

Direction Setting the Margin between IPStream and ATM interconnection Prices

Consultation

Issue date: 26 August 2004

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Summary

- S.1 This statement refers to wholesale products that are used as inputs by internet service providers (ISPs) to offer broadband internet access services to consumers and businesses. Currently, BT is the main provider of these types of product and the requirements of this Direction are designed to allow other businesses to compete with BT in offering these types of product to ISPs.
- S.2 On 27 May 2004, Ofcom published a consultation document (the "May consultation") setting out its proposals on setting the margin between the price of 'IPStream', BT's intermediate broadband internet access service and ATM interconnection ('DataStream') in the form of a draft Direction. This followed publication of the Review of the Wholesale Broadband Access ("the WBA market review") on 13 May 2004. In the WBA market review, Ofcom concluded that BT has Significant Market Power ("SMP") in the market for asymmetric broadband origination in the UK (excluding the Hull area) and the market for broadband conveyance in the UK. Ofcom proposed the margin setting remedy as a way to address BT's SMP. The Direction which accompanies this explanatory statement sets out Ofcom's conclusions in this area.
- S.3 The proposal to derive a margin squeeze rule reflects Ofcom's objective of introducing more certainty for Altnets in particular in order to facilitate competition in the provision of intermediate services, such as IPStream. ATM interconnection has been available since August 2002 but uncertainty about the margin available to Altnets has tended to discourage market entry. By providing more certainty, Ofcom hopes to promote effective and sustainable competition by allowing Altnets to compete with BT in the provision of intermediate services to ISPs offering broadband internet access to consumers.
- S.4 In this context the term margin has been used to describe the 'space' available, between ATM interconnection and IPStream, for Altnets to compete against BT in the provision of intermediate services, based on ATM Interconnect products. The costs/price of ATM interconnection and IPStream, on a per user basis, have very different economies of scale (ATM interconnection costs are influenced by scale much more than IPStream) and, therefore, it is not possible simply to compare prices on a like-for-like basis. The margin must therefore encapsulate both reasonable 'usage' factors, which take account of the fact that costs are a function of scale, for the ATM interconnection products and the additional cost required to convert these ATM products into intermediate services, which are comparable to BT's IPStream services.
- S.5 This document sets out Ofcom's methodology and outlines details of the model it has used to derive a margin. As we made clear in the explanatory statement to the draft Direction, Ofcom's analysis necessarily requires a number of judgements and assumptions and we requested respondents' views on these. Ofcom received 14 responses to the Consultation Document. Non-confidential responses were published on Ofcom's website.
- S.6 It is clear that, in general, stakeholders wanted more detail about the workings of the model and greater transparency. To this end a further Supplementary Note was published on 29 June 2004 to provide greater clarification for industry players during the consultation period to assist them in formulating their responses. The consultation period was extended by a further two weeks to allow respondents to consider this clarification fully before responding. However, Ofcom's ability to provide additional transparency is limited by the commercially confidential nature of

the information on which the margin setting model is based. Therefore, in an effort to balance respondents' wishes for greater transparency with the need to respect commercial confidentiality, Ofcom contracted an external consultancy, Analysys Consulting Ltd, to review the model. The report prepared by Analysys is at Annex 2. The recommendations of the review have been addressed in this Final Statement.

- S.7 Ofcom considers that the obligations contained in this Direction are appropriate. They are objectively justifiable in relation to wholesale broadband access and Ofcom's aim of promoting effective competition in the market for intermediate broadband services, they do not unduly discriminate, and they are transparent and proportionate in relation to what they are intended to achieve.
- S.8 On the basis of the obligations in the attached Direction, BT's current ATM interconnection prices and its proposed IPStream prices are compliant.

Section 1

Introduction

Review of the Wholesale Broadband Access Markets – Objectives and Findings

- 1.1 A new regulatory framework for electronic communications networks entered into force in the UK on 25 July 2003. This framework, based on five new EU Communications Directives, is designed to create harmonised regulation of the electronic communications markets across Europe. Each market review is designed to determine what level of *ex ante* regulation should be applied to operators found to have significant market power (SMP) in the relevant markets identified by national regulatory authorities such as Ofcom (and previously the Director General of Telecommunications (the 'Director')). In its *Recommendation on relevant product and service markets within the electronic communications sector* (11 February 2003), the Commission identified the market for Wholesale Broadband Access as being a market susceptible to *ex ante* regulation. Ofcom, in fulfilling its obligations as required by the new EU regulatory framework, undertook two consultations (in April and December 2003) before completing its review of this market on 13 May 2004.
- 1.2 In the *Review of the Wholesale Broadband Access*, (the "WBA market review") Statement¹ Ofcom concluded that BT has SMP in the following markets:
- a. asymmetric broadband origination market in the UK (excluding the Hull area); and
 - b. broadband conveyance market in the UK.
- 1.3 Given the finding of SMP held by BT in those markets, i.e. its ability to behave, to an appreciable extent, independently of competitors, customers and ultimately consumers, Ofcom has imposed a number of SMP conditions on BT in order to address BT's SMP. In choosing which remedies to impose, Ofcom has considered the relative immaturity of these markets. In particular, it has considered the need to balance remedies designed to facilitate competition with the need to ensure that incentives to invest in broadband infrastructure are not adversely affected. For example, Ofcom has imposed a condition on BT which requires it to provide Network Access on reasonable request and on fair and reasonable terms, conditions and charges, SMP Condition EA1. Ofcom considered whether this Network Access should be provided on a cost-plus basis but, given the difficulties involved in setting cost-plus prices in a dynamic and relatively immature market, and the adverse effects that would arise if the charges were incorrectly determined, particularly if they were set too low, Ofcom decided against such an approach. Instead, Ofcom has imposed a retail-minus pricing approach in this market and Network Access will be provided on those terms. That is, BT must price any Network Access in such a way as to avoid a margin squeeze with its downstream products, in particular its intermediate services, IPStream and BT Central (referred to as 'IPStream' in the rest of the document unless otherwise specified). The purpose is to avoid leverage of market power into downstream markets and to facilitate the development of greater competition in downstream markets.²

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http://www.ofcom.org.uk/codes_guidelines/telecoms/netw_intercon_index/wholesalebroadbandreview/

² For a further discussion of these issues see Chapter 4 of the WBA market review.

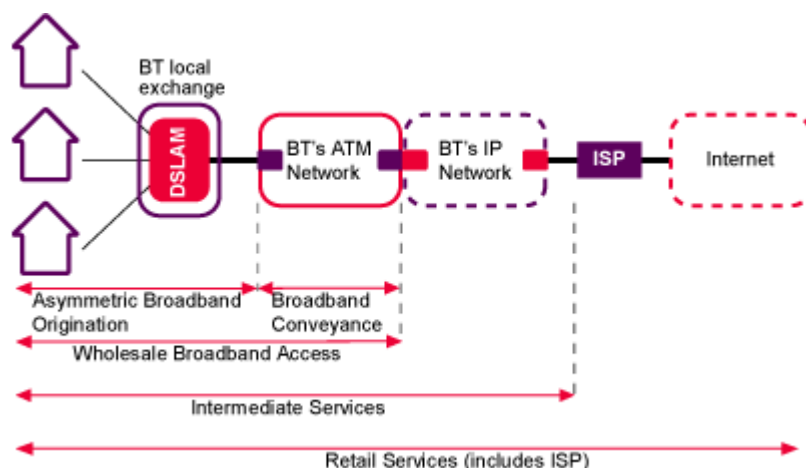
- 1.4 The Network Access SMP condition EA1 also gives Ofcom the power to make certain directions. The Network Access obligation is framed in technology neutral terms and is defined by the scope of the relevant markets. Under that SMP condition, Ofcom has made a direction requiring BT to provide ATM interconnection in order to facilitate downstream competition (the 'Original ATM Direction'). This replicates, in part, a Direction made in June 2002 (the 'June 2002 ATM Direction'), issued by Oftel in order to resolve a dispute between BT, Energis and Thus, which mandated ATM interconnection (often referred to in the industry as 'DataStream') in two forms, Service A (interconnection at the parent switch) and Service B (interconnection at the distant switch). Ofcom believes that it is important and appropriate that BT continues to have a specific obligation to provide interconnection on the terms set out in the Original ATM Direction. While Ofcom³ recognised in the WBA market review that future network development might mean that ATM interconnection ceases to be the most appropriate form of interconnection, it is currently the only practical way Altnets can interconnect with BT, excluding Local Loop Unbundling (LLU), in order to offer intermediate and retail broadband internet access products further downstream.
- 1.5 The next section sets out a brief explanation of BT's network and the different levels of the supply chain.

The products and levels in the vertical chain

- 1.6 In the WBA market review, Ofcom identified five distinct levels in the value chain. Each level includes the previous level as one of its inputs. Starting from the end-user, the levels are as follows:
- a. the local access network;
 - b. broadband origination;
 - c. broadband access (origination plus conveyance);
 - d. services delivered to service providers (intermediate services, e.g. IPStream and BT Central); and
 - e. services delivered to consumers (business or residential) e.g. broadband internet access.
- 1.7 The diagram below illustrates the services in question, focusing on the technology, namely Asymmetric Digital Subscriber Line ("ADSL"), principally used by BT to offer broadband internet access. This diagram is displayed for illustrative purpose only, as the asymmetric broadband services markets include services provided in other ways e.g. broadband cable and unbundled loops.

³ Although the first stage of the WBA market review consultation was published by Oftel and the second stage consultation in December 2003 by Oftel and Ofcom jointly, this document refers to Ofcom throughout unless referring to specific publications issued by Oftel or the Director of Telecommunications ('the Director') prior to Ofcom receiving its powers under the Communications Act .

Figure 1.1



- 1.8 The diagram illustrates, in terms of BT's network, the various vertical levels in relation to broadband internet access. For the remainder of this document, services at levels (ii) and (iii) are referred to as being at the wholesale level; services at level (iv) are referred to as "intermediate services"; and services at level (v) as "retail services".
- 1.9 At the retail level, end-users buy retail services (such as broadband internet access) from service providers (e.g. BT Yahoo, AOL, Freeserve). In order to supply these retail services, the service providers buy intermediate services (e.g. BT's Standard or Capacity Based Charging ('CBC') IPStream services) from wholesale operators. Sometimes wholesale suppliers self-supply to their own service provider. For example, in the intermediate market, BT is a wholesale supplier selling IPStream to its own service provider as well as to other service providers. Other suppliers in the intermediate market include, for example, the cable companies. This Direction concerns the margin available between those Altnets using (ii) and (iii) in order to compete with BT in the provision of (iv) and (v).

ATM Direction and the 'no margin squeeze' rule

- 1.10 As referred to in paragraph 1.4, the Original ATM Direction replicates the provisions of the June 2002 ATM Direction as regards the requirement to provide the interconnection service. At that time there were no appropriate interconnection services which Altnets could purchase from BT which allowed them to interconnect with BT's ATM network and so allow them to offer wholesale DSL services to service providers or allow them to offer retail DSL services for end users. In mandating this interconnection product, Oftel decided to adopt a retail minus approach and opted to specify a pricing rule ('no margin squeeze' rule) and compliance regime to which BT would be subject. This approach was designed to enable Oftel to ascertain promptly whether the interconnection charges set by BT complied with the no margin squeeze rule.

Investigation into complaints about BT's IPStream price reductions

- 1.11 On 3 April 2003, BT announced some price cuts to its IPStream products which were due to become effective on 1 May 2003. In addition, it introduced a volume discount scheme for IPStream which further reduced the price for scale purchasers. No corresponding reductions were introduced for ATM interconnection prices. Oftel requested information from BT to show it was compliant with the June 2002 ATM Direction and, in addition, formal complaints were received from Energis, Tiscali, Your

Communications, Thus and MediaWays alleging that BT was margin squeezing. Following a lengthy investigation and some reductions in the price of ATM interconnection, Oftel finally concluded in September 2003 that BT was not in breach of the 'no margin squeeze' rule set out in the June 2002 ATM Direction. However, the investigation highlighted the shortcomings of the margin squeeze rule set out in the June 2002 ATM Direction.⁴ In reviewing the WBA markets, therefore, Oftel and later Ofcom considered possible alternatives to that regime which are discussed below.

Specific proposal to set a margin

- 1.12 Respondents to the April 2003 WBA market review consultation highlighted two main concerns around the margin squeeze test. These were, firstly, a lack of certainty and predictability about the test and secondly, a concern as to whether economies of scale would determine the outcome of the competitive process since the margin squeeze test in the June 2002 ATM Direction was based on BT's costs. Given its scale, its costs are considerably lower than those faced by smaller scale operators. Oftel/Ofcom agreed with both Altnets and BT that the previous regime which relied on lengthy ex post investigations only allowed for limited transparency in its application and did not create as much certainty regarding the WBA margin as industry required.
- 1.13 Accordingly in the December 2003 consultation, having taken account of these responses, Ofcom set out its proposals to specify the level of the margin such that there was no price squeeze between BT's ATM interconnection charges and its prices for the relevant downstream services (i.e. to set the minus), in particular IPStream. Ofcom considered that this revised approach of setting the margin would address Altnets' and BT's concerns and provide greater certainty and transparency on the conditions that ATM interconnection charges should satisfy, so as to allow effective competition to develop in the provision of intermediate and retail broadband services. Ofcom is conscious that in order to make investment decisions, Altnets require stability and certainty in deciding whether or not to enter this market. The resource intensive investigation following the April 2003 price changes to IPStream and the ensuing uncertainty highlighted the 'chilling' effects of the current arrangement on Altnets, i.e. the investigation discouraged Altnets from taking investment decisions in relation to intermediate services. Furthermore this approach should provide BT with greater certainty in how it can change its IPStream prices while remaining compliant with the margin squeeze test.
- 1.14 Ofcom is, however, also conscious of the need to balance this desire for certainty against the need for flexibility and the need to be responsive to changing market developments. On balance Ofcom has concluded that setting a specific minus in this market is imperative to foster competition with the caveat that any margin would need to be subject to periodic review and also reconsideration if there is a material change in the circumstances. This issue is discussed further at the end of Section 5. The WBA market review process consulted generally on this proposal to set the margin in this way and Ofcom's conclusions on this general approach are set out in the May 2004 Statement. The consultation document, published on 27 May 2004 and the further Supplementary Note published on 29 June 2004 (collectively referred to as the 'Consultation Document' unless otherwise indicated) set out in detail Ofcom's proposals to set the margin between ATM interconnection and BT's Standard and CBC IPStream Services. In developing its proposals, Ofcom considered the views of industry. As well as considering responses made to the WBA market review consultations, more detailed views have also been obtained through information requests and meetings with Altnets, ISPs and BT. In particular, BT cost information

⁴ For further details of this case please look at the case closure summary at: www.ofcom.org.uk/static/archive/oftel/publications/comp_bull/cases/closed_cases/cw_607.htm

from the original margin squeeze investigation, referred to above, has been used in deriving a margin squeeze rule.

Consultation Responses

1.15 Ofcom received 14 responses to the Consultation Document. The majority of respondents supported Ofcom's proposals in principle although there were concerns about the specifics of Ofcom's methodological approach, the model and the resulting size of the margin. The European Commission also responded. The following section sets out respondents' views on the legal basis for Ofcom's approach; alternative approaches to regulating the margin; concerns about the complexity of Ofcom's approach and the lack of transparency and addresses some of the concerns raised by stakeholders in response to the Consultation Document but which are outside the scope of this Direction. Comments on detailed methodological and modelling points are addressed in subsequent sections.

Legal concerns raised

BT's comments

- 1.16 BT made the following five points about the legal basis of Ofcom's approach to setting the margin.
- 1.17 *Breach of competition law.* BT argued that there is a risk that the manner in which the margin squeeze test is being conducted by Ofcom will potentially put BT in breach of proper competition law standards since the margin squeeze methodology forces BT to deviate from its actual cost basis and that this may force BT to price its wholesale service at a level which might be below cost.
- 1.18 *Differences in approach between competition law and ex ante regulation:* BT suggested that Ofcom appears to have introduced concepts and notions into ex ante regulation, which BT claimed did not form part of general competition law e.g. contestability.
- 1.19 *Contestability.* Specifically, BT did not accept that Ofcom had demonstrated any link between 'contestability' and relevant case law or Commission pronouncements under general competition law.
- 1.20 *New entrants' costs:* BT stated that Ofcom had no justification under competition law case law for its modifications to BT's business plan to accommodate a less efficient new entrant and cited in its response case-law where the concept of equally efficient competitor was used.
- 1.21 *Remedy to address an abuse:* Finally, BT suggested that implicit in Ofcom's consultation and the way in which contestability has been presented, was that BT had already acted anti-competitively and the remedy (i.e. the margin squeeze rule) was to redress this abuse. BT points out that this approach is at odds with the European Commission's Guidelines on market analysis and the assessment of SMP, ('Market Power Guidelines')⁵ which make clear that the purpose of remedies is to prevent an abuse taking place which might not be satisfactorily handled under competition law.

⁵ OJ 2002/C165/03. 11 July 2002

Ofcom's response

- 1.22 *Breach of competition law:* It is not clear how Ofcom's proposals would force BT to price below cost. These proposals are aimed at ensuring that there is an adequate margin to allow Altnets to compete. Ofcom is not setting the absolute level of prices. BT has the discretion to comply with the Direction by changing either ATM interconnection prices or IPStream prices.
- 1.23 *Differences in approach between competition law and ex ante regulation:* Ofcom recognises that there are differences between general competition law and an ex ante approach. Ofcom's approach in the WBA markets is that it is necessary to impose ex ante regulations to promote actively the development of competition as set out in the WBA market review.
- 1.24 Indeed, as set out at paragraphs 4.9 to 4.11 of the WBA Market Review, without the imposition of ex ante regulations in the WBA markets to promote actively the development of competition, it is unlikely that ex post general competition law powers will be sufficient to ensure that effective competition becomes established.
- 1.25 Further, the Commission's Market Power Guidelines state at paragraph 15 that when making sector specific regulation, Ofcom must seek to achieve the policy objectives in Article 8 of the Framework Directive. These include the objectives to promote competition and encourage the efficient investment in infrastructure in the WBA markets. Ofcom considers that the ex ante obligations set out in this Statement are necessary to fulfil those specific objectives.
- 1.26 It would therefore be inappropriate for Ofcom to rely on general competition law remedies, in this respect, whose aim as BT identified in its reply is "to sanction agreements or abusive behaviour which restrict or distort competition in the relevant market"⁶. However, that does not mean that similar concepts are not relevant in both ex ante regulation and ex post investigations; it is just a question of how those concepts are applied given the objective of each type of regulation.
- 1.27 *Contestability:* Ofcom does not accept that it needs to demonstrate a link between its use of contestability in this regulation with general competition law since the objective of the regulation is different to that in general competition law. Nevertheless, Ofcom's approach to the margin squeeze analysis, in considering such issues as contestability, is broadly consistent with the Director's consideration under competition law of a margin squeeze in its investigation into alleged anti-competitive practices by BT in relation to BTOpenworld's (BTOW) consumer broadband products.⁷
- 1.28 For example, in that investigation, the Director stated at paragraph 6.2 of the Statement that in conducting his analysis as he had been mindful of the need to avoid a result where the margin squeeze test is passed only because the analysis has built in the rewards of anti-competitive behaviour, he tested the robustness of his margin squeeze results under assumptions about what would have been reasonable for BTOW to expect in a competitive market.
- 1.29 *New entrants' costs:* Again, Ofcom does not accept that it needs to show a link between its approach and competition case law since the goals of ex ante regulation and competition law are different. It is Ofcom's intention to impose a pricing rule which requires that there is a sufficient margin to allow an entrant of similar efficiency to BT

⁶ See also paragraph 31 of the Market Power Guidelines.

⁷ See Statement published on 20 November 2003.

http://www.ofcom.org.uk/bulletins/comp_bull_index/comp_bull_ccases/closed_all/cw_613/cw_613.pdf

to compete. This includes to a limited degree the consideration of new entrants' costs. This issue is discussed in detail in Section 2.

- 1.30 *Remedy to address an abuse:* Ofcom has made no suggestion that this remedy is to address any specific anti-competitive behaviour; its goal is to address BT's SMP as identified in the WBA market review and promote competition.

Alternative approaches

- 1.31 In response to the Consultation Document, BT and another respondent suggested alternatives to that proposed by Ofcom. The respondent suggested that Ofcom should define a 'starting price' for ATM interconnection, as opposed to establishing a margin squeeze formula. The margin between ATM interconnection and IPStream prices would then be implicit and BT could then be required to maintain this margin. The respondent has argued that this approach would offer more transparency and also be compatible with the application of a simple RPI-X price control.
- 1.32 Secondly, BT has suggested that if Ofcom does adopt its proposed approach, the test should take into account the rapidly changing nature of the products set and build in some lessening of regulation e.g. by reducing the margin over time and or determining pre set triggers for regulatory control to be removed.
- 1.33 BT also suggested that another alternative would be for it to "re-structure its product portfolio in such a way as to separate out the functions within the so-called 'IP Layer' into what would effectively be a 'component' portfolio" and that this would "have the benefit of avoiding the need for the additional regulatory uncertainty caused by the margin squeeze rule".

Ofcom's response

- 1.34 In response to the suggestion of establishing a 'starting price' Ofcom believes that the respondent's proposal appears to maintain the same conceptual outcome as in Ofcom's approach but that it seems to get there in a slightly different way. That is, BT retains the flexibility to balance upstream and downstream prices whilst maintaining a constant margin. The respondent seems to suggest that rather than specifying the required margin it would be preferable to specify the ATM interconnection charges by deducting the determined margin from BT's IPStream products. The margin would then implicitly be the difference between the price of IPStream and ATM interconnection. Again BT would have the flexibility to balance upstream and downstream prices as it sees fit, but in this case ensuring that the implied margin is maintained rather than a specified margin.
- 1.35 This proposal would certainly be more complicated to implement as it would be necessary to set all the ATM interconnection charges; potentially there are 60 of them. In doing this it would be desirable to ensure that gross distortions are not introduced and this will be particularly difficult if the various IPStream and BT Central products are generating different margins. Having gone through this exercise BT would then be allowed to reset all the ATM interconnection and IPStream prices as it sees fit, but ensuring that the implied margin is maintained. Ofcom does not believe such an approach would be any more transparent and is practically speaking more complex and is therefore rejected.
- 1.36 In response to BT's suggestion to build in a lessening of regulation in the margin squeeze test Ofcom argues that this is not necessary given that it has been very clear that this is not likely to be a one-off exercise. Ofcom has committed to reviewing the

WBA markets again by the end of 2005. This review would consider the competitive conditions of the markets and would necessarily consider whether regulation imposed as a result of the 2004 WBA market review, such as this Direction, had been successful in allowing competition. As such, it and any future reviews would automatically consider whether there was a need for the current regulation to continue, be amended or removed entirely. Ofcom's commitment to review periodically the margin therefore averts the need for building in a lessening of regulation at this stage. It is also the case that in the event that BT alters its pricing structure for intermediate services, Ofcom may need to revise the margin squeeze rule to accommodate such changes.

- 1.37 In any case, BT's suggestion of pre-set triggers for the withdrawal of regulation would potentially be problematic and result in perverse incentives. For example, if the trigger was based on market share or number of competitors, for example, then potential competitors would have an incentive to maintain a market share or volume numbers just below the trigger in order to ensure that regulation remained in place. The issue of a 'tapering margin' is covered at paragraphs 2.138 – 2.141.
- 1.38 It is not clear how BT's suggestions regarding a component based product portfolio would provide greater regulatory clarity. BT seems to be suggesting that the need for a margin squeeze test results from it offering end-to-end products and that offering products on a component basis will avert the need for a margin squeeze test. Ofcom disagrees; if inputs to intermediate products are offered on a component basis rather than as end-to-end products, the potential for BT to margin squeeze remains and Ofcom would need to consider the best way to handle this. If BT does at some point in the future restructure pricing its products in this way then the margin squeeze rule will need to be amended accordingly.

Transparency/Complexity

- 1.39 Respondents have raised concerns that Ofcom's proposals are too complex and lack transparency. For example, Ofcom's failure to publish "many of the basic principles and calculation methodologies and assumptions" means BT can not estimate in advance how new products would be treated.

Ofcom's response

- 1.40 Ofcom acknowledges that the margin squeeze rule is complex but this is undeniably a complex area. The fact that ATM interconnection and IPStream prices are structured differently and are sensitive to differing scale economies, particularly in the case of ATM interconnection, means that this complexity is unavoidable. Nevertheless, Ofcom believes it has struck the right balance. There are issues such as 'second order effects' (the impact of price changes on volume demand covered at paragraphs 3.57-3.59) raised by BT which, had we taken them into account, would have made the model and the WBA margin rule even more complex.
- 1.41 Ofcom has strived as far as possible to be transparent and in the circumstances i.e. using a model based on adjustments to BT's cost information, believes it has been. Ofcom has ensured that the same information is available to all parties. Ofcom recognises that stakeholders wanted more detail about the workings of the model and greater transparency. To this end the Supplementary Note aimed to provide greater clarification for industry players during the consultation period to assist them in formulating their responses. However, Ofcom's ability to provide additional transparency is limited by the commercially confidential nature of the information on which the margin setting model is based. Therefore, in an effort to balance

respondents' wishes for greater transparency with the need to respect commercial confidentiality, Ofcom contracted an external consultancy, Analysys Consulting Ltd ('Analysys'), to review the model. Respondents to the Consultation Document were invited to a presentation of Analysys' findings. A copy of the full report is at Annex 2. Ofcom has addressed Analysys' feedback in this Statement.

- 1.42 In response to the point that there is little certainty going forward Ofcom would argue that it would not be able to set a margin for products which do not yet exist. As set out in more detail in Section 5, Ofcom proposes to review the margin as part of the next WBA market review due for completion by the end of 2005. And, if there is a material change to the structure of either the ATM interconnection or IPStream prices, the WBA margin rule may require amending.

Issues outside the scope of this Direction

- 1.43 ntl in its response emphasised that Ofcom should be clear that there was a difference between price squeezing, which this Direction attempts to address and margin squeezing which includes non price issues such as quality of service, provisioning times, technical specifications which foreclose the market but which should not necessarily be resolved by widening the margin. Other respondents have raised concerns about BT's current VP port reservation system which, they argue, results in stranded VPs and which would appear to fall into the category of non-price issues described by NTL. NTL also makes the point that the presence of economies of scale and scope can mean that an incumbent can price above cost and still foreclose the downstream market to entry and growth.
- 1.44 Gamma Telecom has made the point that the ATM interconnection pricing structure should be cost reflective otherwise it could not be considered 'fair and reasonable'. Gamma Telecom's particular concern is VP pricing and suggests that the more interconnect points there are, the bigger the reduction in VP costs should be.
- 1.45 The Broadband Industry Group (BIG) suggested that Ofcom should establish an ex ante margin differential between Local Loop Unbundling ("LLU") and ATM interconnection prices as part of LLU market review.
- 1.46 Cable & Wireless (C&W) made the point that IPStream was not the only downstream product for which ATM interconnection was used as an input. Although C&W did not request that Ofcom widen the scope of this particular Direction, it made the point that the WBA margin rule should not be regarded as the single regulatory measure to protect against all anti-competitive effects which could result from ATM interconnection pricing.
- 1.47 The Enovi response, on behalf of a number of ISPs,⁸ questioned Ofcom's approach of adopting retail minus pricing in this market and questioned whether ATM interconnection and IPStream were in separate markets. In particular, the group argued that Ofcom has been inconsistent in its approach to migration charges and ATM interconnection in that in the migration consultation Ofcom implicitly acknowledges that IPStream and DataStream are substitutes.

⁸ The Enovi response was submitted on behalf of the following organisations: Enovi LLP, Mailbox Internet Ltd, Community Internet PLC, Sandco 684 Ltd T/A Onyx Internet, KeConnect Group, NDO limited, Abel Internet, UKFSN/UKPOST.COM/JustADSL and Brightview. Ofcom separately received emails from the following organisations stating that they supported this response: Comline Networks Ltd, Fast.co.uk, FastNet International Ltd and Zen Internet.

Ofcom's response

- 1.48 Ofcom recognises the presence of non-price issues around ATM interconnection which concern Altnets and that these should not all be 'resolved' by means of widening the margin. The Direction still retains the requirement in the Original Direction that ATM interconnection "shall be provided on fair and reasonable charges, terms and conditions". Also, Ofcom made allowances for 'stranded VPs' as this affects significantly the costs to Altnets (see paragraphs 3.44-3.45). Ofcom agrees it is important to resolve these process issues and is taking a number of these issues forward with BT and Altnets.
- 1.49 Ofcom is well aware of the presence of economies of scale and scope and both have been taken into account in devising the WBA margin rule. But the issue here is not one of whether or not these allow an incumbent to price above or below cost. This exercise is one of setting a margin which allows efficient entry. Clearly, we would be concerned if BT priced below cost but Ofcom would deal with these issues with reference to its existing SMP obligations.
- 1.50 Gamma's specific point on VP pricing is outside the scope of this Direction. Indeed any radical restructuring of VP pricing would require that the margin squeeze rule be revisited.
- 1.51 In response to BIG's request for a margin between LLU and ATM interconnection prices, Ofcom would make the point that LLU prices are cost based and subject to the requirement to be charged for on fair and reasonable charges, terms and conditions. This includes a prohibition on margin squeezing. The request to set a specific ex ante margin is, as BIG recognises, outside the scope of this Direction. Ofcom will consider approaches to this in the Autumn.
- 1.52 In response to C&W, Ofcom notes the point that ATM interconnection is used as an input for products other than IPStream and would like to point out that although this Direction specifically relates to BT's IPStream products, if there were concerns about a margin squeeze with another product then Ofcom has powers to intervene. Furthermore, Ofcom recognises that the margin is not the only regulatory measure protecting against all possible concerns about ATM interconnection pricing. There is a general obligation on BT to offer ATM interconnection on fair and reasonable terms and conditions, including charges.
- 1.53 In response to Enovi, Ofcom would like to point out that these issues were consulted on twice previously during the market review process (by Oftel in April 2003 and Ofcom in December 2003) and are not the subject of this Direction.

Scope and legal basis for modifying the Original ATM Direction

- 1.54 In finalising the WBA market review Ofcom issued the Original ATM Direction under SMP Conditions EA1.1 and EA1.2, which state that the provision of Network Access by the Dominant Provider in the form of ATM interconnection shall be provided on fair and reasonable charges, terms and conditions.
- 1.55 Ofcom is now modifying the Original ATM Direction under s49 of the Act to include detailed provisions specifying the appropriate basis on which the ATM interconnection products, Ofcom required BT to provide in that Direction, should be charged for to ensure that they are reasonable. The direction containing these modifications is set out in Annex 3 and this explanatory statement explains the rationale for those

modifications. As a result Ofcom will now discontinue the June 2002 ATM Direction. The Discontinuation Notices implementing this change are set out at Annex 4.

- 1.56 In modifying the Original ATM Direction, Ofcom has considered among other things its duties under Sections 3 and 4 of the Communications Act 2003 (the 'Act'). Under Section 3 of the Act, and as set out in Section 4 of the Act, one of Ofcom's principal duties is to further the interests of consumers in relevant markets, where appropriate by promoting effective competition. Ofcom has also considered the other Community requirements detailed in Section 4 of the Communications Act. In particular, the modification satisfies the Community requirements set out in Sections 4 (3), (7) and (8) of the Act. That is, it promotes competition in relation to the provision of electronic communications networks and encourages the provision of Network Access for the purpose of securing efficiency and sustainable competition in the downstream markets for electronic communications networks and services, resulting in the maximum benefit for retail consumers of broadband internet access services.

Outline of the rest of the document

- 1.57 The following Sections cover:

- Margin analysis methodology (Section 2)
- Margin setting modelling – the top down model (Section 3)
- Margin setting modelling – the usage factor model (Section 4)
- The WBA margin rule (Section 5)

Section 2

Margin Analysis Methodology

- 2.1 As explained in Section 1, Ofcom is proposing to specify the margin between ATM interconnection and Standard and Capacity Based Charging ('CBC') IPStream services. This section sets out the conceptual framework that Ofcom has adopted and discusses the main methodological issues that have arisen in terms of implementing that conceptual approach in order to analyse what the appropriate margin should be.

The Conceptual Framework

Similarly efficient entrant

- 2.2 Consider a vertically integrated firm that is the dominant provider of a product or service which is a key input in a closely related downstream market. A margin squeeze occurs when the vertically integrated firm leverages its market power in the upstream market to charge a high price for the upstream input and/or a low price in the downstream market such that other firms are not able to compete successfully against it in the downstream market. The question of whether there is a margin squeeze is therefore essentially an economic issue and a margin squeeze analysis needs to be based on an economic framework in which the concept of economic costs is central.
- 2.3 In specifying a particular margin, as has been proposed in relation to setting ATM interconnection charges, the basic approach has involved assessing whether there is a potential margin squeeze in relation to BT's downstream business in the intermediate service market, i.e. its IPStream services.
- 2.4 Ofcom recognises that in terms of a margin squeeze analysis ex post competition law would tend to start from a presumption that the appropriate standard against which the dominant firm should be assessed is one of equally efficient competitors i.e. analysing the margin such that an equally (or more) efficient competitor to BT could enter and compete effectively with BT in the relevant downstream services markets. However, as set out in Section 1, the context for the setting of a margin for WBA is one of ex ante regulation which has as its objective the promotion of competition. Given this objective, Ofcom has concluded that a modification of this conceptual approach is warranted.
- 2.5 Ofcom has chosen to use as its benchmark the concept of a "similarly efficient" competitor i.e. one which shares the same cost function as BT's own downstream businesses but which does not yet necessarily enjoy the same economies of scale and scope as BT's business currently does. Taking the regulatory context into account, Ofcom considers that the appropriate conceptual approach for the margin squeeze analysis in this situation would be to establish a margin which would allow a similarly efficient operator to enter the market today; to incur the relevant start-up costs, initial losses etc and still expect to be able to recover their costs over a reasonable period of time and to compete effectively with BT in the intermediate services market going forward. The adjustments which Ofcom has made to take account of costs or cost factors which are unavoidable for competitors are discussed below.
- 2.6 Nevertheless, Ofcom is mindful of the need to avoid promoting inefficient entry. This issue merits particular care given Ofcom's view that ATM interconnection has a valuable but transitional role to play in promoting competition in broadband provision. In the longer term Ofcom expects that local loop unbundling (LLU) is likely to provide

the more important basis for the promotion of competition in broadband in many geographical areas. In that context Ofcom is concerned not to set too large a margin now which could distort incentives to invest for Altnets in terms of the choice between using LLU or ATM interconnection, and also more generally incentives for all operators in terms of investment in alternative technologies to ATM. To derive the size of the margin a number of judgements are required, as discussed below and in Sections 3 and 5. In making the necessary judgements, Ofcom has taken account of this context, when striking the balance between promotion of competition and reducing the risk of inefficient entry and distorted investment incentives.

Consultation Responses

- 2.7 In its response BT has argued that Ofcom has taken as a benchmark the standards which it believes to be applicable under competition law and then to “gear these up” to apply a harsher climate on BT as an SMP operator.
- 2.8 BT has also argued that Ofcom’s approach will destroy the industry’s incentives to innovate and invest. In particular it argued that Ofcom’s proposals will encourage the industry to invest in the “wrong technology choice”. BT appears to have argued that investment decisions will be distorted since investment in ATM will be induced but at the same time entrants will delay entry to reduce the risk of stranded assets as a result of technical progress. BT argued that the consequence of Ofcom’s approach is that BT will be expected directly or indirectly to bear the costs for the whole industry to adapt to new technologies and bear the entire risks of network transition. BT argued that it would be wholly unacceptable and would seriously undermine incentives, “especially viewed in the light of Ofcom’s apparent attitude to BT ever earning above its cost of capital.”
- 2.9 A respondent argued that Ofcom’s approach to setting the size of the required margin had put too much weight on the possibility of inefficient entry leading to a loss in static efficiency and not enough emphasis on the benefits from greater competition. It argued that short term losses in static efficiency can be out weighed in the longer term such that there is an overall improvement in allocative efficiency.

Ofcom’s Response

- 2.10 In response to the first point, as is set out above, it is not that Ofcom intends to penalise BT in some way for being an SMP operator. However, Ofcom is operating in the context of ex ante regulation and it is specifically required to consider remedies to address a finding of SMP in relation to both asymmetric broadband origination market in the UK (excluding the Hull area) and broadband conveyance market in the UK. Setting the margin for WBA stems from the imposition on BT of an SMP condition to provide Network Access on fair and reasonable terms. The approach that Ofcom has adopted i.e. in terms of considering the costs of a similarly efficient operator, is consistent with these requirements.
- 2.11 In relation to the second point made by BT, it is not completely clear what is BT’s point. However to the extent that they are arguing that Ofcom’s approach will lead result in too much entry, Ofcom notes that what BT has described is the potential consequence of setting too large a margin. As discussed in this section, Ofcom has been mindful of the downsides of setting too large a margin, such as encouraging inefficient entry, and has taken them into account when making its judgements about the appropriate size of the margin. Ofcom’s response to BT’s points about the cost of capital is set out below.

