dot·econ

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

Final report for ComReg

19 October 2021

DotEcon Ltd
17 Welbeck Street
London W1G 9XJ
www.dotecon.com

Contents

Executive Summary 1
1 Introduction 8
1.1 Scope 8
1.2 Consultation and previous report 8
1.3 Structure of this report 9
2 Background 10
2.1 Current regulatory position 10
2.2 Interaction with USO 13
2.3 Objectives and relevant policies 16
3 Existing CEI access prices 19
3.1 Current CEI access obligations 19
3.2 Meeting NBI's requirements 22
3.3 Cost orientation obligation for CEI access 23
4 The National Broadband plan 30
4.1 Function of the NBP 30
4.2 CEI in the context of the NBP 33
4.3 Transit in the commercial area 35
5 Cost definitions for shared CEI 38
5.1 Definitions of incremental cost 38
5.2 Capacity constraints and geography 40
5.3 Asset upgrades 42
6 Considerations for CEI access pricing 44
6.1 ComReg's objectives 44
6.2 Eir's cost recovery 46
6.3 Competitive infrastructure provision 47
6.4 Transient excess returns for Eir 53
6.5 Copper to fibre transition 55
6.6 Incentives to facilitate NBI's deployment 66
6.7 Summary 66
7 CEI access in the commercial area 70
7.1 Proposed approach 70

7.2 Rationale 70
8 Options for the intervention area 73
8.1 Options considered 73
8.2 Per operator 'equal' sharing 74
8.3 Primary and secondary users 75
8.4 Usage-based sharing 76
8.5 Comparison of approaches 79
9 Consultation responses 82
9.1 LRIC access pricing in the CA for NBI 82
9.2 Common cost recovery 88
9.3 Access pricing in the intervention area 90
10 Per operator and per operator plus 99
10.1 Eir's proposal 99
10.2 Modified "per operator plus" 99
10.3 Sources of cost differences 100
10.4 Recommendations 101
11 Conclusions and recommendations 103
11.1 Problems with current CEI access pricing 103
11.2 Differentiated CEI access 104
11.3 CEI access pricing in the commercial area 104
11.4 CEI access pricing in the intervention area 105
11.5 Cost modelling issues 106
11.6 Summary of recommendations 110
A Impact assessment 111
Annex B Cost sharing rules 118
Annex C Comparison with other EU countries 127
Annex D Costing model (ComReg D03/16) 130

Tables & Figures

Table 1: Summary of key issues 67

Figure 1:Map of Ireland displaying the intervention area and the commercially served area 31

Figure 2: A detail of Dublin showing urban in-fill premises 31

Figure 3: Zoom-in on a typical rural area 32

Figure 4: Service incremental cost and sharers incremental costs 38

Figure 5: Stylised cost structure 58

Figure 6: Time profile of CEI costs in intervention area under equal cost sharing 74

Figure 7: Time profile of CEI access charges under primary/secondary approach 76

Figure 8: Examples of augmented line sharing rules at different thresholds 78

Figure 9: Sharing rules 122

Figure 10: Share of common CEI cost allocated to copper under different sharing rules 125

Executive Summary

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.

ComReg consulted on proposals for pricing of physical infrastructure access to CEI in its Draft Decision and Consultation, published as ComReg 20/81.[1] DotEcon provided advice to ComReg on economic matters, published as Annex 2 to ComReg 20/81.

This second report considers the comments of consultees and amends the findings of our first report.

Existing access regulation

Mandated access to Eir's ducts and poles has been available since 2013, following ComReg's Decision D03/13[2]. In 2016, ComReg set prices for CEI access in ComReg Decision D03/16[3]. In 2018, CEI access measures and the pricing approach and prices for CEI from D03/16 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; this is called the "per operator" approach. Splitting the costs of ducts is more complex, as sharing operators may make unequal use of duct capacity. For this reason, duct access is currently charged based on metres of subduct used. Prices are differentiated depending on surface type, as this affects the cost of installing duct, and by area (Dublin / Provincial) to reflect differences in subcontractor rates charged to Eircom.

[1] https://www.comreg.ie/publication/pricing-of-eircoms-civil-engineering-infrastructure-cei-consultation-and-draft-decision

[2] https://www.comreg.ie/media/dlm_uploads/2015/12/ComReg1311.pdf

[3] https://www.comreg.ie/csv/downloads/ComReg_1639.pdf

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.

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 Eir or other providers within the commercial area.

The intervention area and commercial area are intertwined

To meet its contractual obligations to supply these services, it is highly likely that NBI will need access to a large proportion of Eir's CEI in both the intervention area and outside (the 'commercial area'). Within the intervention area, NBI will need access to most of Eir'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 CEI access to transit through the commercial area to interconnect these patches of intervention area, whilst being prohibited from offering subsidised services within the commercial area.

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 contract between NBI and the Minister for Communications, Climate Action and Environment in relation to the NBP. Over this period, it is highly likely that Eir will shut its copper network. In this event, Eir would likely rely on taking wholesale services from NBI rather than building a parallel network in the intervention area.

CEI access in the new environment

NBI's needs are not contestable

A large quantity of CEI access services across both the intervention area and part of the commercial area is likely to be required by NBI to meet its NBP commitments. Access within the commercial area is needed to interconnect the fragmented intervention area (though NBI would not be able to offer subsidised services within the commercial area). No other operator other than Eir could realistically supply NBI's requirements for CEI access.

Additional margins from supply of CEI access to NBI

The existing approach to access regulation cannot simply be re-applied, as it would lead to Eir earning additional gross margins on CEI access sold to NBI for the purposes of the NBP, whether within the intervention area or for transit purpose through the commercial area. This would lead to Eir earning excess returns on these CEI assets in the absence of any countervailing changes to the pricing of services sharing those assets.

We are also concerned that such excess returns could lead to competitive distortions. There are various possibly routes by which such distortions might arise, depending on whether any such excess returns are dissipated in lower prices for other Eir services sharing CEI with NBI, through what might be called a 'see-saw' effect.

Competitive distortion in the commercial area

Within the commercial area, NBI's demand for CEI access will be concentrated into the so-called rural commercial area, in which Eir has recently deployed its new NGA network. If Eir earns additional margins within the rural commercial area from supplying NBI with CEI access, there is the possibility that costs of CEI within the commercial area are in part covered indirectly by subsidy. If, hypothetically, Eir's wholesale services were priced on a geographically averaged basis across the whole commercial area and subject to cost-orientation on that basis, then this would lead to lower prices for those services. In those parts of the commercial area where there is competition, if this is based on access to Eir's CEI, these services could become cheaper. Overall, this could distort price signals to competitors deciding whether to buy access or build infrastructure within the commercial area. Whilst consumers might see lower prices, these would be due to subsidy leakage from the intervention area.

One partial solution is price CEI access for purposes other than the NBP to reflect EIr's costs in the so-called urban commercial area – that part of the commercial area where Eir has not deployed its new rural NGA network and where NBI is unlikely to need services for transit purposes. This removes any risk of subsidies leaking into the urban commercial area. However, unless prices for Eir's services within the rural commercial area itself can adjust without corresponding changes on prices in the urban commercial area, there would no mechanism to dissipate any excess margins earned from supplying NBI with CEI access. Therefore, there is a strong argument for not creating those excessive margins in the first place by Eir being paid only the incremental cost that NBI's CEI access causes.

This scenario is of practical relevant as many services supplied by Eir, such as FTTC-based services subject to cost orientation, but based on costs in the urban commercial area. Therefore, without significant regulatory changes, any additional margins earned by Eir in the rural commercial area may not be eroded.

Overall, if Eir were to earn persistent excess margins from supplying NBI – whether in the commercial area or the intervention area – these could not be contested by other suppliers due to Eir's unique ability to supply those services. This could create a more general risk of competitive distortion, for example through Eir having resources to make selective price cuts where facing competitors.

Funding the residual copper network

Within the intervention area, under the current equal sharing approach, Eir'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 Eir 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. In this case, Eir would be making losses – as assessed statically at that point in time - due to the requirement for the copper network to fund an equal share of CEI costs despite having few customers. However, in practice, it is likely that Eir would have benefited from CEI sharing prior to this point under the per operator model, as NBI would pay for CEI access even before Eir lost copper customers. Therefore, any short-run loss that Eir faced from continuing to provide copper services would need to be balanced against these earlier additional payments with profitability assessed over a longer period.

In principle, this issue of the copper network's declining ability to contribute to shared CEI costs could be addressed by some dynamic rebalancing of contributions from copper and fibre networks. In our first report we considered the possibility of splitting costs of CEI within the intervention area based on the relative number of active customer lines served by Eir and NBI (which we called "per customer" sharing).

Differentiated access for NBI purposes

To avoid potential competitive distortions within the commercial area, the supply of CEI access to NBI should not create additional gross margins for Eir. Furthermore, NBI cannot supply subsidised services in the commercial area, so does not present Eir with additional competition that would erode its current returns. For these reasons, we propose that a differentiated CEI access product be created to meet the specific and exceptional requirements of NBI in terms of the scale and longevity of its demand, recognising that NBI is restricted where it can offer subsidised services. This differentiated access service would be contractually restricted so that it could only be used to meet commitments arising from the NBP.

This differentiated access service should not include any contribution by NBI in the commercial area to Eir's common overhead costs that are not incremental to the large-scale CEI access service being provided to NBI. NBI's use of CEI access services for transit through the commercial area to interconnect the fragmented intervention area is not competing in any way with Eir's existing services, so Eir does not need to be compensated for any loss of gross margins from services it supplies within the commercial area.

Generic CEI access

In parallel, the 'generic' CEI access service would remain open to all where CEI access is not for the purposes of fulfilling commitments under the NBP. This would continue be priced using a similar methodology as currently (i.e. per operator sharing for poles and per meter of sub-duct for duct). This would ensure that there was undistorted competition between Eir and other providers competing

based on CEI access. Costs would be estimated using the current methodology (BU-LRAIC+), but it is reasonable to assume that demand for generic CEI access will be primarily in the urban commercial area (i.e. not the intervention area nor where Eir has recently deployed its new rural NGA network).

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'[4]), but no more. In effect, NBI would be a secondary user, with Eir 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 Eir would not enjoy any windfall gains from sharing CEI in the commercial area with NBI. This approach is necessary to avoid either creating persistent excess returns for Eir or, if a see-saw effect operates to erode these excess returns, undermining efficient incentives for competitive infrastructure within the commercial area.

CEI cost sharing in the intervention area

Per customer sharing

In our first report, we suggested that there is merit in a "per customer" sharing scheme for common CEI costs within the intervention area. 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.

However, on consultation, it appears that there are practical difficulties in assessing the relative number of active lines that NBI and Eir would be supplying over time within the intervention area. We understand that Eir has informed ComReg that data on the number of active customer lines by location is not available and cannot be obtained within a reasonable time scale. This makes the per customer approach infeasible.

Per operator plus

If per customer approach is infeasible, this leaves two main alternatives. We could retain the existing per operator approach, which would lead to a 50:50 split of pole costs within the intervention area. Alternatively, we can augment this approach with new information now available about the incremental costs that NBI and

[4] 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.

Eir each individually cause. The latter approach was proposed by Eir and termed "per operator plus". Under this approach:

- 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 split equally between Eir and NBI.

Given a choice between these two variations of per operator pricing, we recommend the 'per operator plus' approach. This is more aligned with cost causation principles. Also, it somewhat reduces the chunk of shared cost that needs to be allocated between fibre and copper networks, so tends to reduce the possible future problem that the burden of cost recovery of shared CEI costs on the declining line base on the copper network may appear unsustainable as customers migrate onto NBI's FTTH network (if profitability is assessed at only one point in time).

Cost modelling implications

Sharer incremental cost

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.

Basis of cost estimation

Within the intervention area, costs can be calculated using a LRAIC approach. However, this needs to consider various increments, including each sharer separately ceasing to use the shared CEI, and both sharers ceasing altogether.

These proposals require some adjustments to ComReg's previous approach to cost modelling. It is necessary to identify the costs caused specifically by NBI's shared usage (what we call 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.

Historical underinvestment

When identifying the costs that NBI's sharing of CEI causes, any correction of historic underinvestment in maintenance of these assets by Eir is not ascribed to NBI's use.

Common overhead costs

Contributions to common overhead costs should be recovered from generic CEI access as at present (i.e. a LRAIC+ basis). However, where NBI uses CEI access, no contribution to common overhead

costs should be made and NBI should pay the costs incremental to its usage.

Within the intervention area, eventually NBI's fibre network will replace Eir's current copper network. Costs that would cease when Eir's copper network switches off should not be classified as common costs. Given this, ComReg has reviewed its previous definition of common costs and identified some of these as being potentially incremental. This change has the effect of decreasing the extent of common overhead costs needing to be recovered.

Within the intervention area, there is no evidence that copper services have historically been contributing materially to common overhead costs due to the likely higher costs of serving customers in this area. Reclassification of some common costs as incremental only reinforces this conclusion. Given this, as NBI's fibre services replace Eir's copper services within the intervention area, Eir is unlikely to be losing any contribution to common overhead costs as a result.

Within the commercial area, NBI pays the incremental cost attributable to its use of CEI (including some costs that were previously classified as common costs by ComReg). This avoids NBI's new demand for CEI access for transit purposes leading to Eir earning windfall gains that would be indirectly funded by subsidy and which could ultimately lead to distortions of competition for downstream services sharing that CEI.

1 Introduction

1.1 Scope

Key questions

DotEcon has been asked by ComReg to consider the appropriate principles for setting access prices for civil engineering infrastructure (CEI) in the context of the National Broadband Plan (NBP) given ComReg's regulatory objectives and the requirements of both relevant EU policy and State Aid rules. This includes:

- 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 Eir'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.

1.2 Consultation and previous report

This is our second report on these matters. ComReg consulted on proposals for pricing of physical infrastructure access CEI in its Draft Decision and Consultation, published as ComReg 20/81. DotEcon's first report published as Annex 2 to ComReg 20/81.[5]

For the convenience of the reader, this report repeats the substantive content of our previous report, in abridged form, before considering the consultation responses and reaching final conclusions. We have made some minor amendments to the original

[5] https://www.comreg.ie/publication/dot-econ-report-annex-2-of-comreg-document-20-81

text for clarity and to remove issues of limited relevance in the light of consultation responses and the eventual conclusions.

1.3 Structure of this report

This report is organised as follows. The first three sections set the scene:

- Section 2 provides an overview of current regulation of CEI access, the NBP, relevant aspects of Universal Service regulation and ComReg's objectives;
- Section 3 provides more detailed description of current CEI access pricing;
- Section 4 describes the relevant aspects of the NBP in more detail.

Section 5 sets out definitions of incremental cost when assets, such as CEI, are shared. It also considers the possibility that assets may need to be upgraded to allow sharing.

The main analysis set out in our first report is then set out in the next three sections:

- Section 6 develops a list of general considerations relevant to the setting of CEI access prices, with more detailed analysis of cost sharing rules given in Annex B;
- Section 7 considers the setting of CEI access charges in the commercial area;
- Section 8 considers three main options for setting CEI access charges in the intervention area, presenting three main options for sharing of common CEI costs between copper and fibre networks (per-operator, per-customer and primary/secondary user).

We then consider consultation responses in Section 9. Section 10 then considers the "per operator plus" approach to CEI cost sharing, which is an additional option introduced in this report. Section 11 then sets out our conclusions and recommendations.

There are four further annexes:

- Annex A provides an impact assessment of the proposed changes (and some variations);
- Annex B provides a detailed analysis of various cost sharing rules;
- Annex C briefly describes relevant practice elsewhere in the EU;
- Annex D includes a summary of the costing approach used for setting access prices in ComReg Decision D03/16.

2 Background

This section provides an overview of relevant background in terms of current regulation and the interaction with the NBP. We also set out ComReg's relevant objectives.

2.1 Current regulatory position

2.1.1 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

In Section 3, we provide a fuller description of current CEI access pricing. For now, we note that there is already 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 Eir'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.

2.1.2 The National Broadband Plan

The National Broadband Plan

The Department of the Environment, Climate and Communications (DECC) 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*' (IA) throughout. We define the '*commercial area*' (CA) to be the complementary area outside the intervention area. We describe the characteristics of the NBP and the IA in more detail in Section 4 following.

The CA includes a mix of areas where there is active infrastructure competition, areas with potential infrastructure competition and other areas where Eir is likely to remain the sole network operator

(though with this being economic without subsidy, unlike the intervention area).

It is expected that NBI will make extensive use of Eir's existing poles across the intervention area 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.[6] NBI can be expected to self-supply CEI assets such as poles where these are not already available from Eir 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 atypical relative to comparable countries. Where subsidies have been offered for extending broadband coverage, these have usually been won by the incumbent operator, who is likely to have an advantage in any such competition.[7] In contrast, in Ireland, there is a range of issues regarding CEI access that arise because of the more complex value chain created by NBI's presence.

2.1.3 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 Eir's copper access network will largely cease service.[8] 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 Eir, but eventually decommissioning by Eir would leave NBI as the primary user of Eir's CEI within the intervention area.[9] Therefore, Eir's CEI within the intervention area would be present primarily to serve NBI's needs and arguably none of these activities would be economically viable on a standalone basis without the subsidisation of NBI by the State.

[6] 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/

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

[8] 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, Eir 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.

[9] Eir will still use its CEI for other services (i.e. leased lines, etc.)

In turn, Eir 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 Eir could be present at two non-adjacent levels within the value chain, both providing essential inputs to NBI and purchasing its wholesale services.

2.1.4 Possible future developments

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

Potential for evolution of the current situation

At the present time, ComReg Decision D10/18 dictates the regulated terms under which NBI's access to Eir'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 Eir (e.g. some maintenance functions) or even buy some CEI assets from Eir, as this might prove more efficient if NBI were the main user of those assets. At this time, it is unclear how these long-term arrangements may evolve.

The "300k area" and the rural commercial area

Eir has recently expanded the reach of its FTTH network (into what has been called the "300k area", although this now amounts to about 340,000 premises). As we discuss in detail below, Eir 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*' (RCA) throughout. By implication, the current NBP intervention area, which excludes the rural commercial area, is one where Eir has chosen not to extend its FTTH network, presumably as it would be unprofitable to do so.

Future extension into the IA

There is nothing in principle to stop Eir 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 Eir 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 then DCCAE (now the DECC) 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 Eir 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 Eir's poles and ducts (though not necessarily in its current form).

2.1.5 Access in the commercial area

Transit through the 3ook area

NBI will need to transit through the Commercial Area in order to connect its network in the intervention area, using wholesale services such as Eir's CEI to support its own network. However, our understanding of the terms of the NBP contract is that NBI cannot use its subsidised network to offer services in a commercially viable area[10]. Consequently, transit services would be used solely to support NGA services offered in the intervention area, rather than in competing with Eir in providing service available within the commercial area.

2.2 Interaction with USO

Current policy on USO

ComReg has indicated that it intends to review the extent of Eir's universal service obligations (USO) in light of developments due to the NBP and the end of Eir's obligation period set out in ComReg Decision D05/16. To this end, ComReg has recently published two consultations concerning USO in providing access to a fixed location (AFL).

In Consultation 21/51[11], ComReg reached the preliminary view that there is a continued need for an AFL USO for Ireland beyond 30 June 2021. ComReg invited expressions of interest from undertakings for the proposed designation of universal service provider (USP) for AFL.

[10] 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.

[11] https://www.comreg.ie/publication/universal-service-requirements-provision-of-access-at-a-fixed-location-afl-uso

In the absence of expressions of interest, ComReg proposed to continue Eircom's current designation as the USP for AFL for a period of 24 months.

