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Quality of Service for WLR, MPF and GEA

Further consultation on proposed quality of service remedies

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CONSULTATION:

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About this document

This document follows our consultation on Quality of Service for WLR, MPF and GEA, published in March 2017 as part of our reviews of the narrowband and wholesale local access markets (the 'March 2017 QoS Consultation').

It sets out some changes to our proposals for regulating the quality of Openreach's services that are used by telecommunications companies to provide broadband and telephone services to consumers and businesses. Most retail providers of broadband and telephone services in the UK (excluding the Hull Area) rely on access to Openreach's network to deliver these services.

Our proposed changes follow consideration and analysis of further evidence about Openreach's operational capabilities and the level of resource likely to be required to achieve higher service standards, as well as our forecast of the reliability of the access network.

Together with responses to our March 2017 QoS Consultation, we will take into account all responses to this further consultation before reaching our final conclusions on what quality of service regulation should apply to Openreach's wholesale broadband and telephone services. We expect any new proposals to come into effect from 1 April 2018.

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1. Executive summary

Strategic context and market reviews

1.1 In March 2017, as part of our Wholesale Local Access (WLA) and Narrowband market reviews, we proposed tougher binding quality of service obligations on Openreach that would require it to repair more network faults, and install more new connections, on time.[1] This followed our Strategic Review of Digital Communications, which identified the need for urgent improvements to ensure all phone and broadband companies provide the service quality customers expect, and set out our strategy to deliver a step change in quality of service.[2]

Quality of service remedies proposed in March

1.2 We proposed that Openreach should be subject to binding quality of service standards for fault repairs and installations in respect of all the main phone and broadband services used in homes and businesses, including fibre to the cabinet (FTTC) superfast broadband. The main proposals were that by 2021:

- Openreach must complete 93% of fault repairs within one or two working days, depending on the service level the telecoms provider chooses. This is an increase on the current requirement of 80%.
- Connections should be installed on the date agreed between Openreach and the telecoms provider on 95% of occasions, up from 90% now.
- In cases where an engineer visit is needed to install a connection:
  - Openreach must provide an appointment for installations within ten working days of being notified (currently twelve working days); and
  - Openreach must offer a ten working day appointment date 90% of the time rather than the current 80%.

Modifications to our March proposals based on new evidence

1.3 We received comments from stakeholders on many different aspects of our March proposals. In particular, Openreach provided new evidence on the following issues:

a) The level of repair performance it is operationally feasible to achieve;

b) The extra resources associated with meeting our proposed standards; and

[1] Ofcom, 2017. *Quality of Service for WLR, MPF and GEA: consultation on proposed quality of service remedies*. https://www.ofcom.org.uk/consultations-and-statements/category-1/quality-of-service.
[2] Ofcom, 2016. *Initial conclusions from the Strategic Review of Digital Communications*. https://www.ofcom.org.uk/phones-telecoms-and-internet/information-for-industry/policy/digital-comms-review/conclusions-strategic-review-digital-Communications. We set out our strategic plans to bring about a step change in quality of service including: introducing transparent information on service quality; automatic compensation for customers when things go wrong; and tougher performance requirements for the installation and repair of network connections that Openreach undertakes on behalf of telecoms providers.

c) Its plans for preventative maintenance on the copper access network.

1.4 In the light of our assessment of this evidence to date, we are consulting further on the following specific issues:

a) A revised proposal for a binding quality standard for 'on-time' fault repair;

b) A revised estimate for the resource impact of our proposals; and

c) A revised forecast of fault rates to take account of Openreach's investment plans aimed at reducing faults on the copper network.

Revised binding quality standards for fault repairs

1.5 A key consideration in setting binding standards for Openreach's fault repair performance is understanding the likely limits of Openreach's operational capabilities. In practice, some repair work can take longer than expected for many different reasons and it may not be feasible for Openreach to complete the repair on time.

1.6 In proposing to set a repair standard in March, we requested information from Openreach about the operational limits to its ability to repair services in line with the service level agreements it has with its customers (i.e. on time). Openreach provided us with information that approximated this limit, and we based our proposals on our analysis of this approximation. Subsequently, Openreach has provided us with new evidence that relates more directly to its ability to repair services on time. We have analysed and tested this evidence and believe it provides us with a better view of the limits of Openreach's operational performance.

1.7 Consequently, we believe our March proposals for fault repair are unlikely to be achievable over the period covered by the Narrowband and WLA market reviews, and we have refined our proposals as set out in Table 1.1 below.