- 2.12 Ofcom recognises that there are benefits associated with competition which can be more important than a short term a loss in static efficiency. It is partly on that basis that Ofcom believes it is appropriate to set a margin which is likely to facilitate entry. However, as explained above Ofcom also believes that it is necessary to give the risk of inducing inefficient (in a static sense) entry serious consideration, particularly because it believes that the promotion of competition through ATM interconnection is likely to be a transitional form of regulatory intervention. Finding the appropriate balance between losses of static efficiency on the one hand and the gains from dynamic efficiency is a matter of judgement and Ofcom believes that it has struck a reasonable balance.

Forward Looking versus Historical Approach and Discounted Cash Flow (DCF) Approach

- 2.13 A margin squeeze analysis relates to the question of profitability over time and therefore to the difference between costs and revenues over time. There is an important issue in relation to the choice between different approaches to the analysis of profitability. The principal analytical methods for assessing profitability are:
- A forward looking approach which would look across a number of time periods. It would typically be carried out on a discounted cash flow (DCF) basis. It could also be adapted to incorporate data on historical costs and revenues in recent periods; and,
 - An assessment of historical financial accounting data which could cover single or multiple time periods. It might also be necessary to make adjustments to the historical data so that the accounting data provides a reasonable measure of economic costs.
- 2.14 In general for cost analysis, but especially where capital costs are involved, the relevant underlying concept is paths that yield cost recovery over time i.e. cost paths rather than costs in any one time period. Both forward-looking and historical approaches address this same underlying issue of paths of cost recovery over time but in different ways. The forward-looking approach explicitly considers the way in which costs are recovered over time. This approach is commonly used in business planning.
- 2.15 In the historical approach, standard accounting techniques are used to analyse costs and assess profits. Standard accounting techniques result in some costs being treated as expenses and allocated only to the period in which they were incurred; with other costs capitalised since they are allocated to more than one time period, typically through the use of straight-line depreciation. This means that an accounting measure of costs can lead to significant deviations from measures of the underlying economic costs and such deviations are referred to here as accounting distortions. This could be particularly acute in the early years of a new product.
- 2.16 If this were a mature, steady-state market, the variation between cost in a particular year and the cost path over time would be less significant. Accounting distortions would then be less significant and it might be appropriate to consider in-year profitability, e.g. what the firm's return on capital employed (ROCE) was, based on historical accounting data.
- 2.17 However, in this case the services involved are relatively new; costs and utilisation may be changing rapidly; and there is also a lack of an established time series of financial data. On this basis, Ofcom considers that there are benefits from adopting a forward looking approach which analyses economic costs and revenues over time rather than relying on an historical approach which looks at accounting measures of

costs and revenues over a limited number of time periods in which the costs and utilisation may not be representative.

- 2.18 Given that Ofcom believes that a forward-looking approach is appropriate, there is then the question of implementation of this approach. In terms of analysing economic costs and revenues over time, there is a need to take account of the different timing patterns with which costs are incurred and revenues are realised.
- 2.19 Ofcom believes that in this situation a DCF approach is the most appropriate in that it is a standard financial appraisal tool that is particularly suited for analysing capital investment projects where the returns are realised over a number of time periods. As such it is well suited to analysing a multi-period business model.
- 2.20 The DCF approach evaluates cash flows over time and it specifically takes into account the “time value” of money i.e. it recognises that money has an opportunity cost. Under a DCF analysis future cash flows are converted into cash in present day values so that they are comparable with each other.

Consultation Responses

- 2.21 In the responses to the consultation, Thus argued that forward-looking costs could assume higher levels of efficiency and planning than are actually achieved. Thus argued that actual costs incurred would include false starts, blind alleys and forecasting inaccuracies and that an approach based on forward-looking costs should make allowances for these factors. Enovi made a similar point.
- 2.22 One of the respondents argued that it was methodologically wrong to use a DCF approach to analyse margin squeeze but did not provide specific details in its submission. Enovi stated it agreed with a forward looking approach but argued it was not sensible to use forecast data gathered when the take up of CBC IPStream services was unknown.

Ofcom's Response

- 2.23 As set out above, the approach that Ofcom is proposing to adopt is one which considers the position of an entrant today – it is therefore purely forward-looking. It is the case that in applying this approach, Ofcom has chosen to use BT's costs – both historic and forecast data - as a data source, and then applied various adjustments, as discussed in more detail below. In relation to the point that it was not sensible to use forecast data when Ofcom collected it, Ofcom rejects the criticism. Ofcom was keen to collect the data as soon as possible so as to ensure that the regulation came into effect as soon as possible after the launch of CBC IPStream services. Ofcom's use of forecast data is discussed further in paragraphs 3.37 – 3.40 of Section 3.
- 2.24 Ofcom recognises that firms cannot predict in advance which particular developments will turn out to be dead ends or false starts – otherwise by definition they could choose not to incur those costs. By taking BT's information as the starting point for populating the forward-looking assessment, Ofcom's intention has been to include the effects of dead ends or false starts to the extent that they were, or are expected to be, suffered by BT and remain relevant. If Ofcom were to build in an additional allowance for such factors, it would be building in a degree of inefficiency which would not be consistent with the concept of a similarly efficient operator which Ofcom has adopted i.e. one where the entrant has the same cost profile as BT. Also it is important to recognise that the cost of capital reflects the risk associated with dead ends or false starts.

- 2.25 Ofcom rejects the suggestion that a DCF approach is inherently incorrect for analysing margin squeezes. As was made clear in the Consultation Document a forward-looking DCF approach is one of a number of standard techniques for analysing future investment decisions and is also explicitly designed for the analysis of cashflows over time. Furthermore, the respondent who has questioned the approach did not provide any reasons why in the case of this particular margin squeeze analysis a forward looking DCF approach was not appropriate.

The appropriate Cost Standard

- 2.26 As part of the process of modelling the profitability of a similarly efficient new entrant, there is the need to consider the choice of the appropriate cost floor.
- 2.27 In terms of assessing commercial sustainability, one relevant choice is between short-run and long-run cost standards. A cost floor based on short-run measure of costs – such as short-run average variable cost (SRAVC) – would set a cost floor which a firm could price down to in the short-term but which would not be sustainable over a number of years where there are fixed costs to recover. Using SRAVC as a cost-floor would not provide for sustainable competitive entry.
- 2.28 There is then a choice between a number of different long-run measures of costs. The main difference between the long-run measures relate to the way in which the recovery of common costs is treated. There are two measures of long-run costs that would be relevant to consider:
- A long-run incremental costs (LRIC) approach where these are the costs arising from the provision of a defined increment of output assuming that some output is already produced.
 - A measure which includes an element for the recovery of some of the common costs e.g. a CCA⁹ fully allocated cost (FAC) approach or LRIC plus a mark-up for the recovery of common costs (a so-called LRIC+ approach).
- 2.29 The LRIC approach measures the costs that are specifically caused by the production of a defined increment of output (e.g. a particular set of products or services). It does not include (by definition) any common costs which are causally-related to the provision of a set of output increments (or services) rather than any single output increment (or service). Common costs arise from economies of scope, i.e. that it is less costly for a set of services to be provided by one firm rather than each by separate firms.
- 2.30 Any price above a LRIC measure of costs would increase the profits of the firm relative to not producing and selling the increment of output. Conversely, a price below LRIC would not be sustainable in the long-term.
- 2.31 However, as set out in Section 1, the context in which Ofcom is setting the margin is one of ex ante regulation that is intended to promote competition. In these circumstances Ofcom believes that it is appropriate to take into account some of the costs that would be faced by new entrants. A feature of telecommunications networks is that they can give rise to economies of scale and scope. This could provide an incumbent operator with an advantage given the likelihood of a broad range of products and services over which common costs can be recovered. That is not to say that such economies of scale and scope would be available to new entrants over time

⁹ Current Cost Accounting. An accounting measure which takes into account specific price changes affecting the assets employed by a company.

but that in order to take full advantage of them they would need to replicate BT's product portfolio.

- 2.32 Ofcom takes the view that entrants are likely to benefit less from economies of scope than BT and considers it reasonable to take this into account when setting the margin, given the objective of promoting competition. Hence Ofcom's benchmark of a similarly efficient entrant involves the same underlying cost function as BT's, but smaller economies of scope. A reasonable method to implement this approach, when using BT's cost information as a data source, is to factor in an allowance for the recovery of common costs in the margin squeeze analysis. On that basis the appropriate cost floor would be one that incorporates an element for the recovery of common costs: e.g. CCA FAC or LRIC+.
- 2.33 Ofcom recognises that a CCA FAC or LRIC+ approach would result in a higher margin compared to a LRIC approach. For instance, if the margin set by BT were to pass a CCA FAC or LRIC+ based test then it would also pass a LRIC based test. Conversely, however, if BT were to fail a CCA FAC or LRIC+ based test then that does not imply that it would automatically fail a LRIC based test. Given the context of promoting competition, Ofcom considers that CCA FAC or LRIC + approach nevertheless is appropriate.
- 2.34 There is also a practical dimension to the measurement of the appropriate long-term costs. As referred to above, at this stage in the development of the market, there is a degree of uncertainty about a number of key issues around the determination of costs: e.g. how BT has chosen to record cost information for these products; what an efficient level of costs is in this context; what the utilisation of assets is; what the timing of cost recovery is etc. This would tend to counsel in favour of working with the existing system of financial data reporting that BT has put in place for these products rather than requiring BT to develop a separate system of financial reporting.
- 2.35 The information provided by BT to Ofcom for the purposes of setting the margin is on a CCA FAC basis. Taking into account the fact that the CCA FAC measure provides a long-term measure of costs and common cost recovery and additionally for reasons of practicality set out above, Ofcom has chosen to use CCA FAC as the appropriate cost standard in conducting the margin squeeze analysis.
- 2.36 Ofcom acknowledges that in a margin squeeze analysis in the context of competition law there would be a presumption that the appropriate starting point would be a lower cost standard, such as long-run incremental costs. However, the context in which Ofcom is setting the margin is that of ex ante regulation designed to promote competition.

Consultation Responses

- 2.37 In its response BT argued that the cost base used by Ofcom was not established in case law and that the only benchmark was the costs of the dominant firm. BT argued that under competition case law there is no justification for modifications to BT's business plan. BT also argued that since the margin was not set at LRIC that implied that there would be a degree of inefficient entry and a corresponding detriment to economic welfare.
- 2.38 BT also argued that in using CCA FAC as the appropriate cost standard, Ofcom has "artificially inflated" BT's input costs. The same point was subsequently made by Enovi.

Ofcom's Response

- 2.39 As set out above, Ofcom has been clear that the context for the margin squeeze analysis is one of *ex ante* regulation to promote competition rather than an *ex post* competition law analysis. However, that does not mean that in a competition law assessment it might not be relevant to make adjustments to an incumbent's costs.
- 2.40 In relation to BT's argument that Ofcom has "artificially inflated" BT's input costs, BT's criticism is difficult to comprehend given that the data provided by BT was on a CCA FAC basis.

Individual products versus whole business base

- 2.41 A margin squeeze is a particular type of cross-subsidy which can be carried out by a vertically integrated firm. In the case of a margin squeeze it is possible for the vertically integrated firm to sustain losses in relation to one part of the provision of a particular good or service but for the provision of that good or service still to be profitable on an end to end basis.
- 2.42 It is possible to carry out a margin squeeze analysis at the whole business level, i.e. across a range of related products and also at the level of individual products and services. In the June 2002 ATM Direction, Oftel chose to carry out the margin squeeze test at the individual product level. Under this approach there was a requirement on BT to charge for ADSL-based interconnection services such that there was no margin squeeze with any of BT's services that provided or enabled the provision of Broadband internet access.
- 2.43 Ofcom has decided to maintain this approach in that it considers such an approach to be consistent with the objective of promoting competition. Ensuring that there is no margin squeeze on any individual product level should avoid an entrant having to replicate BT's product mix in order to be viable. Conducting the margin squeeze at the level of the individual product would also prevent BT from targeting particular competitors.
- 2.44 It is likely that a number of entrants could well be multi-product suppliers in their own right and will choose to compete with BT across a similar product portfolio. However, given that the market is still developing, Ofcom does not want to pre-judge this issue.
- 2.45 On that basis, Ofcom considers that it is reasonable to conduct the margin squeeze analysis on each of the seven Standard IPStream products and also for the two CBC IPStream products, the details of which are set out in Section 3. In the case of the CBC IPStream products, Ofcom carried out the margin squeeze test (MST) on the basis of a defined bandwidth range i.e. it is proposing to specify that BT must pass the MST across the whole range of potential bandwidths. Ofcom believes that the bandwidth ranges that it has used to assess the MST are a reasonable reflection of the way in which these products will, or are likely to, be used to provide services and details are set out in Section 4.

Consultation Responses

- 2.46 In its response BT argued that specifying the margin squeeze analysis in terms of the individual product/service level would distort competition and lead to a reduction in economic welfare. BT resubmitted a paper by Professor Grout which was originally submitted to Oftel in February 2002 during the consultation on the June 2002 ATM Direction. This paper sets out a general argument that by specifying individual margin

squeeze tests this could result in prices for IPStream services which are not optimal in terms of allocative efficiency. BT further argued that the margin squeeze analysis should be done on a combinatorial basis to be consistent both with BT's internal decision making processes and with the entry opportunity faced by BT's competitors in that they typically entered the market with a range of products.

- 2.47 BT also argued that it was not the NRA's duty to ensure that an entrant can match each and every product; rather it was the duty to promote competition in the marketplace as a whole.

Ofcom's Response

- 2.48 As set out above, the reason why Ofcom has chosen to conduct the margin squeeze at the individual product level is to avoid a new entrant having to replicate a large part of BT's product mix or in the limit its entire product portfolio. It is possible that some entrants might choose to compete with BT across a range of products but equally it is possible that a new entrant might choose to offer a more limited product range. At the same time that Ofcom is seeking to promote effective competition, it is conscious of the need to avoid determining the form of competition. To conduct a test at a more aggregated level would require Ofcom to specify the products to be aggregated and the relative weights of the individual products in the aggregation. This would run the risk of deterring some entry opportunities. In contrast, carrying out the margin squeeze analysis at the individual product level provides for a range of different competitive outcomes. Ofcom therefore considers that analysing the margin squeeze at the individual product is consistent with its objective of promoting competition.
- 2.49 In response to the paper by Professor Grout, Ofcom recognises that in theory there may be circumstances where his conclusions would hold. However, Ofcom notes that neither the paper nor BT provides evidence that the point is of particular significance in this case. Furthermore, Ofcom has to balance the possible effect on static (allocative) efficiency which Professor Grout identifies against the desire not to constrain entrants' product mix. Ofcom has concluded on balance, for the reasons explained above, that it is preferable to specify the test at the individual product level.

Approach to cost modelling

Bottom-up versus Top-down modelling: Entrants' Costs

- 2.50 Given that the context for Ofcom's forward-looking margin squeeze analysis is to establish an appropriate margin which would allow a similarly efficient operator to enter the market today and to compete effectively with BT in the intermediate services market going forward, the next step is to consider what an appropriate methodology might be for modelling the costs of a similarly efficient operator.
- 2.51 In terms of deciding upon an appropriate modelling approach, there is a potential choice between two general approaches:
- Bottom-up modelling: i.e. explicitly modelling the costs of a hypothetical operator (e.g. a new entrant) on the basis of cost elements driven by traffic demand; and,
 - Top-down modelling: using actual cost data from an existing operator (e.g. BT itself).
- 2.52 Both approaches have their difficulties in implementation. The bottom-up modelling approach would involve considerable effort to synthesise a representative new entrant

and to develop a bottom-up cost model for that hypothetical operator. For instance, there would be the need to synthesise a whole range of business strategies in relation to: customer acquisition, the product portfolio, the geographical extent of network roll-out, pricing strategy etc. It would entail analysing the business plans of a number of operators or choosing one particular strategy to model. Furthermore, the bottom-up modelling approach would not automatically provide a model of the costs of an entrant which was of similar efficiency to BT.

- 2.53 A simplistic adoption of top-down modelling would use BT's actual (and forecast) data. Ofcom has utilised BT's data as a useful information source, suitable as a starting point for estimating the costs of a similarly efficient operator of a given scale entering the market today. In doing so, Ofcom has not taken a simplistic top-down approach. Ofcom has applied three types of adjustment to BT's data discussed in more detail below and in Section 3. First, to take account of the lower volumes that a new entrant is likely to achieve than BT currently has and forecasts (an upward adjustment to BT's costs). Second, to reflect a "time-shift", i.e. that an entrant today would come into the market some two or three years later than BT and would be able to purchase cheaper equipment (a downward adjustment). Third, to take account of costs that no entrant can avoid, such as the costs of in-span handover (a small upward adjustment).

Consultation Responses

- 2.54 BT's submission argued that the approach adopted by Ofcom was not a true forward looking approach and that instead a proper forward looking approach would involve a "build now scenario on scorched earth lines." BT therefore appears to be arguing for a bottom-up modelling approach with the assumption that a new entrant is able to optimise its network topology and structure without constraints to legacy deployment.
- 2.55 In its submission to the consultation, ntl argued that by adopting a top-down approach, the model that Ofcom was using was based on BT's growth profile which in turn was related to its exchange enablement path. ntl argued that the same gradual, demand-driven growth profile would not be available to a new entrant because a new entrant would have to offer service nationally in order to be able to compete with IPStream and the same growth opportunities would not necessarily be possible.
- 2.56 ntl went on to argue that it would in fact be simpler to model a new entrant's costs explicitly.

Ofcom's Response

- 2.57 Although Ofcom makes use of historical BT data this is to address issues of practical implementation; the conceptual approach it has adopted is a "pure" forward-looking approach because it considers the position of an entrant coming into the market today. The use of a "time-shift" approach to implement this is discussed in more detail below.
- 2.58 In Ofcom's view, the proposal by BT that Ofcom should use a bottom-up modelling approach based on "scorched earth lines" is not about the adoption of a forward-looking approach, but about the degree of efficiency to be modelled. BT's proposal would in fact require a greater degree of efficiency on the new entrants than BT itself is currently able to achieve.
- 2.59 Ofcom does not believe that it is appropriate to impose a higher standard of efficiency on a new entrant than that achieved by BT (except to the extent that lower costs are due to the time-shift, i.e. later entry). As noted elsewhere, Ofcom believes that a more appropriate benchmark is that of a similarly efficient operator. Ofcom does however

recognise that a later entrant may benefit from lower costs at a given stage of its business plan compared to the same stage of BT's business plan due to reductions in Modern Equivalent Asset (MEA)¹⁰ prices and better utilisation of VPs than BT achieved initially. Ofcom has therefore made adjustments to BT's costs to take account of these factors as described in paragraphs 2.81-2.107.

- 2.60 As has been set out above, in order to carry out a bottom-up modelling exercise, Ofcom would need to carry out a review of the cost structures of existing competitors and to derive appropriate assumptions about a number of important strategic decisions (e.g. in respect of product portfolio, pricing etc): an inherently complex exercise. The particular strategy for market roll-out is one of those decision variables where a number of different assumptions are possible. There is no uniquely correct assumption and Ofcom considers that adopting BT's growth profile is a reasonable approach. On that basis, Ofcom does not believe that a bottom-up modelling approach would in fact be easier to implement.
- 2.61 As the growth profile used in the model is that historically experienced by BT (and projected forwards) it has a geographical dimension which reflects BT's exchange enablement path such that in the early years the volumes only build up slowly and are focussed on a limited geographic area. An operator entering the market today will not have to follow that same path which BT did and indeed may, as ntl suggest, choose to offer a more national service serving more exchanges from the outset. Ofcom has not explicitly modelled alternative geographic roll out plans to that achieved by BT because there are a wide range of alternatives (reflecting different entrant strategies) and thus no unique correct assumption. Also from an implementation perspective, the BT data available to Ofcom would not have been consistent with any of those alternatives. Instead, Ofcom has modelled an operator which experiences the same growth profile as BT did in terms of number of exchanges (albeit at a reduced scale). It has ensured that this approach has been consistently applied and therefore as explained below (at paragraphs 2.114-2.118), it has not included migration in the growth profile assumed.
- 2.62 Ofcom acknowledges that an entrant may choose to have a more extensive geographic coverage from the outset. However, if it adopted such an approach it would be likely to have significantly higher volumes than those achieved by BT in its early years. For example, it might choose to build up customer volumes more quickly through migration. Such a strategy would be likely to lead to some costs increasing (relative to Ofcom's assumptions) e.g. migration costs, but other costs would fall e.g. VP costs, due to higher volumes and better utilisation achieved. It is very difficult to determine the overall outcome of these different strategies relative to the approach adopted by Ofcom. Analysys in its report (see Section 3.5 of the report in Annex 2) estimated that differing strategies and growth patterns could increase or decrease the margin failure for the Home 500 IPStream product by about £0.25.
- 2.63 Given this uncertainty and the practical difficulty of modelling an alternative growth profile, Ofcom believes that its approach is reasonable.

Assumptions about Volumes

- 2.64 In deciding upon Ofcom's methodologies for the margin squeeze analysis it is necessary to decide at what volumes / scale the costs should be modelled. This is a difficult issue due to the fact that the assumed scale affects the market outcome. This is because the assumption about scale affects the size of the margin determined which

¹⁰ A Modern Equivalent Asset (MEA) is an asset that replicates assets already in existence using the most cost effective proven technology to perform the same function.

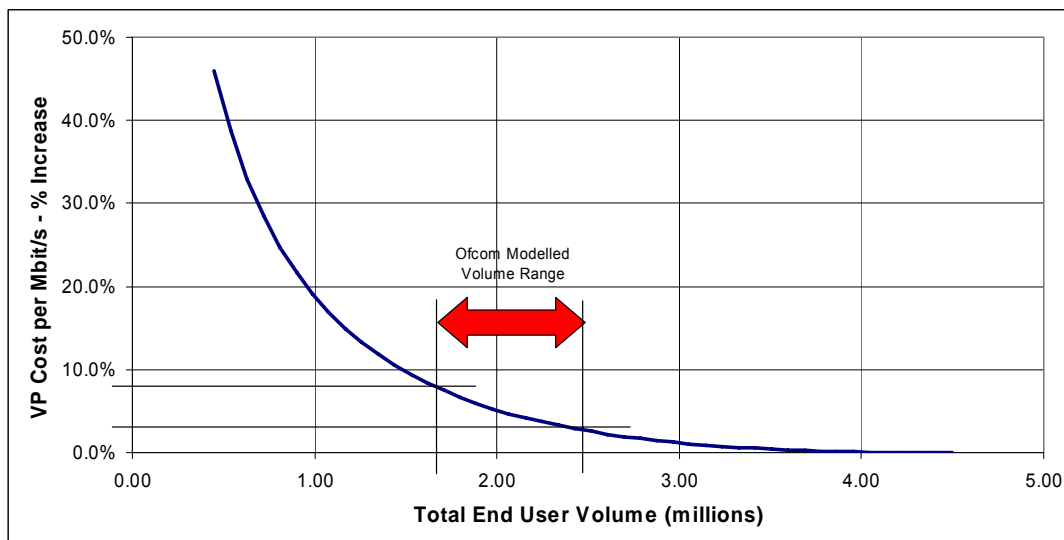
in turn affects the likelihood of entry and so the likely market outcome. This circularity creates some difficulty in deciding upon what scale assumption should be used.

- 2.65 In order to illustrate this issue it is helpful to consider two extreme assumptions. If the entrant is assumed to have high volumes by the end of the modelled period (e.g. BT's forecast volumes), this means it will have lower unit costs and so will lead to a lower margin being set. However, in such circumstances this will make entry relatively unattractive and therefore it is less likely that any operator will enter and so achieve the assumed scale. Accordingly, there is a risk that if high volumes are assumed the objective of promoting competition will not be realised. By contrast, if the entrant is assumed to have very low volumes, this will mean higher unit costs and so a higher margin would be set which is likely to lead to considerable entry. However there is a risk that this entry will be inefficient and so the low volume assumption is also likely to lead to an undesirable outcome.
- 2.66 Therefore it is necessary to find an appropriate volume assumption between these two extremes. On the one hand, as explained above, it is Ofcom's objective to promote competition and so it is appropriate to make a volume assumption consistent with allowing a number of operators to enter and compete effectively with BT, while on the other hand it is appropriate to ensure that the assumed volumes are not so low that there is a large amount of inefficient entry.
- 2.67 As explained above, in practice Ofcom has modelled the cost of a similarly efficient entrant by adjusting BT's cost and volume data. If Ofcom simply used BT's relatively high forecast volumes, the resulting margin may be insufficient to promote competition. Accordingly, Ofcom has chosen to scale back BT's volumes and has considered a range of volumes over which to model the costs of a similarly efficient entrant. The range of volumes is approximately 1.7m-2.5m subscribers by the end of the modelled period, i.e. in 5 years' time (see Section 3). Ofcom believes that this range is reasonable given the objective to promote competition by a modest number of scale entrants. Over this range of volumes Ofcom believes that most of the economies of scale have been exhausted. Hence, our assumptions take account of the risk of encouraging (statically) inefficient entry. Ofcom has constructed cost functions for VP and IP costs based on its understanding of the technical arrangements for providing intermediate services. Figure 2.1¹¹ below illustrates this point. It shows Ofcom's estimate of the cost function per Mbit/s for VP costs i.e. how unit costs change with end user volumes. It is evident from the graph that, while unit costs continue to fall after the low point of the range selected by Ofcom, and so make a difference to the overall result of the margin squeeze test, Ofcom has not selected a volume range over which there are very large changes in unit cost. The same is also true for the IP costs, although in that case, as explained in paragraph 3.35 of Section 3, Ofcom

¹¹ It should be noted that the cost function is an estimate and has been constructed in such a way as to be consistent with cost and volume data obtained from BT. The reference point of this graph is just under 4.5 million [4,495,810] and this point was selected to ensure consistency with the information provided by BT. The y-axis therefore represents the percentage uplift to be applied to the per Mbit/s VP unit cost that is associated with the information provided by BT. Economies of scale would be fully exhausted at the point at which the unit cost function reaches its minimum. The minimum is likely to be at a larger volume than 4.5m. That is, there is likely to be a negative portion of the function shown in Figure 2.1 (i.e. unit costs would be lower than in the information provided by BT at higher volumes). However, in Ofcom's view any further unit cost reductions for volumes above 4.5m are likely to be small.

estimates the cost function to be flatter and therefore the outcome is less sensitive to the particular volume assumption because there are fewer economies of scale.¹²

Figure 2.1 VP cost function per Mbit/s (relative to BT's cost information)



2.68 Ofcom believes that the chosen volume range represents an appropriate balance in order to avoid the two difficulties set out above and has been derived so as to allow for a modest number of scale entrants in the market in keeping with the context of setting the margin to promote competition.

Consultation Responses by BT

2.69 BT argued that scaling back volumes was inappropriate in that BT had won its volumes and market share by competing on merit against other (cable) operators. It further argued that the remedies following designation of SMP were not intended to be used by NRAs as market planning devices. BT also argued that scaling back volumes in this way ignored the role of cable operators and LLU operators.

Ofcom's Response

2.70 As set out above, Ofcom has scaled back BT's volumes because a failure to do so is likely to lead to an outcome which is not consistent with Ofcom's objective of promoting competition. Ofcom acknowledges that the volume assumption used to set the margin, which is established through an adjustment to BT's volumes, is likely to affect the market outcome. To some extent, this issue is unavoidable given the problem of circularity described above. However, it is important to emphasise the distinction between setting a margin which enables a range of market outcomes to transpire and intervening to the extent of pre-determining the actual outcome. Ofcom seeks to set a margin which creates an efficient entry opportunity which opens up the potential for a number of different market outcomes which will be determined through competition. This is very different from attempting to determine explicitly the market structure which is not Ofcom's objective. For the reasons set out above, Ofcom believes its approach is reasonable.

¹² The relationship between end user volumes and IP cost, assumed by Ofcom, is much flatter than the end user/VP cost relationship. In fact with less than 0.5 million (449,581) end users the percentage increase applied to the IP unit cost is assumed to be less than 6%.

- 2.71 Finally, Ofcom has not ignored the effect of the role of cable operators and LLU operators. Ofcom is conscious of the need to ensure that the margin is established in a way that provides appropriate incentives to invest for both LLU operators and cable operators. Ofcom has achieved this by being mindful of the need to avoid encouraging inefficient entry. One of the ways in which this is taken into account is in the judgement about the scale of entrant to assume, when deriving the margin. In addition it should be noted that Ofcom concluded in the WBA market review that BT had SMP and so cable operators and LLU operators did not impose an adequate competitive constraint and consequently there was a need to promote competition.

Consultation Responses by Altnets/ISPs

- 2.72 Altnets raised three points relating to the volumes assumptions used in the Consultation Document.
- 2.73 First, in relation to the issue of whether the methodology implied a particular market structure, one respondent suggested Ofcom should avoid prejudging the structure of the market. By contrast ntl suggested Ofcom should have some target market structure.
- 2.74 Second, a number of Altnets argued that Ofcom had failed to take account of LLU in its approach to specifying the volume assumption. More specifically some have argued that the modelling should have reflected an appropriate split between using LLU at some exchanges and ATM interconnection at others.
- 2.75 Third, a number of Altnets pointed out that BT has the largest retail share of ADSL subscribers at present and is likely to retain a large share. They have argued that given this and the fact that it is unreasonable to expect BT purchase an intermediate service from anyone other than BT, the volume assumption used by Ofcom was too high.
- 2.76 Enovi argued that it was inappropriate to reduce BT's scale as Ofcom has not applied a consistent methodology for purchasers of IPStream. Ofcom does not believe that this comment is relevant to setting the margin between ATM interconnection and IPStream but rather relates to the margin between IPStream and retail services which is not the subject of this Statement.

Ofcom's Response

- 2.77 In relation to the first point regarding market structure, as explained above, to some degree the volume assumption unavoidably impacts the market outcome. However, Ofcom is not setting out to plan explicitly a market structure but rather to set a margin which promotes competition but does not pre-determine the market outcome.
- 2.78 On the second point, Ofcom has modelled the costs as if the entrant only used ATM interconnection as the input into the provision of broadband intermediate services i.e. no LLU is used. Ofcom believes that this is the best way to ensure that operators have undistorted price signals. This approach should not deter the take up of LLU since if LLU offers a cheaper alternative to purchasing ATM interconnection from BT, then an entrant would be incentivised to use LLU.
- 2.79 The Altnets seem to be suggesting that the costs of the entrant should be modelled on the assumption that it only uses ATM interconnection in some areas (e.g. lower density) on the basis LLU would be used as the upstream input in other areas (e.g. higher density). Furthermore, the suggestion appears to be that the analysis should

only take into account those volumes for which ATM interconnection was used. Even ignoring the practical difficulties of deciding where an entrant might use each of LLU and ATM interconnect, Ofcom considers that such an approach would result in an overstated margin. On the first suggestion, it is generally more costly to use ATM interconnection in lower density areas, e.g. because of lower VP utilisation, so adopting such a modelling approach would lead to a larger required margin. But Ofcom is concerned that it would result in distorted pricing signals. Since an operator is able to purchase ATM interconnection on a national basis, it would be able to undercut the modelled unit costs simply by purchasing ATM interconnection in the cheaper areas excluded from the model, not by genuine underlying efficiency improvements. In addition, the inflated margin would bias the operator's choice as between use of ATM interconnection and LLU. As noted in the paragraph above, Ofcom's approach is to model costs as if the entrant used ATM interconnection in all areas, which results in a more neutral price signal and does not deter use of LLU where it is a cheaper alternative. On the second suggestion, only taking account of volumes for which ATM interconnection was used would result in overstated costs of, for example, the IP network. This is because, following the approach suggested by the Altnets, the entrant would have additional volume over its IP network for which LLU was used as the upstream input, but these volumes would be ignored in the analysis of IP costs.

- 2.80 In relation to the third point that part of the market is captive to BT, Ofcom recognises there is some validity to this argument which it did not explicitly consider in the Consultation Document. It is, of course, not possible to know what would happen to BT's retail market share by the end of the modelled period. However, it seems reasonable to assume, given BT's high share today (approximately 40% of the ADSL market segment), that it will continue to have a significant share. Accordingly, Ofcom believes that it is appropriate to reduce slightly its volume assumption used in the Consultation Document and has amended its volume assumption to equal the low point of its volume range rather than the mid point as suggested in the Consultation Document.

Adjustments to BT's Cost Data

- 2.81 BT's financial information relates to the period from 2001/02 and 2006/7 and therefore comprises a mixture of historic and forecast information. Ofcom believes that it is appropriate to make adjustments to this data in order to model the costs that a similarly efficient entrant would incur today. This is because an entrant today would, for example, be able to buy assets cheaper than BT did when it launched its services. If adjustments were not made then it would risk overstating the costs which an entrant would face and so overstate the level of the required margin.
- 2.82 The key adjustments necessary are: firstly, to adjust its historic virtual path (VP) utilisation given subsequent changes in the functionality of certain equipment; and secondly to reflect a decline in costs over time, such as those arising from a declining MEA price trend. Both of these adjustments are discussed below.
- 2.83 Where Ofcom has made adjustments to BT data, the relevant concept that it has applied is that of a similarly efficient entrant to allow competitors of similar or greater efficiency than BT to compete whilst reducing inefficient entry.

Historic Costs

- 2.84 The level of the initial costs that a similarly efficient entrant would incur will depend on the timing of the investment in that, to the extent that the MEA cost falls over time, an

entrant today would have to invest less than BT had to in the past to achieve the same level of functionality/capacity for its downstream products.

- 2.85 If Ofcom were to adopt an approach where the analysis of BT's costs only took into account costs incurred from the present day forward, or equivalently where historic costs and revenues are written off completely, this could permit a positive return to be demonstrated after an initial period, without any initial losses associated with start-up of the service ever being fully recovered. This is important in a DCF approach because where there are start-up costs associated with the launch of a product or suite of products, cash-flows in the initial years are typically negative followed by positive cash-flows in later years. If the initial negative cash flows were ignored altogether then a false view of profitability going forward would be obtained: a new entrant would falsely be deemed to be able to enter and compete even though in practice its business model would not be sustainable.
- 2.86 The relevant principle that Ofcom has used is that historic costs should be factored into the margin analysis to the extent that they yield an on-going benefit and so would be part of the costs expected to be recovered by a sustainable price. Such costs represent an unavoidable cost in that entrants would have to incur these costs to obtain the same benefit. An important methodological step therefore is to determine which components of BT's costs should be included on the grounds that they yield an on-going benefit.
- 2.87 However, even where a type of cost is such that there is an on-going benefit, that does not imply that all of those historic costs should be included. There is an issue as to whether these costs should be included at the actual level at which they were incurred or at an efficient level today e.g. taking into account MEA values.
- 2.88 In the case of the margin analysis, if all BT's historical costs were included in the cost base the cost base of a new entrant would be artificially inflated beyond what it would actually need to invest today to enter the market. The most appropriate approach, one that is consistent with the overall conceptual framework used for this modelling exercise, is to try to approximate the opportunity cost to the incumbent of such investments at this point in time to reflect the costs that an entrant would incur today in order to obtain the same on-going benefits.
- 2.89 In other words Ofcom has applied adjustments to take account of the time shift, i.e. to modify BT's financial information for 2001/02 to 2006/07 such that it is relevant to the period 2004/05 to 2009/10.
- 2.90 There are certain practical constraints about implementing this conceptual framework: e.g. in relation to the reliability of forecasts of costs and prices further into the future, determining appropriate MEA values etc. For pragmatic reasons, therefore, Ofcom has adopted an approach which it believes is in line with the conceptual approach outlined above. The approach which Ofcom has adopted is: to apply a DCF analysis to BT's business model since launch; to incorporate BT's historic costs and revenues into the DCF analysis but to adjust these values to reflect the position of an entrant today. This has necessitated adjustments to BT's historic costs, its forecasts of MEA values for new capital expenditure and also to how VPs have been used historically. The last two adjustments are discussed in separate sections below.
- 2.91 In the Consultation Document, Ofcom proposed an adjustment to historic costs based on BT's historic revenues. On further consideration, Ofcom considers that an adjustment on this basis would not be the best approximation that could be made. In particular, Ofcom has taken on board comments in the consultation (see below from ntl

and BT) to the effect that pricing for IPStream services was not driven just by underlying cost considerations and that demand-side factors were also important, and also the comments of Analysys in its report.