At paragraphs 27 & 28 of Consultation 21/51 ComReg states that:

> *"The committed investment by commercial enterprises coupled with intervention by the State via the National Broadband Plan should, once the NBP Intervention is completed, ensure that high speed broadband and voice services are delivered to all premises in Ireland. At that time, the need for a Universal Service Obligation (USO) to an provide adequate broadband connection and service will be assessed following transposition [of the EECC]. ComReg anticipates however that these commercial and State deployments will not be completed within the next 12 – 24 months"*

Consultation 21/66[12] sets out ComReg's preliminary view to maintain the current AFL USO set out in Section 12 of the Decision Instrument of ComReg Decision D05/16 for an interim period of a maximum of four months. On 30 June 2021 ComReg issued ComReg Decision D05/21[13], maintaining the current AFL USO on Eircom until 30 October 2021 or until the date on which ComReg has made a final decision on the future need for a designation of a USP for AFL USO, whichever date is earlier..

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 Eir's copper-based services by fibre-based services within the intervention area, reducing the profitability of the copper network. Eir'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, rather than at a point in time), it is 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, we can expect the copper network to become uneconomic at some point whilst it still has some residual customers being served;

[12] https://www.comreg.ie/publication/universal-service-requirements-provision-of-access-at-a-fixed-location-afl-uso-interim-designation

[13] https://www.comreg.ie/publication/universal-service-requirements-provision-of-access-at-a-fixed-location-afl-uso-interim-designation-d05-21

it cannot be sustained by ever-increasing prices as customer numbers fall.[14]

- In regard to pricing of copper services already deregulated the Urban WCA/ Broadband Market (see ComReg Decision D10/18). However, Eir's retail pricing is still required to be nationally averaged, with ComReg 21/51 proposing to maintain a requirement for geographically average prices for retail voice services. Therefore, ComReg has already clearly signalled that, regardless of whether future geographical differentiation of wholesale pricing were to emerge, it does not expect higher costs of copper services in the intervention area to be sustained by customers in this area paying a significant retail price premium relative to customers in the commercial area.
- As more and more customers transition onto NBI's fibre network Eir may want to shut-down parts of its copper network in the intervention area. However, Eir may be constrained from shutting down copper services in areas where NBI has not yet fully deployed fibre because of a USO[15], leading to possible unavoidable costs to Eir 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 Eir in shutting down its copper network, these should be ascribed to the NBP intervention or to requirements on Eir to provide certain services over its copper network. 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, the current USO scheme is not germane to the present 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 hypothetical 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 Eir's CEI (say a standalone network). We would then have exactly the same issues arising in that Eir might be constrained by a USO and not be able to decommission its copper network. Any additional costs to Eir 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. Beyond this transition, the NBP provides a means of serving

[14] We cannot expect the costs of the copper network to scale linearly as the number of customers declined, not least due to the presence of fixed costs. Also, residual customers may be geographically distributed in a manner that makes it difficult to shut down assets shared by many users (e.g. a multicore copper cable might be largely unused, but cannot be removed as a small number of lines are still in use).

[15] SMP obligations may also be relevant, as they may require supply of services.

rural customers and so diminishes the need for a USO in the long run. Therefore, there is potentially complex interaction between a USO policy and the NBP intervention, but none of this is of relevance for CEI access prices.

2.3 Objectives and relevant policies

Regulatory objectives

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

- taking utmost account of the principal 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.

The final objective above manifests itself primarily through 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 Eir'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 objective for ComReg. Nevertheless, as we shall see in Section 6.1, an *indirect* consequence of ComReg pursuing its statutory objectives may be that the subsidy requirements may need to be kept to a minimum, subject to the constraint that Eir recover its efficiently incurred costs in addition to a reasonable return, in order to avoid potential competitive distortions. However, we strongly emphasise that we have not taken the minimisation of subsidy costs for the State as an objective at any point in either this report or our first report.

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 effects created by different access pricing regimes for Eir and NBI in both the intervention area and the commercial area, including in respect of NGA roll-out

and switch-off of Eir's copper network within the intervention area;
- the impact of any margins earned by Eir from CEI access services on potential competition outside of the intervention area, including for other services supplied by Eir.

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 Regulations[16] 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 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 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.

The EECC

The European Electronic Communications Code ('EECC'), while not yet implemented in Ireland, provides a framework for NRAs with regards to implementing market remedies where they have made findings of significant market power. In particular, the EECC provides relevant rights and guidance with regards to accessing civil engineering infrastructures[17] and price control[18] obligations.

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

[17] European Electronic Communications CODE (EECC) Article 72

[18] European Electronic Communications CODE (EECC) Article 74

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 in the interests of end-users.[19] 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 about the broader issue of whether these new services are taken up by end-users.

Dispute resolution

In passing, we note that 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. [20] 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.

[19] European Electronic Communications CODE (EECC) Article 81

[20] European Electronic Communications CODE (EECC) Article 26 (1).

3 Existing CEI access prices

ComReg has had in place measures to mandate access to CEI (specifically Eir'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.

3.1 Current CEI access obligations

ComReg's 2013 Decision

In 2013, ComReg published a decision regarding Remedies for Next Generation Access (NGA) Markets.[21] This imposed certain obligations on Eir to provide access to its CEI or, if CEI access is not available, to dark fibre (where available). Eir's CEI access services were subject to a cost orientation obligation and a non-discrimination obligation. The non-discrimination obligation required that Eir 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 Eir itself.

ComReg's 2016 Decision

In 2016, ComReg published a decision[22] 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 Eir 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 Eir'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 decision[23] following its review of the Wholesale Local Access (WLA) and Wholesale Central Access (WCA) Markets (ComReg Decision D10/18). This market review established that Eir has significant market power (SMP) in the

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

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

[23] 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."

WLA Market, nationally, and in the Regional WCA Market. As a result, in the WLA Market, ComReg imposed a number of remedies on Eir, including:

- making available to access seekers a range of WLA products, services and facilities, including Eir'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 Eir 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 Eir'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, Eir 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:

- Eir undertaking to provide FTTH services within the rural commercial area, reducing the size of intervention area and also indicating that Eir was not willing to roll out FTTH further that the rural commercial area (without subsidy);[24]
- Eir 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;[25] 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 Eir had the option of proposing a yet larger area for its planned deployment of FTTH in the rural commercial area, which would have reduced the size of the intervention area and likely led to Eir becoming the sole commercial NGA provider in the additional areas where it deployed. Eir's NGA deployment in the rural commercial area defines the boundary of the intervention area in many places, implying that Eir did not consider any such further extension of the NGA deployment profitable. Furthermore, such NGA deployment within the intervention area is unlikely to be attractive for any other commercial operator, who would not be enjoying subsidy and need to compete with NBI within the intervention area; Eir itself did not find this opportunity commercially attractive even if it would have been the sole operator, let alone if it needed to compete with NBI.

Although ComReg has not yet made any formal finding about 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, DCCAE (now DECC) determined the intervention area was

[24] In 2015 Eir 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 Eir's 300K Area.

[25] 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

being unlikely to be commercially viable to serve without subsidy; and
- Eir'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 access regulation, Eir 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 Eir's CEI is desirable as it would diminish entry cost for those competing with Eir 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 several 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 that a benefit of CEI access regulation is that entrants can purchase CEI access services from Eir 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 Eir across the full value chain.

3.2 Meeting NBI's requirements

Duct and pole access

Access to Eir'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 Eir'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 Eir'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 Eir. Therefore, ComReg identified an ongoing need to review the definition of CEI access products and ensure that Equivalence of Input (EoI) obligations were working well for access users.

In addition, NBI is likely to make new and particular demands on Eir's CEI that differ substantially from how CEI is used by access seekers at the moment. NBI will need widespread and long-term access to most of Eir'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.

3.3 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 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.

3.3.1 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. This is called the 'per operator' approach in D03/16. This per-operator approach could also be summarised as equal cost sharing, in that operators making similar usage demands on CEI assets split costs equally.

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. This approach to duct cost sharing leads to equal sharing of cost where equal use is made of duct, but of course operators may in practice vary in the length and number of sub-ducts or cross-sectional area used. Therefore, the cost sharing is

somewhat more complicated for ducts, but broadly similar principles apply once we take into account the potential for operators have different intensity of usage of ducts, an issue that is largely absent for poles.

3.3.2 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 that can be reused for NGA.

Economies of sharing

These CEI assets are both long-lived and costly to duplicate, making duplication economically undesirable (unless capacity is exhausted). 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 Eir does not over- or under-recover its efficiently 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 Eir's Indexed RAB in the decision) achieves this, as the estimation of the assets value is directly linked to Eir's actual accounting data. This approach is in line with the 2013 European Commission Recommendation on non-discrimination and costing methodologies.[26]

Depreciation and tilted annuity

In practice, the TD HCA model values the reusable assets at the net book value in Eir'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.[27] In

[26] 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.

[27] §5.203 and following, ComReg 15/76.

addition, the asset valuation in ComReg's TD model takes into account Eir's forecasted capital costs associated with ongoing annual investment in poles and ducts over the price control period. 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 Eir'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 pooled 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 Eir 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 Eir's overheads, though this is not explicitly separated out.

3.3.3 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 Eir'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 Eir 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

Eir's historic expenditure on CEI supporting its copper network provides little guide to future costs of repairing or upgrading non-reusable assets required to support NGA. ComReg determined in its 2016 decision that the appropriate pricing methodology for these replacement assets (new assets) is bottom-up LRAIC+, modelling the costs of providing these new assets.

The BU-LRAIC+ includes efficiently incurred costs, both variable and fixed, that are 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'). Therefore, under this approach Eir recovers any additional costs caused by sharing CEI for NGA deployment purposes.

Because any new or upgraded assets are costed on the basis of current costs, this approach is broadly comparable to the forward-looking costs that another efficient operator would face for building its own CEI. Therefore, at least broadly speaking[28], the BU-LRAIC+ estimation generates a price that would be comparable with the cost an efficient operator would incur for building its own CEI. Therefore, other operators should face appropriate price signals promoting efficient investment decisions in either building their CEI to provide NGA or renting Eir's CEI. Often there will cost efficiencies from upgrading or modifying Eir's existing CEI assets, rather than building entirely new ones, but this will be reflected in the price of accessing Eir's CEI.

3.3.4 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 few 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 Eir's network data to ensure that the overall number of poles and duct track lengths are broadly consistent with Eir'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,

[28] The BU-LRAIC+ does mean that an operator deciding between building its own CEI and using Eir's after upgrading will pay a contribution towards Eir's common costs in the latter case, which is not an incremental cost of supplying CEI access. In marginal cases, this additional common cost contribution could lead to an operator building its own CEI, when it fact it might have been cheaper to upgrade Eir's and to share, absent the common cost contribution.

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.[29] 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.

ComReg has revised its approach and costs previously treated as being common are now identified as incremental to the copper network (e.g. some central overheads). This has the effect of reducing the residue of common overhead costs needing to be recovered and means that this residue is clearly non-incremental to copper services. A logical implication of ComReg's approach in D11/18 is that successor services provided in the non-commercial area cannot be expected to contribute to these residual, non-incremental overhead costs.

3.3.5 Geographical differentiation

In the 2016 access pricing decision, ComReg notes that there are three factors that influence duct cost: surface types; trench size and whether duct is deployed in Dublin or "Provincial". This is mainly due to the cost of excavation and surface re-instatement, where contractors usually charge higher rates in Dublin for the same surface type. ComReg considered that the installation cost was sufficiently different that it warranted a different price in Dublin.

With regards to poles, ComReg considered that, 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.

3.3.6 Replacement rates and unit costs

Replacement rates for NGA

In ComReg D3/16, it was established that most poles and ducts are reusable; only a small percentage 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. In practice,

[29] ComReg Decision D11/18. Paragraph 6.226 and footnote 161.

it may be that these assets do not need to be entirely replaced, but instead there is a cheaper alternative of repair or modification. This possibility is not explicitly modelled, but the possibility 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 assumes that the duct access services provided by Eir 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 reduced accordingly. (This is an example of how costs of access services depend on whether access provider or access seeker undertake certain 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 Eir'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.

Within the rural commercial area, Eir has needed to upgrade CEI through pole replacement and duct remediation to deploy its FTTH network, with the large majority of existing assets being upgradable. Thus, CEI within the current network can be supposed to have a 100% re-use factor for NGA services in this area. In the NBP intervention area this may not be the case and the replacement factor would consider the percentage of the pole and duct base that needs to be replaced for full fibre deployment.

3.3.7 Depreciation and assumed asset lifetimes

In Decision D03/09[30], ComReg revised the asset life for poles from 15 years to 30 years to align cost models with the actual average life of poles. However, the estimate of the asset life of poles was based entirely on use within copper networks. Use within a fibre access network could increase average asset lives given the lower weight

[30] ComReg D03/09 Response to Consultation Document NO. 09/11 and Final Decision: Review of the regulatory asset lives of Eir Limited.

and cross-sectional area of fibre cable, reducing 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.

4 The National Broadband plan

4.1 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 (then) DCCAE website[31] 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 Eir has committed to commercial rural deployment plans to rollout high speed broadband to 300,000 premises are in light blue. The definition of the intervention area was fixed for the purposes of the procurement process and is not expected to change for the next 7 years[32].

[31] https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=99c229dc4c414971afc50818b25337ef

[32] 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

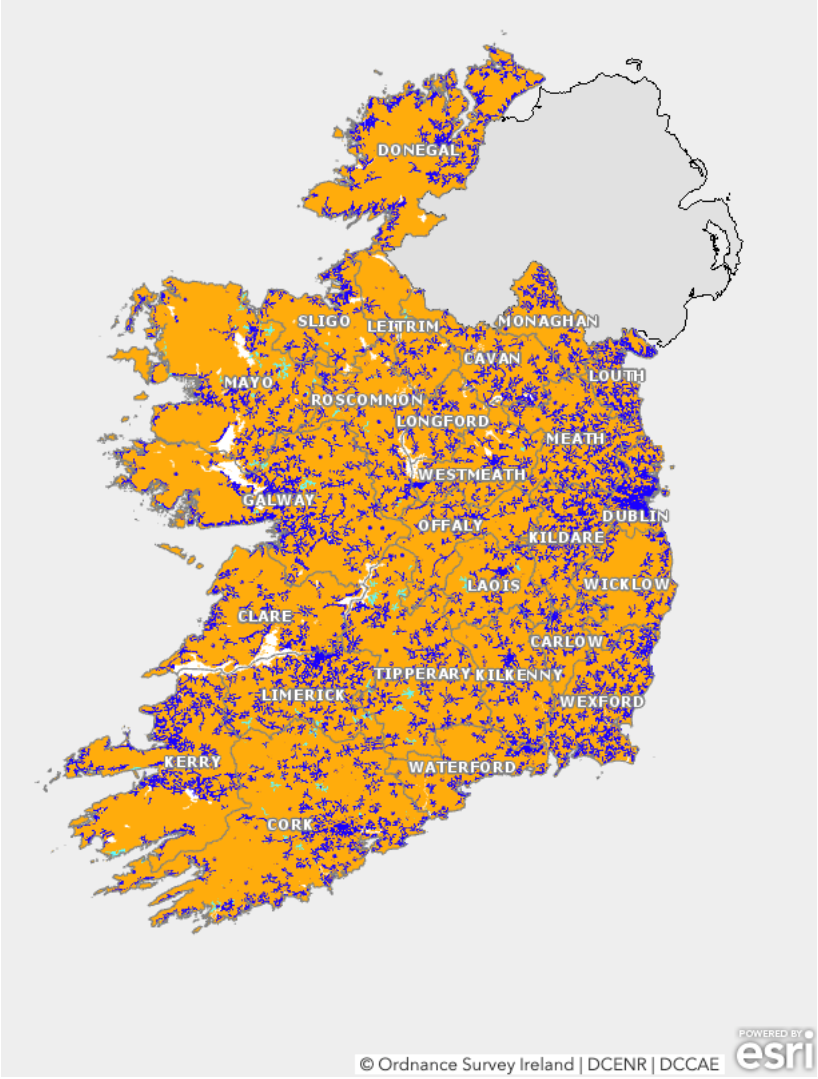


Figure 2: A detail of Dublin showing urban in-fill premises

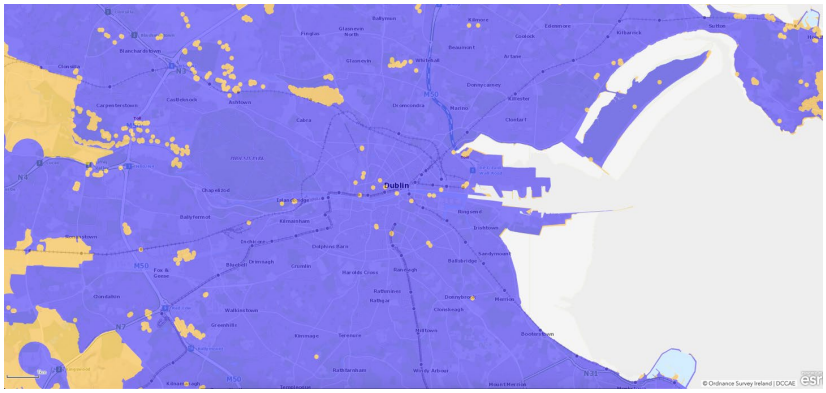
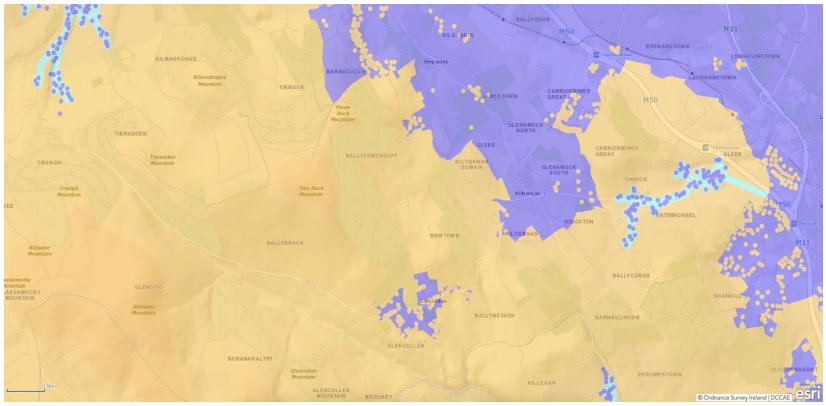


Figure 2 zooms in on the intervention area around Dublin. Although most of Dublin is already, or soon to be covered, by commercial FTTH or FTTC (providing more then 30 Mb/s) deployment, a small number of areas (shown in amber) in the greater Dublin region will need to be served by NBI. About 40,000 premises 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, the intervention area is in practice highly fragmented.

Figure 3: Zoom-in on a typical rural area



Contract obligations met by gap funding

The DECC 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 DECC 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 DECC appointed NBI on 19 November 2019.

4.2 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 Eir'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.

4.2.1 NBI's CEI requirements

The financial aid required by NBI will in part depend on 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.[33] Furthermore, NBI could become the sole user of much of the CEI when Eir retires its copper network. In such a case NBI will be the principal 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 Eir'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.

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 Eir's CEI, but be on commercially agreed terms (subject to dispute resolution by ComReg).

