

Pricing and costing principles for access to civil engineering infrastructure and the NBP

A report for ComReg

8 September 2020

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Executive Summary

Existing access regulation

Mandated access to Eircom's ducts and poles has been available since 2013, following ComReg's Decision D03/13 (since re-imposed by further Decisions in 2016 and 2018). In 2016, ComReg set prices for CEI access (in ComReg Decision D03/16). In 2018, these access and pricing measures were re-imposed (in ComReg Decision D10/18).

"Per operator" equal sharing

The broad approach to pricing to date has been to split costs of shared CEI equally across users making equal use of capacity. Costs of poles are split equally across operators sharing that pole. Costs of duct are split according to length and the number of cables in trenches and sub-ducts an operator uses, differentiated depending on surface type.

The National Broadband Plan

Subsidised provision to non-commercial areas

The National Broadband Plan has led to the appointment of National Broadband Ireland (NBI) to provide fibre-based services to approximate 540,000 delivery points that are not expected to be served commercially (the 'intervention area'). NBI will receive subsidies to cover the economic losses it would otherwise face from serving the intervention area.

The intervention area and commercial area are intertwined

In order to meet its contractual obligations to supply these services, it is highly likely that NBI will need access to a large proportion of Eircom's CEI in both in the intervention area and outside (the 'commercial area'). Within the intervention area, NBI will need access to most of Eircom's poles and a significant proportion of duct. Because the intervention area is highly fragmented, including many small patches surrounded by the commercial area, NBI will need to transit through the commercial area to interconnect these patches of intervention area, requiring CEI access.

Transition from copper to fibre needs to be considered

NBI will need to take CEI access service for the foreseeable future, as it has a 25-year commitment under the NBP. Over this period, it is very likely that Eircom will shut its copper network in the intervention area. In this event, Eircom is likely to rely on taking wholesale services from NBI rather than building a parallel network in the intervention area.

NBI cannot compete

Given that NBI is subsidised for the specific purpose of providing services in the intervention area, it will not be able to make use of that subsidy to offer services outside that area and compete directly with Eircom or other providers within the commercial area.

CEI access in the new environment

A large quantity of CEI access services are likely to be required by NBI. Because of NBI's particular circumstances, the existing approach to access regulation cannot simply be re-applied. To do so would create two main risks.

Competitive distortion in the commercial area

First, within at least some parts of the commercial area, there is actual or potential infrastructure-based competition. However, this could be distorted if the costs of Eircom's CEI are covered in part by additional margins earned by Eircom from providing state subsidised NBI with large-scale access to its CEI in order for NBI to transit through the commercial area. Such margins earned on supplying such CEI access to NBI would eventually lead to lower CEI access prices for other access users. This 'see-saw' effect would occur as a result of competition or regulation (where competition is absent) limiting overall returns on CEI assets to normal levels. In turn, this could distort price signals to those deciding whether to buy access or build infrastructure.

Furthermore, in the short run - before such price adjustments for other access users had flowed through to bring asset returns on CEI to a normal level - Eircom might make transitory excess returns due to additional margins earned on CEI access. There is a general risk that any such excess returns might be used to lower prices on other services, potentially distorting competition.

Inefficient incentives to migrate from copper to fibre

Second, within the intervention area, there is a possibility that an inefficiently strong incentive to shut off the copper network could be created as copper subscriber numbers fall. This is because under the current equal sharing approach, Eircom's copper services would still need to pay for at least half of the total cost of the CEI it uses in the intervention area regardless of how few customers it had. This creates the possibility that Eircom might find it uneconomical to continue to run the copper network (as it would avoid a large share of CEI costs if it shut it down), but the coverage of the fibre network might be patchy at that time. This could create a situation where Eircom was unable to shut down the copper network and would be making losses due to the requirement for the copper network to fund an equal share of CEI costs despite having few customers. The issue would likely have to be addressed by some rebalancing of contributions to common CEI costs from copper and fibre networks in line with the reduced ability of the copper network to contribute. In our view it is better to anticipate this situation now and provide a clear and predictable basis for cost sharing given that we strongly expect a decline in demand for copper-based services as fibre is rolled out.

Differentiated access for NBI purposes

For these reasons, we propose that a differentiated access product be created to meet the specific requirements of NBI in terms of the scale and longevity of its demand, and recognising NBI's obligations and restrictions in the areas it can supply and its consequent

inability to compete directly with Eircom and other providers in NGA services. This differentiated access service would be contractually restricted so that it could only be used to meet commitments arising from the NBP.

Generic CEI access

In parallel, the 'generic' CEI access service would remain open to all. This would continue be priced in the same manner as currently. This would ensure that there was undistorted competition between Eircom and other providers competing on the basis of CEI access.

CEI access pricing in the commercial area

Pricing at sharer incremental cost only

We recommend that within the commercial area, CEI access for NBP purposes be priced so that the additional costs caused by NBI's shared usage are recovered (what we call 'sharer incremental cost'¹), but no more. In effect, NBI would be a secondary user, with Eircom and any sharers other than NBI being primary users. NBI covers the costs its use causes, with remaining incremental costs of providing CEI split between primary users on an equal sharing basis.

This approach means that Eircom would not enjoy any cost benefits from sharing CEI in the commercial area with NBI. This approach is necessary to avoid undermining incentives for competitive infrastructure within the commercial area.

CEI cost sharing in the intervention area

Sharing by relative line numbers

Whilst it may be feasible to continue with the status quo approach in the intervention area in the short run, we recommend that consideration be given to CEI cost sharing scheme for the intervention area based on sharing costs according to the relative number of fibre and copper subscriber lines.

Such a sharing scheme would need to reflect progressive fibre roll-out and adoption, falling demand for copper-based services and eventually shutdown of the copper network. These changes may progress at different speeds at different locations. Therefore, ideally relative number of fibre and copper subscriber lines would be assessed separately in different parts of the intervention area corresponding to one exchange area, as this is the natural unit for Eircom's decisions to shut down its copper network.

Under this approach:

¹ The additional cost caused by an additional user sharing the CEI as opposed to the 'service incremental cost' which is the cost of providing the CEI that could be avoided if all sharers ceased using the CEI. This is a non-standard term, but we use it through to distinguish between these two notions of incremental cost.

- Copper and fibre networks each need to pay their respective sharer incremental cost (i.e. the CEI costs that would be avoided if just that one sharer ceases use);
- This is not sufficient to recover the overall 'service' incremental costs of the CEI (the term we use to describe the CEI costs that would be avoided if *all* sharers ceased use) because some CEI costs are common across sharers. These common CEI costs would be allocated in line with relative numbers of copper and fibre subscriber lines.

Efficient copper shutdown incentives

It can be shown that this cost sharing scheme gives reasonable incentives for Eircom to shut down its copper network at a similar time to that which an integrated operator providing both copper and fibre services would choose.

Improving the line sharing rule

This rule can be somewhat improved by setting a minimum threshold for the proportion of lines switched to fibre which needs to be exceeded before the fibre network begins to make any contribution to common CEI costs. This improved approach corrects the bias against optimal timing of the copper network switch-off caused by Eircom needing to pay wholesale fibre prices that include fixed cost contributions when it migrates customers.

Implementation issues

Measuring relative numbers of copper and fibre subscriber lines in use clearly raises some implementation challenges. In particular, the splitting ratio of common CEI costs between Eircom and NBI within the intervention area would need to be updated at regular intervals as the fibre network is built out. Whilst ideally line shares would be measured at the exchange area level and data updated regularly, the main benefits of this progressive cost sharing scheme would still be largely achieved even if practical simplifications were made, such as setting a common CEI cost splitting ratio for the whole intervention area where the fibre network has been built out, or using estimates of relative number of lines.

It might also be reasonable to simplify by splitting the entire service incremental cost in proportion to relative fibre and copper lines if it is difficult to identify costs caused by shared from costs common across sharers. This would avoid having to calculate a sharer incremental cost within the intervention area at all.

Primary/secondary access pricing in the intervention area

NBI paying only sharer incremental cost in the intervention area

A possible alternative approach to this progressive sharing rule, splitting common CEI costs according to relative numbers of copper and fibre lines, would be to allocate all common CEI costs to Eircom as the existing primary user and have NBI pay only its sharer incremental cost as a secondary user while fibre and copper networks coexist.

This alternative approach for the intervention area is essentially the same as that proposed above for the NBI's CEI access for transit

purposes in the commercial area. Therefore, it avoids the problem of Eircom earning significant additional margins on roll-out of the fibre network if access prices for NBI are materially above the additional costs NBI itself causes (i.e. its sharer incremental cost in our terminology).

Excessive incentives to shut down the copper network

However, this approach would expose Eircom to significant risks of copper network assets becoming stranded. Eircom would face excessive incentives to turn off the copper network to shift the burden of recovering CEI costs to NBI to an even greater degree than the status quo. However, as discussed above, NBI's fibre coverage could be patchy at that time, making it difficult to shut down the copper network without disrupting customers. Therefore, this approach would appear to store up the potential for future regulatory dispute and might lead in future to calls by Eircom for modification of the CEI access pricing regime in the intervention area or even subsidies to support an uneconomic copper network. Therefore, whilst possible in the short term as NBI starts to roll-out, a primary/secondary approach is unlikely to be sustainable in the long term.

Cost modelling implications

To date, ComReg's cost modelling has (brushing over finer details) estimated what we have called 'service' incremental cost, that is the costs avoided if all sharers using CEI cease using it.

These proposals require some adjustments to ComReg's previous approach to cost modelling. In particular, it is necessary to identify the costs caused specifically by NBI's shared usage (its 'sharer incremental cost'). However, previous cost modelling exercises have already identified so-called 'non-renewable' CEI assets that need replacement to enable sharing, which is closely related to this question.

1 Introduction

We have been asked by the Commission for Communications Regulation ('ComReg') to consider an appropriate pricing and costing methodology for access to Civil Engineering Infrastructure (CEI), in particular duct and pole access, in the context of the National Broadband Plan (NBP) in Ireland.

1.1 Background

1.1.1 Mandated CEI access

Current CEI access Mandated access to ducts and poles has been available since 2013, following ComReg's Decision D03/13. In 2016, ComReg set prices for CEI (duct and pole) access (Decision D03/16). In 2018, these access and pricing measures were re-imposed (Decision D10/18).

Geographical differentiation There is some geographical differentiation of access prices for CEI. There are different prices for poles located in the footprint of urban exchanges, referred to as the 'Modified Large Exchange Areas' (LEAs) and the footprint of rural exchanges, referred to as 'Outside the Modified LEAs'. There are also different prices for ducts located in Dublin and Provincial parts of Ireland. Access prices for ducts and poles are largely based on Eircom's top-down costs assessed on an historic cost basis, with an allowance made for replacement of assets on a BU-LRAIC plus basis. Geographical differentiation of access prices is a result of cost differences across these areas.

1.1.2 The National Broadband Plan

The National Broadband Plan The Department of Communications, Climate Action and Environment (DCCAE) has appointed a national broadband provider ("National Broadband Ireland", hereafter "NBI") to deploy high-speed broadband services in non-commercial areas. This affects about 540,000 premises in Ireland, which we call the '*intervention area*' throughout. We define the '*commercial area*' to be the area outside the intervention area.

It is expected that NBI will make extensive use of Eircom's existing poles across the intervention area in order to meet its obligations cost effectively. Indeed, such re-use is strongly encouraged under the terms of the NBP State Aid Decision and the state-aid

guidelines.² NBI can be expected to self-supply CEI assets such as poles where these are not already available from Eircom or an alternative CEI provider (in practice, primarily ESB whose electricity distribution network might be suitable).

Particularity of the Irish situation

The fact that a subsidised broadband access network will be provided by a party other than the incumbent operator means that the situation in Ireland is likely to be atypical compared with other Member States. Where subsidies have been offered for extending broadband coverage, in other Member States these have usually been won by the incumbent operator, who is likely to have an advantage in any such competition.³ In contrast, in Ireland, there is a range of issues with regard to CEI access that arise because of the more complex value chain created by NBI's presence.

1.1.3 Transition from copper to fibre

Decommissioning of copper

Over the course of the 25-year life of the NBP contract, there is a strong likelihood that Eircom's copper access network will largely cease service.⁴ We cannot be sure about the timing of such a development and it is likely that legacy services may endure for some time. Therefore, the most likely scenario is that there will initially be shared use of CEI assets by NBI and Eircom, but eventually decommissioning by Eircom would leave NBI as the primary user of Eircom's CEI within the intervention area.⁵

In turn, Eircom might then become a significant user of NBI's wholesale services itself within the intervention area to supply customers currently served by copper. This would create the somewhat unusual situation that Eircom could be present at two levels within the value chain, both providing essential inputs to NBI and purchasing its wholesale services.

² EU Guidelines for the application of State aid rules in relation to the rapid deployment of broadband networks (2013/C 25/01). See also National Broadband plan Contract (Schedule 2.1 – Technical Solution Specification on reuse of existing infrastructure to avoid duplicate (5.1.2)) available at <https://www.gov.ie/en/publication/16717-national-broadband-plan-contract/>

³ For example, in the UK, competitions for subsidy for superfast broadband roll-out offered by local authorities have been won by BT.

⁴ We can distinguish two separate events: ceasing offering service to customers and physical decommissioning of the copper network. We are primarily concerned with the former. Once copper-based services have ceased, Eircom will likely have incentives to decommission copper cables from poles in any case to recover the scrap metal. Copper cables in ducts would likely be left in place in many cases, due to the risk of damage if removed.

⁵ Eircom will still use its CEI for other services (i.e. leased lines, etc.)

1.1.4 Possible future developments

Potential for evolution of the current situation

The NBP and consequent entry of NBI raises a number of scenarios for how NBI and Eircom might interact.

At the present time, ComReg Decision D10/18 dictates the regulated terms under which NBI's access to Eircom's CEI would be provided. However, given the long time period of the NBP contract, and the potential for NBI or some successor service to require continued access to CEI even after the life of the NBP contract, it is possible that arrangements for CEI within the intervention area could evolve. It is even conceivable that, on a commercial basis, NBI could take over some functions related to CEI from Eircom (e.g. some maintenance functions) or even buy some CEI assets from Eircom as this might prove more efficient if NBI were the main user of those assets.

The "300k area" and the rural commercial area

Eircom has recently expanded the reach of its FTTH network (what has been called the "300k area", although this now amounts to about 340,000 premises). As we discuss in detail below, Eircom had the opportunity to respond to the initial proposals defining the NBP intervention area; it identified geographical areas where it could offer next generation access ('NGA') services commercially. We will call this the '*rural commercial area*' throughout. By implication, the current NBP intervention area, which excludes the rural commercial area, is one where Eircom has chosen not to extend its FTTH network, presumably as it would be unprofitable to do so.

Future extension into the IA

However, there is nothing in principle to stop Eircom from deciding at some later date to extend service from the rural commercial area into the intervention area if the economics were to change sufficiently to make this attractive. If this were to happen, there is a possibility that CEI assets could become shared again on a long-term basis between Eircom and NBI. Clearly such developments are not anticipated within the typical 3-year time frame used for state aid control, as otherwise this would have undermined the case that state aid is needed to deploy high-speed networks in the intervention area. Nevertheless, this shows that there is a range of possibilities for how services and networks might evolve; we need to ensure that any approach to CEI access pricing can deal robustly with these various possibilities.

The approach we have adopted throughout is to take the definition of the intervention area as given, as this is an output of work undertaken by the DCCA and has been subject to scrutiny by the European Commission through a state aid clearance procedure. However, we must also acknowledge the possibility of future changes, including the possibility of Eircom subsequently choosing to extend its network from the rural commercial area into the intervention area. Therefore, we have sought to ensure that our proposals are robust to a range of possibilities under the

assumption of continued regulation of Eircom's poles and ducts (though not necessarily in its current form).

1.1.5 Access in the commercial area

Transit through the 300k area

NBI will need to transit through the Commercial Areas in order to connect its network in the intervention area, using wholesale services such as Eircom's CEI to support its own network. Our understanding of the terms of the NBP contract is that NBI cannot use its subsidised network to offer services in a commercially viable area⁶. Consequently, transit services would be used solely to support NGA services offered in the intervention area, rather than in competing with Eircom in providing service available within the commercial area.

1.2 Interaction with USO

Possible interactions with the USO

ComReg has indicated that it intends to review the extent of Eircom's universal service obligations (USO) in light of developments due to the NBP and the end of Eircom's obligation period set out in ComReg Decision D05/16. In particular, we have been asked as part of this study to assess how the USO might affect any process of transition from copper-based to fibre-based services within the intervention area and also consider any possible interaction between the NBP and the existing USO framework in setting CEI access prices.

Are these issues related to CEI access?

In theory, there are some possible interactions between the USO and NBP policies:

- NBP intervention will hasten replacement of Eircom's copper-based services by fibre-based services within the intervention area, reducing the profitability of maintaining the copper network. Eircom's loss of customers and revenue on its copper network might not be fully mitigated through price increases for wholesale copper services. Whilst we cannot anticipate at this point what a full regulatory review would determine (not least as the profitability of the copper network might need to be assessed on a lifetime basis), it is

⁶ NBI would not be able to use subsidy to service any other area than the intervention area. See the State Aid decision at: https://ec.europa.eu/competition/elojade/isef/case_details.cfm?proc_code=3_SA_54472

Our assumption is that there would need to be sufficient separation between NBI's operations within the intervention area and any unsubsidised operations in commercial areas. Given this, we can simplify our discussion by assuming that NBI does not operate outside the intervention area, as if it did we could treat NBI's unsubsidised operations in commercial areas as being 'as if' provided by a different operator.

reasonable to assume that the regulated prices of these services would in any case be capped by the costs of deploying those services in the most efficient manner (which might not be by a copper network if there are few remaining customers). Therefore, regardless of the details, it is reasonable to expect the copper network to become uneconomic at some point whilst it still has some customers being served; it cannot be sustained by ever-increasing prices as customer numbers fall.

- As more and more customers transition onto NBI's fibre network Eircom may want to shut-down parts of its copper network in the intervention area. Eircom may be constrained from shutting down copper services in areas where NBI has not yet deployed fibre because of a USO⁷, leading to possible unavoidable costs to Eircom if it required to maintain its copper network when unprofitable.

These interactions raise the question of whether, if there are any additional costs caused by constraints on Eircom in shutting down its copper network, these can be ascribed to NBP or to the USO. However, if these issues were to arise, they would likely do so in the future when the current USO scheme had fallen away and there had been a re-evaluation of USO in the light of the NBP. Therefore, we do not see the current USO scheme as being germane to the current issue of setting CEI access charges in the context of the new situation created by the NBP.

USO is not relevant to set CEI access pricing

A simple example makes clear that issues around maintaining service to residual copper customers can be largely separated from design of CEI access pricing. Suppose that the NBP were deployed by some means not requiring any access to Eircom's CEI (say a standalone network). We would then have exactly the same issues arising in that Eircom might be constrained by a USO and not be able to decommission its copper network. Any additional costs to Eircom associated with USO that are caused by the NBP by accelerating the transition from copper to fibre should be considered by ComReg separately as part of a review of USO and its interaction with the NBP, rather than being recovered at all through CEI access prices.

1.3 Scope of this study

Key questions

Against this background, we have been asked by ComReg to consider the appropriate principles for setting CEI asset prices in the context of the NBP in light of ComReg's regulatory objectives and the requirements of both relevant EU policy and State Aid rules. This includes:

⁷ SMP obligations may also be relevant, as they may require supply of services.

- Whether there is a case for geographically differentiated (i.e. sub-national) pricing;
- The appropriate methodologies for pricing and costing within the NBP intervention area and in the complementary commercial area;
- The relevant cost standard, including: the approach to calculation of incremental costs (LRIC and LRAIC); whether costs are assessed on top-down basis (i.e. based on Eircom's actual incurred costs) or a bottom-basis (i.e. modelled for a hypothetical operator) and the appropriate cost base measures (e.g. HCA or CCA);
- Appropriate amortisation and depreciation for capital assets in light of the 25-year lifetime of the NBP contract;
- The basis for access charges (e.g. per pole, per operator or on some other basis).

Impact assessment In addition to the key questions above, we have also been asked by ComReg to consider the potential regulatory impact of our recommendations on operators and to assess our recommendations against other relevant European jurisdictions.

1.4 Objectives and relevant policies

Regulatory objectives

Certain of ComReg's statutory objectives, as set out in section 12 of the Act of 2002 and Regulation 16 of the Framework Regulations, are relevant:

- taking utmost account of the principle of technological neutrality;
- protecting actual or potential competition from various forms of distortion;
- promoting the development of the internal market through efficient investment; and
- ensuring that end-user benefits are maximised.

In our view, the final point above is directly relevant to the question of efficient migration of service from copper to fibre networks.

Regulation 8 of the Access Regulations also requires that an access pricing remedy is based on the nature of the competition problem identified, which here is Eircom's SMP in local access, already identified in ComReg Decision D10/18. The Access Regulations and the EECC also require that the remedy is objective, proportionate, transparent, non-discriminatory and justified in light of the objectives set out in section 12 of the Act of 2002 and Regulation 16 of the Framework Regulations.

Amount of subsidy

Note that the State may have a broader set of concerns to ensure achieving value for money from the subsidy used to deliver NGA services in the intervention zone. This is not a regulatory matter for

ComReg. Nevertheless, as we shall see in Section 5.1, an *indirect* consequence of ComReg meeting its statutory objectives may be that the subsidy requirements may need to be kept to a minimum, subject to the constraint that Eircom recover its efficiently incurred costs in addition to a reasonable return, in order to avoid potential competitive distortions.

Relevant effects

In practice, the scope for potential competition at the network level in NGA provision within the intervention area is limited for the foreseeable future. Nevertheless, we still need to consider:

- the incentives created by different access pricing regimes for Eircom and NBI in both the intervention area and the commercial area, including in respect of NGA roll-out and switch-off of Eircom's copper network within the intervention area;
- the impact of any margins earned by Eircom from CEI access services within the intervention area on potential competition more widely (not only the intervention area), including for other services supplied by Eircom.

State Aid rules for NGA State Aid rules

The EU Guidelines for the application of state aid rules in relation to the rapid deployment of broadband networks (2013C 25/01) provide guidelines on designing and implementing a state aid programme such as the NBP. These guidelines define ComReg's role in the context of the NBP, which includes providing support and advice in designing the state aid scheme.

Other relevant EU policy

The following relevant EU legislation also needs to be taken into account:

- The Framework Regulations⁸ lay out requirements on ComReg to impose *ex ante* regulation on a service provider designated with SMP;
- The EC's 2010 Recommendation on access to NGA networks sets out some general principles for access pricing;
- The EC's Recommendation of 11 September 2013 on consistent non-discrimination obligations and costing methodologies to promote competition and enhance the broadband investment environment (2013/466/EU) provides a set of general principles for NRAs to apply the Recommendations previously set out in 2010, but also provides for a consistent and predictable approach to calculate copper access wholesale prices across the EU;
- The 2014 Directive on Broadband Network Cost Reduction (2014/61/EU) opens up access to a wide range of infrastructure for the purpose of delivering new high-speed broadband network and underlines the likely future importance of CEI sharing. In particular, this requires access to various CEI (such as power networks) for the purpose of deploying new high-speed

⁸ European Communities (Electronic Communications Networks and Services) (Framework) Regulations 2011 (S.I. No. 334 of 2011) (the 'Framework Regulations').

broadband networks, but with access being on commercial terms. For the avoidance of any doubt, access arising under the terms of the 2014 Directive does not derive from any SMP finding nor need to be on *ex ante* regulated terms.

Dispute resolution

ComReg is the national regulatory authority in charge of resolving disputes between authorised network operators in regard of access and interconnection. In case of dispute between the NBP provider and other authorised network operators over CEI access, ComReg would need to determine any dispute brought to it as set out in the EECC.⁹ ComReg will also need to resolve disputes brought to it regarding mandated access on foot of SMP findings or access rights arising from the Broadband Cost Reduction Directive.

The EECC

The European Electronic Communications Code ('EECC') provides a framework for NRAs with regards to implementing market remedies in the context of an operators deemed to having significant market power. In particular, the EECC provides relevant rights and guidance with regards to accessing civil engineering infrastructures¹⁰ and price control¹¹ obligations.

Migration from copper

The EECC also mandates NRAs to facilitate migration from legacy copper networks to next-generation networks by establishing the conditions for an appropriate migration process which is in the interests of end-users.¹² Furthermore, to avoid unjustified delays to the migration this Directive empowers NRA's to withdraw access obligations relating to the copper network once an adequate migration process has been established. Therefore, we consider that there is a basis to be concerned not just about the availability of NGA services to end users within the intervention area, but also the broader issue of whether these new services are taken up by end-users.

1.5 Structure of this report

This report is organised as follows:

- Section 2 describes the existing regime for CEI access resulting from previous ComReg Decisions;
- Section 3 outlines the relevant features of the NBP, how subsidy payments and pricing of services are determined and how this would be affected by CEI charges;
- Section 4 sets out some basic definitions of cost that we use throughout;

⁹ European Electronic Communications CODE (EECC) Article 26 (1).

¹⁰ European Electronic Communications CODE (EECC) Article 72

¹¹ European Electronic Communications CODE (EECC) Article 74

¹² European Electronic Communications CODE (EECC) Article 81

- Section 5 identifies potential issues relevant to the setting of CEI access prices for the purposes of enabling NBI to meet its NBP commitments, filtering out those that are most important;
- Section 6 considers our recommended approach to CEI access for NBI for the purposes of transiting through the commercial area in order to deliver services in the intervention area;
- Section 7 sets out options for CEI access pricing within the intervention area;
- Section 8 summarises our conclusions.
- Annex A describes relevant practice elsewhere in the EU;
- Annex B includes a summary of the costing approach used for setting access prices in ComReg Decision D03/16.
- Annex C provides an impact assessment of the proposed changes (and some variations).

2 The existing CEI access price regime

ComReg has had in place measures to mandate access to CEI (specifically Eircom's ducts and poles) since 2013. In this section, we briefly set out the history of CEI access obligations and the key features of ComReg's previous decisions.

