Section 5

Geographic market definition

Introduction and summary of the proposals

- 5.1 We set out our approach to market definition in Annex 7, and our provisional views on retail product markets in Section 3. In Section 4 we set out our proposed definitions for the relevant wholesale product markets. In this Section we explain our proposals for the geographic scope of the relevant retail and wholesale markets with the exception of the trunk market which is considered in Section 6.
- 5.2 This Section is structured as follows:
 - We set out our proposed approach. This includes:
 - o Setting out the responses to our proposals in the Call for Inputs (CFI);
 - Setting out our approach to the basic geographic unit and highlighting the need to take into account a number of different factors when assessing variations in competitive conditions in the provision of leased lines, in particular at the wholesale level.
 - We set out how we propose to define the relevant retail geographic market for the purposes of this review, taking into account the need for a forward look of three years up until the next review. This includes setting out the cumulative criteria we have applied, and how we have applied them. These are:
 - Analysis of retail service shares
 - Consideration of consumer survey evidence
 - o Consideration of BT's pricing policies
 - We set out our proposals for separate retail and wholesale geographic markets in Hull.
 - We set out how we propose to define the relevant wholesale geographic markets for the purpose of this review. This includes setting out the cumulative criteria we have applied, and how we have applied them. These are:
 - o Assessment of the extent of alternative operators' infrastructure
 - o Review of BT's pricing policies
 - o Analysis of wholesale service shares
 - Finally, we set out our assessment of competitive conditions in city areas outside London and Hull and our reasons for not proposing separate geographic markets outside of London and Hull.

Our proposals

5.3 We have analysed the retail market for TI low bandwidth leased lines and all the wholesale product markets for leased lines defined in Section 4. Our proposed views on the geographic scope of each of the above markets are as follows:

Product market		Geographic markets				
Retail	TI Low bandwidth	The UK excludin	The Hull area			
	Low bandwidth (LB TISBO)	The UK excluding the Hull area		The Hull area		
Wholesale Traditional Interface	Medium Bandwidth (MB TISBO)	The UK excluding the WECLA and the Hull area		The Hull area		
Symmetric Broadband Origination (TISBO)	High bandwidth (HB TISBO)	The UK excluding the WECLA and the Hull area		The Hull area		
	Very high bandwidth (VHB TISBO)	The UK excludin	The Hull area			
Wholesale Alternative Interface Symmetric Broadband Origination (AISBO)	Up to and including 1 Gbit/s (LB AISBO)	The UK excluding the WECLA and the Hull area	The WECLA	The Hull area		
Wholesale Multiple Interface Symmetric Broadband Origination (MISBO)	> 1Gbit/s	The UK excluding the WECLA and the Hull area		The Hull area		

Table 22: Proposed geographic market definition

Our proposed approach to geographic market definition

Call for Inputs

- 5.4 In the CFI¹, we stated that "[o]ur proposal is to adopt broadly the same analytical approach employed for the [2007/8 Review]".
- 5.5 In the 2007/8 Review we defined geographic markets by identifying geographic variations in competitive conditions. We used postcode sectors as the appropriate geographic unit for identifying areas of the UK where competitive conditions were sufficiently distinct from the rest of the UK.
- 5.6 In the CFI we said that, "[i]n our view, the framework for the analysis of geographic markets used in the [2007/8 Review] [...] continues to be relevant for this review and can be maintained unaltered". We asked stakeholders whether they agreed that our

¹ <u>http://stakeholders.ofcom.org.uk/consultations/bcmr-inputs/</u>

analytical approach is still relevant and continues to provide an effective tool for assessing competitive conditions and for considering regulatory obligations².

5.7 We set out below the stakeholders' responses to our proposal to adopt broadly the same approach as the one adopted in the 2007/8 Review. In summary, responses focused on the continued use of postcode sectors as the appropriate geographic unit.

Stakeholders' responses to the CFI and our comments

- 5.8 TTG agreed with our proposed approach. EE and H3G also agreed with the approach but with reservations about the robustness of the data.
- 5.9 BT's main concern was:

"to avoid situations where BT is regulated at a large business site with competitive supply – for example a shopping centre, business park or data centre – because the postal sector as a whole does not meet the criteria. [...]To address this and avoid results that fly in the face of market realities, we think the methodology should have the flexibility to treat any such site differently to the rest of the postal sector in which it is located."

- 5.10 On the face of it, BT appears to be advocating a more granular approach to market definition than we proposed in the CFI, with potentially at least some individual business sites being treated as separate markets. BT also commented, first that identifying all sites belonging to companies with 250 or more employees as potential leased line users, and secondly that the assumption that operators would not be prepared to dig more than 200m to connect to a new customer, were "weaknesses" of Ofcom's approach. We regard these two latter comments as relevant to our wholesale market definition analysis and consequently we address them when we carry out that analysis further below³. What is clear to us, however, is that in BT's view, by adopting the same approach to geographic market definition as the one adopted in the 2007/8 Review we would exclude supply to some large leased line users from the competitive market area.
- 5.11 We address BT's response later in this Section in our discussion of the geographic markets for MISBO services which are the very high bandwidth services frequently used by datacentres and other customers who need to transfer very large amounts of data. We have also taken BT's response into account in our assessment of the appropriate ex ante regulation to address competition problems where we have proposed a finding of SMP in a relevant market⁴.
- 5.12 The CMA said that "geographic segmentation is not compatible with maintaining competitive markets for multi-site business users having CELA locations".
- 5.13 We understand the CMA to be arguing that multi-site users prefer to purchase all their leased lines services from a single national supplier and that this means the relevant underlying wholesale markets should therefore be regarded as national in

² See Question 8.

³ The build distance assumption is an input to our "network reach analysis" which is described in detail in paragraph 5.83 onwards.

⁴ A detailed analysis of the case for differential remedies for datacentres is contained in Annex 12.

scope. As set out in this Section, on the basis of our geographic definition analysis, we do not agree with this argument⁵.

- 5.14 C&W did not comment on the use of postcode sectors although it did comment on aspects of our approach to wholesale geographic market definition. In particular, C&W thought that we should ask CPs for details of how far they had built out their networks in order to serve new customers in recent years.
- 5.15 We have submitted a further information request to OCPs in order to obtain information on their build out in recent years⁶. For each instance in the period 2008-2011 where an OCP has extended its own network infrastructure to connect a business premise for the purposes of supplying business connectivity services, we specifically asked the length of such an extension as well as other information about the services provided over it. We have used this information to inform our approach to the assessment of competitive conditions and in particular the availability and potential reach of alternative infrastructure. We describe this further below in our wholesale geographic market definition analysis.
- 5.16 UKCTA's view was that competitive conditions depend more on where a circuit is in BT's network rather than on its geographic location in the UK, an approach it described as "contextual". We regard this view as relevant to wholesale product market definition and consequently we have addressed it in our wholesale product market definition analysis. In arriving at our proposed wholesale product markets we have noted that LLU backhaul differs from other AISBO circuits in that it does not include an access tail. In effect the access segment of an LLU backhaul circuit is the MPF copper local access line. In theory, the fact that this is always provided by BT might give rise to some differences in competitive conditions between LLU backhaul and other AISBO circuits, however, in practice, we have found that competitive conditions are sufficiently homogeneous for us to include LLU backhaul in the AISBO product markets⁷. In our wholesale product market definition analysis, we have also considered whether it is appropriate to include access and backhaul more generally in a single market and our view is that it is appropriate. In this Section, as part of our analysis, we seek to identify geographic variations in competitive conditions in our proposed wholesale product markets by evaluating the availability of network infrastructure at all LLU sites located in any proposed separate geographic market. We find that the geographic pattern in the availability of alternative infrastructure at LLU sites is similar to that at any other site where leased lines are potentially in demand.
- 5.17 UKCTA suggested that competitive conditions in LLU backhaul might differ from other AISBO circuits of equivalent bandwidth. We regard this is a product market definition issue, but we also note it has a geographic dimension. We propose in this consultation that LLU backhaul is part of the AISBO market (for the relevant bandwidth) because our analysis shows that, in a given geographic area, competitive conditions are sufficiently homogeneous across the two services⁸. We consider that

⁵ Indeed, in the 2007/8 Review we took the view that, even if retail customers have a national purchasing policy, this does not mean that wholesale markets are national in scope, because of the ability of network operators to interconnect with each other. We also required that separate geographic markets should be composed of contiguous sets of postcode sectors.

⁶ Under the powers given to us by section 135 of the Communications Act 2003.

⁷ We consider this again in our assessment of SMP in the relevant AISBO markets and our view is that there are no significant differences in competitive conditions (see Section 7).

⁸ See Section 4 on wholesale product market definition.

the concerns about SMP in LLU backhaul, also raised by both C&W and Sky, arise because it is used largely outside potentially more competitive areas such as London. Within any given geographic area, on the basis of our analysis we consider that competitive conditions would not differ materially from other AISBO. We discuss the provision of LLU backhaul in the WECLA further below (paragraph 5.153 onwards).

- 5.18 Verizon said that the approach was "flawed" and that we should look at actual rather than potential competition based on assumed build distance.
- 5.19 For the reasons we set out below, we consider it appropriate to assess variations in competitive conditions on the basis of multiple criteria. Specifically, we do not propose to rely solely on the network reach indicator which, as pointed out by Verizon, provides an assessment of potential competition and allows a forward look view. Instead we rely also on an indicator such as the share of supply (evaluated on the basis of March 2011 data), which allows us to assess actual competition by means of the number of services sold by CPs and their distribution.
- 5.20 In general therefore, we have interpreted these responses to mean that the criteria used to assess geographic variations in competitive conditions are of more concern to respondents than the use of postcode sectors themselves as the appropriate geographic unit in which we then apply those criteria.

Proposed approach to geographic market definition

- 5.21 Our approach to geographic market definition is set out in Annex 7. In summary, having considered response to our CFI, having taken due account of the SMP Guidelines⁹ and consistent with the ERG Common Position¹⁰, our approach is based on identifying geographic variations in competitive conditions. We note, in this respect, that this approach is consistent with the approach adopted in the 2007/8 Review. However, as set out later in this Section, we also consider whether we need to modify how we implement our approach in order to reflect developments since the 2007/8 Review.
- 5.22 As set out in the SMP Guidelines:

"According to established case-law, the relevant geographic market comprises an area in which the undertakings concerned are involved in the supply and demand of the relevant products or services, in which area the conditions of competition are similar or sufficiently homogeneous and which can be distinguished from neighbouring areas in which the prevailing conditions of competition are appreciably different. The definition of the geographic market does not require the conditions of competition between traders or providers of services to be perfectly homogeneous. It is sufficient that they are similar or sufficiently homogeneous, and accordingly, only those areas in which the conditions of competition are

⁹ Commission guidelines on market analysis and the assessment of significant market power under the Community regulatory framework for electronic communications networks and services (2002/C165/03).

¹⁰ ERG common position on geographic aspects of market analysis (definition and remedies), October 2008 (ERG Common Position).

'heterogeneous' may not be considered to constitute a uniform market"¹¹.

- 5.23 Therefore, geographic areas can comprise a single relevant geographic market to the extent that:
 - competitive conditions in these areas are sufficiently homogeneous; and
 - the areas can be distinguished from neighbouring areas where the competitive conditions are appreciably different.
- 5.24 When assessing the geographic scope of a market on the basis of the homogeneity of competitive conditions it is normal practice to start with a narrow definition (small area) and then to see how this can be augmented. This raises the question of what is the appropriate geographic unit to use for the geographic market assessment. That is, what is the smallest unit of area to be considered and how should it be defined? We address this question further below.
- 5.25 The ERG Common Position identifies three main steps in undertaking a detailed geographic market definition based on identifying variations in competitive conditions¹²:
 - the selection of the basic geographic unit, for example postcodes or exchange areas or administrative areas;
 - a judgment on whether an area can be identified with heterogeneous competitive conditions compared to the rest of the UK, according to factors such as the number of significant suppliers present, distribution of market shares and prices; and
 - the aggregation of areas with similar competitive characteristics in order to define the geographic areas over which to conduct the SMP analysis.
- 5.26 Before turning to how we have followed these steps in arriving at our proposals for the geographic scope of the proposed relevant product markets we have identified, we first set out the approach we have followed in identifying the basic geographic unit as it is common to our approach at both the retail and wholesale level.
- 5.27 Secondly, we point out that there are a number of different criteria relevant to an assessment of geographic variations in competitive conditions in the provision of leased line services, and these have to be reflected in the approach to geographic wholesale, and retail, market definition respectively. For instance, the fact that competition for the provision of wholesale leased lines services is based on investment in infrastructure, rather than the use of BT's network, means that we use a different approach to that used in the wholesale broadband access market. In the Wholesale Broadband Access (WBA) market review we pooled together a set of individual, not contiguous, local exchange areas to compose a geographic market,

¹¹ See paragraph 56 of SMP guidelines.

¹² Prior to conducting a detailed geographic analysis, as we do in this Section for all the proposed relevant product markets we have identified, the ERG Common Position recommends carrying out a preliminary analysis to determine "whether competitive conditions are such that a national approach to market definition, market analysis and the implications of remedies is justified". We consider the appropriate approach to adopt in this review, consistent with our approach adopted in the 2007/08 Review, is to proceed directly to conducting a detail geographic analysis.

leading us to identify three geographic markets¹³. Later on in this Section we explain why our approach to defining the geographic scope of the proposed leased lines product markets must be distinguished from the approach adopted in the WBA market review. We note, in this respect, that our approach in this review is in line with the 2007/8 Review.

Appropriate geographic unit

- 5.28 We consider that the most appropriate geographic unit for assessing the leased lines geographic market definition is the postcode sector. For the reasons we set out below, and consistent with the ERG Common Position¹⁴, we consider that the use of postcode sectors satisfies the following criteria:
 - they are mutually exclusive and less than national;
 - the network structure of all relevant operators and the services sold on the market can be mapped onto the geographic units – i.e. the postcode sectors;
 - they have clear and stable boundaries; and
 - they are small enough that competitive conditions are unlikely to vary significantly within the unit but at the same time large enough that the burden on operators and us, the relevant NRA¹⁵, with regard to data delivery and analysis is reasonable.¹⁶
- 5.29 We also note that the use of postcode sectors as the appropriate geographic unit is consistent with our approach in the 2007/8 Review.
- 5.30 When selecting an appropriate geographic unit it is likely that there will need to be a trade-off between granularity and practicality. For example, using individual business premises, which would certainly allow a very granular assessment to be conducted, could mean that obtaining accurate data, conducting the analysis and implementing the findings became impractical¹⁷. On the other hand, the geographical unit selected needs to be capable of mapping the local competitive constraints that exist in the market and in effect this means that the unit should not be so large as to arbitrarily mix together areas that have heterogeneous competitive conditions¹⁸. For example, using the nations and regions areas may seem to be attractive from a presentational point of view, but there would be a risk that competitive conditions within such large areas would not be homogeneous and as such their use would fail to capture the local competitive conditions that are being assessed.

¹³ Review of the wholesale broadband access markets, statement December 2010 <u>http://stakeholders.ofcom.org.uk/binaries/consultations/wba/statement/wbastatement.pdf</u>

¹⁴ See Section 2 of the Executive Summary.

¹⁵ National Regulatory Authority.

¹⁶ We have also carried out an analysis of the competitiveness of supply to datacentres within individual postcode sectors. This analysis is described in Annex 12.

¹⁷ The sheer number of individual premises makes them impractical as a general basis for conducting geographic market analysis. However, it may be practical to consider the competitiveness of supply to some individual sites, such as datacentres, where the much smaller numbers make the task manageable. Such an analysis is described in Annex 12.

¹⁸ This is consistent with the ERG Common Position.

- 5.31 We therefore considered a number of alternative options. At one extreme and in keeping with the view that retail customers are unlikely to move business premises in response to a SSNIP¹⁹, was the individual premises i.e. each business premise would be considered separately. In 2008, we estimated, based on the Experian Business Database that in the UK there were about 221,000 individual business premises which could be interested in using leased lines products.²⁰ Defining each as a separate market would, in our view, clearly have been impractical.²¹ We therefore looked for a more practical building block. Below, we set out the options for possible geographic units considered and identify the approximate number of units needed to cover the entire UK.
 - full postcode about 1.8m units. This was considered impractical because of the number of units;
 - business premises about 221k units also impractical due to the large number of units, except in specific circumstances where the number of relevant sites is small enough to make analysis manageable (such as the analysis of datacentres);
 - postcode sector about 10k units preferred on grounds of practicality and because it allows sufficient granularity to identify relevant variations in competitive conditions;
 - BT local exchanges about c.5.6k units practical and reasonably granular, and already used to define geographic markets for the WBA market review. However, unlike the WBA market, in which entry is possible by renting wholesale local access lines from BT, competitors in wholesale leased line markets require their own network infrastructure in order to supply customers. Connecting to BT at a particular exchange site does not by itself enable an OCP to supply wholesale leased line (TISBO or AISBO) services to the customers who might be located within the 'catchment area' of that exchange. To supply a TISBO or AISBO service the OCP must build its own network right to the customer. There is therefore no economic rationale for the geographic building block for wholesale leased line markets to reflect the structure of BT's network;²²
 - areas associated with BT Tier 1 nodes or Openreach Handover points (OHPs). Tier 1 nodes are the main points at which OCPs interconnect with BT for the purposes of supplying an end to end TI service whilst OHPs fulfil a similar function for AI services. As with BT local exchange areas, these areas are insufficiently granular for the purposes of defining geographic markets and do not reflect the fact that competition in TISBO and AISBO markets is infrastructurebased. This means that an operator will be able to compete in TISBO and AISBO

¹⁹ Small but significant non-transitory increase in price. See Annex 7 for an explanation of this and its relevance to our geographic market definition analysis.

²⁰ These are the premises belonging to businesses employing more than 250 staff overall. We think these businesses are likely to be typical of most leased line users. However, some particularly heavy users of connectivity, such as data centres, may not be captured by the Experian dataset and we have therefore carried out separate analyses of these using other data sources.

²¹ i.e. with regard to data delivery and analysis. However, some exceptions to this may be practical: see our analysis of datacentres in Annex 12.

²² In what follows, we will elaborate in more detail about the key differences between the characteristics of the WBA and leased lines market and their implications for the appropriate approach to geographic market definition.

markets in areas where it has its own network, but these will not necessarily correspond to the entire catchment area of a particular BT Tier 1 node or OHP;²³

- counties/metropolitan districts or Nations and Regions insufficiently granular.
- 5.32 We consider that the most appropriate geographic unit for assessing the leased lines geographic market definition remains the postcode sector.²⁴ In our view, the use of this option:
 - satisfies the criteria that the ERG Common Position states the appropriate geographic unit should satisfy; and
 - provides an appropriate trade-off, which must be made, between granularity and practicality. In particular this option provides a manageable number of units with which to conduct our geographic market definition analysis. The data is in most cases readily available from service providers. We have also taken into account the burden on operators and us with regard to the associated need for data and related analysis. In our view, the data delivery requirements based on postcode sectors strikes the appropriate balance.²⁵
- 5.33 We also note, in this respect, that this is consistent with the 2007/8 Review.

Assessing geographic variations in competitive conditions

- 5.34 Having identified the appropriate geographic unit, we apply criteria to analyse the conditions of competition in each postcode sector. By doing so, we will be able to group together areas which are sufficiently homogeneous and which can be distinguished from neighbouring areas in which the prevailing conditions of competition are appreciably different, to the point of being heterogeneous.
- 5.35 As the ERG Common Position makes clear, "market definition should be based on the actual conditions of competition, reflected by the behaviour of the market players (e.g. pricing) and the effect of their behaviour on market structure (e.g. market shares). As it is generally the case in ex ante regulation, the analysis of the criteria should also be forward-looking and should as far as possible take into account developments until the next review".²⁶
- 5.36 Consistent with our approach throughout this market review, the forward-looking period we have adopted in our analysis is three years up until the next market review.
- 5.37 As the ERG Common Position makes clear, which criteria are the most relevant will as in an SMP analysis depend on the circumstances and has to be decided by us as the relevant NRA. The relevant criteria should be applied cumulatively and such

²³ The catchment area of a node is the area within which BT's terminating segments are 'parented' to a node.

²⁴ We have not carried out an analysis of the sensitivity of the results of our geographic analysis to the choice of building block. However it seems likely that any reasonable approach would lead to the identification of broadly similar markets reflecting the geographic concentration of competition in certain locations. We consider the case for specific exceptions for datacentres and other large business sites as suggested by BT later in this Section.

²⁵ We note that some exceptions may be possible where the number of sites in questions is sufficiently small, as in the case of datacentres which we consider in Annex 12.

²⁶ See Section 4.1.

that differences in competitive conditions between different markets are large while differences in competitive differences within a market are small.²⁷

- 5.38 The criteria we apply cumulatively to define the geographic scope of the proposed wholesale product markets are:
 - number of suppliers (referred to as an assessment of the impact of alternative infrastructure supporting the provision of terminating segments);
 - distribution of service shares²⁸ (referred to as an assessment of wholesale service shares); and
 - pricing and price differences (referred to as an assessment of BT's pricing policies)
- 5.39 We assess barriers to entry²⁹ when we define the geographic scope of the wholesale markets as part of the application of the number of suppliers' criterion.³⁰
- 5.40 The criteria we apply cumulatively to define the geographic scope of the proposed retail markets, both within and outside the Hull area, which we identify as those in which ex ante regulation may be warranted are:
 - distribution of service shares;
 - pricing and price differences; and
 - the nature of demand, in particular the extent to which consumers source their retail leased lines services from multiple suppliers.³¹
- 5.41 Since we are primarily concerned with competition in the wholesale markets, of most relevance are the criteria we take into account for defining the geographic scope of those wholesale markets, in particular:
 - the requirement of contiguity as part of our assessment of the alternative infrastructure supporting the provision of terminating segments; and
 - how we take into account BT's service shares at the wholesale level.
- 5.42 We explain later in this Section the reasons for the proposed approach we have adopted.

²⁷ See Section 4.2.

²⁸ The ERG Common Position notes "these are not market shares in the true sense as the precise scope of the market has not yet been defined" (see Section 4.1). We refer to this criterion as the distribution of service shares however we apply the criterion in the same way as applied in the ERG Common Position.

²⁹ We note the ERG Common Position states that "barriers to entry are usually related to economies of scale and sunk costs" (see Section 4.1).

³⁰ We do this by assessing the impact of operators' alternative infrastructure.

³¹ This is consistent with the ERG Common Position (see Sections 2 and 4).

Defining the geographic scope of the proposed relevant wholesale and retail product markets

- 5.43 We first present the results of our assessment of competitive conditions in the Hull area (for both the proposed retail and wholesale product markets).
- 5.44 Secondly, we set out our retail geographic market definition analysis outside the Hull area, beginning with our approach and findings of the 2007/8 Review. We define the geographic scope of the proposed retail TI low bandwidth leased lines market outside the Hull area because we propose that this market is a market in the UK that warrants ex ante regulation.³²
- 5.45 Thirdly, we set out our wholesale geographic market definition analysis outside the Hull area. In this respect, we set out in Annex 7 the reasons why we proceed directly to define the geographic scope of our proposed wholesale product markets outside the Hull area in the absence of defining the geographic scope of the retail product markets outside the Hull area which we have set out in Section 3.³³

Geographic definition of retail and wholesale markets in the Hull area

Findings in the 2007/8 Review

5.46 In the 2007/8 Review we concluded that the Hull area was a distinct geographic market from the rest of the UK partly on the basis that KCOM, the incumbent operator, was by some distance the biggest communications provider, with a much wider network reach than other providers throughout the Hull area.

Proposals on retail and wholesale geographic markets in the Hull area

- 5.47 Having conducted an updated analysis of network reach and service shares in Hull, this remains the case. KCOM also adopts a uniform price policy and where it is required to publish its prices it defines a set of pricing rules which applies equivalently throughout the Hull area for all of its leased line services sold within the area.³⁴
- 5.48 Consequently, we propose that the Hull area constitutes a separate geographic market from the rest of the UK in each of the proposed retail and wholesale product markets for terminating segments, as defined in Sections 3 and 4. The precise definition of the Hull area is provided in the Notification in Annex 14 below.

³² References to ex ante regulation should be interpreted as SMP regulation – we use these terms interchangeably.

³³ In summary there are two reasons: first, and foremost, the retail geographic market definition is not necessary to inform our product and geographic wholesale market definition analysis; and secondly, apart from the retail TI low bandwidth leased lines market, we do not propose to identify any retail leased lines market outside the Hull area as a market in the UK warranting ex ante regulation.

³⁴ As part of its retail pricing rules, KCOM charges different prices where the ends of a retail circuit are in exchange areas which are not adjacent to each other. However, this applies equally whether each of the ends is located in Hull or elsewhere.

Product market		Geographic markets				
Retail	TI Low bandwidth	The UK excludin	The Hull area			
	Low bandwidth	The UK excluding the Hull area		The Hull area		
Wholesale TISBO	Medium Bandwidth	The UK excluding the WECLA and the Hull area	The WECLA	The Hull area		
	High bandwidth	The UK excluding the WECLA and the Hull area The WECLA		The Hull area		
	Very high bandwidth	The UK excludin	The Hull area			
Wholesale AISBO	Up to and including 1 Gbit/s	The UK excluding the WECLA and the Hull area	The WECLA	The Hull area		
Wholesale MISBO	> 1Gbit/s	The UK excluding the WECLA and the Hull area	The WECLA	The Hull area		

Table 23: Proposed geographic market definition

Retail geographic market definition

Approach and findings of the 2007/8 Review

- 5.49 As noted above, the only retail market we analyse in detail is the market for TI low bandwidth leased lines, as in the 2007/8 Review. Ofcom's retail geographic analysis in the 2007/8 Review had three main elements:
 - an analysis of retail service shares on a postcode sector basis, using retail circuit information provided by operators;
 - consideration of consumer survey evidence which found that around half of businesses use more than one supplier to provide business connectivity services, with the propensity to do so positively correlated with business size; and
 - consideration of BT's pricing policies, which can inform the extent to which there exists a common pricing constraint across geographic areas.
- 5.50 We used the following data sources to identify variations in retail level competition:
 - Data from service providers on the services which they provide at the retail level, including the geographic locations of the ends of these retail services, which we used to calculate service shares;
 - Consumer research which indicated the extent of multi-sourcing;
 - Information on BT's pricing policies and how these may or may not vary by geography.

Retail service provision data

5.51 In 2008, we estimated operators' shares of service provision in each of the postcode sectors in the UK. We found that BT's service shares in the retail low bandwidth TI leased lines market were reasonably uniform (in the vast majority of cases above 50%) throughout the UK, including and throughout London. This indicated that competitive conditions were geographically relatively homogeneous in this retail product market.

Consumer survey evidence

- 5.52 The main purpose of the geographic element of the consumer research was to ascertain the extent to which consumers source their retail leased lines services from multiple suppliers. Because of the inherent location-specific nature of leased lines, in the absence of regulation requiring the provision of wholesale products, any barriers to consumers purchasing leased lines from multiple suppliers would limit the ability of operators to compete and restrict them to offering services only in areas where they are able to provide services on their own network. Entry is likely to be easier if customers are prepared to buy from more than one supplier. Then, an operator would not need to supply all the requirements of a business, which might be spread across several locations, but could enter in a small local area. Local entry would then be more likely to lead to geographic variations in competitive conditions.
- 5.53 The consumer research conducted in 2008³⁵ showed that there was relatively limited use of multiple suppliers by large businesses. Of the businesses that did use multiple suppliers, those buying low bandwidth leased lines were significantly less likely to use more than one supplier than those businesses buying high and very high bandwidth leased lines.³⁶ Where a business used multiple leased lines suppliers, just under half used BT as one of the suppliers. Where a business used only a single supplier, over half used BT, with the next largest single provider being used by around 5% of businesses.
- 5.54 The consumer survey evidence suggested that, except for the largest of the large businesses, businesses tended to source low bandwidth retail leased lines from a single supplier. This indicated again that competitive conditions were determined on a national, or at least a very broad geographic, basis at the retail level.

BT pricing policies

- 5.55 The third element of the retail geographic analysis information was the pricing policies adopted by BT in each of the relevant retail product markets.
- 5.56 We noted that it would have been preferable to have the pricing policies of all operators in order to conduct a comprehensive analysis of geographic variations in competitive conditions. However, because retail leased lines are only one of a number of products sold by service providers to businesses and the fact that these tend to be priced on a bespoke basis, it was only possible to observe the retail prices of BT where it has obligations to publish these.
- 5.57 This information was relevant to our analysis as it could inform the extent to which there existed a common pricing constraint across geographic areas (see above). In

³⁵ <u>http://stakeholders.ofcom.org.uk/consultations/bcmr/bcmr_research/</u>

³⁶ That is to say that large business buying high bandwidth and very high bandwidth leased lines were more likely to use multiple suppliers.

circumstances where BT set a national price within a particular product market (and where it was not required to do so by existing SMP obligations) then this could indicate the existence of a national market.

- 5.58 In the same light, to the extent that BT set prices which varied on a geographic basis then this could also be an indication of geographic variations in competitive conditions which BT was responding to by setting lower prices in some areas compared to others.
- 5.59 At the time of the 2007/8 Review, BT priced some of its retail low bandwidth traditional interface leased lines circuits at a discount in the Central London Zone (CLZ), which is the area traditionally corresponding to 0207 numbers. This suggested that there could be a separate local market in the London area and that this could be perhaps defined by the CLZ boundary. However, BT was (as it still is) subject to retail regulation in this market which requires it to publish its prices and Ofcom concluded that, absent such regulation, BT might not continue to price in the way it has historically. For example, BT might choose to set non-uniform prices within the CLZ, or to set prices on a bespoke basis. Bespoke pricing is common practice amongst its competitors in this market and by BT itself in other retail leased lines markets where it is not under such regulatory obligations. Accordingly, BT's prices are not well suited in this instance to evaluating differentials in competitive conditions.

