as reasonable
- 1 was recorded as not reasonable

The exception was ☒ at Plympton. The Arqiva schedule shows an annual consumption of ☒kWh for ☒ whereas the schedule shows the ☒ (which use the same equipment and have a similar RF power output) with an annual consumption of ☒kWh. The Arqiva schedule notes that the consumption is matched. Arqiva had previously noted that *"The consumption separately agreed with each broadcaster is based on the aggregate of a number of different groups of sites across a range of power levels resulting in different agreed consumption."*

The question is considered further in section 10.1.

10. Questions to Arqiva following the March and June 2016 audits

10.1. Explanation of variances in electrical power consumption between like transmitter equipment

Observations at both the March 2016 audit and the June 2016 audit showed that the recorded electrical power consumption of like transmitter types can vary between Arqiva's customers. While small variations could be easily explained, the audit showed that variations can be as much as five fold from one customer to another. Observed in isolation, this might suggest that one customer is paying five times as much for electricity use when compared to another customer at the same site and with like equipment at a similar RF power output. This variation in recorded electrical power consumption warranted further investigation and explanation from Arqiva.

Arqiva explained that electrical power consumption used to calculate electrical charges is agreed with their customers using either an averaging methodology or through matching with like sites. Arqiva provided a full analysis for Plympton in a document dated 22 July 2016 and which is attached as Annex 6 to this report. A summary of Arqiva's explanation is provided below;

The consumption of the Plympton ✂ service is matched to the Fenham ✂ service along with five other sites of similar power levels. The Fenham ✂ service is measured by meter.

The consumption of the Plympton ✂ service is derived from the average consumption at sites with the same equipment type and of a similar power setting. The measurements are from meters for the service and also from measurements over a period of operation. The aggregate power consumption for one service is then derived from these measurements and used as an average consumption. The average consumption is then applied to all of the ✂ services that have the same equipment type and are agreed to have an appropriate power level. There are 81 services with this categorisation of equipment type. The agreed consumption of the Plympton ✂ services is for the average power consumption in the group of services.

Arqiva's response to this question was considered reasonable by the representative of the Adjudicator and the item closed.

10.2. Hannington DTT antenna

The Hannington DTT antenna (DT_HAN_01) was observed as 11 tiers of 5 panel antennas whereas the KEEP schedule recorded 10 tiers of 5 panels. Arqiva were asked to explain the difference in observation to records and they provided extracts from the antenna manual and the following response in a document dated 22 July 2016:

Keep Antenna Audit
Hannington S1 Antenna

Antenna Number 176801
Antenna Force under 1m/s wind 0.00051492kN

Antenna Load Calculation

This gives the individual antenna force of 0.00051492kN from:

Force = Area (0.7) x drag coefficient (1.2) x Pressure at 1m/s wind speed (0.613).

The number of antennas is then used with the mean height to derive the antenna bending moment.

The approach taken with antennas has been to include the active antenna elements.

Where there are other additional elements on the structure such as mounting steelwork, screening components, access ladders and platforms, lightning protection and rigging points, these are not assigned a wind-loading.

The additional dummy antennas at Hannington are treated in the same way as the other additional elements as above.

Arqiva's response to this question was considered reasonable by the representative of the Adjudicator and the item closed.

10.3. Observations and categorisation of redundant and remove antennas

Observations showed that antennas with the categorisation of redundant or remove within the KEEP database may or may not be present on the structure. Arqiva were asked to explain the categorisation and the logic behind any windloading apportionment which may or may not be associated with these samples. Arqiva provided the following response in a document dated 9 September 2016.