2.1 Current CEI access obligations

ComReg's 2013 Decision

In 2013, ComReg published a decision regarding Remedies for Next Generation Access (NGA) Markets.¹³ This imposed certain obligations on Eircom to provide access to its CEI or, if CEI access is not available, to dark fibre (where available). Eircom's CEI access services were subject to a cost orientation obligation and a non-discrimination obligation. The non-discrimination obligation required that Eircom ensure that all equivalent products, service and information were provided in the same quality to others in equivalent circumstances as they are also provided to Eircom itself.

ComReg's 2016 Decision

In 2016, ComReg published a decision¹⁴ further specifying the details of the CEI access pricing regime, referred to as the 2016 Access Pricing Decision (ComReg Decision D03/16). This decision established the maximum rental charges that Eircom could charge for access to duct, on a meter of sub-duct basis, and poles, per pole and split equally amongst operators using the pole. ComReg's decision also determined the appropriate rental charge for access to dark fibre in areas where access to duct and poles is not available but where dark fibre is available.

The rental charges outlined in ComReg Decision D03/16 are largely based on Eircom's historically incurred costs for assets that can be reused for Next Generation Access (NGA) services. However, in the case of assets that cannot be reused and need to be replaced, their value is based on current market prices.

ComReg's 2018 Decision

In November 2018, ComReg published a decision¹⁵ following its review of the Wholesale Local Access (WLA) and Wholesale Central Access (WCA) Markets (ComReg Decision D10/18). This market review established that Eircom has significant market power (SMP) in the WLA Market, nationally, and in the Regional WCA Market. As a

¹³ ComReg Decision No D03/13, ComReg Document No 13/11: Remedies in Next Generation Access Markets; dated 31 January 2013.

¹⁴ ComReg D16/39, "Pricing of Eir's Wholesale Fixed Access Services: Response to Consultation Document 15/67 and Final Decision".

¹⁵ ComReg D10/18, "Market Review: Wholesale Local Access (WLA) provided at a Fixed Location, Wholesale Central Access (WCA) provided at a Fixed Location for Mass Market Products. Response to Consultation and Decision."

result, in WLA Market, ComReg imposed a number of remedies on Eircom, including:

- making available to access seekers a range of WLA products, services and facilities, including Eircom's CEI and, where CEI is not available, dark fibre;
- further specifications on the obligations to negotiate in good faith with access seekers concerning Service Level Agreements (SLAs);
- further specification on the timeline to respond to access seekers regarding new products, services or facilities or a non-pricing amendment to an existing product, service or facility;
- enhancements to the non-discrimination obligations with regards to providing access to pre-ordering, ordering, provisioning, fault reporting and repair for WLA and CEI on an EOI basis;
- requirements to make information publicly available regarding NGA rollout plans, wholesale products, services, and facilities such as the expected time for service availability, in advance of implementation;
- continuation of existing cost orientation obligations with respect to LLU, Line Share and CEI products, the imposition of a new cost orientation obligation for FTTC-based VUA & Exchange launched VUA products and updating of obligations not to cause a margin squeeze; and
- enhancements to the Statement of Compliance requirements which now requires Eircom to demonstrate its compliance with all obligations.

Current SMP findings

In assessing the competitive environment in the relevant WLA market (which consists of both current generation products provided over copper network and next generation WLA products provided over fibre networks (FTTx)), ComReg determined that there was a lack of competition and a high cost to duplicate Eircom's infrastructure, allowing the incumbent to act independently of competitors, customers and consumers. ComReg was of the view that, in the absence of ex-ante regulation, Eircom would have the means to harm customers and end-users through its SMP, exclude or harm competitors by leveraging its wholesale and retail position and deter investment and limit market entry into the WLA market. ComReg considered that the prospect of entry to the WLA market was limited by to the high cost of building a new access network.

Considering the lack of national or regional competition in the WLA market and the uniformity of WLA products and pricing, ComReg determined that the competitive environment was sufficiently homogenous across Ireland to assess the market at a national level.

D10/18 and the NBP's competitive impact

With respect to the NBP, ComReg determined in D10/18 that it was too early to evaluate the potential impact of the NBP on competition in the intervention area. However, since the beginning of the NBP process, there has been significant progress in terms of:

- Eircom undertaking to provide FTTH services within the rural commercial area, reducing the size of intervention area and also indicating that Eircom was not willing to roll out FTTH further than the rural commercial area (without subsidy);¹⁶
- Eircom withdrawing from the competition to become the NBP provider, leaving just one other bidder in the process; and
- In May 2019, the announcement of a preferred bidder to supply NGA in the intervention area;¹⁷ and
- appointment of NBI in November 2019.

Lack of competition in the intervention area

Given this sequence of events, even with access to shared CEI, competing wholesale NGA networks within the intervention area (as currently defined) appear unlikely for the foreseeable future. We can reasonably infer this because Eircom had the option of proposing a larger area for its planned deployment of FTTH when it proposed and subsequently enlarged the rural commercial area, reducing the size of the intervention area and likely becoming the sole commercial NGA provider where it deployed. However, Eircom chose a number of areas where it proposed to deploy its fibre network commercially, which now define the boundary of the intervention area. Given this, it is unlikely to be attractive for an additional commercial operator not enjoying subsidy to enter and compete with NBI within the intervention area, given that Eircom itself did not find this opportunity commercially attractive even if it would have been the sole operator.

Although ComReg has not yet made any formal finding with regard to competitive conditions within the intervention area, we maintain the assumption throughout that competing NGA networks are not feasible within the intervention area and, indeed, even to deploy a single network would require some subsidy. This is a reasonable starting point as:

- Following an extensive process for design of the NBP, DCCAIE has determined the intervention area as being unlikely to be commercially viable to serve without subsidy; and

¹⁶ In 2015 Eircom announced its plans to deploy FTTH network in some areas of the original "Intervention Area". In 2017 the Irish Government revised the Intervention Area to exclude Eircom's 300K Area.

¹⁷ See <https://www.dccae.gov.ie/en-ie/news-and-media/press-releases/Pages/Biggest-investment-in-Rural-Ireland-since-Electrification-as-Preferred-Bidder-appointed-to-National-Broadband-Plan.aspx>

- Eircom’s own fibre network deployment plans are likely to have removed any areas that could be served commercially on a standalone basis from the intervention area.

In the unlikely event that competitive access network investment into the intervention area were to emerge in the future, this would probably require a re-evaluation of the assumptions behind subsidising NGA roll-out in the intervention area and consequently CEI pricing in this area.

SMP with regard to CEI access

With regards to CEI specifically, ComReg stated in Decision D10/18 that, absent of access regulation, Eircom would have the ability and incentive to refuse access to its CEI to leverage its market power in the downstream markets. Whilst there exists alternative CEI inputs from other CEI providers (e.g. Waterways Ireland, ESB), ComReg concluded that this was insufficient to rectify the existing distortions in the WLA market.

Benefits of sharing CEI

In principle, access to Eircom’s CEI is desirable as it would diminish entry cost for those competing with Eircom and in the case of the intervention area, also reduce the subsidy necessary to support the sole provider of NGA. Often CEI can be shared by a number of operators with little incremental cost being caused by a sharer, provided the capacity limits (such as duct capacity or numbers of cables on a pole) are not exceeded. Therefore, there may be strong scale economies amongst operators sharing CEI assets.

ComReg identified in decision D10/18 a benefit of CEI being that when access seekers initially enter the market, they can purchase CEI access services from Eircom to build a network with a much lower initial investment. Key aspects of service quality and characteristics will be determined by the network built by the entrant on the top of CEI access. Therefore, many aspects of competition can be opened up through the use of CEI sharing, even though an entrant is not necessary replacing Eircom across the full value chain.

2.2 Meeting NBI’s requirements

Duct and pole access Access to Eircom’s CEI consists of pole and duct access (including sub-duct and chambers). It is currently subject to a regulated maximum rental-charge for a set price-control period, as set out in Chapter 8 of Decision D03/16.

What NBI is likely to need Within the NBP intervention area, access to CEI by NBI is likely to consist mainly of access to poles. Indeed, NBI is likely to want access to the large majority of Eircom’s poles within the intervention area. However, we understand that some access to ducts is likely to be also needed.

Differences from generic access In Decision D10/18, ComReg noted that there are large differences between Eircom’s self-supplied products and what it offers access

seekers, leading to a lower demand for CEI access from other operators. ComReg considered that the current and future demand for CEI access products is currently inhibited by the lack of fit-for-purpose products from Eircom. Therefore, ComReg identified an ongoing need to review the definition of CEI access products and ensure that Equivalence of Input (EoI) obligations were working were for access users.

In addition, NBI is likely to make new and particular demands on Eircom's CEI that differ substantially from how CEI is used by access seekers at the moment. In particular, NBI will need widespread and long-term access to most of Eircom's existing poles across the intervention area, rather than access to a small and specific subset of CEI assets. It is also relevant to note that competition is not expected to take place in the intervention area making the deployment of parallel infrastructure inefficient and undesirable.

2.3 Cost orientation obligation for CEI access

The following sub-section discusses the CEI pricing regime as set by ComReg Decision D03/16.

Although the cost orientation obligation with regards to CEI access pricing (amongst other remedies) was recently re-imposed following the WLA and WCA Markets Review (ComReg Decision D10/18), the methodology and pricing approach was originally specified in ComReg Decision D03/16. In determining the methodology for cost orientation in 2016, ComReg considered a set of objectives including promoting competition, incentivising infrastructure investment, ensuring appropriate cost recovery for the incumbent and the overall interest of the end-user.

2.3.1 Basis of charges

Splitting of CEI costs

The regulated rental charge for poles is on a per pole basis and split amongst operators using each specific pole. For duct, the price is calculated on a meter of sub-duct basis where sub-ducts are installed (as sub-ducts have a common size). Where sub-ducts are not installed, duct costs are shared on the basis of cross-sectional area used.

Per operator cost sharing

In D03/16, this is called the "per operator approach", but could also be summarised as equal cost sharing, in that operators making similar usage demands on CEI assets split costs equally. This is clearly the case with poles, where there is no difference in the intensity of use being made of the pole by sharers, so costs are split equally between them. In the case of duct, this is somewhat more complicated as different users might take up different amounts of

available cross-sectional capacity, but it is still the case that where use is equal, costs are still split equally.

2.3.2 HCA and reusable assets

Definition of reusable assets

In its 2016 access pricing decision, ComReg followed the European Commission's definition of *reusable civil engineering assets* as those CEI assets that are currently being used for copper networks but that can be reused for NGA services. Falling in this category are duct, poles, trenches and chambers which can be reused for NGA.

Economies of sharing

These CEI assets are both long-lived and costly to duplicate, making duplication economically undesirable. Provided capacity limits are not breached (e.g. all ducts are completely filled with cables or sub-ducts in use or the cable carrying capacity of poles is reached) then the incremental costs caused by a sharer using CEI may be low, even on a forward-looking basis if usage is not expected to grow much. Therefore, there may be strong economies in sharing CEI, subject to capacity limitations not being exhausted. However, where capacity is exhausted, or spare capacity needs to be maintained to accommodate uncertainty about future demand growth, additional CEI would be required at some incremental cost.

Cost recovery through TD HCA pricing

Taking this into account, ComReg's main objective in setting access prices is to ensure that access pricing is such that Eircom does not over- or under-recover its efficient incurred costs of building, maintaining and operating its reusable asset base. An HCA-based access price adjusted for efficiencies and future expected expenditure (referred to as Eircom's Indexed RAB in the decision) achieves this, as the estimation of the assets value is directly linked to Eircom's actual accounting data. This approach is in line with the 2013 European Commission Recommendation on non-discrimination and costing methodologies.¹⁸

Depreciation and tilted annuity

In practice, the TD HCA model values the reusable assets at the net book value in Eircom's accounts and depreciates them over the remaining of their lifetime using a tilted annuity formula which includes an asset specific price trend as a parameter. This approach is intended to give better price signals to market players.¹⁹ In addition, the asset valuation in ComReg's TD model takes into account Eircom's forecasted capital costs associated with ongoing annual investment in poles and ducts over the price control period.

¹⁸ 2013/466/EU: Commission Recommendation of 11 September 2013 on consistent non-discrimination obligations and costing methodologies to promote competition and enhance the broadband investment environment, Paragraph 34 determined that Reusable CEI assets and their corresponding regulatory asset base should be set at their regulatory accounting value net of depreciation and indexed by a price index.

¹⁹ §5.203 and following, ComReg 15/76.

As such, replacement of assets at the end of their asset life are accounted with the HCA modelling.

Common operating costs amongst poles and ducts

ComReg has also analysed the costs within Eircom's cost accounting systems and had identified the operational costs related to either pole or ducts and associated these costs to the related access price. These costs are typically common across all poles or all ducts, rather than being broken down and associated with individual assets. As an example of this, to calculate the expected number of poles that need replacement Eircom conducts surveys of the pole network each year, these surveys are considered operating costs of maintaining the pole portfolio as a whole and are priced in the pole access price on per pole basis.

This approach assumes that there are no major systematic differences in how CEI assets are used in different locations, making it reasonable to allocate categories of operating cost to CEI assets using simple keys (such as per pole). Whilst this has been a reasonable approach to date, ComReg will need to consider whether this remains a reasonable approach if NBI uses CEI assets in very different ways to other access users.

Central overhead costs

An allowance is made for central common costs, such as corporate overheads, and included in the estimates of total cost of CEI. This is then divided out per sub-duct or per pole. This leads to a mark-up being applied to the (average) incremental cost of CEI to provide a contribution towards Eircom's overheads, though this is not explicitly separated out.

2.3.3 BU-LRAIC+ and non-reusable assets

Definition of non-reusable assets

In the 2016 access pricing decision ComReg also identified non-reusable assets. These are CEI assets that, in their current condition, cannot be reused for NGA services and need to be repaired or modified to allow for NGA deployment. An example of non-reusable asset would be a duct, currently in use for Eircom's copper network, but blocked and not currently allowing installation of new fibre; clearance of the blockage (at some cost) would allow the asset to be re-used for NGA at much lower cost than laying new duct. Therefore, there are costs associated with bringing the assets into shared use for NGA services that are not currently incurred when assets are used solely by Eircom for its copper network. By their nature, most of these costs are likely to be one-off in nature (e.g. clearing duct blockages) rather than recurrent.

Historic expenditure does not include costs of repairing non-reusable assets

Eircom's historic expenditure on CEI to support its copper network provide little guide to the costs of repairing or upgrading non-reusable assets required to support NGA. ComReg determined that the appropriate pricing methodology for these replacement assets (new assets) is bottom-up LRAIC+, modelling the costs of providing these new assets. We understand that Eircom is itself deploying a

new NGA network in the rural commercial area, which is likely to yield useful data for assessing the costs of upgrading CEI assets likely to be needed in the intervention area.

The BU-LRAIC+ includes efficiently incurred costs, both variable and fixed directly attributable to the additional investment needed over the long run to build CEI for NGA deployment, together with a contribution to costs common across various services (the 'plus'). Generally, the BU-LRAIC+ estimation generates a price that would be comparable to the cost an efficient operator would incur for building its own CEI. As operators are faced with a build or buy signal, they are encouraged to make an efficient investment decision in either building their CEI to provide NGA or rent Eircom's CEI and ensure its efficient cost recovery. Therefore, potential competition in CEI provision is not precluded but encouraged where commercially viable.

2.3.4 Mark-ups for central overhead costs

Mark-up for central overhead and common costs

The '+' in LRAIC+ refers to the mark-up to recover common costs that are not directly attributable to the services in question but shared across a number of services. The common costs included are network rates, central planning, warehousing and corporate overheads.

As part of the Revised CAM (copper access model) used to set pole and duct prices in 2016, some assumptions were made with regards to measuring the access network. In the Bottom-Up model pole and duct quantities are determined with reference to the overhead and underground route lengths and these are then calibrated against Eircom's network data to ensure that the overall number of poles and duct track lengths are broadly consistent with Eircom's actual network after allowing for relevant efficiencies. In the estimated model Ducts are shared between D-Side Cables, E-Side Cable, leased line cables, core cables and NGA cables and the total size of required sub-duct is based on the surface occupied by each cable (though copper cable are typically not placed in sub-duct). Poles are shared by the final drop and D-side cables.

Central overhead costs in the intervention area

In ComReg decision D11/18, ComReg noted that there is no margin on revenues earned from longer lines in the non-commercial area to contribute to the recovery of general overheads and common costs. As such ComReg revised its approach in a manner that all common costs contributions are on a cost per service basis and should be recovered from the commercial line base. Furthermore, a consequence of this approach is that successor services provided in the non-commercial area cannot be expected to make a contribution to common cost and overhead recovery. In particular, the NBP operator does not need to include a common cost mark-up

and should pay lower CEI access charges than prices set in the ComReg decision D03/16²⁰.

2.3.5 Geographical differentiation

In the 2016 Access pricing decision, ComReg notes that there are three factors that influence duct cost which are surface types, trench size and whether duct is deployed in Dublin or outside Dublin. This is mainly due to the cost of excavation and surface reinstatement which contractors usually charge higher in Dublin when comparing the same surface type. ComReg considered that the installation cost was sufficiently different that it warranted a different price in Dublin compared with Provincial areas outside of Dublin.

With regards to poles, ComReg considered that in order to send the appropriate investment signals in the (Modified) LEA and outside the (Modified) LEA the price per pole should reflect the cost in each of these areas.

2.3.6 Replacement rates and unit costs

Replacement rates for NGA

In ComReg D30/16 it was established that most poles and ducts are reusable, while only a small percentage of them are non-reusable for the development of future NGA services and would require replacement. For ducts the non-reusable replacement rate is assumed to be 5% while for poles it is assumed to be 8% over the price control period.

In effect, this assumed replacement rate acts as a proxy for costs that may be incurred in making assets re-usable for NGA. It may be that in practice assets do not need to be replaced, but instead there is a cheaper alternative of repair or modification. This possibility is not explicitly modelled, but the possibility can be reflected in the replacement rate assumptions.

Unit basis for costs

ComReg determined the appropriate unit basis to derive a per unit rental charge:

- Once the total cost relating to duct access is calculated using the blend of HCA and BU-LRAIC+ for a 5% replacement of the duct base, the total is divided by the total length of cable/sub-duct. The unit cost of duct is based on length as this is the primary driver for duct cost. However, the price per meter of sub duct is based on the assumption that the duct access services provided by Eircom includes pre-supplied sub-duct. If an access seeker would self-supply sub-duct the regulated access price from ComReg Decision D03/16 would need to be

²⁰ ComReg Decision D11/18. Paragraph 6.226 and footnote 161.

reduced accordingly. (This is an example of how costs of access services depend on whether access provider or access seeker undertake particular activities.) The rental charge is differentiated for the Dublin region and for Provincial areas.

- Once the total cost relating to pole access is calculated using blend of HCA and BU-LRAIC+ for an 8% replacement of the pole base, the total is divided by the total number of poles on Eircom's network. The access price is differentiated between exchanges part of the Modified LEA (consistent with those more urban based exchange areas) and outside the Modified LEA (consistent with those more rural exchange areas). In addition, ComReg determined that the rental charge for each pole should be divided by the number of operators using each specific pole.

Considering the extent of CEI upgrades in terms of pole replacement and duct remediation that Eircom would have undertaken in order to deploy its FTTH network in the rural commercial area most, if not all, CEI assets can be classified as reusable assets. Thus the current network would have a 100% re-use factor for NGA services in this area. In the NBP intervention area this is not yet the case and the replacement factor would take into account the percentage of the pole and duct base that needs to be replaced for full fibre deployment.

2.3.7 Depreciation and assumed asset lifetimes

In Decision D03/09²¹, ComReg revised the asset life for poles from 15 years to 30 years to more closely align cost models with the average actual life of poles. However, the asset life of poles was based entirely on copper networks, whilst in the case of a fibre access network this life could be greater given the lower weight and cross-sectional area of fibre cable which would reduce the wind loading borne by the supporting pole.

With regards to ducts, the regulatory asset lifetime was revised from 20 years to 40 years by D03/09.

²¹ ComReg D03/09 Response to Consultation Document NO. 09/11 and Final Decision: Review of the regulatory asset lives of Eircom Limited.

3 The National Broadband plan

3.1 Function of the NBP

The National Broadband Plan (NBP) is intended to provide high quality and reliable broadband services in rural areas where a competitive NGA deployment is not expected to be commercially viable. Under this program, the Government has identified an intervention area for which it will provide funding to a commercial entity to support the build of NGA and associated backhaul network infrastructures.

The intervention area

The intervention area contains approximately 540,000 premises (and other delivery points), of which 450,000 are located in the most rural parts of Ireland and the remaining are located in urban areas that are currently unserved by high speed broadband. This area is characterised by having no existing or planned commercial deployment of high-speed broadband in the next 3 to 5 years. The NBP aims to provide NGA for all premises in the intervention area, with broadband speeds of at least 30 Mbps, upload speeds at a minimum of 6 Mbps and to generate competition at the retail level.

Figure 1 below shows a snapshot of the interactive map provided on the DCCA website²² outlining the National Broadband scheme target regions in amber. Areas where commercial operators are delivering or have indicated plans to deliver high speed broadband services are displayed in blue. Areas where Eircom has committed to commercial rural deployment plans to rollout high speed broadband to 300,000 premises are in light blue. The map was fixed for the purposes of the procurement process and is not expected to change for the next 7 years²³.

²² <https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=99c229dc4c414971afc50818b25337ef>

²³ As set out in §51 (page 15) of the state aid notification available at: https://ec.europa.eu/competition/elojade/isef/case_details.cfm?proc_code=3_SA_54472

Figure 1: Map of Ireland displaying the intervention area and the commercially served area

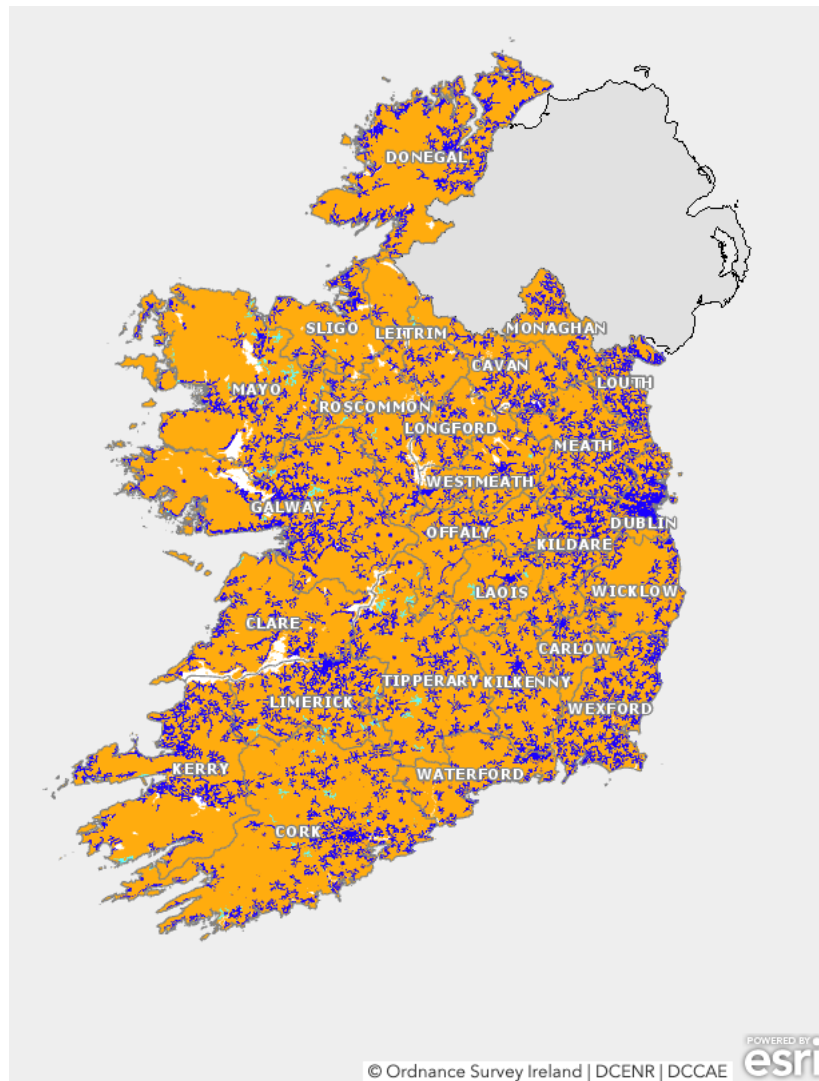


Figure 2: A detail of Dublin showing urban in-fill premises

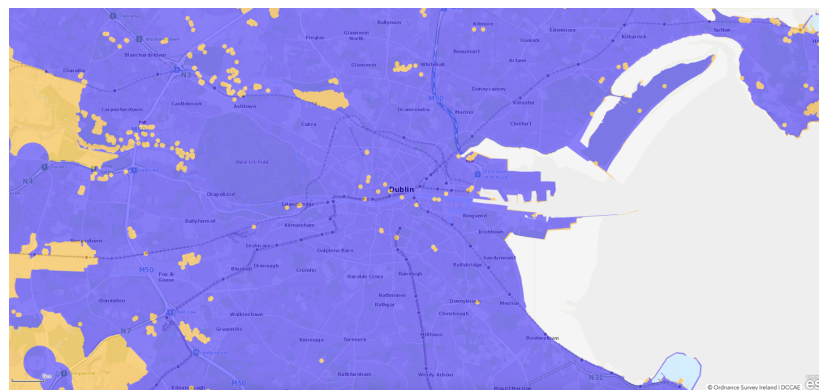
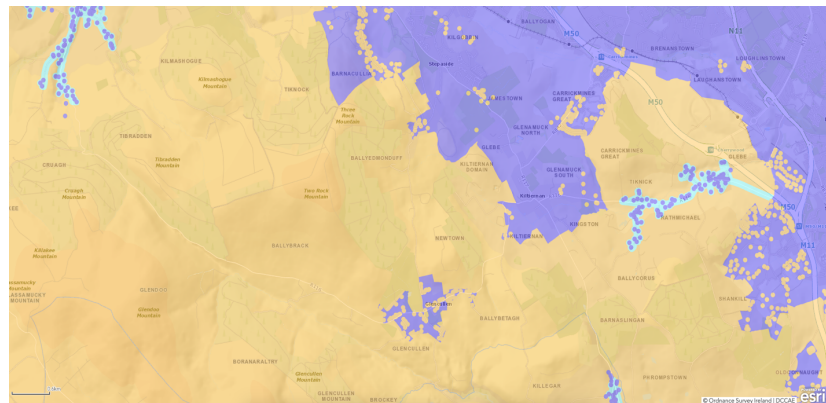


Figure 2 zooms in on the intervention area around Dublin. Although most of Dublin is already, or soon to be covered, by commercial FTTH or FTTC (providing more than 30 Mb/s) deployment, a small number of areas (shown in amber) in the greater Dublin region will need to be served by NBI. About 40,000 premises in more densely populated regions in Ireland and 873 in the county of Dublin fall within the Intervention area.