- 2.92 The approach which Ofcom is now proposing to use is to assume that MEA prices have followed a consistent trend over time i.e. that the reduction in MEA prices is at a constant rate of decline over time. The detail of how this has been implemented in the modelling approach is set out in Section 3.

Consultation Responses

- 2.93 In its submission, Energis argued that MEA calculations underestimated the true value of necessary assets at the start of the modelled period. It argued that Ofcom needed to clarify whether the term “historical investment” included both capital and operating costs. Energis were concerned that Ofcom’s calculation included reductions in unit operating costs which meant that Ofcom was over-depreciating BT’s assets and understating the true MEA value of the starting assets that a new entrant would require.
- 2.94 Energis also argued that the adjustment to reflect changes in MEA values included the whole of the capital employed in the IPStream (including BT Central) business but that it did not include an appropriate adjustment for the additional costs involved in the provision of the service from the ATM interconnection onwards. Finally Energis argued that BT was able to “game” the over-recovery of the assets between periods in order to lead to an over-depreciation.
- 2.95 In its submission ntl argued that the approach taken to adjusting historic costs involved a circularity: if BT chose to increase IPStream prices to remedy the margin squeeze this would reduce the size of the reduction made to the historic costs of BT’s assets, increasing the MEA value at the beginning of the modelled period and therefore making it harder for BT to pass the MST. ntl also argued that broadband pricing is driven by retail demand and so it is not appropriate to use the revenue differential as an approximation for changes in MEAs.
- 2.96 BT argued that Ofcom was not correct in assuming that it anticipated changes in MEAs over time and that BT priced accordingly in the past to recover anticipated changes in MEAs. In fact, BT argued that there “was a much higher under recovery of development costs than expected”.
- 2.97 Enovi, while agreeing with the historic cost adjustment, argued that it may not be sufficient as with the benefit of hindsight BT may have been able to build a more efficient network.

Ofcom’s Response

- 2.98 In the table which followed paragraph 4.22 of the Consultation Document, Ofcom was explicit that the adjustment to historic costs was in relation to BT’s actual historic capital costs rather than to its historic operating costs.
- 2.99 Ofcom can also clarify that the adjustment which Ofcom has made in relation to BT’s historic costs is in relation to the additional costs relating to the IPStream services i.e. the costs of the IP layer and not the costs of ATM Interconnection. It is also the case that BT would not have been able to “game” the over-recovery of assets between periods because the MEA adjustment has been to historic costs – BT could not have anticipated in advance the nature of the adjustments that Ofcom has made. In any

event, the approach which Ofcom has decided to use – i.e. to assume a constant downward trend in MEA prices over time – is not subject to gaming by BT.

- 2.100 In relation to the points made by ntl, the proxy which Ofcom had used to make an adjustment for changes in MEA prices that a new entrant would face was based on BT's current versus historic IPStream prices. That adjustment would not have been affected by a decision to increase IPStream prices in future and so there was not a circularity in this calculation. In any event, ntl's concerns should not be relevant to the approach Ofcom is now using.
- 2.101 However, as set out above Ofcom acknowledges the validity of the point made by ntl that if broadband pricing was being driven by demand factors then it would not be appropriate to assume that BT's pricing reflected trends in underlying MEA prices. Ofcom accepts that its previous approach did not represent a suitable approximation. However, ntl did not propose an alternative approach. In the absence of an alternative approach to adjusting for changes in MEA prices, Ofcom considers that its new approach – based on an assumption of a constant trend in MEA prices - is reasonable.
- 2.102 BT appears to suggest that it had not anticipated changes in MEAs over time but it is not clear whether they agree that Ofcom should make an allowance for such price trends. Given that Ofcom is modelling the costs of a new entrant today, it is appropriate to make an allowance for likely changes in MEA prices and to reduce the level of start-up costs that a new entrant would require. If Ofcom did not make any adjustment to BT's historic costs, then the initial margin it set would be higher and there would be a greater risk of inefficient entry.
- 2.103 In relation to the points made by Enovi, these would appear to imply a scorched earth approach to modelling the costs which, as explained above (see paragraphs 2.58-2.59), Ofcom has rejected.
- 2.104 In addition, it may be that as a result of BT's comment regarding the desirability of a scorched earth approach (see paragraph 2.54 above), BT is of the view that Ofcom should have reduced BT's historic costs further than it did. However, it has not provided any specific details of which costs it envisages should be excluded or reduced and why and therefore it is not possible for Ofcom to comment further on this issue.

Future Costs

- 2.105 Since Ofcom is considering a forward-looking analysis from the current time period, i.e. 2004/05, rather than from when BT actually launched its service, it is necessary to make an adjustment to BT's forecast of the future costs that would be incurred in the provision of the intermediate products. In effect this involves time-shifting the date at which certain costs are incurred. BT's forecasts of future costs are based on current asset prices which are relevant to a particular stage of the business plan, (say) year 3 of the plan. The equivalent point of a new entrant's business would be (say) three years into the future when a different set of asset prices would be relevant. If it is accepted that future prices are likely to be lower than today's prices, in real terms, due to declining MEA prices, then it will be necessary to make an adjustment to BT's forecast future costs in line with the expected trend in MEA prices. To do otherwise would be likely to overstate the costs which an entrant would incur over the relevant time period entering the market now.

VP utilisation

2.106 A third adjustment has been made in respect of the way in which BT chose to utilise VPs in the initial years of the IPStream services. Ofcom considers that the historic level of BT's utilisation of VPs would not reflect the utilisation levels than a new entrant could achieve today. Owing to issues related to the functionality and the costs of certain equipment in the past, BT faced limitations on the number of end-users that were able to share a VP. This resulted in BT using multiple VPs whereas today it would be more feasible and more efficient to use a single VP. The MEA available to an entrant today has greater functionality than the historic equivalent and as such an entrant today should be able to achieve a higher VP utilisation than BT was able to achieve historically. On that basis, Ofcom believes that it is appropriate to make an adjustment to BT's historic use of VPs. This is on the basis that the higher VP utilisation arises simply from the later date of entry, not from assuming a more efficient operator than BT would be in similar circumstances. To do otherwise would be likely to understate the VP utilisation achievable by a new entrant today (even one of similar efficiency to BT) and consequently overstate the costs.

2.107 The detail of how this has been implemented in the modelling approach is set out in Section 3.

ISH charges

2.108 Ofcom has considered how to treat ISH costs which BT does not incur but which new entrants do. A new entrant would face a charge for interconnecting their networks with BT's network, i.e. the ATM In span handover (ISH) charge. This is a charge which BT by definition does not have to incur due to its vertical integration between wholesale broadband access and intermediate services.

2.109 There is a trade off relating to the inclusion / exclusion of these costs in the margin. On the one hand given the objective of promoting competition, it would seem appropriate to take into account these costs which a competitor would face even if it were of similar efficiency as BT in other respects. However, on the other hand there is a risk that in doing so it will have the effect of forcing BT to price above its own costs levels and so forcing overall price levels to be greater than they would otherwise be. In its margin analysis Ofcom has considered sensitivities relating to the inclusion / exclusion of ISH charges. As set out in Table 3.6 of Section 3 the effect of including ISH is relatively small, for Standard IPStream Home 500 it increases the margin by £0.08 (per month).

2.110 On balance Ofcom considers that it is appropriate to make adjustments for ISH costs because a failure to do so would continue to give BT a cost advantage over its competitors, which the competitors could not address regardless of the efficiency of their operations. This would be contrary to Ofcom's objective of promoting competition.

Consultation Responses and Ofcom's Response

2.111 In its response to the consultation, BT argued that it was unreasonable that it should be required to fund new entrants regarding ISH charges when this was not a cost which it incurred itself.

2.112 As set out above, one of the objectives of setting the margin is to promote competition. If Ofcom was to ignore ISH charges, which are an unavoidable cost to BT's competitors, then if all else were equal BT would continue to have a cost advantage

which would leave others unable to compete. As a result Ofcom believes that the unique benefit afforded to BT of not incurring ISH charges (as a result of its vertical integration) should not be a reason for reducing the size of the margin.

2.113 Other respondents who commented on the issue supported Ofcom's proposed approach.

Migration charges

2.114 Ofcom has considered whether migration charges should be included in the margin. Competing operators face a migration charge when they migrate existing end users between IPStream and ATM interconnection based services.

Consultation Responses

2.115 In the Consultation Document Ofcom proposed not to include migration in calculating the margin. A number of the responses from Altnets argued that Ofcom should in fact include an allowance for migration charges on the grounds that migrating customers away from BT and other operators would be a key part of a new entrant's business plan. In particular, some respondents have commented that migration is necessary to allow them to build end user volumes quickly so that a reasonable level of network utilisation is achieved. By contrast BT and Enovi supported the exclusion of migration charges.

Ofcom's Response

2.116 Ofcom has modelled the costs of a similarly efficient operator as if that operator followed BT's actual growth profile, with the level of volumes scaled back. This is characterised by a gradual build up of volumes over time. The margin has therefore been assessed on the basis of a particular growth profile which is characterised by early year low utilisation.

2.117 Ofcom believes that this approach is reasonable. First, if migration were included, there would be an argument to model a different growth profile in which customers were acquired more rapidly. As explained in paragraphs 2.61-2.63 above, Ofcom does not believe that such an approach is appropriate. Second, it is possible that some entrants may well experience a profile not dissimilar to that experienced by BT. Demand for ADSL services is still growing and in Ofcom's view it would be possible for a new entrant to grow a customer base by acquiring new end users rather than relying solely on migration.¹³

2.118 Therefore Ofcom believes that its approach of excluding migration is an internally consistent approach to follow and provides a reasonable basis on which to assess the margin. Finally, it should be noted that the impact of including / excluding migration (where no change is made to the growth profile) is relatively small. As set out in Table 3.6 of Section 3 the effect of including migration for the Standard IPStream Home 500 is to increase the margin by £0.10 (per month).

Relevant starting level of intermediate service prices

2.119 Ofcom considered whether IPStream prices were the relevant downstream prices that should be used in the margin squeeze analysis. In response to the WBA market review consultation with Altnets, a number of competitors to BT at the downstream level –

¹³ This issue was raised by Analysys in its report and Ofcom provided Analysys with additional calculations. See section 3.5 of the report in Annex 2.

who rely upon purchasing ATM interconnection from BT – argued that they need to offer a discount on BT's IPStream prices across the board in order to induce intermediate service level customers (i.e. ISPs) to switch away from BT. They asserted that they need to consider offering discounts of between 10-15 % off the prices charged by BT as a matter of course. They went on to argue that the relevant reference price against which to conduct the margin analysis was therefore not BT's own prices for the IPStream products but the prices which they are able to charge.

2.120 The argument put forward by BT's competitors appears to presume that competition on price is the main form of competition in this area and that competition based on other attributes e.g. quality of service, additional functionality, customer support etc would not be relevant. However, one of the reasons for adopting a retail minus approach in this area is that the market is at a relatively early stage of its development and that there is uncertainty about future market developments. Although Ofcom has received representations from one ISP on the risks involved in switching its intermediate services supplier, Ofcom has not been provided with any detailed quantitative evidence of any costs involved. In addition it notes that such costs, to the extent they exist, are likely to be one-off costs for the ISP which would make the inclusion of any allowance for them in the margin difficult.

2.121 If Ofcom were to construct a reference price for conducting the MST based on the price for IPStream less, for example, 15 %, it would be building in an automatic margin for new entrants. There is a risk that this in itself would tend to determine the way in which competition evolved in the market.

2.122 There is also the issue as to whether promoting competition in this market relies exclusively on ISPs completely switching away from BT. In a number of cases, Ofcom understands that some of the larger ISPs have pursued a deliberate strategy of multi-sourcing i.e. they do not rely solely on one operator for the provision of these products. This is in order to stimulate competition and in doing so creating more responsive and customer focused suppliers. Against this background, it is less likely that ISPs would make decisions about different suppliers based purely on price. This is another reason for being cautious about building in an additional margin for Altnets.

2.123 On the basis of the above, in the context of a retail minus approach to determining interconnection charges, Ofcom does not believe that it is appropriate to build in an automatic additional margin for BT's competitors purely to allow them to offer discounts off BT's prices.

Consultation Responses

2.124 In their responses to the consultation a number of BT's competitors continued to maintain that they needed to offer a discount to the prices charged by BT in order to induce ISPs to switch. Some of the responses were specific in that they argued that retail ISPs required a discount of at least £1 (pcm) to be persuaded to move to an ATM interconnection based provider from BT's IPStream product. One respondent in particular argued such a discount reflected the commercial risks and that such a "risk premium" would be necessary for the near future.

Ofcom's Response

2.125 Ofcom has not received any quantitative evidence in the responses for additional ISP costs (such as those incurred when multi-sourcing). Ofcom also notes that a number of respondents (e.g. ntl and Energis) commented that Ofcom's approach is reasonable

and acknowledge it would be “indefensible” to build in an additional allowance in respect of this issue.

2.126 Ofcom also notes that its methodology already takes into consideration a number of commercial risks faced by new entrants (for instance, low utilisation of VPs and port reservation charges) and has factored in these considerations in setting the margin. To build in an additional allowance would not be appropriate.

2.127 As stated above, Ofcom does not believe that it is appropriate to build in an automatic additional margin for BT’s competitors purely to allow them to undercut BT’s prices.

Pricing Assumptions and Contestability

2.128 One potential criticism of the use of a DCF approach in a margin squeeze analysis is that it can yield a “false positive” result. That is, if future profits are assumed to be so significant then they may outweigh losses incurred in the early years of a project with the result that a DCF analysis could yield a positive NPV even though the basis for the assumptions about future profits was not sustainable.

2.129 For example, in a competition context, consider the application of a DCF approach to the business plan of a firm that engaged in a successful predatory pricing strategy. The first stage of predatory pricing strategy involves setting prices below cost in order to force other firms to exit the market. The second stage then involves not just raising prices to recoup the earlier losses but being able to sustain those prices above the competitive level because there is no threat of entry. In this case, it is likely that a DCF analysis would return a positive NPV even though anti-competitive conduct is involved.

2.130 Equally in the context of analysing a similarly efficient entrant, it might be possible to derive a positive NPV but only on the basis that the operator could sustain widening margins over time in the face of increasing competition. In that situation the concern would be that the price/cost assumptions underpinning the business are incorrect or the business model depends on increasing margins over time that are not sustainable in a competitive market.

2.131 The purpose of Ofcom’s margin squeeze analysis in this context is to establish a margin between ATM interconnection and IPStream prices which would allow a similarly efficient operator to enter the market; to incur the relevant start-up costs, initial losses etc and still expect to be able to recover their costs over a reasonable period of time and to compete effectively with BT in the intermediate services market going forward.

2.132 This entails modelling the profitability of a competitor to BT in the intermediate services market. The modelling of profitability over time in turn implies an analysis of costs and revenues over a number of time periods. Where the underlying ongoing costs are expected to fall over time, there is the need to ensure that assumptions about the associated price paths are consistent with the outcome of a competitive market, i.e. it is important to check to ensure that a positive outcome for the margin squeeze analysis does not depend on unrealistic assumptions about the ability of a new entrant to benefit from an increasing margin over time.

2.133 The use of contestability scenarios is a means of addressing the concern that prices should only be included in the analysis for future years that are plausible assumptions or prices that could be sustained in a competitive market. The approach involves assumptions that future intermediate services’ prices will be lower than the current prices, as cost reductions are achieved. By limiting the increase in future margins over

ongoing costs, the implication of the contestability scenarios is that the current margin between ATM interconnection and IPStream prices needs to be larger to enable the entrant to be profitable over the 5-year period.

- 2.134 Ofcom starts from the assumption that in a competitive market, a large fall in costs would generally be expected to lead to lower prices. However, Ofcom recognises that most markets are not characterised by perfect competition and contestability where prices adjust immediately to changes in costs. On the other hand it would not be reasonable to assume that firms could maintain prices above costs indefinitely in the face of competition.
- 2.135 The conceptual framework assumes that as on-going costs fall over time, competition would force operators to reduce their intermediate services' prices as well, although not necessarily immediately. Ofcom has chosen to analyse the sensitivity of the business model for the new entrant to these effects by means of the use of contestability scenarios. The magnitude and timing of the assumed reduction in prices can be varied as part of the sensitivity testing that is embodied in the contestability scenarios. This provides a range of quantifications to inform the judgement about the reasonable increase in the current margin.
- 2.136 Ofcom recognises that the design of the contestability scenarios, to take account of the concern about the sustainability of future prices in a competitive market as cost reductions are achieved, is far from straightforward. However, in Ofcom's view, the difficulty of the task is not a sound reason for ignoring the issue. That is, Ofcom considers that it is preferable to make some assumptions about lower future prices than to analyse the entrant's profitability at constant intermediate services' prices. The basis for Ofcom's approach to constructing the contestability scenarios is set out below.
- 2.137 Ofcom recognises that it has adopted a pragmatic approach to a complex issue. Consequently, the assumptions used in the contestability scenarios about the timing and size of price reductions are stylised and should therefore not be taken as providing reliable forecasts of the precise path of future prices. Whilst Ofcom does not believe that the approach adopted is sufficient to infer these specific details and hence the precise future path of margins, by considering the overall impact of different assumptions, Ofcom believes that the contestability scenarios provide a mechanism to make a judgement about the size of the current margin that should be set.

Setting the margin over time.

- 2.138 As it stands, Ofcom has formulated the margin rule in terms of a single margin between ATM interconnection and IPStream prices for each of BT's existing IPStream products. The WBA margin rule itself does not specify any change in this margin over time.
- 2.139 However, given that the MST reflects the implication of the contestability scenarios, the methodology involves setting a sufficiently large current margin to allow an entrant to be profitable even if future intermediate service prices are lower than current prices. That is, the methodology used to derive the MST implies an expectation that the margin between ATM interconnection and IPStream prices would in fact decline over time.
- 2.140 The reason why Ofcom has not set a specific (reducing) margin for each of the five years of the modelled period is that this would involve a specific forecasting exercise and would require a degree of certainty and precision in terms of specifying cost/price

paths which is beyond the purpose for which the contestability scenarios have been designed.

- 2.141 Instead of attempting to pre-specify the way in which the margin should evolve over time, Ofcom instead prefers to allow adjustments to the margin over time to occur via periodic reviews. Given that the WBA market review is itself due to be reviewed in the course of 2005, it would seem appropriate to revisit the issue of the size of the margin and any future reviews at that point in time.

Modelling Contestability

- 2.142 The contestability scenarios are set up in such a way that allows a degree of flexibility in terms of being able to accommodate the situation in which a firm finds it desirable to set an initial price for a product which does not appear fully to cover the costs of serving early customers but which is sustainable once cost reductions are achieved. Having a delay between the point at which costs begin to fall and the point at which prices begin to fall recognises that markets in practice are not frictionless, that even in competitive markets there can be a lag between cost reductions and falls in price. The contestability scenarios then place a limitation on the extent to which the margin between IPStream prices and on-going costs is permitted to increase as on-going costs fall.
- 2.143 In the Consultation Document the different scenarios analysed by Ofcom were based upon fixing (i.e. holding constant) the margin between IPStream prices and on-going costs from different points in time. Ofcom has chosen to look at the impact of introducing contestability after 2-, 3- and 4-years within the 5-year modelling period. For instance, applying a contestability assumption from year 2 means that the initial margin between IPStream prices and on-going costs increases by the size of the reductions achieved in on-going costs between years 1 and 2 but not any subsequent cost reductions in later years.
- 2.144 Imposing contestability in year 1 would imply that a new entrant would not have the flexibility to be able to set an initial price for a product which did not fully cover the costs of serving early customers but would be sustainable once cost reductions are achieved. Setting contestability in year 1 would not allow the margin between IPStream prices and on-going costs to increase by the size of the reduction in on-going costs achieved after the first year. This would essentially set the current margin on the basis that new entrants would be forced to price so as to recover their costs from the outset. Taking account, for example, of the abnormally low VP utilisation experienced by any entrant with low initial volumes, this would not be a realistic assumption and runs the risk of overstating the margin required to enable entrants to compete effectively.
- 2.145 Equally, introducing contestability in year 5 would fail to take account of the concern about the sustainability of widening margins between IPStream prices and on-going costs in a competitive market. It would run the risk of setting too small a current margin, which would not be consistent with the objective of promoting competition.
- 2.146 Having excluded the extremes of 1-year and 5-year contestability for the reasons set out above, Ofcom has quantified the impact of introducing contestability from years 2, 3 and 4.
- 2.147 Many respondents have commented on the impact of contestability, both in terms of its magnitude and the sensitivity of the effect. Recognising the stylised nature of the contestability assumptions, Ofcom has considered further approaches to constructing

contestability scenarios in the context of setting the margin in this market, specifically addressing the issues of:

- True cash flows versus cumulative cash flows;
- Taking account of all reductions in costs versus only cost advantages to future entrants.

2.148 This further analysis (described below) results in a broader base of results, which can then be considered in deriving a judgement about the reasonable size of the impact of contestability on the current margin.

2.149 In order to set out the specific margin rule it is necessary to select one particular contestability scenario in order to generate the required specific figures. However, this does not mean that Ofcom's approach is to decide that one particular contestability scenario is correct and the others are wrong. Rather, Ofcom's approach is to select one contestability scenario which provides a representative view of the impact of contestability on the current margin.

2.150 Before discussing the calculation of contestability in detail it is helpful to explain the distinction between a "cumulative" cash flow approach and a "true" cash flow approach. In Section 4 of the Consultation Document, Ofcom described that unit average costs in any year were calculated as the ratio of the cumulative costs from the start of the explicitly modelled period and the appropriate cumulative units (volumes or bandwidth), both expressed in present value terms. This means that the average unit costs in Year 2 are a function of the average unit costs in Year 1 and 2, and so on. Using the true cash flow approach instead, the average unit costs in any year are simply the average unit costs incurred in that year.

2.151 In specifying a margin squeeze rule and usage factors, the use of cumulative cash flow approach has a number of merits over the true cash flow one, as it removes the phasing distortions between the various down stream products and results in a more consistent average unit cost across these products. As a result, in the Consultation Document, Ofcom implemented a methodology that assessed the difference in ongoing unit costs expressed on a cumulative cash flow basis, rather than on a true cash flow basis, as this approach is consistent with the overall structure of the MST top-down model.

2.152 The implications of using the "cumulative" cash flow approach as opposed to its alternative is that the average margin going forward is fixed as a measure of the average margin to date at the point in which contestability is introduced, rather than the margin at that point in time as calculated from the in year cash flows (see comments by Analysys in Annex 2).

2.153 There are also conceptual attractions for calculating the impact of contestability on the basis of cumulative cash flows. As an extreme example, consider ongoing unit costs which, on a true cash flow basis, reduce significantly from the first to the second year, but thereafter remain constant with no further reductions in subsequent years. Focusing exclusively on these ongoing unit costs, if a contestability assumption was calculated on a true cash flow basis applying at any point after the first year it would have no impact on the results as there are no reductions in ongoing unit costs after this point. In other words, it would be as if a contestability assumption had not applied. By contrast, a calculation based on cumulative cash flows would capture part of the initial reductions in ongoing unit costs, even if applied from year 2 or subsequent years.

- 2.154 On the other hand, there are arguments which support calculating the impact of contestability on the basis of true cash flows. For example, in its external review, Analysys highlighted that it would arguably be clearer to fix the average margin between the price and ongoing costs going forward on the basis of the margin at that point in time (calculated from the true cash flows), rather than fixing the average margin going forward on the basis of a measure of the average margin to date, which is effectively the result of using a cumulative cash flow calculation. Ofcom also notes that an approach based on true cash flows is more consistent with its implementation of contestability assumptions used in other contexts .
- 2.155 In light of the different arguments outlined above, for the purpose of setting the margin, Ofcom sees no compelling reason to favour one approach over the other and has therefore decided to take into account results based on both the true cash flow and cumulative cash flow approaches. At the time Ofcom published the Consultation Document this was not possible as it had not quantified the true cash flow results.
- 2.156 The second issue which Ofcom has analysed concerns the extent to which all forecast cost reductions over time should flow through to matching price reductions. The assumption in the contestability scenarios that all types of cost reduction might lead to matching price reductions reflects, in concept, constraints in a competitive market that arise both from the threat of entry as well as competition amongst actual suppliers. An alternative perspective is to consider that the first type of constraint, relating to the threat of entry at each point in time, is the relevant competitive constraint, thus abstracting from competitive constraints that actual suppliers may impose on each other. This perspective would result in assuming that only cost advantages available to new entrants flow through to matching price reductions.¹⁴
- 2.157 In determining which cost reductions relate to constraints in a competitive market arising from the threat of entry, it is instructive to distinguish between cost reductions that may be related to the “date of entry” and others which may be related to the “age of operation” since entry. The first category recognises that later entrants can achieve lower costs (over the first five years of operation) than suppliers that entered earlier, as a result of benefiting from lower asset prices and lower operating costs associated with later technologies. The second category recognises that it takes a period of time before any entrant would achieve certain cost reductions, regardless of the date of entry. This second type of cost reduction is not a source of cost advantage to entrants in the sense that a later entrant would experience the same path of costs (over the first five years of operation) as a supplier that had entered in an earlier year. It is not straightforward to determine which of these two categories each type of cost reduction falls into, however, in order to derive quantified results Ofcom has considered a proxy based on the broad-brush assumption that:
- declines in the cost of using ATM interconnection are due to the age of operation since entry i.e. not available to an entrant in the first year of operation since these cost reductions generally relate to improved utilisation which is achieved as an operator increases its volumes over time;
 - IP cost declines (both MEA price reductions and ongoing costs) are due to technological progress and the passage of time: i.e. they are a source of cost advantage to a future entrant.
- 2.158 As for the first issue concerning true cash flows versus cumulative cash flows, Ofcom considers it relevant to take account of both an approach which captures all cost reductions as well as an approach which is limited to cost advantages available to new

¹⁴ See Freeserve decision of 20 November 2003

www.ofcom.org.uk/static/archive/oftel/publications/comp_bull/cases/closed_cases/cw_607.htm

entrants since for the purpose of setting the margin it is not clear that one approach should be strictly preferred over the other. Further details regarding quantification of the impact of contestability are described in paragraphs 5.18-5.22.

Consultation responses

2.159 In responses to the consultation a number of views were expressed in relation to the conceptual basis for introducing contestability scenarios and also the practical way they had been implemented.

2.160 In relation to the conceptual issues, BT argued that:

- Ofcom had not established that contestability was part of the accepted competition law framework.
- Ofcom's approach to contestability implies that BT had already acted anti-competitively but that Ofcom had not specified what anti-competitive behaviour was being referred to.
- It was not appropriate to build in a contestability assumption: there is no indication that the margins BT might earn now or in the future were in any way anti-competitive or excessive.
- There was no certainty in Ofcom's model that unit costs would continue to fall or that prices should bear some mechanistic relationship to unit costs.
- Contestability was in effect a pure subsidy from BT to the rest of the industry.

2.161 Comments by BT's competitors focused on the implementation of the contestability scenarios and in particular whether the margin should be adjusted earlier. For instance, Telefónica argued that current price levels were expected to fall within 12 months and so contestability should be introduced after year 1 whereas Thus argued that new entrants faced price competition "from Day 1".

2.162 A number of BT's competitors argued that there was a need to ensure that the volume and contestability assumptions were consistent in that if a new entrant were expected to reach a market share of 20-30% within 5 years, this would imply that contestability would be relevant as early as year 2 of the modelled period. Enovi argued that it did not believe there was likely to be sufficient competition to force BT to reduce prices of IPStream and so no adjustment should be made.

2.163 Finally, ntl questioned whether there was a need to model the effects of contestability explicitly. They argued that the consequences and timing of contestability were a function of the chosen margin: i.e. future reductions in price were a function of the chosen margin and so should be endogenous to the model. They proposed an alternative in which the modelled period was shorter and contestability excluded. The relevant time horizon they proposed was the minimum period to break even given constant prices.

Ofcom's response

2.164 Ofcom has set out its response to BT's first point in paragraphs 1.27-1.28 above.

2.165 In the WBA market review (Review of Wholesale Broadband Access) Ofcom determined that BT had SMP in relation to both the asymmetric broadband origination market in the UK (excluding the Hull area) and the broadband conveyance market in the UK. Given the finding of SMP in those markets, Ofcom is required to consider

remedies to address that SMP. Setting the margin for WBA stems from the imposition on BT of an SMP condition to provide Network Access on fair and reasonable terms. Ofcom has therefore not suggested that BT has already acted anti-competitively.

- 2.166 Given that at a conceptual level the margin squeeze analysis is attempting to analyse the prospects of a similarly efficient operator entering the market today, the contestability scenarios are explicitly designed to test the robustness of the assumptions about future prices and the extent to which a new entrant would need to rely on increasing margins over ongoing costs over time for a business model to have a non-negative NPV.
- 2.167 The assumptions about reductions in unit costs are a function of the data provided by BT; they are a function of the increase in volumes over time and of the reduction in underlying costs such as those arising from technical progress. Ofcom recognises that the relationship between prices and unit costs in the contestability scenarios do represent stylised assumptions. This is why, as explained above, Ofcom has not relied on these assumptions to derive a pre-specified path for a declining margin in future years. However, Ofcom considers that in a competitive market it can be expected that significant falls in costs would feed through into lower prices. Given smaller expected future margins, the current margin needs to be larger than it otherwise would be to allow the opportunity for cost recovery by an entrant of specified size and similar efficiency to BT. In other words, Ofcom considers that, rather than entirely ignoring this important issue, it is preferable to seek to take account of the need for future prices and margins built into the forecasts in the DCF analysis to be sustainable in a competitive market through the use of contestability scenarios.
- 2.168 In relation to comments from other operators and Enovi, it is important to be clear that the contestability scenarios are not Ofcom's forecasts of future price trends. The contestability scenarios are intended to test the robustness of current pricing assumptions and involve fixing the margin over ongoing costs at a particular point in time. They do so by adopting stylised assumptions about the operation of a competitive market. It is therefore incorrect to make a direct link between the price paths implicit in the contestability scenarios and expectations about actual price movements in the relevant market.
- 2.169 Contestability scenarios are used as a check to ensure that the new entrant model does not rely on expectations about an increasing margin over time that in turn would not be sustainable in a competitive market. That in itself provides the rationale for incorporating the contestability assumptions into the modelling process. As stated above, they are not predictions of how prices will actually change over time so they are not endogenous to the model in that sense.
- 2.170 The point at which contestability is introduced into the model does not depend upon the break even date in the business case. Such an approach would run the risk of circularity. Instead contestability is a variable in the model and a range of start dates and ways of modelling have been considered to examine the robustness of the margin squeeze analysis. Given a five year time horizon, the first and last years of the modelled period have been ruled out on the basis that they represent extremes. This in turn leaves scenarios based on introducing contestability in years 2, 3 and 4
- 2.171 If the concern is that there may be circularity in the modelling process whereby a "fail" on the MST leads to a requirement to reduce wholesale prices which in turn feeds through into a reduction in underlying costs which in turn implies further reductions in retail prices exacerbating the "fail" on the MST, then that is not the case. The modelling of contestability is carried out in such a way as to avoid this problem,

because changes in wholesale prices are not a source of relevant cost reductions.

Approach to key parameters

Relevant time period

2.172 In assessing the profitability of a similarly efficient operator entering the market today, the relevant approach is a forward-looking approach. This in itself gives rise to a number of possible approaches in relation to choosing the relevant time period for analysing a business model. For instance, it could be possible to consider the profitability of the key current investments which would imply using the economic life of those assets. Alternatively one could adopt a very long-run approach which would consider profitability over the whole lifetime of the business or at least over multiple investment cycles.

2.173 In both instances there will inevitably be trade-offs between modelling the relevant period and the generation of reliable forecasts over the relevant lifetime of the economic assets for a long-lived project. For instance, with the very-long run approach, there would be a need to try to anticipate not just the impact of future technological innovations but also to try to assess what this would mean for investment decisions and the level of investment in the future. For well established services this would be a demanding exercise; for services which are still developing any such forecasts would be subject to potentially significant margins of error.

2.174 Given the considerable difficulties associated with taking a very-long run approach with services which are still developing, as is the case here, Ofcom believes that it would be more appropriate to focus on the nature of the underlying investments and an appropriate period for the recovery of those investments. Ofcom considers that an appropriate timescale would be one under which the current investments were profitable and where the firm did not rely on earning super-normal profits on future investments. On this basis, Ofcom considers that it would be more reasonable to specify a time period that was related to the economic life of the underlying assets rather than the very long-run.

2.175 As referred to above, even with an approach which focuses on the profitability of key current investments there can still be issues around:

- generating reliable forecasts for individual aspects of the business case against the background of a developing market;
- the fact that assets (tangible and intangible) do not generally have the same economic lifespan.

2.176 The first point implies that for practical reasons the future period that can be sensibly included in the DCF analysis will be constrained by the period over which it is reasonable to derive forecasts of cash flow expenditures and revenues. The longer the time period of a DCF analysis, the greater the risk of errors in the forecast.

2.177 In respect of the second point, the relevant assets in this case are those required to provide the IPStream services but which are additional to the underlying ATM interconnection service. However, it is not the case that all such assets have a coterminous asset life. In reality, the assets required to provide the service are acquired over time and exhibit varying economic lives. Based on the information provided by BT, Ofcom has modelled asset categories which have lifetimes ranging from 3 to 6 years. At any point in time the assets currently in use will exhibit a variety

of remaining asset lives. It is therefore not possible to truncate analysis cleanly at a single point after a full single cycle of asset lives. This observation suggests that it may be appropriate to consider a time period which is longer than the minimum single asset lifetime.

- 2.178 If a shorter time period is modelled there is a risk that this would not allow sufficient time for an entrant to recover early year losses resulting in an inflated margin in order to pass the MST and thus encouraging inefficient entry. Conversely, a longer time period places reliance on forecasts for an extended period into the future, increasing the risk of forecast error and the likelihood of generating unreliable results. Mindful of the need to balance these two concerns, Ofcom considers that it is reasonable to carry out the DCF analysis over a five year period¹⁵ and truncate the analysis at that point with the inclusion of terminal values. Ofcom believes that this provides sufficient time for an entrant to recover any legitimate initial losses whilst taking account of issues around reliability of forecasts in that the analysis uses both data from BT's actual experience as well as BT's updated forecast data. Additionally, Ofcom has considered sensitivities to the MST results based on a time period of 4-6 years (again including terminal values at the point of truncation).

Consultation Responses

- 2.179 In response to the issue of what is the relevant time period over which to conduct the DCF analysis, two respondents (Energis and Thus) agreed with Ofcom's proposal. Tiscali also agreed that five years was a reasonable length of time to consider but expressed concern over the impact of LLU. Telefónica expressed a stronger opinion that the five year period should be adjusted to reflect the limited economic life of ATM interconnection due to the development of LLU. Ofcom has adopted an approach of modelling costs as if an entrant competes with IPStream using ATM interconnection exclusively rather than a mixture of ATM interconnection and LLU for the reasons stated in paragraphs 2.78-2.79.
- 2.180 Finally, ntl suggested a shorter period on the basis that this would negate the need for a contestability assumption adjustment. While, as recognised above, the contestability assumption is a pragmatic way to address a complex issue, Ofcom does not believe that the difficulty of deriving the adjustment is a satisfactory reason for carrying out the analysis over a very short time period.

Terminal value

- 2.181 The DCF analysis runs for five years and is then truncated at that point. Whenever a DCF analysis is truncated, it is appropriate to consider the terminal value associated with the activity at the time of truncation to reflect the fact that the business will continue beyond this time and that assets have an on-going economic value (or earning power).
- 2.182 The approach which Ofcom has adopted is, in effect, to allocate the costs of assets to be recovered (including cost of capital) between two periods of time: the explicitly-modelled period of five years from launch up to the point of truncation and the years beyond the point of truncation. The smaller the terminal value, the greater the amount of cost to be recovered in the explicitly modelled period.