Office of the Adjudicator – Broadcast Transmission Services

Keep Audit – Antenna Use Description

Latest Antenna Status Explanation

<i>Installed</i>	<i>Antenna in use – included in Site Apportionment</i>
<i>Planned</i>	<i>Antenna expected to be installed – not included in Site Apportionment</i>
<i>Redundant</i>	<i>Antenna not in use – not included in Site Apportionment</i>
<i>Reserved</i>	<i>Antenna expected to be installed and customer commitment to pay confirmed – included in Site Apportionment</i>

Remove	<i>Used to highlight an antenna for removal and may be used with an Installed or a Redundant antenna – Site Apportionment matches the status of the associated antenna.</i>
Swapout	<i>Used to highlight an Installed antenna that is planned to be replaced with another antenna within the same aperture. When the new antenna is confirmed as Installed as a replacement to a previous antenna the old antenna is deleted from Keep.</i>

As a result of the Keep Audit, the process and data review has highlighted a number of examples of inconsistencies in the approach to the updating of the status of antennas. This will be addressed in the process improvements as part of the Arqiva action plan following the Keep Audit.

Arqiva's response to this question was considered reasonable by the representative of the Adjudicator and the item closed.

10.4. Analysis of the discrepancies in the KEEB records and the impact on broadcast customer charges

Arqiva were asked to analyse the discrepancies between site observations and the antenna KEEB records to understand any impact on customer charges. On 3 August 2016 Arqiva provided analysis of how the data discrepancies impact rent and rates apportionment (pass through charges). Arqiva's analysis of March and June observations show a relatively small change in the charge passed through to each customer. Some sites show an increase and some a decrease, most at a few £ or tens of £ per customer.

Arqiva were then asked to consider not only the rent and rates apportionment changes but also any changes to Network Access charges which are based on windloading. On 9 September 2016 Arqiva provided this analysis which showed potential changes of up to +/- £ pa per TV Multiplex and up to +/- £ pa per Radio service. Averaged over all the sample sites, the impact on radio charges is £ % and £ % on television charges.

Arqiva's analysis shows that the data discrepancies in KEEB result in incorrect charges to customers for both pass-through and network access charges. The analysis also shows that discrepancies are not site specific and charges may be over or under. Arqiva note that as such, correctional changes can not be implemented more widely across further sites but that they will implement corrections for the sample sites in line with the relevant customer contract. Arqiva further note that for other sites not in the audit, they will follow up with other on-going initiatives.

Arqiva's full response is attached to this document as Annex 7.

11. Arqiva's response to the audit findings

Arqiva provided the following response dated 2 August 2016:

Keep and Facilities Audit

Proposal for On-going Audit of Broadcast Portfolio Structures

Background

Following the audit of antennas on a sample of Arqiva structures as part of the Keep and Facilities Audit by the Office of the Adjudicator Broadcast Transmission Services, (OTA), in March 2016, Arqiva has sought to provide a proposal for an on-going audit programme. Arqiva acknowledges the discrepancies that were identified between some of the antennas on the structures and the records in the Keep data system.

Arqiva has put in place a number of actions as part of an action plan already provided to the OTA. These include a review of the data management processes around Keep and implementation of data quality templates to identify errors against data structure templates.

It is expected that these measures will assist in improving the quality of the data across the Arqiva sites.

Proposal

To validate the expectation of quality improvement, Arqiva proposes to commit to further actions to look at the data on the broadcast sites in future years.

- 1) Arqiva will trigger an audit of antenna data for a sample of broadcast sites to be carried out by the Arqiva Internal Audit team.
- 2) Arqiva will invite the Adjudicator to carry out an audit of antennas on a sample of broadcast sites.
- 3) Arqiva will trigger an internal independent audit of the actions agreed across Terrestrial Broadcast and Telecoms to ensure that the proposed improvements (e.g. process work) have been implemented and that improved practices are being maintained

These audits would be carried out once per year for the next two years starting in spring 2017.

The antenna audit and process audit by the Internal Audit team will use internal Arqiva effort. The antenna audit for the Adjudicator will use internal Arqiva effort and an auditor selected and funded by the Adjudicator to give an independent view.

Arqiva may also implement some additional surveys of sites to investigate customer issues for Telecoms customers. This will be addressed solely within Arqiva.