[33] Government of Ireland "Delivering the National Broadband Plan", available at https://www.dccae.gov.ie/documents/Delivering%20the%20National%20Broadband%20Plan.pdf

4.2.2 Subsidy payments and access prices

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

The rental costs associated with access to Eir's poles and ducts are used in the financial model to calculate the state-aid intensity in NBI's contract. Therefore, ComReg's determination with regard to access prices for Eir'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.[34] These were 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 at least 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 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.[35] 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 Eir's copper network is turned off

It is possible, as we discuss in detail in Section 5, that CEI access charges might increase over time for NBI as Eir 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 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. Any impact on subsidy requirements would then be a matter for DECC and NBI in the light of NBI's contract in the first instance[36], though this could

[34] 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/

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

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

presumably be renegotiated if there were a significant change in circumstances. Clearly, we cannot anticipate what might happen.

Benefits of stable CEI access prices

Given the structure of the NBP, there appears to be potential for problems if regulated CEI access prices were to increase appreciably and unexpectedly. This risk would fall mainly on NBI unless there is compensating revision of subsidy payments (which we understand is not automatic under the NBP contract). This suggests that there is some merit in stability of CEI access prices over time, to the extent that this is possible, especially in regard of avoiding unanticipated shocks.

Over the long-term, there could be fundamental changes such as Eir 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 Eir ceases once Eir withdraws its copper network; this is largely unavoidable in the current circumstances. However, this is a foreseeable change, rather than a shock.

4.3 Transit in the commercial area

The commercial area

The intervention area is formally defined by the DECC 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 Eir has extended its plans for commercial deployment of FTTH during the NBP procurement process (what we call the rural commercial area), but which were originally part of the intervention area; and
- areas where Eir 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 Eir. As discussed above, presumably Eir will have identified areas where it can profitably roll out FTTH (i.e. profitable on gross margin[37] basis, before allocation of common costs). By implication, no parts of the intervention area (as now defined) can presumably be served profitably by Eir in the absence of subsidy, otherwise they should have been included in Eir's FTTH coverage in the rural commercial area.

Transit through the 300k area and fragmentation of the IA

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

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

intervention area[38]. This was subsequently extended to around 340,000 premises (consistent with our view that Eir had incentives to identify whatever customers within the proposed intervention area it could profitable serve). However, this extension of Eir'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 Eir 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 Eir 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. Access to this alternative CEI is not likely to be an effective substitute to access to Eir's CEI, not least as this alternative CEI will typically have been located and built for very different purposes.

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

As a result of this definition of the intervention area, NBI will likely require access to Eir's 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 Eir within the intervention area. Eir would be unlikely to be providing NGA services in the intervention area, at least in the near term (as Eir would have presumably already have included customers it could profitable serve within rural NGA network).

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.[39] 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

[38] 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

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

services through the commercial area required to serve the intervention area.

5 Cost definitions for shared CEI

In this section, we set out some basic definitions of incremental cost that we will use throughout this report. These definitions are unchanged from our first report.

5.1 Definitions of incremental cost

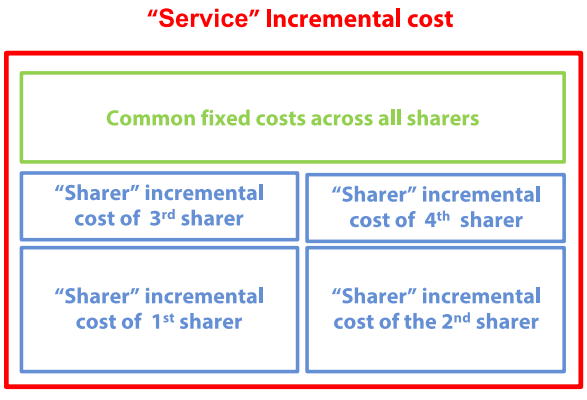
Incremental cost of one user vs incremental cost of providing a service

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, given multiple sharers of an asset (such as 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 and there would be economies of sharing.

Therefore, in this situation, 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).[40]

Figure 4: Service incremental cost and sharers incremental costs



[40] 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 Eir.

These definitions of "service" and "sharer" incremental cost are not standard terminology, but we will use them throughout to avoid confusion between these two cost concepts. Figure 4 illustrates the concepts (assuming four sharers). These are conventional forward-looking, long-run incremental costs, but the increment varies according to whether we are measuring the incremental cost of one particular sharer, or the overall service used by all sharers.

CEI costs common across sharers

Service incremental costs exceed the sum of sharers' individual incremental costs where there are potentially strong scale economies in sharing – what we might call "economies of 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 a long-run 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), then to allocate this to individual users according to some metric that proxies for the intensity with which each sharer uses the shared CEI asset. In the case of poles, the cost is split equally across the operators sharing those 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[41]). 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)

[41] In LRAIC (long-run average incremental cost), typically an increment is used to calculate incremental cost that includes several services of interest, then cost is split amongst those services on some accounting basis. This contrasts with a LRIC approach, which the incremental is typically the entire volume of one service. In general, when defining an incremental cost, we must be clear about the relevant demand increment (as above when we distinguished between service incremental cost and sharer incremental cost, which have different demand increments).

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*". For ducts, the situation is slightly more complex, as we need to charge based on length used and also the number of sub-ducts occupied, reflecting the intensity with which different operators use the shared asset.

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 Eir 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 is 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.

5.2 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 to meet new demand. 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 the sharer, even if it does not exhaust current capacity, 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 slower than linearly with cross-sectional area. 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.[42]

[42] 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.

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 can carry multiple cables[43], with fibre cables being lighter than copper cables. With Eir 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 rural commercial area where competition is also expected to be very limited. We understand from ComReg that that area the majority of poles did not need to 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 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.[44] 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.

[43] Even with heavier copper cables, poles can still carry a significant number and capacity limitation should be rare within the intervention area. For example, ComReg D03/16 notes (at §8.18) that: *At a simple level a standard deployed pole at present is an 8.5m pole inserted 1.5m in the ground. The required height clearance to the lowermost cable is 6m leaving 1m typically for cable carrying. With 300mm clearance between cables this leaves room for six cables using front and back of the pole without resorting to any extension brackets*."

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

5.3 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 Eir'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 Eir'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 Eir).

We understand from ComReg that in the rural commercial area, Eir has built new duct but that there may be no spare capacity for a sharer or where there is capacity, sub-duct for a sharer may need to be installed. 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 Eir is not under an obligation to build additional CEI to meet access demand where it has no existing assets. We assume that NBI will self-supply any additional new asset required in areas not yet served by Eir 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) due to the need to enable existing assets for sharing.

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 Eir 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 Eir previously. To the extent that past levels of investment and/or maintenance have been inadequate, this should not be rewarded. However, because Eir 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 proviso that this should not compensate historic under-investment.

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

- Eir'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 Eir 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.

Timing of upgrade cost recovery

We see no reason that these additional asset upgrade 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. This would be in line with typical practice for most regulated charges. However, given that Eir and NBI would be in a long-term bilateral relationship, it is equally possible for any upgrade costs to be charged to NBI without amortisation. Clearly there are cashflow implications for both Eir and NBI, and if Eir were to pass through upgrade costs without amortisation then there would be no need to reflect interest costs. However, there are no obvious economic efficiency consequences preferring one approach to the other.

6 Considerations for CEI access pricing

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 for developing various options for setting CEI access prices considered in Section 7 (for the commercial area) and Section 8 (for the intervention area).

Section 6, 7 and 8 set out the options presented in our first report (with some minor amendments and clarifications). Consultation responses are then considered in Section 9.

6.1 ComReg's objectives

6.1.1 Basis of intervention

Current SMP

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

SMP in the future and need for a long view

When considering the role of CEI access in delivering the NBP, we need to look forward beyond the typical length of a market review. The useful life of CEI assets and the new NGA network within the intervention area are far beyond the length of market reviews.

Even once Eir withdraws copper services in the intervention area, leaving NBI as the sole user of CEI, Eir would still have most of the CEI in the intervention area and NBI would have little alternative but to seek access. Therefore, the need for NBI to access Eir's CEI within the intervention area is likely to endure. 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 for NBI to use Eir's existing CEI rather than build alternative CEI, and 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 based on an SMP finding beyond the current market review. However, the detailed nature of that finding might change if Eir withdraws its copper services (for example, an infrastructure services market might need to be defined and Eir 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 Eir 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.

6.1.2 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). When determining an appropriate access price for CEI, 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.

Five 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 Eir, as the access provider, can recover its efficiently incurred costs;
- where relevant, avoiding undermining the incentives of alternative infrastructure-based competitors to invest where efficient to do so;
- avoiding distortions of competition that could arise if Eir is over-compensated for providing CEI access and can use these excess returns to cross-subsidise other services;
- supporting the 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 Eir to facilitate NBI's roll-out.

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

In our first report, we discussed the possibility of retail market distortions, but found no clear mechanism by which CEI access pricing would affect retail level competition. Therefore, we do not analyse this issue further here.

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 NBI's pricing will not be affected by NBI's cost of accessing the CEI. Although the level of subsidy required by NBI is strongly influenced by the CEI access prices paid by NBI, 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.

As we shall see below, an *indirect consequence* of ComReg exercising its proper statutory objectives in regard of competition and end-user benefits is that the level of NBI's required subsidies could be affected. Whilst we have not taken this into account in our assessment, we have noted such effects.

6.2 Eir's cost recovery

Why costs need to be recovered

CEI access prices need to allow Eir to recover its reasonably incurred costs and earn a reasonable return on its investments. This is a typical feature of any reasonable access regime 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 sunk investments are made, 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 predicable, otherwise investment in sunk assets may be discouraged.

Recovery of sharer incremental cost

Where CEI assets are currently used solely by Eir 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 5.1, as distinct from the "service" incremental cost of the CEI that would be avoided if Eir *and* other shared users never used the CEI.

Common fixed costs

The requirement that NBI pays for the specific costs of 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, Eir 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 11.5.

6.3 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 itself can recover its own costs, as we must also consider the impact on the viability of other actual or potential competing providers.

Such concerns naturally arise from 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.

Promotion of entry as a concern over and above incumbent cost recovery

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. It may still be efficient to encourage entry even where the entrant is at a short-run cost disadvantage to the entrant (provided this is not too great), both because of wider benefits of competition and because an entrant's cost disadvantage may be eliminated over time by growth or efficiency improvements.

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.

6.3.1 Intervention area

Restrictions on services offered by NBI

We understand that, under the terms of its contract, NBI is bound to offer subsidised 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 consider the converse possibility that some commercial operator might at some subsequent point choose to extend its NGA from the commercial area into the intervention area. This scenario is unlikely in the near term for two reasons. First, if it were possible to serve part of the currently defined intervention area without subsidy, then Eir would have had a clear incentive to identify customers they could profitably serve with NGA services when the geographical definition of the intervention area was under consideration by DECC. (This is what happened with Eir's plan to deploy NGA into rural commercial area.)

Second, the appointment of NBI has necessitated a freeze of this definition of the intervention area so that NBI's contractual obligations can be set. We understand that the Department does not intend further revisions to the definition of the intervention area. Eir's incentive to encroach into the current intervention area is reduced, as Eir would lose margins from supply of CEI access if NBI were then not required to supply locations served by Eir.

Whilst these are good reasons why Eir is unlikely to enter the currently defined intervention area, in the long run, we cannot entirely exclude the possibility that the economics of supply NGA services in the intervention area might change, with subsidy becoming unnecessary at some locations. In this case, some eventual revision of the definition of the intervention area might be needed.

The remote possibility of a commercial operator encroaching into the intervention area does not create any difficulty for defining an

CEI access product for non-commercial purposes to deliver NBP commitments. If it were viable for Eir or some other operator to provide NGA services on a commercial basis (either in competition or instead of NBI) at a location within the current intervention area, then CEI used in supply of those services would be being used on a commercial basis. Therefore, regardless of whether the Department formally redefined the intervention area (for the purposes of NBI's contract), such encroachment would amount to a *de facto* expansion of the commercial area. There would be a corresponding reduction in the intervention area for the purposes of making an CEI access product available for non-commercial delivery of services related to the NBP. Therefore, even if the Department did not immediately update its definition of the intervention area in the light of such developments, these could still be accommodated within the definition of CEI access services themselves.

6.3.2 Commercial area

Access pricing at sharer incremental cost

Eir 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 also important that Eir 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.[45]

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 Eir and other users according to usage, this would not create any competitive distortion. NBI would not be competing with Eir or other third parties using CEI access, but Eir and access users other than NBI would continue to be treated symmetrically.

[45] If some non-subsidised arm or affiliate of NBI did offer services in the commercial area, then it could not use subsidy and such services would have to be supplied on a commercial basis. Any CEI access used for these purposes would be generic CEI access rather than a differentiated CEI access service used for the purposes of delivering NBP commitments.

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 – what we might call 'generic' CEI access would not be available to Eir's competitors within the commercial area, so would not undermine their incentives to build infrastructure where more efficient than using CEI access from Eir. Whilst building out of alternative infrastructure is not necessarily likely, such incentives should not be undermined.

Additional margins from CEI access

However, what if Eir earns an additional margin on sales of CEI access services to NBI within the commercial area? There are two possibilities:

- Eir could earn windfall gains, making an excess return on those CEI assets; or
- those windfall gains could be dissipated by a reduction in the prices of other services using that CEI (relative to whatever prices would have prevailed), which we might call a 'see-saw' effect.

These are the polar cases, and it is also possible to have intermediate cases in which windfall gains are partially, but not entirely, dissipated by lower prices for services using that CEI. The mechanics of how such a 'see-saw' price reduction – whether full or partial - might come about depends on the detail of how prices are determined and whether regulation changes to erode such returns, which is also a matter of timescale.

Nature of NBI's CEI access demand

The rural commercial area – where Eir has recently deployed its new rural NGA network – often forms a boundary to the fragmented intervention area. Therefore, where NBI needs CEI access for the purposes of interconnecting isolated components of the intervention area, this will tend to be within the rural commercial area. NBI's CEI access demand for transit purposes will be concentrated in the rural commercial area, rather than the urban commercial area.

Geographical averaging

Given this concentration of NBI's demand for CEI access into the rural commercial area, whether a 'see-saw' pricing effect might occur depends on how prices for services are determined, especially whether costs are geographically averaged. We consider the two cases on a hypothetical basis below.

Suppose first that, for regulatory purposes, CEI costs are considered on a geographically averaged basis across the whole commercial area. As a result, if part of the existing CEI cost within the commercial area is recovered from NBI (through NBI paying more than the incremental cost its use causes), then the remaining cost allocated to generic CEI access and other services sharing that CEI is reduced. Where prices of regulated services supplied by Eir include these CEI costs in their cost stack, as would be case for services

subject to cost orientation falling into the Wholesale Local Access and regional Wholesale Central Access markets identified by ComReg D10/18, their prices should fall too. For services where prices are determined by competition, rather than regulation, if competitors use generic CEI access that has become cheaper, prices of these competitive services should also fall. The overall effect would be to discourage, at the margin, any competitors using their own CEI (such as Virgin or SIRO) or not needing CEI to the same extent as Eir (e.g. wireless providers). Therefore, we have a potential competitive distortion; its underlying cause is leakage of the subsidy intended for the intervention area into the commercial area, which is due to NBI paying more than its incremental cost for CEI access for transit purposes. Whilst it is efficient for competitive operators to share Eir's CEI where feasible, it is inefficient if a subsidy leakage biases their choices away from self-provision.

Without geographical averaging

Alternatively, what if we drop the assumption of geographical averaging of CEI costs across the commercial area, whilst maintaining the assumption that NBI pays more than its incremental cost for CEI access? This should help to restrict the impact of subsidy leakage to the rural commercial area.

Competitive operators will predominantly use CEI access within the urban commercial area, rather than the rural commercial area (where Eir is expected to be the sole provider). Therefore, costs of generic CEI access could be determined by reference to CEI within the urban commercial area, as that is where demand for generic CEI access is primarily concentrated. In this case, even if NBI pays more than the incremental costs it causes for its CEI access within the rural commercial area, this should not significantly affect the pricing of generic CEI access within the urban commercial area used by competitive providers. (There might still be some effect if NBI purchases some CEI access within the urban commercial area, but this should be much more limited than their needs within the rural commercial area.) This approach has the significant advantage of insulating the urban commercial area from any bleed-through of subsidy into a lower price for generic CEI access.

How are excess returns eliminated?

However, even with such de-averaging of cost measurement, problems remain. In particular, what happens to the pricing of Eir's wholesale services within the rural commercial area? Both Eir's wholesale services within the commercial area (as a whole) are currently priced on a geographically averaged basis. If that were maintained, then these prices would need to fall if excess returns on CEI within the rural commercial area were to be eliminated. However, this would create the same problem as previously, as subsidy would have then leaked through into lower prices for Eir's services within the commercial area, creating the same competitive distortion.

Alternatively, we would split (wholesale) prices in the urban commercial area from those in the rural commercial area. However,

then Eir's prices in the rural commercial area need to fall if excess returns on CEI within the rural commercial area are to be avoided. However, this in effect mean that customers for NGA services within the rural commercial area would be indirectly receiving subsidy, which is clearly contrary to desired impact of the NBP intervention, which should be limited only to the intervention area.

Avoiding subsidy leakage

In summary, we can insulate competitive provision in the urban commercial area from direct competitive distortion by setting generic CEI access prices within that area by reference to Eir's costs in that area, which should be largely unaffected by NBI's new demand for CEI access primarily within the rural commercial area. However, this still leaves the question of whether Eir would be earning excess returns to CEI within the rural commercial area. If we want to avoid competitive distortion within the urban competitive area, then either Eir's excess return needs to be tolerated permanently, or else prices for wholesale NGA services within the rural commercial area need to be adjusted downwards to eliminate the excess return (whilst leaving prices in the urban commercial area unchanged). One or other problem is unavoidable unless NBI's payment for CEI access within the intervention area is reduced to the incremental cost that access causes Eir, eliminating any additional margin.

General problems with persistent excess returns

Allowing Eir to earn a persistent excess return on CEI in either the rural commercial area or the intervention area brings a more general risk of competitive distortions. Eir would be indirectly receiving NBP subsidy through additional margins earned from supplying NBI. It would not be possible for any other provider to contest the supply of CEI access to NBI. Eir would have available a revenue stream that it had not competed to earn, and which would be unavailable to competitive operators. Whilst it is possible that this could simply be passed through to shareholders without behavioural changes by Eir, there is some risk that Eir could use these resources – unable to others – to make selective price cuts where it faced competition, which could be distortive. Such behaviour could be to discourage competitive entry. Again, although consumers might benefit from lower prices, this would be due to the indirect effect of subsidy, again extended the impact of the NBP intervention beyond its intended scope.

Materiality

NBI is likely to require a substantial volume of CEI access services in the commercial area (primarily the rural commercial area) due to the intervention area being highly fragmented. Therefore, excess returns for Eir and/or this "see-saw" effect may not be insignificant. 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.

Implications for CEI access pricing

Therefore, although we cannot necessarily map out the detailed consequences in terms of specific pricing impacts on all of Eir's individual wholesale and access services, there is a case for ensuring

that Eir does not earn additional gross margins from supplying CEI access services to NBI within the commercial area. 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.

This approach is consistent with encouraging efficient re-use of existing CEI assets within the commercial area where possible, whilst at the same time ensuring that Eir's costs are covered. There is no competitive implication for Eir from NBI using Eir's CEI within the commercial area for transit purposes to deliver non-commercial services within the intervention area. Therefore, the impact of NBI's usage of Eir's CEI is limited to the additional costs it causes.