Figure 3 shows an example of the intervention area (shown as amber) in the rural context. Again, the intervention area comprises of many small isolated patches surrounded by the commercial area, as well as larger swathes of area. Therefore, we can see that intervention area is in practice highly fragmented.

Figure 3: Zoom-in on a typical rural area



Contract obligations met by gap funding

The DCCAIE has determined that a “gap-funding” model would be the most appropriate to realise all the objectives of the NBP while requiring the minimum government funding and minimising risks. Assets and infrastructure built under the NBP will be owned by a private sector operator. In return, the operator will be obliged to provide the required services within the intervention area under certain conditions related to price and quality. If the operator is not compliant with its contractual obligations towards the State, the DCCAIE may take over the subsidised assets and, where necessary, the operator’s wholesale business.

The provider has been selected through a competitive selection process, from which three bidders were shortlisted. Two of the bidders withdrew during the process, leaving only one bidder remaining. The winning bidder is a consortium of private entities operating under the vehicle National Broadband Ireland (NBI). The DCCAIE appointed NBI on the 19 November 2019.

3.2 CEI in the context of the NBP

Importance of CEI sharing in the IA

The Broadband Cost Reduction Directive (2014/61/EU) identifies CEI as a significant component in the cost of rolling-out new high-speed electronic communications networks. Being able to share Eircom's existing CEI within the intervention area is essential to delivering the objectives of the NBP cost-effectively. Indeed, the terms of the NBP State Aid Decision require the provider to share CEI where possible rather than build its own CEI.

3.2.1 NBI's CEI requirements

A significant part of the financial aid that will be required by NBI will be most likely determined by the regulated cost of accessing the incumbent's physical infrastructure, both poles and ducts. To cover the intervention area, NBI will require access to up to 1.1 million poles and at least 15,000 km of existing ducting for the whole duration of the NBP contract.²⁴ Furthermore, NBI could become the sole user of much of the CEI in the event that Eircom retires its copper network. In such a case NBI will be the principle supplier of broadband services in the intervention area.

Alternative CEI available on commercial terms

Whilst it is likely that NBI will make extensive use of Eircom's CEI within the intervention area, there is alternative CEI that could be used to deploy NGA services, such as ESB's infrastructure. The exact details with regards to the infrastructure that will be used will presumably be decided by NBI on a case-by-case basis. In the event access to ESB's network is required by NBI, this would be under the framework established in Broadband Cost Reduction Directive. Although NBI may have a right of access to such alternative CEI (under certain conditions), pricing would be determined under a commercial agreement between NBI and ESB. Although there is the possibility of disputes being raised over the terms of access, obligations to make CEI available arise from the general provisions of the Broadband Cost Reduction Directive, rather than any SMP finding. Therefore, the terms of access to such alternative CEI would not be regulated in the same manner as access to Eircom's CEI.

3.2.2 Subsidy payments and access prices

Terms for access to Eircom's CEI affects the quantum of subsidy required

The rental costs associated with access to Eircom's poles and ducts are used in the financial model to calculate the state-aid intensity in the NBI's contract. Therefore, ComReg's determination with regard

²⁴ Government of Ireland "Delivering the National Broadband Plan", available at <https://www.dcae.gov.ie/documents/Delivering%20the%20National%20Broadband%20Plan.pdf>

to access prices for Eircom's CEI will directly affect the quantum of subsidy required by NBI.

Changing CEI access prices over time

The amount of state aid subsidy has presumably been determined on the basis of assumptions about the CEI access charges that NBI would be likely to pay.²⁵ These were most recently set by ComReg's Decision D03/16, though are subject to regular review. This raises the question of what happens if access charges change over time. Rental charges for poles and ducts are calculated for a price control period of three years and may change in response to costs or other factors. On the other hand, the NBI contract period is of 25 years, which creates some uncertainty about the long-term profitability of NBI if access prices change and are not matched by corresponding changes in subsidy.

Clawback provisions

We understand that the NBP contract contains various provisions intended to claw back capital underspends and cost savings, splitting these between NBI and the Government in order to provide incentives for cost reduction.²⁶ These provisions would presumably apply if CEI access charges were to reduce for some reason.

Increases in access charges

If on the other hand regulated access prices were to increase over time, NBI may face some risk that subsidies might not be increased, not increased enough to compensate for the cost increase, or only increased with some delay. We presume that such risk would have been factored in the bid submitted by NBI during the selection process.

Increases in CEI access charges likely once Eircom's copper network is turned off

It is plausible, as we discuss in detail in Section 5, that CEI access charges will tend to increase over time for NBI as Eircom withdraws its copper network in the intervention area and the costs of CEI assets are needed to be recovered primarily from NBI. This increase is very likely to happen regardless of the specific details of how CEI access costs might be shared and, therefore, should - in some way - have been factored into bids to become the NBP provider.

Significant unanticipated increases in access charges

In the event that regulated access prices are greater than anticipated and the required state aid is, therefore, also greater than anticipated, we are not aware²⁷ of an explicit mechanism set out in the NBP contract to balance the risk between the DCCAE and NBI. NBI is not generally entitled to any increase in subsidy if its costs increase. Indeed, the Government intends to cap its exposure to increases in CEI access costs increasing subsidy requirements.²⁸

²⁵ Infrastructure access charges are mentioned as a relevant cost for NBI in Section 2.1.6 of Schedule 5.2 the Project Financial Model (page 22), available at <https://www.gov.ie/en/publication/16717-national-broadband-plan-contract/>

²⁶ See Schedule 5.1 of the NBP contract (especially page 54), available at <https://www.gov.ie/en/publication/16717-national-broadband-plan-contract/>

²⁷ This is on the basis our reading of the State Decision.

²⁸ See the State Aid Decision at §31.

Our understanding is that the NBI may be granted limited additional subsidy at the discretion of the DCCAE.²⁹ However, if CEI access prices increased, presumably NBI would first need to make a case to the DCCAE and this would need to be considered and a contract amendment made, which would take some time. We are unclear whether there would be any element of retrospection in subsidy increases in this scenario.

Benefits of stable CEI access prices

Therefore, there appears to be potential for problems if regulated CEI access prices were to increase appreciably and unexpectedly. This suggests that there is some merit in stability of CEI access prices over time, to the extent that this is possible. However, over the long-term, there could be fundamental changes such as Eircom turning off its copper network, requiring a shift in the recovery of CEI costs in the intervention area towards NBI. As we discuss below, we can anticipate that CEI access prices for NBI will need to increase as sharing of costs between NBI and Eircom ceases once Eircom withdraws its copper network; this is largely unavoidable in the current circumstances.

3.3 Transit in the commercial area

The commercial area

The intervention area is formally defined by the DCCAE and described in NBI's contract. The commercial area (i.e. the complement to the intervention areas) can be further divided into:

- the areas where Eircom has extended its plans for commercial deployment of FTTH in the course of the NBP procurement process (what we call the rural commercial area), but which were originally part of the intervention area; and
- areas where Eircom or other operators already planned to roll out FTTH (which includes urban areas).

Therefore, the intervention area, as we currently find it, and the rural commercial area have been shaped by choices made by Eircom. As discussed above, presumably Eircom will have identified areas where it can profitably roll out FTTH (i.e. profitable on gross margin³⁰ basis, before allocation of common costs). By implication, no parts of the intervention area (as now defined) can presumably be served profitably by Eircom in the absence of subsidy, otherwise they should have been included in Eircom's proposed FTTH coverage in the rural commercial area.

Transit through the 300k area

In April 2017, Eircom initially committed to a large commercial plan to deliver FTTH to 300,000 premises that were originally part of the

²⁹ Details are redacted, but see §78.49 of the NBP contract which indicates the possibility of an increase in subsidy. The redacted contract is available at <https://www.gov.ie/en/publication/16717-national-broadband-plan-contract/>

³⁰ Gross margin is price minus variable (i.e. avoidable) cost, before any allocation of common or fixed costs.

intervention area³¹. This was subsequently extended to around 340,000 premises. However, this extension of Eircom's network created additional fragmentation in the already geographically fragmented intervention area. This in turn is likely to increase NBI's need for transit through the commercial area to interconnect isolated components of the intervention area.

Interconnection might be achieved through the use of wholesale services (e.g. optical services or leased lines) from Eircom or through NBI self-building transit links on top of CEI access. Whilst there may be some competitive providers of wholesale services or CEI access at certain locations within the commercial area, within the rural commercial area it is likely that Eircom will be the main supplier of CEI and wholesale services to NBI at most locations. NBI could seek access to alternative CEI, such as ESB's and eNet's network, within the rural commercial area for the purposes of deploying a high-speed broadband network in the intervention area under the provisions of the Broadband Cost Reduction Directive, where possible. Any such access to alternative CEI would be on commercially agreed terms, but subject to dispute resolution by ComReg.

NBI would not use transit services to compete with Eircom on NGA services

As a result of this definition of the intervention area, NBI will likely require access to poles and ducts in the commercial area (especially within the rural commercial area, but not limited to this) for transit purposes to serve customers in the intervention areas, not to provide any wholesale services within the commercial area. NBI would not be using these transit services to provide NGA services in direct competition with Eircom within the intervention area, as Eircom would not be providing such services in the intervention area (only legacy copper-based services).

We understand that under the terms of its contract, subsidy payments made to the NBI cannot be applied to services provided outside the intervention area.³² However, the subsidy payments can be applied to areas where the costs are specifically related to addressing the intervention area, as would be the case for transit services through the commercial area required to serve the intervention area.

³¹ AGREEMENT BETWEEN THE MINISTER FOR COMMUNICATIONS, CLIMATE ACTION AND ENVIRONMENT ("Minister") AND EIRCOM LIMITED ("Eir") IN RELATION TO NATIONAL BROADBAND PLAN – COMMERCIAL DEPLOYMENT COMMITMENT, <https://www.dccae.gov.ie/documents/Commitment%20Agreement.pdf>

³² See §37.2 (page 72) of the NBP contract, available at <https://www.gov.ie/en/publication/16717-national-broadband-plan-contract/>

4 Cost definitions for shared CEI

In this section we set out some basic definitions of incremental cost that we will use throughout.

4.1 Definitions of incremental cost

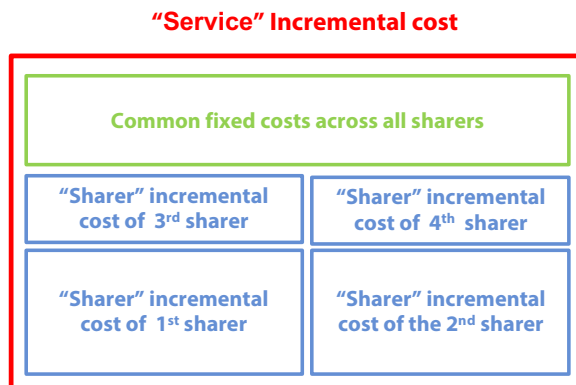
Incremental cost of one user vs incremental cost of providing a service

CEI access allows operators to share assets such as ducts and poles when deploying copper or fibre networks. CEI has the typical feature that, provided capacity constraints are not exhausted, sharers can use the assets with relatively little additional cost to the provider. Therefore, if we had a number of sharers of an asset (e.g. a pole), if each sharer paid only the incremental cost its own *individual* usage caused, then the overall costs of the asset would not be recovered.

Therefore, we need to distinguish between:

- the “service” incremental costs (i.e. costs avoided if all sharers had stopped using the asset and it was never needed); versus
- the “sharer” incremental cost (i.e. the costs avoided by just one sharer ceasing use, but the asset still being needed to meet the needs of other sharers).³³

Figure 4: Service incremental cost and sharers incremental costs



These definitions of “service” and “sharer” incremental cost are not standard terminology, but we will use them throughout to avoid

³³ We simplify matters for now by ignoring that sharers may differ significantly in how they use CEI assets. We have already noted that NBI is likely to have large-scale and long-term needs for CEI access within the intervention zone, which would need to be taken into account when considering the incremental cost caused by NBI becoming a sharer on CEI assets currently used solely by Eircom.

confusion between these two cost concepts. Figure 4 illustrates provides an illustration of the concepts. These are conventional forward-looking, long-run incremental costs, but the increment is different in the four cases.

CEI costs common across sharers

Service incremental costs typically exceed the sum of sharers' individual incremental costs because there are potentially strong scale economies in sharing. The excess of the service incremental cost over the sum of the individual sharers' incremental costs is the *common CEI cost*, which we define to be that part of the service incremental cost that is common across sharers.

Cost sharing possibilities

Where there are common CEI costs, there are multiple ways that service incremental costs may be split between sharers within the constraints that:

- (i) each sharer pays at least its individual incremental cost (which sets a floor on what each sharer must pay); and
- (ii) the CEI provider recovers its service incremental cost, which requires some splitting of the common CEI cost between users.

Distributing the service incremental cost using usage keys

One approach satisfying these constraints – as adopted in ComReg's decisions to date – is to calculate an incremental cost using *all* usage of the relevant CEI as the demand increment in a given geographical region (i.e. the "service" incremental cost in the definitions above) taking a long-run view, then to allocate this to individual users according to some metric for the intensity with which the sharer uses the shared CEI asset. In the case of poles, the cost is split equally across the operators sharing poles; in the case of ducts, the incremental cost related to duct access is calculated for all the underground infrastructure and divided by the total length of sub-duct/cable deployed across the network, this provides an average cost for sub-duct/cable deployed across the network.

This approach calculates an *average incremental cost* for each asset, in the sense that the service incremental cost is being distributed across users in proportion to the amount of assets they use (in other words a LRAIC+ approach). Notice that, when using an average incremental cost concept, we need to specify both (i) what increment of demand is used to calculate incremental cost and (ii) what scheme is used to allocate this incremental cost to individual users. In the case of poles, the distribution of the service incremental cost is particularly simple, as it results in symmetric pricing for all users, what ComReg has previously called "*per operator sharing*".

Distributing the service incremental cost using other keys

There are many other potential keys that could be used to distribute the service incremental cost. For example, if Eircom and NBI were sharing an asset, then common CEI costs could be split in proportion to the number of consumer lines or in proportion to revenue. Each user then pays the average sharer incremental cost, plus a share of the common CEI cost (which again a LRAIC+ concept, but with incremental costs distributed across users differently).

Another alternative is to assign all the common CEI cost to a primary user, with other secondary sharers paying only their sharer incremental cost. There are many alternatives.

Note that in this example the service incremental cost, assuming some factor reflecting the increase in costs related to NBI's demand, would be divided by the number of assets that are related to this service cost, giving a LRAIC cost measure on a per asset (poles or length of sub-ducts). However, the proportion of the per asset cost associated to the common costs will be distributed according to the number of consumer lines or in proportion to the revenue of each of the users.

4.2 Capacity constraints and geography

Capacity constraints and long-run incremental costs

Once capacity constraints are exhausted, such as the cable carrying capacity of a pole or the cross-sectional area of a duct, new CEI assets are needed. Therefore, calculation of the "service" incremental cost should be considered taking a forward-looking long-run view. Long-run incremental costs should anticipate demand growth and new capacity requirements when measuring the additional costs caused by access users. This tends to increase the incremental costs caused by a sharer, as use of capacity by a sharer, even if it does not exhaust current capacity, it may bring forward the need for future capacity enhancements if there is underlying growth in demand for access services.

Build-ahead where demand is uncertain

In the case of duct, it may be cost efficient to over-size ducts to leave some spare capacity in anticipation of possible future demands, as the majority of cost is related to laying the duct and the cost of duct increases less than linearly with cross-section. Given demand uncertainty, some degree of build-ahead will be usually efficient as it avoids having to re-lay additional ducts later. This is a reasonable cost of an efficiently organised CEI network. ComReg takes this into account in its existing cost modelling through an allowance for spare capacity.³⁴

Capacity constraints differ across geographies

A key difference across geographies is the extent of anticipated demand growth for CEI access and whether capacity constraints are likely to bind at any point in the future. Within the intervention area, it is unlikely that deployment of fibre onto poles will hit capacity constraints. Poles are able to carry at least two cables, with fibre cables being lighter than copper cables. With Eircom expected to decommission its copper network in the future and NBI becoming the sole user, it is not anticipated that poles cable-carrying capacity and duct capacity limits will be reached within the intervention area (at least typically). Indeed, evidence of this can be taken from the

³⁴ The model includes A 25% mark-up for spare capacity and a 20% mark-up for empty spaces to the modelled duct surface. See ComReg Consultation Document 15/67 §5.134.

rural commercial area where competition is also expected to be very limited; in that area the majority of poles did not need be replaced and those that needed to be replaced because of the condition of the poles rather than capacity constraints being exhausted. Overall, if copper cables are removed from poles, there would likely be capacity to carry additional fibre cables over and above NBI's needs. Whilst we would expect decommissioned copper cables to remain in ducts, as removing them might cause damage, in many cases there will still be spare duct capacity within the intervention area.

Future capacity expansion may be less relevant for the IA

Therefore, sharing CEI in the intervention will typically not bring forward the need for future capacity-expanding investment. The opportunity cost of spare capacity is essentially zero in this case, if capacity constraints are not expected to be reached within the timeframe of the cost assessment exercise.

In contrast, in urban areas, demand for duct can be expected to grow over time due to various demands from providers for both provide point-to-point links within their own networks and to connect customers to nodes of their networks.³⁵ When a new duct is dug, over-dimensioning relative to immediate needs is desirable, as this allows future new demand to be met without new digging and lowers unit costs given demand uncertainty. Sharing a duct (through use of a sub-duct) diminishes available spare capacity and may bring forward future investment required to expand capacity. Therefore, there is an opportunity cost of using up spare capacity that needs to be reflected in the long-run incremental cost of the sharer's access.

4.3 Asset upgrades

NGA and upgrade requirements may contribute to sharer incremental cost

Sharing of CEI for NGA applications within the intervention area may require some upgrades to Eircom's current CEI. This might in part be repair or replacement of existing assets where they are substandard. It might also be that an NGA network has a different topology to Eircom's copper network and so needs entirely new CEI in certain locations. Therefore, in practice we are likely to have three main cases within the intervention area:

- (i) sharing of existing CEI, with sharing causing little additional cost;
- (ii) sharing requiring some repair/upgrading of existing CEI as a one-off additional cost;
- (iii) new assets being built by NBI specifically for NGA use and so not being shared (as they are not required by Eircom).

³⁵ We note that future demand growth might be partially offset by decommission of the copper network.

We understand that in the rural commercial area, Eircom has built new duct and installed its own cables without sub-ducting. Therefore, the installation of sub-ducts to facilitate sharing would be an example of the second category of cost. Clearing blockages in duct or upgrading cable hangers on poles are other examples.

New assets

The third case is not relevant to the question of CEI access pricing as Eircom is not under an obligation to build additional CEI to meet access demand where there it has no existing assets. We assume that NBI will self-supply any additional new asset required in areas not yet served by Eircom or use access to other CEI on commercial terms (e.g. ESB's distribution network).

In practice, we expect a mix of the second and third cases above to be most relevant. Therefore, even in the intervention area where capacity constraints are not expected to be reached, there will be some incremental costs caused by sharers (i.e. sharer incremental costs).

Are upgrade costs caused by inadequate prior investment?

One issue that will need to be considered by ComReg as part of its cost modelling is whether actual costs incurred by Eircom in upgrading CEI assets for use by sharers represents a genuine new cost, or whether this is the result of maintenance and repair activities not being carried to an adequate level by Eircom previously. To the extent that past levels of investment and/or maintenance have been inadequate, this should not be rewarded. However, because Eircom may reasonably have had little expectation of significant demand for CEI access within the intervention area, it is reasonable to treat costs of modifying or upgrading assets to allow sharing as being costs caused by sharing, subject to the provision that this should not compensate historic under-investment. We see no reason that these additional costs could not be amortised and recovered over time (rather than recovered as a one-off charge) given that NBI would have a long-term need to use these assets.

Therefore, within the intervention area, the relevant distinction is between:

- Eircom's reasonable steady-state business as usual costs, maintaining CEI in reasonable condition (which might require some uprating of historic costs if there has been historic under-investment);
- additional costs required to upgrade CEI for the specific purposes of NGA (e.g. to reduce risks of existing CEI assets failing or changes to existing CEI required to accommodate shared use) over and above those business-as-usual costs.

We cannot necessarily assume that Eircom has historically been incurring these business-as-usual costs at a steady state rate. To the extent that maintenance/upgrades has been deferred, it may be possible for historic operating costs and capital replacement rates to fall below the steady state rate; this incurs a deficit that needs to be made up later through higher expenditure.

5 Considerations relevant to CEI access pricing for NBP purposes

In this section, we set out the main issues that need to be considered when assessing possible approaches to setting CEI access prices in the context of the NBP. This will form the basis of an assessment of various options for setting CEI access prices considered in Section 7.

5.1 ComReg's objectives

5.1.1 Basis of intervention

Current SMP

The existing regulatory framework required that an access remedy is based on an identified competition problem. As discussed in Section 2, access obligations on Eircom's CEI currently arise from ComReg Decision D10/18, which found Eircom to have SMP in the Wholesale Local Access market. It is also required that the remedy is proportionate and not overly burdensome. The same will be required under the EECC.

SMP in the future

When considering the role of CEI access in delivering the NBP, we need to look forward beyond the typical length of a market review. This is because of the potential for long-term effects, for example on incentives to withdraw copper network at some point in the future, and also given that the useful life of CEI assets are beyond the length of market reviews.

Even if Eircom withdrew copper services in the intervention area, leaving NBI as the sole user of CEI, it is reasonable to assume that Eircom would still have most of the CEI in the intervention area and that NBI would have little alternative but to seek access. There is no reason to expect there to be significant future changes in the fundamental cost conditions allowing competitive provision of CEI within the intervention area. It is likely to remain cost advantageous to share CEI rather than build alternative CEI, and that this will be unaffected by technological progress elsewhere in the telecoms value chain.

Whilst ComReg cannot fetter its discretion in future market reviews, a reasonable working assumption is that CEI access obligations will endure in some form on the basis of an SMP finding beyond the current market review. However, the detailed nature of that finding might change if Eircom withdraws its copper services (for example, an infrastructure services market might need to be defined and Eircom might have SMP in that within the intervention area). NBI would still have a reasonable need for CEI access, arising not least

from its contractual obligations under the NBP to share existing CEI where available. ComReg would still need to set a regulated price due to the potential for Eircom to exercise its SMP, as an example by setting inefficiently high access prices for CEI absent such regulation or failing to meet NBI's reasonable CEI access requirements.

5.1.2 ComReg's objectives

Objectives are typical, even if the circumstances are not

The NBP creates a particular set of circumstances (especially regarding the limited potential for competition in the intervention area) that we need to take into account when determining an appropriate access price for CEI. In this context, ComReg's statutory objectives primarily lead to concerns about:

- protecting actual or potential competition from various forms of distortion; and
- ensuring that end-user benefits are maximised.

Six key issues

The main issues that need to be considered when setting CEI access prices in the context of the NBP scheme are:

- ensuring that Eircom, as the access provider can recover its efficiently incurred costs;
- where relevant, avoiding undermining the incentives of alternative infrastructure-based competitors to invest;
- avoiding over-compensating Eircom, leading to excess returns, especially if these could be used to cross-subsidise other services and distort competition;
- avoiding creation of retail market distortions;
- providing incentives for efficient migration from copper to fibre services (i.e. maximising overall consumer benefits whilst trying to avoid unnecessary costs of network duplication); and
- providing incentives for Eircom to facilitate NBI's roll-out.

These issues directly relate to ComReg's objectives and are considered in detail in the remainder of this section. The first four relate to promotion of competition and avoidance of competitive distortions, and the final two to maximisation of end-user benefits.

Subsidy is not a direct consideration

As explained in Section 3, the pricing of NBI's wholesale services will be set by benchmarking with similar services supplied outside the intervention area and so the pricing will not be affected by NBI's cost of accessing the CEI. However, the level of subsidy required by NBI is strongly influenced by the CEI access prices paid by NBI in both the intervention and competitive areas. In spite of this, the level of subsidies paid by the State under the NBP scheme is not a relevant consideration for ComReg in setting CEI access prices. With this in mind, we have not taken this into account in making our recommendations. Nevertheless, as we shall see below, an *indirect consequence* of ComReg exercising statutory objectives could affect the level of these subsidies.

5.2 Eircom's cost recovery

Why costs need to be recovered CEI access prices need to allow Eircom to recover its reasonably incurred costs and earn a reasonable return on its investments. This is a typical feature of any reasonable access regime. It is necessary so that there are incentives to provide infrastructure in the first place. Failure to ensure reasonable returns risks creating adverse precedents that could undermine investor confidence in the regulatory system as a whole. Where investments are made in sunk assets, there can be risk of regulatory hold-up, as the investment cannot be unwound once made if there is subsequent adverse regulation. Regulation needs to be consistent and predictable, otherwise investment in sunk assets may be discouraged.

Recovery of sharer incremental cost Where CEI assets are currently used solely by Eircom but will become shared, as will often be the case within the intervention area, it is necessary for NBI to pay costs that are directly caused by its shared use. This is what we have called "sharer" incremental costs in Section 4.1, as distinct from the "service" incremental cost of the CEI as a whole that would be avoided if Eircom *and* other shared users never used the CEI.

Common fixed costs The requirement that NBI pays for the specific costs its shared usage causes does not by itself determine a rule for pricing CEI access for NBI because of the economies from sharing use of CEI assets. If each user paid only their sharer incremental cost, then this would not recover the overall incremental costs of providing the CEI as there are costs that are common across sharers that need to be split. Therefore, CEI assets will recover their incremental costs when each sharer pays its incremental cost, plus some share of these common costs.