<u>Conclusions in the Ofcom 2007/8 Review on the geographic scope of the retail low</u> <u>bandwidth TI market</u>

- 5.60 We concluded that the retail low bandwidth traditional interface leased lines market was national (excluding the Hull area). This was primarily on the basis of the analysis of retail service shares and the consumer survey evidence. Whilst there was some differential pricing at the retail level, with lower prices available in the CLZ suggesting some difference in competitive conditions in the London area, this by itself was not considered to be sufficient to show that competitive conditions were sufficiently distinct that local markets should be defined.
- 5.61 We defined a separate geographic market in the Hull area, in which BT does not operate.

Our proposed approach and findings of the current review

Summary of the proposals on retail geographic market definition

- 5.62 We consider that the criteria and types of data (updated where necessary) used in the 2007/8 Review remain relevant to retail geographic market definition in the current review, taking into account the need for a forward look of three years up until the next review.
- 5.63 For the reasons set out below, we propose to find that the retail low bandwidth TI market is national in scope (outside the Hull area) as in the previous review. Annex 8 provides further detail of the analysis that we have conducted to inform our geographic market definitions. The rest of this Section sets out our approach to retail geographic market definition.

Service share analysis

5.64 Established case law indicates that market shares in excess of 50% carry the presumption of a dominant position. Further, market shares over 40% are, in the

Commission's decision-making practice, likely to be the source of concerns over dominance. Whilst this Section considers market definition rather than SMP, the key purpose of our analysis is to group postcode sectors based on homogenous competitive conditions on which we can base our SMP analysis. Consequently, it is helpful to take into account service share information when defining the precise market boundaries.³⁷

- 5.65 We requested that operators provide us with information on each of the retail circuits which they provide. This includes information on the postcode location of each end, the bandwidth of the circuit, whether the circuit is analogue or digital and the interface of the circuit (which allows us to distinguish between traditional interface or alternative interface).
- 5.66 With this information we are able to identify the retail provider of each circuit and assign it to the relevant product market. From the geographic information we are then able to construct a picture of how service shares vary on a geographic basis. This uses the postcode sector as the basic geographic unit (or building block) for conducting the analysis. We have not, however, included an analysis of service shares in the retail low bandwidth TI leased line market at the level of the postcode sector in this document, for the reasons set out below.³⁸
- 5.67 As noted above, we take a forward-looking approach to market definition. We have considered likely developments in service shares over the three years up until the next review. Our market assessment and any associated remedies will run for three years from the date of the statement.
- 5.68 The market generally is declining and significant new entry by local operators is unlikely to have occurred since the previous review. In fact we think the picture is likely to be one of consolidation among BT's rivals with some leaving the market as independent competitors. Nonetheless, BT's overall market share has fallen gradually over time since the last review suggesting some increase in the strength of competition. Along with other changes which have affected the market nationally (the achievement of replicability and the reduction in point of handover charges resulting from the charge control associated with the 2007/8 Review), we think that future developments in the market are more likely to be influenced by these national factors and, because significant new entry is unlikely, we do not anticipate the emergence of local variations in competitive conditions.
- 5.69 We also note that BT supplies almost 100% of the retail analogue circuits and this leaves little scope for geographic variations in competition in this market segment. Later on in this consultation, we will present our view that remaining retail regulation should be concentrated on the analogue and lowest bandwidth digital segments in the national market, as we discuss in Section 9.

³⁷ We use the term 'service share' when discussing the share of the sales of a particular product in an area which is smaller than a defined market, such as an individual postcode sector. Of course care should always be taken when interpreting market share data for the purposes of assessing market power, and this is particularly the case for small geographic areas where the number of leased line customers may be small, and hence service shares can be more than usually volatile.

³⁸ We have conducted an analysis of service shares in the retail Low bandwidth TI market, the results of which are included in Annex 8. In summary, this analysis indicates that – throughout the UK (except Hull) – BT holds a significantly high share of services supplied, which signals limited variation in competitive conditions by geography. This corroborates our proposal to find that this market is national in scope (outside Hull).

Consumer survey evidence

- 5.70 We have taken account of the latest findings from the Jigsaw Research report. Section 5.5 of the Jigsaw research report shows that leased line users choose their suppliers in very much the same way as in the previous review (for which research was conducted during 2007). In the latest survey, 47% of respondents said that they used more than one supplier (compared with 50% in 2007), and 53% use a single supplier for all Business Connectivity Services.
- 5.71 BT remains the largest supplier, as it was in 2007, with 2 in 3 respondents using BT for business connectivity services. Once again, large companies (those with more than 500 employees) are significantly more likely to use alternatives to BT than are small or medium businesses.
- 5.72 The high proportion of businesses using a single supplier (slightly higher than in the previous review) suggests that, at the retail level, national purchasing remains important. This view is borne out by the comments of the CMA in its response to the call for inputs. Although we do not agree with the CMA that the definition of a distinct geographic market in the London area (which in the 2007/8 review was found to be the CELA) will cause problems for multi-site firms experience does not suggest this is the case we note that the CMA said that multi-site businesses need national solutions at the retail level. This does not preclude the use, by the firm supplying the retail customer, of wholesale services purchased from more than one CP. Our view is that the finding of a distinct geographic market in the London area is not an obstacle to this and, in any case, only higher bandwidth TISBO markets were found to be competitive in this area in the 2007/8 Review.
- 5.73 Finally, as part of our forward-look, we have considered whether there is likely to be any significant change in purchasing patterns over the three years up until the next review. In the light of evidence from the 2011 and 2007 surveys that the proportion of businesses using a single supplier is broadly constant, we do not expect any significant change in the frequency of usage of multiple suppliers over this time horizon.

BT pricing policies

- 5.74 There has not been any material change to the pattern of geographic variations in retail prices since the last review, either in the extent of the CLZ discounts or in the areas in which discounts are offered.³⁹
- 5.75 Because we are here defining a retail market for the purposes of identifying retail level SMP and assessing the need for retail-level regulation, it is correct to take into account wholesale level regulation which is imposed to address wholesale level SMP. In the last BCMR, the wholesale low bandwidth TISBO market was found to be national in scope and BT was found to have SMP in it. As a result BT was required to provide low bandwidth TISBO products at controlled prices.
- 5.76 By itself, the availability of wholesale low bandwidth TISBO products nationally at a uniform price (except for the CLZ discount) is unlikely to encourage geographic variations in retail competition except where CPs compete using their own infrastructure. However, (to anticipate the findings of our later analysis) we propose that the wholesale low bandwidth TISBO market which underpins the supply of digital

³⁹ BT has maintained more favourable terms for Kilostream and Megastream customers demanding links whose ends are within the London CLZ area.

low bandwidth TI circuits is national in scope, indicating that geographic variations in the use of competing infrastructure to supply retail low bandwidth TI leased lines are limited. This seems likely to reflect the low-value and largely 'legacy' nature of the product and suggests that this picture is unlikely to change over the period before the next market review.

5.77 Finally, as part of our forward-look, we have considered whether there is likely to be any significant change in BT pricing policies over the three years up until the next review. Clearly BT can change its prices at any time⁴⁰ and so a change in the geographic pattern of BT's discounts cannot be ruled out. However, as there has been no material change since the last review, we think a material change over the relevant time horizon is unlikely.

Proposals on geographic market definition for the retail low bandwidth TI leased line market

5.78 As found in the 2007/8 Review, we propose to find that the retail low bandwidth TI market is national in scope (outside the Hull area).

Wholesale geographic market definition

Approach of the 2007/8 Review

- 5.79 In the 2007/8 Review, Ofcom developed a methodology for defining wholesale geographic leased line markets which had three main elements. As at the retail level, the aim was to identify areas where competitive conditions were significantly different from the surrounding area and, at the same time, sufficiently homogeneous for those areas to be regarded as distinct geographic markets. The three elements were:
 - An assessment of the impact of alternative infrastructure
 - An analysis of wholesale service shares
 - A review of BT's pricing policies

Our proposed approach of the current review

- 5.80 We consider that these elements remain relevant to wholesale geographic market definition in the current review. Consistent with our proposed approach to retail geographic market definition, we apply these criteria cumulatively. However, as set out earlier, our approach takes into account the different criteria relevant in assessing geographic variations at a wholesale level in competitive conditions. We also take into account the need for a forward look of three years up until the next review, consistent with the ERG Common Position and SMP guidelines.
- 5.81 Our approach involves first an assessment of the alternative infrastructure supporting the provision of terminating segments. For the reasons set out below, having carried out this assessment, we then apply the requirement of contiguity.
- 5.82 Secondly, on the basis of the results produced by the first step, we assess BT's service shares and its pricing policies in those geographic areas. The cumulative

⁴⁰ Subject to compliance with any required notice periods and of course such other regulation as may apply.

application of these criteria enables us to identify those geographic areas in which the conditions of both actual and potential competition are, in our view, sufficiently homogeneous and sufficiently distinct from those in neighbouring areas for them to be regarded as separate geographic markets.

Overview of the alternative infrastructure supporting the provision of terminating segments

Network reach analysis

- 5.83 The impact of alternative infrastructure is particularly relevant to competition in wholesale markets. This is because, in the absence of upstream regulatory remedies such as a requirement for BT to provide dark fibre or duct access, an operator wishing to compete with BT in wholesale leased line markets will require its own infrastructure (or negotiated access to another operator's) to do so.
- 5.84 Accordingly, in the 2007/8 Review, we devised a method for measuring the extent of alternative infrastructure on a postcode sector by postcode sector basis. This was the 'network reach analysis'.
- 5.85 In addition, we assessed the extent to which competing operators were likely to interconnect with each other, in the absence of regulation. As we noted earlier, a leased line connecting two points is unlikely to be regarded as a good substitute for a leased line connecting two different points. Hence to compete to supply any particular customer, an operator will need to be able to connect the relevant locations specified by the customer which may, for example, be two sites many kilometres apart. In an unregulated market, the operator will either need its own infrastructure in both locations, and between them, or it must be able to interconnect with other operators on a commercial basis, in order to supply the customer.
- 5.86 Interconnection becomes more relevant to competition the larger the area being considered. In the absence of interconnection, an operator would be limited to competing in the area where it has infrastructure of its own. But with interconnection, it, and the operators with which it interconnects, would be able to compete across a much wider area (for example, a major city consisting of many postcode sectors). Wherever one operator has infrastructure, all the interconnected operators would be present as competitors. It would then be appropriate to define an area as competitive even though no single operator (other than BT) might be present in all parts of it. We consider whether, in practice, operators interconnect with each other in our analysis of competitive conditions in individual market areas later in this Section.

Application of the network reach analysis to the current review

- 5.87 The purpose of the network reach analysis is to appraise the presence of alternative operators' infrastructure in order to capture the scope of potential competition. This is because an operator's infrastructure, while deployed in a given area, may not be actually in use at present (i.e. because the OCP has not sold any leased lines therein). For this reason, the network reach analysis is especially valuable in informing a forward-look at competitive conditions. The network reach analysis is inherently forward looking in the sense that it indicates the potential for competition rather than the actual competition which is shown in the service shares.
- 5.88 Our network reach analysis seeks to identify the average number of operators in a postcode sector that are able potentially to supply the representative customer, based on assumptions about the distance which an operator would be willing to build

from the operator's closest flexibility point ('flex point'). A flex point is a point on an existing network where a CP, in accordance with its current network planning practice, can add new fibre in order to connect it to end-users. Flexibility points may, for example, be buildings where fibre terminates on an Optical Distribution Frame or underground chambers where the fibre can be accessed, or where ducts meet at a junction. Where a CP connects a new end-user premise to its network, it may do so by digging duct from the premises to the nearest flex point on its network, installing new access fibre in the duct and then connecting this fibre with the existing fibre optic cabling at the flex point.

- 5.89 The important point to note here is that the network reach analysis is the same for each product market because operators can provide leased lines services in all of the proposed relevant product markets from each of the flex points. Where network is present, it can in principle be used to supply circuits of any capacity. The results, therefore, of our network reach analysis set out below for the wholesale low bandwidth TISBO market apply equally to all of the proposed relevant product markets for which we carry out our geographic market definition analysis. Although as noted below, the economic build distance is likely to be lower for lower bandwidth circuits, this point is reflected in our assessment of the competitive conditions of product markets. First, in the service share analysis, a higher BT service share will tend to be observed in product markets where the economic build distance is lower. Secondly, we have also considered the implications of build distances as high as 1km in the case of datacentres, and discuss the results of this analysis later in this Section and in Annex 12.
- 5.90 In practical terms our approach involves a number of different steps as set out below:
 - i) The flex points for each OCP (thus excluding BT) are plotted on a map;
 - ii) The locations of businesses with more than 250 employees across the business are also plotted on the map;
 - iii) A buffer area of 200m is drawn around the location of each business; and
 - iv) The number of different operators that fall within the 200m buffer area around each business site (counting each operator only once) is calculated.
- 5.91 This gives the number of OCPs from which each business site could seek supply, given the 200m build distance assumption. We then average this value across all the business sites within a postcode sector.⁴¹
- 5.92 We set out below the reasons for parameters used in carrying out the steps outlined above, starting first with the business size parameter.

Businesses with more than 250 employees

5.93 We have used the Experian Business Database to identify the location of large businesses in the UK. This database of business locations serves the purpose of providing a characterisation of the geographic pattern of potential, rather than just actual, demand for leased lines. As an alternative, we could evaluate the presence of alternative infrastructure simply by inspecting OCPs' network maps. However, this would be much less informative since, for example, some flex points may be far from

⁴¹ We have carried out separate analysis of network reach in relation to MNO base station sites, MDF sites used for LLU backhaul (see later in this Section) and for datacentres (see Annex 12).

any source of leased line demand. OCPs infrastructure can provide a meaningful competitive constraint only where it is close enough to those who may potentially consume services delivered upon that infrastructure.

- 5.94 While businesses which are a source of potential demand for leased lines (i.e. within the timeframe of the current review) differ in their characteristics, the survey that we conducted indicates that in general it is larger sized businesses which are associated with consumption of business connectivity. In line with the 2007/8 Review, we refine the Experian database by selecting only those businesses employing more than 250 employees UK-wide, which we deem to be most likely to have demand for leased lines services in general. We consider that this filter enables the network reach analysis to be computationally more manageable, which is desirable. At the same time, we expect the pattern of locations of small and larger firms to be broadly similar, which implies that this filtering would not bias the network reach analysis.
- 5.95 It may be possible that in some industries businesses employing fewer than 250 staff could demand leased lines (e.g. in finance, where a hedge fund with a few staff may demand leased lines). On the other hand, in other industries (e.g. agriculture or low ICT use sectors) it is likely that there are large businesses which do not constitute even potential demand for leased lines. To address the potential risk that the threshold may exclude businesses whose demand for leased lines could be relevant to our geographic market definition analysis, we have also considered some specific types of sites which are not in the Experian dataset MNO base station sites, MDF sites (relevant to LLU backhaul) and data centres⁴².
- 5.96 According to the latest data (obtained in 2011), in the UK there are around 221,000 sites belonging to firms employing at least 250 staff. This is the sample of sites that we use and refer to from now on. We have then compared this information to the location of competing operators' flex points. Based on this analysis we have been able to calculate the number of operators that are able to offer services to businesses in each postcode sector.
- 5.97 The two other key parameters in the network reach analysis are: the 'build distance'; and the number of operators which we require to be present. By network presence we mean operators who have a 'flex point' located within an assumed build distance enabling them to reach or address businesses in the area.
- 5.98 The build distance is the assumed distance that an operator would build out from their network in order to provide services to end users/customers. The base case build distance assumption that we have used in our analysis is 200m. This was the assumption used in the 2008 review.⁴³ We reconsider this assumption below, after having addressed the presence of other operators' networks.

Presence of other operators' networks

5.99 In the 2007/8 Review, we took the view that, on average, the presence of two or more operators (in addition to BT) within reach of the business site was a good indicator that an area would be more competitive than areas with limited presence of

⁴² See Annex 12.

⁴³ We are aware that, as the length of the build distance parameter decreases, so does the precision of the network reach analysis. This is because businesses occupy an area whilst we are forced to represent them by a point. Using a buffer distance below 200m will result likely in several cases where a site appears to have no network within reach while in reality the buffer intersects the boundary of the business.

alternative operators. In reaching this view, we took account of the cost structure of competing operators and the fact that within the London area, the area in which there were two or more operators in addition to BT closely matched the area in which BT's service share was relatively low.

- 5.100 We have reappraised the question as to what the appropriate threshold is to characterise a postcode sector as an area with high network reach. In the 2007/8 Review, the exact boundaries of the London geographic market (the CELA) were identified by grouping a set of London postcode sectors in which there were on average two or more OCPs within 200m of each site. In the call for inputs, we proposed to adopt the same approach for the current review. Having reviewed the responses, we consider that the key parameters of the approach the 200m and two competing CPs thresholds remain appropriate.
- 5.101 This is because, as found in the 2007/8 Review, competition in these markets is based on operators installing their own fibre and duct, and there have been no fundamental changes in the technology or costs of doing so since the 2007/8 Review nor do we consider that this will change over the course of the review period of three years.
- 5.102 Below we summarise the evidence which Ofcom relied on in the 2007/8 Review. In the light of this, we distinguish between those postcode sectors where, on average, BT and two or more other operators are within reach of the average business site and those postcode sectors where, on average, only one other operator is within reach or BT is the only operator. We will refer to the former as 'high network reach areas' and the latter as 'low network reach areas'. We do not consider that attempting to identify additional areas, for example 'very high network reach areas' with even greater numbers of operators present, would add materially to our evaluation of heterogeneity in competitive conditions for the purposes of market definition, though the presence of larger numbers of operators in an area can be taken into account in the SMP analysis.
- 5.103 This approach is consistent with the 2007/8 Review.

200m build distance assumption

- 5.104 As mentioned earlier, a number of operators commented, in their responses to the call for inputs, on the appropriateness of the build distance assumption.⁴⁴ Some, including BT, pointed out that the actual distance which operators would be willing to dig would depend on the value of the business they would gain by doing so, and this would in turn depend on the type of customer and particularly the bandwidth of the circuits to be supplied. In general, operators will be prepared to dig further the higher the bandwidth of the circuit.
- 5.105 We have not received evidence to suggest that economic build distances have changed materially since the 2007/8 Review. We therefore summarise here the detailed analysis undertaken in order to pinpoint 200m as the appropriate build distance assumption. Initially, in the January 2008 consultation document, a longer

⁴⁴ The 'BT+2' assumption seems to have attracted no comment. We also note that in its response to Ofcom's March 2010 Wholesale broadband access market review consultation, BT referred to academic work showing that the largest benefits to competition come with the addition of the third firm in a market, with subsequent entrants having a smaller impact. For our response to BT, see the second WBA market review consultation at:

http://stakeholders.ofcom.org.uk/binaries/consultations/wholesale-broadbandmarkets/summary/WBA_condoc.pdf, especially paragraph 3.33.

build distance of 250m had been used but this was revised downwards in the light of responses and further analysis. This analysis showed that 200m was most consistent with the results of the service share analysis for both the 34-45MBit/s and 155MBit/s TISBO markets. Indeed, the boundary of the CELA did not appear to be very sensitive to the build distance. So, even if BT is correct that operators are sometimes prepared to dig further to win a high value contract, there did not appear to be a good case for a general build distance assumption of more than 200m. Build distances above 200m were seriously considered but rejected after consultation in the 2007/8 Review and we do not consider are unlikely to have changed materially.

- 5.106 The analysis which we undertook to assure ourselves that the 200m distance was appropriate is set out in Annex 6 of the July 2008 consultative document.⁴⁵ The key elements are a detailed examination of service shares in the London area, and information from BT about its network extension rules.
- 5.107 Service share analysis showed that the appropriate build distance must be in the range of 150m 250m. We stated:

"there is a strong overlap between the postal sectors [within the London area] where BT has a low service share and the postal sectors which are more contestable based on an assumed economic build distance of 250m, 200m and perhaps also 150m [...] To reduce the economic build distance assumption below 150m would not appear to be consistent with the available evidence of the competitive outcomes in the various markets which is shown by the service share analysis".

5.108 The conclusive service share evidence for 200m is set out in paragraphs A6.22 – A6.24 of the July 2008 document. We examined BT's average service share in those postcode sectors which would be included within the boundary of the competitive area if a build distance of 250m was assumed, but not when one of 200m was assumed, and found that it was significantly higher than the average and (for 34-45MBit/s TISBO) above the 40% dominance threshold. BT's average service share in those areas which would then additionally be excluded if the build distance was further reduced to 150m was significantly lower, and below the 40% threshold. We concluded:

"The service share analysis as a whole therefore suggests that the most appropriate assumption is likely to be 200m".

- 5.109 We also took into account BT's policy on building out to serve a new customer. BT's recommended build distance from a flex point to a new customer was, for industrial estates and retail parks, 500m, it was 300m in shopping centres and business parks and lower again at 200m in financial and business districts. We considered that the latter was most relevant to the CELA, and this further reinforced the view that the appropriate build distance was 200m.⁴⁶
- 5.110 We have revisited the build distance assumption in the current review, supplementing the analysis from the 2007/8 Review. For this purpose, we requested information on the distance which CPs have actually built in order to install leased lines for business

⁴⁵ http://stakeholders.ofcom.org.uk/binaries/consultations/bcmr_tisbo/summary/consultation.pdf

⁴⁶ This distance will also be appropriate to the central business districts of other cities. We consider competitive conditions in urban areas outside London later in this Section.

customers over the last three years. The data shows that there was a large variation in the actual dig distance with, in some cases distances of over 1 km being dug.⁴⁷ This was however rather unusual (see Table 24 below), and the typical distance was much shorter, with the median value at 22m and the average at 65m.



Table 24: The distribution of build distance in OCPs network extensions over the past three years (extensions to customer site in order to supply leased lines)

- 5.111 For our purposes, what is relevant is the *maximum* distance which an OCP would be *generally* likely to extend its network to serve a business customer in the absence of regulation in the market under review (the modified Greenfield approach). It is then appropriate for our assumed economic build distance to be some way above the observed mean for two main reasons:
 - We note that observed build distances are likely to have been affected by the availability of regulated wholesale products from BT. It is possible that operators would be prepared to dig further if such products were not available as an alternative to investment in their own infrastructure.
 - ii) In most cases, the actual distance which an operator needs to dig to reach a customer will be less than the maximum, simply because some businesses will inevitably be located less than 200m from a flex point.
- 5.112 However, it should also be below the longest actual distance dug. The longest distances dug may well reflect special factors such as particularly high value

⁴⁷ This appears to have occurred only to a very limited extent, since out of circa 3000 network extensions (for leased lines) surveyed, only 22 are of 1km+ and a further 18 are of a length between 500m and 1km.

contracts for multiple services.⁴⁸ In our judgment, a build distance of 200m, which is above the mean, encompasses 94.5% of actual lengths of network extensions, but is below the maximum actual distance dug, is a reasonable approach and so we continue to regard 200m as the appropriate build distance assumption.

- 5.113 Importantly, as in the 2007/8 Review, we have also observed that the build distance of 200m produces outcomes which are supported by the results of the service share analysis in higher bandwidth markets.⁴⁹ The service share analysis indicates the extent of actual competition whilst the extent of potential competition is represented by the network reach analysis.⁵⁰
- 5.114 We understand that the build distance decision is made on a case by case basis and will likely vary by individual contract as a higher margin contract can support a bigger investment. However, the evidence from CPs shows a positive yet limited correlation (correlation coefficient = 0.19) between the distance of CPs' new build for leased lines and the bandwidth of the product delivered over it. This is consistent with using a single distance of 200m for the purposes of market definition, but supplemented by sensitivity analysis and the use of a longer build distance assumption in our analysis of data centres in Annex 12.
- 5.115 Finally, because the MISBO market comprises products of particularly high value compared to the rest of leased lines products, we have performed a further sensitivity analysis involving a longer build distance for this market. This is discussed further below in the subsection on MISBO.

Contiguity

- 5.116 Consistent with our approach in the 2007/8 Review, having identified postcode sectors with high network reach, we impose the requirement of contiguity.
- 5.117 A contiguity requirement reflects the fact that competition in wholesale provision of leased lines is based on investment in infrastructure, rather than the use of BT's network. This is because an OCP's decision to deploy infrastructure and supply leased lines is done on an incremental basis as extensions to its existing network. In addition, interconnection is key to competition in leased line markets. For an operator to be able to compete in an unregulated leased line geographic market it must have, or be able to obtain access to, infrastructure at both ends of the leased line and also between the two end points. This means that we need a different approach to that used in the WBA market review. In the WBA market review we pooled together a set of individual, non-contiguous local exchange areas to compose a geographic market, leading us to identify three geographic markets.
- 5.118 An OCP considering entry in the WBA market by means of local loop unbundling is likely to assess the economics of entry in each local exchange individually, by

⁴⁸ In the case of datacentres, where we are aware that contracts are likely to be large, we have considered the use of longer build distances. See Annex 12 for details.

⁴⁹ As a further robustness check, we have performed some broad sensitivity test by varying the build distance parameter. As expected, by varying this parameter by an increment of 50m, we obtain some changes in results, while the broad pattern of variations in competitive conditions (i.e. between London and the rest of the UK) remains broadly unaltered.

⁵⁰ On the basis that we rely on several indicators to assess geographic variations in competitive conditions (in line with ERG recommended practice) we do not agree with Verizon's view that our analysis is "flawed" by its inclusion of the network reach analysis.

comparing the cost of using LLU in that exchange with the benefits from serving the potential customer base linked to that exchange by means of LLU.⁵¹ An LLU operator pondering the business case for entering a given local exchange knows that by doing so it will gain reach to the entire set of delivery points (DPs) – i.e. the loops to all customers served by the exchange, and thus become able to serve all the household and businesses within the exchange catchment areas. However, unlike the exchange area which is the geographic building block in WBA markets, the postcode sector boundary does not have any intrinsic economic significance for the provision of business connectivity. An OCP considering the business case for deploying fibre in any given postcode sector (e.g. to fulfil a business tender for a leased line) will not by doing so automatically gain reach to all the sites in that postcode sector.

- 5.119 Therefore, grouping isolated postcode sectors in a single market would not reflect the economic characteristics of the wholesale provision of leased lines. Instead we group together neighbouring postcode sectors which we have identified as 'high network reach areas'. This provides us with a geographic area throughout which, on average, leased line users have a choice of at least two OCPs, in addition to BT.
- 5.120 The next step is to check BT's pricing policies and its services shares in the geographic area we have identified. The cumulative application of these criteria then enables us to identify whether the competitive conditions in that geographic area are sufficiently homogeneous and can be distinguished from neighbouring areas such that they constitute a separate geographic market.
- 5.121 Before we turn to assess BT's pricing policies and its service shares, we set out the results of the updated network reach analysis for the current review.

Results of the updated network reach analysis for the current review

- 5.122 We have repeated the network reach analysis carried out in the 2007/8 Review with the latest data on business and network locations. We have used this to review the boundary of the competitive CELA defined in the 2007/8 Review. In addition, we have carried out a similar analysis for other large city areas in which there is reason to believe that there could be significant infrastructure competition.
- 5.123 First we report the results of the updated analysis at the national level, from which it is possible to identify areas where competing operators are present throughout the UK.
- 5.124 We then report the updated analysis of the London area. This includes our assessment of the geographic coverage of alternative operators' infrastructure in London relative to the locations of businesses with more than 250 employees. We also assess the proximity of competing networks to MNO base stations, the MDF sites used by LLU operators, and data centres.
- 5.125 We discuss results from the analysis of other areas towards the end of this Section.

Results of the updated network reach analysis at the national level

5.126 The results of the distribution of high network reach areas throughout the UK (for a build distance of 200m) are shown in Figure 28. The results of the updated analysis for the London area are shown further below in Figure 29 and Figure 30 respectively.

⁵¹ In many cases, operators build up a retail subscriber base using WBA before switching to LLU and, in effect, beginning to self-supply WBA services.





Note: High network reach postcode sectors are in blue.

5.127 Throughout the UK, out of the 10,043 postcode sectors countrywide, only 753 (7.5%) are such that businesses have, on average, two or more alternative service providers within 200m (these areas account for 26,472 businesses sites, i.e. 12% of the whole of the UK business sites considered). Half of these postcode sectors are located in London (i.e. within the M25), while the remainder (377) are sparsely and disjointedly distributed across different areas, broadly corresponding to parts of other urban areas. We take these latter postcode sectors into account in the report of our analysis of competitive conditions in city areas outside London and Hull⁵². However, since the network reach indicator points to London as a key area for the geographic market analysis, we first review this area.

A reference area for the analysis of the London area: the WECLA

5.128 Figure 29 shows which of the postcode sectors in Greater London (e.g. within the M25 London orbital) have, on average two or more OCPs within reach of a business site – i.e. which therefore constitute areas of high network reach.

⁵² See paragraphs 5.291 onwards. We do not propose to define additional distinct geographic markets in these areas.





Note: High network reach postcode sectors are in light blue, motorways in grey, the London Metro area outlined in black and the 2007/8 CELA outlined in green, while data centre locations are displayed as stars.

- 5.129 Figure 29 above also displays (in green) the boundary of CELA, which is the area that was defined as a separate geographic market for some TI products in the 2007/8 Review. It also displays (in black) the boundary of the London Metro area which BT refers to in its network management and pricing practice and which pools together the catchment areas of a set of ASNs / LEs broadly located in and around central London.⁵³
- 5.130 This closer look at Greater London allows us to capture a pattern of alternative infrastructure presence which spans beyond the CELA boundary established in the 2007/8 Review. In particular, it is clear that the vast majority of the areas featuring high network reach are captured by a contiguous series of postcode sectors including CELA and extending West of CELA all the way to reach the edge of Heathrow airport and the M25 / M4 motorways junction. This reflects the competitive conditions along and in-between the urban corridors alongside the A4/M4 and the A40, which are areas sufficiently homogeneous and contiguous to the CELA.