6.4 Transient excess returns for Eir

How transitory excess returns might be caused

We start from a point where, because of regulatory reviews, Eir is earning (at least approximately) only a normal return on its CEI assets. This is because Eir'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 Eir 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 Eir's own services or CEI access services sold to users other than NBI. In effect, Eir enjoys some benefit from the large increase in CEI asset sharing due to 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 Eir'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 Eir 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.

Lack of contestability

Furthermore, Eir is in a singular position as a supplier of CEI access to NBI. Where NBI needs transit to interconnect the fragmented intervention area, this will primarily run through the rural commercial area, where Eir has already deployed its new NGA network. Indeed, the fragmentation of the intervention area is due in part to Eir's decision to deploy NGA into the rural commercial area.

Eir is expected to be the sole NGA operator within the rural commercial area for the foreseeable future due to its first-mover advantage. Therefore, it is highly unlikely that other operators could compete to any significant degree against Eir in serving NBI's demand for CEI access services within the commercial area (or more generally in providing wholesale transit services if NBI did not want to build transit links using CEI access from Eir). Any additional margins that Eir would earn because of selling CEI access to NBI within the commercial area would, therefore, be largely uncontestable by other operators.

General effects vs. specific incentive distortions

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

- the general issue of Eir 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 Eir's CEI assets to be cost-reflective.

The discussion in the previous sub-section regarding impacts on incentives for other competitors within the commercial area fall into the second category. This is of much greater importance, as it is a persistent effect. It is caused by the feed-through of margins earned from NBI's access demand on other services sharing those CEI assets leading to competitive distortions. Therefore, we recommend that these risks of potential distortion be considered when setting CEI access charges for NBI and that Eir should not earn significant additional margins from supply of CEI access within the commercial area for NBP purposes.

Why transitory excess returns are not a major concern

The first issue listed above – transitory enrichment of Eir, 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 Eir were to enjoy transitory benefits from CEI sharing with NBI, this is broadly similar to windfall gains from a cost reduction brought on by external events (in this case, sharing economies due to the NBP intervention) rather than any specific action by Eir. Therefore, much less weight should 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. In any case, it would always be open to ComReg to accelerate the regulatory review of prices of Eir's services using shared CEI whose pricing might be affected by additional margins from supplying CEI to NBI.

6.5 Copper to fibre transition

Impact of CEI access prices on transition

Over the life of the NBP contract, it is likely that Eir will want to decommission its copper network. This is desirable as will avoid inefficient duplication between copper and fibre networks. The unit costs of maintaining the copper network will tend to increase as the number of customers using its services decline, as many costs of the copper network cannot be scaled back as customer numbers fall.

We first make three simple observations about this transition process:

- NBI's roll-out of its fibre network is subject to contractual obligations under the NBP. This is not a matter that either NBI or Eir can obviously influence. Therefore, we take the speed of roll-out of NBI's fibre network as a given that is unaffected by whatever approach ComReg takes to setting CEI access prices.
- Take-up of new fibre services within the intervention area will likely be driven by a complex mix of factors, including consumer knowledge about the benefits of fibre services (in terms of speed and reliability) and the relative pricing of copper and fibre services. Retailers will no doubt have a role in choosing how strongly to encourage migration through their marketing efforts, which may be influenced by the relative margins earned from different services. Eir will have some choice around when it plans to cease offering new copper services within the intervention area and how actively it wishes to seek to migrate existing customers.
- Whilst there are various short-run regulatory constraints on Eir requiring it to continue to provide service over its copper network, in the longer run these are of limited relevance for copper switch-off. Although Eir is currently subject to a USO obligation, this is a retail level obligation and could be met by using another operator's wholesale service, including potentially one from NBI. In any case, over the timescale that copper switchover would be relevant, ComReg will have reviewed USO (as discussed in detail in Section 2.2 above). The other main obligation on Eir arises from having SMP in regard of some wholesale copper services, but even if this were not removed by future deregulation, this would fall away within the intervention area where fibre services were available (though the issue of Eir's control of CEI needed by NBI and which would be costly to replicate would remain).

Transition before copper switch-off

Therefore, the main regulatory issue with copper switch-off concerns the transitional period in which Eir is losing copper customers, and unit costs of copper services increase due to falling customer numbers, but NBI's fibre network is not available to all copper customers. This is a limited period, but during this time there may be limited ability for residual copper customers to face these higher unit

costs of copper services through higher prices for existing services (not least as this would be incompatible with equitable treatment of customers in different localities).

We would not want to create a situation in which Eir would prefer to delay copper switchover due to the possibility of a period in which it could be difficult for Eir to recover costs from a small number of legacy copper customers. If Eir were required to keep providing legacy services in this situation, then it is possible that Eir might prefer to cease offering copper services, but cannot.[46] A partial solution to any profitability shortfall may be to allow prices for copper services to increase, or at least not be subject to typical declining real prices typically set in price controls.[47] However, this can only partially solve the issue, as unit costs of copper services will likely increase hyperbolically as customer numbers become small, but retained customers require fixed costs of the copper network to still be incurred.

Declining ability of the copper network to cover fixed costs

This raises the question of whether the pricing of CEI access for NBI will have any effects on Eir's incentives to make this transition, especially within the intervention area. Put simply, the greater share of jointly used CEI costs allocated to the copper network, and so the lower the CEI access charges paid by NBI, the stronger will be Eir's incentives to decommission its copper network. There are various regulatory constraints on Eir decommissioning legacy services, so Eir may not in practice be able to make a free choice about when to decommission its copper network. If Eir had an incentive to decommission its copper network, but was prevented from doing so by these constraints, then a case for compensating it for this obligation might arise. However, we should not create an *unnecessary* case for a USO compensation payment through the CEI cost sharing mechanism failing to reflect the copper network's declining ability over time to contribute to shared CEI costs.

Benefits of timely copper switch-off

These potential problems arise where obligations remain on Eir to provide certain services that can only be provided over its copper network, but Eir facing declining demand. However, there is likely to be significant merit in trying to push through this transitional situation, avoiding inefficient delay to copper switch-off and encouraging the take-up of faster fibre services:

[46] Even if Eir faced a short-run cost – through reduced profits – from being required to provide such a legacy service, this does not automatically imply that Eir should be given some compensating payment for universal service. Other questions would arise, including whether Eir had earned a reasonable return on the service over a longer time scale and whether the service was being provided in the most cost-efficient manner.

[47] For example, this approach has been taken in Ofcom's Wholesale Fixed Telecoms Market Revive (18 March 2021), where copper based (MPF) service has a flat price cap in real terms.

- There may be positive externalities of take-up, as customers learn about the benefits of faster broadband services;
- There are commonly thought to be prevalent external economic and social benefits from take-up of faster broadband services (for example, by encouraging complementary services dependent on faster connections, facilitating home-working and business relocation and so on);
- Pushing through the phase in which significant fixed costs of copper networks are still being incurred because of a small number of residual customers (who may have an exceptional high unit cost of serving) would allow significant cost savings by removing duplication between copper and fibre networks.

Working against these factors, it is also the case that 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, provided there are a sufficient number of copper customers.

Qualitative features of optimal copper switch-off

Therefore, in broad terms, the optimal path for copper switchover will entail parallel running of copper and fibre networks for some time. Once it becomes feasible to migrate the large majority of customers within a geographical area in which copper decommissioning can occur (thereby terminating the fixed costs of serving that group of customers). Once that tipping point is reached and network duplication becomes inefficient, there would be merit in moving quickly. That may entail incentives or compulsion being applied to copper customers who are laggardly.

Implications for CEI pricing

Given these broad features of the copper switch-off path, 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 Eir to favour decommissioning the copper too early, as the copper network needs to cover a larger part of shared CEI costs. However, setting them too high might even cause the price of copper services to be lower than they otherwise might have been, slowing transition to fibre. In striking a balance, there is also the potential for CEI access prices to change over time as fibre is rolled out and demand for higher bandwidths grows, with costs of CEI being progressively shifted towards NBI.

6.5.1 The Ramsey pricing framework

CEI pricing as a cost sharing problem

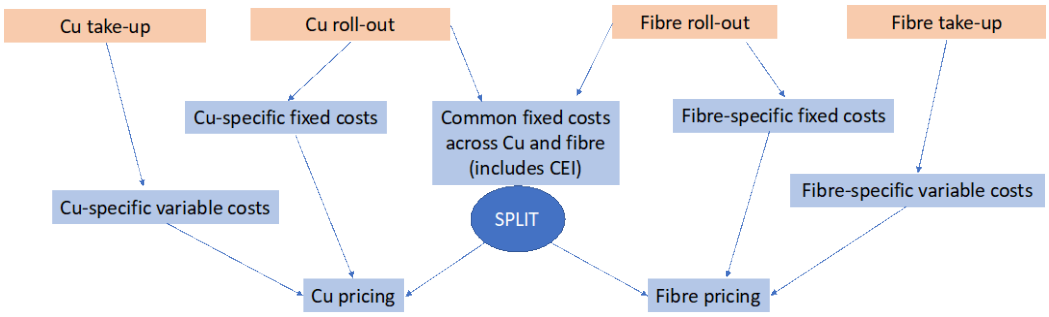
Where CEI is shared between copper and fibre networks, a part of the costs of the CEI are common between those two uses. Therefore, we can think of the question of setting NBI's access charge as effectively one of allocating the joint costs of CEI across the two networks to each network.

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 joint 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 joint 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



This is a somewhat stylised representation, as there are various possibilities for the extent of CEI sharing. We are primarily concerned here with CEI that is shared between fibre and copper networks whilst both are operating. There may be some CEI assets (e.g. distribution poles in very rural areas) that could be specific to individual customers, and so simply switch from use in the copper network to use in fibre network when that customer migrates its service. In the diagram above, such a CEI asset would be a fixed cost of whatever network was using it, rather than a common fixed cost needing to be split between the two networks.

Overall, prices are cost reflective and the CEI assets cover their costs through contributions from each service. We can then ask hypothetically how the common CEI costs should be efficiently split if customers then pay the resulting split of costs across the two services. This question is an example of so-called Ramsey pricing[48],

[48] Ramsey pricing can equivalently be considered to be: (i) 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 (ii) 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.

where common costs across several services are split efficiently taking account of the impact on demand for services. If a service takes a larger share of common costs, then its price needs to be higher and demand for that service will be reduced. Therefore, the splitting of common costs needs to strike a compromise across the various services regarding the contributions they make to common cost and the effect these have on demand.

Prices facing end customers

This is a hypothetical and simplified exercise that will tell us about the qualitative features of how shared costs might be shared assuming that consumers ultimately faced those costs. There are significant differences from the actual situation regarding the NBP. Within the intervention area, prices for NBP's (wholesale) service will be set contractually by reference to benchmark services outside the intervention area. Eir's copper services are likely to continue to be priced at the retail level on a nationally averaged basis. Therefore, in practice, changes to the splitting of shared CEI costs within the intervention area do not directly impact retail prices of copper and fibre-based services within the intervention area.

Nevertheless, despite this caveat, it is still useful to consider what the Ramsey pricing framework says about how to share CEI costs efficiently if the policies leading to the subsidisation services within the intervention area were absent. The state's contribution to fibre services through the NBP is an explicit subsidy. If Eir sets nationally averaged prices for copper services despite higher costs within the intervention area (due to the require for nationally averaged price for voice services), there may be a cross-subsidy from customers of copper-based services in the commercial area.

The Ramsey pricing framework tells us that 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 is 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 Annex B. 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 8.4 below).

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 potentially 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 viable due to an essentially arbitrary requirement to recover some minimum proportion of common costs.

Copper shutdown

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 based on a zero contribution to common CEI costs. At this point, the service should cease as it is unprofitable, but there will still be residual copper customers at this point.

Limitations

Therefore, a simplistic application of Ramsey pricing principles, or alternative applying an analogue to the commonly used EPMU approach to allocating common costs, suggests an approach in which shared CEI costs shift progressively over time from being recovered from the copper network to being recovered from the fibre network. However, this framework is highly stylised and leaves out some important features.

First, as we have noted above, in practice there is no immediate consequence for the prices that customers will face within the intervention area from changes in the sharing of common CEI costs. If the fibre network bears a larger share of common CEI cost, then –

in the logic of the Ramsey pricing framework – the economic cost is not a deadweight loss created by higher prices and reduced demand, but rather an increased subsidy requirement. In the broadest terms, there would still be a deadweight loss, but this due to the distortive effects of needing to raise tax revenue to pay that subsidy; such broader public policy concerns lie outside ComReg's remit. Similar, if the copper network pays a larger share of common CEI costs within the intervention area, the pricing effect is significantly diluted if Eir sets nationally averaged prices; however, there is still some deadweight loss, but a smaller price increase is experienced by a larger number of customers due to nationally averaged pricing.

Second, we have implicitly assumed in the discussion above that we split common CEI costs efficiently at each point in time (i.e. an essentially static analysis, but repeatedly over time to reflect the changing balance of demand for copper and fibre-based services). This approach is complicated by the need to measure the relative extents of fibre and copper networks over time (with the former building out and the latter eventually switching off) and consequent customer switching. A simpler alternative may be only to look to achieve a reasonable split of common CEI costs looking at this over a longer timeframe; it may not matter much in practice if one network pays more earlier, but less later, in this transition period, not least as this should not have any direct impact of what customers actually pay for the two services.

6.5.2 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. In particular, if copper and fibre networks are operated by two different parties, there is the potential that cost saving from avoiding duplications might not be fully taken into account. In contrast, if one party operated both such cost savings would be taken into account.

The Ramsey pricing framework discussed 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 fixed 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 consider 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 are likely higher than cost of maintain a connection to the copper network). 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

These stylised assumptions are unlikely to apply fully 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 than copper. Again, this reduces the benefit from shutting down the copper network relative to the stylised discussion above.
- 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 to 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 becomes higher on migration, 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. 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.

6.5.3 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 are 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 ultimately a decision of Eir, though there must be regulatory oversight to protect the interests of end-users (including provisions in the EECC).

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 Eir when migrating customers from copper and (ii) the avoided share of CEI access costs, as show in detail in Annex B. The greater the share of CEI costs that NBI bears, the less cost is saved by Eir on copper switch-off, and weaker are incentives for copper switch-off. Similarly, higher wholesale prices for fibre services discourage copper switch-off, as the costs of moving residual copper customers becomes higher for Eir.

Per customer sharing of common CEI costs

We show in Annex B that it is possible to tune the sharing rule such that Eir, as the operator of the copper network and CEI, but not the fibre network, would favour copper shutdown at the same time as would an integrated operator of both copper and fibre networks. In practice, this rule is well approximated by sharing common CEI costs in proportion to the number of customer lines on each network (what we call 'per-customer' sharing).

Avoiding adverse impacts on Eir

The reason that it is useful to consider this question is twofold. First, Eir may have information (for example, on customer switching from copper to fibre services and the costs that can be saved from shutting down the copper network) that are only imperfectly known in ComReg. Therefore, so it may be helpful to incentivise Eir to make an efficient choice about copper switch off using that information known only to them. However, we fully acknowledge that Eir could not act independently without various regulatory issues being resolved, so may be limited in how it can respond to such incentives.

Second and more importantly[49], even if Eir's actions were constrained by regulation, it is still helpful to set up at least roughly efficient incentives for copper switch off, as avoids Eir experiencing an adverse profitability impact if a broadly optimal path for copper switchover were followed.[50] For example, if conversely NBI made, say, too small a contribution to common CEI costs, Eir might want to shut down its copper network too readily. If Eir were then required to maintain availability of copper services when it would want to close them, then Eir could reasonably complain that this caused it a profit loss for which it should be compensated. Put simply, it would be undesirable for the CEI access pricing regime to penalise Eir for doing the right thing. This is a benefit of the per customer sharing approach for common CEI costs.

6.5.4 Optimal transition and subsidies for fibre

Fibre prices in the intervention area are fixed

The preceding discussion 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 subsidy 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 the analysis

[49] In our first report, this discussion was primarily framed in terms of incentives for Eir to shut down its copper network. This was not intended to deny that Eir could face some regulatory constraints in doing so. However, regardless of this, we consider that there is significant benefit in trying to avoid a situation in which Eir would be exposed to a loss of profit from following a (roughly) optimal path to copper switchover.

[50] Clearly ComReg would need to consider the impact on residual users of legacy copper services, which may not be fully reflected in Eir's preference for the timing of copper switch-off.

we have performed in Annex B when deriving various sharing rules for common CEI costs.

6.5.5 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. Actual take-up and use of advanced services, not just the roll-out of network (giving customer the option of new services), 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 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. As noted above, this may be muted by national averaging of the pricing of these services. However, in this case there is potential for effects on national prices of copper services from NBI's demand for CEI access in either the intervention area or the commercial area.

If fibre services contribute to recovery of CEI costs common with copper services, this could lead to the price of copper services being lower that 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, benefit externalities of NGA services is not 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. However, these issues are potentially relevant to setting NBI's roll-out plan in the first place and may also arise in the future when considering how copper switch-off might be best managed.

Impacts in the commercial area

There is also potential for Eir earning additional margins through sharing CEI in the commercial area affecting the price of copper and fibre 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.

6.6 Incentives to facilitate NBI's deployment

Incentives to cooperate

Eir'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 Eir has a positive incentive to supply CEI access to NBI. This might reduce the incentive for disputes between Eir and NBI that ComReg would need to resolve.

Transient excess returns to CEI assets

To the extent that Eir 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 Eir can recover any additional costs caused by sharing CEI (i.e. what we have called the 'sharer' incremental cost) and also some contribution to shared CEI costs, it is likely to enjoy some transitory excess returns from NBI's new demand for CEI access. In effect, Eir temporarily enjoys part of the cost saving that results from sharing CEI within the intervention area. Therefore, Eir 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 Eir 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.

6.7 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.[51]

[51] Again, we have dropped retail effects from the table in our first report to simply matters, as we concluded that these effects were not likely. The overall conclusions of this subsection are unaffected.

Table 1: Summary of key issues

Issue	*CEI access in the intervention area to support NBI's deployment*	*CEI access in the commercial area for transit purposes*
Cost recovery for Eir 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 due to see saw effects on prices of other services	Largely irrelevant due to lack of potential competition in the intervention area	Subsidisation of Eir'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 Eir 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 Eir to cooperate with NBI in rolling out its fibre network	
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 larger contribution to shared CEI costs. Very difficult to assess the scale of benefit, so probably cannot be factored in.	

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 Eir to earn its reasonable costs of providing CEI access. However, this only requires that the additional costs caused by NBI's shared use of Eir'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 shared CEI costs is likely to create an incentive for Eir to facilitate provision of CEI access and avoid delay. This incentive should increase in the size of contribution made to common CEI costs. However, 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 Eir's CEI is supported by contributions to the common costs made by NBI for transit demand, as this could chill incentives for competitive entry due to see-saw effects on prices of other services provided by Eir;
- *Within the intervention area*, a key concern is providing incentives for efficient cost sharing between fibre and copper network and supporting efficient decisions about copper switch 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 influence Eir's preferences about when to shut down the copper network, as this directly affects what costs Eir saves on copper switch-off. Eir will clearly need regulatory approval for copper switch-off, so Eir cannot necessarily act fully in line with its own timing preferences. Nevertheless, we note the following key arguments in Section 6.5 above:

- Efficient sharing of common CEI costs between copper and fibre network at each point in time will entail some dynamic 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.
- Such a usage-based approach avoids the problem of requiring a minimum contribution to common CEI costs from each network when its demand for services is small, making that network unnecessarily uneconomic at that point in time. This avoids creating an artificial USO funding case for a residual copper network with few customers but where that network is expected to cover some fixed share of shared CEI costs; a usage-based approach leads to the copper network's share of these CEI costs declining in line with customer numbers.
- We show in Annex B that Eir's incentive to migrate customers to fibre may be diluted relative to that of a hypothetical integrated copper/fibre operator because the wholesale fibre price is marked up to provide for recovery of fixed costs (both those specific to the fibre network and a share of common CEI costs). This bias can be corrected through an uplift to common CEI contribution of the copper network, taking the form of the fibre network not contributing 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).