Efficient costs This said, Eircom should only be compensated for efficiently incurred costs. To the extent to which there are identifiable inefficiencies, these should not be passed on to access users through higher access prices. In the current context of CEI access, a key question is whether there might be an accumulated maintenance backlog, requiring additional maintenance expenditure to bring CEI assets into a state suitable for shared use. We defer this practical question to Section 8.5.

5.3 Competitive infrastructure provision

Build vs buy decisions and efficient access prices A further general regulatory principle when setting access prices is that access prices should not be set so low that they preclude potential *efficient* infrastructure-based entry, biasing build-vs-buy decisions of competitive providers and impeding the development of competition.

To some extent, this requirement is already met by ensuring the access provider recovers its costs of providing access; this maintains incentives for alternative infrastructure investment where it can efficiently bypass the incumbent and provide services at lower overall cost. However, protecting investment incentives is often seen as an additional burden over and above simply ensuring that the access provider is able to recover its own costs. In part, this issue can arise naturally due to the regulator having imperfect information about the access provider's costs. If access prices are set too low, there may be risks both that the access provider fails to recover its costs and that incentives for competitive infrastructure are undermined. The latter runs the danger of creating unnecessary long-lasting regulation, where competitive provision might have been possible but remains untested due to incentives to use access services rather than build infrastructure.

For these reasons, the requirement that access pricing does not preclude *efficient* infrastructure-based entry is usually cautiously applied by regulators. In many cases, the access provider will be an incumbent enjoying economies of scale and scope not available to an alternative infrastructure provider; simply ensuring that the access provider recovers its costs may provide insufficient incentive for alternative infrastructure-based entry unless such an entrant expects to gain scale sufficiently rapidly. A regulator might still judge that the dynamic benefits of full infrastructure competition could outweigh any short-run, static cost disadvantage that an alternative provider would be initially subject to. Therefore, the efficiency of entry is best judged taking a long-run view.

Whilst these are sound general reasons for being cautious to avoid undermining incentives for competing infrastructures when setting access prices, the particular circumstances of the NBP makes this issue largely irrelevant, as we explain below.

5.3.1 Intervention area

Restrictions on services offered by NBI

We understand that, under the terms of its contract, NBI is bound to offer services only within the intervention area. The intervention area has been defined by the Department to be those locations where commercial (i.e. unsubsidised) provision of high-speed broadband is unlikely.

In any case, even if NBI were (hypothetically) to provide services within the commercial area at some subsequent time, it would presumably need to demonstrate that it was not using subsidies to compete unfairly, for example by separation of subsidised provision in the intervention area from unsubsidised provision elsewhere; if this were not the case, then compliance with state aid rules could not be verified.

Therefore, provided that the intervention area has been appropriately defined to include only premises that cannot be served with NGA services without subsidy, there can be no potential infrastructure-based competition within it to be distorted. Setting a lower CEI access price would not affect any incentives of competitive CEI provision, as by hypothesis such provision is infeasible given economic conditions within the intervention area.

Entry into the intervention area

For completeness, we should nevertheless consider the theoretical possibility that some commercial operator might at some subsequent point choose to extend its NGA from the commercial area into the intervention area. The intervention area is fragmented and intermingled with the commercial area, so this scenario is not entirely implausible. If this were to happen then either:

- the intervention area has included a location it should not have; or else
- there would have been some change in the underlying economics that rendered NGA provision now profitable without subsidy.

Pre-emption incentives

In the first case (misidentification of a location as being in the intervention area), should not in theory happen. However, if it did occur, we would expect that Eircom would have an incentive to try to pre-empt deployment of services in that location by NBI. If Eircom pre-empts NBI, then it is possible that the intervention area might be modified to exclude that location, as it would be difficult to justify subsidising roll-out of NBI's network alongside Eircom's.

There was a period of the NBP procurement process during which there was significant revision of the intervention area. Therefore, if there were locations misidentified as being within the intervention area where NGA could be deployed by Eircom, there would have been a strong incentive for Eircom to identify these. This is exactly what happened with Eircom's plan to deploy NGA into rural commercial area.

This means that the more significant risk is changing circumstances, rather than initial misidentification of locations within the intervention area. Appointment of NBI has necessitated a freeze of this definition so that NBI's contractual obligations can be set. We understand that the Department does not intend further revisions. Nevertheless, clearly the possibility of changed circumstances cannot be entirely excluded and if there were significant entry into the intervention area this would in all likelihood require some subsequent adjustment of NBI's obligations (regardless on any current freeze on such adjustments).

If there were a significant risk of such a possibility, then the level of CEI access charges could have an effect on incentives that Eircom might have to pre-empt NBI in serving locations within the intervention area. In particular, the higher the price for CEI sold to NBI, the less incentive Eircom will have to enter the intervention area with NGA services itself. This is the reverse of the usual 'build

versus buy' logic, as higher CEI access prices for NBI leads Eircom to be *less* likely to build out to pre-empt NBI.

Why pre-emptive entry of Eircom is largely irrelevant

Overall, we consider that these considerations should be given little weight as they are hypothetical. The definition of the intervention area has been scrutinised and the NBP scheme cleared by the European Commission under State Aid rules. Therefore, we have no specific reason to think that Eircom might enter the intervention area to a significant degree and, even if this did occur, this would probably require some subsequent adjustment of the intervention area.

Entry due to changing circumstances

The other possibility is that NBI deploys to a location within the intervention area and then Eircom deploys a parallel network to that location subsequently. This scenario is probably more likely to be due to some change in the economics of deployment, rather than initial misidentification of the location as being within the intervention area (as in the latter case, Eircom would have an incentive to pre-empt deployment by NBI, as there would likely only ever be a single network). Therefore, this is an unlikely possibility in the short-term and would again presumably warrant some adjustment of the intervention area if it did occur.

In summary, although there are various hypothetical scenarios in which there might be competition (whether through pre-emption or duplicate networks) between Eircom and NBI within the intervention area, this is clearly not intended by the NBP scheme and not an issue that should significantly concern the design of CEI access prices.

5.3.2 Commercial area

CEI access for transit

Outside of the intervention area, there is a mix of areas where Eircom expects to deploy NGA on a commercial basis, but is likely to be the sole provider, and other areas (particularly urban areas) where competitive NGA provision is likely with parallel infrastructures alongside Eircom. NBI is very likely to need significant access to CEI within the commercial areas for the purposes of servicing customers in the intervention area, but this is for transit purposes, rather than because NBI would be offering any services within the commercial area.

Access pricing at sharer incremental cost

Eircom needs to recover any costs of providing such a CEI access service to NBI within the commercial area. This sets a minimum for access charges to be paid by NBI, as it needs to cover the costs caused by its shared use of CEI.

It is important that Eircom and access users other than NBI are treated symmetrically within the commercial area, as they may be providing directly competing services. This leads to the "per operator" approach to CEI access pricing used to date, where CEI costs are shared equally (where equal use is made of assets) to

ensure that competition is undistorted. However, there is no necessity that NBI be treated in the same way, as it is not able to supply subsidised services within the commercial area; CEI access would be used only for the purposes of delivering services required under the NBP within the intervention area and so NBI is in a different position to other access users within the commercial area.

In particular, if we had a situation in which NBI was covering only the incremental costs it caused by sharing CEI, but the remaining service costs of CEI were split between Eircom and other users according to usage, this would not create any competitive distortion. NBI would not be competing with Eircom or other third parties using CEI access, but Eircom and access users other than NBI would continue to be treated symmetrically.

No direct effect on build-vs-buy decisions of others

Therefore, it is possible to create a differentiated access service for NBI, providing CEI access within the commercial area for the purposes of delivering NBP services in the intervention area, and to price this access at NBI's sharer incremental cost. This differentiated service would not be available to Eircom's competitors within the commercial area, so would not undermine their incentives to build infrastructure where more efficient than using CEI access.

Gross margins from supply of CEI to NBI and cross-subsidisation

Whilst we need not be concerned about direct effects of CEI access charges for other providers' incentives to build alternative infrastructure, there is also a potentially important indirect effect if Eircom benefits from additional margins from providing CEI access to NBI. The mechanism is that:

- Eircom gains additional revenue for CEI access supplied to NBI exceeding the incremental costs of supplying that access, leading to additional gross margins being earned on its CEI assets;
- Those additional gross margins lead to Eircom setting lower prices for its wholesale services using those assets (potentially as a result of regulation of those services);
- Users of CEI access other than NBI (i.e. general access users not using those assets for the purposes of the NBP) sharing CEI with NBI and Eircom potentially also face lower CEI access charges, so that Eircom does not earn excess returns overall on the CEI assets (again, a likely eventual consequence of regulation squeezing out any excess returns over time).

Therefore, there are two potential impacts affecting competitors to Eircom:

- lowering the cost of wholesale services provided by Eircom such as VDSL VUA, particularly if prices are cost oriented; and
- making the use of CEI access more attractive for other providers relative to building their own infrastructure.

Both impacts tend to suppress incentives for competitive infrastructure-based competition within the commercial area. (This

is only a potential issue for the commercial area, as by assumption such other CEI users are absent in the intervention area.)

Indirect effects on build-vs-buy decisions

Therefore, to the extent that Eircom earns additional margins from supplying NBI with CEI access within the commercial area, this has the potential to affect infrastructure-based competition between Eircom and third parties within that area. This is both because prices of Eircom's wholesale services might fall and also because general CEI access prices might fall, affecting build-vs-buy incentives (what might be called "see-saw" effects caused by requiring cost-reflective CEI assets). Any such distortion would be an indirect consequence of the NBP intervention, as Eircom's CEI, used by Eircom and parties other than NBI, would be cross subsidised by NBI's payments for CEI access.

Materiality

NBI is likely to require a substantial volume of CEI access services in the commercial area due to the intervention area being highly fragmented therefore this indirect effect may not be insignificant. In order to interconnect the various isolated patches of intervention area, NBI is likely to need to criss-cross the commercial area even though it is not supplying services there. Therefore, there is a case for ensuring that Eircom does not earn additional gross margins from supplying CEI access services to NBI within the intervention area to avoid this problem; this amounts to NBI paying for CEI access for transit purposes in the commercial area to cover the additional costs caused by NBI's use, but no more.

5.4 Excess returns for Eircom

In the subsection above, we identified a specific concern that if Eircom earns additional gross margins from supplying CEI access to NBI for transit through the commercial area, this could lead to a possible distortion of competition if there were other third-party infrastructure-based competitors making build-vs-buy decisions. This is one particular example of the broader issue of whether Eircom might earn excess returns to its CEI assets and what adverse effects this might have.

How transitory excess returns might be caused

It is reasonable to assume that we are starting from a point where, as a result of regulatory reviews, Eircom is earning (at least approximately) only a normal return on its CEI assets. This is because Eircom's services using that CEI need to be cost reflective (either because they are regulated or subject to competition), taking into account any contribution to the costs of those CEI assets made by sharers.

If NBI now arrives as a new large-scale sharer of those assets and Eircom earns additional gross margins from the supply of CEI access to NBI (whether within the intervention area or the commercial area), then this is likely to lead to excess returns on those CEI assets unless there is some corresponding adjustment in the contribution

to the costs of those CEI assets made by Eircom's own services or CEI access services sold to users other than NBI. In effect, Eircom enjoys some benefit from the large increase in CEI asset sharing that results from NBI's presence (which in turn, only occurs because of the NBP intervention).

We can expect any such excess returns to CEI assets to be dissipated over time, most probably due to the normal application of periodic regulatory reviews. Exactly how this happens and whether competition also has a role depends on the geographical structure of Eircom's prices for the services supplied using these assets, but it is reasonable to consider that regulation would have an important part to play due to the lack of competition within the intervention area. We do not need to delve into the details, but rather notice simply that there is potential for Eircom to earn some transient excess returns due to the necessary lag in addressing regulation to take account of the changed situation with NBI becoming a large-scale user of CEI.

General effects vs. specific incentive distortions

In considering whether Eircom earning excess returns creates adverse effects, we need to distinguish between:

- the general issue of Eircom earning *transitory* excess returns that might provide financial resources that could be used to compete unfairly in other, unrelated services; and
- specific *persistent* distortions that arise due to "see-saw" effects on other services created by the need for Eircom's CEI assets to be cost-reflective.

The discussion in the previous section regarding impacts on build-vs-buy incentives for other infrastructure -based competitors within the commercial area fall into the second category. This is a persistent effect, as it is caused by the feed-through of margins earned from NBI's access demand on other services sharing those CEI assets. We consider that this effect could have a distortive effect, in effect making Eircom's CEI in the commercial area cheaper than competing infrastructure if Eircom benefits from sharing CEI with NBI. Therefore, we recommend that these risks be considered when setting CEI access charges for NBI.

Why transitory excess returns are not a major concern

The first issue listed above – transitory enrichment of Eircom, without a specific and persistent competitive distortion arising – is much less concerning, as similar issues arise in other circumstances. For example, the periodic review of price caps specifically allows for transitory excess returns to provide an incentive for the regulated provider to reduce costs. If Eircom were to enjoy transitory benefits from CEI sharing with NBI, this is broadly similar to a cost reduction brought on by external events (in this case, sharing economies due to the NBP intervention) rather than any specific action by Eircom. Therefore, we consider that much less weight needs to be given to the issue of transitory excess returns, as this is a largely unavoidable consequence of the combination of period regulatory reviews with the large scale of the NBP intervention. It would always be open to

ComReg to accelerate the regulatory review of prices of Eircom's services using shared CEI whose pricing might be affected by additional margins from supplying CEI to NBI.

5.5 Retail market distortions

Eircom will have the opportunity to purchase NBI's wholesale NGA services within the intervention area and retail them to its customers. This provides a route for Eircom to migrate customers from its current copper-based services to fibre-based services. Although over the timescales we are considering the USO may need reviewing, the current USO on Eircom is clear that such migration could be undertaken, and its obligations still met through use of another provider's wholesale services.

Incentives to retain copper-based services

it is possible that Eircom could have incentives to slow migration of customers from copper-based services due to the relative margins that Eircom might expect to earn as a wholesaler compared with being a retailer. Whilst we would not expect Eircom to be earning economic rent from its wholesale copper services, as identified in D11/18, ComReg has only imperfect information about Eircom's costs; even with effective regulation, the regulated party can be expected to earn some economic rent (so-called "informational" rent). In contrast, retailing NBI's wholesale fibre services is likely to be a largely contestable activity and earn only small margins. Therefore, there may be some incentive to retain copper customers where possible to maintain somewhat larger margins.

Reasons for retail rents

Of course, if Eircom delays transition of customers to fibre for these reasons, then it is exposed to the risk that other providers might build significant retail presence. Whether this is ultimately detrimental to Eircom depends on whether there are significant consumer switching costs, tending to make customers sticky in switching between suppliers and creating the potential for rents even from retailing. In this case, it is possibly that Eircom might expect to earn some rent even as a retailer, providing it can switch retail customers quickly to pre-empt losing them to alternative retailers. This would tend to neutralise incentives to maintain customers on copper to earn some rent from wholesale services.

Therefore, the overall incentives of Eircom with regard to migrating customers from copper to fibre are somewhat difficult to predict. Nevertheless, it is probably more reasonable to suppose that Eircom could have a somewhat deficient incentive to migrate due to the combination of little retail margin and some rents from wholesale copper services. We take this as a starting point.

Impact of CEI access prices

These incentives are potentially affected by whether Eircom expects to earn additional gross margins from supplying CEI access to NBI. If Eircom does expect significant additional margins from CEI access, then it might prefer customers to migrate to fibre if that boosts CEI

access demand from NBI. Moreover, there could even be potential for a retail market distortion if Eircom took into account additional margins it would earn from NBI, but other retailers did not.³⁶

Is CEI access demand sensitive to retail take-up?

In our view this theoretical concern about retail market distortions can be largely dismissed. It rests on the assumption that retail sales of NBI's wholesale services will lead to a corresponding increase in NBI's volume of CEI access services taken from Eircom. However, NBI needs to meet a roll-out plan set in its contract, so network deployment will not be sensitive to retail take-up. NBI's fibre network will need to pass premises whether or not they take NGA services. The only potential exception to this is isolated individual premises where NBI might be able to defer some network roll-out specific to that customer until service is taken (e.g. an isolated farm up a long track). However, situations such as this are relatively infrequent.

Indeed, if the volume of CEI access services needed by NBI is largely unaffected by retail take-up of NGA services within the intervention area, then it follows that there cannot be a significant effect on the retail market due to any margins that Eircom might earn from selling CEI access. Therefore, unless the regime for NBI's CEI access pricing explicitly brings in some dependency on NGA penetration (e.g. splitting costs according to the relative number of lines, which we will return to in Section 7.4 below), the level of CEI access charges paid by NBI should not have a significant effect on conduct at the retail level.

5.6 Copper to fibre transition

Impact of CEI access prices on transition

Over the life of the NBP contract, it is likely that Eircom will want to decommission its copper network. This raises the question of whether the pricing of CEI access for NBI will have any effects on Eircom's incentives to make this transition, especially within the intervention area. Put simply, the greater share of CEI costs allocated to the copper network, and so the lower the CEI access charges paid by NBI, the stronger will be Eircom's incentives to decommission its copper network. Whilst there may be merit in encouraging the take-up of faster services, equally many of the costs of the copper network are sunk and it may be desirable to continue the supply of legacy services for some time in parallel with the roll-out of fibre within intervention area.

Therefore, there is potential for errors in either direction in setting CEI access prices for NBI within the intervention area. Setting them too low might provide an inefficient incentive for Eircom to decommission the copper too early, whereas setting them too high

³⁶ We note that separation between wholesale and retail decisions within Eircom might be sufficient to mitigate this. However, as discussed below, we consider that this problem is largely irrelevant even if we ignore this mitigation.

might even cause the price of copper services to be lower than they otherwise might have been, slowing transition to fibre. There is also the potential for CEI access prices to change over time as fibre is rolled out and demand for higher bandwidths grows.

Key features of optimal transition

What then is an optimal transition path from copper to fibre service? Whilst it is difficult to be precise about timing, we can identify some broad qualitative features of optimal transition paths and what this implies for sharing of CEI costs between copper and fibre networks. In particular, as we show below, it is likely to involve:

- progressive shifting of common CEI costs from copper to fibre networks over time;
- abrupt shutdown of the copper network at some point whilst there are still some residual customers.

5.6.1 Ramsey pricing as benchmark

CEI pricing as a cost sharing problem

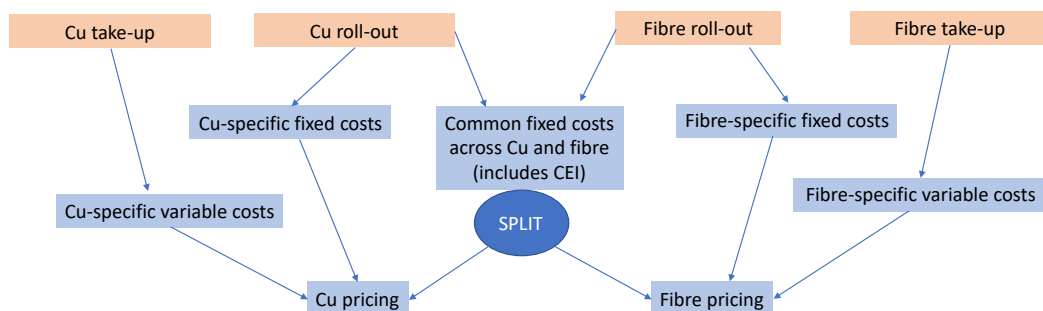
Where CEI is shared between copper and fibre networks, a part of the costs of the CEI are common between those two uses. Therefore, we can think of the question of setting NBI’s access charge as effectively one of allocating the common costs of CEI across the two networks to each network.

Making the simplifying assumption that there is a single copper and a single fibre service sharing the CEI, this means that cost-oriented prices for these services are determined by:

- splitting the common CEI costs between copper and fibre networks;
- each network also needing to recover fixed costs specific to that network type;
- total fixed costs for that network (i.e. the sum of network-specific fixed costs and the share of the common CEI costs) are divided over the relevant number of customers for each network to give an average cost; and
- the price of each service being equal to sum of this average cost plus any variable per customer cost.

The situation is summarised in the figure below.

Figure 5: Stylised cost structure



Prices are then cost reflective and the CEI assets cover their costs through contributions from each service. We can then ask how the common CEI costs should be efficiently split. Allocating more common CEI cost to, say, the fibre service increases its price, but reduces demand for that service and vice versa for the copper service. We want to structure prices across the two services to minimise the overall loss of consumer surplus caused by increasing price.

This is a Ramsey pricing problem, which can equivalently be considered to be:

- the problem that would be faced by a regulator seeking to price copper and fibre to minimise deadweight losses caused by pricing services above marginal cost, subject to the two providers recovering their costs (including the shared CEI costs); or
- the pricing problem that would be faced by a single profit-maximising monopolist providing both services, but subject to a regulatory constraint that revenue equals total cost.

Marking up prices above marginal cost entails some deadweight loss, as consumers will reduce demand. Therefore, prices for each service should be set in line with its ability to sustain a higher price without losing customers. This depends on each service's demand characteristics and, in particular, its price elasticity.

EPMU

Regulatory applications of Ramsey pricing are usually handicapped by not having much information about demand conditions. In the absence of solid information about which services are more price elastic, it is common to assume that all services are similarly price elastic, which in turn implies that each should have a price equal its long-run marginal cost (in practice usually implemented as a LRIC or LRAIC cost) with a common proportionate mark-up applied to recover common costs. This approach is usually called 'equi-proportionate mark-ups' (EPMU).

*Revenue-based
common cost
sharing*

It can be readily shown that the EPMU approach amounts to splitting the common CEI costs in proportion to the relative (wholesale) revenue from copper and fibre services. Furthermore, under some assumptions we can even show that EPMU is equivalent to sharing common CEI costs in proportion to the customer lines each network services. This is demonstrated in Box 1 below. Therefore, as fibre is built out and customers switch from copper to fibre, the burden of recovering common CEI costs shifts from copper to fibre. Such usage-based cost splitting will be one of the options we consider subsequently for CEI access pricing for NBP purposes in the intervention area (see Section 7.4 below).

BOX 1: EPMU and splitting CEI costs by subscriber line

EPMU means applying a common mark-up to both copper and fibre services over their respective average incremental costs.

Let C_c be the variable (per subscriber) cost associated with a copper subscriber line and F_c be the fixed cost specific to the copper network. Let Q_c be the volume of copper subscriber lines. The average incremental cost of copper lines is then $A_c = C_c + F_c/Q_c$.

Let C_f be the variable cost for fibre lines and F_f the fibre network fixed cost. Q_f be the volume of copper services and $A_f = C_f + F_f/Q_f$ the average incremental cost of fibre lines.

Under EPMU, prices for copper and fibre will be $p_c = (1 + m)A_c$ and $p_f = (1 + m)A_f$ respectively, where $m > 0$ is the cost mark-up (equal across both services). Therefore, profits before deduction of any fixed costs are just $mA_cQ_c + mA_fQ_f$. If the common fixed CEI cost across fibre and copper networks is F , then in order to ensure the CEI provider earns exactly normal returns, we need that $F = mA_cQ_c + mA_fQ_f$.

The contribution to common fixed costs from the fibre services is $mA_fQ_f = F \cdot A_fQ_f / (A_cQ_c + A_fQ_f)$. This corresponds to the access payment for shared CEI that would be paid if we separated the fibre provider. Therefore, the share of the common CEI to be paid by the fibre network, s_f , is given by

$$s_f = \frac{A_fQ_f}{A_cQ_c + A_fQ_f} = \frac{p_fQ_f}{p_cQ_c + p_fQ_f}$$

As are assuming equal mark-ups for the two services, the rule reduces to splitting the common cost in proportion to the revenue raised by copper and fibre services.

If we assume that $A_f \approx A_c$, so that the average incremental costs of fibre and copper networks were similar, or equivalently that prices of copper and fibre networks were similar, then the share of common CEI costs that would be borne by the fibre service would be approximately $Q_f / (Q_c + Q_f)$. This corresponds to a sharing of common CEI cost in proportion to relative subscriber lines.

Inefficient of fixed common costs splits and minimum contributions

A further immediate qualitative conclusion (within the narrow confines of the question of efficient cost sharing set out above) is that a minimum contribution to common CEI costs from either network is not efficient. If we start with very little demand for fibre services, copper services need to cover the common costs of CEI and the fibre network would pay only for the specific CEI costs they cause (i.e. the sharer incremental cost). Similarly, if we end with

customers having switched to fibre and very little demand for copper services, then fibre services need to cover the common costs of CEI.

In contrast, if we had some fixed split of common CEI costs (say 50% each to copper and fibre networks), this would create a situation in which it might not be possible to fund the contribution to common CEI costs because the revenue that can be raised from a service is limited; as price is increased, this causes demand to fall, leading to a maximum possible revenue regardless of how high the price of that service is set. Therefore, the service would cease to be profitable if it is required to make a fixed (or more generally, some minimum) contribution to common CEI costs. However, this is clearly inefficient, as provided a service can cover its network-specific fixed costs and then make some contribution, no matter how small, to common costs, then this is better than the service not being available.

Copper shutdown

A closely related issue is the path for shutdown of the copper network. As demand for copper services falls, fixed costs specific to the copper network need to be recovered from a declining number of customers, causing average cost to increase. At some point the service would become unprofitable even on the basis of a zero contribution to common CEI costs. At this point, the service should cease as it is unprofitable, but there will still be a number of copper customers at this point.

Network duplication

This argument is solely based on copper services not being able to cover their only specific fixed costs at some point. There are additional considerations that arise because of copper and fibre services being substitutes, creating the possibility that there might be unnecessary duplication of cost if copper and fibre networks are run together. We develop this in the following subsection.

5.6.2 Substitution between copper and fibre

Cross-price effects in the Ramsey framework

The Ramsey pricing model discussed above usually assumes – in its simple textbook form – that demand for a service responds to its own price (the ‘own-price elasticity’) but ignores cross-price effects between different services. Ignoring cross-price effects, mark-ups over marginal cost for different services are inversely related to their own-price elasticities (i.e. more price sensitive services get smaller mark-ups). Absence evidence of differences in these own-price elasticities, we can use the EPMU approach.