Table 1.1: Revised proposals for Openreach's fault repair performance within SLA standards (excluding adjustment for *force majeure*[3])

	Current level	First year (2018/19)	Second year (2019/20)	Third year (2020/21)
Repair completion within SLA timescale	80%	83%	86%	88%

Source: Ofcom.

[3] A fixed allowance of 3% on repair standards to take account of events such as severe storms and flooding which are beyond Openreach's reasonable control.

Changes to our proposed view on extra resources needed to meet higher standards

1.8 In developing our March proposals, we recognised that improvements in service quality would likely require an increase in engineering resources. We therefore asked Openreach to provide resource estimates for us to consider. Because Openreach did not provide this information in time, we proceeded with our own model of the implications for resources and costs. We then asked consultants Analysys Mason to help us refine our model further. We presented the results in our March consultation.

1.9 Since publishing our consultation, Openreach has provided us with its resource estimate model. Openreach has submitted that the increased resource required to meet our proposed standards is materially higher than the estimate on which we consulted.

1.10 To assess whether Openreach's model of increased resource is robust, we have asked Analysys Mason to conduct an audit of the model's integrity and any potential biases in it. Analysys Mason's report is published with this consultation. At a high level, Analysys Mason considers that Openreach's model is well constructed, and addresses some of the limitations of our own model. However, the model is reliant on inputs that Analysys Mason have not been able to verify. Also, it does not allow for the sharing of resources between Openreach's operating units during times when demand for provisions and repairs may be exceptionally high in some areas. Furthermore, Analysys Mason's audit has determined that much of the additional detail in the Openreach model does not materially affect the overall results. The subsequent complexity also results in less transparency, a more problematic estimation process, and in some cases generates counterintuitive results. Analysys Mason advises that we should treat the results of the Openreach model with caution.

1.11 We recognise that this type of modelling is complex and challenging. Having considered Openreach's model, which we view to be more representative of some aspects of operational reality than the Ofcom model, and based on consultation responses, we propose to base our judgement on the resources required to meet our proposed standards on a range of sources.

1.12 Therefore, we have made adjustments to the model we used for our March 2017 consultation. We have used this to estimate a range for the extra resources Openreach would require. Running the Openreach model has provided a result that falls within our range, and which we are consequently confident to use as our base case. The range and the base case are set out in Table 1.2 below.

Table 1.2: Revised resource increase required to meet our proposed quality of service standards by 2020/21

	March 2017 Proposal	Current Proposal	Resource Uplift
		Base case	Range
Increase in resources from 2015/16	8%	11%	9-14%
Repair completion within SLA timescale	93% repair on time	88% repair on time	

Source: Ofcom.

Forecast fault rates

1.13 Our March proposals included an assessment of fault rates on Openreach's network over the next few years. We looked at fault trends over the last five years, using data provided by Openreach, and overlaid on this the estimated impact of Openreach's investment in proactive maintenance of the network.

1.14 Further evidence provided by Openreach indicates that our original proposals overestimated the likely reduction in fault rates over the next few years, primarily because the effects of Openreach's investments in preventative maintenance are likely to be materially lower than we thought. We have updated our analysis to take into account the new evidence provided by Openreach on its actual plans, which also reflect its operational experience over the last year. This means we are now forecasting a smaller reduction in fault rates over the market review period.

New result from our charge control models

1.15 The refinements to our March proposals for quality of service have an impact on our proposals for regulated charges.[4] Table 1.3 below sets this impact out.

[4] Ofcom, 2017. *Wholesale Local Access Charge Control, Further consultation*. https://www.ofcom.org.uk/consultations-and-statements/category-2/wla-market-review-further-consultation-on-charge-control.

Table 1.3: Outputs from charge control models for QoS proposals – Impact on unit costs per annum in 2020/21

	Fault reduction[5]	Higher standards	Total
MPF rental SML 1	(£1.59)	+£0.83	(£0.76)
GEA 40/10 rental SML 2	(£0.43)	+£0.60	+£0.17

Source: Ofcom.

Consultation and next steps

1.16 We invite stakeholders to comment on these proposals and to review any previous responses in light of these changes. We have not at this stage taken any decisions in relation to other aspects of the proposals set out in our March 2017 QoS Consultation. We are currently considering all consultation responses and undertaking further analysis before deciding on appropriate next steps.

1.17 We will take into account all responses, including those received in response to the March 2017 QoS Consultation, before making our final decisions.

1.18 This further consultation runs for six weeks and the deadline for response is 26 October 2017. Annex 1 provides further details on how to respond.

1.19 We aim to publish our final conclusions in early 2018.

[5] We have identified a methodological issue with the calculation of the benefits of fault reduction in our March 2017 consultation. This has been amended in our current proposal. For further details refer to the accompanying charge control consultation.