- Overall, these various usage-based approaches to sharing CEI costs assume that the splitting of shared CEI costs tracks changing circumstances over time. However, there is limited impact of the CEI sharing rule used within the intervention area on both pricing and coverage of copper and fibre networks. As a result, there may be limited downside if the sharing rule for the intervention area does not fully track changes over time during the transitional period that both copper and fibre network share CEI, provided that over some longer time period there is reasonable averaging out of shared costs (i.e. one sharer might pay more earlier, but less later relative to a fully dynamic approach).

7 CEI access in the commercial area

7.1 Proposed approach

Differentiated CEI access at sharer incremental cost

In this section, we set out our recommendations made in our first report 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 Eir would not enjoy any significant cost sharing benefit due to NBI's access demand within the commercial area as (i) there is a risk of creating competitive distortions in downstream markets and (ii) in any case operators other than Eir are not in a position to contest demand for CEI access from NBI for transit purposes, as this falls primarily in the rural commercial area.

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 Eir's CEI (and able to offer NGA services that compete with Eir 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 downstream competition with Eir remained undistorted. This would require maintaining the current "per operator" 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).

7.2 Rationale

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

Impact on competition

If NBI were paid in excess of its sharer incremental cost, then Eir would enjoy benefits from CEI sharing with NBI. Eir would earn a

positive gross margin from sales of CEI access to NBI. Other operators are not able to contest this new demand for CEI access from NBI within the commercial area, as if NBI is transiting to connect up the isolated components of the intervention area, then it will need CEI access primarily within the rural commercial area. Eir is present in the rural commercial area, having deployed a new NGA network, but it is very unlikely that this area would sustain multiple networks.

As set out in Section 6.3.2 above, if Eir earned significant margins from CEI access supplied to NBI in the commercial area, then 'see-saw' effects lead to lower prices for other services. This could lead to a distortion of competition in various downstream services. This risk is our main concern as, unlike transient windfall gains for Eir, its effects could be persistent.

Exactly how pricing of different downstream services might be affected is difficult to judge. Eir's downstream services using that CEI would also become cheaper, though the impact would be shared out across various services using that CEI.; after copper switch-off, FTTH would be predominant service affected and this could be provided by integrated operators using their own CEI (e.g. as do Virgin and SIRO at present). Overall, this would be likely to depress incentives for competitive providers to some degree.

Short-run excess returns

This potential impact on incentives for provision is a long-run effect, reliant on prices of services sharing CEI adjusting to bring Eir's returns from CEI assets back to normal given the additional demand for shared access from NBI (the 'see-saw' effect). However, prior to this adjustment happening, Eir 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 Eir, as only Eir has widespread CEI assets in place to meet NBI's needs. We do not know how Eir 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.

These transient windfall gains for Eir would be eliminated over time by a mixture of competition and regulation of services sharing CEI being priced to bring asset returns for Eir 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 Eir - 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 possible 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 based on data gathered by ComReg on NBI's likely use of

Eir's CEI within the commercial area and various hypothetical assumptions. 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 Eir would earn from NBI's use would amount to a small, but material, proportion (likely <5%) of the likely revenue from the supply of FTTH services by Eir in the commercial area as a whole. Whilst this calculation is only indicatory, the additional margins from providing NBI with CEI access would allow Eir to reduce prices for FTTH services in the commercial area by a similar amount. If price cuts were focused on services, areas or customers where competition with rivals was most acute, selection price reductions could be much 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 Eir 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 Eir's CEI for the foreseeable future, with NBI facing prohibitive costs if it were migrate to an alternative supplier of CEI. Therefore, this additional revenue source provides an advantage to Eir not available to its competitors within the commercial area. If Eir 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.

8 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.

These are the same options that were presented in our first report and formed part of ComReg's consultation. We shall go on to consider some further variations around these options prompted by consultation comments in subsequent sections.

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, we still need to set out prices for other CEI access seekers wanting access for other purposes, even if such cases might be rare. 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 7 for the commercial area).

8.1 Options considered

In our first report, we set out three main options for CEI access pricing in the intervention area for NBP purposes in the following sub-sections. These primarily relate to pole access, which forms the bulk of NBI's CEI access needs within the intervention area:

- 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.[52] 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 Eir 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

[52] 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.

dynamic approach to common CEI cost sharing, as NBI's access price will change over time.

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.

NBI will also require some duct access within the intervention area. However, in this case, NBI would need to pay 'sharer' incremental costs associated with its use (primarily remediation costs) and, because these assets are largely fully depreciated anyway, there is no material costs to be shared.

8.2 Per operator 'equal' sharing

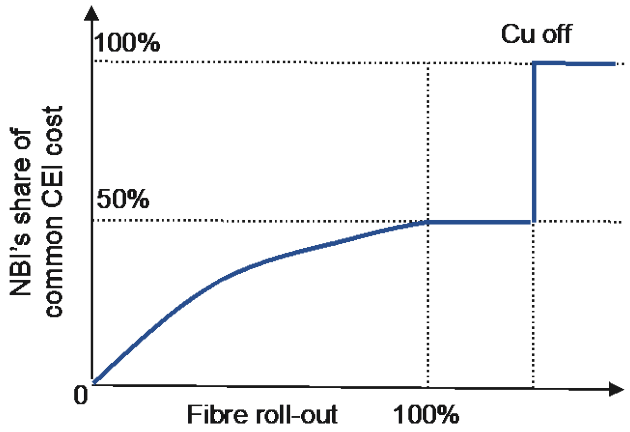
Need for alternatives to have sufficient benefit

This is the status quo option for ComReg for pole access, 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

Figure 6 below illustrates how the overall cost of CEI in the intervention area would tend to split between NBI and Eir 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 Eir and NBI). Eventually all cost would be borne by NBI once Eir 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 6: Time profile of CEI costs in intervention area under equal cost sharing



Inefficiencies with this equal sharing

The equal sharing approach cause 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 shared 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). 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 Eir 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. Clearly Eir cannot necessarily act on such an incentive, as regulatory scrutiny of copper switch off would be needed. Nevertheless, if Eir found switch off profitable, but was prevented from acting, then this may result in claims for USO-type compensation. However, any claim that profits had been lost due to an obligation to provide copper-based services simply be the result of seeking a contribution from the copper network to shared CEI costs that it could not sustain.

Unequal, but fixed sharing

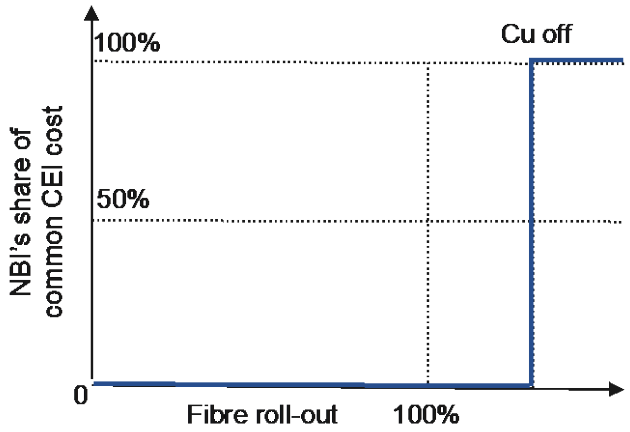
In principle it would be possible to split common CEI costs in some fixed ratio in order to induce Eir to prefer copper switch-off at the optimal point (see Annex B). However, to do so the regulator requires a very considerable amount of information to estimate the optimal timing for shutting down the copper network. This would also mean that the splitting of common CEI costs between NBI and Eir unequally (unless by fluke this exercise 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.

8.3 Primary and secondary users

Our second option is to charge NBI only its sharer incremental cost as a 'secondary' user of Eir's CEI in the intervention area until such time as Eir 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 7, with NBI making no contribution to common CEI costs until Eir ceases its copper service, at which point NBI becomes the primary user and bears all the common cost.

Figure 7: Time profile of CEI access charges under primary/secondary approach



Excessive incentives for copper shutdown in the intervention area

This approach creates even stronger preference for Eir copper switch-off than the equal sharing rule. This approach might even be considered an active intervention to encourage early shut down of the copper network. Therefore, 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 Eir will be an integrated provider who should have broadly appropriate incentives to transition.[53]

8.4 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 joint CEI until copper switch-off, this approach is dynamic, as the split will change over time with the take up of fibre services. This approach best approximates the decisions that an integrated provider of both fibre and copper network would face.

Sharing on the basis of revenue

In Section 6.5 above and also Annex B, we considered a number of usage-based sharing rules. If we used an analogue of an EPMU approach to share the common CEI costs, as is commonly used for sharing common costs in other regulatory contexts (and as a proxy for Ramsey pricing where demand characteristics are unknown), this

[53] This does assume that if Eir 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.

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

In Annex B, we show that there was in practice rather little difference between sharing common CEI costs based on the relative revenue or the relative number of active fibre and copper subscriber lines. Therefore, the simpler approach of sharing based on copper and fibre subscriber lines is attractive as a simplification.

The augmented line sharing rule

This approach creates reasonable incentives for copper switch-off at the right time. We also show in Annex B that is possible to improve the approach so that Eir 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:

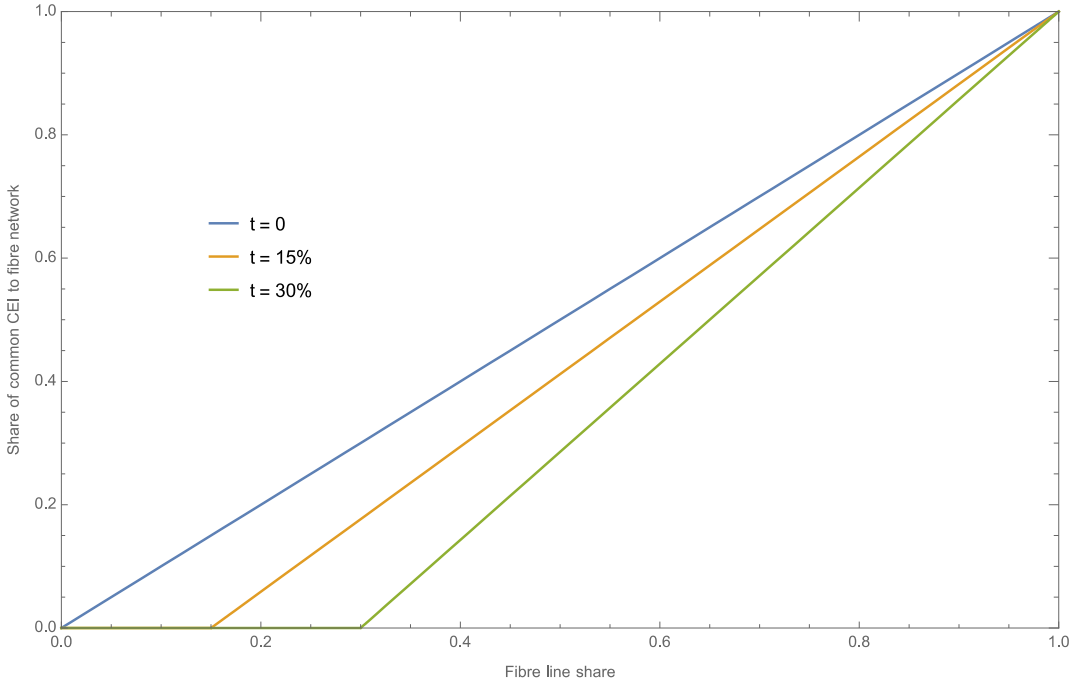
- The fibre network makes no contribution if its share of subscriber lines is less than some specified threshold t%;
- Once the fibre network's share of lines x% is a least t%, it pays a share of $(x - t)/(1 - t)$ of the common CEI cost for shared assets.

Figure 8 below shows some examples of augmented line sharing rules for different values of the threshold parameter.

We also derive in Annex B 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 Eir facing the same incentives to shut down the copper network as would an integrated operator of both networks (assuming that wholesale fibre prices are cost oriented). This is the main attraction of this approach.

As noted earlier, we fully acknowledge that Eir is currently under various regulatory constraints that affect its ability to cease offering copper services (though these may change in future, not least due to the presence of NBI's services within the intervention area). However, this incentive question is still relevant. If Eir's private incentives for copper switch-off were strongly misaligned with a socially optimal timing for copper switch-off, this creates potential for future conflict. For example, if Eir wanted to switch off copper too early, this would open up further issues about either having to serve unprofitable residual copper customers.

Figure 8: 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. Eir can be expected to decommission its copper network in logical units such as exchange areas (or possibly cable routes within exchange areas). Therefore, we should logically apply the line share rule for common CEI cost sharing area-by-area. However, this could be burdensome in terms of data requirements.

However, we can make some 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. However, this still requires measure of the number of customer lines by area.

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; poles are no longer shared and NBI would incur the full cost.

8.5 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 and is far from replicating the decisions that an integrated provider of fibre and copper would make. In turn, this could lead to difficult policy issues later if the fibre network is not fully built out, yet Eir wants to switch off its copper network. Under these circumstances, Eir might reasonably contest that copper switch-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. Eir 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 it 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 optimising them requires access to detailed information on current and future demand that may not be available. Nevertheless, the general form of the sharing rule is clear from the analysis in Section 6.5. Fairly simple approaches can provide reasonable approximations to optimal sharing.

The augmented sharing rule

The *augmented line sharing rule* (derived in Section 6.5.2 above) seeks to correct inefficiencies in the copper switch off decision caused by having separate copper and fibre providers who do not directly take network duplication costs into account. It tries to provide Eir with similar incentives for copper switch 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 contributing 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 replicate the incentives that would face an integrated operator of copper and fibre networks. 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. If Eir were required to continue providing copper services, despite it being more profitable to cease, this might lead to claims that a subsidy to support a USO might be needed; however, the underlying cause of the problem would be that copper services would be asked for a contribution to shared CEI cost that was infeasibly large given declining demand.

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 switch off that are clearly too strong – as happens with the equal sharing rule as the number of copper customers falls – is that Eir 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 that 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 copper switch-off. This leaves NBI facing cost risk regarding CEI access payments depending on when the copper network is decommissioned under the equal sharing approach. Over the period of the fibre deployment, it is not clear which approach results in greater total payments from NBI to Eir 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 and may raise issues of practicality, it has certain advantages in coping with the roll-out of NBI's fibre network over the transitional period where copper and fibre co-exist. A usage-based sharing rule avoids risks that arise with the equal-sharing approach due to it 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 Eir 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 7. 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.

Feasibility of per customer approach

Whilst there are advantages to the usage-based approach, as set out above, we will see subsequently that concerns have arisen about the practicality of implementing this approach due to data availability limitations. If the usage-based approach is impractical, then the per operator approach is the second-best, rather than any primary/secondary user approach.

9 Consultation responses

The consultation process

ComReg consulted on proposals for pricing of physical infrastructure access CEI in its Draft Decision and Consultation, published as ComReg 20/81. DotEcon provided advice to ComReg on economic matters, published as Annex 2 to ComReg 20/81. The substantive content of our first report has been set out in the preceding sections, especially Section 6, 7 and 8 (plus Annex B, which sets out detail analysis of per-customer sharing of common CEI costs).

Responses

ComReg received consultation responses from ALTO, BT, Eir, NBI, SIRO, SKY, Virgin Media and Vodafone. Eir submitted an accompanying report from BRG, and NBI a report from Frontier Economics.

The main issues raised fall into three main areas, reflected in the following subsections:

- The use of incremental cost-based (LRIC) access prices for CEI access by NBI within the commercial area;
- Implications for the recovery of Eir's common overhead costs;
- The methodology for sharing the costs of commonly used CEI assets in the IA, especially poles.

9.1 LRIC access pricing in the CA for NBI

9.1.1 Proposals

The Draft Decision proposed that NBI would pay a differentiated access price within the commercial area, based on an estimate of the incremental cost that NBI's specific demand would cause. Other users of Eir's CEI within the commercial area would continue to pay for access on a similar basis to the present, with costs estimated on a LRAIC+ basis for all users, and then split according to usage. For poles, this amounts to an equal split across all operators using a pole. For ducts, charges are by distance and occupancy (i.e. sub-ducts used).

The key reason for proposing a different basis for pricing access to NBI is that setting a higher price than the LRIC caused by NBI would mean that the State's intervention in the IA would have knock-on effects within the commercial area and risk distorting of competition. To the extent that NBI pays for CEI access for transit through the commercial area above this level, then this must lead to some mix of higher profits for Eir, or lower prices for services supplied by Eir within the commercial area.

As set out in Section 6 and 7, we suggested in our first report that the most likely scenario would be some transitory windfall gain for Eir in a combination of the adjustment of prices for services. The latter effect arises because of the effects of competition (where present) and/or regulation (where competition is absent) translating any additional gross margins earned by Eir on CEI access sold to NBI into persistent lower prices for other services.

Our concern is with lower prices for Eir's services in the commercial area, including both services sold to end customers, wholesale equivalents and other access services sold to other CPs. Lower prices for these various services reduce incentives for provision by competitors to Eir and risk competitive distortions due to bleed-through of subsidies given to NBI. It would be concerning if a reducing in incentives for competitive entry were a side-effect of the State's intervention.

By setting a differentiated access price for NBI CEI access in the commercial area CEI causes (i.e. a LRIC where the demand increment is CEI's demand for CEI access for transit purposes), this ensures that both Eir is no worse off from serving NBI, but also that competition in the competitive area is insulated from any adverse effects as an unintended consequence of the NBP intervention.

9.1.2 Responses

Eir disagreed with the proposed approach on the following grounds:

- There was no proper basis for differentiation of access prices for NBI, as there was no objective difference between the use that NBI was making of CEI and the use made by any other operator (for example, see §15 of Eir's response);
- A differentiated approach was not supported by a corresponding market definition, especially in terms of distinguishing access services within the commercial area, as ComReg's market analysis had previously identified a national WLA market given the ubiquity of Eir's CEI (see §9(ii) in Eir's response);
- Any windfall profitability gains arising from NBI's new CEI access demand in the CA would soon be eroded through competition or in the normal process of periodic regulatory review, so little weight should be given to the question of Eir earning excess returns;
- Concerns about infrastructure competition in the competitive area being affected are misplaced, and in fact ComReg should be seeking to avoid asset duplication in the commercial area (see §55 of Eir's response and also the BRG report). We note that competitive entry is unlike in the rural commercial area, so we presume that Eir's comment is limited to urban areas.

- Eir suggests that NBI's incentives for cost reduction will be reduced by the proposed approach to CEI pricing (see §30 of Eir's response), as NBI will pay less than other access seekers in the CA.

In contrast, NBI was broadly supportive of the proposed approach. Other respondents tended to favour NBI paying some share of Eir's common overheads.

9.1.3 Analysis

Relevant differences in NBI's access demand

In our view, Eir's arguments do not engage with the logic (set out above in summary) for differentiated CEI access pricing within the CA to prevent adverse effects on competitive entry being caused by the State's intervention.