¹⁵ Ofcom also notes that a five year period is consistent with the time period considered in IPStream case closure September 2003 - CW/00607/04/03.

http://www.ofcom.org.uk/static/archive/oftel/publications/comp_bull/cases/closed_cases/cw_607.htm

- 2.183 To this end Ofcom first allocated the acquisition cost (including a cost of capital) of any asset across its life time. This allocation can be performed using a number of methods – as a starting point Ofcom has used a flat annuity since this is the most neutral approach (to which an MEA adjustment is then applied).¹⁶ The terminal value is calculated using the annualised asset costs that have not been allocated beyond the point of truncation. The cost of the asset during the explicitly modelled period is given by the difference between the acquisition cost of the asset and its terminal value (which is, in effect, treated as if it were a positive cash flow at the point of truncation).
- 2.184 This ‘allocates’ any ‘un-depreciated’ costs at the point of truncation to be recovered in later years (along with an appropriate return on capital) but any cross-subsidy from future super-normal profit is excluded. The purpose of deriving terminal values by starting from the investment costs of the assets in this way is to reduce the risk of obtaining a false result by being over-optimistic about future earning power, i.e. overstating the terminal value and hence understating the amount of cost recovery relevant to the explicitly modelled period. Ofcom does not consider that it is appropriate to include excess profits generated beyond the explicit modelling period because, in a competitive market, a new entrant could not rely on such profits to subsidise losses made during the explicitly modelled period.
- 2.185 Against that background, it is also the case that in deriving terminal values, Ofcom has deliberately avoided calculation methods typically used to derive terminal values in business cases or valuation exercises (e.g. using the final period margin to derive a value in perpetuity). This is because these methods are based on assumptions about price-cost relationships which the margin squeeze model is in fact designed to analyse and so could be circular or yield false results.

The Cost of Capital

- 2.186 A DCF analysis takes account of (or ‘discounts’ for) the fact that the present value of a sum of money is higher than the value of the same amount of money at some point in the future. It is the discount factor which provides for the firm to earn a reasonable return on its investment. A firm’s cost of capital represents the weighted average yield that it needs to offer to investors in order to attract funds for investment – it represents a “cost” of money.

¹⁶ The terminal value is adjusted downwards in line with the reduction in the MEA price between the date of acquisition and the point of truncation. The effect of reducing the terminal value is to increase the amount of cost allocated to the explicitly modelled period. There is a question about the best part of the WBA Margin Rule to represent this adjustment: in the additional costs or in the contestability factor. One way of characterising this adjustment is that it is part of the contestability scenarios discussed above. That is to say that the reduction should be made to reflect the fact that an operator entering the market at the point of truncation would be able to purchase the assets more cheaply and therefore it is because of this competitive constraint that the terminal values should reflect this MEA adjustment. On the other hand there are some differences between this adjustment and the adjustment in the contestability scenarios to reflect reductions in ongoing costs. Contestability in relation to ongoing costs assumes that cost reductions are matched by output price reductions in a competitive market, whereas the MEA adjustment to the terminal value is about cost allocation over time, ie the effect is to increase the cost allocated to the explicitly modelled period, and it does not involve assumptions about reductions in output prices. In addition, cost allocation over time that reflects changing MEA values is a feature of some accounting approaches, for example a Financial Capital Maintenance CCA approach using MEA asset valuation, whereas this is not the case for contestability in relation to ongoing costs. In presentational terms it is not clear-cut, therefore, whether the MEA adjustment to the terminal value is better characterised as part of the analysis of additional costs or part of the contestability scenarios. Since it is, however, pragmatically easier from a modelling perspective to include it in the additional cost calculations rather than the contestability calculation, Ofcom has adopted this approach and specified the WBA margin rule accordingly in Section 4.

2.187 The use of a firm's cost of capital as the discount factor therefore in principle provides a 'bright line' test in investment appraisal. If the Net Present Value (NPV) using an appropriate discount rate (and true mean forecasts of future costs and revenues) is positive (or even, at the margin, is zero), then the project represents a worthwhile use of the funds. If the NPV is negative then there are severe concerns whether the firm should invest in that project.

2.188 At the conceptual level, the appropriate discount rate to be used in a DCF analysis should be the risk-adjusted cost of capital i.e. one which takes into account the risk of the investment at the outset.

Pre-tax/post-tax cash flows

2.189 There are a number of ways to apply the DCF approach and the most widely implemented in practice uses after-tax cash flows and an after-tax discount rate. After tax cash flows reflect the cash flow generated by the company's operations that is available to all the company's capital providers, both debt and equity. For consistency with the cash flow definition, the discount rate applied to the free cash flows needs to reflect the opportunity cost to all capital providers weighted by their relative contribution to the company's capital (i.e. the weighted average cost of capital, WACC) and adjusted by any tax benefits received by the company (such as tax shields provided by the interest expense).

2.190 The tax "payable" (calculated as the corporation tax rate multiplied by cash flows before tax) does not generally equal the actual taxes "paid" by a company because of differences between the accounting and tax treatment of profit. For valuation purposes, when looking at post-tax cash flows, the tax payable by a company needs to be calculated on a cash basis for each year within the explicitly modelled period. This is a very complex computation, especially if it needs to be performed on a forward looking basis which will require the overall tax position of a company to be analysed. For example this would need the consideration of complex issues such as any tax losses brought forward, deferred taxes and capital allowances on capital investment and a forecast of these to cover the whole of the explicitly modelled period.

2.191 In the light of the inherent difficulties and inaccuracies in forecasting the tax paid by a new entrant Ofcom has considered whether to resolve all of these issues in detail or to take a simplified approach. As part of this exercise Ofcom has undertaken a sensitivity analysis comparing pre-tax calculations with a number of simple post-tax scenarios based on different assumptions regarding the tax position of the company. Ofcom has concluded that for the purposes of setting the margin in this review the most appropriate methodology is to use pre-tax cash flows.

2.192 On that basis, and in the absence of any systematic evidence of the appropriate level of the risk-adjusted cost of capital that would be applicable for the IPStream products, Ofcom believes that it is reasonable to use BT's cost of capital as estimated by Ofcom and used in relation to BT's regulated activities (i.e. currently 13.5¹⁷ % pre-tax nominal) as the relevant discount factor in the DCF analysis.

¹⁷ Ofcom is currently consulting on whether the appropriate weighted average cost of capital for BT should be 12.5% rather than the 13.5 % as currently used by Ofcom. However, it would not be appropriate for Ofcom to anticipate the results of that consultation process and move to use the lower cost of capital figure for the purposes of setting the margin. Equally, in the event that it considers that BT's cost of capital is lower than 13.5 %, Ofcom is not proposing to re-open this margin squeeze analysis since the impact on the results would not be sufficiently material. For example, moving from 13.5% to 12.5% will decrease margin for IPStream Home 500 by 4 pence which is equivalent to a decrease of approximately 0.89% of the total margin set.

Consultation Responses

- 2.193 In response to the consultation, a number of competitors to BT argued that it is inappropriate to use BT's cost of capital which reflects BT's diversification and hence lower risk as well as BT's incumbent advantage. They suggest that it would be more appropriate to use their own cost of capital which they claim is higher (15-20 %) as this represents costs that they are unable to avoid. Although, C&W commented that in the absence of reliable alternative data BT's cost of capital was "probably the most appropriate proxy available". Telefónica made a similar point. Enovi agreed with Ofcom's proposed approach.
- 2.194 In addition, Thus has argued that the Consultation Document reveals an incomplete understanding of IRR thresholds. It argued that IRRs are directly related to a company's cost of capital but with adjustments appropriate to the degree of risk assessed for a particular project being appraised. It maintains that IPStream is still a risky business from an investor's perspective since there is a risk that more entrants will emerge than can be supported by the given level of margin and therefore an IRR in the range of 25-30% should be used in determining the margin.
- 2.195 Some respondents also argued that the use of BT's cost of capital is inappropriate as this is used in relation to BT's regulated activities which are of lower risk. For instance, one respondent noted that IPStream products are not regulated and it raised the specific concern that a higher cost of capital than BT's average is appropriate for IPStream products since BT's average cost of capital includes regulated activities which are of lower risk and therefore would have a lower cost of capital.
- 2.196 In its submission BT argued that in using its weighted average cost of capital Ofcom was attempting to constrain BT's profits and that defining excess return as any return above a regulated rate of return was not compatible with incentivising risk-taking. BT further argued that Ofcom had not estimated "BT's *ex ante* cost of capital, either the systematic risk or the total risk".

Ofcom Response

- 2.197 Whilst Ofcom acknowledges that the cost of capital for BT's competitors may differ from BT's cost of capital, Ofcom notes that no response has provided evidence to support a cost of capital for a new entrant in excess of 13.5 %. For instance, in other regulatory decisions, Ofcom has set out the basis for the derivation of a cost of capital figure for BT's regulated activities using the capital asset pricing model (CAPM) including the figures it has used for the different components of the CAPM. For example, none of the respondents have provided evidence that the Beta coefficient which measures systematic risk that Ofcom has used would be incorrect in this instance.
- 2.198 Ofcom's DCF analysis is based on a new entrant purchasing ATM interconnection products and investing in IP networks. Ofcom does not have clear evidence as to why these activities would be of a different (or higher) risk profile to BT's regulated activities or its activities on average.
- 2.199 Ofcom would also point out that the derivation of the 13.5 % figure for the cost of capital for BT's regulated activities is based on the Beta coefficient for BT plc i.e. it is not specific to BT's regulated activities and therefore incorporates all of BT's business activities.

- 2.200 Contrary to Thus's suggestion, Ofcom has not misunderstood the use of IRR thresholds. In the Consultation Document, Ofcom explained that IRRs were used "...to provide an internal mechanism for "sifting" investment projects.." (see paragraph 3.70). Thus' argument seems to be that the relevant IRR threshold for assessing a particular investment project should reflect the risk of that project, which may be different from the overall average risk faced by the company as a whole. Ofcom recognises this point and discusses above the absence of compelling evidence to suggest that 13.5% is an unreasonable proxy for investment in intermediate services by an entrant buying ATM interconnection.
- 2.201 Ofcom also notes that the results of the margin squeeze analysis are relatively insensitive to discount rates in the range of 12.5-15 %: the difference is around 5 pence in either direction if the midpoint is taken to be around 13.5 %.
- 2.202 As stated in paragraph 3.71 of the Consultation Document, in the absence of systematic evidence of the appropriate level of the risk-adjusted cost of capital that would be applicable for IPStream products, Ofcom believes that it is reasonable to use BT's cost of capital as estimated by Ofcom.
- 2.203 In relation to the points made by BT, it is not the case that Ofcom is setting out to constrain BT's profits. BT's profits will depend in part on the level of BT's costs. The margin ultimately set by Ofcom is not based on the costs BT will achieve or even on the costs which Ofcom expects BT to achieve – the margin will be set on the basis of an estimate of the costs faced by a new entrant today of a specified scale. To the extent that the costs achieved by BT are lower than those of a similarly efficient entrant today, then BT's profits would be higher than those assumed in the margin squeeze analysis.
- 2.204 It is unclear to Ofcom from BT's response whether BT is arguing for a higher or lower cost of capital. On the face of it, BT's response set out in paragraph 2.196 above would appear to imply that it believes Ofcom should use a higher cost of capital. But Ofcom notes that since this would imply a larger margin, it would be inconsistent with BT's concerns elsewhere in its response.

Assumptions used to derive the margin

- 2.205 In summary, in deriving a margin Ofcom's methodology is based on the following conceptual framework:
- The context for analysis of the appropriate margin between BT's IPStream and ATM interconnection products is one of ex ante regulation that is designed to promote competition in the downstream business.
 - Ofcom has taken as its benchmark for setting the margin, a new entrant today which has the same underlying cost function to BT (i.e. similarly efficient) but enters later and benefits from fewer economies of scale and scope.
 - The analysis of profitability of the similarly efficient new entrant today should be forward-looking over a number of years and a DCF approach is an appropriate way of implementing such an approach.
 - BT's financial information is used as a source of data for the analysis, but various adjustments are made including those necessary to reflect a 'time-shift', i.e. that the analysis relates to an entrant coming into the market today whereas BT's financial information relates to entry at an earlier date.

- The margin squeeze test should be applied at the level of the individual product level
- The relevant cost floor for the analysis is a long-run measure of costs which includes an element for the recovery of common costs.
- Contestability scenarios are analysed to quantify the effect on the current margin, given that in a competitive market future cost reductions would be expected to result in lower future prices.

Section 3

Margin Setting Modelling – the top down model

3.1 Ofcom has formulated its own spreadsheet models for performing the margin squeeze test and to calculate the various usage/adjustment factors and to parameterise the effect of the contestability assumption and the additional cost. To this end Ofcom has formulated two models:

- The top down margin model: This model performs a margin squeeze test between the unit price charged by BT for IPStream products and the unit costs incurred in provisioning such products (i.e. the ATM interconnection costs and additional costs).
- The usage factors model: This model uses the results from the top down model and BT's current price list to calculate the usage factors associated with ATM interconnection and the revenue adjustment factors. It also parameterises the effect of the contestability assumption and the additional cost.

3.2 This section discusses the modelling approach taken and the key assumptions made in developing the top-down model. The modelling approach taken in developing the usage factors model is discussed in detail in Section 4.

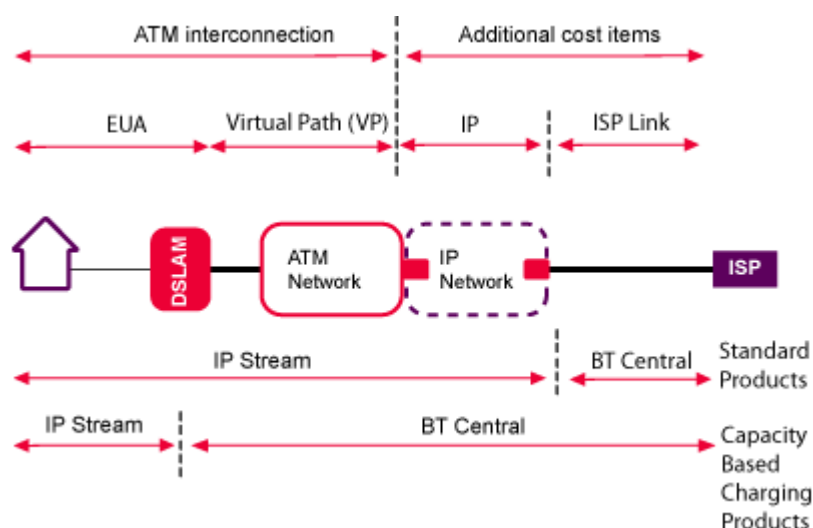
The services

3.3 Ofcom views the current IPStream services as being downstream to the ATM interconnection product set. That is, in provisioning the current IPStream services the ATM interconnection products are used as an input. This means, therefore, that the current IPStream services are composed of ATM interconnection products plus some additional network and operational elements. However, because of the different structures associated with the ATM interconnection products and the IPStream services they can not be directly compared. An assessment of the 'margin' between these products therefore needs to encompass both the structural differences and the additional elements. The 'margin' is thus made up to of two components:

- The cost of the ATM interconnection product (i.e. given BT's charges, how much would an interconnecting operator (including implicitly BT) pay for the ATM interconnection services);
- The cost of the additional inputs which are needed to make the transformation from ATM interconnection to IPStream, such as: broadband access servers, IP conveyance, customer handover links and various operating and sales and marketing costs. In the following text the cost of these other inputs will be referred to generically as the 'additional cost'.

3.4 Figure 3.1 below illustrates the basic structure of BT's ATM interconnection, IPStream and BT Central services.

Figure 3.1



3.5 Figure 3.1 illustrates the four main elements that make up BT's end-to-end 'intermediate' broadband DSL services. The end user access (EUA) and the virtual path (VP) are essentially the ATM interconnection products whereas the IP network and the ISP link are essentially the additional cost elements.

3.6 Within BT's Standard IPStream suite of products there are seven different IPStream products available. These are listed in Table 3.1 along with the maximum end user speed and the specified contention ratio associated with each. Each of the Standard IPStream products has its own unique rental price.

Table 3.1 IPStream Standard Products

| IPStream Standard Products | Max Speed | Contention Ratio |
|----------------------------|------------|------------------|
| Home 250 ¹⁸ | 250 kbit/s | 50 |
| Home 500 | 500 kbit/s | 50 |
| Home 1000 | 1 Mbit/s | 50 |
| Home 2000 ¹⁹ | 2 Mbit/s | 50 |
| Office 500 | 500 kbit/s | 20 |
| Office 1000 | 1 Mbit/s | 20 |
| Office 2000 | 2 Mbit/s | 20 |

3.7 The Standard IPStream product suite also includes various BT Central sizes and options. For the Standard IPStream products the BT Central element is simply the ISP link, as shown in Figure 3.1. There are a total of 20²⁰ different BT Central sizes and options available and each has its own unique connection and rental price.

3.8 Within the CBC IPStream suite of products there are also seven IPStream products available, 4 Home variants and 3 Office variants. The names and the maximum end user speed of these products are the same as those available within the Standard IPStream product suite (see Table 3.1). However, with the CBC IPStream products, the IPStream element is simply the EUA, as shown in Figure 3.1. Because the EUA is dedicated to an end user there is no overbooking (contention) in this part of the

¹⁸ This product is due to be launched on 1 September 2004.

¹⁹ An indicative price for this product was announced on 14 April 2004, but at the present time no launch date has been specified.

²⁰ In addition to these 20 options BT also offers a BT Central Plus product which includes Internet connectivity.

network, the CBC IPStream products therefore do not have a specified contention ratio. Although seven unique products exist, BT only levies two different rental prices, one for the Home variants and one for the Office variants.

- 3.9 As with the Standard IPStream product suite, the CBC IPStream product suite also includes various BT Central sizes and options. For the CBC products, however, the BT Central element covers all of the core network (VP and IP) and the ISP link. Again there are a total of 20 different BT Central options available and each has its own unique connection and rental price.
- 3.10 Although the structures of the Standard IPStream and CBC IPStream products are different, on an end-to-end basis they are composed of exactly the same network elements. Indeed, they share the same physical and virtual network elements. The different demarcation points between IPStream and BT Central for Standard and CBC is therefore purely a pricing distinction.
- 3.11 With the Standard IPStream products, BT is, in effect, offering an end-to-end service where a large proportion of the price, on a per end user basis, is fixed, with the remaining portion being variable with the allocated BT Central bandwidth. Whereas, with the CBC products the fixed portion is smaller and consequently the variable portion is larger. The price for the CBC IPStream products, on a per end user basis, is therefore more dynamic than that for the Standard IPStream products.
- 3.12 Although BT offers two different pricing structures when selling Standard and CBC IPStream services, because the underlying network elements are the same, only a single approach is necessary when assessing the cost associated with the provisioning of either Standard or CBC IPStream services. The total cost of provisioning a particular IPStream service will vary with the amount of network resources allocated and the primary driver for this is bandwidth.
- 3.13 Within the top-down model, Ofcom assesses the cost and revenue associated with the IPStream services on a per end user basis. With this approach the costs will be composed of a fixed part, i.e. a per end user part such as the EUA, and a part that varies with bandwidth, i.e. the core network elements (VP and IP) and the ISP link. Therefore, in order to determine the actual cost associated with a given product/configuration it is necessary to identify how much bandwidth is allocated to it. Equally, the revenue will be composed of a fixed part, i.e. IPStream, and a part that varies with bandwidth, i.e. BT Central. Therefore, when determining the revenue associated with a given product/configuration it is also necessary to identify how much bandwidth is allocated to it. When assessing the margin the same bandwidth must be used for determining both the cost and the revenue.
- 3.14 However, as discussed above the demarcation point between the IPStream and BT Central elements is different for the Standard and CBC IPStream products. With the CBC IPStream services the BT Central element covers all of the core network (VP and IP) and the ISP link. Therefore, with the CBC IPStream services the revenue, on a per end user basis, that BT receives for the core network and ISP link varies with the BT Central bandwidth allocated to the end user. In contrast, with the Standard IPStream products the BT Central element is simply the ISP link and therefore only the revenue for the ISP link varies with the BT Central bandwidth allocated to the end user. Alternatively, for a given Standard IPStream product, BT receives a fixed or 'average' revenue for the core network (VP and IP), on a per end user basis, irrespective of the amount of BT Central bandwidth allocated to the end user.

- 3.15 As indicated above Ofcom is of the view that the cost associated with the core network will primarily vary with bandwidth and this is the approach adopted when assessing the cost. This approach to core network cost is compatible with the CBC IPStream pricing structure and this makes assessing difference between cost and revenue straight forward as both track with allocated bandwidth. However, when assessing the difference between cost and revenue for the Standard IPStream products things are not as straightforward as the cost of the core network varies with bandwidth but the revenue does not.
- 3.16 In essence, BT receives an 'average' revenue for the core network when selling the Standard IPStream products. Therefore when assessing the difference between cost and revenue it is necessary to use the 'average' cost, to ensure consistency. In order to do this, the average BT Central bandwidth allocated to each Standard IPStream product needs to be determined.
- 3.17 When determining the average BT Central bandwidth allocated to each Standard IPStream product Ofcom decided to weight each IPStream product by its associated contended bandwidth²¹. For simplicity within the various models Ofcom calculated a generic adjustment factor that could be applied to all Standard IPStream products. This adjustment factor, which is referred to as the 'Contented Bandwidth Adjustment Factor', was calculated by dividing the total Standard BT Central bandwidth by the total Standard IPStream contended bandwidth. Thus, the average BT Central bandwidth associated with each Standard IPStream product can be determined by multiplying the Contented Bandwidth Adjustment Factor with the contended bandwidth for the given product.
- 3.18 The Contented Bandwidth Adjustment Factor can be considered as a way of dimensioning the CBC IPStream products so as to replicate the Standard IPStream products. Thus, the Standard IPStream products can be considered to be pre-dimensioned versions of the CBC products and this is the approach adopted by Ofcom throughout its analysis.

Methodology and approach adopted in the top down model

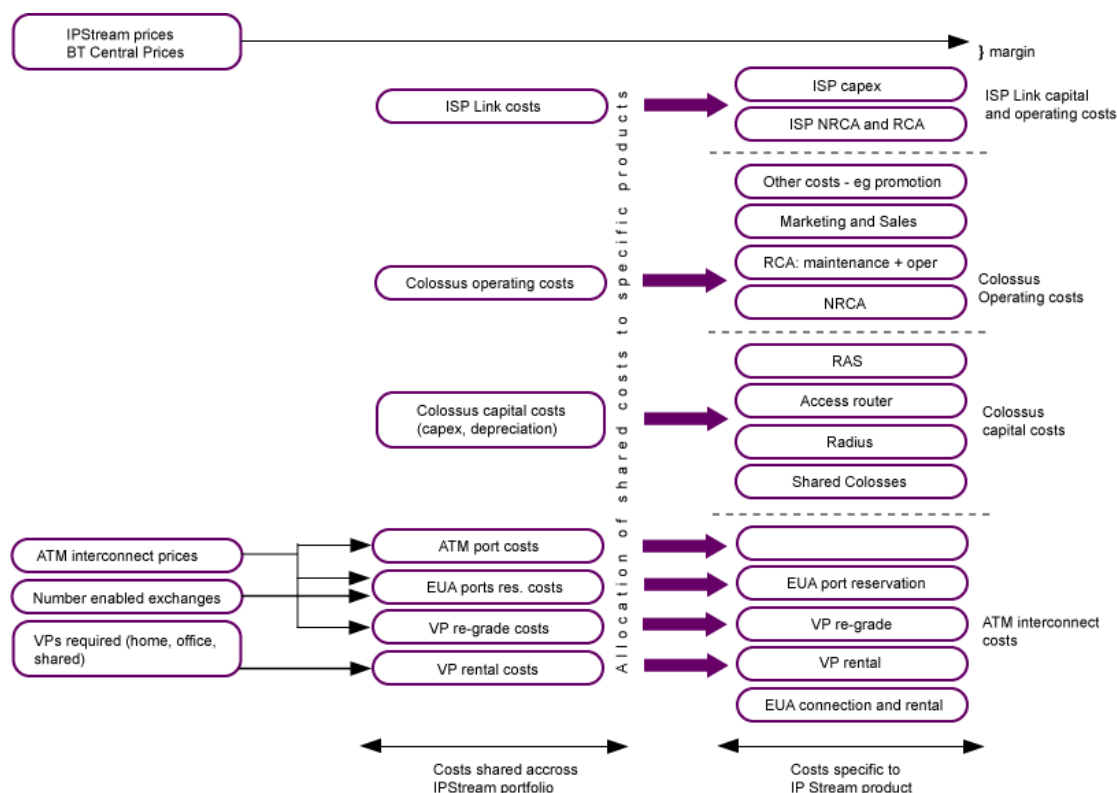
- 3.19 The top down model determines whether or not BT is passing a margin squeeze test and this is achieved by comparing the unit price charged for Standard and CBC IPStream products and the unit cost incurred by BT to provide each of these services, if BT were to purchase the ATM interconnection products on the same basis as Altnets.
- 3.20 Based on information provided by BT from 2001/02 to 2007/08, Ofcom has modelled a 5 year period time shifted to begin in 2004/5. The year at which the modelled period is truncated is the terminal year and as such terminal values for the appropriate assets are introduced in this year.
- 3.21 The model calculates, for the terminal year, the average unit costs associated with provisioning the IPStream products over the explicitly modelled period. The average unit costs are driven by bandwidth and/or number of end users and both the costs and (where appropriate) the cost drivers, are expressed in present value (PV) terms. The average unit costs are then allocated to the various IPStream products. Ofcom is of the view that adjusting the cash flows, to represent unit costs and revenues, is more appropriate than using an unadjusted cash flow approach in this particular situation. This is because it removes phasing distortions between the various downstream

²¹ The contended bandwidth is equally to the maximum end user speed divided by the specified contention ratio. This is discussed further in Section 4.

products and this is particularly important when new products and/or pricing structures are introduced at different points within the modelled period. The removal of phasing distortions ensures that the ATM interconnection usage factors can be specified in a consistent way for all the IPStream services.

- 3.22 In modelling capital costs (and connection charges) in the periods in which they arise, it has been necessary to take account of opening and terminal values of assets. This is both in terms of assets (and connections) whose useful economic life has not been exhausted by the end of the explicitly modelled period, as well as assets that are utilised during this period but acquired in earlier years. Both opening and terminal values have been calculated on the basis of the residual value of the asset (or connection) using a flat annuity at the assumed discount rate.
- 3.23 A number of costs incurred in provisioning the end-to-end products, in particular the core IP network costs and VP rental charges, are shared across the entire portfolio. These shared unit costs are allocated to the various downstream products primarily in proportion to the bandwidth demanded by the products.
- 3.24 The total unit costs for a particular product are then determined by adding the unit costs that can be identified directly with the specific IPStream product (such as EUA connection and rental charges) to the above allocation of shared unit costs.
- 3.25 In a similar way, the average unit revenues for a particular product are calculated taking into account the end-user demand figures and the current unit charges. These are then expressed in PV terms. Finally, these total unit costs, and the margin resulting from comparison with the associated unit revenues, are presented on a per end-user per month basis.
- 3.26 The modelled elements constituting the cost stack are summarised in Figure 3.2 below and can be categorised into the following four areas:
 - Upstream ATM interconnect unit costs;
 - IP capital and operating costs;
 - ISP Link capital and operating costs; and
 - Sales and marketing.
- 3.27 Migration costs are excluded from the diagram below as this is a side calculation based on the volume of migrations forecast by BT in the context of Ofcom's case for resolving the dispute on migration. Ofcom Website | IPStream to DataStream Migration / Equal terms for DataStream
- 3.28 The modelled elements of the cost stack are more fully discussed in the tables below. All abbreviations used in Figure 3.2 are explained in the following tables.

Figure 3.2: Overview of modelling approach



Detailed modelling considerations

3.29 This section describes in detail key elements of the top down model such as components of the cost stack (ATM interconnect costs, additional capital costs and additional operating costs), associated product revenues and key assumptions made by Ofcom. Comments made by respondents are discussed separately from paragraph 3.36 onwards.

ATM interconnect costs

3.30 The model derives the ATM interconnection costs on the basis of BT's current charges. They are also based on BT's architecture which has 9 points of interconnection (POI). Ofcom believes that it is necessary to use BT's network architecture in the top-down model to ensure consistency with BT's 'additional' cost information. For a description of the ATM interconnection costs see BT's price list Section 44, Part 2²². All costs are adjusted in line with changes made by Ofcom to BT's forecast end user volumes in each of the explicitly modelled years. Whilst many of the costs have been adjusted by assuming a linear relationship between costs and volumes, VP rental costs are adjusted using a specific cost/volume relationship assumption.

²² http://www.serviceview.bt.com/list/current/docs/Wholesale_Broadband_Services.booc/sectoc.htm

Table 3.2 Description of ATM interconnection costs

| | |
|---------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| EUA connection and rental cost | <p>Average unit EUA connection cost is calculated by multiplying the connection charge by the gross number of end user additions (incremental end users and churned end users), divided by the total average number of end users (both Standard and Capacity). The total EUA connection costs include a terminal value calculation, based on an end user life of 1/churn.</p> <p>Average unit EUA rental cost is calculated by multiplying the rental charge by the total average number of end users, divided by the total average number of end users (both Standard and Capacity). Note if the EUA rental charge remains constant throughout the explicitly modelled period then the average unit rental cost will be equal to the rental charge.</p> |
| VP rental cost | <p>Total VP rental cost is calculated as the sum of the products, of the total average number of VPs and the average VP rental charge, for each VP size. The number of VPs is based on BT's forecasts and the average VP rental charge, for each VP size, is the weighted average price based on the assumptions made about the distribution of VP categories. The base case assumption for the distribution of VP categories is 10%, 10%, 70%, 10% for Handover, Local, Regional and National VPs respectively.</p> <p>Average unit VP rental cost is calculated by dividing the total VP rental cost by the total average VP capacity and then uplifting this result by a factor that represents the ratio of the total average VP capacity to the total average BT Central capacity.</p> <p>Average unit VP rental cost is apportioned to the CBC products based on the BT Central bandwidth allocated and apportioned to the Standard products based on the 'average' BT Central bandwidth used by each IPStream product (i.e. using the Contended Bandwidth Adjustment Factor).</p> |
| VP re-grade cost and VP re-arrangement cost | <p>Total VP re-grade cost is calculated by multiplying the total average number of VPs in use by the VP re-grade charge and by a variable that represents the typical number of VP re-grades per VP per annum.</p> <p>VP re-arrangement is not explicitly modelled. However, to ensure that a non-zero value is carried forward into the usage factors model the total VP re-grade cost is shared between VP-re-grades and VP re-arrangements. This has been done on the basis of an 80:20 split between VP-re-grades and VP re-arrangements respectively. This is considered to result in an</p> |

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| | <p>appropriate allocation.</p> <p>Average unit VP re-grade and re-arrangement cost are calculated by dividing the respective total costs by the total average VP capacity and then uplifting this result by a factor that represents the ratio of the total average VP capacity to the total average BT Central capacity.</p> <p>Average unit VP re-grade and re-arrangement costs are apportioned to the CBC products based on the BT Central bandwidth allocated and apportioned to the Standard products based on the 'average' BT Central bandwidth used by each IPStream product (i.e. using the Contended Bandwidth Adjustment Factor).</p> <p>Ofcom accepts that the VP re-grade and re-arrangements costs were slightly overstated in the Consultation Document, as indicated by Analysys (see Annex 2). Ofcom therefore believes that it is necessary to reduce these costs and has implemented this by changing the number of re-grades per VP pa from 1.5 to 0.75.</p> |
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| | |
|--------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| EUA port reservation cost and EUA port reservation adjustment cost | <p>Total EUA port reservation cost is calculated as the sum of the total reservation cost associated with used ports and the total reservation cost associated with unused ports.</p> <p>The total cost of the used ports is calculated by multiplying the port reservation charge by the total average number of end users (both Standard and CBC).</p> <p>The total cost of unused ports is calculated by multiplying the number of enabled exchanges by a variable that represents the typical target number of end users per VP, divided by 2.</p> <p>EUA port reservation adjustment is not explicitly modelled. However, to ensure that a non-zero value is carried forward into the usage factors model the total EUA port reservation costs are shared between the EUA port reservation and EUA port reservation adjustment. This has been done on the basis of a 99:1 split between EUA port reservation and EUA port reservation adjustment respectively. This is considered to result in an appropriate allocation.</p> <p>Average unit EUA port reservation and EUA port reservation adjustment costs are calculated by dividing the respective costs by the total average number of end users.</p> |
| ATM port connection and rental cost | <p>Average unit ATM port connection cost is calculated by multiplying the connection charge by the net addition of STM-1 ATM ports (155 Mbit/s), divided by the total average VP capacity and then uplifting this result by a factor that represents the ratio of the total average BT Central capacity to the total average VP capacity. The ATM connection cost</p> |

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| | <p>includes a terminal value calculation.</p> <p>Average unit ATM rental cost is calculated by multiplying the rental charge by the total average number of STM-1 ATM ports required, divided by the total average VP capacity and then uplifting this result by a factor that represents the ratio of the total average VP capacity to the total average BT Central capacity²³.</p> <p>Average unit ATM port connection and ATM port rental costs are apportioned to the CBC products based on the BT Central bandwidth allocated and apportioned to the Standard products based on the 'average' BT Central bandwidth used by each IPStream product (i.e. using the Contended Bandwidth Adjustment Factor).</p> <p>The number of STM-1 ATM ports required is calculated by dividing the total average VP capacity by the usable STM-1 capacity. This is then rounded up to the nearest whole number.</p> <p>As indicated by Analysys (see Annex 2), Ofcom slightly understated the ATM port costs by assuming a high port utilisation. Therefore, in line with Analysys's recommendation an additional 4.5 ATM ports have been added to the total to reflect the fact that on average there is likely to be 0.5 of an ATM port unused at each of the 9 POI.</p> |
| ATM ISH cost | <p>Average unit ISH connection cost is calculated by multiplying the connection charge (for a 155Mbit/s service) by the net additions of STM-1 ATM ports (155 Mbit/s), divided by total average VP capacity and then uplifting this result by a factor that represents the ratio of the total average BT Central capacity to the total average VP capacity. The ISH connection cost includes a terminal value calculation.</p> <p>Average unit ISH rental cost is calculated by multiplying the rental charge (for a 155Mbit/s service) by the total average number of STM-1 ATM ports required, divided by average VP capacity and then uplifting this result by a factor that represents the ratio of the total average VP capacity to the total average BT Central capacity.²⁴</p> <p>Average unit ATM ISH connection and ATM ISH rental costs are apportioned to the CBC products based on the BT Central bandwidth allocated and apportioned to the Standard products</p> |

²³ Ofcom acknowledges that there was an error in the description of the average unit ATM rental costs in the Consultation Document, where the description included was "Average unit ATM rental costs are calculated as the product of rental charges and in year average end users, divided by the total average VP capacity." Ofcom has now amended the underlined section of this description as outlined in the above table.

²⁴ Ofcom acknowledges that there was an error in the description of the average unit ATM ISH rental costs in the Consultation Document, where the description included was "Average unit ATM ISH rental costs are calculated as the product of rental charges and in-year average end users, divided by the total average VP capacity." Ofcom has now amended the underlined section of this description as outlined in the above table.

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| | based on the 'average' BT Central bandwidth used by each IPStream product (i.e. using the Contended Bandwidth Adjustment Factor). |
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Additional capital costs

3.31 All IP capital costs are adjusted in line with any changes made by Ofcom to BT's forecast end user volumes in each of the explicitly modelled years. IP costs are adjusted using a specific cost/volume relationship assumption. The cost/volume relationship for the IP costs is however assumed to be much flatter than that used for VP rental costs and this is due to the greater level of aggregation at the IP layer. For the ISP link capital costs a linear cost/volume relationship is assumed, i.e. no scale related economies are assumed.