2. Introduction

Background

2.1 Homes and businesses rely on broadband more than ever before. This means that when things go wrong it is not just frustrating and inconvenient – it can cause real financial and non-financial harm. We highlighted how urgent improvements are needed to ensure that all phone and broadband companies provide the service quality that customers expect in the initial conclusions of our Strategic Review of Digital Communications in 2016 ('the Strategic Review').[6] Since then, we have introduced transparent information on service quality so customers can compare performance[7], set out plans for automatic compensation for customers when things go wrong[8] and proposed tougher quality standards on Openreach. This document concerns the latter.

2.2 We published proposals for imposing new quality of service (QoS) standards on Openreach in March 2017 (the 'March 2017 QoS Consultation').[9] These proposed regulations formed part of a broader package of proposed requirements which include imposing obligations on BT to continue to provide telecoms providers with access to its network.[10] This package of proposals seek to address the competition concerns we have identified having provisionally found that BT has significant market power (SMP) in the wholesale fixed analogue exchange line (WFAEL) and wholesale local access (WLA) markets in the UK excluding the Hull area.

2.3 Most telecoms providers rely on access to BT's network to deliver broadband and telephone services to their customers which they do by renting wholesale fixed access line products from Openreach.[11] The main products are:

- Wholesale Line Rental (WLR), which allows telecoms providers to rent telephone lines on wholesale terms from BT and resell the lines to customers, providing a single bill that covers both line rental and, when combined with a wholesale calls product, voice calls;
- Metallic Path facility (MPF), which allows telecoms providers to rent copper access lines on wholesale terms from BT and connect these lines to their own electronic equipment to offer voice and broadband services to customers; and

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[6] Ofcom, 2016. *Initial conclusions from the Strategic Review of Digital Communications*. https://www.ofcom.org.uk/phones-telecoms-and-internet/information-for-industry/policy/digital-comms-review/conclusions-strategic-review-digital-Communications.
[7] Ofcom, 2017. *Comparing service quality. The performance of broadband, landline and mobile providers in 2016*. https://www.ofcom.org.uk/phones-telecoms-and-internet/advice-for-consumers/quality-of-service/report.
[8] Ofcom, 2017. Consultation. *Automatic compensation. Protecting consumers from quality of service problems*. https://www.ofcom.org.uk/consultations-and-statements/category-1/automatic-compensation.
[9] Ofcom, 2017. Consultation. *Quality of service for WLR, MPF and GEA. Consultation on proposed quality of service remedies*. https://www.ofcom.org.uk/consultations-and-statements/category-1/quality-of-service.
[10] Part of our current reviews of the wholesale local access (WLA) and narrowband markets.
[11] Notable exceptions include Virgin Media who provide services over its cable network which is less extensive than BT's national network and telecoms providers in the Hull area where the municipal network is run by KCOM.

- Generic Ethernet Access (GEA), BT's wholesale product providing telecoms providers with access to BT's fibre networks (FTTC[12] and FTTP[13]) to supply higher speed broadband services.

2.4 Openreach installs and maintains different types of connections to BT's network on behalf of telecoms providers.[14] Openreach was created as a functionally separate division of BT Group in 2005 and gave legally binding undertakings to us to provide telecoms providers with equality of access to parts of BT's network least likely to be subject to competition. BT has recently committed to further reforms to Openreach to address competition concerns set out in our Strategic Review. It will become a distinct company with its own staff, management, strategy and purpose to serve all its customers equally.[15]

2.5 Section 2 of our March 2017 QoS Consultation provides further detail on the background.

Approach to regulating quality of service

2.6 We set out our proposed approach to regulating quality of service in Section 3 of the March 2017 QoS Consultation. By way of context for the proposals contained in this document, the following provides a summary of our proposed approach in relation to the appropriate level of quality standards.

2.7 Openreach's performance in maintaining the condition of the access network, installing connections to order and fixing network faults swiftly, is very important to stakeholders. Greater numbers of faults, slower resolution of those faults and long delays to the installation of fixed broadband and voice services cause harm and frustration to customers. Inadequate Openreach quality of service also potentially undermines the effective functioning of the network access remedy with adverse consequences for retail competition by, for example, disincentivising customers from switching providers.

2.8 In competitive markets, customers' ability to switch providers creates a signal for providers to choose a cost-quality trade-off that will suit its customers and help attract others. However, in the case of wholesale fixed access markets, Openreach is unlikely to receive such signals, as customers generally cannot switch to alternative networks. In addition, lack of competitive pressure may result in Openreach having little incentive to innovate to find ways of improving quality of service. There is also the potential for discriminatory conduct such as Openreach providing BT divisions with better quality of service than it provides to their rivals.