⁵³ OR has offered on a limited basis some AI products at a discount within the London Metro and some other urban areas.

5.131 We propose to consider this set of contiguous postcode sectors as a reference area to assist the geographic wholesale market definition. We label this area as the West, East and Central London area (the WECLA).⁵⁴ Figure 30 below provides greater detail and highlights the WECLA (in deep blue)



Figure 30: Distribution of areas with high network reach - London

Note: the WECLA postcode sectors are in deep blue, other high network reach postcode sectors in light blue, motorways in grey, the London Metro area in black and the 2007/8 CELA in green, while data centre locations are displayed as stars.

- 5.132 In line with the approach to contiguity used for CELA in the 2007/8 Review, we include within the WECLA a handful of postcode sectors which, although not meeting the strict network reach criterion, are entirely surrounded by areas in the WECLA which are included on the basis of the network reach test. Specifically, this corresponds to only three postcode sectors (all in West London), which from now on we will consider as part of the WECLA reference area.⁵⁵
- 5.133 Compared to the CELA, which comprised 300 postcode sectors, the WECLA covers 387 postcode sectors (a 29% relative increase). While 2.9% of the UK business sites considered are located within the CELA, the WECLA accounts for 4.1% of business sites (a relative increase of 40%).⁵⁶

⁵⁴ A list of the postcode sectors which constitute the WECLA is included in Annex 14.

⁵⁵ As a robustness check, we have investigated in greater detail the attributes of these three postcode sectors (TW3 4, UB7 9, and W7 1) and concluded that, while they do not display a high level of network reach, they are characterised by: i) an average number of OCPs within reach of the average business site which is greater than 1.6 (thus not excessively below the threshold used to establish a high network reach); ii) a relatively small number of business sites located within these postcode sectors; and iii) a number and pattern of fibre flex points comparable to those in high network reach areas. On this basis, and noting the very low materiality of including these three postcode sectors in WECLA, we consider it appropriate to do so in order to compose WECLA. We have also looked at BT's service share in each product market in these three postcode sectors. In the MB, HB and VHB TISBO markets and in the MISBO market, there is in all three postcode sectors either no supply, or BT's service share is very low. In the LB TISBO and LB AISBO markets, BT's service shares are broadly in line with those elsewhere in the WECLA.

⁵⁶ The increase in coverage is likely to reflect the better quality of the flexpoint data available to the current review, as well as network expansion since the last review.

The geographic coverage of alternative operators' infrastructure in London

- 5.134 Absent the ability of operators to access wholesale services from other operators (either on regulated or unregulated terms) an operator would only be able to provide services within the geographic area covered by its own network. Therefore, an individual operator's coverage of a local geographic market might limit the competitive constraint that it can exercise in that local geographic market. In order to allow us to evaluate whether this might undermine any finding of local geographic markets in the London area, we have calculated the coverage of each operator in terms of number of postcode sectors and businesses within the WECLA reference area, using our assumed network build distance of 200m. This replicates what was done in the 2007/8 Review.
- 5.135 We review first the 2007/8 Review findings, displayed in Table 25, which found that, in 2007/8 for the CELA market, at least two operators had a very significant coverage of the market, and one other was able to provide services to more than half of all the businesses included in the dataset and also present in three quarters of the postcode sectors. On the basis of this analysis, the 2007/8 Review noted that there were operators able to provide services to businesses throughout the CELA market without needing to access wholesale products from other operators (either BT or other alternative operators).

Communications provider	Businesses	Postcode sectors
Operator 1	99%	100%
Operator 2	97%	100%
Operator 3	55%	76%
Operator 4	20%	39%
Operator 5	17%	28%
Operator 6	17%	29%
Operator 7	9%	21%
Operator 8	7%	17%
Operator 9	7%	14%
Operator 10	4%	9%
Operator 11	4%	10%
Operator 12	4%	9%
Operator 13	3%	6%
Operator 14	2%	4%
Operator 15	1%	1%
Operator 16	0%	0%
Operator 17	0%	0%
Operator 18	0%	0%
Operator 19	0%	1%
Operator 20	0%	0%
Operator 21	0%	0%

Table 25: Coverage of each alternative operator (excluding BT) in the CELA in 2007 by number of: i) business sites; and ii) postcode sectors (Table 13 of the January 2008 Consultation)

- 5.136 The operators' coverage evidence supported our conclusion that competitive conditions in the CELA market differed from those in neighbouring areas. The evidence that several operators had very significant coverage of the CELA meant the existence of an active merchant market for leased line capacity on OCP networks was less important for the finding of a separate geographic market in the CELA. Whether or not such a market existed, those large operators could compete throughout the CELA.
- 5.137 We have replicated the same approach used in the 2007/8 Review to assess operators' coverage in the WECLA reference area on the basis of the data collected for the current review. The results are shown in Table 26 below.⁵⁷

Communications provider	UK-wide		The WECLA		
	Businesses	Postcode sectors	Businesses	Postcode sectors	
Operator 1	32%	43%	90%	99%	
Operator 2	23%	42%	80%	96%	
Operator 3	7%	9%	47%	74%	
Operator 4	6%	13%	44%	76%	
Operator 5	5%	10%	31%	50%	
Operator 6	3%	5%	13%	32%	
Operator 7	2%	7%	13%	37%	
Operator 8	2%	5%	4%	7%	
Operator 9	2%	3%	3%	10%	
Operator 10	1%	2%	2%	8%	
Operator 11	0%	0%	2%	5%	
Operator 12	0%	0%	0%	1%	
Operator 13	0%	0%	0%	2%	
Operator 14	0%	0%	0%	1%	

Table 26: Coverage of each OCP (thus excluding BT) by no of business sites and by postcode sectors in the WECLA and UK-wide in 2011

- 5.138 The above evidence indicates that, as in the CELA, in the WECLA at least two operators would have a very significant coverage of the area, and one other would be able to provide services to about half of businesses and also be present in three quarters of the postcode sectors. Moreover, a fourth operator displays coverage similar to the third operator. This pattern is markedly different from that seen in the rest of the UK, which signals potential heterogeneous competitive conditions, with London being more competitive than the rest of the UK.
- 5.139 On the basis of this evidence, we consider that there are operators able to provide services to businesses throughout the WECLA reference area without needing to access wholesale products from other operators (either BT or other alternative operators). The fact that there are operators present with very significant coverage of

⁵⁷ We have also performed the same analysis for the CELA area and found that results on the basis of the current data are virtually unaltered from what displayed in Table 13 of the January 2008 Consultation. We do not observe any material change in the operators' coverage in CELA when comparing the current data with the 2007/8 Review evidence.

the WECLA means that, even if there were barriers to interconnection in this area, the market could still be effectively competitive.

- 5.140 We have also performed a further analytical step to gain a greater understanding of operators' coverage. While Table 26 above provides coverage statistics for each OCP, it does not allow us to understand whether the coverage of any two OCPs overlaps. If the coverage of several OCPs' overlaps, some customer sites (up to 10% of the total) might have no alternative network within reach. If there were complete overlap, then the coverage of all operators combined would be the same as that of Operator 1, and limited to 90% of businesses, even if each postcode sector in the WECLA has on average a high network reach.
- 5.141 The following figures and tables display the distribution of the network reach for each individual customer site considered. We compare the results for the WECLA to the UK-wide results of our analysis. The results show that there are distinct differences in the reach of OCPs' networks between the WECLA and the UK as a whole.



Figure 31: Distribution of OCPs per business site (UK)

5.142 Figure 31 reflects the network reach for the population of business sites considered as a proxy for locations potentially served or interested in being served by leased lines.

# of OCPs within reach	UK-wide	The WECLA
0+	100%	100%
1+	52%	95%
2+	22%	92%
3+	9%	75%
4+	4%	40%
5+	1%	17%
6+	0%	5%
7+	0%	2%
8+	0%	1%
9+	0%	0%
10+	0%	0%

Table 27: Cumulative distribution of OCPs within reach of business sites

5.143 Table 27 shows that only 22% of the population of UK business sites considered has two or more OCPs within reach of the site (that is, within 200m).



Figure 32 Distribution of OCPs per business site (the WECLA)

5.144 Figure 32 shows how the network reach pattern differs when considering only the subset of business sites located in the WECLA. Here, it is 92% of the business sites which have two or more OCPs within reach of the site.

5.145 Unlike the rest of the UK, in the WECLA a considerable majority of sites is within reach of the infrastructure of a large number of different alternative operators.⁵⁸

Alternative operators' infrastructure coverage of MNO, LLUO and data centre sites in London

- 5.146 As explained earlier, we have evaluated the strength of the competitive constraint imposed by the presence of CPs with their own alternative infrastructure by means of the network reach analysis. We have performed this analysis by using the Experian dataset to identify the sites belonging to businesses employing more than 250 staff.
- 5.147 There may nonetheless be some sites where there is demand for leased lines which may not have been included in the sample of sites from the Experian dataset (e.g. because they are not office locations or because the company owning the site may employ fewer than 250 staff). We have identified three sets of sites of this kind:
 - MNO sites such as mobile base stations where leased lines are purchased
 - MDF sites, where CPs provide broadband on the basis of local loop unbundling
 - Data centre sites
- 5.148 For each of these three categories, we performed a supplementary network reach analysis in order to test the broad validity of the results obtained with the main network reach analysis, based on sites in the Experian dataset. We have investigated whether the competitive conditions in terms of availability of OCPs' infrastructure are different at MNO, LLUO or data centre sites when compared to the conditions generally prevailing throughout the WECLA, measured with reference to the relevant business sites from the Experian database.

MNO base station sites

5.149 Figure 33 presents the results of the network reach analysis for MNO sites. We have computed the network reach indicator (by postcode sector) for the population of sites where MNOs purchase leased lines. We have not included sites where MNOs exclusively self supply the terminating segments serving the mobile network point. We have excluded these sites since, as discussed in the assessment of the product market definition in Section 4, we consider that, where MNOs supply fixed links themselves using microwave, MNOs are unlikely to consider leased lines from CPs as an effective substitute at the margin.⁵⁹ For this reason the appropriate set of sites are those where MNOs are presently purchasing leased lines from CPs.

⁵⁸ We have also analysed the area including the entire UK less the WECLA. The share of businesses in that area which have two or more OCPs within reach is 19%, which is comparable to the value of 22% obtained relative to all the UK business sites considered.

⁵⁹ In other words, MNOs are unlikely to switch between microwave links and fibre circuits in response to a small price change.



Figure 33: Distribution of areas with high network reach to MNO sites – London

Note: high network reach areas (for MNOs sites) are in yellow, motorways in grey, the CELA outline in green and the WECLA outline in blue.

5.150 When interpreting the evidence in Figure 33, it is essential to keep in mind that the average number of MNO sites per postcode sector is considerably smaller than the average number of business sites in the reference Experian dataset. Therefore whether a postcode sector presents a high network reach (for MNO sites) will be subject to a greater extent to random variations in the number of MNO sites. The key finding in Figure 33 which is of relevance to our analysis is that, throughout the entire WECLA, MNOs have access to infrastructure from, on average, two or more OCPs within reach.



Figure 34 Distribution of OCPs per mobile site (the WECLA)

5.151 Figure 34 displays the distribution of OCP coverage relative to each MNO site in the WECLA. The cumulative distribution in Table 28 indicates that a share of 94% of the population of mobile sites considered has two or more OCPs within reach of the site, whereas the analysis relative to business sites yielded a figure of 92%.

Table 28: Cumulative distribution of OCPs within 200m reach of mobile sites in the WECLA

# of OCPs within reach	Cumulative
0+	100%
1+	98%
2+	94%
3+	77%
4+	47%
5+	23%
6+	8%
7+	4%
8+	2%
9+	1%
10+	1%

5.152 On the basis of the above evidence, we consider that, with respect to the geographic pattern of availability of alternative infrastructure, the competitive conditions at MNO sites in the WECLA are similar to those at business sites in the WECLA.

MDF / LLU sites

- 5.153 The WECLA contains a limited number of LLU sites, amounting to 40 unique BT sites where 46 Main Distribution Frames (MDFs) are located. These are the head ends for the local loops providing the BT business and residential telephone/broadband lines. This is equivalent to less than 1% of the MDFs serving the whole of the UK. The vast majority of these MDF sites are in WBA market 3 which is competitive, the rest being in market 2 in which BT faces some competition but retains SMP. Hence there is a requirement for LLU backhaul at the MDF sites in the WECLA.
- 5.154 Given their small number compared to the number of postcode sectors in the WECLA (387), we do not present a figure displaying their location and the network reach results by each postcode sector. In the following chart, we present the results of our analysis of OCP coverage of MDF sites within the WECLA.



Figure 35: Distribution of OCPs per MDF site (the WECLA)

5.155 Figure 35 displays the distribution of OCP coverage relative to each MDF site in the WECLA. The cumulative distribution in Table 29 shows that 98% of the MDF sites in the WECLA are on average within reach of two or more OCPs' networks. This compares to 92% of businesses in the WECLA being within reach of 2 OCPs' networks on average.

Table 29: Cumulative	distribution	of OCPs	within 2	200m r	each of	MDF :	sites i	in the
WECLA								

# of OCPs within reach	Cumulative			
0+	100%			
1+	100%			
2+	98%			
3+	78%			
4+	37%			
5+	30%			
6+	13%			
7+	7%			
8+	2%			
9+	0%			
10+	0%			

5.156 On the basis of the above evidence, we consider that, with respect to the geographic pattern of availability of alternative infrastructure, the competitive conditions at MDF sites in the WECLA are similar to those at business sites in the WECLA.
Data centre locations

- 5.157 We have obtained a list of data centre locations, corresponding to 201 distinct postcodes. These locations include all those listed within a publicly available repository, as well as all those submitted to us by BT.⁶⁰
- 5.158 The WECLA contains 41 data centres, which amounts to 21% of the UK-wide set of data centres that we have been able to establish.



Figure 36: Distribution of OCPs per data centre location (the WECLA)

⁶⁰ The publicly available repository is available at <u>www.datacentermap.com</u>. This website is a free web service acting as the link between providers and clients in the data centre industry (worldwide). Data centres signup to this register to advertise their services. The register focuses on co-location and IP transit, but also covers a lot of other data centre services such as wholesale space, dedicated servers, internet exchanges and others. Since the website is free to use on both sides of the market and is financed primarily by advertising and commission fees for connecting providers with new clients we expect it to provide a relatively exhaustive list of data centres.

# of OCPs within reach	Cumulative
0+	100%
1+	98%
2+	95%
3+	90%
4+	83%
5+	73%
6+	49%
7+	34%
8+	15%
9+	12%
10+	12%

Table 30: Cumulative distribution of OCPs within 200m reach of data centre locationsin the WECLA

- 5.159 Figure 36 displays the distribution of OCP coverage relative to each data centre site in the WECLA. The cumulative distribution in Table 30 shows that 95% of the data centre locations in the WECLA are on average within reach of two or more OCPs' networks. This compares to 92% of business sites in the WECLA being within reach of 2 OCPs' networks on average.
- 5.160 On the basis of the above evidence, we consider that, with respect to the geographic pattern of availability of alternative infrastructure, the competitive conditions at data centre locations in the WECLA are similar to those at business sites in the WECLA.

Summary of results of the updated network reach analysis for the current review

- 5.161 On the basis of the analysis above, we propose:
 - To consider the contiguous postcode sectors making up the WECLA as a reference area for the purpose of identifying separate geographic markets. Compared to the CELA, which comprised 300 postcode sectors, the WECLA covers 387 postcode sectors (a 29% relative increase). While 2.9% of the UK business sites considered are located within the CELA, the WECLA accounts for 4.1% of business sites (a relative increase of 40%).
 - that, with respect to the geographic pattern of availability of alternative infrastructure, the competitive conditions at MNO base station sites, at MDF sites and at data centre locations in the WECLA are similar to those at business sites in the WECLA. We therefore propose that the WECLA and the rest of the UK as a whole (excluding Hull) are the reference areas for the purpose of identifying separate geographic markets remains unaltered.

Overview of BT pricing policies across the markets for terminating segments

Findings of the 2007/8 Review

5.162 In the 2007/8 Review, we evaluated the pattern of geographic discounts offered by BT, as summarised in Table 31 below.

Table 31: Summary of BT's pricing by product market as established in both the2007/8 Review (Table 10 of the January 2008 Consultation) and the presentconsultation

Market (name as per January 2008 Consultation)	BT pricing policy (as assessed in the January 2008 Consultation)	Market (in which it is included in this consultation)	BT pricing policy (as observed in this consultation)
Low bandwidth TISBO	Some circuits (2Mbit/s) priced at a discount in CLZ	Low Bandwidth TISBO	Some circuits (2Mbit/s) priced at a discount in CLZ
High bandwidth TISBO	CLZ discount	Medium Bandwidth TISBO	CLZ discount
		High Bandwidth TISBO	CLZ discount
bandwidth TISBO	CLZ discount	Very High Bandwidth TISBO	CLZ discount
Low Bandwidth AISBO	Single national price	Low Bandwidth AISBO	Some circuits' connection fees priced at a discount (on a time limited basis) in London and some other markets. Geographic price banding for EBD circuits
High Bandwidth AISBO ¹	Single national price	MISBO	Limited evidence, due in part to key prices being unpublished

Note 1: WDM circuits were outside the scope of the 2007/8 Review. In the current review they are included in the MISBO market along with high bandwidth AISBO circuits.

BT's pricing policies subsequent to the 2007/8 Review

- 5.163 Since the 2007/8 Review, BT has been deregulated in the CLZ area as to the provision of Medium Bandwidth TISBO and High Bandwidth TISBO products. BT currently sells Medium Bandwidth, High Bandwidth and Very High Bandwidth TISBO with a pricing schedule which provides a discount (for some elements) where the circuits are supplied to the CLZ. Across all TISBO markets there has not been any material change to the pattern of geographic variations in prices, either in the extent of the CLZ discounts or in the areas in which discounts are offered.
- 5.164 BT has introduced, to a limited extent, geographic variations in its pricing of some AISBO products. In particular, for a time-limited period, the connection (but not rentals) of the 1Gb/s EAD products have been offered at a discount in the London, Birmingham and Manchester metro areas. No geographic variations of prices have been implemented by BT for EAD 10Mb/s and 100Mb/s products. A similar connection discount was introduced in London for a time-limited period on another occasion. At the same time, BT currently sells EBD products on the basis of geographic price banding, which BT has claimed reflects the geographic variations in the costs of delivering EBD.⁶¹ The transient nature of the EAD 1Gb/s connection offer

⁶¹ BT has clarified to us that EBD is priced on the basis of three price bands, reflecting cost differences driven by different levels of network utilisation in urban, suburban and rural geo-types.

and the cost variations-driven nature of the EBD price banding lead us to consider that geographic variations in the AISBO pricing observed are not clear evidence of a difference in competitive conditions.⁶² Nonetheless, we note that, on those occasions where BT has offered geographic price variations, London has always been part of such schemes.

- 5.165 We have limited information on MISBO products, which at present are not subject to any SMP regulation. BT currently does not publish a list price for most of these products, which are instead priced on application according to the customer's individual requirements. MISBO products present a degree of customisation which could add complexity to the straightforward comparison of prices across different areas. We do not observe any price information that could shed light on geographic variations in BT's prices in MISBO.
- 5.166 Finally, we are aware that, for three reasons, the pricing pattern displayed in these markets is not sufficiently reliable as an indicator for the purpose of establishing heterogeneity in competitive conditions.
 - First, in several of the terminating segments markets, pricing is subject to the effect of regulatory measures in place.⁶³ That is, the prices observed in the markets where BT is regulated provide a limited indication as to what BT's pricing behaviour would be absent regulation.⁶⁴
 - Second, the pricing evidence before us is by definition not a forward-looking indicator. During the course of the next three years BT's pricing strategy may depart from the pattern that we have observed over the past few years, perhaps particularly in the low bandwidth AISBO market which we regard as prospectively competitive.
 - Third, we have some information on variation of costs by geography, although this information is only partial. As stated in the Explanatory note to the EC Recommendation on relevant markets⁶⁵, the existence of price variations does not necessarily imply variations in competitive conditions, absent an

⁶² See, in this respect, the ERG Common Position which notes "differences in prices could also reflect differences in underlying costs. Therefore, where geographic differences in prices are observed, NRAs should investigate whether they only reflect differences in costs or (also) differences in competitive conditions".

⁶³ The markets for certain TISBO circuits (covering all circuits of bandwidths up to 155Mbit/s) are currently subject to charge control.

Each EBD-enabled serving exchange is allocated a price band (A-C) based on the demographics of that node (volumes of business or residential premises driving broadband or voice traffic etc.). The price charged for a circuit is based on the serving exchange price band only. The principle is that a high demand node will drive higher levels of utilisation on its network, better efficiency and therefore low unit costs and as a result a lower rental price (with connection charge not varying by band). This is also reflected in BT's response (pp. 23-24) to the 2008 Leased Lines Charge Control consultation: http://stakeholders.ofcom.org.uk/binaries/consultations/llcc/responses/BT1.pdf

⁶⁴ A Greenfield scenario refers to a thought experiment about the workings of competition in a given market, absent regulation in that same market. Brownfield refers to the functioning of a market which is subject to regulatory measures.

⁶⁵ See pp. 12-13.

understanding of geographic variations in costs.⁶⁶ In our view, the information we have on costs suggests that geographic variations in pricing, which are currently largely limited to the CLZ, may at least in part reflect cost variations. However, the information on costs is incomplete, which suggests caution in its interpretation.

Overview of service shares across the markets for terminating segments

Proposed approach in the current review

- 5.167 In the Section above on retail geographic market definition, we explained that it is helpful to take into account service share information when defining the precise market boundaries⁶⁷ this applies equally to our assessment of wholesale geographic market definition. In this Section we set out the average of BT's service shares in all the postcode sectors in the two reference areas respectively we have identified on the basis of our network reach assessment: the UK (excluding the WECLA and Hull) and the WECLA. We examine service shares market-by-market in more detail later in this Section.
- 5.168 Consistent with the ERG's Common Position, we have considered two points in time to enable us to draw inferences about trends in service shares in the wholesale product markets we have proposed to define: 2007 and 2011. For completeness we also show the average of BT's service shares in all the postcode sectors in the UK (including the WECLA and Hull).

	BT service share						
		20	07		20:	2011	
	UK-wide	The WECLA	UK excluding the WECLA and Hull	UK-wide	The WECLA	UK excluding the WECLA and Hull	
LB TISBO	87%	73%	90%	85%	68%	89%	
MB TISBO	37%	22%	45%	59%	17%	74%	
HB TISBO	43%	18%	57%	39%	12%	49%	
VHB TISBO	7%	6%	7%	5%	3%	8%	
LB AISBO	65%	47%	69%	62%	41%	67%	
MISBO	65%	62%	66%	47%	15%	59%	

Table 32: Overview of service shares across product markets

5.169 As Table 32 shows, for four of the product markets (those highlighted in yellow), the service share indicator is markedly distinct in the reference London area of the WECLA when compared to the rest of the UK.⁶⁸ The pattern of shares in 2011 is very similar to that observed in 2007. This provides reassurance that this analysis is robust for market definition purposes.⁶⁹ As previously shown, the network reach

⁶⁶ This is stated in the ERG guidance, as referred to in the previous footnote. It is worth noting that an unregulated profit-maximising monopolist would set different prices in different areas, where there were geographic variations in marginal costs.

⁶⁷ This is also consistent with the ERG's Common Position.

⁶⁸ We have also computed the service shares for the London Metro area (as defined in the BT ASN network), which display a similar pattern as what is resulting from the WECLA reference area.

⁶⁹ Further discussion of the levels of and trends in market shares is contained in Section 7.

analysis indicates that the London area exhibits a pattern of presence of alternative infrastructure which is different from the rest of the UK.⁷⁰

5.170 We also take into account the need for a forward look of three years up until the next review, consistent with the ERG Common Position and SMP guidelines. At page 14 of the Common Position, the ERG states:

"As the market definition exercise is required to be forward-looking, it is important for NRAs to try to gauge how market shares might be expected to change over the period of the market review and whether any observed variations in current or historic market shares are likely to increase, decrease or remain relatively stable. In this regard it can be useful for NRAs to classify areas according to the level and the trend of the market share of the incumbent operator (e.g. high and stable or declining slowly, high and declining rapidly, low and stable or declining)."

- 5.171 At this stage we are only concerned to identify differences and similarities in competitive conditions between areas: we do not take a view on whether levels and trends in market shares are consistent with a finding of SMP until Section 7. Using the ERG classification, the table above shows that BT's share of the low bandwidth TISBO market is 'high and stable or declining slowly' both inside and outside the WECLA. This uniformity suggests that definition of a national market is likely to be robust over the forward-look period. Outside the WECLA, this is also true of the medium and high bandwidth TISBO markets and the MISBO market.⁷¹ But within the WECLA, these markets are more appropriately placed in the "low and stable or declining" category, with the fall in BT's share of the MISBO market since 2007 being particularly striking. The low bandwidth AISBO market outside the WECLA is also in the former category, but inside it is closer to being "low and stable or declining". These differences again confirm that our proposed market definitions are consistent with ERG guidance on taking a forward-looking approach. Finally, BT's share of the very high bandwidth TISBO market is everywhere "low and stable or declining", supporting the definition of a national market.
- 5.172 In what follows we set out our proposals on wholesale geographic leased lines markets, for each product market in Table 32 above we review the cumulative application of BT's pricing policies, and of its service shares, in each of the postcode sectors in the UK (excluding the WECLA and Hull) and in the WECLA. We also review the extent of variations in BT's service shares in each postcode sector in these geographic areas. We expect there to be significant variations in small areas like postcode sectors, because the number of circuits in any individual case is likely to be small, so we do not put much weight on the presence of outlying values (in some cases 0% or 100%) when identifying contiguous areas of homogeneous competitive conditions.

⁷⁰ The share estimates in Table X are of direct relevance for the purpose of the geographic market analysis, insofar as they allow us to highlight the presence of heterogeneous competitive conditions between different areas. It is for instance possible that, given the limitations in the data process (discussed in Annex 8), the AI shares may be biased downwards in each of the areas, which would nonetheless not undermine the evidential value for the geographic market definition analysis. In identifying apparently significant differences in market shares, we have taken into account both the difference between the shares and the level of the shares relative to the conventional 40% and 50% thresholds used in the assessment of market power.

⁷¹ See Section 7 for a discussion of concerns about the reliability of the 74% market share of medium bandwidth TISBO in 2007.

- 5.173 Before turning to this we set out in more detail why we have not sought to rely purely upon services shares in individual postcode sectors alone.
- 5.174 First, the absence of clear economic significance to the postcode sector boundary in the wholesale provision of terminating segments reduces the weight which could be reasonably attached to service shares in individual postcode sectors.⁷² Instead, the postcode sector is used as the appropriate geographic unit because it is small enough so that competitive conditions do not vary significantly within it and the overall number of areas is small enough for our analysis to be practical. Applying cumulatively the criteria of an assessment of alternative infrastructure and then BT's pricing policies and its service shares, we aggregate postcode sectors according to the homogeneity of the competitive conditions that our analysis identifies to the point where we can then identify a separate geographic market.
- 5.175 Secondly, a further characteristic of wholesale leased line markets which leads us to place less weight on service shares in individual postcode sectors is the fact that they may be, in some respects, 'bidding markets'. Particularly for higher bandwidth circuits, the number of customers in any given area is likely to be small, they are likely to be well informed and they typically make large but infrequent purchasing decisions. These purchases may in essence take the form of invitations to tender in which competing operators submit bids for a package of services to be supplied over a number of years and possibly locations. In many cases, a single operator can win the entirety of the bid and this may be sufficient to gain a high share of the total market in a small area, such as an individual postcode sector, in which the number of sites is likely to be low. Losing bidders can end up winning none of the tender and may therefore gain only a low market share or none at all in an individual postcode sector. However, the winner's high share does not, in and of itself, necessarily indicate market power. The bidding process may well have been competitive, and when the process is repeated, another operator may be able to win the contract.⁷³
- 5.176 This may mean that service shares in individual postcode sectors fluctuate over time to a greater extent than at the level of the geographic market as a whole. This is an important consideration because the ERG Common Position indicates that the definition of a separate geographic market is justified only when its boundary is sufficiently stable and sustainable. Therefore, we have first assessed the average of BT's service shares in all the postcode sectors in the UK (excluding the WECLA and Hull) and in the WECLA respectively. This has allowed us to assess BT's service share across the totality of each of the reference areas and thus cross-check the results of our network reach analysis.

Our proposals on wholesale geographic leased lines markets

5.177 In what follows, for each product market in Table 32 above, we review the cumulative application of BT's pricing policies, and its service shares in postcode sectors, in the two geographic areas we have identified as a result of the network reach analysis in our assessment of alternative infrastructure. While service shares vary by product market, the network reach indicator produced is instead invariant by product market.

 $^{^{\}rm 72}$ See also the discussion of this point in connection with the network reach analysis.

⁷³ In a paper for the Competition Commission, Paul Klemperer has argued that the term "bidding market" is overused and should not be taken to imply that competition problems do not or cannot arise in such markets. It is only under certain strict conditions that a bidding market will lead to an optimal outcome and these may well not be satisfied in practice. See "Bidding Markets", June 2005, at http://www.competition-commission.org.uk/assets/competitioncommission/docs/pdf/non-inquiry/our_role/analysis/bidding_markets.pdf

- 5.178 We then set out our proposed geographic market definition. Where we find evidence pointing towards sufficiently different competitive conditions in the WECLA relative to those prevailing generally in the UK as a whole, we propose to define separate geographic markets.
- 5.179 In summary our proposals on wholesale geographic leased lines markets are as follows.