Table 3.3 Description of additional capital costs

| IP Network | |
|------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Remote Access Server (RAS) cost | <p>IP RAS capital expenditure, attributable to the IPStream products, has been supplied by BT for the years 1999/00 to 2007/08. Capital expenditure in the first two years (i.e. 1999/00 and 2000/01) is used as set out above to determine an opening or "starting value" to add to the expenditure in the first explicitly modelled year, 2001/02. Terminal values are calculated for capital expenditure in subsequent years to subtract from the expenditure in the terminal year.</p> <p>Part of the total RAS cost is allocated by the number of end users and the other part is allocated by bandwidth.</p> <p>Average unit cost, on a per end user basis, is calculated by the dividing the portion of the RAS cost that is allocated to end users by the total average number of end users. This average unit cost is apportioned to each product (end user).</p> <p>Average unit cost, on a bandwidth basis, is calculated by the dividing the portion of the RAS cost that is allocated by bandwidth, by the total average BT Central capacity. This average unit cost is apportioned to the CBC products based on the BT Central bandwidth allocated and apportioned to the Standard products based on the 'average' BT Central bandwidth used by each IPStream product (i.e. using the Contended Bandwidth Adjustment Factor).</p> |
| Access Router and related equipment cost | <p>Access router and related equipment capital expenditure is treated in the same way as RAS costs in terms of opening and terminal values.</p> <p>Average unit access router and related equipment cost is calculated by dividing the total cost by the total average BT Central</p> |

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| | <p>capacity.</p> <p>Average unit access router and related equipment cost is apportioned to the CBC products based on the BT Central bandwidth allocated and apportioned to the Standard products based on the 'average' BT Central bandwidth used by each IPStream product (i.e. using the Contended Bandwidth Adjustment Factor).</p> |
| RADIUS cost | <p>RADIUS capital expenditure is treated in the same way as RAS costs in terms of opening and terminal values.</p> <p>Average unit RADIUS cost is calculated by dividing the total cost by the total average number of end users. The average unit cost is then allocated to each product (end user).</p> |
| IP core network conveyance cost | <p>IP core network capital expenditure is treated in the same way as RAS costs in terms of opening and terminal values.</p> <p>Average unit IP core network cost is calculated by dividing the total cost by the total average BT Central capacity.</p> <p>Average unit IP core network cost is apportioned to the CBC products based on the BT Central bandwidth allocated and apportioned to the Standard products based on the 'average' BT Central bandwidth used by each IPStream product (i.e. using the Contended Bandwidth Adjustment Factor).</p> |
| ISP Link | |
| ISP Link capex | <p>ISP link capital expenditure, attributable to the IPStream products, has been supplied by BT for the years 2001/02 to 2008/09. Terminal values are calculated for capital expenditure in these years to subtract from the expenditure in the terminal year.</p> <p>Average unit ISP link cost is calculated by dividing the total cost by the total average BT Central capacity.</p> <p>Average unit ISP link cost is apportioned to each product based on the BT Central bandwidth allocated.</p> |

Additional operating costs

- 3.32 All IP operating costs are adjusted in line with any changes made by Ofcom to BT's forecast end user volumes in each of the explicitly modelled years. IP operating costs are adjusted using the same cost/volume relationship as used for IP capital costs. For the ISP link capital costs a linear cost/volume relationship is assumed, i.e. no scale related economies are assumed.

Table 3.4 Description of additional operating costs

| | |
|----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Non-recurring current account (NRCA) IP cost | <p>NRCA cost, attributable to the IPStream products, has been supplied by BT for the explicitly modelled period. These costs primarily represent the cost of product development.</p> <p>Part of the total NRCA IP cost is allocated by the number of end users and the other part is allocated by bandwidth.</p> <p>Average unit cost, on a per end user basis, is calculated by the dividing the portion of the NRCA IP cost that is allocated to end users by the total average number of end users. This average unit cost is apportioned to each product (end user).</p> <p>Average unit cost, on a bandwidth basis, is calculated by the dividing the portion of the NRCA IP cost that is allocated by bandwidth, by the total average BT Central capacity. This average unit cost is apportioned to the CBC products based on the BT Central bandwidth allocated and apportioned to the Standard products based on the 'average' BT Central bandwidth used by each IPStream product (i.e. using the Contended Bandwidth Adjustment Factor).</p> |
| Recurring current account (RCA) IP cost | <p>RCA cost, attributable to the IPStream products, has been supplied by BT for the explicitly modelled period. These costs represent costs incurred in maintaining and operating the IP network.</p> <p>The RCA IP cost is treated in exactly the same way as the NRCA IP cost, although the split between end user and bandwidth may be different.</p> |
| ISP Link NRCA cost | <p>ISP link NRCA cost, attributable to the IPStream products, has been supplied by BT for the explicitly modelled period.</p> <p>Average unit ISP link NRCA cost is calculated by dividing total capital expenditure by the total average BT Central capacity. This average unit cost is apportioned to each product based on the BT Central bandwidth allocated.</p> |
| ISP Link RCA cost | <p>ISP link RCA cost, attributable to the IPStream products, has been supplied by BT for the explicitly modelled period.</p> <p>Average unit ISP link RCA cost is calculated by dividing total capital expenditure by the total average BT Central capacity. This average unit cost is apportioned to each product based on the BT Central bandwidth allocated.</p> |
| Marketing and sales cost | <p>Marketing and sales costs are estimated for each IPStream product as a percentage of total revenue.</p> |
| Migration | <p>Although the calculation for migration has been performed within the top-down model, this relates to the volume of migrations forecast by BT in the context of Ofcom's case for resolving the</p> |

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| | <p>dispute about migration.²⁵</p> <p>The forecast volume of migrations was then used in conjunction with BT's forecast of DataStream end users volumes. It is important to use these sets of information together as they are related to one another (i.e. if there were to be a different volume of DataStream end users then the volume of migrations will change).</p> <p>The average migration charge (per end user) is calculated as the product of the migration charge and the number of migrations divided by the average number of forecast DataStream end users.</p> <p>The average migration charge includes a terminal value calculation to reflect the fact that the migration charge will have a value over a number of years (assumed end user life is equal to 1/churn).</p> |
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Standard and CBC IPStream revenues

3.33 This section describes in detail the modelling approach taken to determining the Standard and CBC IPStream revenues which are then used to calculating the margin.

Table 3.5 Description of Standard and CBC IPStream revenues

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| IPStream connection revenue | <p>Average unit IPStream connection revenue, for each individual IPStream product, is calculated by multiplying the connection charge by the number of gross additions, divided by total average number of end users.</p> <p>The average unit connection revenue includes a terminal value calculation to reflect the fact that this revenue will have a value over a number of years (equal to 1/churn).</p> |
| IPStream rental revenue | <p>Average unit IPStream rental revenue, for each individual IPStream product, is rental charges as published in the BT price list.</p> |
| BT Central connection revenue | <p>The total BT Central connection revenue is calculated as the sum of the products, of the number of net additions and the BT Central connection charge, for each BT Central size.</p> <p>Average unit BT Central connection revenue is determined by dividing the total connection revenue by the total average BT Central capacity.</p> <p>The BT Central connection revenue includes a terminal value calculation to reflect the fact that this revenue will have a value over a number of years.</p> <p>Average unit BT Central connection revenue is apportioned to each product based on the amount of BT Central bandwidth allocated.</p> |

²⁵ http://www.ofcom.org.uk/consultations/current/broadband_access/?a=87101

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| BT Central rental revenue | <p>The total BT Central rental revenue, for the CBC and Standard products, is calculated as the sum of the products, of the total average number of BT Centrals and the BT Central rental charge, for each BT Central size. Note; for this calculation the CBC and Standard products are treated separately.</p> <p>Average unit BT Central rental revenue, for CBC and Standard products, is determined by dividing the total rental revenue by the total average BT Central capacity.</p> <p>Average unit BT Central rental revenue is apportioned to each product based on the amount of BT Central bandwidth allocated.</p> |
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Model parameters and sensitivities

3.34 The resulting margin between unit costs and unit prices for each of the IPStream products depends on a number of key model parameters. The economic concepts underlying each of these key parameters and Ofcom's position in respect of these are discussed in detail in Section 2. Ofcom identified reasonable ranges for these key parameters and these together with the results of the sensitivity analyses undertaken by Ofcom are set out in the Table 3.6 below.

3.35 The use of cost/volume relationships for the VP rental costs and the IP capital and operating costs has been discussed above. The specific adjustments made are as follows:

- **VP rental costs:** in the top down model, Ofcom used a mathematical expression to describe the relationship between end user volumes and the unit VP rental costs. This is discussed in Section 2 (see Figure 2.1). With reference to BT's volume and cost information the increase in unit VP rental costs is 7.45%, 4.17% and 2.38% for end user volumes of approximately 1.7m, 2.1m and 2.5m respectively.
- **IP capital and operating costs:** in the top down model, Ofcom used a mathematical expression to describe the relationship between end user volumes and the unit IP capital and operating costs. The methodology adopted is the same as the one followed for VP rental costs, although the assumed unit cost function is flatter (see paragraph 2.67). With reference to BT's volume and cost information the increase in unit IP capital and operating costs is 2.45% 1.85% and 1.42% for end user volumes of approximately 1.7m, 2.1 m and 2.5 m respectively.

Table 3.6 Description of key model parameters and sensitivity results

| Parameter | Range | Impact ²⁶ | Comment |
|-----------|-------------------|----------------------|-------------------------------------|
| Period of | 4 to 6 years from | MARGIN DECREASES | OFCOM HAS CHOSEN A 5 YEAR MODELLING |

²⁶ The impact of a parameter is quantified for a Standard IPStream Home 500 Product and is the difference in the margin calculated at the lower and upper bounds of a given range assuming all other parameters are set in accordance with Ofcom's chosen approach and using BT prices as at 27 May 2004 when the Consultation Document was published. The impact is quantified after having made the necessary arithmetical amendments to the top-down model as suggested by Analysys (see Report in Annex 2).

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| model | initial product launch | BY £0.57 | PERIOD AS ITS BASE CASE SCENARIO. FOR MORE DISCUSSIONS ON THIS POINT, SEE SECTION 2, PARAGRAPHS 2.172-2.180. |
| Adjustment to the volumes | <p>The volumes have been decreased to²⁷</p> <p>1.7m subs ($\approx 20\%$)</p> <p>2.1m subs ($\approx 25\%$)</p> <p>2.5m subs ($\approx 30\%$)</p> <p>of the total number of ADSL end users, as forecast by BT</p> | Margin decreases by £0.23 | Ofcom has used BT's forecast of end-user volumes for 2000/01 to 2008/09 and decreased these by the same percentage in each of the explicitly modelled years such that by year 5 (2006/07 of BT's data) the total volume of end users is equal to one of the numbers in the specified range of volumes (i.e. for example 2.1m subscribers). All costs described in the previous paragraphs are varied in line with the assumed volume adjustments. Ofcom opted to use the lower bound of the range. For more discussion on this point see Section 2, paragraphs 2.64-2.80 and Section 5, paragraphs 5.23-5.24. |
| Discount rate | 12.5%, 13.5% and 15% | Margin increases by £0.10 | The currently determined cost of capital for BT estimated by Ofcom for regulatory purposes (13.5% nominal pre-tax) has been used in the model in the absence of compelling evidence that it is inappropriate for assessment of investment in intermediate services. Sensitivity at a higher discount rate was considered either because it may be applicable to a new |

²⁷ In line with comments made by Analysys (see Report in Annex 2) the actual subscriber numbers and market shares assumed for a new entrant to reach by 2008/09 are: 1,708,408m subs (20.71%), 2,157,989m subs (26.16%) and 2,562,612m subs (31.07%). The percentages stated represent the percentage of BT's forecast for the total number of ADSL subscribers by the end of 2008/09 of 8,247,916.

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| | | | entrant or allows for greater riskiness of the investment in intermediate services. Sensitivity at a lower discount rate was considered in line with Ofcom's current review of BT's cost of capital ²⁸ or to allow for less riskiness of investment in intermediate services. Section 2, paragraphs 2.186-2.188 |
| Churn | 10%-20% | Margin increases by £0.02 | Ofcom has undertaken sensitivity analysis with the churn levels assumed. Please note that this parameter was not discussed in the Consultation Document. However, it is now included in response to a specific question from a respondent. |
| Distribution of VP categories | Distribution of VPs: 10%, 10%, 70%, 10% versus 5%, 3%, 77%, 15% of Handover, Local, Regional and National respectively. | Margin increases by £0.14 | BT has previously provided its estimate of the distribution of VP categories consistent with 9 PoI ²⁹ . Ofcom is also of the view that the category distribution is relatively stable to small variation in the number of POI in the region of 5 to 15 (for more discussion see Section 4, paragraphs 4.38-4.44). Ofcom has therefore used BT's estimate in the top down model. |
| Target number of end users per VP (EUA Port reservation sensitivity) | 180-230 | Margin decreases by £0.26 | Sensitivities were undertaken with this parameter which determines the ratio of unused to used ports. Ofcom adjusted this parameter in conjunction with volume adjustments, i.e. lower volumes = lower target number of end users |

²⁸ The PPC price control consultation document published on 24 June 2004 included Ofcom's proposals for revising BT's cost of capital to 12.5%. See http://www.ofcom.org.uk/consultations/past/ppc_charge_control/ppc_charge_control/?a=87101

²⁹ In information provided in the investigation described in the case closure document, "Investigation of complaints about BT's IPStream Price Reductions", 3 April 2003, CW/00607/04/03. [Competition Bulletin: closed Cases: CW/00607/04/03](#)

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| | | | per VP. |
| Number of VP re-grades pa | 0.5 -1.5 | Margin increases by £0.04 | Sensitivities were undertaken with this parameter which determines the number of VP re-grades in each of the explicitly modelled years. This parameter was not explicitly discussed in the consultation document as its impact is not considered to be material, although it was included in the top down model. Ofcom reduced the number of VP-re-grades from 1.5 to 0.75 in line with comments from Analysys (see Annex 2). |
| VP utilisation | The number of VPs in use for the period up to and including year 2 has been decreased by between 10% and 20% | Margin decreases by £0.32 | This sensitivity reflects the likely level of inefficient usage of VPs by BT in the historic years, which is believed to be mainly due to the available functionality of historic equipment, such as Broadband Access Servers, at a given costs, compared to the MEA. For more discussions on this point see Section 2, paragraph 2.106. |
| IP CVE | Option 1 versus Option 2 | Margin increases by £0.09 | Sensitivities were undertaken with this parameter where the IP CVE curve follows a shallow (Option 1) versus a relatively steep curve (Option 2). Ofcom considers Option 1 is preferable to Option 2 suggested by Analysys (see Annex 2), as Ofcom expects less variation in the IP costs, when compared to VPs, due to greater level of aggregation at the IP layer (i.e. the number of POI compared to the number of enabled exchanges/DSLAMS). |
| Opening and | Decrease in line with | Margin | BT's opening (1999/00 and |

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| historic capital expenditure | MEA trend or use changes in IPStream prices as a proxy | decreases by £ 0.30 | 2000/01) and historic (2001/02 and 2002/03) capex costs have decreased in line with an assumed MEA trend to reflect falling asset prices. In the Consultation Document, opening and historic capex costs were decreased by around 58% using a different methodology ³⁰ . Ofcom has now amended this methodology as outlined, in line with comments from Analysys (see Report in Annex 2). For more discussion on this point see Section 2, paragraphs 2.82-2.104. |
| Modern equivalent asset (MEA) trend on opening, historic and future capex and TV | 5%-10% | Margin increases by £0.02 | Ofcom undertook sensitivity analysis to quantify the impact of this parameter, in the absence of reliable third party data showing the actual change in asset prices. Ofcom has decreased BT's opening (1999/00 to 2000/01), historic (2001/02 to 2002/03) and future (2003/02 to 2007/08) IP capex. In addition the TV calculations on these capex items are adjusted in line with the assumed MEA trend. For more discussions on this issue see Section 2, paragraphs 2.105 and 2.181-2.185. |
| Contestability assumption – calculation methodology | True cash flows versus cumulative cash flows | Margin increases by £0.55 | Contestability can be calculated either by quantifying the year on year change in unit on-going costs based on the in year cash flows ("true cash flows") or in the average unit on-going costs calculated in a manner consistent with the overall |

³⁰ The methodology adopted by Ofcom in the Consultation Document was to decrease the opening and future capex costs (year 0 to year 5 inclusive) by the difference that between the revenue that BT would have received in these years if it had charged on the basis of its current price of IPStream products, and BT's actual revenue.

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| | | | <p>structure of the model (“cumulative cash flows”). Ofcom considered both ways of calculating contestability (see Section 2, paragraphs 2.147-2.155), also in line with comments made by Analysys (see Annex 2). The WBA margin rule uses a scenario that yields a representative result which is based on calculating contestability based on true cash flows (see Section 5, paragraphs 5.18-5.22).</p> |
| Contestability assumptions – start year | Contestability starts between year 2 and year 4 | Margin decreases by £1.53 | <p>In a contestable market it would be unreasonable to assume that prices could be maintained indefinitely with falling costs (and so increasing margins). On this basis Ofcom considered the sensitivity of varying the start year for the contestability assumptions between year 2 and year 4 (see Section 2, paragraphs 2.143-2.146) The margin rule uses a scenario that yields a representative result which is based on year 3 as the start date for contestability (see Section 5, paragraphs 5.18-5.22.)</p> |
| Contestability assumption-calculation methodology | ATM interconnection unit on-going cost reductions included or excluded | Margin decreases by £0.45 | <p>Ofcom acknowledges that certain cost reductions are dependent on the date of entry of a new entrant and are a source of cost advantage for later entrants. However, other cost reductions (such as on-going ATM IC) could be seen as being related to the “age of operation” of an new entrant and therefore an argument could be made for excluding these from the calculation of contestability, if the competitive constraint was assumed to be provided by future new</p> |

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| | | | entrants. Ofcom considered both ways of calculating contestability (see Section 2, paragraphs 2.156-2.158). The WBA margin rule uses a scenario that yields a representative result which is based on calculating contestability with reductions in the ATM on-going costs included (see Section 5, paragraphs 5.18-5.22) |
| Marketing and sales costs | 2%-3% of revenues | Margin increases by £0.15 | BT has previously provided information which showed sales and marketing overheads as 2.8% of revenue in 2002/03 ³¹ . Ofcom has considered marketing and sales costs in the range from 2%-3% of revenues. |
| Tax | Pre-tax cash flows versus post-tax cash flows | Margin can either decrease or increase by £0.15 | Ofcom has performed the MST based on the pre-tax cash flows of a new entrant of similar efficiency to BT. Post-tax cash flow analysis undertaken by Ofcom has revealed that the final result is not materially different to the one calculated using a pre-tax cash flow approach and can move in either direction (i.e. the calculated margin can increase or decrease) subject to the specific assumptions made with regards to the tax position of a new entrant. Please note that Ofcom has not modelled this sensitivity in the Consultation document. For more discussions on this point see Section 2, paragraphs 2.189-2.192. |
| Volume discount for IPStream | 1.5%-2.0% | Margin increases by £0.04 | Whilst the volume of ATM interconnection EUAs that an Altnet with the scale assumed in this model, would need to purchase |

³¹ *ibid*

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|-----------------|-------------------|---------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | | | means that it would qualify for a 2% discount, the fragmentation of demand from different customers means that a new entrant does not necessarily incur a corresponding full 2% discount on the IPStream revenues received. Information provided by BT suggests that a 1.75% volume discount applicable to IPStream would be more appropriate. |
| ISH costs | Included/Excluded | Margin decreases by £0.08 | This is a cost that a new entrant would face, but one that BT would not need to incur. Ofcom has considered the sensitivity of including and excluding this parameter from the cost stack. For more discussion see Section 2, paragraphs 2.108-2.113. |
| Migration costs | Included/Excluded | Margin increases by £0.10 | Ofcom has considered the sensitivity of including and excluding this parameter from the cost stack. For more discussion see Section 2, paragraphs 2.114-2.118. |

Consideration of Analysys report

3.36 Analysys have conducted a detailed mechanical review of the top-down model developed by Ofcom to ensure that the model is arithmetically correct and that it accurately implements the methodologies and approaches described in the Consultation Document. They have also undertaken a high level review of the reasonableness of certain key assumptions. The Analysys report is attached at Annex 2. Most of the comments raised by Analysys are dealt with in the above paragraphs. Additional comments raised by Analysys are:

- **Consistency of the contestability calculation.** In section 3.3 of their report Analysys raised the issue that there is a conflict between the margin rule (which assumes a constant margin) and the way in which contestability has been modelled in the top down model (which assumes a changing margin) and suggested that Ofcom could either address this now or in the future. As discussed in Section 2 paragraph 2.138-2.141, Ofcom prefers to allow adjustments to the margin to occur via periodic reviews.

- **Cost of capital.** In section 3.4 of their report Analysys suggested the use of a higher cost of capital and quoted a study undertaken by Nera in 2000 in support of this, which suggested a cost of capital 2 percentage points higher for new entrants. Ofcom does not consider that this provides compelling evidence that the cost of capital it has used is too low and it notes that this study is now out of date and was not undertaken in relation to the UK. A minority of UK companies were quoted in this report as comparables for the purposes of determining the beta values and the cost of debt, however, as suggested in the report itself, the sample chosen was small and not representative. In any event, even if the cost of capital was to be 2 percentage points higher for new entrants than incumbents, this would not have a material impact on the results, as indicated by the sensitivity analysis undertaken by Ofcom (see Table 3.6). See Section 2, paragraphs 2.186-2.204 for more discussion.
- **Subscriber volumes.** In section 3.5 of their report Analysys suggested the use of a different subscriber growth profile for a new entrant, as opposed to using BT's. As noted by Analysys the impact of this parameter is symmetrical (i.e. it could either decrease or increase the margin) and dependent on the particular strategy that a new entrant decided to follow. In addition, as acknowledged by Analysys themselves, the use of BT's growth profile allows Ofcom the ability to make more reliable adjustments to BT's costs, as these are intrinsically linked to BT's volume forecasts in each of the explicitly modelled years. Based on the fact that the potential outcome could go either side of Ofcom's proposal (and therefore favour a particular strategy) and given the intrinsic link between assumed costs and BT's volumes, Ofcom prefers not to alter this parameter.
- **Migration charges.** In Section 3.6 of their report Analysys suggested the inclusion of a portion of migration charges in the top down model. However, as acknowledged by Analysys themselves, as the subscriber growth projections could be reasonably achieved by a new entrant without migrations Ofcom prefers to exclude migrations. (See Section 2, paragraph 2.114-2.118 for more discussion).
- **Adjustments made to the balancing factor.** In section 3.7 of their report Analysys suggested that the adjustments made to the balancing factor, to ensure that the costs stacks for Standard and CBC IPStream products are aligned, could be made in another way, however they did not provide any alternatives. It is worth noting that these misalignments are caused by the inclusion of sales and marketing costs, which are calculated as a percentage of revenue. Because BT's prices, for the various IPStream services, are not all aligned to cost in the same way (hence the differing pass/fail levels) it follows that sales and marketing costs will not be aligned. To ensure consistency Ofcom chose to align these costs when specifying the margin and in keeping with the general approach achieved this by using the CBC IPStream products as the reference. The misalignments are small (~2p for Standard IPStream Home 500 product) and Ofcom believes that there should be consistency across the products. These alignments could be achieved in other ways and other references could be used and there does not appear to be any good reasons to prefer one over the other. Given that Analysys did not propose an alternative method or suggested that some other alternative would be 'better' Ofcom does not have any reason to alter the methodology previously adopted.

Consideration of industry responses

3.37 Comments made by the respondents in respect of a number of key parameters are discussed in the below paragraphs.

Accuracy of End User Volume Forecast

- 3.38 Enovi raised a general point about the accuracy of the end user volume forecast upon which the margin is set, in particular the relativities between Standard and CBC IPStream. Enovi notes that when the forecast was developed there was relatively little usage of CBC and concludes that this may lead to a higher variation than expected. In support of its conclusion Enovi note that BT has publicly stated that uptake of CBC IPStream has been much higher than it expected. This suggests that utilisation of Standard IPStream products is actually lower than expected and this brings into question the calculated bandwidth factors.
- 3.39 The approach taken by Ofcom when setting the margin is forward looking and as such the use of forecast information is unavoidable. Ofcom recognises that it is quite possible, indeed quite likely, that the future Standard and CBC IPStream volumes may differ from those forecast today.
- 3.40 Ofcom would however contend that assessing the validity of a 5 year forecast after the first few months is not a reasonable proposition, as the time period/sample size is still relatively small. Ofcom also believes that it is unreasonable to delay the implementation of this regulation while new forecasts are gathered and the various factors are re-calculated, because there is no reason to expect a new forecast will be any more accurate than a forecast made a few months ago. The logical play out of such an approach would ensure that the regulation is never introduced or constantly being reassessed and so creates regulatory uncertainty.
- 3.41 Ofcom believes that in such a situation the best approach is to use the best information available at the time. If there is a structural error in the forecast that has a material impact then this will become apparent as the market develops. Ofcom has pre-committed itself to re-assess the market in 2005 and believes that this will provide the necessary opportunity to make any required adjustments.

VP utilisation

- 3.42 Telefonica, Thus, Viatel, Tiscali and C&W disagreed with the downward adjustments made to BT's historic VP utilisation if the Altnets cannot benefit from the same improvements in efficiency as BT.
- 3.43 The adjustment made by Ofcom aims at removing BT's inefficient use of VP's resulting only from the use of equipment of lower functionality that was available at a certain cost in the past compared to equipment that is available today. Such inefficiencies are no longer faced by Altnets as the MEA available today is of greater functionality than the historic equivalent which allows greater VP utilisation to be achieved.
- 3.44 Ofcom has not removed all earlier year inefficiencies in BT's VP utilisation, but made a downward adjustment to the degree which is representative of BT's use of equipment of lower functionality. This adjustment made by Ofcom is between 10-20% of BT's historic usage of VP's and Ofcom believes this to be a reasonable estimate. For more discussions on this point see Section 2, paragraph x.

VP fragmentation

- 3.45 Telefónica argued that Ofcom did not take into consideration the effects of VP fragmentation, as this would lead to higher VP costs per end user as a result of higher unit bandwidth charges for smaller VPs and loss of statistical gain.
- 3.46 In setting the WBA margin rule, Ofcom has assumed that Altnets will reserve sufficient ports to reduce fragmentation and achieve a reasonable VP utilisation and accordingly

an allowance for un-used reserved ports has been built into the Margin. This can be seen by the usage factor for Port Reservation, which is above one. Ofcom did not receive any responses that suggested that this allowance was insufficient. Having already included an allowance for un-used reserved ports it would clearly be inappropriate to also factor in some adjustment for VP fragmentation. For more discussion on this point see Section 4, paragraph x.

VP rental costs

- 3.47 BT argued that the VP rental usage factor, and therefore the VP rental costs, is too high. This is because BT disagreed with the calculation of this factor using historic information on BT's usage of network components, which BT claimed is not appropriate in a forward looking context (even after taking into account the adjustments made by Ofcom). The network usage components referred to by BT include limitations on the capacity of the historic BRAS equipment and the initial exchange roll-out. BT argued that an entrant today would not face any of these inefficiencies.
- 3.48 It is correct that there is an uplift, of about 30%, built into the VP usage factors to represent the typical ratio of VP capacity to BT Central (ISP link) capacity.
- 3.49 Ofcom accepts BT's point about the limitations of historic BRAS equipment employed by BT. However, an adjustment to BT's historic VP utilisation was made to allow for this. The uplift built into the VP usage factors therefore represents the VP/BT Central ratio post the VP utilisation adjustment.
- 3.50 In the early stages of rollout a new entrant will face poor VP utilisation in exactly the same way as BT did in the early stages of its rollout. To not allow for this in the WBA margin rule would disadvantage a new entrant by under-estimating the VP costs that they face and so would not be consistent with Ofcom's underlying concept of a similarly efficient operator. Ofcom also notes that this factor includes the 10%-20% efficiency adjustment made to the use of VP's by a new entrant.

IP capex opening values

- 3.51 BT argued that the opening development costs should not be included in the test as a new entrant would benefit from BT's example from improvements in technology and lower unit costs. BT also argued that such an opening value should not be based on the Net Book Value of assets in question as this is not a true reflection of the investment options available to competitors.
- 3.52 In setting the Margin Ofcom assumed that new entrants will also incur development costs and the non inclusion of such costs would understate the margin. Ofcom also notes that BT's development costs are reduced in line with the assumed MEA trend (as for the remaining IP capex costs) to reflect developments to date/improvements in technology and are varied in line with adjustments made to BT's volumes assuming the same cost volume relationships as for the IP capex costs.
- 3.53 Ofcom derived an opening value for development costs using BT's incremental capital expenditure and acknowledges that this opening value can be regarded as a NBV using effectively a tilted annuity cost recovery profile. Ofcom points out that this methodology does not limit the investment options available to a new entrant. In effect the downwards adjustments made (through MEA and volume adjustments) result in reduced development costs which can be thought of as a proxy for the development costs that a new entrant will likely have to incur.

STM contention

- 3.54 Tiscali argued that due to BT rules on DataStream, a DataStream operator is obliged to contend at the STM level based on the number of connected VP's, not on traffic (as is the case with IPStream).
- 3.55 As far as Ofcom is aware BT does not overbook the STM capacity with VPs when providing IPStream. Rather, all the overbooking at the ATM level takes place within the VPs.
- 3.56 An Altnet therefore has the same opportunity as BT for overbooking the ATM layer. Beyond the ATM layer the Altnet has the freedom to convey onward the traffic however it sees fit, as does BT.
- 3.57 Ofcom therefore concludes that the basis upon which the WBA margin rule has been assessed is fair and reasonable.

Second order effects - Elasticities and Linear representation of Cash Flows

- 3.58 **Elasticities** - BT identified the fact that the WBA margin rule does not include any elasticity parameters, in particular price/demand elasticity and innovation/cost elasticity. BT believes that this omission may compromise the accuracy of the test result.
- 3.59 It has been Ofcom's approach to model an entrant of a particular scale when determining an appropriate level at which to set the margin. Although, Ofcom expressed this scale in terms of a percentage of the total DSL market segment it is the absolute scale that Ofcom intended to capture in the WBA margin rule. The price/demand elasticity referred to by BT will affect the total DSL market segment size. However, it does not follow that the size of an entrant should necessarily track the total market segment size.
- 3.60 The WBA margin rule is based on the results generated by the top-down model and this model takes a forward looking approach, based in part on BT's forecast information. Therefore, to the extent that technological innovations and MEA trends have been reflected in the forecast they have been included in the WBA margin rule. Of course it is possible that unforeseen innovations may occur in the future and this may lead to lower than expected cost and/or new products/services. It is clearly not possible to allow for such occurrences today, as by definition they are unknown. However, Ofcom does recognise that it may be necessary to re-assess the WBA margin rule in light of how things develop and to this end has committed itself to review the market in 2005.
- 3.61 **Linear representation of Cash Flows** - BT also expressed concern about the linear representation of cash flows and BT suggests that this implies that a change in one driving parameter will have the same proportionate impact on the outcome. BT made the point that because cost and demand elasticities are not equal to one the margin estimated by the WBA margin rule and the margin calculated by the cash flow model are likely to be different.
- 3.62 Ofcom decided to represent the cash flows in this way for several reasons. Firstly, Ofcom was conscious that the relationship between ATM interconnection and IPStream prices was always going to be complicated. It therefore decided to represent the relationship in this way to minimise the complexity and thus make the WBA margin rule more user friendly. Secondly, the information used to set the margin

is commercially confidential. It is therefore not possible to simply publish the top-down model. Ofcom therefore produced the WBA margin rule in this way to provide maximum transparency to the industry whilst at the same time protecting the confidentiality of the underlying information. Lastly, Ofcom believes that it is actually necessary to break the connection with the top-down model in a number of areas to prevent certain self-fulfilling assumptions from being exploited. For instance, Ofcom believes that it is necessary to set different VP size weights than those actually used by BT.

- 3.63 Even so, it is Ofcom's view that the way the WBA margin rule is structured is a very good first order approximation. When the WBA margin rule is first set it is in fact a precise representation of the cash flows and although certain future price changes may force it to deviate slightly the scope for this is limited as currently a significant proportion of the total cost is fixed (on a per end user basis). Further, as indicated above, it is Ofcom's stated position that it will re-assess the WBA margin rule in light of future developments.

Contended bandwidth adjustment factor

- 3.64 In its response BT raised a number of issues in relation to the Contended Bandwidth Adjustment Factor, as follows:

- BT argued that this factor is overstated and a new entrant will be more efficient. Ofcom notes that this factor is not affected by any of the efficiency adjustments introduced by Ofcom (such as BT's earlier utilisation of VP's) and is based on BT's actual data.
- BT argued that this factor ignores CBC incentives for utilisation. Ofcom notes that this factor is BT's forecast of how Standard IPStream products will be used. It has no bearing on the use of CBC products.
- BT has argued that this factor should not be applied to calculate VP rental and other costs. Ofcom notes that the margin rule is based on modelling a similarly efficient operator to BT when provisioning products that are equivalent to BT's IPStream and BT Central products. Ofcom therefore believes that it is reasonable to allocate the same network resources when setting the WBA margin rule, as those used by BT in the provision of its IPStream and BT Central products.

- 3.65 Enovi makes the comment that due to existence of CBC and Standard pricing structures, BT Central Standard products will typically have a lower utilisation than BT Central CBC products, i.e. a lower number of end users. This is because the Standard products represent the most economical choice when a customer (ISP) is serving a low number of end users, however above a certain number of end users the CBC products represent the most economical choice. Enovi asserts that although there will be a lower number of end users on the BT Central Standard products these end users will not have a corresponding higher bandwidth. Enovi then claims that Ofcom appears to assume a higher bandwidth per end user for the Standard products (e.g. Home 500 Standard will have a higher utilisation than Home 500 CBC). Enovi believe that this assumption is flawed and that that bandwidth used on a per end user basis is likely to only depend upon the Virtual Circuit size (end user access speed).

- 3.66 Ofcom fully agrees with Enovi in terms of the relative uses of Standard and CBC products, i.e. Standard products will typically be configured with a lower number of end users on the BT Central element. Indeed this is exactly what the forecast information suggests. However, when a lower number of end users share a BT Central product of

a given capacity it follows that the 'average' bandwidth available to each end user will be higher than when a higher number of end users share the capacity. For example, if 2,000 end users were connected to a 100Mbit/s BT Central product then on average each end user would have 50kbit/s available to them, if however the number of end users is increase to, say, 4,000 then each would have 25kbit/s available to them on average. Ofcom therefore finds Enovi's comments on this point to be inconsistent.

- 3.67 As previously explained Ofcom views the Standard products to be pre-dimensioned versions of the CBC products and uses the 'Contended Bandwidth Adjustment Factor' as a convenient method of dimensioning the CBC products in order to replicate the Standard products. The 'Contended Bandwidth Adjustment Factor' was calculated by dividing the total BT Central Standard bandwidth by the total IPStream Standard contended bandwidth.
- 3.68 Ofcom does not make any explicit assumptions about the BT Central bandwidth allocated to each end user. Instead Ofcom proposes a range of BT Central bandwidths over which to set the margin. This is explained in detail in Section 4.
- 3.69 Ofcom has used the VC size (end user access speed) when weighting the allocation of core network resources between different products and when determining suitable bandwidth ranges over which to set the margin. However, Ofcom believes that other factors are necessary when assess the bandwidth used on a per end user basis, such as the level of network overbooking and BT's published contention ratios for its IPStream Standard products. Relying on the VC size alone would fail to capture the significant differences in cost between provisioning lowly contended and a highly contended products.
- 3.70 The Contended Bandwidth Adjustment factor is discussed further in Section 4

Other issues

- 3.71 Respondents raised issues is respect of the following Ofcom parameters which are discussed in detail in other parts of this document:
- **Distribution of VP categories.** Specific issues raised by respondents are discussed in Section 4, paragraphs 4.38-4.41.
 - **Distribution of VP sizes.** Specific issues raised by respondents are discussed in Section 4, paragraphs 4.32-4.33.
 - **IP capex historic cost adjustment.** Specific issues raised by ntl, Energis and Enovi are discussed in Section 2, paragraphs 2.93 – 2.97.
 - **Contestability assumptions.** Specific issues raised by respondents are discussed in Section 2, paragraphs 2.159-2.163.
 - **ISH costs and migration.** Specific issues raised by respondents are discussed in Section 2, paragraphs 2.111 and 2.115.

Section 4

Margin Setting Modelling – the usage factor model

Introduction

- 4.1 The top-down model described in Section 3 performs a margin squeeze test between ATM interconnection and each of BT's current Standard and CBC IPStream products. However, Ofcom's proposal is to set this margin in order to provide BT and Altnets clarity about what Ofcom considers to be the minimum necessary margin. This section describes the approach taken by Ofcom when setting this margin and its mechanical implementation.

General Approach

- 4.2 When setting the margin it was Ofcom's objective not to specify the price for any of the ATM interconnection or IPStream products, but to instead specify the minimum price difference between ATM interconnection and IPStream. This approach ensures that BT maintains the ability to set its own prices, but at the same time provides a clear signal about what relative pricing would constitute a margin squeeze.
- 4.3 Superficially, specifying the minimum required margin between two prices appears to be a relatively simple proposition. In its simplest form there will be a price for the ATM interconnection service (p_{ATM}), a price for the IPStream service ($p_{IPStream/BT\ Central}$) and the minimum required margin (X) between them. In order to ensure that a margin squeeze is not occurring, the relationship between these three factors would need to satisfy the following equation.

$$p_{ATM} \leq p_{IPStream/BT\ Central} - X$$

- 4.4 In this simple equation the required margin (X) therefore represents the total additional costs incurred when converting ATM interconnection into IPStream. However, in practice things are slightly more complicated than this, for a number of reasons.
- Firstly, the ATM interconnection and IPStream services are not directly comparable. In fact ATM interconnection can be considered as a kit of parts that when combined with certain additional parts and suitably configured, can be made into IPStream.
 - This highlights a second complication and this is that ATM interconnection consists of more than one element. At the present time there are in fact 60 individual ATM interconnection products and some of these products are provided on a per end user basis whereas others are network capacity that can be shared between multiple end users.
 - A third complication stems from the fact that there are multiple IPStream and BT Central products which can be combined and configured in an almost limitless manner. Further, the various BT Central products, which are provided as network capacity, can have differing unit prices depending on BT's pricing policy.