Annex 1: Sample of site photographs

Clockwise from the left; Hannington, Exeter St Thomas, Marlborough, Caradon Hill, Plympton, Salisbury



Annex 2: Glossary of related terms used in the Arqiva schedule

4L Cardioid	Four Lambda Cardioid where lambda relates to the wavelength of the services being transmitted.
8L Cardioid	Eight Lambda Cardioid
16L Cardioid	Sixteen Lambda Cardioid
DR	Digital Radio
GPRS	General Packet Radio Service
MHA	Mast Head Amplifier
ODU	Outdoor Unit
PCN	Personal Communications Network
RCU	Remote Control Unit
TETRA	Terrestrial Trunked Radio

Latest Antenna Status Explanation

Installed	Antenna in use – included in Site Apportionment
Planned	Antenna expected to be installed – not included in Site Apportionment
Redundant	Antenna not in use – not included in Site Apportionment
Reserved	Antenna expected to be installed – included in Site Apportionment
Remove	Used to highlight antennas for removal and may be used with an Installed or a Redundant antenna.

Feeders

A feeder is usually associated with an antenna.

Where a broadcast antenna is constructed from a number of separate dipoles, panels or other discrete elements, the group of antennas that comprise the whole antenna system will be captured within Keep as a number of elements.

Each antenna entry may have multiple tiers in the Keep antenna entry.

A five-around antenna system of eight tiers will have five antenna entries, (usually one per bearing), and eight panels in the individual entry on that bearing stacked above each other.

For such an antenna system, there will be only one or two feeders. These are associated with the antenna entry for one bearing and no feeders are associated with the remaining antennas in the system on other bearings.

An example of this is:

Mendip S1 DTT antenna, (DT_MEN_01), - 10 tiers of panels on 5 faces

Antenna ID	Antenna Type	Antenna Quantity	Feeder Quantity
258319	UHF DTT Panel	10	2
258321	UHF DTT Panel	10	0
258322	UHF DTT Panel	10	0
258326	UHF DTT Panel	10	0
258327	UHF DTT Panel	10	0

Antenna Leg Designation

Each structure will have each leg of the structure designated with a letter starting from A. Any face of the structure may be defined as being between two adjacent legs such as AB and CA.

There are additional designations used, either where the antenna is at the top of the structure or for structures that do not have legs such as steel or concrete cylinders.

The following description is used in Keep:

Antenna Leg denotes the mounting position of the antenna on the structure. Codes referencing the structure legs are used for towers (i.e. A, B and C for triangular towers - A, B, C and D for square towers - leg A is always the first leg east of True North).

Examples:

- A (antenna located on leg A),
- AB (antenna located at the centre of face AB),
- ABR (antenna located along the right half of face AB),
- ABL (antenna located along the left half of face AB).
- A number of other codes identify alternative mounting locations:
- AXI (antenna on top of the tower located centrally),
- TOP (antenna on top of the tower offset from centre),
- WAL (antenna located on a wall or building),
- P (antenna located on a pole or other cylindrical structure),
- ALL (antenna located on a triangular/delta frame),
- TOR (antenna located on a circular/toroid frame) and
- PLT (platform signifier).

An antenna may have a bearing on which it is pointed, but this may not apply to some antennas such as omni-directional antennas. These antennas may be given a bearing of 0 degrees or 360 degrees.

Annex 3: Antenna observations

Columns 13 to 15 show the results of the antenna observations. Columns 1 to 12 are extracted from the KEEP database except where an antenna was observed but not recorded in the KEEP database, in which case the record has been added to this table.



Annex 4: Accommodation results from observations



Annex 5: Electricity consumption results from observations



Annex 6: Arqiva's explanation of electrical consumption variances at Plympton

Keep Audit – Electricity

Plympton – DTT Services

1) ✂ Multiplexes

The approach to charging that has been agreed with the customers is as follows:

Measurements are taken at 5 sites with the same equipment type of a similar power setting. The relevant type for Plympton is ✂ Low.

The measurements are from meters for the service and also from measurements over a period of operation.

The aggregate power consumption for one service is then derived from these measurements and used as an average consumption.

The average consumption is then applied to all of the ✂ services that have the same equipment type and are agreed to have an appropriate power level. There are 81 services with equipment type ✂ Low.