Product market		Separate geographic market in London?	Separate geographic market in Hull?
Retail	TI Low bandwidth	No	Yes
	Low bandwidth	No	Yes
Wholesale TISBO	Medium Bandwidth	Yes	Yes
	High bandwidth	Yes	Yes
	Very high bandwidth	No	Yes
Wholesale AISBO	Up to and including 1 Gbit/s	Yes	Yes
Wholesale MISBO	≻ 1Gbit/s	Yes	Yes

Table 33: Proposed geographic market definition

LB TISBO (up to and including 8Mbit/s)

Wholesale service shares

5.180 The figures below display the results of our analysis of BT's service shares in this product market, first for the UK as a whole and secondly with a focus on London.⁷⁴

⁷⁴ The information that communications providers have been able to provide us with is subject to some imprecision. In Annex 8 we review the data analysis process, presenting the key steps in the methodology and its benefits and limitations. We also present an analysis of competition in UK cities outside London, including maps.



Figure 37: BT's service share in the LB TISBO market: UK

Figure 38: BT's service share in the LB TISBO market: London



Note: BT Tier 1 TI network nodes are displayed as diamonds (green) and data centres as stars (brown). Service share values are coloured as per the previous legend.

5.181 BT's service share in the WECLA averages 68% (see Table 32 for a cross-market overview). We compare the WECLA average share with the average in the UK excluding the WECLA and Hull, which is 89%. We interpret this comparison as not indicating significant differences in competitive conditions between those two areas because both average shares are well above the SMP threshold.



Figure 39: Distribution of BT LB TISBO service shares UK-wide

- 5.182 Figure 39 displays a distribution of the BT share across all the UK postcode sectors. BT's share differs across postcode sectors, with extreme values of 100% and 0%. However, such variations are to be expected where the number of sites in an individual postcode sector may be very low. Indeed, we frequently find the same maximum and minimum in all the product markets and this indicates that these extreme values tell us little or nothing about competition in the area. Notwithstanding that, the variance of the BT share UK-wide stands at 3%.⁷⁵ This is reflected by the distribution of shares shown in Figure 39.
- 5.183 The above figures above show that there is very little variation in BT's service share in the LB TISBO market when assessed on a postcode sector basis.

BT's pricing policies

5.184 As discussed earlier in this Section, in the LB TISBO market, BT currently prices 2Mbit/s circuits at a discount in the CLZ.

⁷⁵ The variance is a statistical measure of the extent to which observations – in this case service shares in individual postcode sectors – are spread around the mean. The low variance in this case indicates that service shares in most postcode sectors tend to be close to the UK-wide mean of 85%.

Proposed geographic market definition in the wholesale LB TISBO product market

- 5.185 On the basis of the evidence above and having applied the criteria cumulatively, we consider that the geographic scope of the LB TISBO market is national (excluding the Hull area).
- 5.186 The results of the wholesale service share analysis we have undertaken suggest that there are insignificant geographic variations in competitive conditions in the LB TISBO market. BT's service share is broadly uniform across the whole of the UK. While alternative operators have, as would be expected, focused much of their network roll-out in the geographic areas where business customers are located, especially in the London area, the analysis of service shares indicates that this infrastructure is not being widely used to compete in the provision of low bandwidth TISBO circuits. In addition, while BT offers a discount on its 2Mbit/s TISBO circuits in the CLZ, which might be indicative of increased competitive pressure in the London area, this is only a single bandwidth service (although the most significant) in the low bandwidth market, with BT choosing to price the remaining bandwidth circuits on a geographically uniform basis.

MB TISBO (from 8Mbit/s up to and including 45Mbit/s)

Wholesale service shares

5.187 We set out below the results of this analysis. Figure 40 shows BT's service share by postcode sector in the MB TISBO market for the UK as a whole with Figure 41 focusing on the London area.



Figure 40: BT's service share in the MB TISBO market: UK



Figure 41: BT's service share in the MB TISBO market: London

Note: BT Tier 1 TI network nodes are displayed as diamonds (green) and data centres as stars (brown). Service share values are coloured as per the previous legend.

- 5.188 This service share analysis shows that there is significant variation in BT's service share in the MB TISBO market when assessed on a postcode sector basis. Many of the postcode sectors where BT's service share is low are in the London area (and markedly within the WECLA), although there are a small number of other areas in the UK where BT's service share is also relatively low.
- 5.189 BT's service share in the WECLA averages 17% (see Table 32 for a cross-market overview). BT's service share differs across postcode sectors, with extreme values of 100% and 0%. This is reflected by the distribution of shares shown in Figure 42 below.



Figure 42: Distribution of BT MB TISBO service shares within the WECLA

- 5.190 In the majority of postcode sectors, BT's service share is very low, 10% or less. In the few postcode sectors where BT's service share is high, we think this is likely to reflect the relative 'thinness' of the market (small number of customers) in some sectors. This suggests that, insofar as service share variation, competitive conditions within the WECLA are relatively homogeneous.
- 5.191 The service share evidence for London, together with the network reach analysis, indicates that alternative operators are using their networks to provide services in this market in competition with BT, such that there exists sufficiently different competitive conditions to warrant the definition of separate geographic markets.

BT's pricing policies

5.192 As discussed in the Section above which sets out BT's pricing policies across the markets for terminating segments, in the MB TISBO market, BT currently prices all of its circuits at a discount in the CLZ. This may be indicative of different competitive conditions in the London area, although, as we noted earlier, there may also be other reasons for such pricing differences. In particular, unit costs are likely to be relatively low in the London area because of the high concentration of customers. Consequently, we do not put much weight on BT's CLZ price discounts.

Proposed starting point for geographic market definition in the MB TISBO market

5.193 The wholesale service share information available to us indicates that there are significant geographic variations in competitive conditions in the MB TISBO market. While there are postcode sectors with high BT shares throughout the UK, these are mainly outside London. In London, BT's service share in most postcode sectors is well below 40%. In addition, the network reach analysis which we have conducted shows that alternative operators have, as would be expected, focused much of their

network roll-out in the geographic areas where business customers are located, especially in the London area. The analysis of service shares indicates that in this case this infrastructure is being used to compete in the provision of MB TISBO circuits. We also acknowledge the presence of a longstanding geographic variation in BT prices in London in the form of the CLZ discount for all of its MB TISBO circuits, which may be indicative of increased competitive pressure in the London area as well as of cost differences.

- 5.194 On the basis of the evidence above, we consider that for the MB TISBO market there exist separate local geographic markets, with a separate market in the London area and a single separate geographic market in the rest of the UK (excluding the Hull area). We do not consider that any separate geographic markets exist beyond London (and Hull)⁷⁶.
- 5.195 However, having considered that this is the case we now need to determine what the precise geographic boundary of the London market is.

Defining the precise geographic boundary of the London market for MB TISBO

- 5.196 Having assessed that it is likely that local (i.e. sub-national) geographic markets exist in the MB TISBO market, we need to define the precise geographic market boundary.
- 5.197 We consider that the network reach analysis, supplemented by consideration of service shares, provides an appropriate basis for identifying the precise boundary of the geographic market.
- 5.198 We recognise potential limitations that can arise when fine-tuning the precise boundary of a separate market on the basis of the network reach indicator results by postcode sector. For example, an operator's ability to serve a particular customer may be affected by natural obstacles such as rivers, which are not reflected in the network reach analysis. On the other hand, we expect these factors to be reflected in the local service shares. We therefore cross-check the boundary established by means of the network reach indicator (i.e. the WECLA) by taking into account the service share results in the reference area considered.
- 5.199 Having reviewed service shares in the London area, we consider that the WECLA broadly matches the area in which BT's service share for MB TISBO is relatively low. Our proposal is therefore to define the boundary of the local geographic market in the London area as the WECLA.

The viability of competition in the WECLA geographic market in the MB TISBO market

- 5.200 In the 2008 BCMR, we considered whether there were barriers to effective competition in a local market like the CELA. The barriers that we considered were:
 - limits to individual operators' coverage of the proposed local geographic markets; and

⁷⁶ BT has argued that we should look at the extent of competition in areas other than London or Hull. Our analysis in fact has reviewed in detail the whole of the UK and we provide further information on our considerations towards the end of this section.

- limits to merchant market transactions⁷⁷ between OCPs (e.g. driven by barriers to interconnection).
- 5.201 We have conducted an analysis of both of these issues to determine whether they warrant revising our proposed market boundaries set out earlier in this Section. Earlier on, we presented the results of the analysis of operators' coverage within the WECLA. The pattern of alternative infrastructure present indicates that operators' coverage is not a factor of concern in the WECLA.
- 5.202 The market for MB TISBO in the CELA was deregulated as a result of the last BCMR. In a scenario with no regulation of this market and where operators do not have a network presence in all parts of it, the existence of merchant market transactions between OCPs may be important when considering in which areas competitive constraints exist and in which areas they do not. In order for the geographic reach of competitive constraints to extend beyond an individual operator's network, it would have to be able to access the infrastructure of other operators which are present in other areas.
- 5.203 The existence of merchant market transactions between OCPs depends on a number of relevant factors including:
 - The extent of technical barriers to interconnection;
 - The extent of commercial barriers to interconnection e.g. what incentives are there to interconnect with each other rather than only with BT; and
 - The extent to which networks built using wholesale inputs from a number of different operators can provide the same quality of service as one based on wholesale inputs provided by a smaller number of operators.⁷⁸
- 5.204 We have some information on the geographic location of sites where operators may be able to interconnect with each other and what type of interconnection such sites may support. Nevertheless, we do have evidence from the information provided by operators to us which allows us to test the extent of merchant market transactions between OCPs. If there were no, or only very limited, merchant market transactions which involve circuits delivered in the WECLA then this might suggest that only operators with more or less complete coverage of the WECLA would be able to compete everywhere in it. Table 34 displays the outcome of this check and captures all merchant market transactions, irrespective of whether they involve the resale of end-to-end circuits or a degree of interconnection.

Table 34: Current OCPs merchant market transactions in the MB TISBO market

	National	The WECLA
Total no. of circuit ends	10,295	2,772
No of ends of circuits sold as an OCP merchant market transaction	2,849	1,299

⁷⁷ By merchant market transactions we mean sales by one CP of (in this case) MB TISBO capacity on its network to another CP.

⁷⁸ For instance, it is usual practice for service providers to limit the number of network operators that input into the provision of a retail business connectivity service.

- 5.205 The results in the above table provide evidence that nearly half of circuit ends in the WECLA are sold in the OCP merchant market. This suggests that technical or commercial barriers to interconnection in the WECLA are limited.
- 5.206 However, we also note that alternative operators with significant coverage of a particular geographic area may have less of an incentive to transact with its competitors than an operator with a lower coverage. Where it has capacity, an operator is likely to want to use its own network end-to-end since, once capacity is installed, the additional costs of using it are very low, and so it will be less likely to purchase such capacity in the merchant market.
- 5.207 In addition, it may be the case that interconnection of multiple alternative operators could create transaction costs that make such interconnection less economically justifiable, limiting the incentives for such arrangements to take place on a purely commercial basis. However, as noted above in Table 34, merchant market transactions between OCPs do currently take place indicating that any such commercial barriers may be limited.
- 5.208 On the issue of whether a service provided using the networks of multiple operators causes a degradation of service, we do not have any substantial evidence on this point, although we are aware of the nature of leased lines service level agreements.⁷⁹ However, operators have told us that service degradation does occur, particularly when networks of more than two or three operators are required to provide the service.
- 5.209 However, what we have been told by operators must be balanced against the available evidence which suggests that insurmountable barriers to an OCP merchant market do not exist. On the basis of this analysis, we consider that potential limitations in OCPs coverage or merchant market transactions are not a concern that would warrant a revision of our proposed definition of the WECLA geographic market.

Proposed geographic market definition in the MB TISBO market

- 5.210 We find that the geographic extent of the London area covers not only the City and east London, as was found In the 2007/8 Review, but also extends westward to Heathrow. We refer to this geographic market as the WECLA.
- 5.211 Our proposal, for the reasons set out above, is that there are separate local geographic markets in the UK (excluding the Hull area) for MB TISBO services. These separate markets are the WECLA and the UK (excluding the Hull area and the WECLA). A list of the postcode sectors which constitute this separate local market is included in Annex 14.

HB TISBO (from 45Mbit/s up to and including 155Mbit/s)

Wholesale service shares

5.212 We set out below the results of this analysis. Figure 43 displays BT's service share by postcode sector in the HB TISBO market for the UK as a whole with Figure 44 focusing on the London area.

⁷⁹ For example, if a fault develops, establishing on whose network the fault lies is critical.



Figure 43: BT's service share in the HB TISBO market: UK

Figure 44: BT's service share in the HB TISBO market: London



Note: BT Tier 1 TI network nodes are displayed as diamonds (green) and data centres as stars (brown). Service share values are coloured as per the previous legend.

5.213 This service share analysis shows that there is significant variation in BT's service share in the HB TISBO market when assessed on a postcode sector basis. Many of the postcode sectors where BT's service share is low are in the London area (and markedly within the WECLA), although there are other areas in the UK where this is also the case.

5.214 BT's service share in the WECLA averages 12% (see Table 34 for a cross-market overview). BT share differs across postcode sectors, with extreme values of 100% and 0%. This is reflected by the distribution of shares shown in Figure 45 below.



Figure 45: Distribution of BT HB TISBO service shares within the WECLA

- 5.215 The chart suggests that, insofar as competition is reflected in service share variation, competitive conditions within the WECLA are relatively homogeneous. In the great majority of postcode sectors, BT's service share is very low, 10% or less. In the few sectors where BT's service share is high, we think this is likely to reflect the relative 'thinness' of the market (small numbers of customers) in some areas.
- 5.216 The service share evidence for London, together with the network reach analysis, indicates that alternative operators are using their networks to provide services in this market in competition with BT, such that there exist sufficiently different competitive conditions to warrant the definition of separate geographic markets.

BT's pricing policies

5.217 As discussed above, in the HB TISBO market, BT currently prices all of its circuits at a discount in the CLZ. This may be indicative of different competitive conditions in the London area, although, as we noted earlier, there may also be other reasons for such pricing differences. Consequently, we do not put much weight on BT's pricing policies in the CLZ.

Proposed starting point for geographic market definition in the HB TISBO market

5.218 The wholesale service share information available to us indicates that there are significant geographic variations in competitive conditions in the HB TISBO market. While there are high BT shares throughout the UK, this holds mainly outside London, where shares are markedly lower. In addition, the network reach analysis which we

have conducted shows that alternative operators have, as would be expected, focussed much of their network roll-out in the geographic areas where business customers are located, especially in the London area. The analysis of service shares indicates that in this case this infrastructure is being used to compete in the provision of HB TISBO circuits. We also acknowledge the presence of a longstanding geographic variation in BT prices in London in the form of the CLZ discount for all of its HB TISBO circuits, which could be indicative of increased competitive pressure in the London area.

- 5.219 On the basis of the evidence above, we consider that for the HB TISBO market there exist separate local geographic markets, with a separate market in the London area and a single separate geographic market in the rest of the UK (excluding the Hull area). We do not consider that any separate geographic markets exist beyond London (and Hull).⁸⁰
- 5.220 However, having considered that this is the case we now need to determine what the precise geographic boundary of the London market is.

Defining the precise geographic boundary of the London market for HB TISBO

- 5.221 Our proposed definition of the exact boundary of the London area market for HB TISBO is informed by the same consideration presented in the discussion of the MB TISBO market.
- 5.222 This leads us to consider the WECLA reference area as a starting point towards defining the exact market boundary. We cross-check the boundary established by means of the network reach indicator (i.e. the WECLA) by taking into account the service shares results in the reference area considered. As described earlier (paragraph 5.198), service shares should reflect the impact of local features such as natural obstacles which are not taken into account in the network reach analysis.
- 5.223 Having reviewed service shares in the London area, we consider that the WECLA broadly matches the area in which BT's service share for HB TISBO is relatively low. Our proposal is therefore to define the boundary of the local geographic market in the London area as the WECLA.

The viability of competition in the WECLA geographic market in the HB TISBO market

- 5.224 For the same reasons discussed in the Section on the MB TISBO market, we also need to check whether the evidence on OCPs' coverage or interconnection in the WECLA may lead us to revise our proposed market boundaries set out earlier in this Section.
- 5.225 Earlier we presented the results of the analysis of operators' coverage within the WECLA. The pattern of alternative infrastructure present in the WECLA indicates that operators' coverage is not a factor of concern in the WECLA.
- 5.226 We have also checked whether alternative operators can and do transact with each other in the WECLA. If there were no, or only very limited merchant market transactions which involve circuits delivered in the WECLA, then this might suggest

⁸⁰ BT has argued that we should look at the extent of competition in areas other than London or Hull. Our analysis in fact has reviewed in detail the whole of the UK and we provide further information on our considerations towards the end of this Section.

that only operators with more or less complete coverage of the WECLA would be able to compete everywhere in it. Table 35 below displays results for the HB TISBO market.

Table 35: Current OCPs merchant market transactions in the HB TISBO market

	National	The WECLA
Total no. of circuit ends	5,534	1,510
No of ends of circuits sold as an OCP merchant market transaction	2,543	783

- 5.227 The above evidence suggests that over half of the ends in the WECLA are sold in the OCP merchant market, which suggests that technical or commercial barriers to interconnection in the WECLA are limited.
- 5.228 Thus, as in the medium bandwidth TISBO market discussed above, we consider that potential limitations in OCPs coverage or merchant market transactions are not a concern that would warrant a revision of our proposed definition of the WECLA geographic market.

Proposed geographic market definition in the HB TISBO market

- 5.229 We propose that the geographic extent of the London area covers not only the City and east London, as was found In the 2007/8 Review, but also extends westward to Heathrow. We refer to this geographic market as the WECLA.
- 5.230 Our proposal, for the reasons set out above, is that there are separate local geographic markets in the UK (excluding the Hull area) for HB TISBO services. These separate markets are the WECLA and the UK (excluding the Hull area). A list of the postcode sectors which constitute this separate local market is included in Annex 14.

VHB TISBO (622Mbit/s)

Wholesale service shares

5.231 We set out below the results of this analysis. Figure 46 displays BT's service share by postcode sector in the VHB TISBO market for the UK as a whole with Figure 47 focusing on the London area.



Figure 46: BT's service share in the VHB TISBO market: UK

Figure 47: BT's service share in the VHB TISBO market: London



Note: BT Tier 1 TI network nodes are displayed as diamonds (green) and data centres as stars (brown). Service share values are coloured as per the previous legend

5.232 BT's service share in the WECLA averages 3% (see Table 32 for a cross-market overview). We compare this WECLA average share with the average in the UK excluding the WECLA and Hull, which is 8%. We interpret this comparison as not indicating significant differences in competitive conditions between those two areas because both average shares are well below the SMP threshold.



Figure 48: Distribution of BT VHB TISBO service shares UK-wide

- 5.233 Figure 48 displays a distribution of the BT share across all the UK postcode sectors. BT's share differs across postcode sectors, with extreme values of 100% and 0%. However, such variations are to be expected where the number of sites in an individual postcode sector may be very low. Notwithstanding that, the variance of the BT share UK-wide stands at 9%. This is reflected by the distribution of shares shown in Table X.
- 5.234 The above figures show that there is some, yet limited variation in BT's service share in the VHB TISBO market when assessed on a postcode sector basis.
- 5.235 The service share analysis shows that, throughout the UK, there are only 12 postcode sectors where BT has a service share greater than 50% (one of which, SW8 1, is in the WECLA) and only one postcode sector where it is between 40% and 50%. BT's service share equals 100% in all of those 12 postcode sectors where it is greater than 50%, which we think reflects the small number of circuits supplied and limits the relevance of service share analysis at the postcode sector level in this market. Notwithstanding this handful of high BT share postcode sectors, as shown in Table X the BT average share in the VHB TISBO market is quite low throughout the UK (3% in the WECLA and 8% in the rest of the UK). This could suggest that any localised geographic variations in competitive conditions in this market are essentially random variations and do not imply heterogeneity in competitive conditions.
- 5.236 However, unlike the other product markets which we have considered so far, there is currently a much more limited number of VHB TISBO circuits in the UK. This means that in any particular postcode sector, it only requires a small number of circuits (in absolute terms) to be provided by an operator for there to be significant changes in operators' service shares. Due to the low volumes of circuits in this market, extreme caution is advisable when interpreting the results of the service share analysis for the VHB TISBO market, since its information value is likely to be significantly reduced.

BT's pricing policies

5.237 As discussed above, in the VHB TISBO market, BT currently prices all of its circuits at a discount in the CLZ. In fact, the pricing of BT's VHB TISBO circuits depends on a set of factors, including distance and the number of hops it needs to provide a circuit. Some distance related charges are subject to a CLZ discount. This may be indicative of different competitive conditions in the London area, although, as we noted earlier, there may also be other reasons for such pricing differences. We do not put much weight on these therefore.

Proposed geographic market definition in the VHB TISBO market

- 5.238 We are aware that the value of a circuit is typically positively correlated with its bandwidth: as the bandwidth increases the value increases. This means that it is more economical for operators to extend their networks to provide services to business premises which demand VHB TISBO circuits. This is one reason why we have considered that there is a break in the product markets between the HB and VHB TISBO markets (there are different competitive conditions). In light of this observation, we interpret the evidence for this market as indicating that competitive constraints in the VHB TISBO market generally extend (possibly quite significantly) beyond the limit of current network infrastructure.
- 5.239 At the same time, we note that volumes in this market have shrunk vastly. Although there are some geographic variations in service shares, they appear to be largely random, and are likely to reflect the small number of very high bandwidth TISBO circuits in any given postcode sector. Overall, the evidence suggests that the competitive constraints in the VHB TISBO market are likely to be quite similar throughout the UK. On this basis, we consider that the geographic scope of the VHB TISBO market is national (excluding the Hull area).

LB AISBO (up to and including 1Gbit/s)

Wholesale service shares

5.240 We set out below the results of this analysis. Figure 49 displays BT's service share by postcode sector in the LB AISBO market for the UK as a whole with Figure 50 focusing on the London area.



Figure 49: BT's service share in the LB AISBO market: UK

Figure 50: BT's service share in the LB AISBO market: London



Note: Openreach Handover Points are displayed as diamonds (green) and data centres as stars (brown). Service share values are coloured as per the previous legend.

5.241 This service share analysis shows that there is significant variation in BT's service share in the LB AISBO market when assessed on a postcode sector basis. Many of the postcode sectors where BT's service share is low are in the London area (and markedly within the WECLA). We also observe that there are some small areas throughout the rest of the UK (i.e. outside London) where BT service shares are low, often in isolated postcode sectors.

5.242 As displayed in Table 32 (as part of a cross-market overview), BT's service share in the WECLA averages 41%.⁸¹ The BT share differs across postcode sectors, with extreme values of 100% and 0%. This is reflected by the distribution of shares shown in Figure 51 below.



Figure 51: Distribution of BT LB AISBO service shares within the WECLA

- 5.243 Superficially, the distribution of service shares appears rather flat, although with a peak in the 50% 70% range. Notwithstanding that, the variance of the BT shares within the WECLA postcode sectors stands at only 7%. This suggests that, insofar as competition is reflected in service share variation, competitive conditions within the WECLA are relatively homogeneous. We can also see that BT's service share is above 40% in about two thirds of postcode sectors and above 50% in more than half.
- 5.244 The service share evidence for London, together with the network reach analysis, might indicate that alternative operators are using their networks to provide services in competition with BT in the London area to a greater extent than elsewhere in the UK, such that sufficiently different competitive conditions exist there in order to warrant the definition of separate geographic markets.

BT's pricing policies

5.245 As discussed above, BT has introduced geographic variation of the prices of a subset of its LB AISBO product, in several instances as a time-limited offer.

⁸¹ The 41% share is consistent with the other shares reported in this section. Consistency is of course necessary to identify differences in competitive conditions across markets. When we consider whether BT has SMP in this market in Section 7, we make some adjustments to the data which have the effect of raising our estimate of BT's share to between 45% and 50%.

5.246 We also note that, when BT has offered geographic price variations for LB AISBO products, London has always been included in such discounting schemes.

Proposed starting point for geographic market definition in the LB AISBO market

- 5.247 The wholesale service share information available to us indicates that there are significant geographic variations in competitive conditions in the LB AISBO market. While there are high BT service shares throughout the UK, this holds mainly outside London. In addition, the network reach analysis which we have conducted shows that alternative operators have, as would be expected, focused much of their network rollout in the geographic areas where business customers are located, especially in the London area. The analysis of service shares indicates that in this case this infrastructure is being used to compete in the provision of LB AISBO circuits to a distinctly greater extent in London than elsewhere in the UK. In fact, the BT service share in the WECLA is 41% (the same holds in the CELA), while in the rest of the UK (excluding the WECLA and Hull) this share stands at 67%.
- 5.248 We also acknowledge the discounting of BT's low bandwidth AISBO prices in London, which we interpret as consistent with greater competitive pressure in the London area, compared to the rest of the UK. However, as in other product markets, this discounting may also reflect other factors and we do not put much weight on it here.
- 5.249 On the basis of the evidence above, we consider that for the LB AISBO market there exist separate local geographic markets, with a separate market in the London area and a single separate geographic market in the rest of the UK (excluding the Hull area). We do not consider that any separate geographic markets exist beyond London (and Hull).⁸²
- 5.250 However, having provisionally considered that this is the case, we now need to determine what the precise geographic boundary of the London market is.

Defining the precise geographic boundary of the London market for LB AISBO

- 5.251 Our proposed definition of the exact boundary of the London area market for LB AISBO is informed by the same consideration presented in the discussion of the MB TISBO market.
- 5.252 This leads us to consider the WECLA reference area as a starting point towards defining the exact market boundary. The boundary established by means of the network reach indicator is based on potential competition rather than outcomes in particular areas. We therefore cross-check this by taking into account the service share results in the reference area considered.
- 5.253 Having reviewed service shares in the London area, we consider that a comparison of BT's average service share for LB AISBO in the WECLA with that in the rest of the UK shows a clear difference between the two, supporting the conclusion of the network reach analysis. Our proposal is therefore to define the boundary of the local geographic market in the London area as the WECLA.

⁸² BT has argued that we should look at the extent of competition in areas other than London or Hull. Our analysis in fact has reviewed in detail the whole of the UK and we provide further information on our considerations in paragraphs 5.291- 5.315.

The viability of competition in the WECLA geographic market in the LB AISBO market

- 5.254 For the same reasons discussed in the Section on the MB TISBO market, we also need to check whether the evidence on OCPs' coverage or interconnection in the WECLA may lead us to revise our proposed market boundaries set out earlier in this Section.
- 5.255 Earlier we presented the results of the analysis of operators' coverage within the WECLA. The pattern of alternative infrastructure present in the WECLA indicates that operators' coverage is not a factor of concern in the WECLA.
- 5.256 We have also checked whether alternative operators can and do transact with each other in the WECLA. If there were no, or only very limited, merchant market transactions which involve circuits delivered in the WECLA, then this might suggest that only operators with more or less complete coverage of the WECLA would be able to compete everywhere in it. Table 36 below displays results for the LB AISBO market.

Table 36: Current OCPs merchant market transactions in the LB AISBO market

	National	The WECLA
Total no. of circuit ends	288,856	48,333
No of ends of circuits sold as an OCP merchant market transaction	29,909	7,519

- 5.257 The above evidence suggests that there is an active OCP merchant market for low bandwidth AISBO services in the WECLA. The proportion of circuit ends which are sold in the merchant market is lower than in the TISBO markets discussed above, but is still significant, and we do not believe that there are likely to be material technical or commercial barriers to interconnection in the WECLA.
- 5.258 Thus, we consider that potential limitations in OCPs coverage or merchant market transactions are not a concern that would warrant a revision of our proposed definition of the WECLA geographic market.

Proposed geographic market definition in the LB AISBO market

- 5.259 We find that the geographic extent of the London area covers the WECLA.
- 5.260 Our proposal, for the reasons set out above, is that there are separate local geographic markets in the UK (excluding the Hull area) for LB AISBO services. These separate markets are the WECLA and the UK (excluding the Hull area and WECLA). A list of the postcode sectors which constitute this separate local market is included in Annex 14.

MISBO (over 1Gbit/s)

Operators' network reach

5.261 Earlier in this Section we explained that the results of the network reach analysis do not vary by product market since we use the same 200m build distance assumption in all cases. We found that only 7.5% of the UK postcode sectors present a high

network reach and that the majority of these postcode sectors are located in London, while the remainder are sparsely and disjointedly distributed across different areas.

- 5.262 We also highlighted earlier that data centre sites display a similar pattern to other business sites in that in all cases there is a markedly greater choice of OCPs with their own infrastructure for sites located in the WECLA compared to the rest of the UK. We showed that, while 95% of the data centre locations in the WECLA are on average within reach of two or more OCPs' networks, the equivalent figure for business sites stands at 92%. Thus the key cumulative statistics for network reach in the WECLA appear quite similar whether the focus of the analysis is all business sites or exclusively the data centre locations.
- 5.263 Stakeholders have informed us that a feature specific to the MISBO market is that many of these services are bought at data centre locations. Some stakeholders have questioned the appropriateness of the 200m build distance assumption in this market given the high value of MISBO services.⁸³ Given the high volume of supply of higher value circuits concentrated at data centres, we expect that OCPs have greater incentives to establish presence at or near those sites. They may, as a result, be prepared to build further to supply a data centre than they would to connect the average leased line customer. In addition, data centres themselves may choose to locate in areas where several competing operators are present, in order to benefit from the best deals or to meet requirements for multi-sourcing.
- 5.264 It is thus of particular interest whether this means that data centres located outside the WECLA benefit from similar levels of availability of OCP infrastructure to their counterparts in the WECLA. In fact, the average data centre located anywhere in the UK has access to 2.7 OCPs within reach (200m), and 49% have access to at least two OCPs; the average data centre in the WECLA has access to 5.6 OCPs within reach, which is more than twice the UK-wide average. Table 37 provides more detail by way of the cumulative distribution of network reach at data centre sites throughout the UK and then specifically in: i) the WECLA; and ii) the rest of the UK.