- d. Fourthly, the ATM interconnection and IPStream products attract a mixture of connection and rental charges. For instance, some of the ATM interconnection products attract a connection and rental charge while others only attract a rental charge. Whereas all IPStream and BT Central products attract both a connection and rental charge.
 - e. Fifthly, when performing the margin squeeze test in the top-down model Ofcom introduced a contestability assumption. Although the effect of the contestability assumption is part of the required 'Margin' it is not strictly part of any of the three factors in the basic equation above; (ATM price, IPStream price or additional cost).
- 4.5 The basic approach adopted by Ofcom when setting the margin is to convert the ATM interconnection products into a form that is directly comparable with the IPStream products and this is achieved by the introduction of usage factors. In essence, a usage factor represents the average use of a given ATM interconnection product when used to produce a given IPStream product. A unique usage factor is therefore required for each individual ATM interconnection product. The total ATM interconnection price, in the margin equation, is thus the sum of each individual ATM interconnection product price multiplied by its associated usage factor. This usage factor approach addresses the first two complications identified above and the ATM interconnection part of the fourth complication.
- 4.6 The third and the remaining part of the fourth complication identified above are addressed by using a 'reference price' for the BT Central element and by converting the IPStream and BT Central connection charge into an annuity. The BT Central reference price used is in fact the lowest per Mbit/s price available from BT. The use of a reference price and the need to convert connection charges into an annuity requires the introduction of adjustment factors that need to be applied to BT's IPStream and BT Central prices (revenue adjustments).
- 4.7 The fifth complication identified above is addressed by either simply adding the effect of the contestability assumption to one of the other factors in the equation or by introducing a separate contestability assumption factor.
- 4.8 Finally, in order to capture all of the IPStream products and all the possible configurations that could be adopted it is necessary to make the margin setting equation a function of allocated bandwidth. This allocated bandwidth is the amount of BT Central bandwidth that is allocated to a particular service or end user and this is under the control of the customer (ISP). Note: allocated bandwidth is inversely proportional to the number of end users that are connected to a given BT Central.
- 4.9 A practical implementation of setting the margin is therefore given below. This is the format of the margin equation that Ofcom specified in the Consultation Document.

$$\sum_{i=1}^{i=n} A_i \times p_i(BW) \leq p_{IPStream} + p_{BTCentral}(BW) - X(BW)$$

where:

- A_i = usage factors
- p_i = reference ATM interconnection charges
- n = number of relevant ATM interconnection charges

| | |
|-----------------|---------------------------------------------------------|
| $p_{IPStream}$ | = reference price for the IPStream service for rental |
| $p_{BTCentral}$ | = reference price for the BT Central service for rental |
| X | = balancing factor |

- 4.10 When producing the above equation Ofcom was aware that there is a trade-off between transparency and simplicity. The above equation is one of the more simple forms of possible margin equations and this was achieved by representing three individual elements/effects by the balancing factor. The three elements/effects included in the balancing factor are: additional cost, revenue adjustment factors and the contestability assumption.
- 4.11 However, initial industry feedback to the Consultation Document suggested that more transparency was required to assist them in responding to the Consultation Document, even if that meant more complexity. Ofcom therefore published an amended margin equation in the Supplementary Note. This amended margin equation is simply a rearrangement of the earlier equation, with the revenue adjustment factors separately specified rather than being included in the balancing factor. The amended equation is shown below.

$$\sum_{i=1}^{i=n} A_i \times p_i(BW) \leq p_{IPSRental} + B_1 \times p_{IPSConn} + B_2 \times p_{BTCentral}(BW) + B_3 \times p_{BTCConn}(BW) - X(BW)$$

where:

| | |
|---------------------|----------------------------------------------------------------|
| A_i | = usage factors |
| p_i | = reference ATM interconnection charges |
| n | = number of relevant ATM interconnection charges |
| " B_1 " | = Revenue Adjustment Factors for IPStream connection service |
| " B_2 " | = Revenue Adjustment Factors for BT Central rental service |
| " B_3 " | = Revenue Adjustment Factors for BT Central connection service |
| " $p_{IPSRental}$ " | = reference price for the IPStream service for rental |
| " $p_{IPSConn}$ " | = reference price for the IPStream service for connection |
| " $p_{BTCentral}$ " | = reference price for the BT Central service for rental |
| " $p_{BTCConn}$ " | = reference price for the BT Central service for connection |
| X | = balancing factor |

- 4.12 By removing the revenue adjustment factors from the balancing factor and separately specifying them the equation clearly becomes more complex but also more intuitive. However, the remaining 'revised' balancing factor still represents two elements/effects, namely: additional cost and the contestability assumption. In the Supplementary Note Ofcom gave an indication of the relative size of each of these parts and indicated that it was considering separating them fully in the final direction, so that the additional cost could be separately specified.
- 4.13 Respondents to the consultation generally welcomed the proposal to further disaggregate the balancing factor. Ofcom has therefore decided to take this step when specifying the final margin equation. However, since publishing the Supplementary Note Ofcom has further considered how to represent the contestability assumption in the margin equation. It is Ofcom's opinion that the most appropriate

and transparent way of representing the contestability assumption is to separately specify it in the equation. Therefore the equation that Ofcom intends to use when setting the margin is given below.

$$\sum_{i=1}^{i=n} A_i \times p_i(BW) \leq p_{IPSRental} + B_1 \times p_{IPSConn} + B_2 \times p_{BTCRental}(BW) + B_3 \times p_{BTCConn}(BW) - (Y + X)(BW)$$

where:

- A_i = usage factors
- p_i = reference ATM interconnection charges
- n = number of relevant ATM interconnection charges
- " B_1 " = Revenue Adjustment Factors for IPStream connection service
- " B_2 " = Revenue Adjustment Factors for BT Central rental service
- " B_3 " = Revenue Adjustment Factors for BT Central connection service
- " $p_{IPSRental}$ " = reference price for the IPStream service for rental
- " $p_{IPSConn}$ " = reference price for the IPStream service for connection
- " $p_{BTCRental}$ " = reference price for the BT Central service for rental
- " $p_{BTCConn}$ " = reference price for the BT Central service for connection
- Y = contestability assumption
- X = balancing factor

Note: not all of the ATM interconnection charges are a function of bandwidth, see Table 4.3.

- 4.14 The underlying objective when setting the margin is to capture the margin squeeze test result from the top-down model and to present it in the form of the equation shown above. To achieve this Ofcom is required to specify the various factors identified in the above equation, as follows:
- Usage factors
 - Revenue adjustment factors
 - Contestability assumption
 - Additional cost
- 4.15 All of the remaining elements in the equation are ATM interconnection and IPStream prices and these are variables that are under BT's control.
- 4.16 In order to calculate the various factors Ofcom developed a spreadsheet model, (the 'usage factor model'). This model and the assumptions used in it are discussed in detail below.

Methodology and approach adopted in the usage factor model

4.17 The purpose of the usage factor model is to calculate values for the various factors identified in the equation that is to be used when setting the margin. Given the structure of the equation to be adopted, there are four areas that need to be calculated:

- Usage factors
- Revenue adjustment factors
- Contestability assumption
- Additional cost

4.18 The usage factor model uses the following three basic inputs.

- a. Top-down model information - (pass/fail levels and unit cost and revenue)
- b. BT Price List – (ATM interconnection and IPStream)
- c. Assumptions – (VP size and category distributions and end user churn)

4.19 When calculating the various factors the usage factor model is constrained in a number of ways. Firstly, the result of the margin equation is required to be the same as the pass/fail result from the top-down model³². Secondly, the unit cost and unit revenue information from the top-down model are fixed. Thirdly, the BT price information is fixed. The only flexibility in the usage factor model is therefore the assumptions and this is very limited. For instance, the assumption about VP size and category distributions is purely about how to distribute a given amount of 'cost', from the top-down model, across the various VP options.

4.20 The following paragraphs explain how the various factors identified in the margin equation are calculated in the usage factor model and which products/ factors are a function of bandwidth. To simplify this explanation the margin equation has been divided into the following three distinct parts.

- ATM interconnection Cost – $(\sum_{i=1}^{i=n} A_i \times p_i(BW))$
- Revenue – $(p_{IPSRental} + B_1 \times p_{IPSConn} + B_2 \times p_{BTCRental}(BW) + B_3 \times p_{BTCConn}(BW))$
- Additional Cost and Contestability Assumption – $((Y + X)(BW))$

4.21 Initially the various factors associated with each of these distinct parts will be described along with how they are calculated. Following this the implementation of the margin equation, including how to apply the various factors, will then be explained.

Usage Factors (Ai)

4.22 As explained above (paragraph 4.5) the usage factors are essentially used to convert the ATM interconnection products into a form that allows them to be directly compared

³² In practice the results for the Standard IPStream products differ slightly (~2p (pcm) for Home 500) between the two models, as the CBC IPStream products are used as a reference to ensure consistency. See final bullet of paragraph 3.36 for further discussion. Annex 2

with the IPStream products. The usage factors therefore represent how much of each ATM interconnection product is used when producing a given IPStream product. It therefore follows that a usage factor is required for each and every ATM interconnection product that is used.

- 4.23 In simple terms the usage factor for a given ATM interconnection product is calculated by dividing the unit cost, as determined in the top-down model, by the 'today's' price, as defined in the BT price list. For example, if the unit cost for a certain input was determined as being £1.20 and the current price was, say, £1, then the usage factor for this input would be 1.2. Once the usage factors have been calculated their values are fixed for the purpose of setting the margin.
- 4.24 When calculating the ATM interconnection usage factors the prices used are the published prices after deducting the maximum published spend discount. Currently the maximum published spend discount is 2% and this is applicable to the end user access (EUA) rental and the EUA port reservation charges only.
- 4.25 There are currently 60 individual ATM interconnection products listed in the BT price list and Ofcom is required to specify a usage factor for each product it considers the margin equation needs to capture. A full list of all the ATM interconnection products, along with the driver (end user or bandwidth) that Ofcom believes is most appropriate, is given in the table below.

Table 4.3

| Product | Driver |
|---------------------------------------------------|--------|
| EUA Connection | EU |
| EUA Rental | EU |
| EUA Port Reservation | EU |
| EUA Port Reservation adjustment | EU |
| VP Rental (4 categories × 12 sizes = 48 in total) | (BW) |
| VP Re-grade | (BW) |
| VP Rearrange (same serving centre) | (BW) |
| VP Rearrange (different serving centre) | (BW) |
| ATM Access Port Connection (2 sizes) | (BW) |
| ATM Access Port Rental (2 sizes) | (BW) |
| End User Migration | EU |

- 4.26 In addition to these 60 ATM interconnection products an Altnet who wishes to interconnect with BT must also pay the ATM In-Span Handover (ISH) charges, as defined in Section B9, Part 9.01 of the BT Carrier Price List. There are in fact 22 individual ATM ISH items listed and, as with the ATM interconnection products, a usage factor for each item to be captured is needed to accurately reflect its relative value.
- 4.27 Ofcom considers that the margin equation should capture all of the ATM interconnection products except 'End User Migration'. The rationale for excluding end user migration is addressed in Section 2. Ofcom is therefore required to calculate 59 individual usage factors for the ATM interconnection products.

- 4.28 Ofcom considers that the margin equation should fully capture the ATM ISH charges. However, given that the total ATM ISH charge is relatively small (approximately 7 pence pcm for the Home 500 standard product), Ofcom considered that setting an additional 22 usage factors would be unnecessarily complicated. In the Consultation Document Ofcom therefore proposed to capture all of the ATM ISH charges in a single factor. This single factor represents Ofcom's view of the total 'average' ATM ISH charges and is expressed in (£ per Mbit/s pa). All of the respondents who commented on this proposal either agreed that it was an appropriate approach or had no strong view on what approach is used. Given this Ofcom has decided to adopt a single factor for the ATM ISH charges in the final margin equation, as proposed.
- 4.29 Ofcom is therefore required to calculate a total of 60 individual usage factors for the ATM interconnection costs; 59 for the ATM interconnection products and 1 for the ATM ISH charges.
- 4.30 As explained above (paragraph 4.23) the usage factor for a given product is calculated by dividing the unit cost, as determined in the top-down model, by the 'today's' price, as defined in the BT price list. Therefore, for the majority of the products the usage factor model only needs to perform a simple division when calculating the usage factors. However, some additional steps are necessary when calculating the usage factors for the VPs, as the top-down model only produces a total cost for the VPs rather than an individual cost for each VP size/category. When calculating the usage factors for the VPs Ofcom is therefore required to determine how to distribute the total VP cost, as determined in the top-down model, across the various individual VPs and this is achieved by introducing assumptions about VP size and category distributions.
- 4.31 The distributions that Ofcom proposed in the consultation document were as follows: even (flat) VP size distribution (i.e. each VP size is given a 1/12 weighting) normalised to a unit bandwidth and a VP category distribution of 10%, 10%, 70% and 10% for Handover, Local, Regional and National respectively.

Consultation Responses on VP Size Distribution

- 4.32 Ofcom received a number of responses on its proposed VP size distribution. The Altnets' opinion on the most appropriate VP size distribution were clearly divided and fell into one of three basic groups; distribution should be weighted more towards smaller size VPs, even distribution (as proposed by Ofcom) is reasonable or small VPs unlikely to be used and therefore should attract a zero weight. Some particular Altnet comments are given below:
- a. Tiscali stated that a new entrant is likely to use a greater number of small VPs and as such smaller VP sizes should be given a higher weighting than larger VPs.
 - b. C&W, ntl and Viatel all generally agreed with Ofcom's proposal, that giving all VP sizes an equal weight seems reasonable.
 - c. Energis and Thus both stated that small VPs, particularly 0.25Mbit/s and 0.5Mbit/s are unlikely to be used at all, as they would limit the EUA speed. Therefore, these VPs should be given zero weight.
- 4.33 BT's response made the comment that there seems little justification for the inclusion of very small VPs and further it believes VP usage will be similar to BT's own forecast distribution (i.e. highly concentrated around the 8Mbit/s to 10Mbit/s VP sizes).

Ofcom's Response

- 4.34 It is apparent from the various responses that different providers intend to use ATM interconnection in different ways. Some are clearly planning to produce entry level products and/or forecast lower volumes and as such are likely to require smaller VPs generally, whereas others are planning to produce higher speed products and/or forecast higher volumes which will require larger VPs.
- 4.35 It is Ofcom's intention to promote product innovation and as such it would clearly be inappropriate to favour a particular strategy. Ofcom notes that the Altnet responses either agree with Ofcom's proposal or they are either side of it. That is Ofcom's proposal seems to sit fairly centrally to the range of views expressed by the Altnets.
- 4.36 BT's comment however seems to favour a particular business strategy. Further, Ofcom notes that BT's forecast distribution is based on BT achieving a significant share of the intermediate services market, which Ofcom does not believe is consistent with its objective of promoting competition.
- 4.37 Given the points above Ofcom believes that the proposed VP size distribution is reasonable.

Consultation Responses on VP Categories

- 4.38 Ofcom also received a number of comments on its proposed VP category distribution. C&W, ntl, Telefonica and Tiscali all agreed that Ofcom's proposed VP category distribution was reasonable.
- 4.39 Energis made the point that 9 POI does not make efficient use of the existing VP pricing structure, which is relatively flat. This implication being that less than 9 POI may be used in practice, which would lead to a higher proportion of regional and national VPs.
- 4.40 Thus made the comment that as more exchanges are enabled the proportion of regional and national VPs may increase as these later enablements will tend to be in more remote areas.
- 4.41 BT commented that logically the distribution should mirror that of BT's.

Ofcom's Response

- 4.42 As identified above different providers are likely to use ATM interconnection in different ways and this will naturally affect their own VP category distribution. Simplistically, as the number of POI increases the VP category distribution will become more concentrated around the handover category. Conversely as the number of POI decrease the distribution will concentrate around the regional and national VP categories. However, the underlying approach throughout this exercise has been to assume a similarly efficient operator. That is not to say that the distribution employed by BT should be unquestionably copied, but rather there would need to be solid grounds for any significant deviation.
- 4.43 From the information available to Ofcom about how Altnets are interconnecting with BT today and from the responses, it appears that the typical number of POI is unlikely to significantly deviate from that currently employed by BT (i.e. 9). Further, Ofcom notes that given the current boundaries (VP length) between the various categories the majority of the reduction in the national category has occurred by about 5 POI. Further

increases in the number of POI leads to a fairly gradually shift towards handover, with all VPs being categorised as handover at 119³³ POI. Ofcom therefore believes that the VP category distribution does not materially change within the range of; 5 to 15 POI.

- 4.44 On this basis Ofcom can see no compelling reason for changing the VP category from that proposed in the Consultation Document.

Revenue Adjustment Factors (B1, B2 and B3)

- 4.45 The revenue adjustment factors are required to align the unit revenue, determined in the margin equation with the unit revenue that was determined in the top-down model. Therefore, the revenue adjustment factors are calculated by dividing the unit revenue, as determined in the top-down model, by the 'today's' reference price, as defined in the BT price list. As an example, if the unit revenue for IPStream connection was say £10 (pa) and the 'today's' price is £50, then the revenue adjustment factor for IPStream connection would be 0.2. As with the ATM interconnection usage factors, once the revenue adjustment factors have been calculated their values are fixed for the purpose of setting the margin.

- 4.46 As mentioned above in paragraph 4.6 the revenue adjustment factors are required for two basic reasons.

- The margin equation is specified on a per end user per annum basis, however both IPStream and BT Central attract a connection charge. Clearly, these connection charges are unlikely to have an economic life of precisely one year. In fact both have an economic life significantly longer than one year. An adjustment factor is therefore required to convert these one-off connection charges into an annuity. The revenue adjustment factor in this case therefore encapsulates both the economic life and the cost of capital.
- When specifying the margin equation Ofcom has decided to use a 'reference price' for the BT Central element, for both rental and connection. The reference price chosen is in fact the lowest per Mbit/s charge available from BT. The use of the lowest per Mbit/s price in this way is likely to understate BT's actual 'average' per Mbit/s revenue. A revenue adjustment factor to compensate for this understatement is therefore required. A fuller explanation of the rationale for using this reference price and how it is applied in the margin equation is given below in the paragraphs below on implementation.

- 4.47 A revenue adjustment factor will therefore adjust the price to: convert it into an annuity, compensate for the use of the reference price or both depending on which price is being adjusted. The IPStream and BT Central prices that require a revenue adjustment factor are listed below, along with which adjustment(s) are being made.³⁴

- IPStream connection (B1) – convert to annuity
- BT Central rental (B2) – compensate for reference price
- BT Central connection (B3) – convert to annuity and compensate for reference price

- 4.48 Due to the availability of Standard and CBC price structures two sets of revenue adjustment factors are required - one for each price structure. Ofcom is therefore

³³ I.e. Interconnection at everyone of BT's ATM switches

³⁴ A revenue adjustment factor is not required for IPStream rental, as this charge is recurring and dedicated to a single end user.

required to calculate a total of 6 individual revenue adjustment factors; 3 for the Standard price structure and 3 for the CBC price structure.

Contestability Assumption Factor (Y)

- 4.49 When performing the margin squeeze test in the top-down model Ofcom introduced a contestability assumption and the effect of this assumption needs to be included when setting the margin. For reasons of transparency Ofcom has decided to separately specify the effect of the contestability assumption in the margin equation.
- 4.50 The effect of the contestability assumption is determined in the top-down model and as this effect is merely stated in the margin equation no calculations in the usage factor model are required. Instead the effect determined in the top-down model is simply passed across into the usage factor model.
- 4.51 The contestability assumption factor is actually composed of a fixed part (i.e. fixed per end user) and a part that varies with the amount of bandwidth allocated to the end user. The reason for this is that the contestability assumption assesses changes in on-going unit cost and part of this cost will be fixed irrespective of the bandwidth demanded (e.g. port reservation cost or a physical port/line card) whereas the other part will vary with the demanded bandwidth (i.e. VP costs or IP conveyance). The contestability assumption factor (Y) thus follows the basic equation: $Y = m \times BW + c$, where: Y is the total effect of the contestability assumption, m is the variable part per Mbit/s, BW is the allocated bandwidth and c is the fixed part.
- 4.52 There is thus a single underlying contestability assumption factor that is applicable to all IPStream products, Standard and CBC. However, the IPStream Standard products have been pre-dimensioned, in that each has an average core network bandwidth allocated to it. The contestability assumption factor for the IPStream Standard products can therefore be represented as a single fixed value. In contrast the CBC products maintain the fixed and variable structure, to reflect it's more flexible and dynamic pricing structure.
- 4.53 Given this Ofcom is required to specify a total of 9 contestability assumption factors; 7 fixed factors, one for each of the IPStream Standard products, and 1 fixed and 1 variable contestability assumption factor for the CBC products.

Additional Cost (X)

- 4.54 The additional cost element of the margin equation represent the total additional costs (i.e. non ATM interconnection costs) necessarily incurred when converting the ATM interconnection products into intermediate products that are functionally identical to BT's IPStream and BT Central products. This will therefore include things like: broadband access servers, IP conveyance and routers, customer handover links and various operating costs, such as; product development, maintenance and sales and marketing.
- 4.55 The additional cost is the last element in the margin equation that is determined in the usage factor model. It is therefore possible at this stage to produce values for every other element in the equation; ATM interconnection costs, IPStream and BT Central revenue and contestability assumption. The pass/fail level for each IPStream/BT Central product is also known from the top-down model. The additional costs are therefore calculated in the usage factor model in a way that ensures that the margin equation produces the same pass/fail result as the top-down model. Once the

additional cost has been calculated its value is fixed for the purpose of setting the margin.

- 4.56 Like the contestability assumption factor, the additional cost is also composed of a fixed part and a part that varies with the amount of bandwidth allocated to the end user.
- 4.57 Ofcom is therefore required to calculate the fixed and variable parts of the additional costs for each IPStream product, potentially 14 in total - 7 Standard and 7 CBC. However, for the purpose of specifying the additional cost, the CBC product set can be represented by two fixed values, one for IPStream Home and the other for IPStream Office, and one variable value.
- 4.58 However, because the IPStream Standard products are considered to be pre-dimensioned versions of the CBC products it is necessary to consider each in turn. This means that a unique fixed value needs to be calculated for each of the 7 IPStream Standard products. However, as with the CBC products only a single variable value is required.
- 4.59 The total individual values that Ofcom is required to specify for the additional cost is therefore 11, 3 for CBC (2 fixed and 1 variable) and 8 for Standard (7 fixed and 1 variable).

The contended bandwidth adjustment factor

- 4.60 As explained above, when calculating the contestability assumption factors and the additional costs for the IPStream Standard products the approach taken by Ofcom was to assume that these products are pre-dimensioned versions of the CBC products. It is thus necessary to determine how to dimension the CBC products in order to create the various Standard products.
- 4.61 For each IPStream Standard product BT specifies a maximum end user speed and a maximum contention ratio. These parameters give a measure of the quality/performance that BT is underwriting. It also therefore gives a relative measure of the network resources that BT needs to provide.
- 4.62 By dividing the maximum end user speed by the contention ratio a value, referred to as contended bandwidth, can be determined. For instance a 500kbit/s product with a contention of 50:1 has a contended bandwidth of 10kbit/s.
- 4.63 Within the top-down model Ofcom calculated the ratio of the total BT Central Standard bandwidth to the total IPStream Standard contended bandwidth, this ratio is what Ofcom calls the 'contended bandwidth adjustment factor'. Based on the information provided by BT Ofcom calculated this factor to be ~2.45
- 4.64 This factor suggests that 'on average' 2.45kbit/s of BT Central Standard bandwidth is allocated for every 1kbit/s of IPStream Standard contended bandwidth in use. Thus the 500kbit/s, 50:1 contended product discussed above would on average have 24.5kbit/s of BT Central bandwidth allocated to it.
- 4.65 Ofcom used the contended bandwidth adjustment factor, as calculated in the top-down model, to dimension the CBC products when assessing the Standard products.
- 4.66 In order to minimise the number of individual variables for the Standard IPStream products, and thus simplify the margin equation, Ofcom decided to maintain the use of

the contended bandwidth adjustment factor when specifying the margin setting equation.

Implementation

- 4.67 In the above paragraphs it has been explained how the various factors in the margin equation are calculated in the usage factor model. All of these factors are then fixed for the purpose of setting the margin and thus the combined results of the top-down model and the usage factor model are captured in a linear equation. These captured results represent the mathematical relationship between ATM interconnection and IPStream prices (or the 'WBA margin rule') that BT will be required to comply with.
- 4.68 The WBA margin rule is specified around assessing a single end user on an end-to-end basis, i.e. from the end user premises to the ISP customer. All the values/prices used in the rule are expressed on a per annum basis.
- 4.69 The paragraphs below explain how to implement the WBA margin rule and again for simplicity each distinct part will be explained separately. All the explanations below initially address the CBC products and then go on to describe how these can be pre-dimensioned in order to assess the Standard products.

ATM Interconnection Costs - ()

- 4.70 In order to determine the cost associated with each ATM interconnection product it is necessary to multiply the product price by the relevant usage factor and where appropriate also by the bandwidth allocated to the end user. Table 4.3 shows which products are driven by bandwidth. For the ATM ISH cost it is necessary to multiply the Ofcom determined value (£ per Mbit/s pa) by the bandwidth allocated to the end user. The total ATM interconnection costs are thus the sum of all of these products, 60 in total.
- 4.71 When assessing the ATM interconnection costs for the IPStream Standard products it is necessary to suitably pre-dimension the CBC products and this is achieved by allocating an appropriate amount of bandwidth. The amount of bandwidth to be allocated can be calculated by multiplying the contended bandwidth, associated with the IPStream Standard product being considered, with the contended bandwidth adjustment factor. Thus, for IPStream Standard Home 500 the allocated bandwidth is ~24.5kbit/s and for the IPStream Standard Office 500 the allocated bandwidth is ~61kbit/s.
- 4.72 Although for the Standard products the IPStream element is pre-dimensioned, this is not the case for the BT Central element. Assessment of the Standard products is therefore still a function of allocated bandwidth and as such it is necessary to specify the allocated bandwidth. However, the effect of allocated bandwidth is less for Standard than it is for CBC, as with the Standard products only the ISP link is a function of bandwidth whereas for CBC it is the ISP link and the core network (VPs and IP).
- 4.73 The ATM interconnection price that needs to be used when making this assessment is the published price after deducting the maximum published spend discount. Currently the maximum published spend discount is 2% and this is applicable to the end user access (EUA) rental and the EUA port reservation charges only.

$$\text{Revenue} - (p_{IPSRental} + B_1 \times p_{IPSConn} + B_2 \times p_{BTCRental}(BW) + B_3 \times p_{BTCConn}(BW))$$

- 4.74 There are four different pricing areas that contribute to BT's revenue; rental and connection for both IPStream and BT Central. When assess BT's revenue each of these four areas needs to be taken into account.
- 4.75 BT provides numerous BT Central options ranging from 0.5Mbit/s to 622Mbit/s with some sizes having optional features such as L2TP or SDH resilience. There are in fact 20 BT Central options available for both Standard and CBC IPStream services. In order to simplify the WBA margin rule and to limit BT's ability to circumvent it Ofcom has decided to use a single reference price for the BT Central products. The reference price is in fact the lowest per Mbit/s price that BT sells at.
- 4.76 In determining the reference price per Mbit/s for the BT Central products Ofcom divides the selling price by the net capacity³⁵ for each product and this is done for both the connection and the rental. For example the 155Mbit/s L2TP standard BT Central product currently attracts a connection charge of £50k and a rental charge of £45k (pa) and these equate to £442.48 per Mbit/s and £398.23 per Mbit/s (pa) respectively, based on a net capacity of 113Mbit/s.
- 4.77 The IPStream price that needs to be used when assessing BT's revenue is the lowest price that BT sells at. Assuming that BT only sells off the published price list the lowest price will be the published price less the maximum discount available, which is currently 2%. If BT did sell 'off list' at a lower price then Ofcom would use this off list price as the reference.
- 4.78 An explanation of how to determine each of BT's four different revenue areas is giving below. In all cases the reference prices discussed above need to be used.
- i. IPStream rental – The IPStream rental revenue is simply the per annum rental price. It is not a function of allocated bandwidth and does not attract a revenue adjustment factor.
 - ii. IPStream connection – The IPStream connection revenue is determined by multiplying the connection price with the appropriate revenue adjustment factor (B1). This revenue adjustment factor is required to convert the one-off connection charge into an annuity.
 - iii. BT Central rental – The BT Central rental revenue is determined by multiplying the lowest per Mbit/s rental price with the appropriate revenue adjustment factor (B2) and with the allocated bandwidth. This revenue adjustment factor is required to compensate for the fact that BT's average rental revenue per Mbit/s is higher than the reference price used in the WBA margin rule.
 - iv. BT Central connection – The BT Central connection revenue is determined by multiplying the lowest per Mbit/s connection price with the appropriate revenue adjustment factor (B3) and with the allocated bandwidth. This revenue adjustment factor is required to both convert the one-off connection charge into an annuity and to compensate for the fact that BT's average connection revenue per Mbit/s is higher than the reference price used in the WBA margin rule.

³⁵ Net capacity refers to the typical maximum IP throughput downstream as specified in BT's Suppliers' Information Notes (SINs).

Consultation Responses

- 4.79 All non-BT respondents, with the exception of Enovi, that commented on the use of the lowest price, both by end user and by bandwidth, agreed that this was a reasonable and appropriate approach.
- 4.80 Enovi stated that it believes the price should be weighted by likely demand. It also made reference to a survey of 70 ISPs which suggests that the appropriate value for BT Central Standard Rental is £748.09 (per Mbit/s pa)³⁶ and suggests that this value could be used instead of the lowest price per Mbit/s and the BT Central Standard Rental adjustment factor.
- 4.81 BT initially stated that it did not agree with the use of the lowest and that the price should reflect the expected demand. However, BT went on to recognise that Ofcom proposed this approach to simplify the calculation and that there is a specific revenue adjustment designed to compensate for any understatement of revenues caused by this simplification. BT acknowledged that an accurate adjustment would have the desired effect.

Ofcom's Response

- 4.82 The BT Central Standard Rental adjustment factor does weight the minimum per Mbit/s price so as to represent the forecast demand. The comments made by Enovi and its proposals in this respect seemed to be closely related to its more general point about the accuracy of the end user volume forecast used when setting the margin. This general point was addressed in Section 3.
- 4.83 On this specific point of the survey that Enovi made reference to, Ofcom notes that Enovi recognises it does not have access to all BT's usage statistics and agrees with its conclusion that it cannot claim that the survey is scientifically accurate.

Contestability Assumption and Additional Cost – ()

- 4.84 The contestability assumption factor is composed of a fixed part and a part that varies with allocated bandwidth. When determining the total effect of the contestability assumption it is therefore necessary to multiply the variable part with the allocated bandwidth and then to add this to the fixed part.
- 4.85 For the Standard products the total effect of the contestability assumption is already specified, as the variable part was pre-dimensioned when the factors were calculated.
- 4.86 The additional cost is also composed of a fixed part and a part that varies with allocated bandwidth. Therefore when determining the total additional cost it is therefore necessary to multiply the variable part with the allocated bandwidth and then to add this to the fixed part.
- 4.87 Although the additional cost values are different for the Standard products they still follow the same fixed and variable part format and as such the approach described above is still valid.

BT Central Bandwidth Allocation for Applying the WBA margin rule

³⁶ Enovi did not specify the units associated with its value. Because Enovi are making a comparison with a value in the WBA margin rule Ofcom has assumed that it has adopted the same units.

- 4.88 From the paragraphs above it is apparent that the amount of BT Central bandwidth allocated to an end user is an integral part of the relationship and thus the WBA margin rule that Ofcom is introducing. It is clearly necessary for Ofcom to therefore specify the bandwidth or range of bandwidth at which the rule needs to be satisfied.
- 4.89 It needs to be recognised that the amount of BT Central bandwidth allocated to and end user is inversely proportional to the number of end users that are connected to a given BT Central and that this is entirely under the control of the customer (ISP). The allocated bandwidths used in the WBA margin rule should therefore reflect how customers typically use the BT Central elements. Given that different customers are likely to configure the BT Central element in different ways, depending on the services they intend to provide, it would seem to be inappropriate to use a single bandwidth in the WBA margin rule. Therefore, in the Consultation Document Ofcom proposed a bandwidth range over which the WBA margin rule should be applied. These proposals and respondents comments are discussed below.

CBC Products

- 4.90 The pricing structure for the CBC products is very flexible and dynamic and this provides customers a wide range of options about how to configure the BT Central element. This suggests that the allocated bandwidth range over which the WBA margin rule should be applied should be relatively wide.
- 4.91 It is also noted that BT provides two basic IPStream CBC variants, Home and Office, and currently the Office variant is being sold at a premium. It therefore seems reasonable to assume that purchases of the Office products want a higher specification product and accordingly will be likely to allocate more bandwidth to an Office end user than a Home end user.
- 4.92 The above logic led Ofcom to propose different bandwidth ranges for the CBC Home and Office products in the Consultation Document. For the Home products Ofcom proposed the range of 5kbit/s to 30kbit/s whereas for Office Ofcom proposed the range of 25kbit/s to 150kbit/s.

Consultation Responses

- 4.93 None of the non-BT respondents, with the exception of Enovi, disagreed with Ofcom's proposed bandwidth ranges for the CBC products.
- 4.94 In its response BT rejected the concept of specifying a range of bandwidths over which to apply the rule for CBC IPStream products and instead suggested that the WBA margin rule should be applied at the average bandwidth per end user, as implied by BT's forecast information.
- 4.95 Enovi support BT's consultation response, i.e. that the average bandwidth per end user implied by (BT's forecast) CBC volumes should be used.

Ofcom's Response

- 4.96 Ofcom notes that it is important to ensure that a new entrant can offer innovative services, rather than replicating the products currently offered by BT. It is for this reason that Ofcom believes it is important to apply the MST to all Standard and CBC IPStream products individually. Throughout its analysis Ofcom has characterised the Standard IPStream products as pre-dimensioned versions of the CBC IPStream products. This of course can be turned around and thus the CBC products can be

considered to be a continuous series of Standard products, depending on the bandwidth allocated. The use of a single 'average' bandwidth, as proposed by BT and supported by Enovi, would therefore have the effect of making the WBA margin rule perform an aggregate test for all the possible CBC products/configurations. This of course is contrary to Ofcom's position about applying the MST to all individual products. Ofcom therefore rejects BT's and Enovi's suggestion.

- 4.97 However, since publishing the Consultation Document Ofcom has carried out some additional analysis of BT's current Standard and CBC prices. This analysis shows that for the higher speed Home products the CBC products represent better value than the Standard products at allocated bandwidths well in excess of 30kbit/s. Ofcom therefore believes that the upper bandwidth limit for the CBC Home products should be increased.
- 4.98 At the present time the binding constraint on BT occurs at the lower bandwidth limit, so increasing the upper limit will not affect BT's current position. It will however provide some future proofing of the WBA margin rule to price changes.
- 4.99 The same logic about future proofing the WBA margin rule can also be applied to the CBC Office products. At the present time BT charges a premium for the Office products, however this may not be sustainable in the future, in which case CBC Office products may be configured with lower bandwidths. Ofcom therefore believes that the lower limit for the CBC Office products should be reduced.
- 4.100 The range of bandwidths over which the WBA margin rule will be applied is therefore as follows: 5kbit/s to 150kbit/s for both the Home and Office products.

Standard Products

- 4.101 The cost and revenue associated with the Standard products is affected to a much lesser extent, than the CBC products, by changes to the BT Central bandwidth allocated. This is due to the fact that a greater proportion of the Standard product is fixed and this can be seen from the contestability assumption factor and the additional cost.
- 4.102 As discussed above Ofcom considers the Standard products to be pre-dimensioned versions of the CBC products. Further, this pre-dimensioning is based on the concept of a Contended Bandwidth Adjustment Factor, which represents the average amount of BT Central Standard bandwidth allocated to the IPStream Standard products. The average allocated bandwidth for a given IPStream Standard product can therefore be determined by multiplying the Contended Bandwidth Adjustment Factor with the Contended Bandwidth associated with the product in question.
- 4.103 Although Ofcom uses the average BT Central bandwidth when constructing the usage factors/additional cost etc for the IPStream Standard and BT charges a fixed 'average' price, there is still flexibility for allocating a different amount of BT Central bandwidth. However, given the pricing structure for the Standard products and the existence of the CBC pricing structure it seems unlikely that there will generally be large deviations from the average.