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[12] Fibre to the cabinet.
[13] Fibre to the premises.
[14] Openreach does not have an operational presence in Northern Ireland; instead, BT Northern Ireland Networks acts as the delivery agent for Openreach and BT Wholesale & Ventures. Our proposals for quality of service regulation also apply to BT in Northern Ireland. For simplicity, we refer to Openreach throughout as the operator of BT's access network.
[15] Ofcom, 2017. *Delivering a more independent Openreach. Statement on releasing the BT Undertakings pursuant to section 154 Enterprise Act 2002*. https://www.ofcom.org.uk/consultations-and-statements/category-3/delivering-a-more-independent-openreach.

2.9 In our previous review of wholesale fixed access markets (the 2014 FAMR[16]), we found that Openreach's service performance had declined over several years, particularly in relation to fault repair and installing WLR and MPF services. We concluded that the prevailing regulatory[17] and contractual framework to ensure appropriate service standards had not been sufficient to prevent material detriment to downstream competition in fixed access markets, arising out of BT's SMP. We therefore intervened by imposing minimum quality of service standards for the installation and repair of WLR and MPF under our powers to set regulations on providers found to have SMP. These regulated service standards were additional and complementary to existing regulations aimed at ensuring quality, such as requirements that the SMP provider offers contractual service level agreements (SLAs), service level guarantees (SLGs) and provides transparency of its service performance (for example, by publishing certain key performance indicators (KPIs)).

2.10 The quality of service standards we introduced in 2014 required Openreach to speed up broadband and telephone repairs and installations to specified levels. Should Openreach fall short of those standards we could impose financial penalties of up to 10% of relevant turnover. These rules (the first of their kind imposed on BT) sought to arrest unacceptable performance and restore it to previous levels. Openreach has met the standards we imposed and service performance has improved but we consider that the standards need to be updated with the three factors below considered.

Benefits to customers and telecoms providers

2.11 Setting higher standards on repairs and installation times provides direct benefits to customers and telecoms providers because both parties spend fewer days waiting for a repair or an installation. In addition, we believe that more challenging repair standards are likely to lead to stronger incentives on Openreach to reduce faults, which will in turn lead to further benefits for customers and telecoms providers.[18]

2.12 Quality standards also provide more certainty over the level of service that will be received from Openreach. Having a sufficient degree of certainty over the speed of repairs and installations is important in the functioning of retail competition. It allows telecoms providers to plan their strategies for delivering retail services.

2.13 We think that it is important that Openreach meets any target repair or installation time in a very high proportion of cases. As a rule of thumb and subject to the other factors below, we consider that a standard of at least 90% is necessary to provide telecoms providers with a sufficient degree of certainty.

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[16] Ofcom, 2014. *Fixed access market reviews: wholesale local access, wholesale fixed analogue exchange lines, ISDN2 and ISDN30. Volume 1: Statement on the markets, market power determinations and remedies*. https://www.ofcom.org.uk/phones-telecoms-and-internet/information-for-industry/telecoms-competition-regulation/narrowband-broadband-fixed/fixed-access-market-reviews-2014/statement.

[17] In particular, the obligation on Openreach to provide products and services equivalently to all telecoms providers including levels of quality of service.

[18] We refer to the consumer research and studies set out from paragraph 3.32 of our March 2017 QoS Consultation.

Openreach's operational capabilities

2.14 We also consider Openreach's technical capabilities to make improvements and the time it will take to achieve them. It is unlikely to be economically efficient or even practically possible for Openreach to meet its SLAs 100% of the time. This is because certain jobs require complex civil engineering work and can only be done within the relevant SLA at very high cost, if at all. In addition, the inherently volatile and unpredictable nature of fault and installation volumes makes it difficult to eliminate all field resourcing failures.[19]

2.15 We propose to set standards that are stretching enough to drive Openreach to make improvements, but that are not so high that they are unachievable. We also take into account the additional engineering resources Openreach may need to recruit, and the time required for Openreach to achieve those staffing levels and for the newly recruited or retrained engineers to become competent. This is particularly relevant to our proposals for the period of time over which the quality standards will increase.

Costs to customers and telecoms providers

2.16 We would be concerned if higher quality standards led to materially higher prices for customers as our evidence indicates that value for money is an important factor for many customers although it also shows a wide range of customer preferences about paying for better service.