Impact of price on migration to fibre

Whilst we are largely ignorant of the details of likely price sensitivity of copper and fibre services in the intervention area, we do, however, know that fibre services are likely to be a substitute to copper services, albeit a superior one. Switching from copper to fibre services over time will be driven mainly by an underlying trend of growing bandwidth needs. However, there may also be a price

effect, where an end user is more likely to switch from copper-based services to fibre if there is a bigger price premium for moving/staying with copper services. Therefore, increasing the price of copper services may tend to cause switching to fibre; equally, raising the price of fibre may inhibit switching from copper.

It is difficult to tell how important these price effects might be, and it is probably reasonable to assume that the predominant effect is simply the time trend of shrinking demand for copper services and growing demand for fibre. Nevertheless, if there is a cross-price effect, this is relevant to the setting of optimal prices and the Ramsey pricing framework can be extended to include this. There are likely two countervailing effects in play:

- Relative to the case where we ignore cross-price effects, it may be desirable to shift common cost recovery slightly more towards copper, as the main effect is that customers switch to fibre, rather than ceasing to take the service at all;
- Especially later on once early adopters have switched to fibre, increasing the price of copper services may also lead to some customers taking no broadband service at all. In contrast, those who have switched to fibre might be more likely to stay with that service even if its price is raised somewhat. This suggests that the ability of copper services to bear an additional burden of common cost recovery declines over time as consumers switch to fibre. This is because any cross-price effect between fibre and copper will probably decline over time (i.e. initially adoption of fibre is sensitive to any price premium, but as customer switch the rump of remaining copper customers are increasingly likely to cease service rather than switch to fibre if their price increases).

Modification of the EPMU rule

Overall, the simple revenue-based common cost sharing rule derived from EPMU is likely to be a reasonable approximation to optimal (Ramsey) prices for copper and fibre services, but it is likely that taking into account cross-price effects would result in a larger proportion of common cost being allocated to copper when fibre take-up is low than is suggested by this simple rule. This is because the effect of doing so would be primarily to cause additional migration from copper to fibre, rather than consumers ceasing services altogether. Some customers might be lost, but the scenarios for this are quite limited (e.g. a voice only customer switch to mobile only).

5.6.3 Network duplication

The Ramsey framework does not account for network duplication costs

If copper and fibre services are substitutes, this raises the further issue of whether running fibre and copper networks in parallel results in unnecessary cost duplication. The Ramsey pricing framework above does not take this issue of network duplication

and possible cost savings into account: rather, it takes the existence of both copper and fibre services as given and then asks the limited question of how common CEI costs should be split efficiently given consumer demand responses.

Cost savings from turning off the copper network

As we have seen above, it is always the case that the copper network should be shut down once the number of customers reaches some threshold, as it becomes impossible to recover the costs specific to the copper network, let alone make any contribution to common CEI costs. However, this argument only identifies the point at which the copper network becomes unviable. It could be desirable to shut down the copper network earlier than this to avoid duplication of fixed costs specific to each type of network. If there were a single provider of both copper and fibre networks, then it would take into account those potential cost savings and would be likely to force migration of residual copper customers to fibre at some point.

By way of simple example, suppose for a moment that the variable per customer costs of copper and fibre networks were similar (which is probably not reasonable, as costs of connecting customers to the fibre network may well be higher than cost of connecting to the copper network if new service leads into premises are needed). Suppose also that fibre services can replicate copper services. In this case there is no advantage *at all* in running two parallel networks; shutting down the copper network avoids the fixed cost associated with that network. There is neither a cost penalty (as variable costs are assumed the same for both network), nor a consumer surplus penalty (as fibre replicates copper services) from doing this.

Balancing fixed cost savings with migration costs

The assumptions made in this simple example are unlikely to apply in practice:

- Because the copper network is already fully built out, many fixed costs are sunk and so not avoidable on shutting down the copper network. This reduces the potential benefit in terms of avoided cost from shutting down the copper network.
- The per customer variable cost (which includes terminal equipment and costs of connecting the customer to the network) are likely to be significantly higher for fibre.
- If there is enforced migration of copper customers, it may be difficult to charge any premium associated with the greater functionality provided by fibre if they are simply receiving a similar service to that they would have received over copper, but now delivered over fibre. (For example, this would be true for voice only customers, or those only wanted basic broadband connectivity.)

For these reasons, it is likely only become cost efficient to migrate remaining copper customers to fibre once the number of copper customers has dropped sufficiently. A balance needs to be struck between a reduced margin on each customer subject to enforced migration (as variable cost of serving the customer is higher, but no

premium can be charged for the fibre service), but a saving of the fixed costs associated with the copper network.

Optimal copper shutdown may occur when the copper network is still profitable

Again, it is difficult to be predictive about what an optimal migration path should look like, as this requires detailed information about costs and demand responses. However, we can see that a single provider of copper and fibre services would certainly take duplication of network-specific fixed costs into account and this would provide a strong incentive for shutting down the copper network once the number of subscribers had dropped below some critical threshold. At the point of shutdown, it could still be the case that copper network was profitable, in the sense that it could cover its network-specific fixed costs and make some contribution to common CEI costs. However, it would at that point be more cost efficient to migrate customers to the fibre network to avoid the fixed costs associated with the copper network.

5.6.4 Delegation of efficient copper shutdown

Separation of decisions about copper and fibre

As a result of the NBP, the decisions to roll-out fibre and to shut down the copper network have been separated and being taken by different parties, even though there is clearly a strong interaction between these decisions. The roll-out of the fibre network is in the control of NBI, but it must meet the obligations of its contract set by the Department. Shutdown of the copper network is a decision of Eircom (though there would likely be regulatory oversight arising through copper services being subject to SMP obligations and its USO).

When is a separated shutdown decision efficient?

Whether this separation of decisions leads to any inefficiency depends on (i) the wholesale price for fibre services faced by Eircom when migrating customers from copper and (ii) the avoided share of CEI access costs, as we now show. In fact, with an appropriately designed sharing rule for common CEI costs, it is possible for Eircom to delegated copper shutdown decisions efficiently.

Let us suppose that we are part way through the transition and the number of copper lines has fallen to N_c . There is a migration cost per line, equal to the wholesale fibre price p_f less the variable per line cost of copper service c_c . Suppose that there is also a network-specific fixed cost of F_c for the copper network. In addition, there is a common fixed cost of CEI, F , of which the copper network pays some share x and the fibre network the remaining share $(1 - x)$. Therefore, the critical number of lines at which it is cost effective to turn the copper network off is where

$$N_c(p_f - c_c) = F_c + xF \quad (1)$$

We can see that the larger the share of the common CEI cost allocated to the copper network, the sooner it will be decommissioned, as this contribution to the common CEI is treated

as an avoidable cost for Eircom. Although the CEI stays in place when the copper network is decommissioned, NBI pays for all the CEI.

An integrated operator's shutdown decision

If we had an integrated operator making this shutdown decision, then the common cost of CEI becomes irrelevant to any turn-off of the copper network, as this needs to be incurred anyway once the fibre network is in place. The migration cost per line now takes into account the variable per line cost³⁷ of fibre service, c_f , rather than the wholesale price p_f . Therefore, an integrated operator would turn off the copper network when

$$N_c(c_f - c_c) = F_c \quad (2)$$

There are two countervailing sources of bias to Eircom's delegated switch-off decision relative to an integrated supplier:

- First, the costs of migrating customers from copper to fibre faced by Eircom is higher than the true resource cost. This is because the wholesale price p_f for fibre services is higher than the variable cost c_f . The wholesale price must also recover the fibre network's fixed cost and also the fibre network's share of the common CEI cost (though in practice these may be partially offset by subsidies). This discourages Eircom from shutting down its copper network, other things equal. These costs would not be taken into account by an integrated network, as shutting down the copper network would have no effect on the fixed costs of the fibre network or the common CEI.
- Second, Eircom avoids the copper network's share of the common CEI costs when it shuts the copper network, even though those costs still need to be incurred to support the fibre network. This incentivises it to shut down the copper network. This effect is stronger the larger the share of the common CEI paid by the copper network.

There is no reason why these two effects should cancel out; indeed, the second depends on the how CEI access prices are set and what share of common CEI access prices has to be covered by copper services. However, because of this, it is also possible to tune the share of common CEI costs that Eircom's copper network needs to pay so Eircom has the same incentive to shut down as an integrated operator. This means that the shut-down decision should be efficient.

Efficient delegated shutdown by Eircom

From the relationships above, we can see that in order for Eircom's copper shutdown decision to be the same as that of an integrated operator, we need that the share of common CEI costs allocated to the copper network, x , to satisfy

³⁷ We assume that any subsidies for fibre reduce the provider's fixed cost, rather than affecting variable costs.

$$\frac{p_f - c_c}{c_f - c_c} = 1 + x \frac{F}{F_c}$$

This condition is obtained by dividing equation (1) by equation (2) above, so forcing the critical number of copper lines N_c at which the copper network becomes unviable to be the same for Eircom as for an integrated provider. We can rearrange this to give

$$x = \frac{F_c p_f - c_f}{F c_f - c_c}$$

thereby making it clear that the optimal sharing of the common cost depends on the fibre price, which may change over time, but the other parameters are just constants. We can write the rule even more neatly as

$$x = \frac{N_c^*}{F} (p_f - c_f) \quad (3)$$

where N_c^* is the number of copper lines at the point that the integrated operator would turn off the copper network (which is defined by equation (2) above).

The wholesale fibre price p_f is itself given by the break-even condition on the fibre provider that gross margins exactly cover fixed costs, i.e.

$$N_f(p_f - c_f) = F_f + (1 - x)F \quad (4)$$

where N_f is the number of fibre lines, F_f is the fixed cost specific to the fibre network (net of any subsidy) and $(1 - x)F$ is the share of the common CEI fixed cost allocated to fibre. It can then be shown (by eliminating the price p_f between equations (3) and (4) above) that the share of common CEI cost allocated to copper that induces an efficient shutdown decision is

$$x = \frac{N_c^*}{N_c^* + N_f} \left(1 + \frac{F_f}{F} \right) \quad (5)$$

Equation (5) expresses a sharing rule in the sense of defining the split of costs x in terms of the number of fibre line N_f . Note that the other parameters are all constants (including N_c^* , which is the number of copper lines at the point where integrated operator turns off the copper network, defined by equation (2)).

The difficulty with using (5) as a mechanism for splitting cost is that we are unlikely to know when an integrated provider might choose to shut off its copper network (i.e. the parameter N_c^*). We ideally want a sharing rule for common costs that induces a separate copper provider to switch off at the efficient time without need to know these details. However, if we use the very similar simple linear sharing rule

$$x = \frac{N_c}{N_c + N_f} \left(1 + \frac{F_f}{F} \right) \quad (6)$$

where N_c is the *actual* number of copper lines at any time, rather than N_c^* , the number of copper lines at the point where the integrated operator would turn off the copper network, this clearly gives the same cost split at the point where $N_c = N_c^*$ and so should also induce efficient switch off.

The rule given by equation (6) shifts common costs to the fibre network somewhat more slowly initially (i.e. starting from zero fibre penetration). Nevertheless, it is still a good approximation to rule (5) and we do not need to know anything about the optimal point at which to turn off the copper network; the simple linear sharing rule delegates the efficient turn off decision to the fibre provider without needing to know the point at which its optimal to turn off the copper network.

The relationship between the cost sharing rules in (5) and (6) above can be clarified if we assume that there is some fixed number of lines N so that $N_c + N_f = N$ at all times. Let $s_f = N_f/N$ be the share of fibre lines and $s_c^* = N_c^*/N$ be the share of copper lines at the point where the integrated operator would turn off the copper network. Then sharing rule (5) can be written as

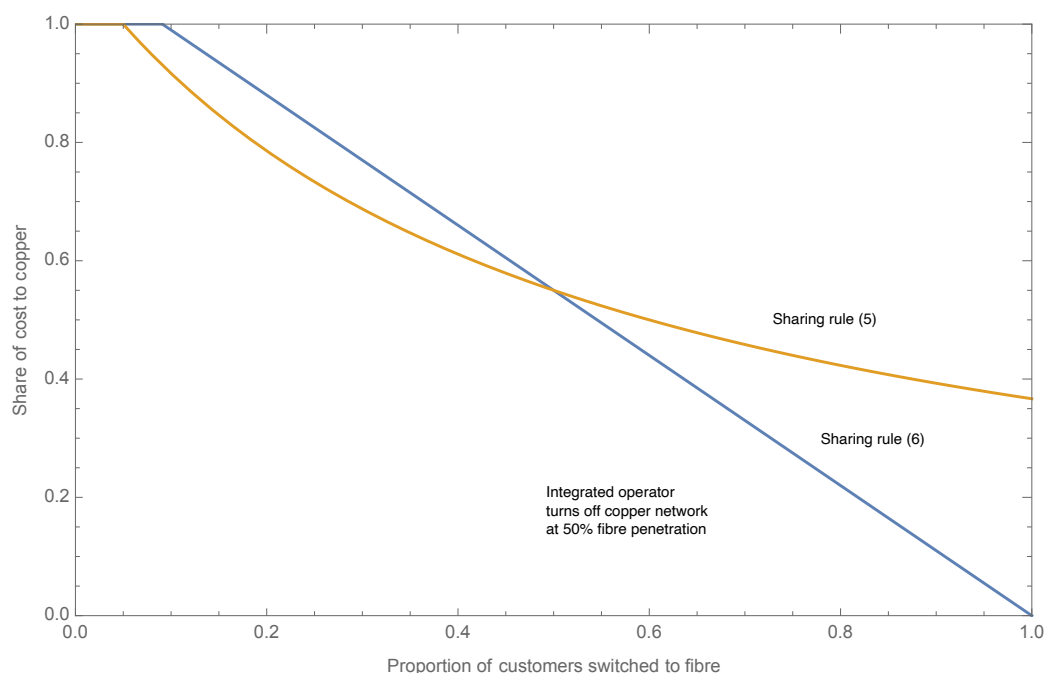
$$x = \frac{s_c^*}{s_c^* + s_f} \left(1 + \frac{F_f}{F}\right) \quad (5')$$

and linear sharing rule (6) as

$$x = (1 - s_f) \left(1 + \frac{F_f}{F}\right) \quad (6')$$

These two rules are shown as an example below, where we assume that the integrated operator turns off the copper network at 50% penetration (for the purposes of an example). The two rules coincide at the point that it is optimal for the copper network to switch off. We can see that the sharing rule given by equation (5) is non-linear and has common costs initially shifting somewhat faster to the fibre network than the simple linear sharing rule (6), but then slower as we approach the level of fibre penetration at which the integrated operator would turn it off.

Figure 6: Sharing rules



Fibre build out

For simplicity, we have not been explicit above about the progressive build out of the fibre network, but the sharing rule above applied within that part of intervention area where the fibre network has been built out. This raises the complication that the ratio of the fibre-specific fixed costs to CEI fixed costs F_f/F might vary from area to area, and so change as the fibre network is built out. However, there is no particular reason to think that this ratio should change systematically (as a covering a certain number of customers requires so much CEI and so much fibre). Therefore, it is reasonable to assume that the sharing rule remains stable as the fibre network is deployed. The sharing rule then gives the CEI cost split depending on fibre take-up in those areas where it is deployed.

Also, in the sharing rule (6) above, the fibre-specific fixed cost F_f should be measured net of subsidy. Therefore, the simple rule of just splitting cost in proportion to relative lines, i.e.

$$x = \frac{N_c}{N_c + N_f}$$

may be a reasonable approximation as F_f may be small relative to the overall CEI fixed costs F .

The attraction of splitting common CEI costs in proportion to the changing relative numbers of lines is that this does not require any knowledge of the optimal timing of copper shut down. The rule (*) above only requires one parameter: the fibre network-specific fixed cost relative to the fixed cost of the shared CEI, but this can probably be dispensed to give a reasonable approximate rule. With

this sharing rule for common CEI costs, the decision can be fully left to Eircom and will result in efficient copper shutdown; all we are assuming is that the wholesale price of fibre is cost oriented (including common CEI costs allocated to fibre under the CEI sharing rule itself).

Comparison of the efficient shutdown rule with EPMU

Notice that the sharing rule (equation (6) above) based on relative line numbers is similar to the EPMU sharing rule in that it is dynamic and usage based. However, there are two significant differences.

First, the EPMU sharing rule is based on relative revenues, where the rule above inducing an efficient copper shutdown decision considers the relative number of customer lines. The reason for this difference is our assumption that forced migration of residual copper customers in order to shut down the copper network does not allow those customers to be charged any price premium for fibre; customers are transferred to an equivalent service provided over fibre at the same price they pay for copper. This is reasonable as we are thinking pessimistically about the migration problem of switching copper customers to fibre and providing a similar service. In practice, customers will switch to fibre for better service, in which case we are underestimating the fibre networks ability to contribute towards the common CEI costs. If fibre is superior, it should pay more for access that the simple sharing rule (*) above suggests, but this requires further assumptions about the characteristics of demand for fibre.

Second, there is a factor $(1 + \frac{F_f}{F})$ that boosts the share of common CEI costs recovered from the copper network above the copper network's share of total lines (in order to compensate for the fact the wholesale fibre price includes a mark-up over variable cost to recover fixed costs). The magnitude of this adjustment depends on fixed costs specific to the fibre network. However, these fixed costs should be measured net of any subsidy that the fibre network receives, so in practice this adjustment might be modest.

Compensating for the wholesale fibre price including allocated fixed costs

The reason this adjustment arises is because the wholesale price of fibre services needs to recover the fibre network's specific fixed cost, dividing it over the number of fibre customers. This is not an economic resource cost, as the fibre network will be in operation regardless and this fixed cost cannot be avoided if the copper network is shut down. Nevertheless, this recovery of the fibre-specific fixed cost F_f through wholesale prices inefficiently discourages Eircom from shutting down its copper network. We can correct this inefficiency by boosting the share of common CEI costs borne by the copper network.

Minimum value for fibre take-up before fibre contributes to shared CEI costs

This adjustment also has the effect that the copper network should bear all of the common CEI cost until the fibre take-up has reached some minimum value (equal to $F_f / (F_f + F)$), which depends on the relative importance of the fibre-specific fixed cost relative to the fixed cost of common CEI. This arises because the copper network

cannot contribute more than 100% of the common CEI cost, so this may limit our ability to correct for the disincentivising effect of the fibre wholesale price recovering some fixed costs by increasing the contribution from the copper network. The sharing rule is, therefore, strictly

$$x = \min \left[1, \frac{N_c}{N_c + N_f} \left(1 + \frac{F_f}{F} \right) \right] \quad (4)$$

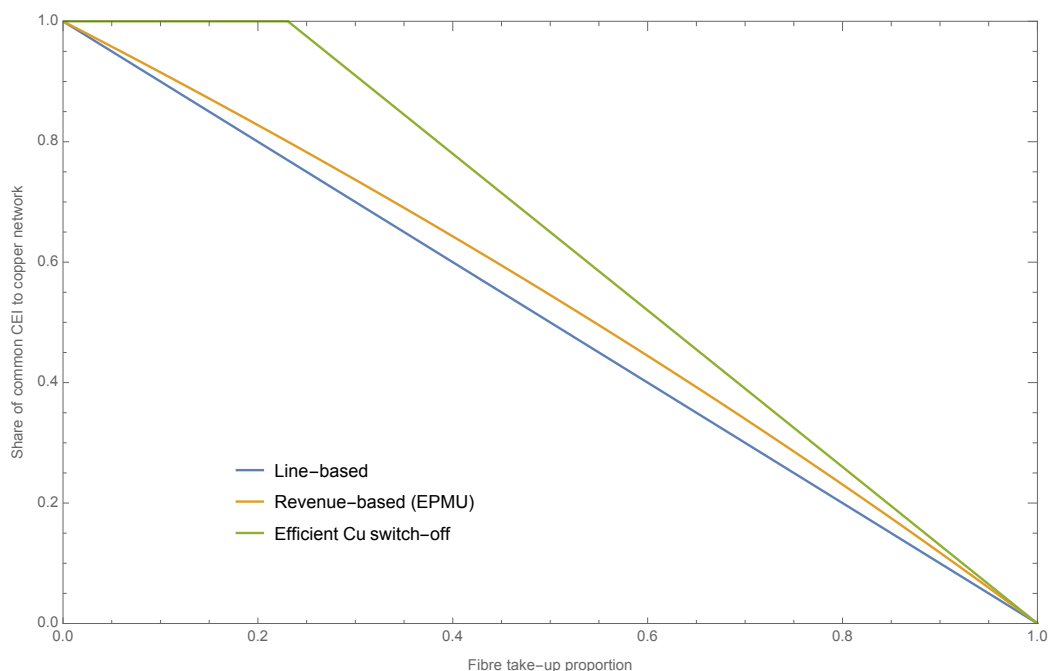
This creates the possibility that we might not be able to induce an efficient shut down decision by Eircom if an integrated operator would choose to shut down prior the point that the fibre network started to contribute to common CEI costs. However, the delegated shut down decision would still be as close to efficient as possible under the constraint that the wholesale fibre price needs to recover certain fixed costs.

Comparison of sharing rules

By way of example, Figure 7 below shows three different sharing rules for common CEI costs:

- Line-based sharing simply splits the common CEI costs in proportion to the relative number of copper and fibre subscriber lines.
- The EPMU rule we developed earlier that splits common CEI in proportion to relative (wholesale) revenue from copper and fibre. For the purpose of the example we assume a 20% wholesale price premium for the fibre service. This rule is based on the Ramsey pricing model (i.e. efficient cost sharing to minimise deadweight losses) assuming equal own-price elasticities for copper and fibre service.
- The efficient copper switch-up rule (equation(4) above) induces an efficient switch-off of the copper network by Eircom, assuming that the wholesale fibre price is cost orientated and needs to recover the fibre networks specific fixed costs (net of any subsidy) and the share of common CEI allocated to the fibre network. For the purposes of the example, the network-specific fixed cost for fibre (net of subsidies) is assumed to be 30% of the overall fixed cost of the CEI.

Figure 7: Share of common CEI cost allocated to copper under different sharing rules



Line-based sharing and EPMU sharing are very similar

We can see that simple line-based sharing and the EPMU (revenue-based) sharing rule are very similar in practice. This is because they must approximately agree when fibre penetration is both very low and very high, only deviating at intermediate values. Therefore, we conclude that in practice, there would probably be little advantage in the more complex EPMU rule over a simple line-based sharing rule given the other uncertainties involved.

Deficient incentives for copper shut down

The line-based sharing and EPMU rules give too little incentive for Eircom to shut down the copper network (as a delegated decision). To include efficient shutdown, more cost needs to be loaded on the copper network at low levels of fibre take-up. However, this bias diminishes as fibre take-up increases. Therefore, the main concern is with situations where an integrated operator might choose to shut down the copper network fairly soon, but Eircom has a weakened incentive to do so as a result of the contribution to recover common CEI costs being made by NBI. This provides a rationale for the fibre network only making a contribution once a certain minimum penetration is met.

5.6.5 Optimal transition and subsidies for fibre

Fibre prices in the intervention area are fixed

The Ramsey pricing benchmark discussed above does miss out some key features of the situation as we actually find it. It is not the case that the pricing of NGA service in the intervention area will depend on CEI access costs faced by NBI. Rather, these prices will be set by benchmarking to the price of similar services in the commercial area. The main effect of changing the CEI access price

paid by NBI is, therefore, to change its subsidy requirement, rather than the price of its services.

Intervention should not subsidise copper services

As we have discussed earlier, minimising the subsidies required by NBP scheme does not fall into ComReg’s statutory objectives and we take the level of subsidised as a given. Equally, it would not be reasonable when modelling the situation to treat subsidies for the fibre network as a means of paying for common CEI costs to the benefit of copper customers, as that would be incompatible with the objective of the intervention.

Integrated operator as a benchmark

For these reasons, we consider that an appropriate benchmark for thinking about both the question of efficient recovery of common CEI costs and of incentives to migration from copper to fibre is taking the perspective of a hypothetical integrated supplier of copper and fibre services. We can then ask how copper and fibre prices should be set on the assumption that fibre services must be supplied (which is the consequence of the NBP). This is essentially the analysis we have performed above when deriving various sharing rules for common CEI costs.

5.6.6 External benefits of fibre take-up

Reasons for positive externalities

A final complication is that there may be external benefits from take-up of NGA services. Take-up, over and above roll-out, is an objective set out in the EECC. There may be benefits in terms of development of complementary services, including delivery of government services, that require high bandwidth. It is also possible that there may be positive externalities in the adoption process for NGA services, with consumers’ take-up decisions being influenced by seeing the benefits of higher bandwidth enjoyed by others.

Positive externalities suggest lower CEI access prices for NBI in order to raise the price of copper services

If there are positive external benefits from fibre take-up, this is a potential additional consideration in design of an optimal sharing rule for common CEI costs. However, the roll-out of NBI’s fibre network is set by contractual requirements and the pricing of fibre services within the intervention area is set by benchmarking with similar services outside the intervention area. Therefore, the mechanism by which take-up of fibre services could be affected is limited to effects on the price of copper services.

If fibre services make a contribution to recovery of CEI costs common with copper services, this could lead to the price of copper services being lower than it might otherwise have been. This might in turn slow migration of consumers from copper to fibre services. Turning this around, if there are external benefits from take-up of fibre services, this suggests that the copper network should make a greater contribution to common CEI costs (and the fibre network a smaller contribution), so that prices of copper services are higher.

Why this is not a significant issue for CEI access pricing

Overall, we do not think this is a significant consideration for the setting of CEI access prices for NBI. The magnitude of any external benefits of fibre take-up is largely unknown and difficult to estimate.

Impacts in the commercial area

There is also potential for Eircom earning additional margins through sharing CEI in the commercial area affecting the price of copper services sharing that CEI. This is a very similar mechanism to that discussed above and for similar reasons we consider that this is not of material relevance to the setting for CEI access prices for transit purposes.

For these reasons, we conclude that there is no compelling need to take into account possible external benefits of fibre take-up when considering CEI access charges for NBI within the intervention area.