Why NBI's CEI access demand is different

There are good reasons for identifying NBI's access demand within the commercial area as being different in nature to CEI access demand from other communications providers:

- NBI's demand arises as a direct result of the State's decision to intervene and subsidise fibre-based services within the intervention area. Had the State not decided to intervene, this additional demand for CEI would not be present.
- NBI cannot use CEI access in the commercial area to supply services within the commercial area because of its agreement with the State.
- The scale of NBI's need for CEI access is exceptional. Within the commercial area, this arises from the fragmentation of the intervention area, which is in part due to Eir's deployment of NGA within the rural commercial area.
- NBI is under a long-term obligation to provide these services in line with requirements set by the State in it NBP procurement process. Therefore, Eir knows that NBI's demand for CEI within the commercial area is necessarily long-term and large scale given NBI's 25-year contract and roll-out obligations.
- If NBI were to fail, the State would need to step in to ensure continuity of services for customers within the intervention area, which would in turn make similar demands on Eir's CEI within both the intervention area and the commercial area. Therefore, there is a high level of predictability around the need for access to Eir's CEI irrespective of whether it is NBI or some other party is fulfilling the State's intervention objectives.

These are specific differences in the nature of CEI access demand faced by Eir from NBI as opposed to other commercial providers. Eir

has not presented any arguments that undermine these points of differentiation.

Discrimination

Eir has, however, contested that whilst NBI's contract limits it to providing high speed broadband to premises within the intervention area, there might be a loophole in that NBI could provide different services within the commercial area. In such a case, the proposed CEI access charge for NBI would be discriminatory, as other provider offering possibly competing with NBI's commercial services would face the higher generic CEI access charge.

We understand that ComReg has conducted a legal review and, whilst there the contractual obligations may not be abundantly clear, NBI may not use subsidies other than for the purpose of supplying high speed broadband in the intervention area. Therefore, we continue to consider that EIr's scenario of NBI offering commercial services based on CEI access provided in the commercial area is unlikely. If that did occur, NBI would need to create an arms-length operation to ensure that subsidy was not used, and this would need to purchase generic CEI access.

Geographical market definition

Sub-national markets

Eir is concerned that there is no sub-national geographical market definition to support a differentiated approach in the commercial area. However, the reason for proposed differentiated approach is not due to any intrinsic market-based differences, but rather the exceptional characteristics of NBP's demand for CEI access.

The defining characteristic of the commercial area for these purposes is that it is an area in which NBI cannot provide services to customers located there, but nevertheless NBI needs to deploy fibre to reach and supply customers located within the intervention area to meet its obligations arising from the NBP intervention. The deployment of Eir's rural FTTH network and the consequent removal of premises from the NBP has given rise to in an intervention area that is highly fragmented and, as a result, NBI needs to transit the rural commercial area to provide services in the intervention area. Therefore, the basis of the differentiated approach is not geography (and its consequences for relevant markets) *per se*, but rather the immediate consequences of the specific obligations on NBI.

New market analysis

Eir suggests that it would be necessary for ComReg to reconduct its WLA market review to find a geographical basis for the proposed differentiated remedy within the commercial area. However, this mistakes the basis for the differentiated approach to CEI access pricing as being geographical in origin, whereas its basis is the obligations on NBI due to the NBP intervention. It is also the case that the classification of a pole as being in the rural commercial area rather than the intervention area is not based on the type of geographic analysis used to support market reviews but on cable deployments: an rural commercial area pole is a pole where eircom

has deployed a fibre cable and an intervention area pole is where eircom only have copper cables.

These obligations mean that NBI is not a competitor in the commercial area and its presence should not change any previous analysis of competition within the commercial area. NBI is a user of CEI within certain parts of the commercial area only because of its obligations to roll-out services in the intervention area. Indeed, we have proposed LRIC-based pricing for NBI's CEI access in the commercial area specifically to avoid having any incidental impact on conditions of competition within the commercial area and leave conditions largely unchanged.

Transient windfall profits and infrastructure competition

Eir believes that concerns about excess profitability if it earned a gross margin on CEI access supplied to NBI are overstated, as these would be eliminated by changes to regulation and/or competition. Eir points out that our previous report only identified concerns about excess profitability that are transitory, which we agree.

Transitory profit vs. persistent price effects

However, this misses the point that if Eir earns such gross margins from CEI access provided to NBP in the commercial area and they are passed through in lower prices in the commercial area due to the typical regular reviews of regulated prices, then this has implications for incentives for competition with the commercial area. Indeed, Eir implicitly acknowledges, when it says that excess profitability would be transitory and eliminated by competition and/or regulation, that there will be 'see-saw' effects on the pricing of other services using CEI. Therefore, Eir appears to admit the possibility of competitive distortions occurring as it acknowledges the potential or feed-through effects on competition within the commercial area.

This see-saw effect is the primary concern with setting CEI access prices for NBI at above LRIC in the commercial area. This pricing effect is not transitory, but permanent (unless there is a subsequent change in the basis of setting NBI's CEI access prices). Moreover, even if it takes some time for those price reductions to filter through, all operators can reason that they will eventually occur, so will factor this into forward-looking entry and investment decisions by Eir's potential competitors.

Asset duplication

Eir contends that ComReg should not in any case be concerned about any such adverse effect on entrants in the commercial area and, quite the opposite, should be concerned about creating incentives for duplication of infrastructure. In effect, Eir's argument is that if NBI pays more for CEI access in the commercial area, then other access users pay less and, in turn, this avoids harmful asset duplication.

Knock-on effects in the commercial area

We strongly disagree with Eir's argument. First, entry possibilities across the commercial area are not uniform. NBI is likely to need CEI access for transit purposes primarily in the rural commercial area. On the other hand, competitors to Eir are likely to want CEI access in the commercial area, but not the rural commercial area where Eir is likely to remain the sole NGA operator. For this reason, ComReg has accepted Eir's arguments in this regard and proposes that the pricing for general CEI access be based on urban area costs, not those in the rural commercial area.

Second, if NBI pays its incremental cost of using CEI in the commercial area, but no more, then there should be no implications for the prices that other operators pay for access within the commercial area. Therefore, this approach simply preserves the status quo and avoids the NBP intervention creating adverse knock-on effects.

In contrast, if NBI pays more than incremental cost and Eir earns a gross margin on NBI's access services in the commercial area, this eventually leads to lower prices for downstream services in some manner, which may lead to distorted competition. As far as we can see, this mechanism is not disputed by Eir, as Eir argues itself that any excess profits earned from supply of CEI access would be transient (with which we agree) as these would be dissipated by competition.

NBI's cost reduction incentives and subsidy requirements

Cost reduction incentives

We can see no good reason why NBI's cost reduction incentives will be affected by the level of NBI's access price for CEI within the intervention area. NBI will need access to a certain amount of CEI within the commercial area that is determined by its roll-out within the intervention area, which is set contractually. CEI access costs are only a part of the costs that NBI will face in the commercial area. We are unclear what aspects of NBI's behaviour Eir thinks will be affected by the level of access prices within the commercial area. In any case, the main mechanism affecting NBI's cost reducing behaviour is likely to be claw-back mechanisms for recovery of excess profit within NBI's contract with the State.

Level of subsidy

Related to this point, Eir allege that NBI is being unreasonably benefitted (§43) and the State's subsidy cost being minimised (for example, §44 and §45). We were clear in our first report that we had not taken subsidy minimisation as an objective for ComReg in determining CEI access prices for NBI and have re-iterated that point in Section 2. The argument for keeping CEI access prices for NBI to incremental cost only in the CA is based on avoiding competition distortions being created in the CA due to the State's intervention, not on reducing subsidy.

Eir is correct to note that we listed the impact on the subsidy requirements in our impact assessment (§45 of Eir's response). However, it is best practice to identify impacts on *all* stakeholders and for this reason we listed the impact on subsidies. However, in making our recommendations we have simply assumed that subsidies adjust as required if different CEI access prices for NBI are set and have not in any way taken minimisation of those subsidies as an objective when making our assessment.

9.2 Common cost recovery

9.2.1 Proposals

Within the commercial area, ComReg has proposed that NBI should not contribute to Eir's central overhead costs through any mark-up being applied to incremental cost.

Impact on investment incentives within the IA

The underlying reasoning for this proposal is closely related to that set out in the previous section. If Eir made a gross margin on CEI access to recover a contribution for central overheads, this would eventually lead to lower prices for Eir's other services in the commercial area and create competitive distortions. In effect, Eir would be gaining an advantage from part of its overheads being paid indirectly through NBI's subsidy. This knock-on effect of the NBP intervention in the commercial area can be avoided by keeping NBI's access price to incremental cost only.

Previous ComReg Decision

We also noted that in D11/18, ComReg had set prices for FTTC/EVDSL VUA assuming that common costs were recovered only from areas deemed economic to serve. Therefore, by this logic there should be little impact on loss of customers from Eir to providers using NBI within the IA, as ComReg has already assumed that these higher cost lines do not contribute to Eir's common cost recovery (see page 22 of ComReg 20/81A). ComReg has now reclassified some costs previously treated as common cost as being incremental to the copper network, which will reinforce this conclusion. We noted that for consistency with the approach current taken on copper lines in the intervention and to preserve the status quo, there would be no need to include a mark-up for common overheads in the CEI access charge in the intervention area.

9.2.2 Responses

Eir's general concern about CEI access prices in the CA

Eir has general concerns about NBI's CEI access charges in the commercial area being set too low, as discussed above. These equally apply to the question of whether common costs should be recovered from the commercial area.

Sky's claim of circular reasoning

Sky was specifically concerned about DotEcon noting ComReg's prior decision on common costs in D11/18 and then claimed that this created a circularity, as DotEcon has in effect adopted ComReg's position in D11/18, then ComReg used DotEcon's conclusion to justify its approach. Sky says that DotEcon have failed to follow its terms of reference by not considering the arguments for common cost recovery independently of ComReg's prior position set out in D11/18.

9.2.3 Analysis

Infrastructure investment

There is a close overlap with the issues discussed in Section 9.1 above. Regardless of the reason – whether contributing to common overheads or for a different reason – whenever Eir makes a gross margin on CEI access in the commercial area sold to NBI, this has knock-on consequences for the pricing of other services. This is the reason that we have recommended that no mark-up for common overheads be applied in the commercial area for NBI's CEI access.

Sky's concerns

Although this is not entirely clear to us from its response, Sky's concern would appear to apply primarily to the intervention area, not the commercial area, as that is where we previously noted the implications of D11/18. Our first report made the simple point that if it has already been established that Eir does not earn a contribution to its common overhead costs on its copper lines in the intervention area, due to these lines being on average more expensive due to their geography but prices being nationally averaged, then there is no lost common cost contribution to be replaced if those customers switch to NBI. Therefore, if NBI's arrival is to leave pricing for Eir's other regulated services unaffected, then there should be no contribution to common overhead costs added as a mark-up in the intervention area.

It is incorrect to characterise this as a circularity, as this argument simply identified a neutral approach to CEI access pricing in the intervention area that minimises the knock-on consequences for other prices from the NBP. At the same time, we noted consistency with the general approach to recovery of common costs taken in D11/18, but on conclusion does not rely on that.

Sky appears to be suggesting that NBI should contribute to Eir's common overhead costs. This would have the effect of reducing the contribution that other users of Eir's services would need to pay

towards those common costs, including both end customers and other operators using various access services bought from Ei; this includes eir's retail business that is competition with other providers, including Sky itself. For the reasons set out in Section 9.1 above, this will, to some extent, reduce incentives for competitive entry within the commercial area, with part of Eir's common overhead costs being funded indirectly by the state through NBI's subsidy. This is a potentially distortive effect of the NBP intervention. Therefore, purely on grounds of avoiding such distortions, there is a reasonable case for not applying a mark-up to recover Eir's non-incremental common overheads in the intervention area. None of this relies on D11/18.

9.3 Access pricing in the intervention area

9.3.1 Proposals

Feasibility of per-customer and per-operator approaches

ComReg has consulted on two main proposals for determining NBI's CEI access price in the intervention area. The preferred approach would be to move to a per customer charging model, where costs of CEI are split between Eir and NBI on a "per customer" according to their relative number of customer lines. An alternative would be to maintain the status quo, and split costs on a "per operator" approach, under which the cost of poles shared by NBI and Eir would be split equally; duct would remain priced per meter of sub-duct used.

Benefits of the per-customer approach

Whilst both approaches are feasible, we considered that the per customer approach had advantages in the context of expected migration of customers from copper- to fibre-based services in the intervention area and eventual copper switch-off. In particular, the per customer approach reduces the copper network's contribution to common costs broadly in line with its reducing ability to make such a contribution as demand for copper lines falls. Annex B sets out a fuller analysis of the implications.

The main benefit of the per customer model is that it avoids a future problematic situation in which the copper network in the intervention area needs to make a fixed contribution to common CEI costs. As copper customer numbers fall, prices could be increased somewhat, but there is a limit to the revenue that can be raised (as prices cannot be increased hyperbolically to cover a fixed cost from an ever-smaller number of customers). Therefore, without progressive shifting of shared CEI costs towards NBI's fibre network, this will eventually lead to a situation in which, although it is not yet

efficient to turn off the copper network completely in the IA, it cannot recover its allocated costs.

9.3.2 Responses

Diametrically opposed views from Eir and NBI

Eir is strongly opposed to the per customer approach, whereas NBI supports this approach. NBI makes some proposals for modification of how the per customer approach might be implemented, which are considered in Section 5 below (but are not particularly to the broader question of the per customer approach vs. the per operator approach).

Both ALTO and BT support the per customer charging model.

Eir's objections to the per customer model

Eir makes a variety of different points objecting to the per customer approach, of which the most significant are that:

- The approach fails to differentiate between the incentives and the ability of Eir to turn off the copper network, whereas in fact Eir has little control over the timing of CSO;
- Data is not available to implement the per customer approach;
- Non-active lines need to be considered (and ComReg has failed to consult on this);
- The per customer approach is discriminatory;
- The per customer approach faces Eir with asset stranding risks;
- ComReg needs to consider an overarching approach to CSO, including relaxation of various potential regulation that requires Eir to offer copper services.

Eir also considers that that per customer approach is inconsistent with Regulation 6 (1) of the Access Regulation.

BRG report

The BRG report raises several further issues, of which the most significant is the potential for substitution to wireless services. BRG also contend that the analysis is our initial report amounts to an application of Ramsey pricing that is inappropriate given lack of knowledge about demand for various services.

9.3.3 Analysis

Eir's preferences for copper switch-off

Incentives and regulatory constraints on Eir's actions

There are various regulations that require Eir to continue to provide copper-based services in the IA (specifically SMP regulation and USO). We acknowledged this in our first report (see page 54). Therefore, we fully agreed that Eir cannot simply shutdown the copper network when it wishes. Therefore, at least in theory, the situation could arise where Eir would find it more profitable to switch off some part of its copper network, but might be constrained to

continue operating. We described this situation in our first report as Eir have an incentive to switch off copper, whether or not it actually could do so.

Incentives and profit shocks

When there is an incentive for copper switch-off, then this simply means that it is more profitable for Eir to shut down the copper network that continue using it. In this case, if Eir is required to continue providing services, that requirement might be costly and Eir might face lost profits if required by regulation to continue offering those services. This does not automatically give rise to a claim for USO payments under the current tests set out in D05/16 (as further conditions apply) and in any case ComReg has is reviewing this framework in Consultation 21/51.[54] Nevertheless, USO-type issues would arise at that point.

Therefore, if Eir is given excessive incentives to shut down its copper network, this means that USO-type issues will arise prior to the point at which it is efficient to shut down that network. Conversely, if Eir is given efficient incentives for CSO this means that we avoid reaching the situation in which it is efficient to keep the copper network operating, but Eir would prefer to shut it down and so might reasonably claim the need for USO-type support at that point.

In our first report, we explained that if Eir has broadly efficient incentives for CSO, then this aligns Eir's preferences with the public good and can avoid the need for complex interventions later by ComReg to support residual customers on the copper network that Eir would prefer not to serve. For this reason, even though Eir cannot shut down its copper network in the intervention area without changes to its current obligations and so cannot respond freely to incentives, it is still valuable to set these incentives broadly efficiently.

Arguments that residual copper customers become uneconomic

In particular, the per operator approach sets a floor on the contribution that the copper network must make to CEI (in particular, half the cost of a pole in the intervention area until CSO), which we can already anticipate will not be sustainable when viewed on a static basis; residual copper customers cannot generate sufficient revenue to cover the costs of the copper network at that point. Therefore, when viewed in terms of the static balance of costs and revenues at that point in time, Eir could then argue that it was being required to serve uneconomic copper customers.

[54] https://www.comreg.ie/publication/universal-service-requirements-provision-of-access-at-a-fixed-location-afl-uso

Copper customer profitability needs a more dynamic assessment if per operator cost sharing is used

The per customer approach avoids this problem by adjusting shares of CEI cost from copper and fibre networks as customers migrate, tracking the relative ability of the two networks to contribute. If a per operator approach is taken, then this tracking is then lost; it then becomes important to consider Eir's cost recovery holistically over the whole transition period from NBI's initial roll-out through to copper switch-off, rather than at each point in time.

Under the per operator approach, Eir pays half the cost of a pole from the point that NBI installs its network, even if no copper customers have yet to switch to fibre services. Therefore, relative to the per customer approach, under the per-operator approach Eir receives a larger contribution early on (when fibre take-up is small) but a smaller one later (when fibre take-up is large). From a cashflow timing perspective, this means that Eir is likely to favour the front-loading within per operator model, whereas NBI would favour the per customer model, as has proved the case in the response comments.

Under the per operator approach, although Eir might – on a static basis – appear to be unprofitable once a sufficient number of copper customers had been lost, Eir would have already enjoyed additional revenue from CEI access sold to NBI from the point that NBI rolled out its network. Therefore, when assessing any subsequent claim that copper customers are unviable to serve, under the per operator account needs to be given to the front-loading of cashflow to Eir, as Eir receives payments from NBI it rolls out and CEI is shared, but Eir may not yet have seen significant customer migration.

In summary, the per customer model has the advantage of simplifying these issues as the splitting of common costs tracks the relative number of customers on copper and fibre networks. The per operator model involves front-loading of revenue to Eir, which then needs to be taken into when assessing any subsequent claim made by Eir that residual copper customers are unprofitable to serve.

Is a full policy for CSO needed?

Eir considers that it is necessary to open a broader debate about how best to manage copper switch off in order to decide the best approach to sharing of common CEI cost. Eir is not specific about why this is relevant. We disagree that this is necessary:

- We note that Eir has in fact already published a white paper on copper switch off,[55],[56]
- The broad features of copper switch off can be determined from general principles even if detailed timing cannot. In particular, there will be progressive switching of customers to NBI's fibre network as it is deployed, but at some point it will be efficient to migrate residual copper customers rapidly so that costs of the copper network that are avoidable, but which do not scale with the number of customers, can be ceased. Therefore, as we have set out in detail, the qualitative features of an optimal transition path are clear even if quantitative details are not.
- We do not need any detail about CSO to foresee that a per operator approach will store up with viability of the residual copper network before the point at which it is efficient to turn it off (as discussed in the previous subsection).
- The analysis presented in our first report (repeated in Annex B of this report) shows how a per customer approach gives approximate efficiency of the Eir's preferred timing of copper switch-off, approximating replication the decision that a joint operator of fibre and copper networks would make without needing knowledge of any particular parameters affecting that decision.

Therefore, we do not agree with Eir that it is necessary for ComReg to anticipate fully all the ramifications of CSO to see that an approach that scales back the copper network's contribution to common CEI costs is likely to be helpful.