2.17 Telecoms providers have a choice over the standard of quality they purchase from Openreach. In particular, in relation to repairs, Openreach supplies products with differing SLA commitments on repair times (referred to as 'service maintenance levels' or 'SMLs'). This means that telecoms providers can select the price/quality trade off most appropriate to their customers.

2.18 Thus, while we want to ensure that our proposals do not impose unavoidable costs on telecoms providers and customers that are out of line with the benefits they receive, telecoms providers should be free to choose the standards they require for their customers themselves. However, we believe that telecoms providers require a high degree of certainty over the quality they receive if they are to make a meaningful choice between different service levels. We believe that the best way to provide them with this certainty is by setting quality standards which require Openreach to meet a target level of quality a high proportion of times.

Summary of our March proposals

2.19 The aim of our regulatory proposals is to incentivise Openreach to improve the quality of service it delivers to telecoms providers and, through them, to phone and broadband

[19] As set out in Section 5 of our March 2017 QoS Consultation, field resourcing failures occur when workload (volume and nature of repair and installation demand) exceeds the field engineering resource planned to be available on any given day.

customers. In proposing regulation which sets specific levels of service performance, we seek to strike an appropriate balance between benefits for competition and customers, operational capabilities and costs as discussed above.

2.20 In summary, we proposed the following standards for fault repairs and installations in our March 2017 QoS Consultation.

Binding quality standards for fault repairs

2.21 In our March 2017 QoS Consultation, we proposed that by 2021 Openreach must complete 93% of fault repairs within one or two working days, depending on the service level the telecoms provider chooses. To protect those customers that fall outside the 93%, we proposed that Openreach be required to complete 97% of repairs within no later than six or seven days dependent on the service level. This is summarised in Table 2.1 below.

Table 2.1: Our March proposed binding quality standards for repair (WLR, MPF and GEA-FTTC)

	Current standard November 2016 to March 2018	March 2017 proposed new standard Year 3 (2020/21)
% of repairs to be completed within 1 or 2 working days depending on Service Level (Adjusted standard for *force majeure*)	80% (77%)	93% (90%)
% of repairs to be completed within Service Level timescales + 5 working days	N/A	97%

Source: Ofcom.

2.22 We proposed that these quality standards for fault repairs apply to all main phone and broadband services used by homes and businesses, including FTTC superfast broadband.

Approach to fault reduction

2.23 Improvements to the reliability of the Openreach maintained network would be beneficial for both telecoms providers and their customers.

2.24 We set out our view that our proposal for more demanding repair standards (summarised above) would provide Openreach with a strong incentive to address the reliability of the network by increasing its capital expenditure in this area.

2.25 We welcomed Openreach's plans to invest in the health of the network but did not propose to make any additional capital expenditure allowance in this review for this programme over and above what we considered appropriate for the maintenance of an ongoing efficient network providing a good quality of service.

2.26 We proposed that BT only be allowed to recover maintenance costs consistent with the faults target it had set itself.

Binding quality standards for installations

2.27 In our March 2017 QoS Consultation we proposed that by 2021 connections should be installed on the date agreed between Openreach and the telecoms provider on 95% of occasions (up from 90% now). See Table 2.2 below.

Table 2.2: Our March proposed binding quality standards for installation date certainty (WLR, MPF and GEA-FTTC)

	Current standards	Proposed new standards Year 3 (2020/21)
% of installations to be completed by the committed date	90%	95%
(Adjusted standard for *force majeure*)	(89%)	(94%)

Source: Ofcom.

2.28 As set out in Table 2.3 below, in cases where an engineer visit is needed to install the connection, we proposed that by 2021:

- Openreach provide an appointment for installations within ten working days of being notified (currently 12 working days); and
- Openreach offer a ten working day appointment date 90% of the time rather than the current 80%.

Table 2.3: Our March proposed binding quality standards in relation to first available appointment date for installations requiring an engineer visit (WLR, MPF and GEA-FTTC)

	Current standards	Proposed new standards Year 3 (2020/21)
Number of working days offered for installation appointments	12	10
Frequency with which regulated installation appointment date must be offered	80%	90%
(Adjusted standard for *force majeure*)	(79%)	(89%)

Source: Ofcom.

2.29 Further detail on these and other quality of service proposals can be found in our March 2017 QoS Consultation.

Regulatory framework

2.30 This further consultation sets out some changes to our proposals, published in our March 2017 QoS Consultation, to make specific directions under the SMP conditions that we have

proposed to impose as part of our 2016 Narrowband Market Review (NMR) Consultation[20] and the March 2017 WLA Consultation[21] in order to address the position of SMP which we provisionally found BT to hold. Ofcom's duties and powers in relation to the carrying out of market reviews and the analytical framework that we apply are set out in the 2016 NMR Consultation (Section 2 and Annexes 10 and 11) and the March 2017 WLA Consultation Volume 1 (Section 2 and Annexes 5 and 6).