# of OCPs within 200m reach	UK-wide	The WECLA	UK excluding the WECLA
0+	100%	100%	100%
1+	83%	98%	79%
2+	59%	95%	49%
3+	42%	90%	29%
4+	31%	83%	17%
5+	23%	73%	9%
6+	15%	49%	5%
7+	10%	34%	3%
8+	5%	15%	2%
9+	4%	12%	1%
10+	4%	12%	1%

Table 37: Cumulative distribution of OCPs within 200m reach of data centre locations

⁸³ Circuits belonging to other product markets are also supplied at data centre locations, although the relative importance of data centre sales in those markets is likely lower than in the case of MISBO.

- 5.265 As noted above, it is possible that OCPs may be willing to build to a longer distance in order to serve MISBO traffic at data centres. For this reason it is of interest whether, when network reach is measured on the basis of a much longer build distance, data centres located outside the WECLA display similar levels of availability of OCP infrastructure compared to their counterparts in the WECLA.
- 5.266 We have performed a further check to assess whether the pattern discussed above is robust to the choice of build distance parameter and specifically to a considerably larger distance, namely of 1km. A 1km distance is towards the upper end of actual dig distances according to the data received from CPs. The average data centre located anywhere in the UK has access to 5.5 OCPs within reach (1km); the average data centre in the WECLA has access to 9.4 OCPs within reach, which is close to twice the UK-wide average. Table 38 provides more detail by way of the cumulative distribution of network reach at data centre sites throughout the UK and then specifically in: i) the WECLA; and ii) the rest of the UK.

# of OCPs within 1km reach	UK-wide	The WECLA	UK excluding the WECLA
0+	100%	100%	100%
1+	98%	100%	97%
2+	89%	100%	86%
3+	76%	100%	69%
4+	63%	100%	53%
5+	53%	98%	41%
6+	46%	95%	32%
7+	39%	90%	25%
8+	31%	83%	17%
9+	23%	63%	11%
10+	17%	59%	5%

Table 38: Cumulative distribution of OCPs within 1km reach of data centre locations

- 5.267 Based on this further check, we consider that, even if we were to consider a 1km build distance for the purposes of a network reach analysis for data centres, the evidence would point towards a separate geographic market in the London area. There is a significantly greater concentration of competing infrastructure in the WECLA, irrespective of the way in which it is measured. As we go on to discuss below, the difference in market shares is also quite stark.
- 5.268 This, by itself, does not preclude the definition of a further, potentially competitive, market area outside the WECLA. However, as in other product markets, the analysis in the UK as a whole shows that outside of the London area there are few if any contiguous postcode sectors where competitive conditions might be materially different to those in the rest of the country. This is confirmed by further analysis, which is presented at the end of this Section. On the basis of the disparate picture of alternative infrastructure emerging from the network reach analysis, we do not consider that the evidence indicates that it is possible to identify further separate geographic markets in any area outside London. However, we give further consideration to the extent of competition to supply data centres outside the WECLA in our analysis of SMP and when we consider what remedies should be imposed in the event of an SMP finding.

5.269 In the London area, the analysis shows that the alternative operators' network presence is such that in the WECLA the average business site has access to two operators (in addition to BT) or more within reach. The service share analysis may then capture the extent to which this has been reflected in actual competition.

Wholesale service shares

5.270 We set out below the results of this analysis. Figure 52 displays BT's service share by postcode sector in the MISBO market for the UK as a whole with Figure 53 focusing on the London area.



Figure 52: BT's service share in the MISBO market: UK





Note: Openreach Handover Points are displayed as diamonds (green) and data centres as stars (brown). Service share values are coloured as per the previous legend.

- 5.271 This service share analysis shows that there is considerable variation in BT's service share in the MISBO market when assessed on a postcode sector basis. Many of the postcode sectors where BT's service share is low are in the London area (and markedly within the WECLA), although there are other areas in the UK where this is also the case.
- 5.272 BT's service share in the WECLA averages 15% (see Table 32 for a cross-market overview). BT's share differs across postcode sectors, with extreme values of 100% and 0%. This is reflected by the distribution of shares shown in Figure 54 below.



Figure 54: Distribution of BT MISBO service shares within the WECLA

- 5.273 This suggests that, insofar as service share variations are concerned, competitive conditions within the WECLA are relatively homogeneous. In the great majority of postcode sectors, BT's service share is very low, 10% or less. In the few sectors where BT's service share is high, we think this is likely to reflect the relative 'thinness' of the market in some sectors.
- 5.274 Earlier we drew attention to the striking decline in BT's share of MISBO services in the WECLA, from 62% in 2007 to 15% in 2001. It is likely that, as the market has grown, operators have been induced to compete increasingly vigorously for the high value customers who purchase MISBO services.⁸⁴ It is also notable that this has taken place in the absence of an effective interconnection product for WDM services, suggesting that most circuits may be relatively short, connecting sites within the WECLA.
- 5.275 The service share evidence for London, together with the network reach analysis of potential competition, indicates that alternative operators are using their networks to provide services in competition with BT in the London area to a greater extent than elsewhere in the UK. A comparison of BT's average share in the WECLA with that in the rest of the UK suggests that there exist sufficiently different competitive conditions to warrant the definition of separate geographic markets.

⁸⁴ It is also possible that some of the apparent change is due to the availability of better data in this review.

BT's pricing policies

5.276 BT is currently not subject to any SMP regulation in its provision of MISBO services.⁸⁵ It is not required to publish its prices and these are made available on a 'terms on application' basis. For this reason, BT may be able to vary its prices flexibly in response to different characteristics of the product requested, one of which may be the location of the service.⁸⁶ Some of the MISBO products are delivered as part of complex bids which are highly customised to reflect the needs of the end customer. For these reasons we have limited evidence of price variation by geography in MISBO, although we consider that such variation is likely given the nature of the market and the obligations to which BT is currently subject.

Proposed starting point for geographic market definition in the MISBO market

- 5.277 The wholesale service share information available to us indicates that there are significant geographic variations in competitive conditions in the MISBO market. While there are high BT shares throughout the UK, this holds mainly outside London, as within London shares are markedly lower. In addition, the network reach analysis which we have conducted shows that alternative operators have, as would be expected, focused much of their network roll-out in the geographic areas where business customers are located, especially in the London area. The analysis of service shares indicates that in this case this infrastructure is being used to compete in the provision of MISBO circuits to a distinctly greater extent in London than elsewhere in the UK. In fact, the BT service share in the WECLA is 15% (it is 14% in the CELA), while in the rest of the UK (excluding the WECLA and Hull) this share stands at 59%.
- 5.278 We also consider the very limited evidence on pricing in this market compatible with potential variations as a function of the location of demand.
- 5.279 On the basis of the evidence above, Ofcom considers that for the MISBO market there exist separate local geographic markets, with a separate market in the London area and a single separate geographic market in the rest of the UK (excluding the Hull area). We do not consider that any separate geographic markets exist beyond London (and Hull).⁸⁷
- 5.280 However, having considered that this is the case we now need to determine what the precise geographic boundary of the London market is.

Defining the precise geographic boundary of the London market for MISBO

5.281 Our proposed definition of the exact boundary of the London area market for MISBO is informed by similar considerations as those presented in the discussion of the MB TISBO market. Moreover, we have performed further checks to reflect the fact that a significant number of customers in this product market are data centres and therefore

⁸⁵ We note that under the Undertakings, a number of Openreach's MISBO products are subject to product level equivalence at present. For an explanation of the Undertakings and the term "equivalence", see Section 11 of this document.

⁸⁶ BT is subject to EOI requirements on almost all of the products within the MISBO market, which does not restrict its ability to tailor its prices as a function of the location of the leased lines.

⁸⁷ BT has argued that we should look at the extent of competition in areas other than London or Hull. Our analysis in fact has reviewed in detail the whole of the UK and we provide further information on our considerations towards the end of this Section.

of particularly high value to CPs. As discussed earlier on, even if we were to consider a 1km build distance for the purposes of a network reach analysis for data centres, the evidence would signal the existence of a separate geographic market in the London area.

- 5.282 This leads us to consider the WECLA reference area as a starting point towards defining the exact market boundary. The boundary established by means of the network reach indicator is based on potential competition rather than outcomes in particular areas. We therefore cross-check this by taking into account the service share results in the reference area considered.
- 5.283 Having reviewed service shares in the London area, we consider that a comparison of BT's average service share for MISBO in the WECLA with that in the rest of the UK shows a clear difference between the two, supporting the conclusion of the network reach analysis. Our proposal is therefore to define the boundary of the local geographic market in the London area as the WECLA.

The viability of competition in the WECLA geographic market in the MISBO market

- 5.284 For the same reasons discussed in the Section on the MB TISBO market, we also need to check whether the evidence on OCPs' coverage or interconnection in the WECLA may lead us to revise our proposed market boundaries set out earlier in this Section.
- 5.285 Earlier we presented the results of the analysis of operators' coverage within the WECLA. The pattern of alternative infrastructure present in the WECLA indicates that operators' coverage is not a factor of concern in the WECLA.
- 5.286 The MISBO market comprises products, such as WDM links, which are based on relatively recent technical developments and for which interconnection standards are not yet clearly established. Currently, there is no interconnection product which would enable a competitive retail WDM service to be supplied over two or more interconnected networks. Interconnection would add to costs and may also result in some important service features, notably the ease of capacity expansion, being unavailable. For these reasons, we would expect the extent of merchant market transactions between OCPs to be limited compared to other product markets.
- 5.287 We have checked whether alternative operators can and do transact with each other in the WECLA. If there are no, or only very limited merchant market transactions which involve circuits delivered in the WECLA, then this might suggest that only operators with more or less complete coverage of the WECLA would be able to compete everywhere in it. Table 39 below displays results for the MISBO market.

Table 39: Current OCPs merchant market transactions in the MISBO market

	National	The WECLA
Total no. of circuit ends	11,108	2,937
No of ends of circuits sold as an OCP merchant market transaction	1,205	411

5.288 The above evidence suggests that there is an active OCP merchant market in the WECLA, notwithstanding the aforementioned potential limitations to interconnection

for some MISBO products.⁸⁸ However, it is smaller, relative to the total number of ends, than in TISBO markets.

5.289 Thus, we consider that potential limitations in OCPs coverage or merchant market transactions are not a concern that would warrant a revision of our proposed definition of the WECLA geographic market. We return to the issue of interconnection when we consider the need for remedies to SMP outside London.

Proposed geographic market definition in the MISBO market

5.290 Our proposal, for the reasons set out above, is that there are separate local geographic markets in the UK (excluding the Hull area) for MISBO services. These separate markets are the WECLA and the UK (excluding the Hull area and the WECLA). A list of the postcode sectors which constitute this separate local market is included in Annex 14.

The assessment of competitive conditions in city areas outside London and Hull

- 5.291 Above, we have analysed each of the product markets for terminating segments. For each of these we have proposed that there exist no separate geographic markets outside London (the WECLA) or Hull. In what follows we present additional considerations that informed our proposals on geographic market definition across the product markets for terminating segments.
- 5.292 In summary, in our view we consider it more appropriate to address indications of possible variations in competitive conditions in small geographic areas through variations in remedies.

BT's call for a more granular approach

- 5.293 As we noted in our summary of responses to the CFI, BT has argued for more geographic deregulation and is also urging us to consider deregulation at a much more granular level (e.g. individual business premises consuming significant amounts of bandwidth such as data centres). In an additional confidential submission received before this consultation, BT maintains that the UK is likely to include a set of three distinct areas:
 - large city centres and certain business locations (e.g. where major data centres are located), which have multiple alternative networks present;
 - a "fibre hinterland", where BT faces a certain degree of competition from alternative infrastructure such as Virgin Media; and
 - the rest of the UK, where BT faces limited or no infrastructure competition, which justifies regulation.
- 5.294 We have therefore considered whether we should define additional geographic markets, using broadly the criteria described in the previous Sections.

⁸⁸ This may mean that the merchant market transactions captured in Table 39 refer to end to end wholesale circuits.

- 5.295 To keep the process manageable we need a way of narrowing down the list of areas for detailed analysis. The existence of price differences which reflect a local response to competition is potentially a good screening criterion. A uniform price across areas is likely to indicate that competitive conditions are similar, not least because maintaining a uniform price will mean that any response to competition takes place across the entire area.⁸⁹ However, the extent of observed geographic variations in pricing outside London is extremely limited. By itself, this would tend to cast doubt on BT's assertion that competition is extensive outside London. However, we are also aware that the pricing evidence before us is of limited information value, because some key prices are unpublished (particularly for MISBO services), because pricing differences could reflect cost differences⁹⁰ and also due to the limited scope and short-term nature of the geographic variations in prices offered by BT. Accordingly, BT's prices are not well suited in this instance to evaluating differentials in competitive conditions.
- 5.296 Notwithstanding this, we have looked in greater detail at competitive conditions in some other areas which are plausible candidates for some measure of deregulation. These are principally the central districts of other large cities: Birmingham, Manchester and the next largest urban areas, measured by the number of businesses within reach on average of BT and two competing networks⁹¹.
- 5.297 We have identified the postcode sectors within each large urban area which display a high level of competitive network presence. This requires that there should, on average, be at least two operators plus BT with a flex point within 200m of each business location within the area. For each postcode sector identified in this way we have information on BT's resulting service share.
- 5.298 For the service share analysis, we focus on the AISBO and MISBO markets as these are growing product markets. TISBO markets are in decline and we do not expect significant developments in local competition in these markets. This approach is consistent with stakeholder views that the emphasis should be on AISBO and MISBO markets.
- 5.299 The analysis that we have undertaken confirms the presence of competition in other areas. For example there is a small set of high network reach areas within each of Birmingham and Manchester. In those areas, services shares are low for some product markets in some postcode sectors, but for other product markets and postcode sectors shares are high (even if in all of these areas we have evidence of the presence of alternative infrastructure).

⁸⁹ Uniform pricing does not necessarily imply that there is a single market in the area subject to the uniform price. For example, in its 2008 "Groceries Market Investigation", the Competition Commission defined a number of local markets despite the adoption of national pricing strategies by supermarket chains. One reason for this was the prevalence of local variations in other aspects of the retail offer.

⁹⁰ Although where prices are uniform it is perhaps unlikely that this is the result of weaker competition exactly offsetting lower costs and vice versa, particularly as competition is generally more likely in areas where the cost of supply is lower.

⁹¹ See Annex 8 for further analysis of competition in UK cities outside London.
	Businesses in urban area	Businesses reached on average by BT + 2 OCPs	LB AISBO installed base (000s) in high NR areas	% of UK total LB AISBO volumes	BT LB AISBO share in the high NR areas (%)	MISBO installed based (000s) in high NR areas	% of UK total MISBO volume	BT MISBO share in the high NR areas (%)
Manchester	3,107	1,396	3.9	1.3	73	0.3	2.2	71
Birmingham	3,838	634	2.8	1	34	0.1	0.7	20
Bristol	2,880	1,211	3.9	1.4	64	0.1	1.2	60
Leeds	1,682	1,153	4.5	1.6	50	0.5	4.5	74
Glasgow	2,872	1,107	3.6	1.2	58	0.1	0.8	35
Edinburgh	2,175	596	0.3	0.1	49	0	0	n/a
Liverpool	2,989	270	3.9	1.3	37	0.1	1	84
The WECLA	9,103	8,965	48	16.6	41	3	26.4	16

Table 40: Distribution of LB AISBO and MISBO services sold in high network reach areas within key urban areas

Note: a high Network Reach (NR) area is composed of those postcode sectors where the average business site has access to two OCPs within reach of 200m.

- 5.300 Table 40 allows us to compare the materiality of the areas in seven key urban areas (other than London) with the amount of circuit ends supplied in the WECLA, both for LB AISBO and MISBO circuits. In LB AISBO it is evident that in each of the urban areas, the share of the UK volumes is a full order of magnitude smaller than in the WECLA (i.e. ten times smaller). This holds also for MISBO circuits, with the exception of one area, where the share of supply is five times smaller than in the WECLA. There is a clear contrast between the scale of the WECLA and the much smaller 'high network reach' areas in other cities.
- 5.301 By way of example, we focus on Leeds, which is the urban area which is second to London in terms of share of circuit ends for these product markets. For LB AISBO, Leeds is ten times smaller than London in terms of share of supply (and five times smaller for MISBO).
- 5.302 A further example is Birmingham, where the BT share in the MISBO market stands at 20%. This is the share of those circuits supplied within all high network reach areas within Birmingham. When considered in total, they amount to 0.1% of all MISBO sales UK-wide.

Challenges to defining geographic markets outside London

5.303 The analysis set out below clearly illustrates the challenges to defining geographic markets outside London. There are three in particular. Firstly, and in contrast to the WECLA, the areas identified by the network reach analysis are typically small, comprising a handful of postcode sectors and a few hundred business sites. Secondly, service shares in individual postcode sectors inevitably vary between close to 0% and close to 100%, sometimes in adjacent postcode sectors within the network reach defined area. Finally, there are isolated postcode sectors where there is apparently some competing infrastructure but which are not contiguous with any

other such area. Our assessment is that, while there are pockets of competition in metropolitan areas other than London, these pockets are of a very small scale.

Table 41:	Distribution	of postcode	sectors an	d business	sites	across the	e top three	e UK
cities ¹								

			London	Manchester	Birmingham	
	UK-wide		Metro	Metro	Metro	
# of postcode sectors	10,043	ofwhich	4.6%	1.1%	1.2%	
# of business sites	221,046	, or which	4.5%	1.4%	1.7%	

Note 1: The 'metro' areas comprise in each case a small number of BT local exchange areas in which discounted prices are offered for Ethernet products.

- 5.304 Table 41 provides us with an initial picture of the sizes of the top three UK urban areas relative to the UK and to each other, measured as shares of the number of postcode sectors and of the number of business sites.⁹² These figures provide us with a picture of potential demand linked to these areas, although they do not necessarily capture exactly the geographic pattern of actual demand.
- 5.305 Table 42 below focuses on those areas, within each of those three urban areas, where we find a high network reach. These are those postcode sectors where the average business site has two or more OCPs within a 200m reach.

	High network reach areas located:						
	UK-wide	London WECLA	Manchester Metro	Birmingham Metro			
Share of UK postcode sectors with high network reach	7.5%	3.6%	0.4%	0.1%			
Share of UK businesses therein	12.0%	4.1%	0.6%	0.3%			

Table 42: Distribution of postcode sectors with high network reach (and business sites therein) across the top three UK cities

- 5.306 The above results show that only a limited number of postcode sectors present a high availability of alternative infrastructure (defined as 2 or more OCPs within 200m of the average business site) in the two urban areas outside London.⁹³ This is consistent with the UK-wide map displayed above as Figure 28. When the distribution of alternative infrastructure is taken into account, the difference between the London area and any other urban area in the UK becomes marked.
- 5.307 As a further test, we have focused on the only two product markets displaying a growth in demand, namely LB AISBO and MISBO. Rather than potential demand, Table 43 below instead captures the actual amount of circuit ends supplied within those areas (for each of the product markets).

⁹² Here and throughout, we use the sites selected from the Experian business database according to the criteria used for the network reach analysis as an indicator of the presence of potential leased lines customers.

⁹³ The WECLA accounts for about one third (4.1% out of 12%) of those sectors with high network reach. The other two areas each account for a much smaller proportion of the total.

		Total supply						
	All areas Low network reach areas		High network reach areas					
			UK-wide, of	London	Manchester	Birmingham		
		UK-wide	which \rightarrow	WECLA	Metro	Metro		
Share of UK circuit	100%	62.6%	26 10/	16 69/	1 29/	1.0%		
ends (LB AISBO)	100%	05.0%	50.4%	10.0%	1.5%	1.0%		
Share of UK circuit	100%	17 00/	E2 2%	26 10/	2.2%	0.7%		
ends (MISBO)	100%	47.8%	52.2%	20.4%	2.270	0.7%		

Table 43: Relative sizes of high network reach areas, measured by share of circuit ends, by UK city (top three)

- 5.308 The above figures highlight how, in these two growth markets, the amount of supply provided in the WECLA is of a distinctly greater order of magnitude than the circuits supplied in either Manchester or Birmingham. Our review of other urban areas confirms that this observation holds, even to a greater extent, in the other urban areas.
- 5.309 The evidence from Table 40 shows that this pattern is not confined to Birmingham and Manchester or indeed to central urban districts more generally. It is thus very much less clear than in the case of the WECLA that these areas are sufficiently distinct from other areas to be considered as distinct geographic markets. The network reach analysis suggests that there are small pockets of alternative infrastructure in a large number of disparate parts of the UK. We do not think this would be an appropriate basis for defining geographic markets. We consider it more appropriate, and more consistent with the ERG common position on geographic market analysis, to address indications of possible variations in competitive conditions in small geographic areas through variations in remedies.
- 5.310 There is a need for practicality and stability in the analysis and in seeking to achieve this we have sought consistency with the ERG Common Position which states:

"the unit should have clear and stable geographic boundaries which can easily be understood by all market parties". (p.11)

"Once the (forward-looking) geographic segmentation has been made, it appears to be in the sense of legal certainty and practicability that it does not change until the next review, even if future developments are somewhat different than expected. If future developments are very different to those expected, there is likely to be a necessity for a new analysis anyway." (p.18)

5.311 We also note that, in its comments letter of February 14, 2008 on the 2007 WBAMR, the EC (quoted in the ERG Common Position) stated

"[...] a geographic delineation which is primarily based on the number of operators present in a local exchange is not by itself sufficiently detailed or robust to identify real differences in competitive conditions for the purpose of market definition. In assessing whether conditions of competition within a geographic area are similar of sufficiently homogenous, additional structural and behavioural evidence is necessary. Relevant evidence would include information on the distribution of market shares and the evolution of shares over time. In addition, evidence on differentiated retail or wholesale pricing which might apply could help indicate different regional or local competitive pressure. [...] differences in the functionalities or types of products being offered by both the incumbent and alternative operators or in marketing strategies being pursued in different geographic areas may further reflect regional/local differences in demand and supply conditions."

- 5.312 We note once again that we do not have reliable evidence of "differentiated retail or wholesale pricing" outside London. In addition, outside the WECLA, there tends to be much less consistency between the areas of BT low service share and the areas where potentially competing networks are present. This means that, although there may be some small pockets of competition outside London, we cannot identify with confidence where they are.
- 5.313 In our view it would also be difficult to make an objective case for treating data centres differently, for the purposes of market definition, to other areas where similar competitive conditions are likely to exist. As discussed in Annex 12, we have gathered a list of all the 100+ main data centre locations in the UK. In our service share and network reach maps we have highlighted the areas where these data centres are sited to enable us to check whether we could identify any patterns that would affect our proposed market definition but we could not find any evidence that this was the case.
- 5.314 We have therefore considered geographic or customer segment based variations to remedies as an alternative to defining a large number of separate geographic or customer-specific markets. The ERG Common Position states (at p.19):

"However, within a national market it could still be the case that there exist geographic differences in competitive conditions which do not vary so much that it undermines the finding of a national market but which may lead to differences in identified competition problems and hence differences in appropriate remedies."

And at p.23:

"within a national market it could be the case that there exist geographic variations in competitive conditions, but that any differences in the conditions of competition between geographic areas are not yet sufficiently stable or sustainable to justify the definition of regional or local markets. In such circumstances it may be appropriate to vary remedies within that national market where an operator is found to have SMP."

5.315 Mindful of the guidance from the Explanatory note to the EC's recommendation on relevant product and service markets (p.13) and the ERG Common position (pp.18-19), we consider that some apparent geographic differences in competition may be reflected through variations in remedies. These are considered in Annex 12.

Question 3: Do you agree with our approach to geographic market definition and our proposed geographic market definitions? In particular do you agree with our proposal to define a larger geographic market in London (the WECLA)?

Section 6

Product and geographic market definition for wholesale trunk

Introduction

- 6.1 In our analysis of wholesale product and geographic market definition issues (in Sections 4 and 5), we have focused on terminating segment markets. In this Section we consider product and geographic market definition for wholesale trunk services.
- 6.2 Trunk or core networks are used to transfer data over long distance national routes and between the major urban centres where businesses are concentrated. Data transported over trunk (or core) networks is combined with other traffic streams (using multiplexors), which allows CPs to transport traffic on their networks more efficiently. By contrast, terminating segments (such as AISBO or TISBO circuits) are often used to provide the connectivity from end-user sites into core networks.

Figure 55: Trunk versus terminating segments



Source: Ofcom 2012

6.3 In summary, as set out in Table 44 below, we propose to identify a national TI trunk market and short-distance regional trunk markets at all bandwidths and a national market for core conveyance.

Table 44: Summary of proposed wholesale market definitions for trunk / core connectivity services

	Product market
	TI regional trunk at all bandwidths
	TI national trunk at all bandwidths
Trunk / core connectivity	National core conveyance at all bandwidths

Source: Ofcom 2012

- 6.4 We propose to retain the overall approach we used in the 2007/8 Review to determine the break-point between the trunk and terminating segments. However, we propose some amendments to our trunk market definition such that we identify separate regional and national trunk markets for TI trunk. We also consider that a separate TI trunk market exists that is distinct from "core conveyance" services used to provide Ethernet trunk. We do not propose to identify any bandwidth breaks for the TI trunk or core conveyance markets.
- 6.5 This section is sub-divided into three main parts dealing with the following issues:
 - Issue 1: Separate trunk and terminating segments: we consider the case for separate trunk market(s) and the appropriate boundary between trunk and terminating segment market(s) (paragraphs 6.7 to 6.138).
 - Issue 2: trunk versus core conveyance: we consider whether we can identify separate markets for different 'types' of trunk/core networks that are used to support leased lines services (e.g. trunk or core services used to support retail AI and TI services). (paragraphs 6.139 to 6.169)
 - **Issue 3: Bandwidth breaks:** we discuss whether we should identify separate markets for trunk or core conveyance based on the bandwidth of the service delivered. (paragraphs 6.170 to 6.179)
- 6.6 Under Issue 1, we consider whether demand and supply-side substitution analysis points to separate markets. Our proposed conclusion is that demand and supply-side arguments point to separate markets. Further, we note that are sufficient differences in the competitive conditions for the trunk part of the network relative to terminating segments consistent with there being separate markets for trunk and terminating segments. We then discuss how best to define the precise boundaries between trunk and terminating segments. Under Issue 2, we look at the alternative technologies that can be used in trunk or core networks and we assess whether a distinction can be made between: the trunk networks used to support TI retail markets (often based on TDM-technologies) and other forms of 'core' conveyance⁹⁴ used to support among other things AI services. As a result of this analysis, we propose a TI trunk market which is separate from core conveyance.

Issue 1: Is there a break between trunk and terminating segments

6.7 In the following paragraphs, we assess whether there is a separate trunk market in the UK and the appropriate boundary between trunk and terminating segments. We first summarise our approach in the 2007/8 Review (to identify separate trunk and terminating segments). We also consider stakeholders' responses to the CFI. In light of those comments and our further analysis we set out below why we think that a separate trunk market still exists. In particular, we explain why we think that trunk remains prospectively more competitive than the market for terminating segments. We then assess our approach to identifying the break in the market between relevant trunk and terminating segments for AI and TI markets.

⁹⁴ An example of a core conveyance service used for leased lines would be MPLS technologies used in IP – networks.

2007/8 Review

6.8 In the 2007/8 Review, we considered that trunk and terminating segments were in separate markets. However, we noted that the approach we had taken up to that time to identifying the break between trunk and terminating segments had a number of drawbacks. On this basis we introduced the concept of trunk aggregation nodes.⁹⁵ Given the important concepts and terminology associated with trunk and terminating segments developed in the 2007/8 Review, in the following paragraphs them in more detail.

Trunk and terminating segments are in separate markets

- 6.9 In the 2007/8 Review, we noted that leased lines trunk and terminating segments (made up of access and backhaul) were likely to be complements rather than substitute services. Therefore, our analysis of demand-side substitution suggested separate markets. We also considered that the competitive conditions were likely to differ between trunk and terminating segments and we considered this was consistent with separate markets.
- 6.10 In light of the identification of separate termination and trunk markets, we then considered how to define the precise boundaries between them (i.e. what the appropriate break-point was between trunk and terminating segments).

Changing the break point between trunk and terminating segments

- 6.11 In the 2007/8 Review, we proposed a change in the trunk market definition. In the previous 2004 market review, we used certain nodes on BT's network known as Tier 1 nodes to define the boundary between trunk and terminating segments. We defined circuits between different Tier 1 nodes as trunk and circuits from an end-user's premise (or local exchange) to a Tier 1 node as terminating segments.⁹⁶
- 6.12 In the 2007/8, we noted that definition of trunk based on Tier 1 nodes had a number of drawbacks. We highlighted that the prospectively competitive trunk market (where many CPs potentially had competing infrastructure for major routes) was not accurately captured within the existing trunk market definition. We considered that the extent of OCPs' interconnection with BT and the size of their trunk networks was not as extensive as suggested by BT's full list of Tier 1 nodes. In other words, basing the trunk definition solely on BT's list of Tier 1 nodes was not likely to accurately capture alternative competing trunk networks.
- 6.13 Because trunk services are subject to economies of scale, CPs collect or aggregate traffic from the customer sites they serve within an area before sending it over their trunk networks. There are fixed costs to establishing a point of connection with BT to collect traffic, and these also give rise to economies of scale. This in turn means it is only likely to be efficient for a CP to establish one point of connection in a single (TAN) area, rather than one at every BT node. However, in some large urban areas, a CP may have sufficient traffic to justify establishing greater than one node, in that area.

⁹⁵ We describe Trunk Aggregation Nodes in more detail in paragraphs 6.16 to 6.21 below.

⁹⁶ This definition of trunk also included circuits between a Tier 1 node and an OCP's equivalent point of connection to a Tier 1 node.