5.7 Incentives to facilitate NBI's deployment

Incentives to cooperate

Eircom's cooperation in providing CEI access to NBI in a timely manner will be necessary for the success of the NBP. As a result, there may be some merit in ensuring that Eircom has a positive incentive to supply CEI access. This might reduce the incentive for disputes between Eircom and NBI that ComReg would need to determine.

Transient excess returns to CEI assets

To the extent that Eircom receives additional revenues from selling CEI access to NBI that contribute to common CEI costs, it will take some time for the prices of other services sharing CEI to adjust due to regulatory lags. Therefore, provided Eircom can recover any additional costs caused by sharing CEI (i.e. the sharer incremental cost) and also some contribution to common CEI costs, it is likely to enjoy some transitory excess returns to shared CEI assets. Therefore, Eircom should have incentives to facilitate NBI's roll-out by providing CEI access both within the intervention area and the commercial area; these incentives should increase with the contribution to common CEI costs made by the fibre network.

Limited benefit

Nevertheless, it is unclear whether such a 'carrot' is necessary. SMP regulation on Eircom in any case requires timely provision of CEI access. Therefore, incentive benefits only arise to the extent that the 'stick' provided by regulation is not effective. For this reason, such incentive benefits are not a compelling reason for significantly increasing NBI's CEI access charges.

5.8 Summary

The table below summarises the discussion above. Relevant considerations for the setting of charges for CEI access for NBP purposes are shown as shaded cells. We will use these conclusions

to evaluate various options for CEI access pricing in the following sections.

Table 1: Summary of key issues

<i>Issue</i>	<i>CEI access in the intervention area to support NBI's deployment</i>	<i>CEI access in the commercial area for transit purposes</i>
Cost recovery for Eircom NBI needs to pay at least the "sharer" incremental cost caused by its use Question whether all costs caused by NBI's shared use are efficiently incurred	Relevant	Relevant
Effects on incentives for competitive infrastructure provision	Largely irrelevant due to lack of potential competition in the intervention area	Subsidisation of Eircom's CEI from access charges paid by NBI affects third party infrastructure investment incentives to the extent the NBI pays more than its "sharer" incremental cost
Transient excess returns for Eircom due to lag in adjustment of prices of other services provided over shared CEI to new CEI access revenues	Largely unavoidable (due to the established regulatory structure) and of limited relevance Provide a positive incentive for Eircom to cooperate with NBI in rolling out its fibre network	
Retail NGA market effects	Theoretical possibility if Eircom gains additional gross margins from CEI access sold to NBI. However, weak linkage between retail NGA take-up in the IA and NBI's volume of CEI access needed makes material distortions unlikely.	
Transition from copper to fibre within the intervention area	Complex issues, discussed below	Not relevant
Positive external benefits from take-up of NGA services	Possibly better incentives for facilitating NBI's roll-out if NBI makes a contribution to common CEI costs.	

Relevant issues

We can see in summary that only a very limited number of issues are ultimately relevant:

- In *both the intervention area and the commercial area*, we need to ensure that CEI access prices allow Eircom to earn its reasonable costs of providing CEI access. However, this only requires that the additional costs caused by NBI's share use of Eircom's CEI are recovered. By itself, this requirement does not place any particular requirement on how any common CEI costs are split between fibre and copper networks;
- In *both the intervention area and the commercial area*, NBI making some contribution to common CEI costs is likely to create an incentive for Eircom to facilitate provision of CEI access and avoid delay. This incentive should increase in the size of contribution made to common CEI costs, but given regulatory obligations are in place to supply access anyway, this is not a good reason for significantly higher CEI access charges;
- *Within the commercial area*, a key concern is to avoid that Eircom's CEI is supported by contributions to the common costs made by NBI for transit demand, as this could chill incentives for infrastructure provision by other parties;
- *Within the intervention area*, a key concern is providing incentives for efficient cost sharing between fibre and copper network and efficient incentives for copper network turn off.

Copper to fibre transition

The issue of copper to fibre transition within the intervention area is complex. The approach taken to setting CEI access prices within the intervention area is likely to have an effect on the incentives of Eircom to shut down the copper network. We identified the following key arguments in Section 5.6 above:

- Optimal sharing of common CEI costs between copper and fibre network will entail some usage-based sharing rule for splitting these costs. Splitting based on relative number of copper and fibre lines and splitting based on relative wholesale revenues give broadly similar results, but the former is somewhat simpler to implement.
- This usage-based approach avoids the problem of requiring a minimum contribution to common CEI costs from each network when demand for services is small, making that network unnecessarily uneconomic. Rather a usage-based rule splits the common CEI costs in line with fibre and copper networks' ability to contribute to those common CEI costs. This can then change over time as the penetration and take-up of fibre grows and customers switch away from copper services.
- Providing optimal incentives for Eircom to make a delegated decision to shut down its copper network requires an uplift to the contribution of the copper network relative to a simple sharing rule for common CEI costs based on relative numbers of copper and fibre lines. As compared with an integrated operator supplying both copper and fibre services, Eircom's incentive to migrate customers to fibre is too small. This happens because the wholesale fibre price is inflated by

recovery of fixed costs (both those specific to the fibre network and a share of common CEI costs). This uplift to common CEI contribution of the copper network takes the form of the fibre network not making a contribution to those common costs until its share of lines reached some threshold level (related to the size of fibre-specific costs relative to common CEI costs).

6 CEI access in the commercial area

6.1 Proposed approach

Differentiated CEI access at sharer incremental cost

In this section, we set our recommendations for CEI access by NBI for the purposes of transit through the commercial area. In this case, the considerations set out in Section 5 lead to the conclusion that NBI should pay the incremental costs caused by its shared use of CEI, but no more. This means that Eircom does not enjoy any cost sharing benefit due to NBI's access demand.

Under this approach NBI would purchase a differentiated access service not available to other access seekers by reason of:

- NBI being restricted from competing in offering NGA services in the commercial areas; and
- the large scale of NBI's likely need for CEI access to interconnect the fragmented intervention area and the high degree of predictability that NBI would require such access for a considerable time.

Within the commercial area, there may be other users sharing Eircom's CEI (and able to offer NGA services that compete with Eircom if they wished). These other users would not be able to avail of the differentiated access service targeted at NBI.

Equal sharer for other users

For these other access users, it would remain important that any retail-level competition with Eircom remained undistorted. This would require maintaining the current equal sharing regime:

- For poles, splitting costs equally amongst those operators using a pole;
- For ducts by surface type, splitting cost in proportion to cross-section area used (which might be measured on a per meter of sub-duct/cable used).

6.2 Rationale

Under this approach Eircom still recovers its efficiently incurred costs caused by NBI's shared used but does not gain any cost benefit itself from sharing CEI with NBI.

Impact on infrastructure competition

The main reason for this approach is that if NBI paid in excess of its sharer incremental cost, then Eircom would enjoy benefits from CEI sharing with NBI. Eircom would earn a positive gross margin from sales of CEI access to NBI, which would then eventually reduce the costs that needed to be recovered from other shared users of that CEI, including Eircom's own use of its CEI.

As set out in Section 5.3.2 above, this has the potential to discourage competitive infrastructure investment in the commercial area both as:

- the prices of Eircom’s services using shared CEI would be reduced; and
- build-vs-buy decisions of third parties providing competitive infrastructure would be affected, as generic CEI access (i.e. access not for NBI purposes) would become cheaper.

The primary effect is on full infrastructure-based providers deploying their own CEI, as this becomes relatively less attractive. For partially infrastructure-based providers, using Eircom’s CEI to deploy their own infrastructure, there are countervailing effects leaving them largely unaffected, as CEI access used as an input gets cheaper, but so do Eircom’s competing wholesale network services.

Short-run excess returns

This potential impact on incentives for competitive infrastructure-based provision is a long-run effect, reliant on prices of services sharing CEI adjusting to bring Eircom’s returns from CEI assets back to normal given the additional demand for shared access from NBI. However, prior to this adjustment happening, Eircom will earn transient excess returns from shared CEI to the extent that it earns gross margins from access services supplied to NBI. These transient excess returns are only available to Eircom, as only Eircom has widespread CEI assets in place to meet NBI’s needs. We do not know how Eircom might use any such excess returns, but there is at least the potential it could distort competition elsewhere, for example to fund selective price cuts.

This transient effect would be eliminated over time by a mixture of competition operating where Eircom’s competitors use CEI access, and regulation of services sharing CEI being priced to bring asset returns for Eircom to normal levels. Therefore, it might be reasonable to assume that if transient excess returns occurred as a one-off event would be eliminated within the typical regulatory review cycle (say within 3 years). However, NBI’s build-out is progressive and demand for CEI access – along with any associated excess margins earned by Eircom - would increase over time as NBI builds out. Therefore, it might not be possible to deal with this issue readily within a single regulatory review cycle; two or possibly even three cycles might be needed until CEI asset returns stabilised at normal values (i.e. the relevant cost of capital).

Materiality of any potential distortion

We have assessed the materiality of this possible competitive distortion on the basis of data gathered by ComReg on NBI’s likely use of Eircom’s CEI within the commercial area. Over time, usage of both poles and ducts by NBI is likely to become substantial as it rolls out to meet its coverage obligations under the NBP. If CEI access prices were set on the current ‘per operator’ equal sharing basis, the additional revenue that Eircom would earn from NBI’s use would amount to a small proportion (likely <5%) of the likely revenue from the supply of FTTH services by Eircom in the commercial area as a

whole. Therefore, at least roughly, the additional margins from providing NBI with CEI access would allow Eircom to reduce prices for FTTH services in the commercial by this amount (assuming pricing is geographically differentiated, rather than national). If price cuts were focused on services, areas or customers where competition with rivals was most acute, selection price reductions could be larger.

Concerns arise because this additional revenue from sale of CEI access to NBI is not contestable by other operators. NBI would likely be in a long-term contractual relationship with Eircom for CEI access and, although there may be other providers of CEI access to NBI, there is very unlikely to be an effective substitute to access to Eircom's CEI for the foreseeable future. Therefore, this additional revenue source provides an advantage to Eircom not available to its competitors within the commercial area. If Eircom were to focus this advantage by using this additional revenue to support selective price cutting in those areas within the overall commercial area where it faced competition, this could impact competitors' incentives to enter.

7 Options for the intervention area

In this section we consider potential approaches to CEI access pricing within the intervention area for the purposes of delivering the NBP. We apply the criteria set identified as relevant in Section 5 against three main options.

CEI access demand other than from NBI

Whilst CEI access within the intervention area is likely to be mostly demanded by NBI for the purposes of delivering the NBP, it is possible there could be other CEI access seekers wanting access for other purposes. For example, it is possible that another provider might want shared CEI access to deploy a leased line. Because these other services are not for the purposes of delivering the NBP, access would continue to be on similar terms as at present (as discussed already in Section 6 for the commercial area).

In the remainder of this section we focus on the case of CEI access for NBP purposes within the intervention area.

7.1 Options considered

We set out three main options for CEI access pricing in the intervention area for NBP purposes in the following sub-sections:

- The *status quo* 'per operator' or 'equal sharing' approach, which in essence amounts to splitting the overall costs of CEI amongst sharers equally if they make similar use of CEI.³⁸ In the case of poles, costs are split according to the number of operators sharing a pole. For duct, costs are split according to the use of the duct, which depends on the cross-sectional area on a per meter of sub-duct/cable.
- A *primary/secondary user* approach, where NBI is treated as a secondary user and pays only its sharer incremental cost until such time as Eircom decommissions its copper network;
- *Usage-based sharing*, where common CEI costs are split in proportion to the relative number of copper and fibre subscriber lines (or some similar measure of relative scale of the two networks, such as wholesale revenue). This is a more dynamic approach to common CEI cost sharing, as NBI's access price will change over time.

³⁸ In principle we could take a slightly more sophisticated approach and have each sharer pay its sharer incremental cost, then split remaining common CEI costs equally. Here we take the slightly simpler approach of simple splitting the CEI costs. Both approaches will be similar provided sharer incremental costs do not vary too much across different sharers.

These options are not exhaustive, and it is possible to create many other variations. However, they are useful in illuminating the advantages and disadvantages of different approaches to CEI pricing.

7.2 Per operator 'equal' sharing

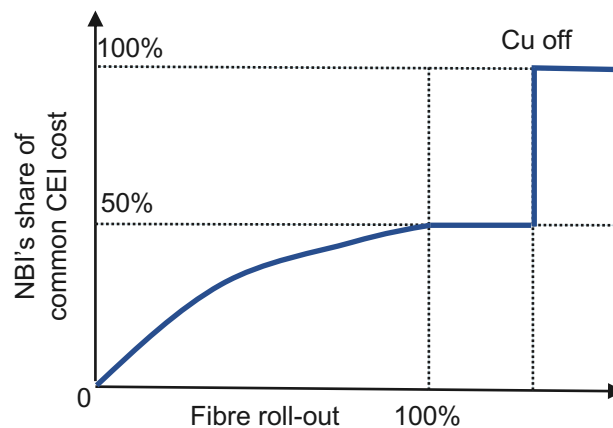
Need for alternatives to have sufficient benefit

This is the status quo option for ComReg, so any alternative option needs to demonstrate sufficient relative benefits against this option to justify a significant change in the structure of CEI access charges.

Impact of minimum required contribution to common CEI costs

The main difficulty with the equal cost sharing approach is that it requires a minimum contribution of (roughly) 50% from the copper network regardless of how few customers might remain, unless that network is switched off and cables removed. Figure 8 below illustrates how the overall cost of CEI in the intervention area would tend to split between NBI and Eircom over time as fibre rolled out, assuming that as NBI eventually got to a position where it made roughly equal use of shared CEI (e.g. two operators on every pole, though duct utilisation might vary somewhat between Eircom and NBI). Eventually all cost would be borne by NBI once Eircom decommissioned the copper network (shown here as a sharp turn-off, but this might in practice be a progressive turn-off across exchange areas or even smaller geographical units).

Figure 8: Time profile of CEI costs in intervention area under equal cost sharing



Inefficiencies with this equal sharing

There are two potential inefficiencies that result from the equal sharing approach:

- It causes an excessive incentive to shut off the copper network once fibre roll-out is high and the number of residual copper customers is small. This is because it may be impossible for the copper network to make such a large contribution to the common CEI costs. Increasing the price of copper services may not yield any additional revenue beyond some point. In any

case, regulation may constrain the price of those services to the cost of the service provided using the least cost modern approach (in this case, likely to be over the fibre network). Fixed costs specific to the copper network also need to be covered, as well as this contribution to shared CEI costs. In considering decommissioning of the copper network, its share of CEI costs are treated by Eircom as avoidable costs, which results in an inefficient shut down decision as these costs are not saved, but rather simply transferred to NBI as an additional fixed cost.

- In contrast, in early stages of the fibre roll-out, incentives for copper network shut down are likely to be deficient. This is because the fibre network will start to bear costs of CEI as it rolls out, whereas we have seen in Section 5.6 that common CEI costs should transfer to copper network in line with the transfer of subscriber lines in order for there to be efficient incentives for copper shutdown (and also to approximate efficient common cost sharing if both networks are operating).

Whilst there is potential for these two biases to cancel out, with the incentive for copper shutdown tipping from insufficient to excessive at just the right point for an efficient shutdown decision, this can only happen by chance. There is no systematic reason why the equal sharing approach should yield an efficient transition path from copper to fibre.

Unequal, but fixed sharing

In principle it would be possible to split common CEI costs in some fixed ratio in order to induce copper shutdown at the optimal point (as we found in Section 5.6.3 above). However, to do so the regulator requires a significant amount of information to estimate the optimal timing for shutting down the copper network. This would also mean that the splitting of common CEI costs between NBI and Eircom unequally (unless by fluke this resulted in equal splitting). This is likely to be difficult to justify as an administrative decision given the high degree of uncertainty about key parameters. Therefore, we can conclude more generally that any fixed sharing rule is unlikely to provide efficient incentives for copper shutdown.

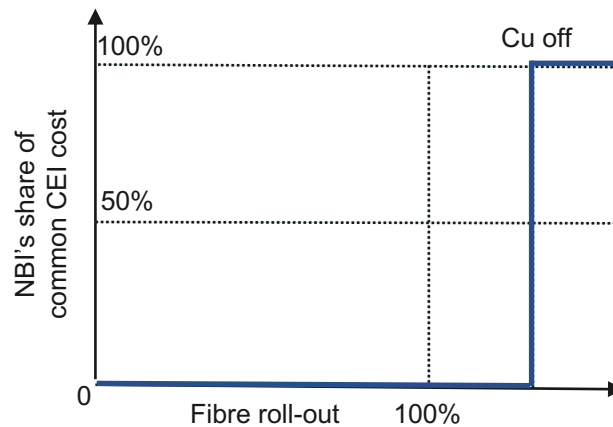
7.3 Primary and secondary users

Our second option is to charge NBI only its sharer incremental cost as a 'secondary' user of Eircom's CEI in the intervention area until such time as Eircom ceases offering its copper services. (This decommissioning might happen within subareas within the intervention area, such as local exchange areas.) This is essentially the same proposal as for CEI access for transit purposes by NBI within the commercial area (made in Section 6).

The time profile of CEI access payments for NBI is now much simpler, as shown in Figure 9, with NBI making no contribution to

common CEI costs until Eircom ceases its copper service, at which point NBI becomes the primary user and bears all the common cost.

Figure 9: Time profile of CEI access charges under primary/secondary approach



Excessive incentives for copper shutdown in the intervention area

This approach creates even stronger incentives for copper network shutdown than the equal sharing rule. Now we have an excessive incentive for shutdown throughout the roll-out of the fibre network. This is a significant disadvantage of this approach. It amounts to an active intervention to encourage early shut down of the copper network. It is difficult to justify this approach absent a clear case for encouraging early copper turn off because of positive externalities from fibre adoption.

Notice that this issue does not arise for CEI access for NBI purposes in the commercial area, even though our proposal that NBI pay only sharer incremental cost in the commercial area is the same as the proposal being made here for the intervention area. In the commercial area, we do not need to be concerned about the impact of CEI access pricing on copper to fibre transition, as Eircom will be an integrated provider who should have broadly appropriate incentives to transition.³⁹

Incentives to facilitate NBI's roll-out are weak

Whilst it is the case that this approach does not risk creating any transient excess profits for Eircom, as we have discussed in Section 5.4 above, this is not a particular concern for the intervention area, as we do not expect there to be any infrastructure based competition that could be distorted. However, equally it means that there is no positive incentive for Eircom to supply CEI access to NBI to facilitate its roll-out, which is a disadvantage of this approach.

³⁹ This does assume that if Eircom has both copper and fibre networks present in the commercial area, it covers the same CEI cost as if it had just one network present. This is clearly true if there is no other CEI sharer other than NBI, who pays only its sharer incremental cost.

7.4 Usage-based sharing

Dynamic approach to sharing common CEI costs

Our third option is a usage-based sharing scheme. Unlike the previous two options, which involve a fixed split of the costs of common CEI, this approach is dynamic, as the split will change over time with the take up of fibre services.

Sharing on the basis of revenue

In Section 5.6 above, we considered a number of usage-based sharing rules. If we used a simple Ramsey pricing approach (equivalent to EPMU) to share the common CEI costs, this gives a revenue-based splitting rule, where common CEI costs are shared on the basis of relative revenue raised from fibre and copper wholesale services in the intervention area.

Sharing on the basis of subscriber lines

We also showed that there was in practice rather little difference between sharing common CEI costs on the basis of the relative revenue or the relative number of fibre and copper subscriber lines. Therefore, the simpler approach of sharing on the basis of copper and fibre subscriber lines is attractive as a simplification.

The augmented line sharing rule

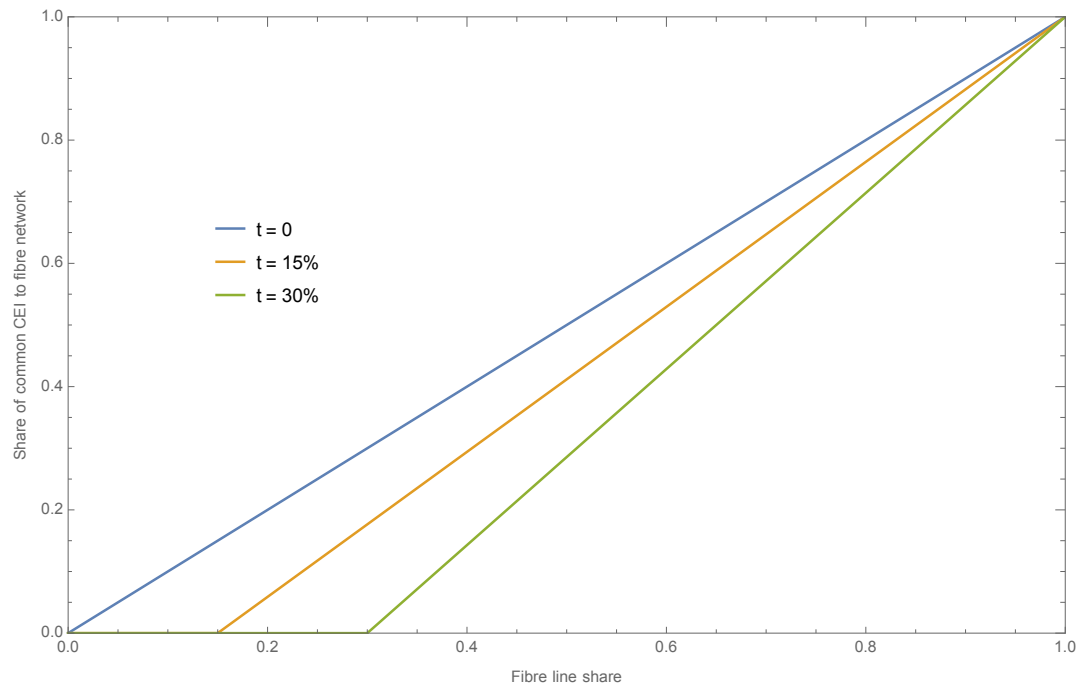
This approach creates reasonable incentives for copper switch-off, but we also showed in Section 5.6.3 that it was possible to improve the approach so that Eircom would take into account cost benefits of eliminating network duplication and shut down the copper network in the same manner as would an integrated provider facing all the costs and benefits. We call this improved approach an *augmented line share rule* and it has the following features:

- The fibre network makes no contribution if its share of subscriber lines is less than some specified threshold $t\%$;
- Once the fibre network's share of lines $x\%$ is at least $t\%$, it pays a share of $(x - t)/(1 - t)$ of the common CEI cost for shared assets.

Figure 10 below shows some examples of augmented line sharing rules for different values of the threshold parameter.

We also derived in Section 5.6.3 that if the threshold parameter is set to the ratio $t = F_f/(F_f + F)$ where F_f is the network-specific fixed cost of fibre network (net of subsidy) and F is the common CEI cost to be apportioned, this results in Eircom making an efficient decision to shut down the copper network assuming that wholesale fibre prices are cost oriented. Therefore, conceptually, little information is needed to give Eircom efficient incentives to shut down the copper network if this sharing rule is used. This is the main attraction of this approach.

Figure 10: Examples of augmented line sharing rules at different thresholds



Geographical units for copper switch off

One important implementation question is the definition of the geographical units at which the line sharing rule is applied. Eircom can be expected to decommission its copper network in logical units such as exchange areas. Therefore, we should logically apply the line share rule for common CEI cost sharing area-by-area.

However, we can make some reasonable simplifications. It is reasonable to assume that the ratio of network-specific fixed costs for the fibre network to common CEI costs remains broadly similar across areas, as this will be determined by how the fibre network is deployed using CEI. This in turn implies that the threshold t for the fibre line share at which the fibre network should start being allocated common CEI cost can be assumed similar across all areas. Therefore, put simply, the line share rule can be taken to be the same for all areas, but the actual share of subscriber lines that are fibre may potentially vary if roll-out has been prioritised in some area. The amount of shared CEI may also vary from region to region.

Decommissioned areas

Given the uncertainties involved, little is likely to be lost from aggregating areas where copper and fibre networks coexist and calculating a single share for fibre lines across all areas, then applying this to the CEI in all those areas. However, if copper is decommissioned in an area, that area can be eliminated from this calculation.

Measuring line shares and practicality

One future practical complication is that line shares of copper and fibre cannot be observed in real time. They either need to be observed with a lag, or else forecast. Again, given the various uncertainties involved, we do not necessarily need a high degree of

accuracy in the measurement of the fibre line share to implement a usage-based sharing rule. It would probably be adequate to update the ratio to be used for the splitting of common CEI costs on an annual basis. Therefore, we consider that although a dynamic approach is more complex than setting a fixed ratio for splitting common CEI costs, it is practical to implement. The main challenge is calculating the relative number of copper and fibre lines, rather than having to estimate any cost parameters.

7.5 Comparison of approaches

Primary/secondary approach can be eliminated...

We have seen above that the *primary/secondary user* approach, charging NBI only its sharer incremental cost in the intervention area, creates inefficiently large incentives to shut down the copper network. In turn, this could lead to difficult policy issues later if the fibre network is not fully built out, yet Eircom wants to turn off its copper network. Under these circumstances, Eircom might reasonably contest that copper turn-off is being constrained by a lack of coordination between fibre build-out and copper turn off, in that fibre roll-out is spread across the intervention area, rather than built out in coherent areas where copper services could be turned off. Eircom might then argue at that point that it faces unrecoverable costs if it is required to maintain copper services (either because of some future USO-type requirement in the absence of complete fibre coverage, or because of SMP requirements to continue providing existing services).

... due to lack of justification for strongly pushing for early copper shut down

For this reason, we can largely eliminate the primary/secondary option from further consideration, unless possibly there were some desire from ComReg to intervene actively to encourage early copper switch-off and strongly drive fibre take-up. Although there may be positive externalities associated with fibre take-up, these are unlikely to be large enough or certain enough to justify such a radical approach.

Advantages of the usage-based approach

The clear advantage of the usage-based approach is that provides incentives for reasonably efficient cost sharing between copper and fibre networks, and for eventual turn-off of the copper network. These incentives are not perfect as we lack the detailed demand information needed to fully optimise a sharing rule. Nevertheless, the general form of the sharing rule is clear from the analysis in Section 5.6 and fairly simple approaches can provide reasonable approximations to optimal sharing with relatively little informational burden for the regulator.