Impact Assessment and Equality Impact Assessment

2.31 The further analysis presented in this document constitutes an impact assessment as defined in Section 7 of the Communications Act 2003.

2.32 Impact assessments provide a valuable way of assessing the options for regulation and showing why the chosen option was preferred. They form part of best practice policy-making. This is reflected in section 7 of the Act, which means that, generally, we have to carry out impact assessments in cases where our conclusions would be likely to have a significant effect on businesses or the general public, or where there is a major change in Ofcom's activities. However, as a matter of policy Ofcom is committed to carrying out impact assessments in relation to the great majority of our policy decisions.[22]

2.33 Ofcom is required by statute to assess the potential impact of all our functions, policies, projects and practices on race, disability and gender equality. EIAs also assist us in making sure that we are meeting our principle duty of furthering the interests of citizens and consumers regardless of their background or identity. Annex 12 of the 2016 NMR Consultation and Annex 7 of the March 2017 WLA Consultation set out our EIAs in relation to our proposals including quality of service remedies.

Structure of this further consultation

2.34 This further consultation is structured as follows:

- Revised proposals for the level of on-time repairs (Section 3);
- Revised resource uplifts for proposed quality standards (Section 4);
- Revised proposals for network fault rates (Section 5); and
- Proposed quality of service remedies (Section 6).

2.35 We also rely on our assessment of the resource implications of the proposed quality standards in Annex 5 and a report by Analysys Mason which is published alongside this further consultation and is available at

[20] Ofcom, 2017. *Wholesale local access market review*. https://www.ofcom.org.uk/consultations-and-statements/category-1/wholesale-local-access-market-review.
[21] Ofcom, 2016. *Narrowband Market Review*. https://www.ofcom.org.uk/consultations-and-statements/category-1/narrowband-market-review.
[22] Ofcom, 2005. *Better Policy Making: Ofcom's approach to Impact Assessment*. https://www.ofcom.org.uk/consultations-and-statements/better-policy-making-ofcoms-approach-to-impact-assessment.

https://www.ofcom.org.uk/__data/assets/pdf_file/0013/106312/model-assessment-wlr-llu-quality-service.pdf.

2.36 Annex 6 updates the draft legal instrument in line with the proposals in this further consultation.

2.37 Finally, Annexes 1-4 provide information relating to responding to this consultation.

3. Revised proposals for the level of on-time repairs

Introduction

3.1 This section sets out our revised proposals for *ex ante* quality standards for fault repair over the period 2018/19 to 2020/21. It draws on our approach to quality of service (QoS) regulation,[23] Openreach's recent repair performance,[24] and, importantly, new evidence from Openreach on the operational limitations it faces in repairing faults within one or two days (i.e. the contractually agreed service level timescales on which our proposed quality of service regulation is based).

3.2 As described in Section 6, we consider that the revised proposals set out in this section would achieve our statutory duties and satisfy the relevant legal tests. This further consultation on the level of on-time repairs is focused specifically on the *levels* of the standards, which we have revised in the light of the new evidence provided to us by Openreach. Other aspects of our proposals remain as set out in our March 2017 QoS Consultation. We will consider those other matters arising from stakeholder responses to our March proposals (together with responses to this consultation) in reaching our conclusions, which we will set out in our final statement.

Original proposals

3.3 In the 2016 NMR Consultation and March 2017 WLA Consultation, we proposed SMP conditions to remedy our competition concerns, having provisionally found BT to have SMP in wholesale fixed access markets. These proposed conditions include a requirement that BT comply with such quality of service requirements as we direct from time to time. In our March 2017 QoS Consultation, we proposed to exercise that power by issuing a direction setting, among other things, binding quality standards for the proportion of repairs that BT must complete within service level agreement (SLA) timescales – i.e. on time. These timescales relate to Openreach's two most consumed repair service packages for WLR, MPF, and GEA-FTTC: Service maintenance level 1 (SML 1) – repair by the end of the day after next (i.e. two working days)[25] and SML 2 – repair by the end of the next day (i.e. one working day).[26] The proposed standards on which we consulted in March are shown in Table 3.1.

[23] Detailed in Section 3 of our March 2017 QoS Consultation.
[24] Detailed in Annex 6 of our March 2017 QoS Consultation.
[25] SML 1: Fault clear by 23:59 day after next. Monday to Friday, excluding public and bank holidays.
[26] SML 2: Fault clear by 23:59 next day, Monday to Saturday, excluding public and bank holidays.