Implementation issues

Both the per operator and the per customer approach require identification of shared CEI. The per customer approach requires identification of costs that are incremental to each of NBI's use of CEI (sharer incremental costs in the terminology set out in Section 5).

[55] https://www.openeir.ie/wp-content/uploads/2021/03/White-paper_Leaving-aLegacy.pdf

[56] In addition, ComReg has issued a "Call for Input" (ComReg Document 21/78 and a subsequent consultation process on copper switch-off is planned for later this year. The Call for Inputs seeks interested parties' views on, inter alia, the principles, processes and notification procedures which ought to be followed by an SMP operator when seeking to implement a migration from legacy infrastructure initiative.

Additional information required by the per customer approach

The per operator and the per customer approaches differ in how shared costs are split. The per customer approach requires additional information about the number of active lines operated by Eir and NBI within the intervention area.

Whilst it is in theory possible to apply the per customer approach at the level of local exchange areas (representing the likely logical units for CSO, though cable routes within exchange areas might also be relevant), in practice NBI is expected to deploy widely across its eventual footprint. Therefore, it is likely to be reasonable to apply the per customer approach averaging across the entire interventional area on the basis that progress with deployment would be made across the whole area.

To the extent that copper lines are not active, these would not be counted towards Eir's share of costs under the logic of the per customer approach, as these lines clearly cannot make any contribution to shared CEI costs. Therefore, there is no need to count the number of addressable premises, as Eir suggests (§266 and following of its response).

For the avoidance of any doubt, the proposed per customer approach would apply in the intervention area only and Eir's activities in the commercial area are of no relevance to the proposed splitting of CEI costs in the intervention area. Eir appear to suggest otherwise in their response (see §271 and §272).

Feasibility of collecting data needed for per customer approach

Notwithstanding these simplifications and clarifications, we understand that Eir considers that it is infeasible to determine the current number of active customer lines within the intervention area. We understand from ComReg that whilst Eir knows which active lines are terminating at an exchange, due to the complex definition of the intervention area, it does not know whether those lines serve premises within the intervention area. We understand that ComReg has considered this matter and concluded that in the short run it is not practical to gather the data on customer lines needed to implement the per customer model. (This is explained in Section 6.5.2 of ComReg's Decision document.)

For the per customer model to be feasible, data on customer lines would need to be available during the transitional period in which NBI builds out its network and customers migrate from copper. Therefore, even if steps were taken to improve data availability now, it is not clear that data would be available soon enough to allow the per customer model to be implemented. Therefore, despite the benefits of the per customer model, it may in practice be necessary to fall back to the per operator model (or variants thereof) because of this practical limitation. However, some variation of the per operator model is possible, as we discuss in Section 10.

Discrimination and market distortion

Claimed distortions

Eir alleges various possible forms of distortion or discrimination will occur under the per customer approach. Eir says (at §270 of its response) that '*the "distortion" of market concerns put forward by ComReg in respect to the per operator approach are misplaced – a fact which is acknowledged by ComReg's own consultants DotEcon stating that "[o]verall, we consider that these considerations should be given little weight as they are hypothetical*"'.

However, this quote from page 42 of our initial report relates to an entirely different matter, namely whether there is any argument that higher CEI access prices would reduce incentive for Eir to enter the intervention area itself if the intervention area has been defined too broadly. To the contrary, we have already set out in that report, and repeat above, the concern being expressed in the quote from our first report is that a per operator approach would lead inevitably to a situation where the copper network cannot make its required contribution to common CEI costs. Therefore, the copper network could appear uneconomic (on a static basis, as discussed above) despite it being desirable to continue operating somewhat longer for the benefit of residual customers.

Claimed windfall gains to NBI

It may well be that NBI made certain assumptions about CEI access pricing in their bid for the NBP remit, but we do not know what these are. However, the NBP framework contains various mechanisms to adjust subsidy payments and claw back cost savings. Therefore, we do not accept Eir's contention (at §273 of its response) that the proposed approach to setting NBI's CEI access costs would result in a windfall gain to NBI. The management of changes in circumstances is a contractual matter for NBI and the Department.

Threshold within a per customer sharing rule

Eir has a particular concern that the use of a threshold for penetration which NBI would need to meet before a share of CEI costs was allocated to NBI is discriminatory. This was a refinement of the per customer model that was proposed in our first report. For clarity, we have not recommended such a scheme to ComReg and analysis of it was included in our initial report to illustrate different possible mechanisms for cost sharing and how they might affect when Eir would prefer copper switch-off.

Payment timing and stranding risks

Frontloading of payments under the per operator model

BRG comment that the per customer approach results in smaller initial payments from NBI to eir than the per operator approach. This is correct. However, neither BRG nor Eir mention that eventually, once half of active lines in the IA have switched to NBI, payments are then larger under the per customer model than the per operator model. In our view, a more accurate summary of the cashflow implications of the per operator and per customer models is that the

per operator approach involves a front-loading of revenues for Eir relative to the per customer model.

Whilst a direct comparison of overall payment profile under the per customer and the per operator models requires assumptions about both roll-out and take-up of NBI's services, the primary difference is in the time profile of payments. The per operator approach leads to front-loading of payments to Eir. However, it is possible for the per customer model to result in larger overall payments to Eir, especially in the plausible scenario that a majority of copper lines in the intervention area switch fairly quickly to fibre (once available), but then there is also a residue of copper customers who are slow to switch, delaying CSO.

In practice, these issues become moot if the per customer approach is infeasible.

Ramsey pricing

In our initial report, we used the commonly understood framework of Ramsey pricing to explain and motivate the per customer sharing rule. BRG contend that Ramsey pricing is not useful in this context as the details of relevant demand elasticities are not known in any case demand for CEI from both fibre and copper networks is driven by factors other than retail pricing.

We do not disagree that we do not know much about the price sensitivity of switching between copper and fibre. We would add that consumers' needs for bandwidth may also grow somewhat unpredictably, which would affect switching between copper and fibre services.

It is also the case that the implications of the prices that customers face are somewhat complicated by various policy interventions, as explained in Section 6.5.1 above. The pricing of NGA services within the intervention area will be set by benchmarking with services outside the area; therefore, the immediate impact of difference sharing rules is on the subsidy required rather than the price of these services. For copper services, national pricing is likely so changes to sharing of CEI costs within the intervention area may have a blended impact, reducing the scale of any change in price, but increasing the number of consumers affected. Therefore, we fully acknowledge there are various limitations to applying the standard Ramsey pricing model. Nevertheless, we can distil broad features of an efficient approach to sharing CEI costs in line with these principles, which leads to the option of a per customer sharing rule. This rule is analogous with the EPMU approach commonly used in regulation, which is grounded in Ramsey pricing principles, but agnostic about demand elasticities.

We did not need to make any particularly strong assumptions to demonstrate that the per customer model is likely to be able to approximately implement a decentralised outcome, in which Eir would want to shut down its copper network in the intervention area at a similar time as an integrated operator of both networks would. Details of demand characteristics are not relevant to the general conclusion that the per operator model will lead at some future point to a funding shortfall for the residual copper network at that point in time (though, as discussed above, Eir would have been already receiving front-loaded payments under the per operator model that would need to be taken into account).

10 Per operator and per operator plus

10.1 Eir's proposal

Eir make a proposal for a "per operator plus" model in the IA in which incremental pole replacement cost is paid by NBI, but then shared costs are split 50:50 between NBI and Eir until CSO (see §107 of Eir's submission). Eir comments that this has some "similarity" with the per operator approach, in that cost incremental to NBI's specific use of poles are netted off. Within the IA, this "per operator plus" model is Eir's preferred approach (§236).

As described by Eir, the per operator plus approach would have the effect of increasing the share of total CEI costs paid by NBI relative to the unmodified "per operator" approach, which simply splits pole costs 50:50, including any costs caused by NBI's use.

Asymmetric treatment of NBI and Eir

Furthermore, there is an important difference in how operator-specific incremental costs are considered in Eir's "per operator plus" model and the per customer approach as set out in our previous report. In the per customer model, any incremental costs caused by NBI's usage are identified, as are any incremental costs caused by Eir's usage. The sum of these incremental costs subtracted from pole costs. The remaining shared cost – which is incremental to neither user, but avoidable if both ceased using the pole - is allocated between the users. In the per customer model, the basis of this allocation is each user's active lines, but the essence of Eir's proposal is to change this to a 50:50 split. However, in Eir's proposal only the operator-specific incremental cost due to NBI is netted off from pole costs, not incremental costs due to Eir itself. Therefore, as proposed, this approach treats Eir and NBI differently, for no obvious reason.

10.2 Modified "per operator plus"

Eir's proposal can be modified to net off the operator-specific incremental costs of *both* Eir and NBI to calculate common cost. This means that the two operators are then being treated symmetrically. However, there is then a difference between the simple per operator approach and Eir per operator "plus" approach only to the extent that NBI's and Eir's operator-specific incremental costs differ.

To see this, let C_{tot} be the total incremental cost of a pole, which is avoided if all usage of it ceases. Let C_1 and C_2 be the operator-specific incremental costs due to each of the two users (Eir and NBI); these are the costs that would be avoided if that user ceased using the pole, but the other continued. There will be some remaining common cost $C_{com} = C_{tot} - C_1 - C_2$ which needs to be split

between two users. This is a 50:50 split under the "per operator plus" approach, with the users paying $C_1 + \frac{1}{2}C_{com}$ and $C_2 + \frac{1}{2}C_{com}$ respectively.

If both users have the same operator-specific incremental cost (i.e. $C_1 = C_2$) then both pay the same and this is simply $\frac{1}{2}C_{tot}$. Therefore, unless there is reason to expect the operator-specific incremental costs to differ, there is no reason to use the per operator plus approach rather than the per operator approach. The per operator plus approach creates the additional burden of estimating these operator-specific incremental costs, but if these are approximately equal across operators, we could have avoided estimating them in the first place.

In the case that there is a difference in operator specific incremental costs, the first operator pays $\frac{1}{2}C_{tot} + \frac{1}{2}(C_1 - C_2)$ and the second pays $\frac{1}{2}C_{tot} + \frac{1}{2}(C_2 - C_1)$, so payments depend on only on the *difference* in the operator-specific incremental cost. This is a useful observation, as we can then focus on what is *different* between NBI and Eir in terms of the costs that each operator's usage causes.

10.3 Sources of cost differences

Eir rightly highlights the *incremental* replacement of poles outside the business as usual (BAU) cycle as being an operator-specific incremental cost caused by NBI (§107). It is reasonable to consider this as a cost that is caused by NBI's shared use, but not by Eir. In particular, prior to the NBP, Eir could reasonably have expected to have been the sole user of CEI, barring the odd exception, as in the IA there would have been little reason to expect a competitive provider to enter. The NBP has, therefore, brought the need to share CEI where previous there was no anticipated need to do so. The *additional* costs associated with these changes contribute to NBI's operator-specific incremental cost, but not Eir's, so are a source of difference.

Historic underinvestment

However, as discussed in our first report, we need to be careful to distinguish between correcting for historic underinvestment in CEI within the IA and the need for genuine new investment to serve NBP. To the extent that there has been such underinvestment, it would be inappropriate to treat that as a cost that NBP should now bear entirely. Therefore, there is a practical question about assessing the reasonableness of assumptions about what costs are BAU and what are genuinely incremental due to NBI's sharing.

Cable loading

Furthermore, there may be other sources of difference in NBI's and Eir's operator-specific incremental costs. In particular, Eir is using copper cables, whereas NBI will install much lighter and thinner fibre cables on poles. To the extent that maintenance and replacement

costs are driven by weight and wind loading, arguably Eir causes greater costs than NBI. It may also be the case that NBI's newer cables have lower fault rates than Eir's older copper cables, requiring less pole climbing for repair or replacement; in turn, that may affect wear and tear on poles. These would be a countervailing difference in operator-specific incremental costs, which would tend to offset the additional costs associated with upgrading to meet NBI's new demand.

10.4 Recommendations

In summary, a reasonable and fair implementation of "per operator plus" pricing should reflect costs caused by the need for Eir to enable sharing of poles where, prior to the NBP there was no expectation that sharing would be likely. However, this needs to strip out investment in new poles that is not driven by NBI, but rather is catching up with historic underinvestment. Ideally, it should also take account of other relevant differences to how NBI and Eir use poles and how this drives maintenance and repair costs over the long term, though quantifying such differences may be difficult. Therefore, differences in operator-specific incremental costs are more complex than Eir suggests and cannot simply be identified with pole replacement outside the BAU cycle. Taking account of these other factors would tend to reduce the difference between Eir's proposed "per operator plus" approach and a simple "per operator" approach.

Merits and demerits of per operator plus

In terms of merits, proper implementation of the per operator plus approach does require consideration of the *difference* in operator-specific incremental costs of using poles (i.e. the cost avoided when just one operator ceases use), as explained above. Therefore, it is more burdensome than the simpler per operator approach which only requires knowledge of the CEI cost that would be avoided if all users ceased use.

However, relative to the simpler per operator approach, the per operator plus approach has some merits. First, it is better aligned with the broad principle of users paying the costs they cause, at least once the additional factors discussed above are considered.

Second and related to this, the per operator plus approach somewhat reduces the cost that is being split relative to using a simple 50:50 rule. NBI's sharer incremental cost will be greater than Eir's, as costs of enabling sharing are caused by NBI. Therefore, this approach somewhat shifts the sharing of CEI costs towards the fibre network. In turn, this somewhat delays the inevitable problem that the demand for copper-based services has shrunk to the point that it cannot pay this fixed cost contribution to CEI and there is an excessive incentive to shut down the copper network or seek USO

support (which is a disadvantage of the simple per operator approach that the per customer approach solves).

Eir's suggested modification of the per operator approach does not change our assessment of the relative merits of the per operator versus the per customer approach. However, if the per customer approach is rendered infeasible because of data availability issues, then there is merit in the per operator plus approach, as we have set it out in modified form, rather than the original Eir proposal, relative to a simple per operator approach.

11 Conclusions and recommendations

In this final section we draw together conclusions and recommendations. We have maintained the conclusions of our first report. However, given practical infeasibility issues regarding the implementation of the per customer approach, then it is likely to be desirable to use the "per operator plus" variation described in Section 10.

11.1 Problems with current CEI access pricing

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. Eir suffers no wholesale or retail revenue losses from providing transit to CEI. In effect, Eir's shared CEI in the commercial becomes partially subsidised as a result of the intervention with consequent risks of windfall gains leading to competitive distortions.
- Within the intervention area, equal sharing "per operator" approach 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, as contributions from each network do not change as their relative ability to make such contributions changes. It also leads to an excessive incentive to shut down the copper network as the number of copper customer reduces; this manifests itself as Eir making (short run) losses at some point in time due to residual copper customers being more costly to serve their the revenue raised, though this would be compensated for by the front-loaded payments received by Eir under the per operator model.

As discussed in Section 9, no points raised in the consultation suggest that these two concerns are misplaced.

11.2 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 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 the pricing of NBI's CEI access service being predicated on it only being used for the purposes of complying with the NBP.

Status quo for generic access

The generic CEI access service can maintain a similar methodology to that previously used by ComReg, namely a BU-LIRC+ costing approach with TD HCA valuation of reusable assets. This is because the generic CEI access service could be used to offer services competing directly with Eir'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 for poles. Duct sharing needs to take into account the intensity of operators' usage, achieved by pricing per meter of sub-duct used.

Given that competitive entry into either the rural commercial area or the intervention is not expected, an indirect consequence of NBP is that it has clarified that generic CEI access is likely in urban areas primarily (what is called the urban commercial area, i.e. that part of the commercial area that is not rural). Therefore, the estimation of the costs of generic CEI access can simply be based of the urban commercial area.

Geographical markets

In our view concerns that differentiated CEI access of this nature requires sub-national geographical markets for the purposes of competition analysis are misplaced. The basis for the differentiated approach is the very different use that NBI makes of Eir's CEI assets compared with other access users.

11.3 CEI access pricing in the commercial area

Pricing at sharer incremental cost

Within the commercial area, this problem of potentially distorting competition can be fully addressed by NBI paying only its sharer incremental cost. This avoids Eir earning gross margins on CEI access

services sold to NBI. Eir recovers its additional costs causes 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 Eir or other suppliers within the commercial area. NBI cannot offer subsidised services within the commercial area.

11.4 CEI access pricing in the intervention area

11.4.1 Per customer sharing

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

It is feasible to continue with the status quo ('per operator' equal sharing) approach to CEI cost splitting within the intervention area as a stop gap. In the light of the apparent infeasibility of the per customer approach due to data available and the unattractiveness of the primary/secondary approach, the per operator approach (or variations of this approach) is the preferred option.

This option does store up the future problem that the copper network may be unable to fund itself from a small number of residual customers if it is required to pay half of common CEI costs. However, if this point is reached, then we also need to consider that Eir will have received front-loaded payments once NBI has deployed its network, but few copper customers have yet switched to NGA services. Therefore, any assessment of the viability of Eir's copper services at that point should look at the overall position from NBI's arrival onward, rather than only at static profitability at a point in time once significant copper customer have been lost. Provided that this principle is clear, and Eir is on notice that such an assessment would be likely, this somewhat reduces the concern that an artificial claim for financial support for serving residual copper customers would be created by the per-operator approach if Eir were required to maintain residual legacy copper services in the face of losses.

Furthermore, there would be some fairness problems with following the current status quo approach and then subsequently modifying the rule for sharing CEI costs to reduce 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. Therefore, if a per operator approach is used, then it needs to be maintained, rather than reducing the contribution of the copper network once a majority of copper lines had switched, as this would fail to recognise that Eir had received

incremental revenue from NBI using its CEI prior to Eir losing customers.

11.4.2 Per operator plus

Per operator plus

If the per customer approach is not feasible, then the options reduce to the existing per operator approach, or a "per operator plus" approach of the form suggested by Eir.

Symmetric treatment

We have a concern that Eir's original proposal for per operator plus is not symmetrical in its treatment of NBI and Eir. If adopting this approach, the sharer incremental costs of *both* sharers should net off CEI costs to obtain the shared CEI cost to be allocated, rather only subtracting off the sharer incremental cost of one party only and then splitting the residual. Therefore, NBI and Eir each pay their "sharer incremental cost" (i.e. costs they specifically cause) and then half of the remaining shared CEI costs (i.e. costs that are only avoided if both cease using CEI).

Advantage of per operator plus

There are two main reasons that the per operator plus is preferrable to the simple per operator approach (assuming the per customer approach is infeasible). First, it is more consistent with the broad regulatory principle of paying in line with cost causation.

Second, this approach is likely to deal somewhat better with the problem that the copper network may not be able to sustain its share of CEI costs as customers numbers fall. Additional costs specific to enabling sharing will shift to NBI under this approach.

11.5 Cost modelling issues

11.5.1 Geographical differentiation

Current approach

Appropriate geographic areas need to be identified for cost modelling purposes. As mentioned in Section 3.3.5, 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[57]. 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.

[57] ComReg Consultation document 17/26, 3.56

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 significantly, as it includes both rural and dense urban areas; growth in demand for duct access may be an issue in the latter case. Therefore, generic CEI access is likely to be taken up by other operators only in the urban commercial area, not the rural commercial area or the intervention area.

Investment in the rural commercial area

As we understand there has been significant recent investments by Eir 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.

Given that generic CEI access is expected to be confined to the urban commercial area, the prices for generic CEI access need to be based on the costs in the urban commercial area. NBI's use of transit for NBP purposes would occur in the rural commercial area, and access to deploy its services in the intervention area. Reflecting this, we propose differentiating access pricing for poles and ducts accounting for their geographical location in:

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

Generic CEI access would be available nationally on a national price, albeit one based on the cost in the urban commercial footprint, where the large majority of those services would be purchased.