The agreed consumption of the Plympton ✂ services is for the average power consumption in the group of services.

Derivation:

Measurements for 5 sites = ✂Wh per service per day

Monthly consumption = ✂ x number of days = ✂kWh for a 30 day month

This results in the agreed annual consumption = ✂kWh.

The range of power levels for the services in the equipment group ✂ Low is from ✂W to ✂W. The Plympton ✂ services are at one end of this group at ✂W.

The spread of power levels across the group is shown in the two figures for each of the ✂ and ✂ services included below.

Figure 1:- ✂ and ✂ Output Power Level for ✂ Low Category Equipment



Figure 2:- ✂ Output Power Level for ✂ Low Category Equipment



2) ✂ Multiplex

The approach to charging that has been agreed with the customer is as follows:

The consumption of the Plympton ✂ service is matched to the Fenham ✂ service along with five other sites of similar power levels. The Fenham ✂ service is measured by meter.

Measurement of the Fenham consumption for ✂ = ✂ kWh per month.

This results in the annual consumption = ✂ kWh.

Annex 7: Arqiva's analysis of the discrepancies in the KEEP records and the impact on broadcast customer charges

Office of the Adjudicator - Broadcast Transmission Services

Keep Audit – Impact on Pass-Through Charges

Following the Keep audit for the Adjudicator at two different samples of sites, Arqiva has carried out analysis of the impact of the discrepancies that were identified in the audit. The customer use of antennas on structures is used to apportion certain charges, including pass-through charges in accordance with customer contracts. These pass-through charges are for the rent and rates related to the use of the site.

Keep is used to record the data associated with antennas on Arqiva's structures and is then used to calculate relative wind loading in order to apportion the correct charge to each customer. Should Keep data be inaccurate, then the charges to each customer could also be inaccurate.

The analysis from the two six site samples has identified only small potential changes of the pass-through charges. Details are provided in the analysis spreadsheet.

In summary for the services on the two samples of six sites:



The changes lead to both small increases and small decreases to charges per site per service.

The analysis of the discrepancies is site specific and does not result in common changes that can be implemented more widely across further sites. Furthermore, in the normal course of business the number of sharers increases and decreases over time as well as the underlying rent and rates at each site. This results in annual variations to pass-through charges in the order of 3%, which we note is a greater order of magnitude than the variations reported here.

As a result, Arqiva will implement the corrections for the specific sites already identified and will also follow up other on-going initiatives that will review and update the Keep data.

For the services on the sample sites the changes to charges for the customers are being implemented under the terms of the relevant customer contract.



Office of the Adjudicator - Broadcast Transmission Services

Keep Audit – Impact on Network Access (Non-Pass-Through) Charges

Following the Keep audit for the Adjudicator at two different samples of sites, Arqiva has carried out analysis of the impact of the discrepancies that were identified in the audit. The customer use of antennas on structures is used to apportion certain elements of the Network Access contribution to certain customer charges in accordance with customer contracts. The customer use of antennas is not part of the Managed Transmission Service charge.

Keep is used to record the data associated with antennas on Arqiva's structures and is then used to calculate relative wind loading in order to apportion the correct charge to each customer. Should Keep data be inaccurate, then the charges to each customer could also be inaccurate.

The analysis from the two six site samples has identified only small potential changes of the Network Access charges. Details are provided in the analysis spreadsheet.

In summary for the services on the two samples of six sites:



Note: The Network Access charges shown are for the 12 sites sampled

The changes lead to both small increases and small decreases to charges per site per service, (up to +/- ✂ pa per TV Multiplex and up to +/- ✂ pa per Radio service).

The analysis of the discrepancies is site specific and does not result in common changes that can be implemented more widely across further sites. Furthermore, in the normal course of business the number of sharers increases and decreases over time.

As a result, Arqiva will implement the corrections for the specific sites already identified and will also follow up other on-going initiatives that will review and update the Keep data.

For the services on the sample sites the changes to charges for the customers are being implemented under the terms of the relevant customer contract.