Table 3.1: Our March proposed standards for repairs completed within SLA timescales

	Current level	First year (2018/19)	Second year (2019/20)	Third year (2020/21)
Repair completion within SLA timescales	80%	83%	90%	93%
(Adjusted for *force majeure*)	(77%)	(80%)	(87%)	(90%)

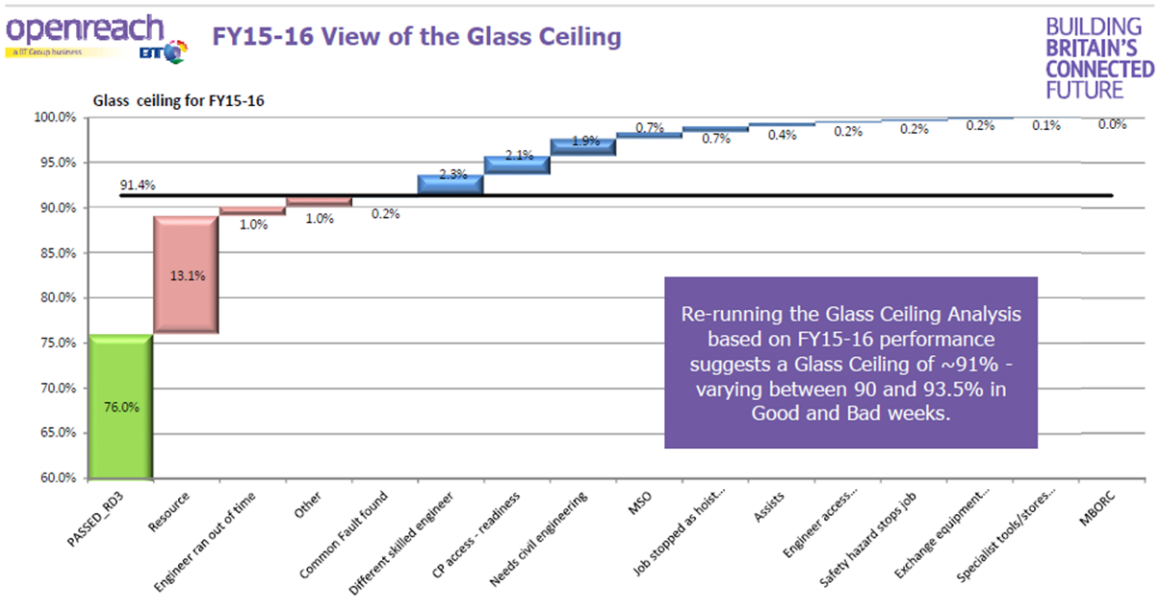
Source: Ofcom.

Operational capabilities

Our March 2017 QoS Consultation analysis

3.4 In determining the levels of the proposed repair standards, we considered a number of factors, including Openreach's operational capabilities. We acknowledged that Openreach cannot meet every one of its service commitments all of the time given the nature of the network and the faults that are reported. We explained that it would be disproportionate to set a regulatory repair standard at a level higher than that which is operationally achievable. For our assessment of Openreach's operational capabilities we obtained and reviewed Openreach's information about the incidence of 'on the day' fault repair failures (i.e. something going wrong while its engineers are working on repair jobs) in 2015/16 to investigate the causes of those failures. This is shown in Figure 3.2 below, which sets out Openreach's then view of what it called the 'glass ceiling'.

Figure 3.2: Openreach pre-consultation view of the repair glass ceiling (2015/16)[27]



Source: Openreach.

3.5 While Openreach acknowledged that there was scope for it to make improvements (i.e. some of the reasons why repairs are not completed on the day could be addressed and removed), at the time of our March 2017 QoS Consultation it had not provided us with any detail about the extent of this. We therefore relied on our own estimates concerning the scope for improvements in making our proposals.

3.6 As illustrated in Figure 3.2 above by the red bars,[28] Openreach considered that 15.3% of the on the day failures were mostly due to factors within its control, primarily field engineering resources. On the basis of this information, we considered that, with additional resources alone, and without changes to working practices, it would be operationally feasible for Openreach to achieve an on-time repair performance of over 90%. We also noted that on the day failures did not translate directly to SLA performance; for example, because it would be possible to complete some repairs on a further attempt within the SLA timescales (either later the same day, or on the following day). We therefore considered that the upper bound of performance against SLA would be higher than that for on the day performance.