4.104 In the Consultation Document Ofcom therefore proposed to apply the WBA margin rule to the Standard products at the average allocated bandwidth $\pm 25\%$ ³⁷ and the minimum and maximum bandwidth for each IPStream Standard is given in the table below.

4.105 Ofcom has determined a Contended BW Adjustment Factor and this represents the typical amount of BT Central bandwidth allocated on a per end user basis for these products. The Contended BW Adjustment Factor determined by Ofcom is about 2.45 and this means that the typical BT Central bandwidth allocated to a standard IPStream Home 500 end user is 24.5kbit/s.

Table 4.4: Proposed Range of Bandwidths to apply rule - Standard Products

| Product | Min BW (Mbit/s) | Max BW (Mbit/s) |
|-------------|-----------------|-----------------|
| Home 250 | 0.0094 | 0.0156 |
| Home 500 | 0.0188 | 0.0313 |
| Home 1000 | 0.0375 | 0.0625 |
| Home 2000 | 0.0750 | 0.1250 |
| Office 500 | 0.0469 | 0.0781 |
| Office 1000 | 0.0938 | 0.1563 |
| Office 2000 | 0.1875 | 0.3125 |

Consultation Responses

4.106 None of the non-BT respondents, with the exception of Enovi, disagreed with Ofcom's proposed bandwidth ranges for the Standard products.

4.107 In its response BT disagreed with the bandwidth ranges proposed by Ofcom and in particular disagreed with the underlying estimate of bandwidth based on the Contended Bandwidth Adjustment Factor. Ofcom notes that although BT raised the objection, it also recognised the fact that the proposed range of bandwidths has a very small impact on the outcome of the margin calculation.

4.108 Enovi supported BT's consultation response, i.e. that the underlying calculation for bandwidth utilisation (Contended Bandwidth Adjustment Factor) is incorrect.

Ofcom's Response

4.109 As explained previously the Contended Bandwidth Adjustment Factor is calculated in the top-down model using BT's actual and forecast information. Further none of the adjustments that Ofcom made to BT's information had an effect on this value. The Contended Bandwidth Adjustment Factor is therefore not an Ofcom generated estimate it is a BT forecast. It therefore seems strange that BT claims not to agree with this value.

4.110 As previously discussed Ofcom is setting the 'Margin' in relation to BT's products when provisioned by a similarly efficient operator and as such the use of the Contended Bandwidth Adjustment Factor, which represents BT's forecast use of the Standard products, is consistent with this approach.

4.111 Ofcom therefore believes that it is appropriate to use the proposed bandwidth ranges when applying the WBA margin rule to the Standard products.

³⁷ When calculating these values Ofcom rounded the Contended Bandwidth Adjustment Factor to the nearest single decimal point, (ie 2.5)

Consultation Responses

- 4.112 ntl made the comment that the Ofcom proposed range of bandwidths seems reasonable, but that the logic behind having separate bandwidths for CBC and Standard is flawed. The rationale for this comment is that CBC and Standard products both used the same network, the only difference is their pricing structures.

Ofcom's Response

- 4.113 Ofcom accepts that CBC and Standard IPStream products use the same network and that the only difference between them is their pricing structures. However, the pricing structures are likely to have a significant effect on how customers use the products. For instance it seems unlikely that Standard products will be used, in any volume, with a low allocated BT Central bandwidth, as customers would almost certainly purchase the CBC products instead. The purpose of the WBA margin rule is to capture BT's IPStream and BT Central products and how they are generally configured. Ofcom therefore believes that it is reasonable to have different bandwidth ranges for CBC and Standard in order to properly reflect how they will be configured and used in practice.

Consultation Responses

- 4.114 Enovi makes the comment that Ofcom appears to have omitted the effect of the session limits currently imposed by BT. These session limits prevent the BT Central products from being used at the efficiency implied by Ofcom on a single product basis.

Ofcom's Response

- 4.115 This issue appears to be about the allocated BT Central bandwidth ranges over which Ofcom intends to apply the WBA margin rule. The point being that if you divide the BT Central capacity by the lowest allocated BT Central bandwidth that the WBA margin rule is to be applied, particularly for IPStream Standard Home 250 and 500 and CBC Home, then the total number of implied end users exceeds the stated session limits.
- 4.116 Although Ofcom has specified the margin for each IPStream product individually it recognises that BT provides a portfolio of products and that BT's customers can mix these various products on a single BT Central. It is therefore possible that a low bandwidth could be attributed to certain 'entry level products' for the purpose of recovering the BT Central cost. The proposed bandwidth range over which to apply the WBA margin rule is intended to capture this situation, thereby allowing an Altnet to enter the market and compete against such entry level products without needing to replicate BT's product portfolio.

Section 5

WBA Margin Rule

Introduction

- 5.1 In this Section, Ofcom sets out its final decision on regulation of the WBA margin in light of the responses to the Consultation Document and the external review carried out by Analysys and Ofcom's responses to them as set out in Sections 2, 3 and 4.
- 5.2 Ofcom's principal duty in carrying out its functions, as set out in Section 3 of the Communications Act 2003 (the "Act"), is to further the interests of citizens in relation to communications matters, and to further the interests of consumers in relevant markets, where appropriate by promoting competition. Section 4 of the Act sets out Ofcom's duties for the purposes of fulfilling Community obligations. In regard to Ofcom's decision to set the WBA margin as set out below, Ofcom has considered all the requirements in those sections, in particular, the requirement for Ofcom to promote competition in relation to the provision of electronic communications networks and electronic communications services.
- 5.3 As explained in Section 1, Ofcom has determined that BT has SMP in the market for asymmetric broadband origination market in the UK (excluding the Hull area) and the broadband conveyance market in the UK. It has imposed a set of regulatory requirements in those markets whose objective, amongst others, is to promote effective competition in the intermediate services market and ultimately the retail market for broadband internet access. In accordance with this, Ofcom's aim in its decision to set the wholesale broadband access margin as set out in this Section is to promote effective competition in downstream services, in particular in the provision of intermediate services. As at March 2004 in respect of the ADSL segment of that market BT has approximately a 92% share and in the market as a whole (i.e. including the in-house sales for cable operators) BT has approximately a 60 % share. Accordingly, Ofcom considers that the proposed additional regulation is appropriate to promote effective competition in the provision of these services.
- 5.4 In deciding what is the most appropriate way to discharge its duties under section 3 and 4 of the Act is, in relation to setting the WBA margin, Ofcom recognises that there is a trade off between facilitating entry into the market for intermediate services, which should bring consumers the benefits of competition, and encouraging inefficient entry into that market which is likely to raise costs and therefore prices unnecessarily and unduly restrict BT's ability to compete, neither of which would further the interests of consumers. In reaching its final decision Ofcom has considered further how best to resolve this trade off and this is discussed further below.

Option 1 or Option 2?

- 5.5 In the Consultation Document Ofcom set out two broad options for regulation of the WBA margin. Option 1 proposed not to set the margin in advance through a specific rule but to rely on the more general requirement under BT's SMP Condition (EA1) for Network Access charges for the provision of WBA to be reasonable. Option 2 proposed that, in addition to this general requirement, Ofcom would specify in advance the WBA margin and establish a specific rule in accordance with which BT would have to set its charges for ATM interconnection.

- 5.6 Of those respondents who comment directly on this issue, all apart from BT, agreed with Ofcom's view that Option 2 was preferable to Option 1. While BT objects to Ofcom's regulation of WBA in general, it comments specifically, as follows:

"..Notwithstanding any representation which BT may wish to make on the outcome of the broadband market review, BT would be prepared to accept a general obligation to provide services on reasonable request and a broad requirement for wholesale services to be priced on a fair and reasonable basis."

- 5.7 BT does not specifically state why it believes that Option 1 is preferable if the WBA margin is to be regulated but it appears from its response that its main rationale is that it does not believe that Option 2 offers sufficient certainty. In particular, BT argues that Option 2 gives it no certainty as to the likely regulatory approach to its planned product development in the short or long term.
- 5.8 In the Consultation Document, Ofcom recognised that if BT carries out a major change to its IPStream, BT Central or ATM interconnection pricing structure or a new product development relating to these services, then the proposed WBA margin rule could not simply be applied and would have to be reviewed. Therefore the proposal does not provide any certainty of the regulatory approach in such circumstances. However, the alternative approach of relying on ex post investigations would not create any more certainty in such situations. Furthermore, the proposed approach will create more certainty for industry as to the size of the WBA margin than Option 1 in circumstances where there are no major restructuring of the relevant products or prices. As explained in the Consultation Document the key consideration which prompted Ofcom to propose the introduction of the specific WBA margin rule was to give Altnets more certainty regarding the path of ATM interconnection charges if BT chose to change its IPStream or BT Central charges. Ofcom still believes that the proposed WBA margin rule is more likely to achieve this than ex post investigations. Therefore, Ofcom believes that Option 2 continues to be the preferred approach as it is most likely to facilitate the promotion of competition.
- 5.9 Accordingly, under Section 3 of the Act, and as set out in Section 4 of the Act, one of Ofcom's principal duties is to further the interests of consumers in relevant markets, where appropriate by promoting effective competition. By taking Option 1, Ofcom considers that it would not, amongst other things, have adequately discharged its duty to further the interests of consumers by the promotion of effective competition and therefore believes it would be more appropriate to adopt Option 2.

Size of the WBA margin in proposed rule

- 5.10 In the Consultation Document, Ofcom set out various possible results of the margin squeeze test which, in effect, determine the size of the margin in the WBA margin rule. It constructed 9 variants based on different assumptions regarding the contestability assumption and volume assumption. It also considered whether or not migration charges should be included as a further variant of each of those 9 options. Ofcom proposed an approach based on variant 5.
- 5.11 There were a large number of variables used in determining that result. Set out below is Ofcom's position on the key variables underlying variant 5 of the Consultation Document:
- Approximately a 25% share of ADSL subscribers / 2.1 million subscribers in 5 years
 - Contestability (calculated on an adjusted cashflow basis) starting in year 3

- Migration charges excluded
- Historic capex cost adjustment of approximately 58%
- MEA trend on future capex and used in terminal values (5-10%)
- ISH costs included
- VP utilisation – adjustment to reflect historic inefficiencies (10-20%)
- End user port reservation assumption (180-230 end users per VP port)
- Cost of capital (13.5% nominal)
- Time period (5 years)
- Sales and marketing costs (2-3% of revenues)

The results for the margin squeeze test given this approach are set out in Table 5.1 below.

Responses to the Consultation Document

5.12 Respondents disagreed with Ofcom as to which was the most appropriate variant and hence the size of the WBA margin. As indicated above, BT objected to Ofcom's proposals in their entirety. However, of those variants presented by Ofcom, BT indicated a preference for variant 9³⁸ which created a smaller margin to that proposed by Ofcom. Enovi also favoured this variant. By contrast all Altnets expressed the view that Ofcom had specified too small a margin but most did not give a specific view of which of the variants Ofcom had set out was more appropriate. Instead, as set out in Section 2, they disputed Ofcom's approach for the key variables. Of those that did express a specific preference, Telefónica favoured variant 7³⁹ while indicating that it still did not believe it was accurate and Thus also supported that variant.

Ofcom's Response

5.13 Ofcom has responded to the particular points made by respondents on Ofcom's approach to determining the appropriate size of the WBA margin in Sections 2, 3 and 4. As explained fully later in this section, Ofcom believes that the size of the margin it proposed in the Consultation Document is still broadly correct although it has revised its position on 3 key methodological points which mean that the exact result is not precisely the same as that set out in the Consultation Document.⁴⁰

5.14 The results of the margin squeeze test which Ofcom has incorporated into the WBA margin rule are set out in Table 5.1 below. The results are given on a 'pounds per month' basis and a negative result indicates a failure of the test. The first line of results sets out the margin squeeze test results published in the Consultation Document. The second line sets out the final results after modification to certain methodologies but based on ATM interconnection charges and IPStream and BT Central charges which existed at the time the Consultation Document was published. A comparison of these results indicates a small difference in the overall result. Furthermore, in terms of the margin set by Ofcom, the difference is very small. For example, the margin set for Home CBC IPStream products is less than 2% smaller than that proposed in the Consultation Document and is less than 3% smaller for Standard IPStream Home 500 products. The final line of results in the table updates the results for the price

³⁸ Specifically variant 9 assumed 20% market share and year 4 contestability assumption.

³⁹ Specifically variant 7 assumed 20% market share and year 2 contestability assumption.

⁴⁰ The results are also changed to a very small degree following arithmetical corrections carried out as a result of the audit of the model conducted by Analysys. See Table 5.3 and Annex 2 for details.

changes to ATM interconnection and Standard IPStream products which BT has notified since the Consultation Document was published.⁴¹

Table 5.1 Pass/fail margin results (pcm)

| | Home 250 | Home 500 | Home 1000 | Home 2000 | Office 500 | Office 1000 | Office 2000 | Home CBC | Office CBC |
|-----------------------------------------------|-------------|-------------|--------------|--------------|---------------|----------------|----------------|-------------|---------------|
| BT Central BW Allocated (Mbit/s) | 0.0094 | 0.0188 | 0.0375 | 0.0750 | 0.0469 | 0.0938 | 0.1875 | 0.0050 | 0.0250 |
| Con doc results | £0.67 | -£1.00 | £3.99 | £9.06 | -£3.41 | -£5.64 | -£15.00 | -£0.67 | £3.24 |
| Final results (before BT price changes) | £0.73 | -£0.88 | £4.23 | £9.56 | -£3.10 | -£5.02 | -£13.77 | -£0.65 | £3.37 |
| Final results (after BT price changes) | £1.71 | £0.10 | £5.21 | £10.54 | £0.24 | £0.51 | £0.93 | £0.33 | £4.35 |

Modifications to Ofcom's Approach

5.15 As set out above in paragraph 5.11, Ofcom constructed its variant 5 approach from a set of particular assumptions to the key variables in the margin squeeze test model. Following the responses to the Consultation Document and the external review conducted by Analysys, Ofcom has reassessed its position on each of these variables. As discussed in detail in Section 2 and Section 3, it believes that for all but 3 of those variables the approach it set out in the Consultation Document is reasonable. However in relation to the historic cost adjustment, contestability assumption and the volume assumption it is more appropriate to amend the approach slightly. The modification to Ofcom's approach to these variables and its rationale is set out below.

Historic cost adjustment

5.16 This is the adjustment made to BT's actual capital expenditure costs which are included in the calculation of the WBA margin. As explained in paragraphs 2.84 – 2.104 of Section 2, Ofcom believes that it is necessary to reduce the value of BT's actual costs to ensure that the costs incorporated in the model are consistent with Ofcom's conceptual approach. This is to determine the margin on the basis of an operator entering the market today and not when BT entered. Operators entering today will be able to invest less than BT did as a result of the fall in MEA prices.

5.17 In the Consultation Document Ofcom proposed a particular way of calculating the necessary adjustment which resulted in BT's historic capex costs being reduced by 58%. As set out in detail in paragraphs 2.93 – 2.97 of Section 2 most respondents, while accepting the need for such an adjustment, queried Ofcom's proposed method of calculation. Furthermore, Analysys in its review of the methodologies used by Ofcom questioned the basis for the difference in the assumption of the MEA trend for historic years which was implicit in the 58% adjustment and MEA trend going forward and suggested that the latter would provide an alternative way for estimating the historic cost adjustment. In the light of these comments, Ofcom has reconsidered its position on this variable. As set out in paragraph 2.92 of Section 2, it now believes that the suggestion made by Analysys provides a better way of estimating the appropriate size of the necessary historic cost adjustment as it is more internally consistent. As set out in Table 5.3 below the effect of this change is to increase BT's failure of the margin squeeze test by £0.30 for the Standard IPStream Home 500 product (after BT's latest notified price changes).

⁴¹ The price change for the ATM interconnection EUA was notified on 1 June 2004 and became immediately and price changes to Standard IPStream Office products were notified on 3 August 2004 and become effective on 1 September 2004.

Contestability Assumption

5.18 In the Consultation Document, Ofcom set out a range of possible approaches to determining the most appropriate contestability assumption. As explained in paragraphs 2.147, 2.159 – 2.163 of Section 2 this has proved to be a very important issue for respondents particularly because of the sensitivity of the results to the particular assumption used. In addition the external review by Analysys has raised some questions about how best to model this variable. Accordingly, as explained in detail in Section 2, Ofcom has undertaken further work to investigate how best to determine the appropriate magnitude of the contestability assumption.

5.19 As a result of this further consideration Ofcom has constructed 12 contestability scenarios by varying the 3 key parameters:

- The year in which contestability is assumed to begin: year 2 or year 3 or year 4
- Modelling approach to cashflows used: adjusted cash flow versus true cash flow approaches
- Cost reductions included: all cost reductions included versus only cost advantages to future entrants (proxied by using only IP layer cost reductions)

5.20 These parameters are explained in full at paragraphs 2.142 – 2.158 of Section 2. Ofcom has quantified the effect of these 12 scenarios and these are presented in Table 5.2 and Figure 5.1 below.⁴²

Table 5.2 Results of contestability scenarios

| Product <i>BT central BW allocated</i> ⁴³ | | Home 500 0.0188 | Home CBC 0.0050 |
|---------------------------------------------------------|-----------|--------------------|--------------------|
| | Scenarios | | |
| Year 2 (CCF-ATM in) | 1 | -£2.70 | -£1.19 |
| Year 2 (TCF-ATM in) | 2 | -£1.83 | -£0.68 |
| Year 3 (CCF-ATM in) | 3 | -£1.30 | -£0.55 |
| Year 2 (CCF-ATM out) | 4 | -£1.24 | -£0.52 |
| Year 2 (TCF-ATM out) | 5 | -£0.75 | -£0.30 |
| Year 3 (TCF-ATM in) | 6 | -£0.73 | -£0.31 |
| Year 4 (CCF-ATM in) | 7 | -£0.66 | -£0.27 |
| Year 3 (CCF-ATM out) | 8 | -£0.56 | -£0.25 |
| Year 4 (TCF-ATM in) | 9 | -£0.30 | -£0.12 |
| Year 3 (TCF-ATM out) | 10 | -£0.28 | -£0.15 |
| Year 4 (CCF-ATM out) | 11 | -£0.23 | -£0.11 |
| Year 4 (TCF-ATM out) | 12 | -£0.05 | -£0.04 |
| arithmetical average | | -£0.89 | -£0.37 |

CCF Cumulative Cash Flow

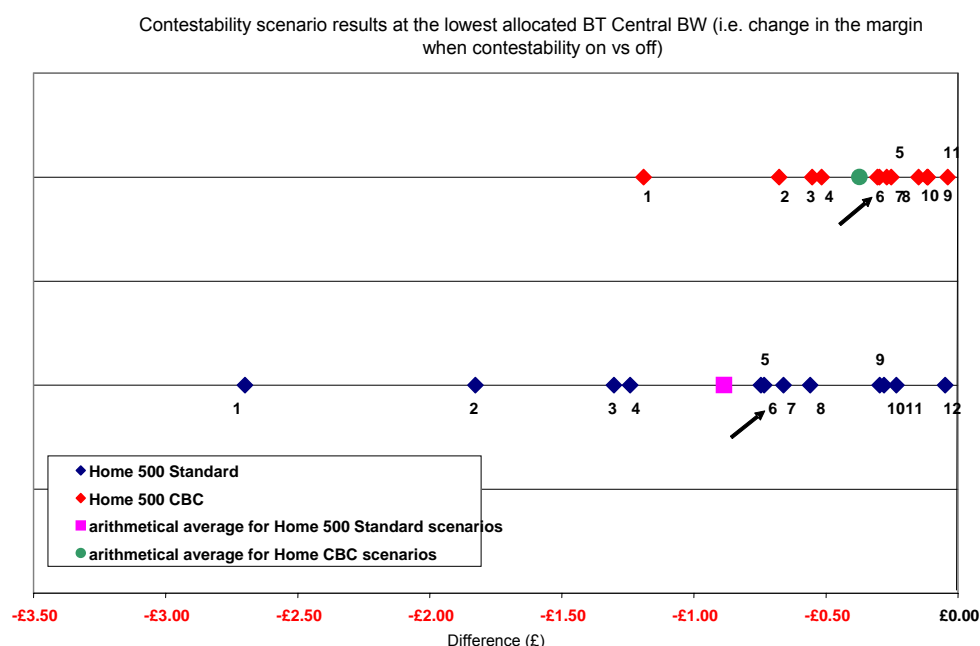
TCF True Cash Flow

ATM in Unit on-going cost reductions in ATM interconnection costs included in contestability calculations

ATM out Unit on-going cost reductions in ATM interconnection costs excluded from contestability calculations

⁴² As discussed in Section 4 the effect of the contestability assumption is composed of a fixed part and a part that varies with allocated bandwidth. For different contestability scenarios the magnitude of these fixed and variable parts will change. It is, however, also possible that the relativities between the fixed and variable parts will also change. Therefore, some contestability scenarios will be more sensitive to allocated bandwidth than others. This can be seen in the table by the differing relative effects of the various contestability scenarios on the Standard and CBC products, when different bandwidths have been allocated.

⁴³ The results are presented at the allocated bandwidth which is the binding constraint given today's prices.

Figure 5.1 Results of Contestability Scenarios

5.21 The purpose of constructing these scenarios is to provide a broader base of results than was available at the time of the Consultation Document from which to determine the appropriate magnitude of the impact of the contestability assumption on the current margin. As explained in paragraph 2.149 of Section 2, Ofcom does not believe that it is possible to say for certain that a particular contestability scenario is the correct scenario for the purpose of determining the outcome of the margin squeeze test. Rather, by considering a broad range of results, Ofcom believes it is possible to select a particular contestability scenario on the basis that it provides a representative view of the impact of contestability on the current WBA margin.

5.22 Having considered the results set out in Figure 5.1, Ofcom has selected scenario 6 as yielding a representative result. It is one of the 4 scenarios which cluster together close to the simple arithmetical average of the results and of those results scenarios 5 and 6 are very close together. It makes little difference which of these scenarios is used. However, on balance Ofcom has selected scenario 6 to construct the WBA margin rule. The slight preference for scenario 6 over the other scenarios in the cluster is that it is not at either edge of the cluster (unlike scenarios 5 and 8) and is a little closer to the arithmetical average than scenario 7 in the case of the Standard IPStream products. Scenario 6 assumes contestability is calculated on a true cash flow basis reflecting all cost reductions and that it is introduced into the calculation after year 3. Ofcom believes that this revised approach to contestability is more appropriate than that set out in the Consultation Document. The Consultation Document approach is scenario 3 and as can be seen from Figure 5.1 that approach tends to be more of an outlier compared to a number of other scenarios, including scenario 6. Table 5.3 below sets out the effect of this change, which is to reduce BT's failure of the margin squeeze test by £0.55 for the Standard IPStream Home 500 product.

Volumes Assumption

5.23 In the Consultation Document Ofcom indicated a range of possible volumes to use in determining the result of the margin squeeze test which was 1.7 m subscribers (approx

20% share of ADSL subscribers) to 2.5m subscribers (approximately 30% share of ADSL subscribers). As indicated above, in deriving its proposals Ofcom used 2.1m subscribers (approximately 25% share of ADSL subscribers).

- 5.24 As explained in paragraphs 2.72 – 2.76 of Section 2, a number of respondents argued that Ofcom's volume assumption was too high. In particular they argued that no account had been taken of the fact that a significant proportion of ADSL subscribers was likely to be captive to BT given its vertical integration. That is to say that BT's downstream arm (e.g. BT Retail) is very unlikely to purchase a wholesale service (i.e. IPStream) from anyone other than BT. As set out in Section 2, Ofcom believes that there is some merit in this view and accordingly a lower volume assumption than that set out in the Consultation Document should be used, otherwise there is too great a risk that Ofcom will not achieve its objective of promoting competition in broadband intermediate services. Accordingly, Ofcom has used the lower figure from the range of volumes it set out in the Consultation Document. As set out in Table 5.3 below the effect of this change is to worsen the pass/fail margin squeeze test by £0.14 for the Standard IPStream Home 500 product. Ofcom believes that this revised assumption is appropriate as it strikes an appropriate balance between, on the one hand guarding against the risk of encouraging inefficient entry, and on the other, pursuing the objective of promoting competition in the provision of intermediate services.

Quantification of the impact of the modifications

- 5.25 Table 5.3 below sets out the quantification of the impact of these 3 modifications.

Table 5.3 Impact of Modified Parameters

| Parameter modified | Impact Standard Home 500 (pass/fail margin £ per month) |
|----------------------------------------------------|---------------------------------------------------------------|
| Historic cost adjustment | -£0.30 |
| Contestability variable | £0.55 |
| Volumes | £-0.14 |
| Sub total (impact of methodological modifications) | £0.11 |
| Arithmetical corrections (Analysys audit) | £0.02 |
| Total impact | £0.13 |

- 5.26 Table 5.3 shows the impact of the changes for the case of the Standard IPStream 500 product relative to the position at the time of the Consultation Document when Ofcom proposed a margin squeeze test which had a -£1.00 result (i.e. BT failed by £1.00 for the Standard IPStream Home 500 product at the prices in effect at that time). The overall impact of the changes, including the arithmetical corrections, means that the result of the test for this product is now: $-£1.00 + 0.13 = -£0.87$ (see Table 5.1 above).⁴⁴

Conclusion

- 5.27 Having considered all the responses made to the Consultation Document and the points made as a result of the external review, Ofcom has concluded that it should, as proposed in the Consultation Document, set the WBA margin but do so on the basis of a margin squeeze test which is modified from that set out in the Consultation

⁴⁴ The actual number in Table 5.1 is -0.88. the difference is caused by rounding when each change is taken in turn.

Document (See Table 5.1 above). As explained above, those differences arise from modifications to three key assumptions in the margin squeeze test. Ofcom believes that its revised approach to these assumptions is more appropriate than those set out in the Consultation Document. The changes will ensure Ofcom sets the WBA margin in a way which most effectively discharges its duties under Sections 3 and 4 of the Act and, in particular, promotes competition in broadband intermediate services while minimising the risk of inefficient entry and unduly restricting BT's ability to compete by preventing it from pricing down to its genuine cost floor.

- 5.28 Accordingly, Ofcom confirms the draft Direction set out in the Consultation Document but with minor amendments to reflect the revised outcome to the margin squeeze test. The draft Direction has also been amended to reflect a slightly different approach to implementing a specific rule for the WBA margin and this is discussed in paragraphs 5.43 – 5.47 below.
- 5.29 Ofcom considers that the proposals contained in the Direction meet the tests set out in Section 49 of the Act.
- 5.30 Ofcom considers that the proposals are *objectively justifiable* in relation to wholesale broadband access and Ofcom's aim of promoting effective competition in the market for intermediate broadband services, as they would potentially allow other operators to compete with BT in offering intermediate services.
- 5.31 Ofcom also considers that the proposals *do not unduly discriminate* against particular persons, as the same WBA margin will apply to all purchasers of ATM interconnection. In addition, the proposals do not unduly discriminate against BT in that although they only apply to BT, they are intended to address BT's ability to margin squeeze in the light of its SMP in the markets to which the Direction applies. As explained in the WBA market review statement, Ofcom has not imposed a specific requirement on Kingston Communications⁴⁵ to provide ATM interconnection because to date there has been no demand for such a service.
- 5.32 The Direction sets out clearly the requirements imposed on BT and therefore it meets the requirements of *transparency*. Ofcom has ensured throughout the consultation process the industry, wherever possible, had clarity as to Ofcom's proposals, including Ofcom publishing a Supplementary Note and commissioning a study by Analysys. Ofcom also considers that those requirements are transparent in relation to what they are intended to achieve, for example, to ensure effective competition in intermediate broadband services.
- 5.33 Ofcom considers that setting the margin in the way outlined in this Statement, and setting the basis on which the margin is calculated, are the least intrusive ways of achieving Ofcom's aim of promoting competition in intermediate services and other downstream services, compared to other alternatives considered such as setting a larger margin or requiring BT to introduce cost based pricing. Therefore, the obligations set out in the Direction are *proportionate* to what Ofcom intends to achieve.

Relative CBC and Standard Results

- 5.34 As can be seen from Table 5.1, in these final results, as with the results presented in the Consultation Document, Home CBC IPStream products fail to a lesser degree than Home Standard IPStream products. As a number of respondents to the Consultation Document stated that they believed this was a counter-intuitive result, Ofcom has set

⁴⁵ which has been designated as having SMP in the market for asymmetric broadband origination in the Hull area. See the market review statement for further details.

out in this section the reasons for the relative failures between Home CBC IPStream and Standard IPStream products.

- 5.35 The reason given by respondents for why they believe that CBC IPStream products should fail by more than Standard IPStream products is because the CBC IPStream products have lower prices. However, this is not strictly true. The fact is that CBC IPStream and Standard IPStream have different pricing structures and this not only complicates a price comparison it also results in the natural separation of different customers based on their usage patterns.
- 5.36 Ofcom recognises that a lower price (per end user) can be achieved by the CBC IPStream product when the BT Central element is heavily overbooked, i.e. allocating less average bandwidth per end user. Conversely, the CBC IPStream product is actually more expensive than the standard product (per end user) when the BT Central element is not so heavily overbooked. Given these pricing choices it seems reasonable to assume that customers who intend to heavily overbook the BT Central element will elect to purchase CBC IPStream, whereas customers who intend to less heavily overbook the BT Central element will elect to purchase Standard IPStream. This natural separation of different customers is exactly what is implied by BT's forecast information.
- 5.37 In terms of the core network (VPs and IP), the CBC IPStream pricing structure can therefore be considered to be de-averaged, i.e. each customer pays for the capacity they use, whereas the Standard IPStream pricing structure is averaged, i.e. each customer pays for the average capacity used. It is therefore necessary to determine the average capacity used by the Standard IPStream products. Based on BT's forecast information the average BT Central bandwidth allocated to each end user is; 2.4538 (the 'Contended BW Adjustment Factor') multiplied by the contended bandwidth for the product. Thus the average BT Central bandwidth allocated to a Standard IPStream Home 500 end user is ~24.5kbit/s.
- 5.38 It is worth noting that for the Standard IPStream Home 500 product, CBC IPStream offers a lower price (per end user) when less than about 23kbit/s of BT Central bandwidth is allocated. Given the natural selection characteristics of the CBC and Standard IPStream pricing structures it is therefore consistent that the average BT Central bandwidth allocated to a Standard IPStream Home 500 end user is slightly higher than 23kbit/s.
- 5.39 Several respondents commented that because CBC and Standard IPStream products share the same network, their underlying costs must be the same. Ofcom agrees with this view. Indeed as explained in the Consultation Document, Ofcom considers the Standard IPStream products can be characterised as pre-dimensioned forms of the CBC IPStream product. Therefore, when formulating the WBA margin rule Ofcom determined a 'single' cost for the core network and this was expressed as a function of allocated bandwidth. This core network cost is applied to all products in an identical manner when assessing the pass/fail level.
- 5.40 In order to make a valid comparison between CBC and Standard IPStream products, within the WBA margin rule, it is essential that both are dimensioned in the same way and this can be achieved by setting the allocated bandwidth for CBC IPStream to be equal to the average allocated bandwidth for the Standard products, see above. If CBC IPStream is dimensioned to be the same as Standard IPStream Home 500 (i.e. allocate ~24.kkbit/s) then the cost stack for CBC IPStream and Standard will be identical. Any difference in the pass/fail level between these two products must therefore be equal to any difference in the price (see Table 5.4 below). At ~24.5kbit/s

of allocated bandwidth, the CBC IPStream product is about 40p (pcm) more expensive than the Standard product. It therefore follows that the CBC IPStream product is more likely to pass the margin test by about 40p which is reflected in the results of the WBA margin rule.

Table 5.4: Comparison of Standard and CBC Costs and Revenues

| | Stn Home 500 | CBC Home |
|----------------------------------|---------------------|-----------------|
| Allocated BT Central BW (Mbit/s) | 0.024546 | 0.0245 |
| Costs | | |
| Total ATM cost | £10.64 | £10.64 |
| Total additional cost | £3.36 | £3.36 |
| Total contestability factor | £0.73 | £0.73 |
| Total costs | £14.73 | £14.73 |
| Revenue | | |
| IPStream connection revenue | £1.06 | £1.06 |
| IPStream rental revenue | £12.74 | £8.23 |
| BT Central connection revenue | £0.19 | £0.19 |
| BT Central rental revenue | £0.85 | £5.75 |
| Total Revenue | £14.84 | £15.24 |
| Pass/Fail Level | £0.11 | £0.51 |

5.41 The comparison in Table 5.4 is made when the allocated BT Central bandwidth is set to ~24.5kbit/s. However, it appears that when commenting on this issue the respondents compared the price of CBC and Standard IPStream Home 500 when a lower BT Central bandwidth is allocated, probably less than 20kbit/s. As recognised above CBC IPStream prices are lower than Standard when dimensioned in this way. The respondents then seem to conclude that CBC IPStream should fail the WBA margin rule to a greater extent than Standard IPStream, as the two services are technically identical but CBC IPStream yields less revenue. The inconsistency with this comparison is that the respondents are comparing the Standard IPStream product, with its averaged price, at a point that does not represent the average network capacity used. Further, the point at which respondents have chosen to make the comparison is not self consistent, as they are assuming that the Standard IPStream product will be used at these lower allocated bandwidths, whereas at the same time they recognise that at this point the CBC IPStream products are available at a lower price. As discussed above the natural selection characteristics of the different pricing structures would suggest that the Standard IPStream products will predominantly be used at higher allocated bandwidths.

5.42 Ofcom is aware of the interest in CBC IPStream and recognises that it will be the more important product going forward. It therefore seems reasonable to conclude that the bandwidth allocated on a typical CBC IPStream product will be less than the average allocated bandwidth associated with the Standard products. Further, due to the de-averaged pricing structure of the CBC IPStream product it can be considered as a continuous series of Standard IPStream products. Ofcom was keen to ensure that the WBA margin rule fully captured the CBC IPStream products and how they may be used going forward and believes that this can be achieved by applying the WBA margin rule across a range of allocated bandwidths. The revised proposed range of bandwidths is set out in paragraph 4.100 of Section 4.

⁴⁶ The precise allocated bandwidth is the product of the Contended Bandwidth Adjustment Factor and the contended bandwidth associated with the IPStream Standard Home 500 product.

Implementation and Revised Direction

- 5.43 The Direction will modify the Original ATM Direction. In addition to setting out the WBA margin rule, other revisions have also been made to the Original ATM Direction in order to ensure that the WBA margin rule is enforceable. The definition of the Basic Services has been revised to take into account the specific ATM interconnection products now offered by BT, and the current terminology used to describe them, to ensure that the margin squeeze rule can be implemented.⁴⁷
- 5.44 Since Ofcom proposes not simply to determine whether or not BT passes the margin squeeze test but to set the WBA margin, it has been necessary for Ofcom to set out in the Direction a set of formulae which will fix BT's ATM interconnection charges in relation to its IPStream and BT Central prices on the basis of the results of the margin squeeze test as described above. Those formulae comprise the WBA margin rule. The Direction is set out in Annex 3.
- 5.45 In order to create the WBA margin rule which is implemented in the Direction Ofcom created the usage factor model. This is described in detail in Section 4 and it sets out the basic relationship in accordance with which BT will have to set its charges for ATM interconnection. As explained in detail in Section 4, Ofcom has modified the formulae which are contained in the usage factor model since the Consultation Document and the Direction reflects those changes. These changes do not affect the outcome of the WBA margin rule but rather how it is expressed. They have been made to ensure that the WBA margin rule is firstly more transparent, since it will facilitate industry in identifying the corresponding components, and secondly it is more flexible, since it will allow BT more discretion to make changes to its pricing structures for IPStream without requiring the WBA margin rule to be reviewed.
- 5.46 In order to assist the industry in understanding the WBA margin rule, a full list of all the factors discussed in Section 4 is given in Part 4 of the draft Direction at Annex 3. Ofcom has also produced an excel workbook that contains all the factors and all the current prices. This workbook also calculates all the costs stacks and revenues as described above in Section 4. This is available for download on the Ofcom website (see Annex 6).
- 5.47 The Direction will take effect on the day it is published. However, as BT chose to notify changes to its ATM interconnection charges and IPStream charges following publication of the Consultation Document, on the basis of these notified prices, BT is not required to notify any further price changes at this stage. Table 5.1 gives the results to the margin squeeze test taking into account BT's new charges.