The augmented sharing rule

The *augmented line sharing rule* (derived in Section 5.6.3 above) seeks to correct inefficiencies in the copper turn off decision caused by having separate copper and fibre providers who do not directly take network duplication costs into account. It tries to provide Eircom with similar incentives for copper turn off to those of an

integrated provider of both fibre and copper services. This sharing rule requires only a single parameter to be set: a threshold for the fibre line share at which the fibre network starts making a contribution to common CEI costs. However, if this provides too much complexity, that threshold can simply be set at zero, giving a *simple line sharing rule* based on relative numbers of subscriber lines that requires no parametric assumptions.

Comparison with the equal sharing approach

Although simpler, the *per operator, equal sharing* approach currently in use for CEI access pricing does not generally provide efficient incentives for copper shutdown. It provides too small an incentive for copper shutdown at the beginning of fibre roll-out, with common CEI cost transferring too quickly to the fibre network as it rolls out and no account being taken of partial take-up of fibre services. At the same time, it provides too great an incentive to shut down the copper network once fibre is more established, as it maintains a substantial minimum contribution to shared CEI costs from the copper network even as the number of copper customers falls.

Equal sharing and risks of copper turn off prior to complete roll-out of fibre

As with the primary/secondary approach, the danger of providing incentives for copper network that are clearly too strong – as happens with the equal sharing rule as the number of copper customers falls – is that Eircom may want to shut the copper network before the fibre network is fully deployed. This then raises the question of how service to residual copper customers is maintained if they have no fibre alternative and who bears the possibly substantial costs of ensuring that they have some service.

Payment profile over time

As a general feature, the *per operator, equal sharing* approach loads shared CEI cost onto the fibre network more quickly at the beginning of fibre roll-out than does usage-based sharing. This is because the *per operator, equal sharing* approach follows fibre deployment regardless of whether there is actual uptake of the new services. On the other hand, as the copper customer base becomes small, the *per operator, equal sharing* approach holds back in allocating further common CEI costs to fibre until such time as the copper network shuts. This leaves NBI facing cost risk with regard to CEI access payments depending on when the copper network shuts under the equal sharing approach, which is entirely outside of NBI's control. Over the period of the fibre deployment, it is not clear which approach results in greater total payments from NBI to Eircom for CEI access due to these countervailing effects; this depends on the details of the take-up path for fibre services.

Conclusions

On balance, we conclude that, although the usage-based approach is a significant change from the current 'equal sharing' access pricing scheme for shared CEI, it has certain advantages in coping with the roll-out of NBI's fibre network, especially in the long term. A usage-based sharing rule avoids certain risks that arise with the equal-sharing approach due to its tendency to create excessive incentives for shutdown of the copper network once fibre penetration is high enough.

In contrast, the usage-based approach provides a smoother transition. It avoids long-run problems that may arise if Eircom has inefficiently strong incentives to shut the copper network but is constrained by the roll-out of fibre being uncoordinated with copper shutdown plans.

Consistency with the commercial area

Finally, we note that a usage-based sharing rule, such as the augmented or simple versions of the line sharing rule, is consistent with the approach proposed for the commercial areas in Section 6. This is because if NBI is not deploying any NGA services, as is the case in the commercial area, then it pays only its sharer incremental cost.

8 Conclusions and recommendations

In this final section we draw together conclusions and recommendations from our earlier sections.

8.1 Problems with the current approach

Equal sharing

The current charging regime for CEI access is one in which the “service” incremental costs of CEI (i.e. costs that would be avoided if all shared use of a CEI asset ceased) are shared across sharers equally for poles, and in proportion to utilisation of ducts per meter of sub-duct/cable. The estimation of incremental cost includes some allowance for replacement of assets at an enhanced rate to allow sharing but is otherwise based on historic costs.

Problems with the status quo

Maintaining the status quo ‘equal sharing’ approach unchanged would be problematic given the introduction of the NBP. NBI would require a large volume of CEI access services in both the intervention area and the commercial area. This would give rise to two main problems:

- Within the commercial area, there is a concern that the new CEI access demand from NBI for transit purposes pays for a part of costs of the CEI through common cost contribution although NBI cannot provide services in the commercial area. Eircom suffers no wholesale or retail revenue losses from providing transit to CEI therefore such contribution from NBI will eventually make both Eircom’s service using shared CEI and access to that CEI by other sharers cheaper, as Eircom cannot earn a sustained supernormal return on the CEI assets. In effect, Eircom’s shared CEI in the commercial becomes partially subsidised as a result of the intervention. This has the adverse effect of reducing incentives for competitive provision of infrastructure within the commercial area.
- Within the intervention area, equal sharing imposes a requirement that the copper network make a certain fixed contribution to common CEI costs. This does not promote efficient sharing of common CEI costs between fibre and copper networks. It also leads to an excessive incentive to shut down the copper network as the number of copper customer reduces, and an insufficient incentive when the fibre network is first introduced; therefore, Eircom’s copper network shutdown decision is very unlikely to be efficient.

8.2 Differentiated CEI access

Access for NBI vs. generic access

These problems can be avoided by creating a differentiated access service for NBI that reflects the particular circumstances of NBI's CEI access demands arising from the NBP. There would then be:

- CEI access for the purposes of meeting NBP commitments, (which entails only providing NGA services within the intervention area);
- Generic CEI access for all other users.

This distinction can be implemented through a contractual requirement on NBI's CEI access service that it is only used for the purposes of complying with the NBP.

Status quo for generic access

The generic CEI access service would need to be priced in a similar manner to that currently used. This is because the generic CEI access service could be used to offer services competing directly with Eircom's offers using common CEI. Therefore, to avoid competitive distortions, CEI costs need to be split equally where different parties are making similar use of the available capacity of the CEI assets. This is what the current 'per operator' equal sharing approach does.

8.3 CEI access pricing in the commercial area

Pricing at sharer incremental cost

Within the commercial area, this problem of potentially distorting infrastructure-based competition can be fully addressed by NBI paying only its sharer incremental cost. This avoids Eircom earning gross margins on CEI access services sold to NBI. Eircom recovers its additional costs caused by NBI's shared use, but no more.

NBI cannot compete in the commercial area

This proposal is a change relative to the status quo. It is justified because NBI cannot compete with Eircom or other suppliers within the commercial area. NBI cannot offer subsidised services within the commercial area.

8.4 CEI access pricing in the intervention area

8.4.1 Usage-based sharing

Efficient cost sharing and copper shutdown

Within the intervention area, the primary concern is the effect of the CEI access charge on the sharing of common CEI costs between Eircom and NBI, and the implications this has for Eircom's incentives to shut down the copper network. In Section 5.6 we develop an appropriate benchmark based on trying to induce Eircom to

replicate the decision of an integrated supplier of copper and fibre services with regard to shut down of the copper network.

The line sharing rule

This concern leads to a recommendation for *usage-based sharing* of common CEI cost. Under this approach:

- copper and fibre networks each pay their sharer incremental cost; and
- the remaining common CEI cost is split in proportion to the relative number of copper and fibre lines in a certain area.

Areas for applying this rule would ideally be formed by partitioning the intervention area according to local exchanges, as this would broadly match the areas that Eircom might use for any decision to cease copper. The line sharing rule would apply until such time as Eircom ceased offering copper services in an area.⁴⁰

The augmented line sharing rule

A slightly more sophisticated version of this can provide somewhat better incentives for Eircom to shut down its copper network. This is the augmented line share rule, where the fibre network only starts making some contribution to shared CEI costs once fibre exceeds some threshold share of consumer lines in an area. This threshold provides a correction for the wholesale fibre price involving some recovery of fixed costs (both specific to the fibre network, and to contribute to common CEI costs) that are not true resource costs (as they are incurred regardless of whether or not Eircom migrate copper customers to fibre and turns off the copper network). The threshold can be estimated from the ratio of the fibre network's specific fixed costs (net of subsidy) to the common CEI costs.

Intervening to encourage copper turn off

This threshold approach can also be used to boost incentives for copper turn off if it was felt that there were external benefits from migrating customers to NGA services. By delaying the point at which the fibre network contributes to common CEI costs, this increases the avoided cost for Eircom from shutting down the copper network.

Implementation complexity

In terms of implementation complexity, the more sophisticated augmented line sharing rule is not essential and the simple rule of splitting common CEI costs according to relative number of consumer lines is likely to be adequate. Both rules become increasingly similar as fibre take-up increases, there is only a difference if it was optimal to turn off the copper network relatively early (in which case the simple rule defers that turn off somewhat). However, both approaches require the number of fibre and copper lines to be monitored. This means that there would need to be

⁴⁰ Eircom only need cease offering copper services to trigger this condition. It might be desirable to continue to charge a cable occupancy charge until Eircom's copper cables are removed from poles to provide incentives to remove them (and reduce wear and tear on poles), but it is likely that the reclaim value of the copper would provide such an incentive. It is unlikely to be desirable for Eircom to remove copper cables from ducts generally across the intervention area, due to possible damage to shared cables.

regular (say annual) updates of the ratio in which common CEI costs would need to be split. This split could be calculated on a retrospective basis but applied to split CEI costs for the following year. Alternatively, it may be possible to forecast line shares, but we doubt this additional complexity would add much.

8.4.2 The status quo: per operator equal sharing

The status quo is feasible, but stores up problems for the future

It is also feasible to continue with the status quo ('per operator' equal sharing) approach to CEI cost splitting within the intervention area as a stop gap. However, this may eventually run into the problem that it provides an excessive incentive for Eircom to turn off the copper network once fibre take-up is high enough. At this point, Eircom may want to turn off the copper network as it is unprofitable (given part of the shared CEI cost that can be avoided and the wholesale fibre price that will need to be paid by Eircom to migrate its customers), but fibre roll-out in the intervention area may be far from complete. This risks some customers receiving no service at all.

Once this point is reached, either there needs to be some requirement on Eircom to maintain copper services in the face of losses or some revision of the CEI cost sharing so that NBI pays a greater share of common CEI costs. In the latter case, there is likely to be some shock to CEI access charges faced by NBI. If some discrete adjustment of the CEI sharing rule is needed to maintain the copper network in place until fibre roll-out is greater, this may also affect prices of copper services, contrary to the requirement in the EECC to provide a predictable and progressive path for prices of copper services.

We note that there may be some fairness problems with following the current status quo approach and then reducing the contribution of the copper network to shared CEI costs at such time as the copper network is unable to sustain such a contribution due to falling number of copper lines. Fibre and copper networks would not then have been treated similarly, as the initial contribution of the fibre network to common CEI costs was not previously scaled back when there were few fibre lines.

We recommend a usage-based approach if possible

For these reasons, we recommend that ComReg give consideration to a CEI sharing rule based on relative number of subscriber lines and only maintain the status quo if the line sharing approach is judged impractical. We also note that the line sharing approach in the intervention area would be consistent with the proposal for NBI to pay only sharer incremental cost in the commercial area, as within the commercial area NBI's line share is zero and it would, therefore, pay no contribution towards common CEI costs.

8.4.3 Primary and secondary users

NBI paying only sharer incremental cost in the intervention area

A possible alternative approach to the usage-based cost sharing rule, splitting common CEI costs according to relative numbers of copper and fibre lines, would be to allocate all common CEI costs to Eircom as the existing primary user and have NBI pay only its sharer incremental cost as a secondary user while fibre and copper networks coexist.

This alternative approach for the intervention area is essentially the same as that proposed above for the NBI's CEI access for transit purposes in the commercial area. Therefore, it avoids the problem of Eircom earning additional margins on roll-out of the fibre network if access prices for NBI are materially above the additional costs NBI itself causes (i.e. its sharer incremental cost in our terminology).

Excessive incentives to shut down the copper network

However, this approach would expose Eircom to significant risks of copper network assets becoming stranded. Eircom would face clearly excessive incentives to turn off the copper network to shift the burden of recovering CEI costs to NBI. However, as discussed above, NBI's fibre coverage could be patchy at that time, making it difficult to shut down the copper network without disrupting customers. Therefore, even more so than the status quo, this approach would again appear to store up the potential for future regulatory dispute and might lead in future to calls by Eircom for modification of the CEI access pricing regime in the intervention area or even subsidies to support an uneconomic copper network. Therefore, whilst possible in the short term as NBI starts to roll-out, a primary/secondary approach is unlikely to be sustainable in the long term.

8.5 Cost modelling issues

8.5.1 Incremental costs

Costs incremental to individual sharers need to split out

In order to implement these recommendations, ComReg would need to modify their previous cost modelling exercise to be able to separately identify service incremental cost and sharer incremental cost for each of the relevant regions. To a large degree this issue has already been identified, in that ComReg's model of CEI access costs to date includes replacement of assets at current cost to enable sharing.

Estimating sharer incremental cost is a matter of splitting out these costs of upgrading CEI to enable sharing. These long-run incremental costs would necessarily be estimated on a forward-looking, current cost basis taking NBI's demand for CEI as the relevant increment. However, care needs to be taken that this

approach does not compensate Eircom for historic investment in maintenance.

Estimating service incremental cost

Estimating service incremental cost is in principle closely similar to the previous modelling approach taken by ComReg, in that there will be some existing, partially depreciated assets and some new assets required to provide the overall NGA services and to facilitate sharing. We ask what costs would not have had to be incurred if there were no used of relevant CEI at all. This is best described as a LRAIC approach, as there is an element of allocation and average of incremental cost: averaging on a per pole basis for poles and allocating on a per subduct/cable per meter basis for ducts.

Capacity

There is unlikely to be a significant need for building additional CEI for capacity reasons in the intervention area, though this may be issue in certain locations within the commercial area (e.g. urban areas). Therefore, within the intervention area, new CEI is very likely to be linked to the requirements of sharing with NBI, rather than new capacity. We do not see a strong case for making a cost allowance for over-dimensioning of ducts within the intervention area as a result. Equally, there is no reason to change ComReg's existing approach to over-dimensioning in the commercial area.

8.5.2 Central overhead costs

ComReg's current approach to CEI access prices includes an implicit contribution to Eircom's central overhead costs in the commercial area.

Usual regulatory approach to central overheads

The typical regulatory approach to recovery of central overheads is to spread these common costs widely across many services. This minimises pricing distortions as no particular service bears too great a burden from its price being raised above incremental cost. One commonly used approach is EPMU (equi-proportionate mark-up) where a common mark-up is applied to the incremental costs of a number of services to recover common costs, often because there is little information available for regulators to justify favouring or disfavouring particular services in terms of their relative contributions. However, services may be excluded from making such a contribution if there are particular issues that justify pricing at incremental cost only, such as for call termination (where there are concerns about competitive distortions from price above this level).

Where a service is efficiently priced and includes a contribution to common costs, in typical cases it will be efficient for the price of an underlying access service that allows other providers to offer a competing service to include a similar common cost contribution. This approach ensures that the access provider will be efficiently bypassed by another provider whenever it can undertake the activities downstream of the access service more efficiently. If this

were not the case, then as customers were lost from the access provider, the contribution to its common costs would be lost as well.

Atypical situation of NBI However, NBI's use of access is atypical and these considerations do not apply. In particular, within the commercial area, NBI would not be able to use access to Eircom's CEI to offer a competing service. Considerations about efficient bypass do not apply and there is no concern about NBI's use of CEI access eroding Eircom's ability to recover contributions to central overhead costs.

Commercial area For this reason, we do not see any particular reason that central overhead costs need be recovered in CEI access charges for NBI in the commercial area. This is because NBI is not offering competing services within the commercial area and so does not affect Eircom's ability to recover its central overhead costs. Indeed, to do would create the problem discussed at length above that Eircom would earn margins on CEI access sold to NBI that would reduce prices for other services sharing that CEI, with possible knock-on effects on incentives for full infrastructure-based competition.

Intervention area Within the intervention area, loss of copper customers does not affect Eircom's ability to recover central overhead costs. According to the assessment in ComReg decision D11/18 (see Section 2.3.4 above) there should not be any significant recovery of the central overhead cost from the non-commercial areas currently occurring from copper services. Therefore, if fibre services replace copper services within the intervention area, there should be no material reduction in Eircom's ability to recover its central overhead costs and so no need to include a mark-up for the recovery of central overhead costs on NBI's CEI access within that area.

8.5.3 Geographical differentiation

Current approach Appropriate geographic areas need to be identified for cost modelling purposes. As mentioned in Section 2.3.5, under the current CEI access pricing regime access prices are set differently for poles in the modified LEA and outside the modified LEA. At the time of the decision, this geographical distinction was intended to reflect the underlying cost differences in those areas and to set the appropriate buy-vs-build signals where ComReg was not trying to encourage infrastructure-based competition⁴¹. For ducts, the geographical differentiation in access pricing for Dublin was rather intended to reflect cost of excavation and surface re-instatement which contractors usually charge higher in Dublin.

Differentiated services Given the proposal to create a differentiated CEI access service for NBI, it would be natural to split out the intervention area due to its particular conditions. However, the commercial area also varies

⁴¹ ComReg Consultation document 17/26, 3.56

Investment in the rural commercial area

significantly, in particular as it includes both rural and dense urban areas; growth in demand for duct access may be an issue in the latter case. Therefore, the commercial area is likely to need to be subdivided. For example, in dense urban areas capacity issues are relatively more important.

As we understand there has been significant recent investments by Eircom to bring CEI up to standard for NGA services within the rural commercial area. Without any further differentiation within the commercial area CEI sharers outside the rural commercial area would be paying part of this investment without directly using the newly revamped CEI. Therefore, CEI costs in the rural commercial area are significantly different to those in the non-rural commercial area then an additional differentiation of the commercial area is required.

In summary, we propose differentiating access pricing for poles and ducts accounting for their geographical location in:

- the rural commercial area;
- the non-rural commercial area; and
- the intervention area.

Within the non-rural commercial area, there may be need to consider dense urban areas separately and whether there is evidence of significant cost differences justifying a further distinction.

8.5.4 Depreciation and tilted annuities

ComReg's current approach uses tilted annuities in order to provide better price signals for access users if prices of underlying assets are changing. This changes the depreciation schedule and essentially shifts the time profile of access payments, leaving the overall lifetime net present value of payments the same.

In the case of NBI's CEI access within the intervention area, there is no particular concern about price signals affecting entry decisions or decisions to build infrastructure rather than use access. Therefore, there is no particular need for use of tilted annuities and should be reasonable to simplify somewhat. More generally, because there is likely to be a long-term relationship between Eircom and NBI, the choice of depreciation schedule and consequent timing of access payments is not especially critical.

8.6 Summary of recommendations

A summary of our recommendations in the following table.

We also provide an impact assessment in Annex C for a number of specific changes relative to the status quo:

- A primary/secondary approach for NBI's CEI access for transit through the commercial area, with NBI paying only its sharer incremental cost;
- A usage-based splitting scheme for common CEI costs in the intervention area (i.e. for splitting the excess of service incremental cost over NBI's and Eircom's sharer incremental cost) according to relative fibre and copper line numbers within that part of the intervention area where fibre is available;
- A variant simplified usage-based scheme, where the service incremental cost is split according to relative fibre and copper lines (thereby avoiding the need to estimate sharer incremental cost); an
- An alternative primary/secondary approach for the intervention for the intervention area where NBI pays only its sharer incremental cost for shared CEI access.

	CEI access service	LRAIC increment	Mark-up for overhead costs?	Basis of charging	Cost adjustments	Depreciation of assets	Other comments
Generic CEI access	Ducts – Urban Commercial Area (UCA)	All ducts located in area	Yes, currently implicitly included as part of the LRAIC calculation.	Per sub-duct per metre	Higher cost of civils in urban area Spare capacity allowance Replacement rate as defined in D03/16 for specific area with a BU-CCA valuation of new assets	HCA with tilted annuity (for non-replaced assets)	As previous ComReg Decision
	Poles – UCA	All poles located in area		Per pole, split equally between all sharers	Replacement rate as defined in D03/16 for specific area with a BU-CCA valuation of new assets		
	Ducts – Rural Commercial Area (RCA)	All ducts located in area		Per sub-duct per metre	Spare capacity allowance Replacement rate as defined in D03/16 for specific area with a BU-CCA valuation of new assets (Probably very marginal)	Costs likely to be higher in the RCA given recent infrastructure investments in the area	
	Poles – RCA	All located pole in area		Per pole, split equally between all sharers	Replacement rate as defined in D03/16 for specific area with a BU-CCA valuation of new assets (Probably very marginal)		

	CEI access service	LRAIC increment	Mark-up for overhead costs?	Basis of charging	Cost adjustments	Depreciation of assets	Other comments
Generic CEI access	Ducts in IA	Ducts located in IA	No, as previously established that there is no margin in the non-commercial area to make contribution to the central overhead cost recovery.	Per sub-duct per metre	No adjustment for scale/scope/term, unlike NBP version of product	HCA with flat annuity (for consistency with corresponding product underpinning NBP)	Take-up likely insignificant, but need to be made available due to SMP finding on Eircom If there is entry in the IA than NBI will need to go back to this generic access costing approach
	Poles in IA	Poles located in IA		Per pole, split equally between all sharers	No need for spare capacity allowance for ducts		

	CEI access service	LRAIC increment for cost modelling	Mark-up for central overhead costs?	Basis of charging	Cost adjustments	Depreciation of assets	Other comments
CEI access to support NBP	Ducts- transit access only in the UCA or RCA	NBI's duct usage	No, NBI exempted from common cost contribution.	Per meter per subduct/cable on secondary basis (sharer incremental cost only)	Same as for generic CEI Access	Same as for generic CEI Access	Same as for generic CEI Access
Usage limited by contract	Poles- Transit access only in the UCA or RCA	NBI's pole usage		Per pole on secondary basis (sharer incremental cost only)			

	CEI access service	LRAIC increment for cost modelling	Mark-up for central overhead costs?	Basis of charging	Cost adjustments	Depreciation of assets	Other comments
CEI access to support NBP Usage limited by contract	Ducts - Wide-spread, long-run access in IA	Incremental costs associated with NBI's long-run demand for ducts in the IA (LRAIC) to calculate service incremental demand NBI's demand to calculate NBI's sharer incremental demand	No, as previously established that there is no margin in the non-commercial area to make contribution to the central overhead cost recovery.	For ducts on a per meter of sub-duct/cable basis Under proposed usage-based approach, NBI pays its sharer incremental cost by a proportion of the common service incremental cost (i.e. service incremental cost less NBI's and Eircom's sharer incremental cost), with proportion depending on relative fibre/copper lines	Efficiencies from geographical scale Efficiencies from a long-term contract Costs related to the natural upgrade replacement of the network should be borne by Eircom as they would still need to keep the assets usable for providing copper services such as remediation work that would have otherwise been done to supply copper services Replacement assets related to improvements for NGA services	Standard annuity can be used, as little concern about encouraging alternative infrastructure. Not important though. For reusable assets valuation can be done on an HCA based approach	Assets need to be identified as exclusively Eircom or exclusively NBI or shared asset

	<p>Poles - Wide-spread, long-run access in IA</p>	<p>Incremental costs associated with NBI's long-run demand for poles in the IA (LRAIC) to calculate service incremental demand</p> <p>NBI's demand to calculate NBI's sharer incremental demand</p>		<p>For on per pole basis</p> <p>Under proposed usage-based approach, NBI pays its sharer incremental cost by a proportion of the common service incremental cost (i.e. service incremental cost less NBI's and Eircom's sharer incremental cost), with proportion depending on relative fibre/copper lines</p>	<p>quicker than anticipated on a BU-CCA valuation</p>		
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Annex A Comparison with other EU countries

According to the Body of European Regulators for Electronic Communications, BEREC, there are 23 member states that have a price control obligation based on a cost orientation approach for physical infrastructure access for Ducts while only 12 for Poles.⁴²

In France the regulating authority has differentiated access pricing to CEI for fibre and copper services. Similarly, to Eircom, in Ireland, Orange, in France, was designated as having SMP in market 3a (WLA) giving rise to some obligations with regard to CEI access. Amongst these obligations, Orange was subject to a cost orientation, accounting separation and non-discrimination obligation. In 2010 ARCEP recognised, in its decision 2010-1211, that there is an ongoing transition from, currently mainly, copper networks to fibre networks. To ensure coherence between revenues and costs for operators in the fibre optics market ARCEP determined that the overall costs of CEI network would be differentiated between access to the Local loop for copper services and to the local loop for fibre services, on the basis of the number of actual access requests. ARCEP has argued that such an approach best reflects the long-term transition from copper to fibre by progressively increasing the costs allocated over to fibre as revenues from the fibre market increase. The price regulation approach is a cost-oriented top-down model with a volume base charge in dense area and a flat-rate in less dense areas.⁴³

In January 22nd of 2009, the Spanish NRA, Comisión del Mercado de las Telecomunicaciones (CMT),⁴⁴ approved the definition and market analysis of the Wholesale Physical Network Infrastructure Access (Market 4).⁴⁵ In this Market Review, Telefónica was found to have SMP in Market 4 and similarly to the case of Eircom was subject

⁴² BEREC Report on Access to physical infrastructure in the context of market analyses, 13 June 2019

⁴³ WIK-Consult, Best practice for passive infrastructure access, 19 April 2017, <https://www.vodafone.com/content/dam/vodafone-images/public-policy/reports/pdf/best-practice-passive-infrastructure-access-050517.pdf>

⁴⁴ Now part of the current Comisión Nacional de los Mercados de Competencia (CNMC)

⁴⁵ Resolución de 22 de enero de 2009 por la que se aprueba la definición y el análisis del mercado de acceso (físico) al por mayor a infraestructura de red (incluido el acceso compartido o completamente desagregado) en una ubicación fija y el mercado de acceso de banda al por mayor, la designación de operador con poder significativo de mercado y la imposición de obligaciones específicas, y se acuerda su notificación a la Comisión Europea (MTZ 2008/626).

to a number of obligations such as cost orientation, cost accounting, accounting separation, transparency and non-discrimination. With regards to access to CEI, the CMT also imposed on Telefónica the obligation to present a reference offer under cost orientation as a basis for commercial negotiation between any access seekers and Telefónica. In 2009 CMT revised the access charges for accessing Telefónica's CEI.⁴⁶ Its revision was based on Telefónica's accounting data (HCA) while also including an element of benchmarking. Telefónica's revised monthly charges include charges on the basis of a per metre of duct and subduct (40mm) and a different monthly charge for access to ducts on the basis of occupied space (cm²). For poles, Telefónica's offer presents three different monthly per pole access charges based on the type of pole (wood, concrete or other). Since 2009 the reference offer was further revised but minor changes have been made to the actual access charges.