Geographical markets

Concerns expressed in the consultation that differentiated CEI nature requires sub-national geographical markets for the purposes of competition analysis are misplaced. The basis for the differentiated approach is the very different use that NBI makes of Eir's CEI assets compared with other access users. This derives from the NBP process, which in turn has led to the definition of intervention area and, through Eir's decision to invest in NGA that affected that definition, the rural commercial area.

11.5.2 Incremental costs

Costs incremental to individual sharers need to split out

In order to implement these recommendations for the intervention area, ComReg would need to modify their previous cost modelling exercise to be able to separately identify service incremental cost and sharer incremental cost. 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 (i.e. LRAIC). However, care needs to be taken that this approach does not compensate Eir 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 CEI users at all within the relevant geographical area. 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 an 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.

11.5.3 Central overhead costs

ComReg's current approach to CEI access prices includes an implicit contribution to Eir's central overhead costs in the commercial area. Since our first report, we understand that ComReg has sought to reclassify some central overhead costs as being incremental to the copper network, so the importance of this issue is now somewhat diminished.

Usual regulatory approach to central overheads

The typical regulatory approach to recovery of central overheads is to spread these common costs widely all network elements that are used to provide those 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 several services to recover common costs, with services with higher incremental costs making a larger contribution. This approach is often adopted as a default where 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 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 Eir'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 Eir's ability to recover contributions to central overhead costs.

Commercial area

For this reason, we do not see any reason that central overhead costs need be recovered in CEI access charges for NBI in the commercial area. Indeed, to do so would create the problem discussed at length above that Eir would earn margins on CEI access sold to NBI that would reduce prices for other services sharing that CEI, leading to potential competitive distortions.

Intervention area

Within the intervention area, loss of copper customers does not affect Eir's ability to recover central overhead costs (due to their higher cost, but nationally averaged prices). In the terminology of ComReg decision D11/18 (see Section 3.3.4 above) there should not be recovery of the central overhead cost from such "non-commercial" areas. We note that ComReg's exercise of seeking to reclassify some costs previous considered to be central overhead as incremental to services will tend to reinforce the conclusion that copper services in the intervention area do not materially contribute to recovery of common overhead costs.

Therefore, if fibre services replace copper services within the intervention area, there should be no material reduction in Eir'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.

11.5.4 Depreciation and tilted annuities

ComReg's current approach uses tilted annuities 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 need for use of tilted annuities and should be reasonable to simplify somewhat. We understand that ComReg has decided to use straight line depreciation for costing NBI's CEI access within the intervention area. More generally, because there is likely to be a long-term relationship between Eir and NBI, the choice of depreciation schedule and consequent timing of access payments is not especially critical.

11.6 Summary of recommendations

Our key recommendations are that:

- A differentiated CEI access product be formed for the sole purpose of serving NBI's need for CEI access to meet its NBP obligations to provide subsidised services;
- Generic CEI access (i.e. access other than for the purpose of NBI supplying subsidised services required by the NBP) remain on the current (BU-LRAIC+) approach, with reusable assets valued at historic cost and new assets at current cost. However, given that this service will be predominately demanded only in the urban commercial area, prices can be based on costs in that area even though the generic CEI access service is available nationally.
- Where NBI needs CEI access for transit purposes in the commercial area (to interconnect the fragmented intervention area), NBI should pay only the incremental costs that its usage causes (i.e. a LRIC basis), without a contribution for common overhead costs.
- In the intervention area, costs of shared poles are split using the "per operator plus" model (i.e. equal sharing of the excess of service incremental cost over NBI's and Eir's sharer incremental cost). For cables, the analogous rule is for NBI to pay the excess of its sharer incremental costs over Eir's (i.e. costs it specifically causes that Eir does not) and split remaining shared CEI costs according to usage (measured by metres and sub-ducts used, as at present).
- No additional markup for common overhead costs should be added to the CEI access charge for NBP purposes within the intervention area. (However, we understand that ComReg has sought to reclassify some costs previous treated as overheads as being incremental for these purposes.)

A Impact assessment

A.1 Definition of proposals and counterfactual

Relevant counterfactual

There is an existing SMP finding against Eir in local access markets. As a result, Eir 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.

Defined options

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 two for the intervention area (including the status quo). We have excluded the per customer approach to sharing CEI costs in the intervention area as this approach is not feasible.

Commercial area	**Intervention area**
Status quo versus Sharer incremental cost	***Status quo versus*** Per operator plus (no common overhead contribution)

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 Eir's central overhead costs.

A.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. Eir, as the supplier of CEI access (in terms of Eir 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 Eir sets for its copper-based services within the intervention area;
F. customers of other Eir services in the competitive area to the extent that Eir's pricing of those services may be affected; and
G. any suppliers of services that compete (or might potentially compete) with Eir'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.

A.3 Eir's comments

Eir made a number of comments concerning the provisional impact assessment in our first report that are relevant to our list of affected parties above. Where these comments are relevant to the options we are now considering and not otherwise considered in the main text, they are addressed below.

Eir complained (at §423 of Eir's response) that we have not included any impact on NBI's profitability and that we had misleadingly suggested that would be no impact on profitability of NBI due to the provisions within the NBP for clawback of underspending by NBI. To be clear, if CEI access charges faced by NBI are changed, then in the first instance there will be a profitability impact on NBI. However, we understand that NBI's contract contains provision for reduction of NBI's subsidy if there were windfall gains due to CEI access charges being lower than expected when the subsidy requirements were estimated. Similar, if CEI access charges were higher than expected, then NBI might request additional subsidy to the Department (who might or might not accept such a request). Therefore, any profitability impact on NBI depends on what change might be induced in NBI's subsidy if access prices are (hypothetically) changed. We do not know what exactly might happen and how rapidly adjustments to the subsidy might be made. Therefore, we adopt the simplifying assumption that NBI's profits remain unchanged and that there is complete pass-through of changes in the access charge to the subsidy, reflected in item D in the list of impacted parties above. In practice, this impact might be split across profitability impacts on NBI and an impact on the State through the subsidy requirement. However, neither are relevant to ComReg's objectives in setting the CEI access charge. Therefore, item D above is included only for the purposes of listing all impacts, not because it is relevant to our objectives in making a recommendation.

Eir also complained (§424-425) that we have not taken into account benefits experienced by customers of services in the commercial area if prices are lower due to part of the CEI costs embedded in those services being covered, in effect, by subsidy through Eir earning margins on CEI access supplied to NBI. However, these are included under item F. We note that although customers will enjoy greater consumer surplus if prices are lower, if prices are set below true incremental cost (as would be the case if there is bleed-though of subsidy) then this is economically inefficient, as additional consumption caused by lower prices creates less consumer surplus than the costs incurred in providing those services. In addition, under item F we also need to consider disbenefits to consumers if there is any distortion of competition resulting in reduced provision by providers other than Eir.

A.4 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 Eir earning gross margins on CEI access sold in NBI in the commercial area

Within the commercial area, our main concern was that if Eir 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 Eir itself. This could both reduce the price of Eir's services using that shared CEI and also make access to CEI cheaper for competitors to Eir 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) mean that these effects cannot be assumed to be immaterial.

Inefficient incentives to shut down the copper network

Within the intervention area, we found that there were benefits in the per customer approach, but that this was infeasible and, therefore, only variations around the per operator approach were feasible. This is a limited change relative to the current position. In particular:

- To the extent that NBI causes costs specific to its usage related to enabling sharing, it faces these additional costs in their entirely (whereas under the status quo it only pays half of these);
- It would not contribute to common overhead costs, but this is of limited importance given ComReg's reclassification of some previous common costs are being incremental.

A.5 Impact assessment for the commercial area

Stakeholder	*mpact of move from status quo to sharer incremental cost based CEI access charges for NBI*
A: Impact on NBI	Reduced CEI access payments to Eir for transit through the commercial area used to backhaul patches of intervention area. 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.
B: Impact on customers of NGA services within the intervention area	Pricing of wholesale NGA services in the intervention area are set by reference to benchmark services in the competitive area. 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). We estimate that under the status quo approach, additional margins for Eir from sale of CEI access to NBI would increase as NBI built out. Although these might be a modest proportion of Eir's revenues from wholesale NGA services in the commercial area, there is some potential for prices of these services to be reduced as result.
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.

E: Impact on Eir profitability	Impacts on Eir'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 though the effect of periodic regulatory review, or due to competition. Under the status quo option, sales of CEI access to NBI would earn gross margins and cause a temporary increase in Eir profitability. Under the proposal, this would be avoided, as there would be no gross margins on CEI services sold to NBI.
F. Impact on customers of other Eir services within the CA	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.
G: Impact on other suppliers of services competing with Eir within the CA	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) Eir'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. This effect is material, as under the status quo approach additional margins for Eir earned by sales of CEI access to NBI within the commercial could be used to lower prices of Eir's services.

A.6 Impact assessment for the intervention area

Stakeholder	*Impact of move from status quo to per-operator plus CEI access charges for NBI*
A: Impact on NBI	Limited. Under the proposal, NBI faces the costs it causes.
B: Impact on customers of NGA services within the intervention area	No obvious effect. Pricing is set by reference to comparator services outside the intervention area.
C: Impact on customers of copper-based services within the intervention area	Limited. NBI makes a somewhat larger contribution to costs of shared CEI under the proposal, but this unlikely to lead to materially lower prices for copper services in the IA, not least as this would probably be incompatible with achieving copper switch-off.
D: Impact on State through subsidy requirements	Directly related to item A, so limited.
E: Impact on Eir profitability	Under the proposal Eir is fully compensated for any costs that NBI cause. Under the status quo, Eir bears half of the costs of enabling sharing of CEI assets.
F. Impact on customers of other Eir services within the CA	No obvious impact
G: Impact on other suppliers of services competing with Eir within the CA	No obvious impact

Annex B Cost sharing rules

In this annex, we explore the implications of various cost sharing rules for common CEI costs.

We first show that if common costs were split using an equi-proportionate mark-up (EPMU) rule, which is a commonly used regulatory approach, this amounts to splitting common CEI costs in proportion to relative revenue from copper and fibre networks.

Second, we show that use of a per-customer sharing rule for common CEI costs between separated copper and fibre networks can lead to a situation in which the timing of copper switch-off preferred by the copper network operator is, at least approximately, the same as an integrated operator would prefer.

Finally, we give some numerical examples and show that an EPMU and a per-customer sharing rule would in practice be fairly similar in effect.

EPMU-based sharing

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, gross 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 costs in proportion to relative numbers of customer lines, which we call *per-customer sharing*.

Copper switch-off and per customer sharing

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 $1 - x$ (where x is not necessarily fixed).

The critical number of lines at which it is cost effective to turn the copper network off is where

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

Therefore, 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 on copper switch-off. The CEI stays in place when the copper network is decommissioned and the fibre network then pays for all the CEI.

An integrated operator's shutdown decision

If we had a hypothetical 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 cost[58] of fibre service, c_f, rather than the wholesale price p_f. Therefore, an integrated operator would turn off the copper network when

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

There are two countervailing sources of bias to the copper network operator's delegated switch-off decision relative to the hypothetical integrated operator:

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

- First, the costs of migrating customers from copper to fibre faced by the copper network operator is higher than the true resource cost. This is because the wholesale price p_f for fibre services is higher than the increment cost c_f caused by migrating those customers. 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 copper switch-off, 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, the copper network operator avoids it'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 the copper network needs to pay so it has the same incentive to shut down as an integrated operator.

Efficient delegated shutdown

From the relationships above, we can see that in order for the copper network operator's 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

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

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 Eir as for an integrated provider. We can rearrange this to give

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

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

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

where $N_c^\star$ 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

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

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 $N_c^\star$, which is the number of copper lines at the point where integrated operator turns off the copper network, defined by equation (2)).

Reducing the information needed to implement the sharing rule

The difficulty with using (5) directly 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 $N_c^\star$). We ideally want a sharing rule for common costs that induces a separate copper operator to switch off at the efficient time without the 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 *actua*l number of copper lines at any time, rather than $N_c^\star$, 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 $N_c = N_c^\star$ 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 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 $s_c^\star = N_c^\star \backslash N$ 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

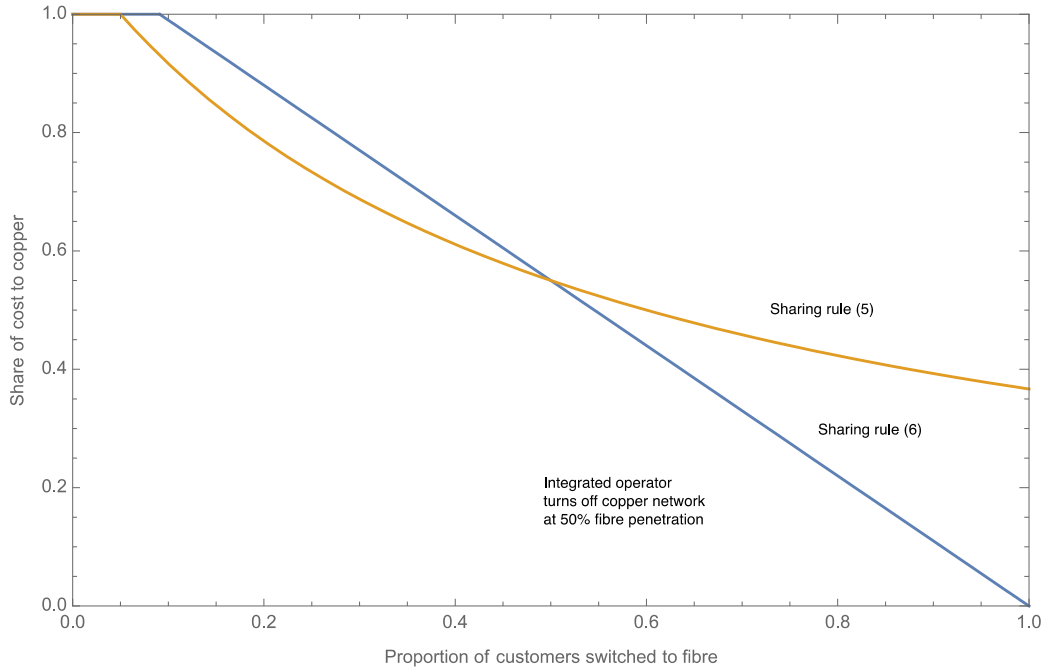
$$x = \frac{s_c^\star}{s_c^\star + s_f}\left(1 + \frac{F_f}{F}\right) \qquad (5')$$

and linear sharing rule (6) as

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

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 9: 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 (6') 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 with to give a reasonable approximate rule. With this sharing rule for common CEI costs, the decision can be fully left to the copper network operator and will result in approximately 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 a 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 copper switch-off. 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 Eir 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.

Numerical examples

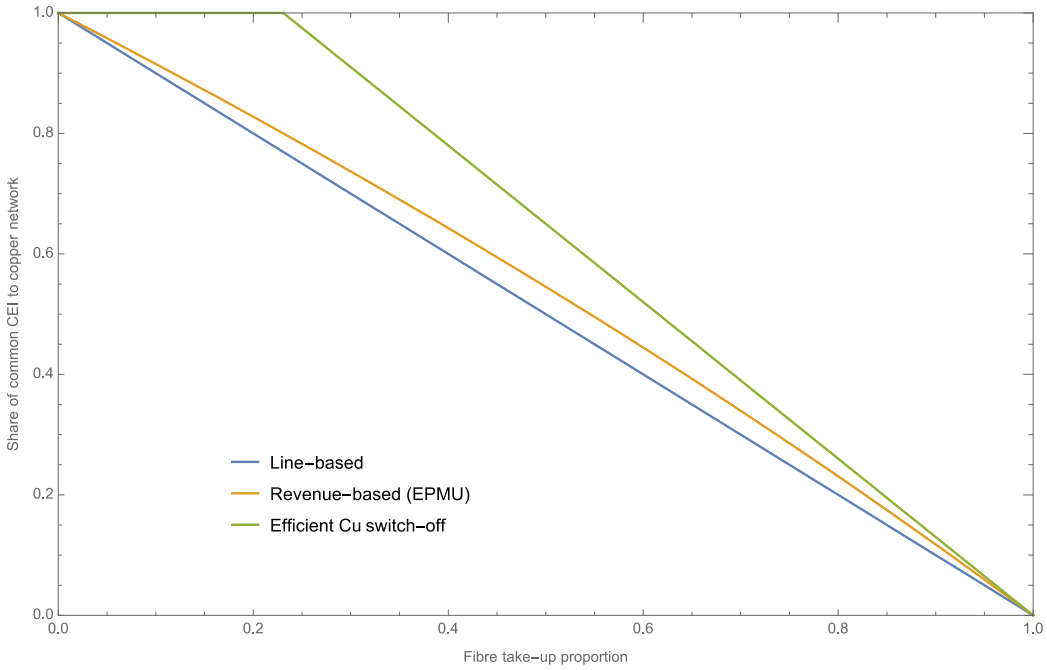
Comparison of sharing rules

By way of example, Figure 10 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 copper switch-off, 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 10: 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 eventually 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 Eir 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 a separated copper network operator has a weakened incentive to do so as a result of the contribution to recover common CEI costs being made by the

fibre opetion. This provides a rationale for the fibre network only making a contribution once a certain minimum penetration is met.

Annex C 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.[59]

In France the regulating authority has differentiated access pricing to CEI for fibre and copper services. Similarly, to Eir, 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 areas and a flat-rate in less dense areas.[60]

In January 22nd of 2009, the Spanish NRA, Comisión del Mercado de las Telecomunicaciones (CMT),[61] approved the definition and market analysis of the Wholesale Physical Network Infrastructure Access (Market 4).[62] In this Market Review, Telefónica was found to have SMP in Market 4 and similarly to the case of Eir was subject to a number of obligations such as cost orientation, cost accounting,

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

[60] 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

[61] Now part of the current Comisión Nacional de los Mercados de Competencia (CNMC)

[62] Resolución de 22 de enero de 2009 por la que se aprueba la definición y el análisis del mercado deacceso (físico) al por mayor a infraestructura de red (incluido el acceso compartido o completamentedesagregado) 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).

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 Telefonica's CEI.[63] Its revision was based on Telefonica's accounting data (HCA) while also including an element of benchmarking. Telefonica'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, Telefonica'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 CNMC[64], in which Telefonica'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 2019[65] 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.

[63] 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.

[64] 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)

[65] 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,[66] 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.

[66] 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 D 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.

Eir'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.

D.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 Eir'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 section[67] level for each MDF by computing the shortest path from each end-user to an SC and each SC to its MDF. Falling 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;
- Coper cables;
- Joints;

[67] 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 ducts 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.

D.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 Eir 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 its 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 Eir'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 factor[68] 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 Eir's Indexed Regulatory Asset Base (RAB) for reusable assets and by subsequently calculating an asset specific depreciation cost. To determine Eir's Indexed RAB ComReg uses Eir's Fixed Asset Register that provides a history of Eir'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 Eir'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 Eir's budgeted pole investment. In

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

addition, the model assumes that the annual re-investment each year increases with price trends.

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 Eir'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 Eir's cost data into direct, indirect and common cost categories.

The operating costs in the BU-LRAIC+ approach starts from Eir'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 model[69]. 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 Eir'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

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

Eir's existing copper access network. In turn, a higher LFI leads to a higher Headcount.

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.

D.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 service 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 primarily based on the cost of poles. The annual cost of poles includes 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.