- 6.14 In the 2007/8 Review, we observed that in some cases BT's Tier 1 nodes might serve customer locations where the demand was not sufficient to support a dedicated aggregation node (from the perspective of all CPs). This is because in some cases, Tier 1 nodes are in relative close proximity to each other (i.e. a few km apart) and it would not necessarily be efficient to build-out trunk networks to each of those Tier 1 nodes. In most urban centres, we noted therefore, operators are likely to select one of BT's Tier 1 nodes (or another network point such as their own point of presence) where they would aggregate traffic together.⁹⁷
- 6.15 On the other hand, we noted that there could be circumstances where the density of traffic is sufficient to generate economies of scale such that a CP could locate at more than one Tier 1 node within a particular urban area. For example, there is likely to be sufficient traffic in London, such that it would be efficient to locate a number of network nodes across the City. This would enable a CP to have a PoP closer to end-users to pick-up traffic and aggregate it on the trunk network from existing (and prospective) customers sooner. Therefore, in a particular urban area with sufficient aggregation opportunities (i.e. lots of potential or existing customers) it may be worthwhile to have a number of interconnection points in relatively close proximity.

Identification of the break point based on Trunk Aggregation Nodes

- 6.16 Based on the above considerations we identified the key locations (urban areas) where those aggregation points were likely to exist, which we defined as Trunk Aggregation Nodes (TANs). In order to determine the likely locations of these aggregation nodes we looked at available evidence on where most OCPs had chosen to interconnect with BT (or where they had their own PoPs). These main interconnect points provided an initial indication of where CPs would locate their key points on the network to pick-up traffic. In parallel, we undertook further analysis (proximity analysis), which sought to take into account the factors that drive CPs' interconnection decisions and hence the likely extent of their trunk networks.⁹⁸ We identified that, as a general rule, CPs' decision to interconnect at a particular node relates to two key factors:
 - the aggregation opportunities available: based for example on the volume of end-users/circuits potentially served by that node; and
 - **the relative distances involved:** if CPs are already located at another interconnection point (i.e. a BT Tier 1 node), what distances would be involved in the backhaul of traffic to that existing interconnection point (relative to interconnecting at the new node).

⁹⁷For example, consider the situation where a CP has the choice over whether to interconnect at one or more Tier 1 nodes in a big city (e.g. in Glasgow an OCP might choose to pick-up terminating traffic from either the Clyde or Glasgow Tier 1 nodes). It might be the case that one of these Glasgow nodes serves a relatively smaller number of potential end-users than the other. If a CP already has a point of interconnection at the other Tier 1 nearby, in these circumstances, it may not be worth investing in additional infrastructure to interconnect at a closer Tier 1 node. Instead of locating at all Tier 1 nodes in Glasgow area (i.e. both the Clyde and Glasgow Tier 1 nodes), the CP would be more likely to backhaul their traffic to an existing point of interconnection (e.g. from an end-user site in the Clyde area to the CP's interconnection point at the Glasgow Tier 1 node nearby).

- 6.17 This proximity analysis therefore looked at a number of centres of demand in the UK and asked whether a CP that has an existing point of interconnection (e.g. at one of BT's Tier 1 nodes) would find it efficient to locate at another major aggregation point (i.e. another Tier 1 node). If a CP retained a single interconnection point in London, for example, then this could require multiple long distance circuits to reach all of the customers (from its existing Tier 1 node). So intuitively it made sense that, in a large urban area like London, it would be efficient to have more than one interconnect point. In other urban areas, however, if the majority of demand is centred around a major business district then it would not make sense to build another major aggregation node in that locality. In other words, there would be insufficient economies of scale to build out further trunk network (and trunk nodes) if this were only used to support a small number of circuits.
- 6.18 In the 2007/8 Review, we therefore introduced the concept of TANs. We identified TANs based on key locations in urban centres where CPs were likely to locate (at least) one of their key interconnect points to pick up termination traffic. Based on the analysis of interconnection behaviour and this proximity analysis, we produced a list of 46 TI TANs. The catchment areas associated with each TI TAN are shown in Figure 56 below. We conducted a similar exercise for the AI market to identify 56 AI TANs.⁹⁹



Figure 56: Catchment areas for TI trunk aggregation nodes

⁹⁹ This analysis was based around the relevant network nodes for the AI market, BT's 106 metronodes, which are now referred to as Openreach Handover Points ("OHPs").

Source: Ofcom 2012, BT s.135 data

6.19 The change in the market definition meant that trunk was now defined as a circuit linking different TANs, which is depicted in Figure 57 below.



Figure 57: Definition of trunk between aggregation nodes in the 2007/8 Review

Source: Ofcom 2007/8 Review

- 6.20 In Figure 57, we show two scenarios to explain the differences arising from our change in the definition compared with the 2007/8 Review. In the top picture, we show a circuit linking Tier 1 nodes situated in different TAN catchment areas. In these circumstances, the circuit between those Tier 1 nodes would be treated as trunk. In the bottom picture the Tier 1 nodes are part of the same TAN catchment area. In this scenario a circuit linking those Tier 1 nodes would be a terminating segment.
- 6.21 In the 2007/8 Review, we also identified a set of 56 AI TANs for the AISBO market. However, the focus of the analysis for the AI market was to identify where the termination market ended. We did not explicitly identify a separate AI trunk market (we discuss AI trunk markets in more detail in paragraphs 6.132 to 6.138 below). In the 2007/8 Review, we did not analyse any of the wholesale markets for WDM services because they were regarded as outside the scope of the review. Therefore there was no consideration of wholesale WDM services (including consideration of WDM trunk or long distance circuits).

Call for inputs

6.22 In the CFI, we noted that in the 2007/8 Review we had defined the scope of trunk and terminating segments based on the identification of TANs. We noted the purpose of this definition was to identify the key points on TI and AI networks where CPs would have a Point of Presence (PoP) to pick-up and aggregate traffic onto major trunk routes. In the CFI, we set out the provisional view that the TAN definition did not require change.¹⁰⁰

6.23 We explained that the main driver for the identification of such TANs (for market definition purposes) was the location of major concentrations of customers, both businesses and residential, which give rise to aggregation opportunities for CPs to construct their own core networks. We noted that the location of centres of population and of businesses across the UK is very unlikely to have changed materially in the past four years. We therefore proposed a "no material" change finding – with more focus placed on an assessment of the extent of competition on trunk routes and any associated remedies.

Stakeholder views

- 6.24 Most stakeholders commenting on the trunk definition did not comment on whether there are separate markets for termination and trunk. Those commenting agreed that we should not change the boundary between termination and trunk by altering the TAN boundaries. Those stakeholders that expressed concerns over the trunk market definition were more worried about how BT had applied the routing rules associated with the TAN concept to the leased lines services it sells. These concerns over the routing rules were mostly in relation to AISBO services (for a discussion remedies see Sections 10 and 11)].
- 6.25 One stakeholder [\gg] agreed that there was a separate market but noted that in rural locations there are often long distances between and to TANs.
- 6.26 C&WW submitted that it continued to purchase PPC trunk segments for a significant proportion of the circuits it buys from BT. This was the case, even though it has sought to rationalise the number of PPC circuits to minimise backhaul circuit lengths and purchases of trunk from BT.
- 6.27 C&WW also considered that the underlying rationale behind TANs was generally sensible. It believed that the purpose of the TAN concept had been to identify locations / routes where CPs have little / no choice other than to purchase transport from BT. C&WW considered however that the implementation of the TAN concept had not worked well (although this point was mainly focused on remedies for trunk services). Talk Talk also highlighted that the implementation of the TAN routing rules was a major failing of the last market review.
- 6.28 C&WW suggested that one solution would be to alter the trunk definition such that it is equivalent to connectivity between non-adjacent TAN locations. This would assume that the UK is built up of a patchwork of TAN areas (as already defined by Ofcom). Connections into and between TAN areas (those "touching one another") should be regarded as access / terminating circuits, whereas a link into a TAN, which is not geographically adjacent to the starting TAN boundary would be regarded as trunk.
- 6.29 Fujitsu had no specific comments on the definition of TANs, but noted that the advent of open access networks may change the number of TANs (on the basis that there

¹⁰⁰ We noted however our concerns that the routing rules BT uses when selling trunk and terminating segments would require consideration. Therefore, we noted that our proposal to retain the market definition was without prejudice to the assessment of the effectiveness of regulatory remedies applied to trunk segments (including the any routing rules).

could be more opportunities to aggregate traffic streams). KCOM noted that it continues to be the case that there is no trunk market in Kingston upon Hull.

- 6.30 UKCTA's view was that there should not be any further changes to the definition of trunk boundaries and no additional grouping of nodes. It argued that the changes that resulted in a reduction in the number of TANs overall has had a negative impact on competition as it resulted in increased costs to OCPs due to resulting adjustments of costs between trunk and terminating segments. While there was a potential for some cost savings from the reduced length of trunk segments required to interconnect between TANs, in the majority of cases this was more than off-set by the increased cost of terminating segments required to interconnect Tier 1 nodes within a TAN. UKCTA submitted that if similar changes were introduced in the BCMR, the outcome would exacerbate this effect. Given the legacy status of TISBO products, it considered that further upheaval is neither warranted nor necessary.
- 6.31 Verizon agreed that there had not been a significant change in the markets to warrant a further review of the trunk routes. It also repeated the point made by UKCTA on the impacts of changing the TANs on operators' costs.
- 6.32 One stakeholder agreed that there was still a separate market for trunk. It considered that there had not been any material changes in the market to warrant a different approach. The identification of trunk routes and TANs were still relevant for competition and market entry given the relative maturity of the TI environment and the corresponding trunk market.
- 6.34 BT argued that the strong evidence for competing national networks suggests that Ofcom should use this review to withdraw ex ante regulation from trunk segments. This would be in line with the European Commission's intention when it removed trunk segments of leased lines from its Recommendation on relevant markets in 2007, before the last review.

BT's December 2011 submission on TI trunk

- 6.35 BT subsequently submitted a paper to Ofcom on 7 December 2011 (BT's December 2011 paper), in which it set out a detailed critique of our TI trunk product market definition (and market power assessment) based on the TAN concept.
- 6.36 BT noted that the objective of the market definition exercise was only necessary in order to understand the extent of competition for trunk. In particular, it should be aimed at helping assess the extent to which CPs are actually reliant on access to BT's services in providing their own end-to-end retail services in the relevant business connectivity markets. It noted that the concepts of 'terminating' and 'trunk' have been developed as a means to understand this, but those historic definitions should not preclude a more relevant market boundary definition in the light of evidence of market developments.
- 6.37 It identified two main issues with Ofcom's existing methodology:
 - Ofcom's definition of 46 "aggregation nodes" fails to capture the full scope of CP's own extensive networks much closer to end-users. BT estimated that it sells

over 1,800 individual POH (services used to interconnect with BT's network). At over 600 of these sites, there is at least one unique CP present. BT argued that at a significant number of local exchanges, there will therefore be alternatives to using BT's network to provide connectivity beyond those nodes.

- Second, Ofcom conducted an exercise to assess competition between its defined "aggregation nodes" that was – in its design – bound to overstate BT's service share and which resulted in the finding of SMP at that "trunk" level. BT highlighted two main issues:
 - Indirect routing and measurement errors: BT noted that the TAN concept does not take into account indirect routing possibilities and results in errors in the measurement of the extent of BT's sales of trunk and underestimates the extent of OCP self-supply; and
 - TAN boundary issues: BT argues that the routing of circuits is often not via Tier 1 nodes (as the TI trunk definition assumes) and therefore incorrectly classifies some circuits as trunk that are more like terminating segments.
- 6.38 We further discuss these points in turn below.

Indirect routing and measurement errors

- 6.39 As part of BT's critique of the TI trunk market definition, it argued that a trunk market cannot be defined for individual routes. BT argued that for leased lines markets a customer is indifferent between how a circuit is routed provided that a connectivity service is delivered. BT therefore argued that parallel/ indirect trunk routes are substitutable from a demand-side and supply-side perspective to the most direct trunk route between two locations.
- 6.40 We agree with BT that some competition using indirect routings is likely to be possible and we do not propose to identify specific geographic markets for individual routes. Indeed, this was the position that we adopted in the 2007/8 market review, as we considered that we should define any trunk market on a national basis.¹⁰¹
- 6.41 BT noted that even if we were to assess the market on a national basis there would still be potential issues with the TAN concept in particular because the wholesale

a direct trunk route from London to Manchester; or

an indirect trunk route such as London-Birmingham-Manchester.

Such indirect routing constraints, if they do exist, could suggest that a CP could meet a particular retail market requirement using alternative wholesale trunk routes. In this sense, an assessment of indirect routing would properly fall under an assessment of demand and supply-side substitution (i.e. whether a SSNIP on a specific route would be constrained by CPs substituting to using alternative "indirect" trunk route). If for each trunk route there was a viable alternative route then combinations could be this could potentially result in the focal market (i.e. an individual wholesale trunk route) being progressively widened to include an alternate route or routes. If this exercise were repeated for every route combination in the UK then through a chain of substitution, this could result in all routes being included in a single trunk market. In other words, the trunk market would be national in nature.

¹⁰¹A number of routes over a core network could be used to meet a particular retail requirement for connectivity between two business sites. For example, for a CP providing a leased lines to a customer needing connectivity between London and Manchester could use:

circuits used to deliver retail connectivity (i.e. a circuit from A to B) can follow indirect routes. Where these routes cross TAN boundaries, a circuit is automatically deemed to include a trunk segment, even if it is in reality a short-distance connection to a customer site.

- 6.42 To demonstrate the issue, BT provided the following example (shown in Figure 58 below) where an OCP:
 - is selling a retail long-distance circuit (from Nottingham-Manchester depicted by the red line in Figure 58)
 - has its own trunk network (interconnected to BT local exchanges in the Leeds and Sheffield areas); and
 - has to rely on BT for the terminating segments.
- 6.43 In the example BT used, it referred to an OCP that has POHs in the Leeds catchment area and another in the Sheffield catchment area. BT explained that in these circumstances the OCP would purchase two PPCs from BT: one from the end-user location in Manchester catchment area to the POH in the Leeds and another from the end-user site in the Nottingham catchment area to the POH in the Sheffield catchment area (depicted by the black lines in Figure 58 below). Between those two points the OCP uses its own trunk network.

Figure 58: BT's example of TAN boundary issues



Source: BT December 2011, Ofcom confidentiality redactions

6.44 In the above example, an OCP meets its retail requirement by purchasing two PPCs at the customer ends (A and B) to the nearest BT exchange where it is interconnected (Huddersfield and Chesterfield). BT notes that as these PPC circuits cross TAN boundaries (depicted by the blue geographic boundaries) we would treat them under our market definition as containing a trunk segment. Indeed, we would assume that the PPC sold to the OCP (spanning the Manchester / Leeds TANs) is routed via the Manchester Tier 1 node to the Leeds Tier 1 node. Similarly, we

assume that the Nottingham to Sheffield PPC would be routed via the Nottingham Tier 1 node to the Leeds Tier 1 node.

- 6.45 BT notes that this example highlights how the retail requirement (for connectivity between Manchester and Nottingham) can become divorced from the wholesale provision (provided over an indirect route). In the example above, the overall retail requirement was actually met by two circuits provided by BT (Manchester Leeds and Sheffield Nottingham) and self-provision by the OCP (Leeds to Sheffield).
- 6.46 At a national level, this would result in an incorrect estimate of BT's share of the trunk market. In aggregate, we would count two trunk circuits sold by BT but we would identify only one retail requirement (i.e. the trunk circuit from Nottingham to Manchester). As we do not have data from OCPs on their self-provision of trunk, we would have to infer this by matching what they need to buy (based on their retail requirements) to what they purchase in the wholesale market (i.e. the wholesale purchases from BT). Therefore, due to this counting of "part trunk" circuits sold by BT at both ends, any self-supply by OCPs for the majority of the route would not be recorded (we would have one trunk circuit requirement but two trunk sales by BT). The incorrect inference (in this particular example) would be that BT is entirely responsible for the supply of trunk circuits.
- 6.47 BT maintained that this measurement issue is likely to be repeated for a number of PPC circuits that it sells. It was concerned that as a result the outcome of any market power assessment based on this trunk definition would overstate BT's shares of the trunk market significantly (and under estimate OCPs' apparent self-supply). Therefore, it considered that the trunk market definition used in the 2007/8 Review is not fit for the purpose of accurately assessing competitive conditions in trunk markets.

TAN boundary issue

- 6.48 BT maintained that even if we could appropriately adjust for the above issues, there would still be a fundamental error as our analysis is still based on the notion that circuits between TAN catchment areas are routed via Tier 1 nodes (and therefore contain trunk). For instance, in the example above, we would assume that the PPC sold to the OCP (spanning the Manchester / Leeds TANs) is routed via the Manchester Tier1 node to the Leeds Tier 1 node.
- 6.49 BT argued that Tier 1 nodes do not have particular significance either on BT's SDH network or in relation to OCPs' network build decisions. It noted for example that 70% of OCPs' Point of Handover interconnection points with BT are at other locations (nodes) on its network (rather than at Tier 1 nodes). It argued that while Tier 1 nodes may have been partially relevant when Oftel first came up with the concept of trunk¹⁰², CPs have subsequently built out nearer to customers and the

¹⁰² Oftel launched a review of national leased lines in 1999 and in its Final Direction, Oftel required BT to offer to provide wholesale part leased lines at a number of different Tiers in BT's network hierarchy (including terminating and trunk elements). This was the first time that wholesale access to leased lines was regulated. For the Final Direction see:

http://www.ofcom.org.uk/static/archive/oftel/publications/licensing/2001/ppcs0301.htm

It was under Phase II of Oftel's Direction to resolve a dispute concerning the provision of partial private circuits, that Oftel issued further detailed regulatory requirements in particular in respect of the pricing of PPCs (as well as the specification of PPCs). Oftel considered that BT should restructure its

scope of competition from infrastructure close to the customer should be factored into our analysis.

- 6.50 BT highlighted that OCPs' networks have in any case been rolled-out much nearer to a customer (beyond Tier 1 nodes). It therefore maintained that we should start by assessing the CPs' incentives to build closer to their customers (and away from and bypassing as much as BT's network as possible). BT argued that an OCP's incentive is always to locate at the node that is nearest their customer. Reflecting this, CPs often interconnect much closer to customers at local exchanges and provide their own trunk/core connectivity between those locations.¹⁰³
- 6.51 BT argued that if a CP has a PoP at a local exchange closer to a customer than the Tier 1 nodes then it must be the case that the CP has undertaken the investment in interconnection and network to support that location. Therefore, any location at a BT exchange must represent a CP's "competitive core" infrastructure.

BT's alternative trunk definition proposals

- 6.52 BT put forward an alternative market definition proposal that relied on identification of what it called a "competitive core" for the TI trunk market, which we explain below. It proposed to identify this competitive core based on the network nodes where OCPs were apparently present (based on where they were purchasing interconnection circuits from BT known as PPC points of handover). It argued that these nodes clearly and simply signal the breakpoint of "non-competitive" access part of wholesale TI provision and regulatory intervention beyond these points is unnecessary.
- 6.53 BT did not specify the minimum criteria for identifying the "competitive core". But in its December 2011 paper it noted that:

"At 665 of those nodes CPs have decided there is sufficient business opportunity to provide a return on the investment needed to extend their network to include the BT serving exchange. In 247 nodes more than 1 CP has made the same calculation; that aggregation opportunities are such that the incremental returns will allow them to offer service on their own network cheaper than purchasing additional conveyance from BT." ¹⁰⁴

PPC charges, so that a more cost reflective method was used to identify the trunk and terminating segments for the distance related element of PPCs. See S.10 to S.15 of the Direction:

 $http://www.ofcom.org.uk/static/archive/oftel/publications/broadband/leased_lines/ppc1202/direction.html m \\ m$

¹⁰³BT argued that SDH networks are dimensioned on a whole 'network' basis ('meshed') and not on particular nodes or links between the nodes (a 'hub and spoke' model). BT argued that if CPs have presence in a particular location such as a local exchange then they will not be using "thin" routes (backhaul capacity) to take traffic back to aggregation points (hubs) on their core networks. Instead, it argued, CPs build meshed networks out to local exchanges. It argued that this network will be a series of inter-linking (resilient) rings rather than a series of high capacity point-to-point circuits between major network hubs. Therefore, any analysis centred around competition on individual routes between hubs (such as Tier 1 nodes) will, BT argued, be based on a fundamentally incorrect proposition as OCPs' core networks are far more extensive and enable them to compete on many different routes.

¹⁰⁴ Quotation taken from BT's December 2011 discussion paper.

6.54 It noted that, for example, that the minimum interconnection capacity for an aggregated POH is 63 * 2Mbit/s circuits so this was a significant investment. It argued that we need to recognise the reality of widespread networks (as indicated by CPs PPC POH purchases) and a vibrant merchant market (i.e. markets where CPs are selling wholesale leased lines services to each other). We set out below some reactions of stakeholders to BT's proposals before discussing our own views.

Stakeholder reactions to BT's proposals

- 6.55 In light of BT's detailed discussion paper, we asked UKCTA members for their views on BT's proposals to identify a "competitive core" for the TI trunk market based around the presence of one or more CPs purchasing (POHs) at a particular BT network node.
- 6.56 All of the UKCTA members who expressed a view were strongly opposed to BT's specific proposals. They argued that the presence of one or more other CPs at a particular BT local exchange was unlikely to provide an effective competitive constraint on BT's provision of leased lines services beyond that node.
- 6.57 C&WW noted that when considering whether the existence of a PoH can support sufficient competition to provide an effective competitive constraint on BT it is necessary to exclude many PoH and/or take into account other factors:
 - Inefficient PoH BT has defined PoH as either efficient or inefficient based on criteria which are mainly down to the nature of the technology used. For example old 4x2Mbit/s and 16x2Mbit/s PoH are classified inefficient. They are certainly not suitable for providing a competitive constraint as a) they are more expensive and b) they probably have insufficient capacity;
 - Spare capacity even if a PoH exists there must be an appropriate level of capacity spare on that PoH for it to be capable of providing a competitive constraint. C&WW noted for example that if a PoH only has 10 x 2Mbit/s spare capacity then this would not be sufficient for the CP to avoid buying 45Mbit/s or 155Mbit/s trunk from BT. In order to gain additional spare capacity, these CPs would have to make additional investments, which would be unlikely for legacy PPC services with an expected short shelf-life. C&WW considered that a CP would need to have sufficiently existing high capacity POHs (STM-4 (622Mbit/s) or above) to support competitive provision; and
 - Nature of the POH connections: a number of C&WW's POHs have been 'novated' into its business as a result of contracts it has taken over from other businesses. C&WW noted that many of these PoH do not sit on its core network and are only used for specific circuits it supports today. C&WW noted that it may not be possible or viable without further investment to be able to use those connections for 'generic' PPC circuits. It also noted that not all POH purchases were necessarily for SDH connections (i.e. they may only support PDH circuits).
- 6.58 C&WW noted that BT's proposal does not attempt to address these issues (for example by distinguishing between the nature of the POH circuit purchased). However, even if it were to do so there are further issues that need to be taken into account when it comes to capturing the competitive conditions in leased lines markets:
 - *Diversity is a crucial part of PPCs:* CPs would need to be able to offer diverse (resilient) routings from a number of locations to offer a strong competitive

alternative to BT. It noted that there are various resilient options that purchasers rely on that require handover at two locations, so in some circumstances CPs must have two PoH options they can use, not just one;

- The need for national wholesale providers C&WW noted that business connectivity markets are quite different to other markets (wholesale broadband access) where presence at an exchange will offer a greater competitive constraint. For leased lines CPs buy far fewer circuits and they often form part of a single nationwide customer solution. That means CPs must have supply options that give ubiquitous coverage and they cannot afford to have many different suppliers for different parts of the country. Hence, if Ofcom is looking at existence of competitive constraints it is important to consider only those CPs with a wide area coverage and not assume a patchwork of different operators will have the same effect.
- 6.59 C&WW also submitted that it is important to note that BT's proposal to change the definition of trunk would result in two different definitions, one for sub 2Mbit/s and one for 2Mbit/s and above. The routing and handover of sub 2Mbit/s (DPCN) circuits is such that they must all go via one of the 69 DPCN nodes (for charging purposes) and therefore there could never be any basis to change the definition of DPCN trunk beyond those nodes.
- 6.60 C&WW argued that with the TI market in decline, no operators will be likely to make significant new investments to support this market. C&WW therefore argued that Ofcom must be certain that viable competition is possible based on those providers already present before risking deregulation.
- 6.61 C&WW also noted that even where some CPs are present (and self-supplying), this may not provide a sufficient competitive constraint on BT. This is because operators cannot justify circuit rearrangements as circuits are likely to migrate to AI in the next few years. These CPs may also not be active in the merchant wholesale market. It noted, in the context of the decline in TI markets, that it is even harder to justify new POH capacity or to establish a wholesale relationship with a new supplier.
- 6.62 One stakeholder, [\times] submitted that:



- 6.63 Colt argued that mere presence of particular operators at local exchanges does not mean that those CPs are present or active in the merchant wholesale market. Indeed, Colt referred to the EC's letter to Ofcom (under the Article 7 notification process) in relation to the Wholesale Broadband Access market review. Colt noted the EC's concerns that market definition should not rely on a single indicator (in that case the presence of Principal LLU Operators at local exchanges) to imply competition was effective. Colt argued that a proper analysis of demand and supply-side constraints was required and not only an assessment based on BT's suggested indicator.
- 6.64 Another stakeholder stated that it was not adverse to the idea of there being a 'competitive core' where there is sufficient choice of alternative suppliers to BT.

However, it did not think that it stretched as far as the BT methodology suggested. It thought that competitive core is limited to the BT NGS sites (i.e. the top level TDM trunk network).

Ofcom's analysis

6.65 In the above paragraphs we provided relevant background and stakeholder's initial views on trunk issues. We now discuss our analysis including in light of those points. Most respondents to the CFI either supported or did not comment on the proposal to identify separate markets for trunk and terminating segments. We explain below why we think it appropriate to continue to identify separate trunk market(s) for the UK. We then focus the remainder of our analysis on the definition of the boundary between trunk and terminating segments, which received the most stakeholder attention.

Separate trunk and terminating segments

- 6.66 In considering separate trunk and terminating segments we first consider possible demand and supply-side substitution. Similar to access and backhaul (considered in Section 4), trunk and terminating segments typically have a complementary relationship. The complementary nature of products is not a reason for putting two services in a single market, but it suggests that a terminating segment would not be an efficient substitute for a trunk segment or vice versa. On this basis, we do not rely on demand-side substitution as a basis for identifying combined trunk and terminating segments markets.¹⁰⁵
- 6.67 The lack of demand-side substitution reflects the differences in aggregation opportunities at different levels in the network. The general distinction between terminating segments and trunk in general relates to the greater aggregation opportunities for trunk. Where sufficient aggregation opportunities exist, then trunk circuit (taking advantage of economies of scale and scope) would be preferred. By definition, it is unlikely that terminating segment that may go to an individual customer (or a link shared across fewer customers) would be efficient alternative and would therefore not provide an effective competitive constraint on a long-distance trunk link.¹⁰⁶
- 6.68 In considering the case for separate trunk and terminating segments, we consider that it is also relevant to highlight the distinction made between trunk and terminating segments in EC's 2007 Recommendation:

"At the wholesale level, it is possible to distinguish separate markets, in particular between the terminating segments of a leased circuit (sometimes called local tails or local segments) and the trunk segments. What constitutes a terminating segment will depend on the network topology specific to particular Member States and will be decided upon by the relevant NRA."¹⁰⁷

¹⁰⁷ Page 185 of the

¹⁰⁶ In the context of a HMT, a SSNIP on trunk segments would not prompt sufficient levels switching to terminating segments to make that price increase unprofitable. Similarly, it would not be efficient for a CP to rely on a trunk link where there are limited aggregation opportunities (as is the case for terminating segments to the end-user).

http://ec.europa.eu/information_society/policy/ecomm/doc/library/regframeforec_dec2009.pdf.

6.69 The EC's main justification for a separate trunk market was that (in many EU Member States) multiple CPs were likely and able to provide competing infrastructure for trunk or core networks. In the 2007 Recommendation, the EC considered that in general the extent of competition for trunk in most Member States justified removing trunk segments from the list of markets susceptible to ex-ante regulation. Nevertheless, it recognised that the scope for competition in trunk is likely to vary both between and within Member States:

> "While many trunk segments on major routes are likely to be effectively competitive in certain geographic areas in Member States, other trunk segments may not support alternative suppliers. Depending on the proportion of such routes in a given Member State, one may see a tendency towards effective competition where alternative operators have made sufficient investments in alternative infrastructures and are in competition with the incumbent on the merchant market. The trunk segment leased line market has so far been found not to meet the second criterion in one Member State and hence not to be susceptible to ex ante regulation. In a number of other Member States, the NRA has found the market for trunk segments of leased lines to be effectively competitive as a number of parallel networks have been established. This trend is likely to continue. Therefore the market for wholesale trunk segments of leased lines is withdrawn from the recommended list on the basis that there is a clear trend towards effective competition through parallel infrastructures, which also indicates that entry barriers are insufficiently high to warrant satisfaction of the first criterion.

Nevertheless a significant number of routes may continue to be served only by a single operator in particular where the route is thin. This will vary within and between Member States but often new entrants cannot be expected to compete with the established operator across the whole of the territory, individual NRAs may be in a position to demonstrate that trunk segments of leased lines continue to fulfil the three criteria and are susceptible to ex ante regulation. Whilst it might be considered that competition law can address the failure on such thin routes, it is unrealistic to rely solely on competition law for as long as the number of unduplicated trunk routes in a country remains high, considering the general costing and pricing principles that would have to be applied throughout the network."¹⁰⁸

- 6.70 Therefore, the EC's view is that the presence of competing infrastructure which is likely to be more extensive for the largest trunk routes is the main driver for identifying a separate market to terminating segments. This mirrors the reasoning in the 2007/8 Review for the identification of separate trunk and terminating segments, in particular:
 - trunk is prospectively more competitive than backhaul (reflecting the opportunities to aggregate traffic together) and the evidence shows many CPs having at least some infrastructure for their core networks; and

¹⁰⁸ Page 185 of the

http://ec.europa.eu/information_society/policy/ecomm/doc/library/regframeforec_dec2009.pdf.