In 2013, the CMT notified the European commission of a new bottom-up Long run incremental cost model (BU-LRIC+) which estimates the monthly cost that would incur an efficient operator for providing unbundled loop services throughout Spain. Accordingly, in addition to the existing costing approach reference charges would now also be set on the basis of the results of the BU-LRIC+. As such Annex 3 of the more recent WLA Market review from the CNMC⁴⁷, in which Telefónica's SMP obligations were re-imposed with regard to physical infrastructure access, suggests that access charges would be mainly determined by the results of the BU-LRIC+ model. However, the parameters used in the model would be calibrated with the information gathered from Telefónica's accounting data. So far, no document has been published signalling significant changes with regard to the access charges for ducts and poles, since 2009. Some adjustments have been made throughout the multiple revisions but no clear application of the BU-LRIC+ model has been noted. In the latest 2019⁴⁸ review some modifications were made to Telefónica's reference offer to facilitate NGA roll-out in the lower density regions, however no regional access pricing differentiation was suggested.

⁴⁶ Resolución de 19 de noviembre de 2009, expediente MTZ2009/1223: Revisión general de aspectos técnicos y operativos, así como análisis detallado y modificación de los precios de provisión del servicio.

⁴⁷ RESOLUCIÓN POR LA CUAL SE APRUEBA LA DEFINICIÓN Y ANÁLISIS DEL MERCADO DE ACCESO LOCAL AL POR MAYOR FACILITADO EN UNA UBICACIÓN FIJA Y LOS MERCADOS DE ACCESO DE BANDA ANCHA AL POR MAYOR, LA DESIGNACIÓN DE OPERADORES CON PODER SIGNIFICATIVO DE MERCADO Y LA IMPOSICIÓN DE OBLIGACIONES ESPECÍFICAS, Y SE ACUERDA SU NOTIFICACION A LA COMISIÓN EUROPEA Y AL ORGANISMO DE REGULADORES EUROPEOS DE COMUNICACIONES ELECTRÓNICAS (ORECE) (ANME/DTSA/2154/14/MERCADOS 3a 3b 4)

⁴⁸ RESOLUCIÓN SOBRE LA REVISIÓN DE LA OFERTA MARCO PARA FACILITAR EL DESPLIEGUE DE REDES NGA EN ZONAS DE BAJA DENSIDAD POBLACIONAL OFE/DTSA/012/17/MARCO BAJA DENSIDAD

Another example of a regulated SMP operator is, MEO in Portugal. SMP obligations on MEO were re-imposed in 2017, following ANACOM's (Autoridade Nacional de Comonicações) market review of Market 3a and 3b,⁴⁹ including various obligations with regards to CEI access. Such obligations are cost-orientation, transparency and non-discrimination. ANACOM determined that access prices to Ducts and Poles would be regulated on the basis of MEO's accounting data with similar characteristics as the ones used in Ireland. However, there are no distinctions between the costing methodology used for reusable and non-reusable assets. Access prices are controlled through the reference offers published by MEO, ORAC and ORAP. ORAC offers access to sub-ducts on a KM or CM2 charge which are different for Lisbon (+Porto) and the rest of Portugal. ORAP offers access to poles access throughout portugal on a per cable charge.

Other relevant SMP regulations for access to physical infrastructure include Germany. In Germany as of 2017 a BU-LRIC+ cost model is used for regulating access prices to Ducts. In the UK, BT is required to price pole and duct access on the basis of cost orientation. However, there are no explicit charge controls set by the NRA.

⁴⁹ Análise dos mercados de acesso local grossista num local fixo e de acesso central grossista num local fixo para produtos de grande consumo - definição dos mercados do produto e mercados geográficos, avaliações de PMS e imposição, manutenção, alteração ou supressão de obrigações regulamentares.

Annex B Costing model (ComReg D03/16)

The costing model to determine CEI access pricing was described in detail in the 2015 consultation and draft decision document ComReg 15/67. The consultation concluded with the final decision document D03/16. In both documents ComReg describes the modelling approach to determine access prices for duct and poles, amongst others.

Eircom's overall access network is modelled using a three-phase approach which are: the network dimensioning phase, the network costing phase and the network cost allocation phase. In the initial phase assumptions are made to estimate the number of assets required to satisfy the access network demand and subsequently the number of estimated assets that interact with unitary asset costs to compute the overall network cost. In the final phase, the model determines the relevant costs to be associated to each wholesale access product. The overall model requires data on streets/road lengths, unit costs and paths between dwellings and network points.

B.1 Network Dimensioning

The network dimensioning phase consists of computing the number of assets required to meet the total demand of the access network. This phase is separated in three steps. As a starting point the model determines the coverage areas of Eircom's exchange positions. Once the Main Distribution Frames (MDF) and the Street Cabinets (SC) positions are identified the country is split into MDF areas and within each MDF areas all end users are connected to the same MDF (directly or indirectly through an SC). From there the second step of the model estimates the number of end users at the section⁵⁰ level for each MDF by computing the shortest path from each end-user to an SC and each SC to its MDF. Following from this estimation, the copper access network dimensions are estimated to meet the end-users demand for each section. In the third step, Each section is aggregated into individual MDF areas and these are subsequently aggregated at the National level. The main dimensioned assets in the model are:

- Distribution points;
- Copper cables;
- Joints;

⁵⁰ A section is a portion of street between two consecutive crossroads.

- Ducts, trenches, poles;
- Street cabinets; and
- MDFs'

The overall quantity of assets required to satisfy the access network demand is discussed in detail in chapter 5 of the consultation document. They are estimated based on assumptions of different deployment possibilities of network assets for an efficient operator (BU estimation of assets).

Two types of ducts are modelled a duct of 37mm and a duct of 110mm. In addition, a mark-up is applied to the surface estimation for spare capacity (25%) and for empty spaces (20%). The number of ducts is calculated by comparing the surface of required copper cables and the surface of the ducts. Subsequently, the size of the required trenches follows from the number of duct required in each section. The number of poles in each section depends on the number of DP's, overhead joints and the maximum distance between two poles. The number of poles is then the maximum number of poles possible given the constraints.

B.2 Network Costing

Once the network has been dimensioned and the BU network asset inventory is determined, the network costing phase seeks to determine the total investment incurred by the operator to date and the annualised costs of the modelled access network. This phase is separated into four steps progressing from determining the individual current asset prices to determining the total annual costs.

Current asset prices are provided by Eircom which are adjusted by 5% to account for large scale projects. Price trends are calculated using an asset specific price index, in turn these price trends are differentiated for assets that are predominantly copper based and those that are not. A mark-ups is added to the asset prices to take account of indirect activities related to the access network , such as :

- Quality checks for performance and quality of work carried out by contractors;
- Network planning and survey work;
- Travel and subsistence;
- Transport; and
- Non-field staff time.

The resulting network unit cost is calculated for a given year by adjusting the asset price with it's corresponding price trend and adding the relevant mark-ups.

The model then computes the required total capital network cost (CAPEX) by multiplying the network unit costs of each asset to the corresponding units in the network total inventory.

Subsequently, the annual network cost is derived from the total capital network cost but also accounts for depreciation and asset replacement factors. The annual network cost is a proposed blend of Eircom’s Actual Costs Adjusted for Efficiencies and the BU-LRAIC+, cost depreciation and asset replacement are accounted differently for each of the approaches.

For the part of the annual network cost derived from the BU-LRAIC+ approach, this is calculated by applying a depreciation factor⁵¹ to the valuation of the assets at unit costs for a given year (number of assets multiplied by the unit asset costs). The depreciation factor is computed using a tilted annuity, the proposed WACC for the annuity was 8.18% (Nominal pre-tax WACC) as per ComReg Decision D15/14. The applied payment term is set at 3 months, this assumes that revenues are realised three months after the investments are made. However, the BU-LRAIC+ is only applied to assets that cannot be reused for NGA services and need to be replaced. A replacement factor of 8% is applied to the annual network cost derived for poles and 5% to the annual network cost derived for ducts.

For the part of the annual network cost derived from the TD approach, this is calculated using Eircom’s Indexed Regulatory Asset Base (RAB) for reusable assets and by subsequently calculating an asset specific depreciation cost. To determine Eircom’s Indexed RAB ComReg uses Eircom’s Fixed Asset Register that provides a history of Eircom’s network roll-out investments. Each investment is separated by asset class and exchange area. By matching individual investments to the calculated network assets capital costs and the asset inventory, an investment chronology for each asset is established. Subsequently a net book value for each asset is computed and then depreciated using an asset specific depreciation formula that accounts for each asset remaining life. By applying the same tilted annuity formula to the current net book value for the remaining asset life for each asset an annual network cost is derived for poles and ducts. The TD approach is applied to reusable assets, therefore the annual network costs for poles and ducts are multiplied by a 92% and 95% factor respectively.

Note that the valuation of poles derived from the TD approach takes account of Eircom’s forecasted capital costs associated with ongoing annual investments in poles over the three-year price control period. The level of investments is assumed to be constant across the price control period and is based on Eircom’s budgeted pole investment. In addition, the model assumes that the annual re-investment each year increases with price trends.

⁵¹ $Depreciation\ factor = \frac{WACC - Price\ Trend}{1 - \left(\frac{1 + Price\ Trend}{1 + WACC}\right)^{Asset\ life}} * (1 + WACC)^{Payment\ term}$

The total annual cost is computed by summing the operating costs to the annual network costs (both the annual network costs derived from the TD and BU-LRAIC+ approaches).

The operating costs are calculated in a separate cost model (OPEX model) which is based on Eircom's HCAs for wholesale access markets. The HCA is derived from the FAC using an activity-based costing approach. However to identify the relevant operating costs ComReg focuses its analysis on the Cost related to the copper access network and those related to the provisioning and repair of Market 1 and market 4. ComReg separates the various cost activities from Eircom's cost data into direct, indirect and Common cost categories.

The operating costs in the BU-LRAIC+ approach starts from Eircom's HCAs and then adjusts them for efficiencies to derive an efficient level of operating costs for the access network. These efficiencies include:

- Determining a reasonable line fault index (LFI) representative of a new efficient network;
- Determining a reasonable number of direct front line staff required to handle this level of LFI;
- Adjusting the existing operating costs based on the efficient level of staff (at point 2 above);
- Determining a reasonable level of actual indirect and common costs; and
- Interfacing the OPEX model with the main capital cost model.

ComReg determined that a reasonable line fault index for an efficient new network is 8%. ComReg proposed to incorporate a headcount number to run a network with an LFI of 8% in the opex model⁵². Direct costs and indirect costs are then adjusted to be consistent with this headcount. Common costs are fixed and maintained constant for modelling purposes. To split these operating costs at a regional level ComReg splits the operating costs into staff driven costs and Line/ network driven costs at an MDF level.

Operating costs computed with the TD approach are calculated in the same way as in the BU-LRAIC+ but assuming the same investment history as Eircom's existing network. However, in the BU approach there is a significant level of operating costs savings due to the assumptions of rolling out a new efficient network which is not present in the TD approach. There is a higher LFI in the case of the BU approach which is consistent with the age profile of the cables in Eircom's existing copper access network. In turn, a higher LFI leads to a higher Headcount.

⁵² The headcount also takes account of additional required staff for the winter periods and to assist during periods of emergency.

There are also some wholesale specific costs that are related to carrier administration and billing costs associated with the access network. To determine the wholesale specific costs per line ComReg divides the overall costs by the total number of retail and wholesale lines and applies the same value to all services.

B.3 Network Cost Allocation

The unit costs of each of the services that use the access network are determined through the Network Cost allocation phase. They are derived from the proportion each services takes in the total annual costs based on the basis of asset utilisation and service volumes.

The annual price of pole access in the Revised CAM model is solely based on the cost of poles. The annual cost of poles include depreciation, operating costs, common costs and wholesale specific costs. Once the number of poles is determined through the dimensioning phase and the annual network cost of poles determined through the network costing phase, as previously described, the access cost of poles is determined by dividing the annual network cost by the total number of poles in the modelled access network. The number of poles and the annual network cost is estimated at the exchange level which is then aggregated to reflect the exchanges in the Modified LEA's and the non-Modified LEA's. In addition, ComReg has made some considerations with regards to the modelled annual number of poles installed which is assumed to be constant for the TD estimation, this would be revised based on the actual number of poles installed following the price control period. ComReg D03/116 determined that a price per pole would be adequate and that the individual access price per pole would be linearly separated amongst the operators using the pole. The price per pole is separately calculated for the Modified LEA's and outside the Modified LEA's.

The annual access price of duct determined in the Revised CAM model include costs associated with trenches, ducts and chambers. Ducts are used by D-side and E-side cables; NGA fibre links and leased line fibre links. In addition, the model assumes that core cables use separate ducts. Depreciation, operating costs, common costs and wholesale specific costs are all included in the annual cost of duct access. The total cost relating to duct access is divided by the total length of sub-ducts to derive a per meter access price. Prices are also differentiated for exchanges in the Dublin area and outside of Dublin.

Annex C Impact assessment

C.1 Definition of proposals and counterfactual

Relevant counterfactual

There is an existing SMP finding against Eircom in local access markets. As a result, Eircom is already subject to CEI access obligations, which have been confirmed in two successive market reviews. Therefore, we are not analysing an entirely new regulatory intervention, but rather considering tailoring of access remedies to the new situation resulting from the NBP.

Given this, the appropriate counterfactual is for NBI to access CEI on terms similar to the pre-existing CEI access regime (i.e. the *status quo* position in the light of ComReg Decision D10/18). The counterfactual is the same in both the intervention area and the commercial area.

Proposed changes

Generic CEI access remains as is

Under all alternative proposals, generic CEI access would remain available for purposes other than NBP deployment. There is no significant change proposed for this form of CEI access, other than possibly some adjustment of geographical boundaries used for estimation of costs. Therefore, generic CEI access does not form part of this impact assessment.

There is little interaction between the proposed changes within the intervention and the commercial area. Therefore, we can perform separate impact analyses for the two areas.

We will compare two alternative policies for the commercial area and three for the intervention area (including the status quo).

Commercial area	Intervention area
<p><i>Status quo versus</i> Sharer incremental cost</p>	<p><i>Status quo versus</i> Splitting by copper/fibre line shares Sharer incremental cost</p>

Sharer incremental cost in commercial area

Within the commercial area, the proposal is to move from the current CEI pricing regime – which we have called ‘equal sharing’ given that sharers making equal use of CEI assets split costs equally – to one in which NBI would only pay the incremental cost caused by its own shared use. We have called this NBI’s ‘sharer incremental cost’ in the main report.

The relevant demand increment for calculating NBI’s sharer incremental cost for either poles or duct should take into account NBI’s wide-area, large-scale and long-term requirements for CEI access to meet its NBP commitments. For poles, this cost is averaged over the number of shared poles. For ducts, this is divided by the assumed usage (number of sub-ducts, or equivalent cross-sectional area if there are no sub-ducts use, and length). Therefore, in both cases this is a long-run average incremental cost. This does not include any contribution to Eircom’s central overhead costs.

Splitting cost according to share of copper and fibre lines in the intervention area

Within the intervention area, our main proposal is to move to an arrangement in which CEI costs are shared according to the relative number of fibre and copper subscriber lines in an area (what we have referred to as usage-based pricing in the main text).

For these purposes, an ‘area’ is defined by partitioning the intervention area into Eircom’s exchange areas, as Eircom would be likely to make closure decisions for its copper network on this basis.

We assume that line shares are calculated and adjusted annually on the basis of the position at some time during the previous year. This would ideally be on an area-by-area basis, though geographic average would be possible provided areas where Eircom had ceased offering copper services were excluded. In those areas, NBI would bear the entire cost of the CEI, as it would not be in shared use.

For poles, it is possible that a cable occupancy charge might be levied if Eircom had ceased copper services, but not yet removed cables (reflecting additional maintenance costs caused by loading on poles). This detail does not affect the impact assessment.

There are two variations on this line sharing rule depending on whether we allocate just common CEI costs or, more simply, all CEI costs:

- *Variant 1:* Each sharer pays its sharer incremental cost. The common CEI costs are then defined to be the excess of the service incremental cost of the CEI over the total of Eircom’s and NBI’s sharer incremental costs. Any common CEI costs are then split between Eircom and NBI in proportion to copper and fibre line shares.
- *Variant 2:* Apply the line sharing rule to the service incremental cost of the CEI (i.e. the incremental cost taking all CEI usage as the increment).

Variant 2 avoids estimation of sharer incremental costs and so is simpler to implement. However, where feasible to implement,

Variant 1 is to be preferred over Variant 2 as it ensures that caused costs by individual sharers fall on the party causing them.

Minimum threshold for fibre share

There is also potential to use an *augmented sharing rule*, which set a threshold for the fibre line share. Costs are then allocated to the fibre network according to amount by which the fibre line share exceeds the threshold, rather than the fibre line share itself. All costs are allocated to the copper network until the fibre share reaches this threshold. We have seen in the main text that this has some theoretical attractions, in terms of giving more efficient incentives for copper network shutdown, but it involves choosing an additional parameter.

For definiteness, the main proposal assumes Variant 1 of the line sharing rule without setting a minimum threshold for the fibre line share.

Sharer increment cost in the intervention area

The alternative proposal for the is for NBI to pay only its sharer incremental cost within the intervention area as what we have called a 'secondary user'.

C.2 Affected stakeholders

We can identify the following *potentially* affected stakeholders:

- A. NBI (especially its profitability and, ultimately, its viability given its dependence on subsidy to serve the intervention area);
- B. customers for new NGA services within the intervention area;
- C. customers for existing copper-based services within the intervention area;
- D. the State, through any effect on the subsidy required to support NBI and enable NGA services within the intervention area;
- E. Eircom, as the supplier of CEI access (in terms of Eircom receiving a reasonable return on its historic and future investments and have appropriate incentives for turn-off of its copper network) and also the prices that Eircom sets for its copper-based services within the intervention area;
- F. customers of other Eircom services in the competitive area to the extent that Eircom's pricing of those services may be affected; and
- G. any suppliers of services that compete (or might potentially compete) with Eircom's services within the competitive area (whose pricing may be affected under point F).

Not all stakeholders will be affected to a material degree. For example, the wholesale, and therefore the retail, pricing of NBI's NGA services will be set by benchmarking relative to similar service within the commercial area.

C.3 Key mechanisms

In the main text, we identified a number of key mechanisms by which changes in CEI access prices for NBI could affect stakeholders. These are discussed in Section 5 of the main report, but we summarise them again here.

Effects caused by Eircom earning gross margins on CEI access sold in NBI in the commercial area

Within the commercial area, our main concern was that if Eircom earned revenues from selling CEI access services to NBI in excess of NBI's sharer incremental cost, this would in time reduce the CEI costs that need to be recovered from other shared users, including Eircom itself. This could both reduce the price of Eircom's services using that shared CEI and also make access to CEI cheaper for competitors to Eircom within commercial area. The latter effect might affect the build vs. buy decision of infrastructure-based competitors, whereas the former effect might generally depress incentives for competitive entry. The large volume of CEI access services NBI is likely to require in the commercial area (in order to interlink isolated patches of intervention area) make these effects not insignificant.

Inefficient incentives to shut down the copper network

Within the intervention area, there were a number of issues. The main concern is how the approach taken to sharing CEI costs between Eircom and NBI significantly affects Eircom's incentives to shut down its copper network. CEI costs that are common between Eircom and NBI are still incurred if Eircom shuts down its copper network. However, allocating part of these common CEI costs to the copper network makes them avoidable by Eircom and so relevant to its decision. Where the copper network needs to recover some fixed contribution to common CEI costs, this may create an inefficient incentive to shut down the copper network, as it could make a smaller contribution to the common CEI costs.

C.4 Impact assessment for the competitive area

Stakeholder	Impact of move from status quo to sharer incremental cost based CEI access charges for NBI
A: Impact on NBI	<p>Reduced CEI access payments to Eircom for transit through the commercial area used to backhaul patches of intervention area.</p> <p>Little effect on NBI's profitability or viability as subsidy payments should be reduced correspondingly reflect the lower costs of CEI access to NBI under the proposal relative to the status quo.</p>
B: Impact on customers of NGA services within the intervention area	<p>Pricing of wholesale NGA services in the intervention area are set by reference to benchmark services in the competitive area.</p> <p>Potentially, these benchmark services might be cheaper under the status quo if NBI makes a greater contribution to shared common CEI costs in the competitive area, reducing the cost contribution needing to come from other services (what might be called a 'see-saw' effect).</p> <p>We estimate that under the status quo approach, additional margins for Eircom from sale of CEI access to NBI would increase as NBI built out. Although these might be a modest proportion of Eircom's revenues from wholesale NGA services in the commercial area, there is some potential for prices of these services to be reduced as result.</p>
C: Impact on customers of copper-based services within the intervention area	No obvious effect.
D: Impact on State through subsidy requirements	Moving to the proposed sharer incremental cost approach reduces the level of subsidies required to support NBI.

<p>E: Impact on Eircom profitability</p>	<p>Impacts on Eircom’s profitability are likely to be transient. The prices of other services supplied using common CEI in the competitive area will eventually adjust to changes in the contribution made by NBI’s CEI access services to common CEI costs, either through the effect of periodic regulatory review, or due to competition.</p> <p>Under the status quo option, sales of CEI access to NBI would earn gross margins and cause a temporary increase in Eircom profitability. Under the proposal, this would be avoided, as there would be no gross margins on CEI services sold to NBI.</p>
<p>F. Impact on customers of other Eircom services within the CA</p>	<p>Potentially these services might be cheaper under the status quo than under the proposal due to the contribution to CEI common costs made by NBI’s demand for CEI access for transit purposes (the see-saw effect in B above). This effect is avoided under the proposal.</p>
<p>G: Impact on other suppliers of services competing with Eircom within the CA</p>	<p>Under the status quo, there is potential for incentives for competitive infrastructure provision in the commercial area to be inefficiently discouraged. This is both because (i) Eircom’s competing services might be cheaper if sales of CEI access services to NBI partly cover common CEI costs and (ii) any build-vs-buy decision of such a competitor might influence by cheaper generic CEI access.</p> <p>This effect is material, as under the status quo approach additional margins for Eircom earned by sales of CEI access to NBI within the commercial could be used to lower prices of Eircom’s services.</p>

C.5 Impact assessment for the intervention area

Stakeholder	Main proposal: Impact of move from status quo to line based sharing of common CEI costs	Alternative proposal: Impact of move from status quo to NBI paying only sharer incremental cost
A: Impact on NBI	<p>CEI costs would initially lower than under the status quo. However, CEI access costs progressively increase with fibre take-up and may become larger than under the status quo if fibre take-up is large.</p> <p>The proposal avoids sharp changes in overall CEI access charges as copper network is turned off.</p> <p>Little effect on NBI's profitability or viability as subsidy payments should be adjusted in line with changing CEI access costs for NBI.</p>	<p>Lower level of CEI costs while CEI assets are shared under this approach that than under the status quo or the main proposal.</p> <p>Sudden, large increase in CEI costs for NBI when the copper network shuts down. Some possible impact on NBI profitability unless subsidy payments adjust sufficiently rapidly when the copper network shuts down.</p>
B: Impact on customers of NGA services within the intervention area	<p>No obvious effects as prices set by benchmarking to the competitive area and the roll-out of fibre services is set contractually for NBI.</p>	

<p>C: Impact on customers of copper-based services within the IA</p>	<p>Status quo may lead to somewhat lower prices for copper services due to contribution to common CEI cost made by fibre network. This effect is much reduced under the proposal.</p> <p>Status quo will eventually lead the copper network not being able to cover its required share of common CEI costs, creating inefficiently strong incentives for turn-off. The fibre network may not be full deployed at this point, so intervention may be needed to ensure availability of services. In contrast, the proposal avoids this problem by progressively reducing the copper contribution to common CEI costs as fibre is taken up.</p>	<p>No impact likely on prices of copper services.</p> <p>Alternative proposal creates even stronger inefficient incentives for copper network turn-off than the status quo, as copper network needs to bear all the common CEI costs. Similar problems to the status quo with service availability, but even more severe under this proposal.</p>
<p>D: Impact on State through subsidy requirements</p>	<p>Subsidy requirements increase progressively under the proposal as the fibre line share increases and common CEI costs split to fibre.</p> <p>Not clear whether the status quo or the proposal results in the large present value of subsidies up to the time that the copper network is turned off. Probably broadly similar.</p> <p>Potential for USO-type costs falling on the state at some future date under the status quo if copper network has incentive to shut but needs to be kept running longer for service continuity/availability reasons.</p>	<p>Lower level of subsidy payments than under the status quo whilst CEI is being shared.</p> <p>Possible sharp increase in subsidy payments to cover additional CEI costs when copper network turned off.</p> <p>Potential for USO-type costs falling on the state at some future date even stronger under this proposal than under the status quo.</p>

<p>E: Impact on Eircom profitability</p>	<p>Move from status quo to line share-based cost sharing delays payments for CEI access from NBI but Eircom should at least recover its reasonable CEI costs under both the proposal and the status quo.</p> <p>Status quo may lead to some temporary excess profitability for Eircom, due to large volume of CEI access services sold to Eircom earning a gross margin and regulatory lags in adjusting the prices of copper services.</p> <p>Status quo leaves Eircom with risk about what happens if copper network is uneconomical but turning it off is difficult if fibre network is not fully deployed. This is avoided by the line share based cost sharing proposal, as copper network remains economical far longer.</p>	<p>CEI access to NBI does not contribute any gross margin so Eircom does not enjoy any benefits from sharing CEI under the alternate proposal.</p> <p>Alternate proposal leaves Eircom with an even greater risk than under the status quo about what happens if copper network is uneconomical but turning it off is difficult if fibre network is not fully deployed.</p>
<p>F. Impact on customers of other Eircom services within the CA</p>	<p>No obvious impact.</p>	
<p>G: Impact on other suppliers of services competing with Eircom within the CA</p>	<p>No obvious impact.</p>	