Discontinuation of continued Interconnection Directions

- 5.48 As explained at paragraph 5.9 of the WBA Market Review, interconnection Directions 11 and 42, as identified in the Discontinuation Consultation and Statement documents (see paragraph 5.12 of the WBA Market Review), and set out below, were continued in relation to the asymmetric broadband origination market and broadband conveyance market for BT on 25 July 2003.
- **Interconnection Direction 11** – xDSL interconnection – 2 March 2001 (the First Direction) - This Direction was made by the Director under Condition 9.2 of the Public Telecommunications Licence granted to BT regarding xDSL interconnection and under Regulation 6(3) and 6(4) of the Telecommunications (Interconnection) Regulations 1997.

⁴⁷ None of the respondents commented on these other changes

- **Interconnection Direction 42** – xDSL interconnection – 14 June 2002 (the Second Direction) - This Direction was made to resolve a dispute between BT, Energis and Thus concerning xDSL interconnection at the ATM switch under Condition 9 & Regulation 6(6) of the Telecommunications (Interconnection) Regulations 1997.

For both Direction references, see

(<http://www.ofcom.org.uk/static/archive/oftel/publications/broadband/dsl/atmi0602.pdf>).

- 5.49 The Second Direction arose out of the requirement placed on BT in the First Direction to enter into negotiations with the Operators to secure adequate interconnection with BT's xDSL products at the ATM level of BT's network. It required BT to conclude negotiations with the Operators for ATM level interconnection within six weeks of the date on which it was issued but they were unable to reach such an agreement and a dispute was brought to the Director to resolve. Also, those continued Interconnection Directions cover in part the regulation of Symmetric Digital Subscriber Line services. As the Leased Line market review has concluded these no longer need to apply those parts can be discontinued at the same time.
- 5.50 Paragraph 22 (9) of Schedule 18 to the Act imposes a duty on Ofcom, as soon as reasonably practicable after continuing an Interconnection Direction, to take the necessary steps to enable it to decide whether or not to set a condition (including a SMP condition) for the purpose of replacing the continued obligation. When it has done so, paragraph 22 (10) of Schedule 18 to the Act requires Ofcom to revoke the Interconnection Direction, and Ofcom must do this as soon as reasonably practicable after taking a decision to impose (or not to impose) conditions under the new regime.
- 5.51 Although the part of the xDSL Interconnection Directions concerning the provision of ATM interconnection was replaced by the Original Direction, Ofcom had yet to put in place the specific charge for the provision of ATM interconnection that is also addressed by the continued Interconnection Directions. Therefore, Ofcom did not discontinue continued Interconnection Directions 11 and 42. Rather, Ofcom in the WBA Market Review stated that it would, where appropriate, wait to do so until after the conclusion of Ofcom's consideration of setting the margin. Therefore, as Ofcom has now concluded its consideration of setting the margin, Ofcom includes in this Statement at Annex 4 the Discontinuation Notices to discontinue Interconnection Directions 11 and 42.

Forward look

- 5.52 The purpose of proposing this Direction is to give industry more certainty regarding the WBA margin. Therefore ideally Ofcom would not wish to review the margin set until the next WBA market review, currently proposed for completion by the end of 2005. In revisiting the issues of market definition and market power assessment Ofcom will have the opportunity to assess whether the remedies imposed as a result of the first market review have been effective and proportionate in addressing BT's SMP in the markets identified. In particular, Ofcom will look at the level and nature of market entry. Promoting competition is not just about increasing the number of players in the market, but about the terms of competition and the extent to which the players are competing on a level playing field. In deriving the WBA margin rule Ofcom has struck a balance between different considerations. On the one hand, an objective is to promote competition, because of the dynamic benefits to economic efficiency and consumers that it can deliver. On the other hand, Ofcom has taken account of the risk of encouraging inefficient entry (i.e. entrants that have higher costs). A margin which is set too wide and which encourages inefficient entry would have undesirable

consequences, because of the losses to static economic efficiency that can result. As noted in paragraph 2.6, Ofcom has struck this balance in the context of its current view that ATM interconnection is largely a transitional product. The way in which this balance should be struck will be considered at the time of the next market review in the light of the developments in WBA and other related markets, such as LLU.

- 5.53 It should, however, be noted that it may be necessary to review the Direction (or parts of it) prior to the next market review if there is a material change to the structure of either the ATM interconnection charges or the IPStream charges. For example, BT's proposals to introduce usage based charging may prompt Ofcom to revisit this issue before the next market review. To the extent possible Ofcom would try to limit the scope of any such interim review so that the fundamental approach reflected in this Statement would continue to be used.
- 5.54 As set out in paragraph 6.9 of the WBA market review, Ofcom expects that as the market develops changes in the regulation of broadband origination will be needed. If at some stage in the future, local loop unbundling provided effective competition in broadband origination then Ofcom considers that it may be appropriate to relax, to some extent, the regulation of ATM interconnection (or its equivalent). However, the growth of unbundling is unlikely to be uniform and it might be expected that it would be more effective in some areas (e.g. in more densely populated urban areas) whilst less effective in others. In such a scenario ATM interconnection will play a transitional role and it may be appropriate for Ofcom to consider some form of deregulation of ATM interconnection (or its equivalent) only in areas where LLU has become effective. Ofcom considers, however, that the regulation of ATM interconnection may continue to be important in areas where LLU-based competition has not emerged. It is therefore likely that in order to achieve national coverage for retail services, operators will need to buy a combination of ATM interconnection and unbundled local loops from BT.

Annex 1

List of Respondents

AOL

BT

Broadband Industry Group (BIG)

Cable & Wireless

Energis

Enovi *

European Commission

Gamma Telecom

ntl

Telefónica

Tiscali

Thus

UK Competitive Telecommunications Association

Viatel

Wanadoo

* The Enovi response was submitted on behalf of the following organisations: Enovi LLP, Mailbox Internet Ltd, Community Internet PLC, Sandco 684 Ltd T/A Onyx Internet, KeConnect Group, NDO limited, Abel Internet, UKFSN/UKPOST.COM/JustADSL and Brightview. Ofcom separately received emails from the following organisations stating that they supported this response: Comline Networks Ltd, Fast.co.uk, FastNet International Ltd and Zen Internet.

Annex 2

External review by Analysys

[Link to pdf here](#)

Annex 3

Direction modifying a Direction made under section 49 of the Communications Act 2003 and Condition EA1 imposed on British Telecommunications plc ('BT') as a result of the market power determinations made by OFCOM that BT has significant market power in the asymmetric broadband origination in the United Kingdom (excluding the Hull Area) and broadband conveyance markets in the United Kingdom

WHEREAS:

- A. As a result of a market analysis carried out by OFCOM, they proposed on 16 December 2003 in accordance with sections 48(2) and 80 of the Act that British Telecommunications plc ('BT') has significant market power in the asymmetric broadband origination (excluding the Hull Area) and broadband conveyance markets in the United Kingdom;
- B. OFCOM having considered every representation duly made and thereafter on 13 May 2004 pursuant to sections 48(1) and 79 of the Act by way of publication of a Notification identified the relevant services markets, made market power determinations to the effect referred to in recital (A) above and set certain SMP conditions on BT to take effect on 13 May 2004, such as Condition EA1, imposing obligations concerning among other things the provision of Network Access;
- C. On 13 May 2004 OFCOM also gave a direction under SMP Condition EA1 pursuant to section 49 of the Act which obliged BT to provide the Basic Services to any Third Party on reasonable request and at reasonable terms, conditions and charges (the 'Original Direction');
- D. this modified Direction concerns matters to which Condition EA1.1 and EA1.2 relate, and modifies the Original Direction;
- E. for the reasons set out in Section 5 of the explanatory statement accompanying this modified Direction, OFCOM are satisfied that, in accordance with section 49(2) of the Act, this modified Direction is:
 - i. objectively justifiable in relation to the networks, services, facilities, apparatus or directories to which it relates;
 - ii. not such as to discriminate unduly against particular persons or against a particular description of persons;
 - iii. proportionate to what it is intended to achieve; and
 - iv. in relation to what it is intended to achieve, transparent.
- F. for the reasons set out in Section 5 of the explanatory statement accompanying this modified Direction, OFCOM have considered and acted in accordance with the six Community requirements set out in section 4 of the Act and their duties in section 3 of the Act.
- G. on 27 May 2004 OFCOM published a Notification of the proposed modified Direction in accordance with section 49 of the Act and on 29 June 2004 published a supplemental note ('Supplementary Note') to that Notification;

- H. by virtue of section 49(9) of the Act, OFCOM may give effect to the proposal set out in the Notification, with or without modification, only if:
- they have considered every representation about the proposal that is made to them within the period specified in the notification; and
 - they have had regard to every international obligation of the United Kingdom (if any) which has been notified to them for this purpose by the Secretary of State;
- I. OFCOM received responses to the Notification and have considered every such representation made to them in respect of the proposals set out in the Notification and accompanying Consultation Document and Supplementary Note and the Secretary of State has not notified OFCOM of any international obligation of the United Kingdom for this purpose; and

Therefore, pursuant to section 49 of the Act and Condition EA1 in Schedule 1 to The Notification, OFCOM give the following Direction:

1. The Dominant Provider shall provide Basic Services as specified in Part 1 to this Direction to every Third Party who reasonably requests in writing such Basic Services.
2. The Dominant Provider shall provide Additional Functionality as specified in Part 2 to this Direction to every Third Party who reasonably requests in writing such Additional Functionality.
3. Without prejudice to paragraph 4 below, the provision of Basic Services and Additional Functionality covered by paragraphs 1 and 2 above shall occur as soon as reasonably practicable and shall be provided on fair and reasonable charges, terms and conditions.
4. The Dominant Provider shall make a charge for the provision of the Basic Services covered by paragraph 1 above to every Third Party who reasonably requests such in writing which is no greater than the charge resulting from the application of the formula set out at Part 3.
5. BT shall not impose any sharing constraints on the number of End-Users on a virtual path (VP).
6. The Parts to this modified Direction form part of the modified Direction.
7. For the purpose of interpreting this modified Direction the following definitions shall apply:

“Act” means the Communications Act 2003;

“Additional Functionality” means Alternative ATM Service Catalogues (VBR-rt, CBR);

“Additional Cost” means the costs as specified in Part 4;

“ADSL Enabled EUA” means an EUA which uses asymmetric DSL, where the bit rate of transmission differs for traffic sent from the End User (upstream) and for traffic sent to the End User (downstream);

“ATM Backhaul” means that part of the Virtual Path between the DSLAM and the first ATM Switch to which that DSLAM is connected within the network;

"ATM Conveyance" means that part of the Virtual Path between two or more ATM switches;

"ATM Interconnection" means interconnection at the Asynchronous Transfer Mode ("ATM") switch;

"ATM interconnection Charges" means charges for the Basic Services;

"Basic Services" means an ADSL Enabled EUA and ATM Backhaul (Service A); and/or an ADSL Enabled EUA, ATM Backhaul and ATM Conveyance (Service B) as required by a Third Party;

"Bandwidth" means transmission capacity measured in Mbit/s;

"BT" means British Telecommunications plc, whose registered company number is 1800000, and any British Telecommunications plc subsidiary or holding company, or any subsidiary of that holding company, all as defined by Section 736 of the Companies Act 1985 as amended by the Companies Act 1989;

"BT Central" means the service as defined at Part 5;

"BT Central Plus" means the service as defined at Part 5;

"CBC" means Capacity Based Charging as defined at Part 5;

"CBR" means Constant Bit Rate;

"Contestability Assumption Factor" means an adjustment factor as specified in Part 4;

"Director" means Director General of Telecommunications as appointed under section 1 of the Telecommunications Act 1984;

"Dominant Provider" means British Telecommunications plc, whose registered company number is 1800000, and any British Telecommunications plc subsidiary or holding company, or any subsidiary of that holding company, all as defined by Section 736 of the Companies Act 1985 as amended by the Companies Act 1989;

"DSL" means Digital Subscriber Line;

"DSLAM" means Digital Subscriber Line Access Multiplexer;

"EUA" means End User Access - that part of the network which is the DSL connection between the End User and the DSLAM. This includes the situation: where the Dominant Provider supplies and installs the End User modem; and where the supply and installation of the End User modem is not carried out by the Dominant Provider;

"Hull Area" means the area defined as the 'Licensed Area' in the licence granted on 30 November 1987 by the Secretary of State under section 7 of the Telecommunications Act 1984 to Kingston upon Hull City Council and Kingston Communications (Hull) plc;

"IPStream" means the service as defined at Part 5;

"Revenue Adjustment Factors" means the adjustment factors as specified in Part 4;

"The Notification" means the notification of confirmation of proposals under sections 49 (2) and 80 of the Communications Act 2003 for identifying inter alia the markets for

asymmetric broadband origination in the United Kingdom (except the Hull Area) and broadband conveyance in the United Kingdom for the purpose of making proposed market power determinations that the Dominant Provider has significant market power in relation to those markets as annexed to the Consultation Document accompanying this Direction;

“Third Party” means either:

- a. a person providing a Public Electronic Communications Network; or
- b. a person providing a Public Electronic Communications Service;

“Usage Factors” means an adjustment factor as specified in Part 4;

“VBR-nrt” means Variable Bite Rate – non-real time;

“VBR-rt” means Variable Bite Rate – real time;

“Virtual Channel, VC” means an established data channel from the End User to the point of Network Access with a Communications Provider’s network;

“Virtual Path, VP” means an established path from the DSLAM through the network to the point of Network Access with a Communications Provider’s network;

8. Except insofar as the context otherwise requires, words or expressions shall have the meaning assigned to them in this Notification (including in the Parts) and otherwise any word or expression shall have the same meaning it has in The Notification (including in the Annexes) and otherwise any word or expression shall have the same meaning as it has in the Act.
9. For the purpose of interpreting this modified Direction:
 - a. headings and titles shall be disregarded; and
 - b. the Interpretation Act 1978 shall apply as if this Direction were an Act of Parliament.
10. This modified Direction shall take effect on the day it is published.

Andrew Heaney
Director of Competition Policy

A person authorised by OFCOM under paragraph 18 of the Schedule to the Office of Communications Act 2002

26 August 2004

Part 1

Basic Services

Basic Services shall be composed of

- An ADSL Enabled EUA and ATM Backhaul (Service A); and/or
- An ADSL Enabled EUA, ATM Backhaul and ATM Conveyance (Service B)

as required by the Third Party.

ADSL Enabled EUA

ADSL Enabled EUAs shall be available with the data rates identified in Table 1. The data rates listed in Table 1 are the ATM cell rate, including headers.

Table 1: ADSL Enabled EUA data rate options

| EUA Option | Upstream speed (kbit/s) | Downstream speed (kbit/s) |
|-------------------|--------------------------------|----------------------------------|
| 500 | 64-288 (rate adaptive) | 576 |
| 1000 | 288 | 1152 |
| 2000 | 288 | 2272 |

ATM Backhaul

ATM Backhaul shall be available in the following capacities: 0.25, 0.5, 1, 2, 3, 4, 5, 6, 7, 8, 9 and 10 Mbit/s and with a VBR-nrt class of service.

ATM Conveyance

ATM Conveyance shall be available in the following capacities: 0.25, 0.5, 1, 2, 3, 4, 5, 6, 7, 8, 9 and 10 Mbit/s and with a VBR-nrt class of service.

Part 2

Additional Functionality - Alternative ATM Service Categories

In addition to the ATM service category provided with the basic services (VBR-nrt), VBR-rt and CBR service categories shall also be made available. The ATM service categories are applicable to both the virtual channel (VC) and virtual path (VP).

Part 3

Formula to determine the charges for the Basic Services

where:

- " A_i " means Usage Factors;
- " BW " means the allocated BT Central Bandwidth for the Provided IPStream service as specified in Part 6;
- " n " means the number of relevant ATM interconnection Charges;
- " B_1 " means Revenue Adjustment Factors for the connection of the IPStream service;
- " B_2 " means Revenue Adjustment Factors for the rental of the BT Central service;
- " B_3 " means Revenue Adjustment Factors for the connection of the BT Central service;
- " p_i " means the lowest price for ATM interconnection as set out in BT's Reference Offer;
- " $p_{IPSRental}$ " means the lowest IPStream price at which BT sells the Provided IPStream service for rental, or its equivalent;
- " $p_{IPSConn}$ " means the lowest IPStream price at which BT sells the Provided IPStream service for connection, or its equivalent;
- " $p_{BTCRental}$ " means the lowest per Mbit/s price of any BT Central service excluding BT Central Plus for rental, or its equivalent;
- " p_{BTConn} " means the lowest per Mbit/s price of any BT Central service excluding BT Central Plus for connection, or its equivalent;
- "Provided IPStream" means either the Home 250, Home 500, Home 1000, Home 2000, Office 500, Office 1000 or the Office 2000, for both the Standard and CBC options;
- " Y " means the Contestability Assumption Factor and;
- " X " means the Additional Cost.

Note: not all p_i charges are a function of BW .

In addition, for the purposes of clarity, this formula is set out in a spreadsheet model which has been made available.

Part 4**Adjustment factors**

Contended BW Adjustment Factor
(IPStream standard)

2.4538E+00

Revenue Adjustment Factors

IPStream (Stn) Connection

2.5356E-01

IPStream (CBC) Connection

2.5356E-01

BT Central (Stn) Rental

1.6084E+00

BT Central (Stn) Connection

3.3883E-01

BT Central (CBC) Rental

1.0589E+00

BT Central (CBC) Connection

3.3883E-01

Usage Factors**Driver**

EUA connection

EU

2.5356E-01

EUA rental

EU

1.0000E+00

EUA port reservation

EU

1.3536E+00

EUA port reservation adjustment

EU

1.1166E-02

VP rental (per Mbit/s)

0.25Mbit/s

BW

Handover

Local

Regional

National

3.8064E-02

3.8064E-02

2.6645E-01

3.8064E-02

0.5Mbit/s

BW

1.9032E-02

1.9032E-02

1.3322E-01

1.9032E-02

1Mbit/s

BW

9.5159E-03

9.5159E-03

6.6612E-02

9.5159E-03

2Mbit/s

BW

4.7580E-03

4.7580E-03

3.3306E-02

4.7580E-03

3Mbit/s

BW

3.1720E-03

3.1720E-03

2.2204E-02

3.1720E-03

4Mbit/s

BW

2.3790E-03

2.3790E-03

1.6653E-02

2.3790E-03

5Mbit/s

BW

1.9032E-03

1.9032E-03

1.3322E-02

1.9032E-03

6Mbit/s

BW

1.5860E-03

1.5860E-03

1.1102E-02

1.5860E-03

7Mbit/s

BW

1.3594E-03

1.3594E-03

9.5159E-03

1.3594E-03

8Mbit/s

BW

1.1895E-03

1.1895E-03

8.3265E-03

1.1895E-03

9Mbit/s

BW

1.0573E-03

1.0573E-03

7.4013E-03

1.0573E-03

10Mbit/s

BW

9.5159E-04

9.5159E-04

6.6612E-03

9.5159E-04

VP re-grades (per Mbit/s)

BW

3.2211E-01

VP re-arrangements same centre
(per Mbit/s)

BW

2.9156E-02

VP re-arrangements different
centre(per Mbit/s)

BW

2.9156E-02

ATM Port (per Mbit/s)

ATM Access Port_155 - connection

BW

4.6432E-04

ATM Access Port_155 - rental

BW

1.9207E-03

ATM Access Port_622 - connection

BW

5.3237E-04

ATM Access Port_622 - rental

BW

2.2022E-03

ATM ISH costs (total per Mbit/s)

BW

£37.01

Additional Cost

| | Fixed Part (c) (pa) | Variable Part (m) per Mbit/s (pa) |
|--|----------------------------|----------------------------------------------|
|--|----------------------------|----------------------------------------------|

Standard Product Set

| | | |
|-------------|---------|---------|
| Home 250 | £17.36 | £493.08 |
| Home 500 | £28.20 | £493.08 |
| Home 1000 | £49.86 | £493.08 |
| Home 2000 | £93.20 | £493.08 |
| Office 500 | £61.76 | £493.08 |
| Office 1000 | £115.92 | £493.08 |
| Office 2000 | £224.26 | £493.08 |

CBC Product Set

| | | |
|-------------|-------|-----------|
| Home 250 | £6.53 | £1,376.08 |
| Home 500 | £6.53 | £1,376.08 |
| Home 1000 | £6.53 | £1,376.08 |
| Home 2000 | £6.53 | £1,376.08 |
| Office 500 | £7.59 | £1,376.08 |
| Office 1000 | £7.59 | £1,376.08 |
| Office 2000 | £7.59 | £1,376.08 |

Contestability factor

| | Fixed Part (c) (pa) | Variable Part (m) per Mbit/s (pa) |
|--|----------------------------|----------------------------------------------|
|--|----------------------------|----------------------------------------------|

Standard Product Set

| | | |
|-------------|--------|--|
| Home 250 | £5.57 | |
| Home 500 | £8.80 | |
| Home 1000 | £15.26 | |
| Home 2000 | £28.18 | |
| Office 500 | £18.49 | |
| Office 1000 | £34.64 | |
| Office 2000 | £66.93 | |

CBC Product Set

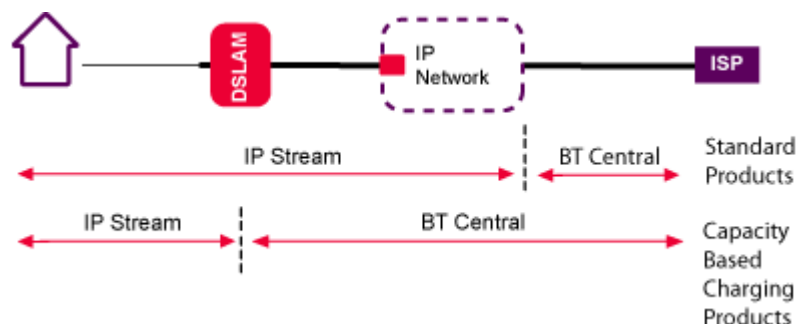
| | | |
|-------------|-------|---------|
| Home 250 | £2.34 | £263.23 |
| Home 500 | £2.34 | £263.23 |
| Home 1000 | £2.34 | £263.23 |
| Home 2000 | £2.34 | £263.23 |
| Office 500 | £2.34 | £263.23 |
| Office 1000 | £2.34 | £263.23 |
| Office 2000 | £2.34 | £263.23 |

Part 5

IPStream and BT Central Service

IPStream and BT Central, when used in tandem, provide a fixed communications connection between end users and the IPStream customer, typically an internet service provider ("ISP"). BT currently offers both Standard and Capacity Based Charging (CBC) IPStream services. The figure below shows the conceptual difference between the standard and CBC IPStream and BT Central services.

Figure A.1



BT offers 7 different IPStream options for both standard and CBC. For the standard IPStream services BT pre-specifies the typical maximum contention that the service should experience and this in conjunction with the peak bandwidth allows a contended bandwidth to be assumed ($\text{contended BW} = \text{Peak BW} / \text{contention}$). The table below lists the 7 standard IPStream services along with the peak bandwidth, contention and contended bandwidth.

Table A.1

| IPStream (Stn) Services | Pk BW Mbit/s | Contention | Cont BW |
|-------------------------|--------------|------------|---------|
| Home 250 | 0.25 | 50 | 0.0050 |
| Home 500 | 0.50 | 50 | 0.0100 |
| Home 1000 | 1.00 | 50 | 0.0200 |
| Home 2000 | 2.00 | 50 | 0.0400 |
| Office 500 | 0.50 | 20 | 0.0250 |
| Office 1000 | 1.00 | 20 | 0.0500 |
| Office 2000 | 2.00 | 20 | 0.1000 |

For the CBC services BT only specifies the maximum peak bandwidth of the services. The contention can, to some extent, be determined by the customer. The table below lists the 7 CBC IPStream services along with the peak bandwidth.

Table A.2

IPStream (CBC) Services Pk BW Mbit/s

| IPStream (CBC) Services | Pk BW Mbit/s |
|--------------------------------|---------------------|
| Home 250 | 0.25 |
| Home 500 | 0.50 |
| Home 1000 | 1.00 |
| Home 2000 | 2.00 |
| Office 500 | 0.50 |
| Office 1000 | 1.00 |
| Office 2000 | 2.00 |

BT offers a range of BT Central services for both standard and CBC. This range includes various bandwidths, various flex options and various resilience options. The table below lists all of the BT Central service that BT currently offers, although not all of these are available for new supply. Also listed in the table below is the gross and net bandwidth for each BT central service. The BT Central Plus products listed in Table A.3 differ from the other BT Central products in that they do not deliver the IPStream products directly to the customer (i.e. ISP). Instead BT Central Plus (Internet only for standard products and Access + Internet for CBC products) connect the IPStream products directly to the Internet. Further information on these services is available on BT's Web site.

Table A.3: BT Central Services (standard and CBC)

| BT Central Services | BW bit/s (gross) | BW Mbit/s (net)⁴⁸ |
|-----------------------------------------------|-------------------------|-------------------------------------|
| 0.5M | 0.5 | 0.37 |
| 1M | 1 | 0.73 |
| 2M | 2 | 1.4 |
| 4M | 4 | 3.1 |
| 4M (SDH Resilience) | 4 | 3.1 |
| 10M | 10 | 7.6 |
| 10M (SDH Resilience) | 10 | 7.6 |
| 34M | 34 | 25 |
| 34M (SDH Resilience) | 34 | 25 |
| 100M | 100 | 85 |
| 155M | 155 | 126 |
| 155M L2TP | 155 | 113 |
| 622M | 622 | 622 |
| 622M/465 flexed | 465 | 465 |
| 622M/310 flexed | 310 | 310 |
| 622M/155 flexed | 155 | 155 |
| 622M L2TP | 622 | 557 |
| 622M L2TP/465 flexed | 465 | 417 |
| 622M L2TP/310 flexed | 310 | 278 |
| 622M L2TP/155 flexed | 155 | 139 |
| BT Central Plus (Access) ⁴⁹ - 100M | 100 | 100 |
| BT Central Plus (Internet) - 100M | 100 | 100 |

⁴⁸ net bandwidth refers to the typical maximum IP throughput down stream as specified in BT's Suppliers' Information Notes 329 and 412.

⁴⁹ Only applicable to the Capacity Based Charging service set

Part 6**Allocated BT Central Bandwidth (per End User);**

For each IPStream service BT is required to satisfy the formula set out in Part 3 across a range of allocated BT Central bandwidth. Table A.4 lists the bandwidth range, for each IPStream service, for the standard services and Table A.5 lists the bandwidth range, for each IPStream service, for the CBC services.

Table A.4: Allocated BT Central Bandwidth Range for the Standard IPStream Services

| Service | Min BW (Mbit/s) | Max BW (Mbit/s) |
|----------------|------------------------|------------------------|
| Home 250 | 0.0094 | 0.0156 |
| Home 500 | 0.0188 | 0.0313 |
| Home 1000 | 0.0375 | 0.0625 |
| Home 2000 | 0.0750 | 0.1250 |
| Office 500 | 0.0469 | 0.0781 |
| Office 1000 | 0.0938 | 0.1563 |
| Office 2000 | 0.1875 | 0.3125 |

Table A.5: Allocated BT Central Bandwidth Range for the CBC IPStream Services

| Service | Min BW (Mbit/s) | Max BW (Mbit/s) |
|----------------|------------------------|------------------------|
| Home 250 | 0.0050 | 0.1500 |
| Home 500 | 0.0050 | 0.1500 |
| Home 1000 | 0.0050 | 0.1500 |
| Home 2000 | 0.0050 | 0.1500 |
| Office 500 | 0.0050 | 0.1500 |
| Office 1000 | 0.0050 | 0.1500 |
| Office 2000 | 0.0050 | 0.1500 |

Annex 4

NOTICE TO BRITISH TELECOMMUNICATIONS PLC AND THE OPERATORS LISTED IN THE SCHEDULE TO THIS NOTICE UNDER PARAGRAPH 22 OF SCHEDULE 18 TO THE COMMUNICATIONS ACT 2003

Notice that the “Direction under Condition 9.2 of the Public Telecommunications Licence granted to British Telecommunications plc and under Regulations 6(3) and 6(4) of the Telecommunications (Interconnection) Regulations 1997” regarding xDSL interconnection made on 2 March 2001 and continued by the continuation notice given to British Telecommunications plc on 21 July 2003 will be revoked with effect from the date this notice is deemed to be effected in accordance with section 7 of the Interpretation Act 1978 and section 394(7) of the Communications Act 2003

1. The Office of Communications (“OFCOM”), in accordance with Paragraph 22(8) of Schedule 18 to the Communications Act 2003 (“the Act”) hereby gives notice to British Telecommunications plc (“BT”) and the operators listed in the Schedule to this notice (“the Operators”) that the “Direction under Condition 9.2 of the Public Telecommunications Licence granted to British Telecommunications plc and under Regulations 6(3) and 6(4) of the Telecommunications (Interconnection) Regulations 1997” regarding xDSL interconnection made on 2 March 2001 and which was continued by the continuation notice given to BT on 21 July 2003, which had effect from 25 July 2003 (“the Continued Interconnection Direction”), will be revoked with effect from the date this notice is deemed to be effected in accordance with section 7 of the Interpretation Act 1978 and section 394(7) of the Communications Act 2003.

2. In giving this notice, OFCOM have, in accordance with Paragraph 22(9) of Schedule 18 to the Act, taken all steps necessary for enabling them to decide whether or not to set a condition under Chapter 1 of Part 2 of the Act for the purpose of replacing the Continued Interconnection Direction and whether or not to exercise their power to set a condition under that Chapter for that purpose.

3. OFCOM issued a consultation as to their proposals to revoke the Continued Interconnection Directions on 2 October 2003 and requested comments by 9.00 a.m. on 16 October 2003. OFCOM have taken into account the comments they received during that consultation.

4. In this notice, except as otherwise provided or unless the context otherwise requires, words or expressions shall have the meaning assigned to them and otherwise any word or expression shall have the same meaning as it has in the Act. For the purposes of interpreting this notice, headings and titles shall be disregarded.

Andrew Heaney
Director of Competition Policy

A person authorised by OFCOM under paragraph 18 of the Schedule to the Office of Communications Act 2002

26 August 2004

Schedule

- 1. Energis Communications Ltd**
- 2. Thus Plc**

NOTICE TO BRITISH TELECOMMUNICATIONS PLC, ENERGIS COMMUNICATIONS LIMITED AND THUS PLC UNDER PARAGRAPH 22 OF SCHEDULE 18 TO THE COMMUNICATIONS ACT 2003

Notice that the “Direction under Condition 9 of the Public Telecommunications Licence granted to British telecommunications plc and under Regulation 6 (6) of the Telecommunications (Interconnection) Regulations 1997” to resolve a dispute between British Telecommunications plc, Energis Communications Limited and Thus plc concerning xDSL interconnection at the ATM switch made on 14 June 2002 and continued by the continuation notice given to British Telecommunications plc on 21 July 2003 will be revoked with effect from the date this notice is deemed to be effected in accordance with section 7 of the Interpretation Act 1978 and section 394(7) of the Communications Act 2003

1. The Office of Communications (“OFCOM”), in accordance with Paragraph 22(8) of Schedule 18 to the Communications Act 2003 (“the Act”) hereby gives notice to British Telecommunications plc (“BT”), Energis Communications Limited (“Energis”) and Thus plc (“Thus”) that the “Direction under Condition 9 of the Public Telecommunications Licence granted to British telecommunications plc and under Regulation 6 (6) of the Telecommunications (Interconnection) Regulations 1997” to resolve a dispute between British Telecommunications plc, Energis Communications Limited and Thus plc concerning xDSL interconnection at the ATM switch made on 14 June 2002 and which was continued by the continuation notice given to BT on 21 July 2003, which had effect from 25 July 2003 (“the Continued Interconnection Direction”), will be revoked with effect from the date this notice is deemed to be effected in accordance with section 7 of the Interpretation Act 1978 and section 394(7) of the Communications Act 2003.

2. In giving this notice, OFCOM have, in accordance with Paragraph 22(9) of Schedule 18 to the Act, taken all steps necessary for enabling them to decide whether or not to set a condition under Chapter 1 of Part 2 of the Act for the purpose of replacing the Continued Interconnection Direction and whether or not to exercise their power to set a condition under that Chapter for that purpose.

3. OFCOM issued a consultation as to their proposals to revoke the Continued Interconnection Direction on 2 October 2003 and requested comments by 9.00 a.m. on 16 October 2003. OFCOM have taken into account the comments they received during that consultation.

4. In this notice, except as otherwise provided or unless the context otherwise requires, words or expressions shall have the meaning assigned to them and otherwise any word or expression shall have the same meaning as it has in the Act. For the purposes of interpreting this notice, headings and titles shall be disregarded.

Andrew Heaney
Director of Competition Policy

A person authorised by OFCOM under paragraph 18 of the Schedule to the Office of Communications Act 2002

26 August 2004

Annex 5

Glossary

ADSL (Asymmetric Digital Subscriber Line): a digital technology that allows the use of a copper line to send a large quantity of data in one direction and a lesser quantity in the other.

Allocated Bandwidth: where multiple end users share a fixed amount of bandwidth the allocated bandwidth is the average bandwidth that is assumed to be allocated to each end user. As an example, if 10 end users were sharing 1Mbit/s then each end user would be assumed to have 0.1Mbit/s allocated to them if they were treated as being equal. This is particularly relevant to the BT Central products, where a fixed amount of capacity can be shared between different numbers of end users.

ATM (Asynchronous Transfer Mode): a cell oriented switching technology that uses fixed-length packets.

Altnets: Alternative network providers.

BT Central: part of BT's intermediate broadband services, which when used in conjunction with IPStream provides the complete end-to-end intermediate service. BT Central is at the customer (i.e. ISP) delivery end of the service.

Contended Bandwidth: the minimum average bandwidth that must be available to a service with a pre-specified peak speed and contention ratio. Contended bandwidth can be calculated in the following way: (contended BW = Peak speed/contention).

DataStream: wholesale interconnection product, based on ATM interconnection, offered by BT to operators allowing them to utilise more of their own networks and compete with it in the provision of intermediate services such as IPStream.

Digital Subscriber Line Access Multiplexer (DSLAM) – it is located in the co-location space of an operator at an exchange site. It is composed of a multiplex and the ADSL modems necessary to operate ADSL services over the loops served by the operator from the exchange.

EUA (End User Access): the term used by BT to describe a DSL enabled telephone line (i.e. the twisted metallic connection between the end user premises and the local serving exchange).

Internet Service Provider (ISP): for the purposes of this document, the term 'ISP' refers to Internet Service Providers who purchase intermediate services and sell retail services to end-users.

IPStream: part of BT's intermediate broadband services, which when used in conjunction with BT Central provides the complete end-to-end intermediate service. IPStream is at the end user access end of the service.

ISH (In-Span Handover): the term used by BT to describe the situation where Altnets interconnect with BT's network using In-Span Interconnection (ISI) as opposed to Customer Sited Interconnection (CSI).

Operator: for the purposes of this document, the term 'operator' refers to providers of intermediate services who purchase (explicitly, or implicitly in the case of self provision) wholesale broadband access, specifically DataStream / ATM interconnection.

VP (Virtual Path): is a path that is assigned to an operator, which goes across the ATM network, between the DSLAM and the point of hand-over.

WBA (Wholesale Broadband Access): a wholesale service providing access from the end-user to the point of connection with a supplier of intermediate services' network for the purpose of providing asymmetric broadband services.

Annex 6

Terms and conditions - Model

This annex sets out the terms and conditions on which OFCOM is making available the model which sets out a full list of the usage factors.

Except to the extent where it is owned by a third party, all right, title and interest in the provided model (the 'Model') constructed in Excel to set the margin between ATM interconnection service and IPStream services charges are owned by OFCOM. Such title and interest is protected by United Kingdom intellectual property laws and international treaty provisions. While you may freely use the Model for the purposes for which it is provided, as set out in this document, it is not to be modified in any way or used for commercial gain or otherwise without the prior written permission of OFCOM.

No representation or warranty is given as to the accuracy, completeness or correctness of the provided Model and it is provided 'as is'. It is provided without any representation or endorsement made and without warranty of any kind, whether express or implied, including but not limited to the implied warranties of satisfactory quality, fitness for a particular purpose, non-infringement, compatibility, security and accuracy.

OFCOM does not accept any responsibility for any loss, disruption or damage to your data or your computer system which may occur whilst using the Model or material derived from the Model. OFCOM does not warrant that the functions contained in the Model will be uninterrupted or error free. Also, OFCOM does not warrant that defects will be corrected, or that the Model provided is free of viruses.

In no event will OFCOM be liable for any loss or damage including, without limitation, indirect or consequential loss or damage, or any loss or damages whatsoever arising from use or loss of use of, data or profits arising out of or in connection with the use or otherwise of the provided Model.