- reflecting the presence of alternative infrastructure in a number of locations, where CPs purchase a terminating segment they do not always purchase a trunk segment as well.
- 6.71 We think these arguments remain valid and that we should continue to define separate trunk and terminating segment markets. Nevertheless, we have repeated analysis undertaken in the 2007/8 Review that we used as a high-level indicator of differences in competitive conditions for trunk and termination.
- 6.72 In the 2007/8 Review, we analysed all of the retail TI circuits sold by OCPs that would 'notionally' require a trunk segment. We compared these 'retail requirements' to BT's overall sales of wholesale TI circuits to third parties (Partial Private Circuits ('PPCs'))¹⁰⁹ that also contained both a terminating segment and trunk segments.¹¹⁰ A comparison of retail requirements for trunk to BT's wholesale sales of PPCs helped provide a view of the extent to which OCPs that are reliant on BT for a terminating segment were able to self-supply the trunk element of a retail circuit themselves. Our analysis suggested that OCPs were able to self-supply trunk to a greater degree than for terminating segments.
- 6.73 The latest available data¹¹¹ suggests that on average, more than one third of OCPs' retail TI circuit sales would 'notionally' require a trunk segment. This is marginally higher than the proportion (around 26%) of TI circuits sold to OCPs by BT which include a trunk segment. This suggests that where a CP requires a terminating segment (from BT) it often also buys a trunk from BT rather than self-supplying. However, within this average there are a number of larger suppliers such as [≫] whose reliance on BT is less significant. Across all CPs there appear to be a sufficient number of instances where OCPs can self-supply the trunk segment.¹¹²
- 6.74 Therefore, for the analysis supporting separate TI trunk and terminating segments markets from the 2007/8 Review stands. A similar analysis can be applied to AI services, because a significant number of CPs have their own core network capacity capable of supporting a long-distance AI conveyance service analogous to TI trunk services. In particular, a CP with its own core network infrastructure capable of supporting AI services should be in a better position to self-provide AI trunk than they are for AI terminating segments. Although we have not formally defined an AI trunk market before, we consider that the reasons for identifying a break between TISBO

¹⁰⁹ A PPC is always sold by BT from the end-user site to an OCP's point of handover to its core network. However, a PPC is not available on an end-to-end basis between two end-user sites (so it is always a partial circuit). A PPC sold always contains at least a terminating segment (from an end-user site to an OCP's POH). Depending on the scope of an OCP's own network an OCP may also rely on BT to provide PPC including a trunk segment as well as a terminating segment.

¹¹¹ Data based on CPs responses to our S135 information request on retail and wholesale circuit sales and purchases.

¹¹² There are some caveats that we must apply to this analysis. This is because some of the inferences over the extent of sales of wholesale trunk circuits may be overstated to some extent. However, if anything, any bias in this analysis is likely to overstate the extent to which OCPs rely on BT for all of their trunk requirements. Therefore, to the extent that the market data suggests that some OCPs are able to self-supply trunk segments (to a greater degree than terminating) then this evidence is still supportive of a separate market to terminating segments.

and trunk segments are likely to be equally valid for AISBO and AI core/trunk segments.¹¹³

6.75 Given that we propose to identify separate terminating and trunk markets, we now consider under Issue 1, whether we should alter the break-point between trunk and terminating segments (i.e. either by changing the identification of the location of TANs for AI and TI markets or by considering alternative proposals such as those set out in BT's December 2011 paper).

Identification of the break between trunk and terminating segments

- 6.76 Most CPs responding to the CFI were against changing our market definition for trunk based on the TAN concept (for market definition purposes). However, in BT's December 2011 paper it set out a number of criticisms of the approach we used to define trunk based on TANs. In light of BT's critique of the TAN boundary issue, we consider there are some aspects of the TAN concept that merit further consideration in particular in relation to TAN boundary issues. Therefore, in the remainder of this section under Issue 1, we compare the two market definition alternatives:
 - Adopting BT's proposal to define trunk based on the presence of CPs at its network nodes; or
 - Adapting our existing trunk market definition to address some concerns over TAN boundary issues, while retaining the overall TAN concept.

BT's proposals for a "competitive core"

- 6.77 BT's proposal for a "competitive core" effectively involves redefining the trunk market boundary, pushing it outwards to a lower tier of smaller nodes such as local exchanges where some CPs have apparently built out their networks. In particular, BT suggested that we should define a boundary between access and a "competitive core" based on the exchanges where CPs have invested in PPC POHs. BT argued that if CPs have invested in POHs in these locations then this is an indication of a significant presence as it represents a significant commitment. It notes, for example, that the minimum interconnection capacity for an aggregated POH is 63 * 2Mbit/s circuits.
- 6.78 We have set out a number of concerns that we have identified with BT's proposal that we discuss in turn below.
 - a) BT's proposal does not follow the approach to market definition consistent with the EC guidelines on market definition and SMP;
 - b) BT's proposal is reliant on a single indicator of competitive presence (POH purchases); and
 - c) Measuring presence of operators based on POH purchases is not a sufficient indicator of competition in backhaul.

¹¹³ We note that it would not be possible for us to calculate the volume of AI trunk circuit sales in the same manner. BT's sales of such services are often under the umbrella of its Managed Ethernet Access Services contracts. The nature of these services and the technology used to deliver trunk services (on BT's 21CN) is such that it is difficult to replicate the above analysis on a per circuit basis.

(a). Approach to market definition

- 6.79 BT's proposal starts with the assumption that CP interconnection (based on OCPs' POH purchases) identifies where the market for trunk is competitive (a competitive core market). We consider that this approach reverses the EC guidelines on market definitions and SMP, whereby product and geographic market definition are logically prior to any SMP assessment, as we explain below.
- 6.80 In the standard approach to market definition, the first step is to identify a narrowlydefined "focal product". The SSNIP test is then used to determine whether this focal product should be regarded as forming a market by itself or whether the market should be broadened to include potential demand-side and supply-side substitutes. In the present context, an analysis of demand-side and supply-side substitution might lead to the definition of a market including a number of different trunk routes given the possibility of indirect routing noted earlier, but would not bring in parts of the access and backhaul networks as these are clearly not demand-side or supply-side substitutes for trunk services.
- 6.81 For the purposes of simplifying the analysis, the market might also be broadened to include other trunk routes on the grounds either that they are subject to a common pricing constraint or that competitive conditions are sufficiently homogeneous to allow this. Reliance on homogeneity of competitive conditions is more usual for the purposes of geographic market definition than for product market definition. However, given the location-specific nature of trunk services and leased lines generally, the distinction between product and geographic market definition is blurred and homogeneity of competitive conditions can be useful for the purposes of product market definition as well. BT's approach, however, omits all usual steps except the very last, and then defines competitive conditions as homogeneous on the basis of a single indicator, contrary to the ERG guidelines.
- 6.82 With respect to market definition, we also have to have regard to the EC Recommendation and BEREC's guidelines on this matter. As set out above, the explanatory note accompanying the EC's 2007 Recommendation highlighted the basis for identifying differences between trunk and terminating segments:

"What constitutes a terminating segment will depend on the network topology specific to particular Member States and will be decided upon by the relevant NRA."¹¹⁴

6.83 This quotation refers to terminating segments but clearly the definition of the market boundary for terminating segment should also inform where the trunk market is likely to begin. This explanatory note highlighted that any definition is linked to the network topology and not, as BT suggests, based solely on the number of interconnected operators at a particular location. We think the EC recommendation is most consistent with the standard approach to market definition because the wholesale leased line products actually sold, for example a trunk or terminating segment, are usually defined on the basis of the parts of the network used. It is then natural that this should be reflected in the definition of the focal product and the final product market definition. In this respect, we consider that our proposed market definition is also more consistent with this approach and with the EC recommendation.

¹¹⁴ See page 39 of:

http://ec.europa.eu/information_society/policy/ecomm/doc/library/proposals/sec2007_1483_final.pdf

- 6.84 Another concern with BT's proposal is that this market definition would reclassify some parts of the network (such as backhaul) as part of its "competitive core" market on the basis that one or more CPs are purchasing a POH at particular nodes. As noted by C&WW in its comment on BT's trunk proposals, if a POH has limited spare capacity then this link back to its core network would not be sufficient for it to avoid buying 45Mbit/s or 155Mbit/s trunk segments. BT's proposals could therefore result in a market definition in which terminating segments (including backhaul routes) are included within the competitive core when they are not good substitutes for core services.
- 6.85 As discussed in below (and in Section 4), many backhaul or regional trunk routes are likely to be parts of the market where the opportunities for CPs to realise economies of scale and scope are more limited. Therefore, BT's "competitive core" could include a number of routes where the competitive conditions are heterogeneous to genuinely competitive trunk routes.
- 6.86 Indeed, as we discuss below, even if the market data suggested that some CPs have built network to BT's local exchanges, there is no evidence to suggest that this is constraining BT to price these segments at the competitive level.
- 6.87 We should only include of services in the same product or geographic market that are either good substitutes for each other or supplied under homogeneous competitive conditions. We consider in paragraphs 6.117 to 6.130 below why our proposals identification of national trunk routes is consistent with this approach, in contrast to BT's proposals.

(b). Reliance on a single indicator

6.88 As set out in paragraph 6.63 above, Colt expressed concerns over the use of a single indicator of competition. Colt argued that a proper analysis of demand and supply-side constraints was required and not only an assessment based on BT's suggested indicator. Indeed, this point was highlighted in the ERG's common position on geographic aspects of markets, where it discussed the need for multiple indicators in order to segment a market:

"The criteria for the assessment of the homogeneity of competitive conditions will usually be correlated (e.g. low barriers to entry are likely to lead to a higher number of operators, a lower market share of the incumbent operator and lower prices). However, the correlation is unlikely to be perfect. It is therefore likely to be appropriate to base the segmentation on a combination of several [....] criteria mentioned above. A segmentation based on a single criterion (e.g. the number of operators) will usually not be appropriate. The relevant criteria should be applied cumulatively and such that differences in competitive conditions between different markets are large while differences in competitive conditions within a market are small. The relevant thresholds for each of the criteria which determine the scope of the market have to be determined on a case-by-case basis based on the characteristics of each market."

6.89 At the very least any market definition reliant on a single indicator would need to be supported by evidence that other market definition factors were not relevant and/or that such indicator is capable of accurately capturing the boundaries of the relevant

market.¹¹⁵ Therefore, even if we were to rely on POH purchases as one of the criteria to justify identification of a competitive core, it is unlikely to be sufficient basis for defining a separate market on its own. In particular, we would need to see wider supporting evidence of variations in competitive conditions for a competitive core.

- 6.90 In our view, BT has not shown that CP presence (based on POH purchases) results in a strong competitive constraint on the backhaul circuits it provides to OCPs beyond those nodes. For example, if we consider the 250 nodes where BT considers two or more CPs other than BT are present, there is no evidence to suggest that BT has sought to apply any variation to its pricing of backhaul circuits delivered beyond these nodes. By contrast, there is some evidence of discounting by BT on national trunk routes (between Tier 1 nodes in London and Birmingham and Manchester).
- 6.91 We note that BT also offers wholesale discounts for terminating segments in the London area. However, if anything, this observed pricing behaviour is more consistent with our proposed market definition. This is because, under our market definition proposals for trunk and terminating segments, we propose to find a separate geographic market for certain TISBO markets in the WECLA where we have found there to be scope for competition based on the extensive CP fibre presence.¹¹⁶
- 6.92 Indeed, we would contrast our proposed geographic market definition, which has been set out on the basis of extensive analysis of CP network presence with BT's proposals. Our geographic market definition also considered other indicators of competition such as BT's service shares; the impact of OCP presence on BT's pricing behaviour in that geographic area; and a further assessment that competition is likely to be sustainable (including an assessment of the interconnection opportunities available and the proportion of businesses the geographic area that individual CPs can serve).¹¹⁷

(c). POH presence is not a sufficient indicator of competition in backhaul

- 6.93 As observed by UKCTA members, CPs' purchases of POH services is an indicator of presence at a node, but it does not provide any indication of the strength of any potential competitive constraint. For example, UKCTA members observed that:
 - not all POHs are enabled to support different technologies. For example, an OCP may have interconnected to support PDH circuits but not SDH;
 - not all POHs are connected to CPs' national trunk networks;
 - the fact that a OCP is purchasing a POH at a BT node does not mean that OCP has sufficient spare capacity (or efficient POHs) that they could then use to compete with BT; and

¹¹⁵ For example, in our reviews of Wholesale broadband access markets, we have sometimes defined markets on the basis of the number of principal operators connected at a BT exchange. This reflects the specific economic characteristics of the provision of WBA services using LLU and based on a full analysis of the evidence of variations in competitive conditions.

¹¹⁶ For a discussion of geographic market analysis and geographic discounts, see Section 5.

¹¹⁷ This is important in the context of leased lines markets as CPs need to be able to deliver end-toend solutions to their retail customers. For a further discussion of this see our geographic market definition in Section 5.

- OCPs do not have as extensive a network as BT, so they are also less able to provide resilience (e.g. two diverse paths) from each exchange location where they are purchasing a POH (this point was made both by C&WW (a major provider of wholesale TI circuits) and [≫] (a major purchaser of wholesale TI circuits)).
- 6.94 These points suggest that even those OCPs purchasing POH at a node may also be reliant on BT for additional circuits at that location to other parts of the UK (i.e. not only access circuits). But even if all of the above conditions were met, as stated by Colt (see paragraph 6.63), there is no guarantee that those players would offer circuits to their rivals in the merchant market.
- 6.95 Related to this point, there is the issue of the cost and practicality of interconnection for a CP relying on a merchant market for backhaul links. BT's proposals seem to suggest that anywhere between from around 600 to 250 exchanges would effectively be competitive as there would be an alternative provider of core capacity to BT at that location. While it may be true that the individual operator purchasing a POH may be able to avoid purchasing trunk or backhaul (to some extent), it does not necessarily follow that a healthy merchant market would be achievable from those locations.
- 6.96 In practice, an operator with its core network connected at each TAN attempting to connect end-users close to two of BT's identified 250 exchanges would face a number of difficulties.



Figure 59: Example of end-to-end circuit provision issues

Source: Ofcom 2012

- 6.97 Consider for example a local serving exchange (LSE 1) with two CPs present (operators A and B). Consider another local serving exchange (LSE 2) with two other CPs (operators D and E). BT's argument is that it should not be obliged to provide a circuit beyond these "competitive exchanges" because there is operator presence at each LSE. Now consider an operator (operator C) that did not have presence (i.e. it had only built out to BT's Tier 1 nodes). In this situation operator C would be obliged to purchase access segments from BT and backhaul from the merchant market either:
 - at one end either from operator A or B and at the other end from either operator D or E; or
 - from BT on an unregulated basis to bridge the gap between regulated terminating segments provided by BT and operator C's own core network nodes in major urban centres.

- 6.98 For a retail circuit with two terminating segments and a trunk segment this could result in operator C having to put together a circuit consisting of up to five circuit segments, two access segments from BT, middle-mile / backhaul connection from either operator A and/or operator B and self-provided trunk. These arrangements would be complicated even further if at the other end of the circuit operator C would have to conclude an interconnection arrangement with either operator D or E.
- 6.99 We do not consider that this would be an efficient proposition either from a technical, operational or cost perspective. There is also the need to consider that if an OCP is only providing a relatively small number of circuits, it would be economically prohibitive for an OCP to switch from BT to an alternative supplier. This is because there could be significant circuit rearrangement costs of handing over a circuit from one provider to another.
- 6.100 One way in which an OCP could overcome these concerns is if it could interconnect with a merchant provider that had sufficient presence (and resilient capacity) at each of BT's identified "competitive" nodes. In the above example, say, Operator A might be present both at LSE 1 and 2. However, putting aside the other concerns such as resilience and capacity requirements, the available evidence¹¹⁸ suggests that the same two CPs are not present at the 250 nodes identified by BT. For example, for the largest two CPs (other than BT) still active in the TI markets, we estimate that there are only 73 exchanges where they are both present. Therefore, a provider looking to ensure resilient connections at the 250 exchanges that BT has referred to as a "competitive core" is likely to face quite limited choice of alternative CPs with extensive national connectivity.

Amending the existing trunk definition based on TANs

6.101 In the following paragraphs, we explain why we think that the overall TAN concept remains valid. However, we also recognise that there may be some issues with our definition when the methodology is applied to circuits that cross the boundaries of defined TAN "catchment areas". Therefore, we explain some possible adaptations to our existing trunk market definition that we consider could resolve those issues.

We consider the TAN concept remains valid

- 6.102 First, we turn to the question as to why we think that the overall TAN concept remains the most valid basis for identifying trunk. To answer this question, we first consider the model of competition for leased lines markets. Demand for leased lines from the retail business connectivity market often requires businesses to connect their sites across the UK. When CPs build competing networks they are likely to locate their trunk nodes first in the most concentrated population centres where their customer base is largest. Progressively, as they gain more customers they may wish to locate more than one PoP in a particular area thereby reducing further their reliance on BT.
- 6.103 BT has criticised the TAN approach on the basis that CPs will always want to be as close to their customers as possible and will not choose to locate at Tier 1 nodes. However, a CP's build decision is not only centred on the location of a single customer. Clearly, if it is efficient to do so, a CP will want to pick-up traffic from its retail customers onto its network closer to the customer. However, building out network entails significant sunk costs. This often means that a CP needs to generate

¹¹⁸ Based on analysis of OCP's purchases of POH circuits based on BT's response to our S135 information request.

economies of scale (and/or scope) to make investment in trunk (or backhaul) at a PoP closer to its customers worthwhile.

6.104 Indeed, it may be that the optimal decision in the first instance is to locate at those exchanges where the most traffic can be served and that would minimise the circuit distances of all customers served from that location. OCPs will also consider the opportunity to interconnect with third parties (either to purchase or sell circuits from others). Therefore, OCPs are likely to be driven towards the major network nodes where a number of other CPs have decided to locate. In the 2007/8 Review, we considered that Tier 1 nodes were likely to be important to OCPs:

"we consider that it would not be logical to completely divorce the analysis of trunk competition from the realities of network build by different CPs and BT's network. In particular, BT's decision to locate its Tier 1 nodes in part reflects where it was optimal to locate these nodes for the purposes of aggregating leased lines traffic. Furthermore, given the fact that many CPs are reliant on BT for the provision of wholesale leased lines for access and backhaul, this suggests that their network build will relate closely to the location of BT's network nodes. For example, OCPs have, in many cases, located their points of presence nearby to at least a subset of Tier 1 nodes."

6.105 Indeed, as part of its response to our formal information request, BT submitted a schematic diagram of its SDH network depicting Tier 1 nodes as providing the national backbone with lower Tiers used for regional/intra-city connectivity.

Figure 60:Schematic view of BT's SDH network



Source: BT 2011, response to S135 information request

- 6.106 BT highlighted that the rings depicted in its network schematic grouped together into 'Tiers' for management and planning reasons but this does not induce a rigid hierarchy i.e. to get from a T3 to another T3 it is not always necessary to route via a T1 node. Clearly, what this highlights, however, is that BT as the incumbent operator with the largest customer base has naturally designed its network with greater level of connectivity between lower layers on its network than would be the case than for its competitors (with lower overall scale). With such a network, BT may be able to supply regional or intra-city circuits without needing to route a service back to a parent Tier 1 node in all cases. However, we are not only concerned about how BT might route a circuit on its network. We are also concerned that our market definition captures the scope for OCPs to compete, which will depend on their likely network topology rather than BT's.
- 6.107 In our view a smaller scale operator than BT is unlikely to be able to build out a fully meshed network at anywhere near the scale of BT. Therefore, the starting point for a rival network entering the market is likely to be a core network located at key points where it can pick-up the most traffic at the most efficient points. This network is likely to have a more hierarchical structure as a CP with more limited scale can only justify aggregation nodes at major urban centres. Through time, CPs may be able to build capacity and locate at points closer to the customer for particular backhaul routes (e.g. in the London area). But we consider that the TAN concept of identifying a core network around key demand concentrations remains valid.

The significance of Tier 1 nodes as part of the TAN concept

- 6.108 In BT's paper it submitted that even if the concept of aggregation points is valid, Tier 1 nodes do not have a particular significance to OCPs. It argued that OCPs do not interconnect at Tier 1 anymore than they do at other layers in BT's network (i.e. lower Tier nodes).
- 6.109 In Table 45 below we show that there is apparently significant 'presence 'of OCPs in at least one Tier 1 node within each of the TAN catchment areas. We compare this to the average 'presence' of OCPs at all other SDH-enabled BT exchanges.

Table 45: Count of OCPs with Point of Handover within proximity to Tier 1 nodes with TAN areas

Trunk aggregation node exchanges		Distance (km)					
in unk aggregation noue exchanges	<250m	<500m	<1km	<2km	<5km		
ABERDEEN	3	4	4	4	4		
BIRMINGHAM	5	7	8	9	9		
BISHOPS STORTFORD	1	1	2	2	3		
BRIGHTON	4	4	4	4	7		
BRISTOL	4	4	4	8	9		
CAMBRIDGE	4	4	4	4	6		
CARDIFF/NEWPORT	4	4	4	4	4		
CARLISLE	2	3	3	3	3		
CHELMSFORD	3	3	3	3	3		
COVENTRY	3	3	4	4	4		
CRAWLEY	2	2	3	3	4		
CROYDON	2	2	4	6	6		
DONCASTER	2	2	3	3	4		
FDINBURGH	1	1	3	4	7		
	1	3	6	7	7		
GLOUCESTER	2	2	2	2	4		
	2	2		4	1		
IPSWICH	3	3	5	5	- 6		
IRVINE	1	1	1	1	1		
KINGSTON	2	2	2	2	2		
I FEDS		4	6	6	7		
I FICESTER	5	5	7	7	8		
	3	3	3	4	5		
	5	6	7	. 9	11		
	3	3	. 3	9	10		
LONDON FAST	3	3	3	3	. 3		
	1	1	2	2	3		
	1	2	3	4	4		
LUTON	4	4	4	4	4		
MANCHESTER	5	5	5	6	11		
MILTON KEYNES	2	2	3	4	5		
NEWCASTLE	0	4	4	5	8		
NORTHAMPTON	3	4	4	4	5		
NOTTINGHAM	4	5	5	6	6		
OXFORD	5	5	6	6	6		
PRESTON	3	3	3	3	3		
READING	3	4	4	7	7		
SALISBURY	2	2	3	3	3		
SHEFFIELD	4	4	4	4	6		
SLOUGH	0	0	3	3	6		
SOUTHAMPTON/PORTSMOUTH	5	5	7	8	8		
SWINDON	3	4	5	6	6		
WARRINGTON	3	3	3	4	5		
WATFORD	4	4	4	4	4		
WOLVERHAMPTON	4	4	4	4	4		
YORK	3	3	3	3	4		
Average number of CPs with proximity to TAN exchanges	2.8	3.3	3.9	4.6	5.4		
Average number of CPs with proximity to other exchanges*	0.1	0.1	0.2	0.3	0.8		

Source: Ofcom 2012, based on BT's S135 data on PPC Point of Handover circuit sales. *National average includes all other SDH-enabled exchanges

- 6.110 The table above shows, for example, that in the Birmingham TAN there are seven unique CPs with a point of handover within a 500 metre proximity to one of the main Tier 1 nodes.¹¹⁹ On average there are more than three CPs with proximity to the Tier 1 nodes for each TAN. This contrasts with BT's other SDH-enabled exchanges, where there are far fewer CPs with proximity on average.
- 6.111 Therefore, in our view our current market definitions based around the concept of prospectively competitive trunk networks (based on circuits between major nodes linking major urban centres) remain appropriate.

Issues over circuits crossing TAN boundaries

- 6.112 In BT's critique of the current definition of trunk, it was concerned about the impact of treating circuits that cross TAN boundaries as trunk. In the example provided by BT (see Figure 58 above), the OCP in question purchased a short-distance circuit that crossed the boundary of the Manchester to Leeds TAN catchment area. We agree with BT that it may not be appropriate to treat a short-distance circuit as trunk simply because it crosses a 'notional boundary' between the Manchester and Leeds TAN "catchment areas". BT may be selling a number of these short-distance circuits that share the characteristics of terminating segments (e.g. more limited opportunities for economies of scale and scope). Therefore, in market definition terms, it would appear that treating circuits linking different TAN areas as trunk circuits is not always appropriate.
- 6.113 We consider that it is possible, however, to adjust the trunk market definition to deal with the issue of circuits crossing TAN boundaries. The approach we propose which was originally suggested in C&WW's response to the CFI is to define two markets: "regional" circuits between adjacent TANs and "national" trunk circuits between non-adjacent TANs (e.g. circuits linking distant major UK cities).
- 6.114 The approach has the benefit that circuits between non-adjacent TANs are far more likely to employ trunk or core networks. For example, a longer distance circuit between, say, a town near Birmingham and a town near London is likely to be routed via London and Birmingham, in which case it would clearly include a trunk segment. However, there will inevitably be some relatively short circuits which would cross a catchment area boundary where the most efficient routing is direct, rather than via the corresponding trunk nodes for that catchment area.
- 6.115 A benefit is that this approach captures the different competitive conditions for different circuits (regional trunk segments and national trunk routes). This is because routes between major urban centres will tend to be the high volume routes where the potential for competition is likely to be relatively high. A trunk definition based entirely around the notion that any circuit between different TAN catchment areas must contain trunk will include circuits which cross catchment area boundaries without in fact being routed across the core network, and where the scope for competition is much more limited.
- 6.116 The rationale for not including circuits between adjacent TANs within a single trunk market is that many of these circuits spanning TAN boundaries share the characteristics of terminating segments. That is, they are relatively short-distance circuits enabling a CP to serve a customer premises by connecting it to the nearest BT node. In these cases, the use of a trunk circuit connecting two Tier 1 nodes is

¹¹⁹ Given that the average distance of a PPC point of handover interconnection link is more than 1km, we consider that CPs within 500m will have proximity to major Tier 1 nodes.

only notional, a product of the logical routing model assumed. In other cases, it may be efficient for BT or an OCP to provide a circuit spanning a TAN boundary by actually using a trunk circuit connecting two Tier 1 nodes. For example, we would expect that BT's trunk network nodes should be centred reasonably close to major cities even if they are in adjacent TAN catchment areas (e.g. Sheffield and Leeds). Therefore, in some cases, it would be efficient to route regional circuits that start and end close to the Sheffield and Leeds Tier 1 nodes over the trunk network. However, we think that it would not be practical to identify which of these "regional" circuits were:

- more like traditional, long-distance trunk; and
- more like termination.
- 6.117 This would require us to assess each circuit sold case by case, which would add significant complexity which we do not consider to be proportionate.

Ofcom's market definition assessment

6.118 As set out above, we consider that our proposed market definition based on the TAN concept remains appropriate. In light of this, we consider below, our proposed market definition in more detail. In particular, we consider whether the national and regional trunk market would pass the standard market definition tests based on demand and supply-side substitution and, given the geographic dimension to these potential markets, we also look at wider evidence such as common pricing constraints and homogeneity of competitive conditions.

Demand and supply-side substitution

- 6.119 As stated in paragraph 6.40 above, we consider that an analysis of trunk segments would tend to suggest that a national trunk market exists. In particular, as noted by BT, there are often multiple ways by which a national circuit could be routed (i.e. a retail circuit from London to Birmingham could be delivered using a wholesale trunk service, which may be routed directly or via an intermediate London to Coventry link and then another link from Coventry to Birmingham).
- 6.120 Therefore, if a hypothetical monopolist sought to apply a SSNIP on a specific route (e.g. London to Birmingham) this would be constrained by CPs substituting to using alternative "indirect" trunk routes. For each trunk route there is likely to be at least one viable alternative route. Consequently, following the standard approach to market definition, we would widen the market from a starting point of an individual route to include an alternate route. If we were to repeat this exercise for every route combination in the UK then through a chain of substitution this could result in all national routes being included in a single national trunk market.
- 6.121 However, as stated in paragraphs 6.112 to 6.117 above, we consider that a distinction can be made between a national trunk market and regional trunk markets. For example, if a hypothetical monopolist were to apply a SSNIP to national trunk routes, it would be difficult for a CP could replicate the economies of scale and scope on national trunk routes by using a combination of multiple regional trunk or terminating segments. Therefore, demand-side substitution would not provide an effective constraint. On the flip-side, for short-distance regional trunk circuits we do not consider it would be efficient to route the circuit back to a major aggregation node

to make use of more national trunk. Therefore, demand-side substitution suggests separate national and regional trunk markets.¹²⁰

Common pricing constraints

- 6.122 Even if demand or supply-side substitution pointed to separate markets, it might be that a common pricing constraint applied across the two services such that they should be included in the same product market.
- 6.123 It is difficult to infer much from BT's current pricing practices (and we do not have available pricing evidence from other operators).¹²¹ In relation to BT's pricing of TI trunk segments, these services are subject to the PPC charging rules that emerged following the regulatory requirements to offer these services on a non-discriminatory basis. As noted in the January 2008 Consultation:

"... In the existing model for TI circuits, BT is obliged to provide PPCs which run from a customer site to a point of presence (POP) in the purchasing CP's network, but does not provide end-to-end wholesale services between customer sites. In this existing model, a CP wishing to provide a short retail circuit which crosses a catchment area boundary has to purchase terminating segments from each customer site to the respective Tier 1 nodes, and then link the Tier 1 nodes using at least some of their own network.

In order to provide competitive parity, when BT provides a similar circuit, it is required to charge its retail business as if the circuit had been routed via the same Tier 1 nodes, even if the physical routing was in fact much more direct. This is a key feature of the PPC charging model. It is essentially an Equivalence of Outcome (EOO) approach rather than one based on Equivalence of Inputs (EOI). BT is not actually providing the same services to its own downstream business as to its competitors, but it uses its internal transfer charging framework in an attempt to achieve an equivalent outcome."¹²²

6.124 However, within this overall EOO framework, BT has had scope to vary its charges including for different trunk segment types or by different geographies. Indeed, we observe that to the extent that BT has applied discounts for trunk services, it has applied them to two significant national routes for 2Mbit/s trunk segments (London to

¹²⁰ We do not consider supply-side substitution is relevant in the case of a HMT applied to national trunk. This is because any providers of regional trunk are also likely to be present in the supply of national trunk. Supply-side substitution is also unlikely to be relevant in relation to providers of 'national' trunk entering the market for 'regional' trunk circuits. If we considered a HMT applied to regional trunk, it is unlikely that a provider of national trunk routes could easily enter the market and begin supplying regional circuits without incurring significant sunk costs associated with digging and ducting and further investment. Therefore, supply-side substitution would not be relevant either to national or regional trunk markets.

¹²¹We did not ask operators for their pricing of trunk segments because wholesale contracts may not explicitly identify trunk segments. In addition, any contracts negotiated between OCPs for third party supply may vary significantly in terms of the coverage of routes, service management such that it would be difficult to collect trunk prices comparable to BT's.

¹²² Paragraphs 6.136 to 6.137 of the January 2008 Consultation.

Manchester and London to Birmingham).¹²³ If anything, this pricing evidence would tend to suggest that there is not likely to be a common pricing constraint between regional and national trunk (at least in relation to the most important national trunk routes).

Homogeneity of competitive conditions

- 6.125 As noted above, we consider that the competitive conditions for national and regional trunk are likely to be sufficiently distinct to identify separate markets. Routes between major urban centres will tend to be the high volume routes where the potential for competition is likely to be relatively high.
- 6.126 By contrast, many of regional trunk circuits spanning TAN boundaries share the characteristics of terminating segments i.e. they are relatively short-distance circuits enabling a CP to serve a customer premise by connecting it to the nearest BT node. In these cases, the use of a trunk circuit connecting two Tier 1 nodes is only notional, a product of the logical routing model assumed. In other cases, it may be efficient for BT or an OCP to provide a circuit spanning a TAN boundary by actually using a trunk circuit connecting two Tier 1 nodes. However, as noted in paragraphs 6.116 to 6.117 above we do not believe that it would be practical to identify which circuits were more like termination and trunk without assessing each circuit sold on a case by case. This would add significant complexity and thus be disproportionate in the context of this market definition exercise.
- 6.127 Nevertheless, we have undertaken an initial assessment of likely service shares for trunk circuits using the TAN catchment areas. This analysis identifies which circuits are regional trunk segments between adjacent TANs catchment areas and national trunk segments between non-adjacent TANs. The analysis suggests that there is scope for greater competition on national trunk routes between non-adjacent TANs. For example, on a national basis we estimate of BT's share of the wholesale trunk market of up to 49% (and potentially less) across these large inter-city routes.¹²⁴ For the "regional" trunk market, we estimate that BT's share would be much higher up to 89%, which is very similar to its overall shares of the TISBO market. Our analysis also suggests that the service shares are persistently higher for regional trunk routes connecting TAN areas in different parts of the country.
- 6.128 We therefore consider that the above market definition criteria are supportive of a national trunk market and a regional trunk market.

Ofcom's proposals

6.129 We propose to continue to identify separate trunk and terminating segment markets. Nevertheless, a distinction can be made between regional circuits crossing adjacent TANs (more similar to terminating segments) and national trunk circuits on the basis of variations in competitive conditions and other market definition criteria. We do not consider that BT's alternative proposal to identify a "competitive core" based on the

¹²³ BT applies a discounted charge of £22.64 per annum per km on these routes compared to an undiscounted charge of £45.28 per km for a 2Mbit/s trunk segment.

¹²⁴ Our method of calculating BT's share of the long-distance trunk market is not distorted by "part circuits" that span TAN catchment areas. Therefore it would not overstate BT's shares (or understate OCPs self-supply) on national trunk routes. For a further discussion of our approach to estimating market shares see Annex 8.

number of interconnecting operators alone would be an adequate basis for defining a trunk market. In particular, competitive conditions within a trunk market defined in this way would not be homogeneous and BT's proposal would lead to the deregulation of parts of this market which are not competitive including, for example, circuits in the "regional" trunk circuits market and some circuits in trunk segment markets.

- 6.130 Therefore, we propose to retain the TAN concept to determine whether a wholesale TI circuit is either:
 - within a TAN "catchment area" (a terminating segment);
 - a regional trunk circuit between adjacent TANs (more like a terminating segment);
 - a circuit between non-adjacent TANs (national trunk segments).
- 6.131 It is important to note that we accept that in defining trunk markets in this manner we are not ruling out that competition may have emerged in certain locations beyond the national trunk routes. As set out in Section 5, in our geographic market definition we have proposed to identify a separate geographic markets in the WECLA for terminating segments. This is based on analysis of there being sufficient alternative competing network to BT and where the evidence shows that there has been appreciable impact on the competition in wholesale markets.

Ofcom's proposed definition of AI trunk

- 6.132 In the above discussion, we have focused our analysis largely on the TI trunk market. However, as noted in paragraph 6.21, in the 2007/8 review we applied the TAN concept to the AI market to define the break-point between the AISBO and AI trunk.
- 6.133 For the AI market, we identified 56 AI TANs, which broadly speaking mapped onto similar locations to the 46 TANs (but reflecting some differences in the location of BT's major nodes for the AI services known at the time as metronodes but now referred to as Openreach Handover Points (OHPs) relative to Tier 1 nodes). We also identified a further ten AI TANs based on the major population and business centres at which CPs are likely to interconnect their core networks with BT to serve AISBO markets. Similar to the TISBO market, we defined the AISBO market as a circuit between any two points within a TAN catchment area. Any circuits between TANs areas (and routed via OHPs) would include competitive AI trunk segments. However, as reflected in our remedies for AI markets, we noted that some short-distance Ethernet circuits crossing TAN boundaries could be provided on an end-to-end basis (such as BT's WEES services).
- 6.134 BT is not currently required to provide AI trunk services. It is however required to provide AISBO circuits which cross TAN boundaries but, unlike similar TI circuits, these are not deemed to include a trunk segment. By contrast, under the PPC pricing model, TI circuits which cross TAN boundaries are deemed to include a trunk segment. It is because short-distance AI circuits crossing TAN boundaries are classed as terminating segments, where the equivalent TI circuit would be regarded as including a trunk segment, that we do not need to identify a regional trunk market for AI circuits.¹²⁵

¹²⁵Indeed, as part of its Undertakings commitments, BT is required to offer on an EOI basis effective access and backhaul services. Unlike PPCs provided for the TI market, these circuits can be provided

- 6.135 As noted above, for the TI trunk market the rationale for not including circuits between adjacent TANs within a single trunk market is that many of these circuits spanning TAN boundaries share the characteristics of terminating segments (i.e. they are relatively short-distance circuits enabling a CP to serve a customer premises by connecting it to the nearest BT node). In these cases, the use of a trunk circuit connecting two Tier 1 nodes is only notional, a product of the logical routing model assumed.
- 6.136 Ethernet services (such as EAD) can be offered over dedicated point-to-point circuits. On this basis, the economies of scale and scope that CPs can realise in the provision of individual point to point circuits are more limited than for networked Ethernet services. Furthermore, for point to point Ethernet circuits (such as BT's EAD circuits) there are limits to their use:
 - there is currently a technical limit (currently to 25km radial distance for the standard EAD service); and
 - it would be uneconomic to provide long-distance capacity over dedicated point to point circuits because this would not allow the user to exploit available aggregation economies.
- 6.137 These factors combined would ensure that regional end-to-end circuits spanning TAN catchment areas (such as EAD type circuits) are far less likely to be used to provide an equivalent to a trunk or core conveyance service. We note that, similar to the TI trunk market, there may be circumstances in which it might be efficient to route a circuit via the relevant OHPs where a circuit spans a TAN boundary rather than using a dedicated point to point link. However, we consider that it would not be practical to identify which of these "regional" circuits were more like traditional, longdistance trunk and which circuits were more like termination without assessing each circuit sold case by case.
- 6.138 Therefore, we propose to identify an AI trunk market for aggregated connections between major network nodes (OHPs) in separate TANs. However, in light of the nature of Ethernet services, we do not consider it necessary to identify a regional trunk market including point to point circuits spanning AI TAN catchment areas. Therefore, point to point Ethernet circuits such as EAD are part of the terminating segment market.

Issue 2: Trunk versus alternative "core" conveyance

6.139 We consider in this part whether we can identify separate markets for different "types" of trunk/core networks that are used to support different leased lines services (i.e. retail AI and TI services and other retail services). Figure 61 below provides an illustration of trunk and terminating segment used to deliver a retail circuit.

on an end-to-end basis between customer sites. This point was reflected in the January 2008 consultation, where we noted that: "When providing short circuits across potential catchment area boundaries, therefore, competing operators are not obliged to purchase partial circuits linking customer sites to their own POPs; they can purchase end-to-end circuits with a more efficient and direct physical routing. This is an EOI approach which provides competitive parity without the need for what might be termed artificial transfer charging arrangements." (Paragraph 6.138).
Figure 61: Trunk versus terminating segments



Source: Ofcom 2012

- 6.140 For retail TI services, many CPs are likely to make use of point-to-point SDH/PDH trunk circuits that employ time division multiplexing technologies. However, we observe today that many CPs also have their own core connectivity often based around packet-based technologies. We refer to these alternative core networks collectively as "core conveyance" services (including ATM or other IP-packet based services). In principle, using certain switching technologies such as Multi-Protocol Label Switching (MPLS), it is possible to prioritise traffic on packet-based networks to deliver 'business class' services. Indeed, many CPs make use of core conveyance to provide AI services (so we would classify AI trunk as a core conveyance service). We consider below whether trunk circuits used to deliver retail TI services (TI trunk) are in a separate market to other forms of core conveyance (AI trunk).
- 6.141 In light of our proposed finding of competitive national TI and AI trunk markets, in principle we would be likely to come to a similar finding of a competitive national trunk market whether or not we identified a combined AI and TI market). Nevertheless, for completeness and given the market we have identified for regional TI trunk segments (i.e. circuits spanning TAN catchment area boundaries), we have considered whether core conveyance services and regional TI trunk circuits could fall within the same market.
- 6.142 Given the similarity of these regional circuits to terminating segments, we consider that the factors underlying our finding of separate AISBO and TISBO markets (under Issue 1) are likely to be applicable to regional circuits. Nevertheless, to the extent that CPs are in a position to make use of TI trunk or core conveyance for some regional circuits, we consider in our market assessment whether TI trunk and core conveyance services would fall in the same market. We set out below our assessment based on the following criteria:
 - *Technical assessment:* we consider the capabilities of TI trunk and core conveyance, developments in the market and any technical barriers that may exist in the use of trunk/core networks to support different services;
 - Demand-side substitution: we assess whether core conveyance services could deliver all of the requirements of a TI trunk network (i.e. whether a CP currently requiring a TI trunk circuit could in theory substitute to purchasing trunk over, for example, an MPLS network);
 - Supply-side substitution: we consider whether a CP currently providing coreconveyance services (and not currently providing TI trunk) could easily switch to

provide TI trunk, such that it would impose an additional competitive constraint;¹²⁶ and

• Interconnection and other barriers to switching: we consider any factors that may affect the ability to switch circuits delivered over TI trunk to core conveyance.

Ofcom's analysis

6.143 We start by looking at developments in the market and a technical assessment.

Technical assessment

- 6.144 The main development in network provision since the last review is BT's deployment of its 21st Century network. This utilises multi-protocol label switching (MPLS) technology on IP-packet based network over WDM fibre in the backhaul and core network. One of the main implications of the 21CN is its ability to support multiple services over a common packet-based network.
- 6.145 Core conveyance using MPLS enables greater ability to "emulate "dedicated leased line services due to improved management of priority traffic and increased support for SLAs on latency and jitter. Initially, at least, BT is utilising the 21CN to support its wholesale broadband access services and Ethernet products including point to point services and Ethernet VPNs. However, as we discuss in the following paragraphs, rather than supporting TI trunk services using "emulation" over the MPLS network, it appears that BT will offer CPs services delivered using an SDH-layer.
- 6.146 SDH/PDH trunk networks employ TDM to deliver low latency and synchronous dedicated point-to-point circuits. The distinguishing characteristic of core conveyance, as opposed to SDH/PDH trunk segments, is that they offer a higher degree of flexibility reflecting the nature of the packet-based technologies employed. For example, wholesale broadband access services will make use of these conveyance networks because they offer flexibility and allow, on a per user basis, virtual paths to be offered at low unit cost. Many point-to-point Ethernet solutions (including VPNs) are supplied in dedicated or contended variants. BT's Ethernet services offer standard contention rates of 5:1 and premium (uncontended) services over the same network.¹²⁷
- 6.147 It is these uncontended services provided on core conveyance networks that would be the closest "candidate" substitute for a TI trunk circuit. On packet-based networks, uncontended "virtual paths" can be employed through routing and switching technologies such as MPLS. This looks similar in many respects to a dedicated pointto-point trunk circuit on an SDH-network. However, it is less clear that MPLS would deliver the same quality of service for those users that value very low latency services. This is supported by evidence from BT's recent statements on its continued support of "native-TDM" ¹²⁸ products on its 21CN. In particular, BT does not propose to develop TDM-emulation solutions for its 21CN network for low latency requirements. Instead, it is planning to offer native TDM-based services:

¹²⁶ We do not consider this in the alternative (i.e. an operator of TI trunk supply-side substituting to provide core conveyance) as we are not aware of there being any major operators of TI networks not currently present in the supply of AI services.

¹²⁷http://www.btwholesale-inspire.com/products2/data/ethernet

¹²⁸ A native-TDM services is provided directly using technology types such as SDH or PDH rather than emulation of TDM services over Ethernet networks.

"BT is seeking to minimise the latency of information within its network. Services that are latency-critical will continue to be provided on an SDH TDM infrastructure, where latency will be minimal (latency is in the main dominated by fibre route km, which is approx 0.005ms per km). Other services will be emulated over an MPLS core network, and will experience an additional packetisation delay of the order of 5ms."¹²⁹

6.148 At the very least this reflects the continued demand for TI trunk services even if "emulation" services over MPLS networks now offer a quality of service closer to that of TI services than previously. On this basis, technically while core conveyance could be a substitute for a number of users, it remains the case that BT will continue to support the strict performance requirements of TI users based on access to "native" TDM-based services. This suggests that a sufficient number of end-users will not find an MPLS-based service an adequate substitute for a native service to make it economic to retain the TDM network in use.

Demand and supply-side substitution

6.149 This section assesses whether the trunk services that form part of the leased lines trunk market are constrained by other core conveyance services in light of our technical assessment. As with other leased lines services, it is necessary to identify all relevant products which provide a sufficient constraint on each other. Generally, this involves assessing direct constraints by assessing demand-side and supply-side substitution opportunities. We have also considered below the relevance of any indirect constraints.

Direct demand-side constraints

- 6.150 Given the starting point of a regional TI trunk service provided over an SDH/PDH network, we consider below whether core conveyance networks could provide a demand-side constraint (or vice versa).
- 6.151 We now turn to the question of whether a user of a TI trunk service (in a response to a SSNIP) would switch to a core conveyance service. In many cases, the performance that could be offered using either SDH-trunk or dedicated paths across core conveyance networks should be broadly acceptable for most users. For example, there are likely to be a number of TI customers that might (in any case) be thinking of migrating to other services that no longer need the strict service requirements of an end-to-end TI service.¹³⁰ So it is possible that there is a sub-set of current retail TI customers that would be unaffected by a switch of their SDH-trunk to a core conveyance network (such as MPLS).
- 6.152 Most critically, however, for some users of SDH/PDH services with very strict quality of service requirements, it may not be possible to replicate SDH/PDH-trunk over dedicated broadband conveyance capacity with the same guarantees. We think that there will remain a rump of users for whom access to TI services appears necessary to deliver certain service characteristics. Indeed, as explained in paragraph 6.147

¹²⁹https://www.btwholesale.com/pages/static/Community/21_Century_Network_Community/What_is_ 21_CN/21CN_FAQs/21CN_FAQs_Legacy_Interconnect.html

¹³⁰ Indeed, many retail customers rely, for example, on VPNs that utilise TI access tails, but with the core connectivity provided over a packet-based MPLS network rather than dedicated fixed TI trunk links.

above, BT's plans for its 21CN are to retain access to a "native SDH" layer, which suggests that this residual demand cannot be met using MPLS (or in the alternative there remains sufficient demand for access to the "native SDH" layers).¹³¹

6.153 Therefore, in response to a SSNIP on trunk services, we consider that wholesale providers would be unlikely to switch from using SDH/PDH-trunk to core conveyance services in order to deliver traditional interface services. This follows a similar logic to our assessment of AISBO and TISBO markets under Issue 1 in Section 4. Indeed, even if the performance characteristics of core conveyance were identical to TI trunk, there are still also a number of barriers to switching from TI trunk services, which we discuss in paragraphs 6.163 to 6.168 below.¹³²

Indirect demand-side constraints

- 6.154 When defining wholesale product markets it is also possible that substitution at the retail level provides an indirect constraint on the pricing of wholesale products. Under the Hypothetical Monopolist Test assessing the effect of indirect constraints entails consideration of the likely impact of a price increase in wholesale trunk prices (i.e. a SSNIP) passed through in some form to the retail market. At the retail level, the impact of a price increase from an upstream input is 'diluted' as the wholesale trunk service is only one element of the cost stack associated with the provision of retail leased line services. Hence, the question is whether a SSNIP at the trunk level (which would translate to a more limited price increase at the retail level) would prompt sufficient retail switching to make such a trunk SSNIP unprofitable.
- 6.155 At the retail level, we propose to find TI leased lines in a separate market to a number of other services such as VPNs, Ethernet and ADSL that are likely to rely on core conveyance. Therefore, there would not be an effective constraint from customers switching from TDM-based retail services to these services. On the other hand, at the retail level we propose to find SDSL and digital PDH/SDH services in the same retail TI market. And because SDSL services would tend to rely on a core conveyance rather than SDH/PDH trunk networks, then in principle it is relevant to consider any indirect constraints from SDSL services. However, we consider that the inclusion of SDSL in the TI market would not result in core conveyance services offering a competitive constraint on TI trunk.¹³³ In addition, in the opposite direction,

¹³¹According to BT's wholesale website its main core and backhaul network (sometimes loosely referred to as the 21CN) utilises multi-product label switching (MPLS) technology over WDM links. Initially, at least, BT is utilising the 21CN to support its wholesale broadband access services and Ethernet products including point to point services and Ethernet VPNs. However, it does appear that even on its 21CN, BT offers the ability to access directly the SDH-layer. This may suggest that there will be ongoing demand for TI trunk services that is supported over a SDH trunk network that is distinct to a MPLS-based service.

¹³² We also consider that demand-side substitution at the wholesale level would be unlikely to occur when viewed from the perspective of core conveyance services switching to dedicated SDH-trunk. This is because switching from providing a retail service using core conveyance capacity to providing such capacity over SDH-trunk would erode the main benefits (such as flexibility and the efficiency advantages of shared capacity) of using conveyance services.

¹³³In our retail market definition, we included SDSL in the TI market, because other TI service types (analogue, SDH/PDH) could provide a competitive constraint on SDSL prices. However, we did not consider that SDSL would provide a competitive constraint on the price of other TI services. This means that the competitive constraint for TI markets only works in one direction (i.e. other TI services offer a competitive constraint on SDSL). On this basis, we do not consider that an 'indirect' constraint (arising from retail TI customers switching to SDSL) would constrain a hypothetical monopolist from imposing a SSNIP on TI trunk services.

we do not consider that core conveyance will be constrained by TI trunk based on indirect constraints.¹³⁴

6.156 Therefore, we do not consider that indirect constraint arguments would provide a basis for a combined TI trunk and core conveyance market.

Supply-side substitution

- 6.157 In general, for supply-side substitution to be relevant to our assessment, we would require that CPs:
 - could enter the TI trunk market relatively easily within a short-space of time (i.e. they have an existing network capacity of some variety); and
 - they are not already 'present' in the TI trunk market (i.e. they are not currently providing a TI trunk service over that core capacity).
- 6.158 For the TI trunk assessment, we believe that in principle supply-side substitution is a relevant factor to consider because there are some CPs with core conveyance networks not currently providing their own TI trunk services.
- 6.159 In considering the ease of entry, it is worth returning to the technologies that CPs might employ in core conveyance networks or trunk networks. If a CP has a core conveyance network (as is not already present in the market), then it is likely to be running this network over a WDM transmission layer.¹³⁵
- 6.160 Within the context of this market definition framework, we consider that there is a difference between the technical capability of providing a single TI circuit over WDM and the provision of a fully functioning TI trunk network. We do not think that operators with core conveyance networks (not currently supplying TI trunk) in response to a SSNIP would be willing to invest in necessary TI equipment to enter the market and offer a competing TI trunk service (particularly in relation to regional trunk routes).¹³⁶
- 6.161 This is because in order to achieve a fully functioning (and efficient) trunk network requires investment in additional multiplexing equipment and interfaces to support

¹³⁴ We consider that it is unlikely that a SSNIP at the wholesale level would generate sufficient switching from SDSL to SDH/PDH to impose a sufficient constraint. A SSNIP on core conveyance would not result in as large an increase in the retail price of SDSL given that core conveyance is only one element of the retail cost stack. SDSL is such a small proportion of core conveyance that it is very unlikely to be a constraint. Furthermore, we note that demand for SDSL is relatively insignificant and is in decline. Therefore, we do not think that it is appropriate to rely on indirect substitution between TDM-based services and SDSL as a reason to place core conveyance in the same market as TI trunk.

¹³⁵ In theory a CP might have an IP-MPLS network run over an SDH trunk layer over WDM. However, we would expect any such operator to already 'present' as it is already likely to be offering TI services.

¹³⁶We observe that all major CPs with their own core networks employ WDM networks as the transmission medium in the core. In principle the same physical fibre and WDM transmission medium could be used to deliver both an MPLS-enabled and TI trunk network.

the SDH/PDH standards.¹³⁷ For a CP that has only invested in an MPLS network it is unlikely to want to enter the market in a relatively short timeframe in response to a SSNIP. Therefore, if a hypothetical monopolist applied a price increase (SSNIP) to TI trunk circuits, we do not consider there would be sufficient supply-side substitution to make that price increase unprofitable.

6.162 On this basis, we do not consider that CPs (not currently present in the market) would provide an effective competitive constraint.

Interconnection and other barriers to switching

- 6.163 Notwithstanding the above demand and supply-side considerations there are likely to be other barriers to a CP currently purchasing TI trunk switching to core conveyance services. First, we note that differences in the location of core conveyance networks and TI trunk networks are likely to represent a significant barrier to providing TI trunk and core conveyance over a converged platform. Second, even where the interconnect points for AISBO and TISBO services coincide there may be still be remaining barriers to switching.
- 6.164 Under the above hypothetical monopolist test, we considered (on the demand-side) whether a CP would switch to using dedicated paths over its own conveyance network (or provided by another wholesale provider). Similarly (on the supply-side) we investigate whether a supplier (not currently present in the supply of TI trunk market) could utilise its capacity on core conveyance network to provide separate TI trunk circuits.
- 6.165 Reflecting the historical evolution of their networks, some CPs have retained separate SDH networks and built that network to reflect where demand was centred (to support TI services). For other CPs who may not have been significant providers of TI services and hence not deployed SDH networks, they may have instead relied on interconnection with third parties such as BT. Therefore, historically, there has been a degree of separation between the interconnect points for AI and TI markets.
- 6.166 Even if an OCP's core conveyance network is interconnected at similar points, this is not the only barrier to switching that needs to be overcome. For example, there might still be circuit reassignment/migration costs in moving a circuit currently provided using regional SDH circuit to a CP's own core conveyance network. In addition, for existing supply, there would in any case be some disruption to the end customer's service when switching between one network and another.
- 6.167 Given the legacy nature of TI services, it may not be worthwhile for a CP to move a proportion of its circuits onto its own network (especially if the volumes are low) and in particular where this risks customer disruption. Hence, if a hypothetical monopolist imposed a SSNIP on trunk, it would not necessarily be easy for a CP to simply migrate those TI trunk circuits to be delivered over its own core conveyance network without incurring significant costs. Therefore, in addition to our technical assessment

¹³⁷ For example, [\gg	\times
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and demand and supply-side considerations, we consider that there could, in any case, be significant barriers to switching for the installed base of legacy TI services.

6.168 Any such barriers are likely to be particularly important for regional circuits where there are likely to be insufficient circuits to justify switching from one network technology to another in the short to medium term.

Ofcom's proposals

6.169 As demand for wholesale services, including trunk, is a derived demand, then the fact that there are separate retail TI and AI markets suggests identifying a separate TI trunk and core conveyance markets at the wholesale level. We note that there are potential technical barriers to the use of core conveyance networks for the provision of TI trunk and we do not think supply-side substitution would impose an effective constraint. We observe that the locations where CPs have core connectivity may not necessarily coincide in all circumstances with TI trunk locations. Even if a CP has a POH for regional TI trunk circuits relatively close to its own core conveyance network, it does not entirely eliminate the costs associated with circuit migrations and reassignments. On this basis, we propose to retain separate TI trunk markets (distinct from core conveyance).

Issue 3: Bandwidth

- 6.170 In our retail product market definition, we proposed a number of bandwidth breaks for AISBO, TISBO and MISBO markets. Under issue 3, we consider whether we should identify any bandwidth breaks for wholesale trunk services.
- 6.171 Our proposal, as per the 2007/8 Review, is that we do not identify any bandwidth breaks. Each trunk or core conveyance market covers all bandwidths.

2007/8 Review

6.172 In the 2007/8 Review, we considered that the breaks we identified at the retail level for different bandwidth services (e.g. retail AI low and high bandwidth services) mapped onto similar breaks at the wholesale level (AISBO low and high bandwidth terminating segments). We relied on a derived demand argument, which suggested that there was a close relationship between the bandwidth of the retail circuit and that of the wholesale circuit a CP would use to deliver a retail service at a particular speed. We considered, however, that the mapping of retail breaks to wholesale services was not applicable to trunk circuits, as we found multiple bandwidths were supplied over a single high capacity link. Therefore, we defined the trunk market at all bandwidths).

Call for inputs and stakeholder views

6.173 In our CFI, we the findings of the 2007/08 Review. We proposed to retain this approach so that, where the retail market definition is unchanged, we would expect this to be reflected in an unchanged definition of the associated upstream wholesale markets. There were no comments on our proposed approach in the CFI.

Ofcom's analysis

National TI trunk and core conveyance

- 6.174 We do not consider it appropriate to define distinct markets for national TI trunk segments at different bandwidths. As discussed in Section 4 in the AISBO and TISBO market, there is a close relationship between the bandwidth of the terminating segment and the bandwidth of the relevant retail leased line.
- 6.175 By contrast, it would be highly inefficient to deliver, for example, a dedicated longdistance 2Mbit/s retail leased line circuit over an individual 2Mbit/s trunk route. By its very nature, on trunk segments, traffic is aggregated together to enable efficient bulk transport over high capacity bearer circuits. Indeed, in order to provide competitive trunk, a CP will seek to exploit these economies of scope and scale by aggregating traffic at any relevant bandwidth. Therefore, for a CP to provide trunk competitively, it is likely to be present at all bandwidths on a given trunk route and competitive conditions are likely to be similar for all bandwidths on that route. In addition, an operator with existing trunk capacity could easily switch from providing one bandwidth to another.
- 6.176 On this basis, we propose to identify a single TI trunk market at all bandwidths. The same logic would apply for core conveyance services as these services would also be subject to similar economies of scale and scope. As such that we would also identify a single market at all bandwidths.

Regional TI trunk

- 6.177 The remaining question we consider in this section is whether to identify bandwidth breaks for regional TI trunk.
- 6.178 As set out under Issue 1 above, many regional trunk circuits spanning TAN boundaries share the characteristics of terminating segments i.e. they are relatively short-distance circuits enabling a CP to serve a customer premise by connecting it to the nearest BT node. In these cases, the use of a trunk circuit connecting two Tier 1 nodes is only notional, a product of the logical routing model assumed. In these circumstances there would be limited opportunities for traffic actually to be aggregated together using trunk segments. On the other hand, we note that in some cases it may be efficient for BT or an OCP to provide a circuit spanning a TAN boundary by actually using a trunk circuit connecting major aggregation nodes. Moreover, whether the trunk circuit used is a real or only a notional one, competitive conditions in the provision of the trunk segment (and its unit cost) will reflect the realisation of economies from aggregating traffic from multiple customers for the various different bandwidths of retail circuit. This could point to a regional TI trunk market at all bandwidths.
- 6.179 It is also important to recall that market definition is only a means to end: i.e. to ensure an effective assessment of SMP. In this context, the majority of regional TI trunk circuits are low bandwidth services (i.e. at 2Mbit/s or below). For example, we estimate that higher bandwidth regional TI trunk exceeding 2Mbit/s represent less than 5% of the total count of regional TI trunk circuits sold to third parties by BT or OCPs. Given that the number of high bandwidth TI trunk circuits is not material,

competitive conditions can be regarded as homogeneous and our SMP finding as robust. $^{\rm 138}$

Question 4: Do you agree with our approach to product and geographic market definition for wholesale trunk and do you agree with our proposed market definitions for wholesale trunk?

¹³⁸ We consider that regional TI trunk is likely to have competitive conditions similar to terminating segments. For terminating segment markets at similar speeds, in our SMP assessment we find that BT has SMP (its market share is well in excess of 50% threshold for a presumption of dominance). Therefore, it should follow that BT would have a similar share for TI regional trunk given the prevalence of low bandwidth trunk circuits.