3.7 Further, we considered that there were incremental improvements that Openreach could make to current processes (such as engineer multi-skilling, better fault diagnostics, and wider availability of specialist equipment) over the three-year market review period such that it would able to achieve an even higher operational limit. Factoring in our own estimates for the realisation of these process improvements, our analysis indicated that

[27] Figure 5.6 on page 54 of our March 2017 QoS Consultation.
[28] The items: resource, engineer ran out of time, other, and common fault found.

the upper bound of on-time repair performance taking Openreach's operational limitations into account could reach 96.6%.

3.8 We considered that this figure would serve as an appropriate ceiling to use in setting the repair standard. Taking this and other factors into account in line with our approach to setting levels for quality of service standards, we proposed a standard of 93% for on-time repair performance, which was in the middle of our 90% to 96% range.[29]

New analysis from Openreach on operational capabilities

3.9 Together with its response to our March 2017 QoS Consultation, Openreach has provided a new analysis of failures against its repair SLAs, which it considers gives a more accurate view of the operational limits to its repair performance. Openreach has restructured its analysis with the following key changes:

- Openreach has considered all events and visits that take place from the point of receiving a fault report to the point of fault clearance. Its previous analysis just analysed what happens on the first engineering visit;
- Openreach has split customer-caused issues between: (i) faults for which an engineer visit to a customer's premises was arranged (i.e. appointed faults); and (ii) faults for which such an engineer visit was not arranged (i.e. non-appointed faults) but, after carrying out testing of the network, the engineer determined that access to the customer's premises would be required to restore service;[30]
- Openreach has carried out a much more detailed examination of the proportion of jobs that fail and why, and revised its view on how failure scenarios (such as long duration or complex faults, or the need for a hoist) contribute to operational limitations; and
- Openreach has considered situations where jobs fail against multiple criteria, identifying the primary barrier for resolution against a specified order of precedence.[31]

3.10 In light of these changes, Openreach's appraisal of its operational capabilities first maps the stages a fault report goes through (by looking at all activities required to clear a fault) in order to make the best assessment of the operational limit of its performance, including third party interactions[32] and engineering visits. It then identifies the primary cause of failure to clear each fault report, which involves allocating each repair job to a single failure scenario (even though, in reality, some repair jobs are held up for more than one reason). Next, Openreach presents the results in a 'waterfall' format for ease of explanation.[33]

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[29] We considered that a 93% standard represented a proportionate yet stretching target that will result in benefits for competition and customers in the form of greater certainty and improved repair times.
[30] Referred to in this section as 'CP access/readiness' issues.
[31] This impacts Openreach's operational limitations as resolving one cause of failure will not necessarily turn the associate block of outcomes from failure to success. In practice, these "edge cases" will be converted from failure into a mixture of successes and different failures.
[32] For example, sometimes Openreach will need to need to obtain agreement from landowners, local authorities, or highway authorities to carry out its work.
[33] And as they did previously. See Figure 3.2.

3.11 Our view is that Openreach's new analysis has a number of features which represent improvements on the information we relied upon for the purposes of our March 2017 QoS Consultation. For example, the new analysis of operational capabilities seeks to determine the reasons for failure against the SLA rather than the reasons why a repair attempt failed 'on the day'. This avoids the need to perform additional calculations to estimate the operational limit in SLA terms. The further analysis is also more detailed exposing additional failure categories such as Reject Clear[34] (as discussed in more detail below).

3.12 Further, Openreach's new analysis covers every SLA failure over multiple years, 2014/15, 2015/16, and 2016/17, rather than relying on a sample within a single year as used before. We consider that Openreach has produced a much more comprehensive and reliable approach to defining the reasons for repair SLA failures, accounting for the fact that some fault causes are not mutually exclusive.[35] It also examines multiple sources of operational data, including engineer instructions in the field, and determines the primary cause of failure by means of a hierarchy – e.g. Openreach looks to identify intractable failures, such as safety hazards or network damage, before considering failures possibly within its control like the need for specialist tools or skills.

3.13 Figure 3.3 below shows the new waterfall chart reflecting Openreach's revised analysis of repair SLA failures in 2016/17. This puts the current operational limit to performance at 88.7%. Openreach has also divided the failure categories into two groups: those that are to some extent within Openreach's power to influence;[36] and those that are either not addressable or very unlikely to reduce.[37] On this basis, Openreach estimates the theoretical upper bound to its repair performance to be 92.6%. However, Openreach does not believe it is practical to completely eliminate all failures in the partially addressable category, nor, in its view, would doing so represent value for money. Openreach therefore argues that the practical operational limit to performance lies within the range 88.7% to 92.6%.

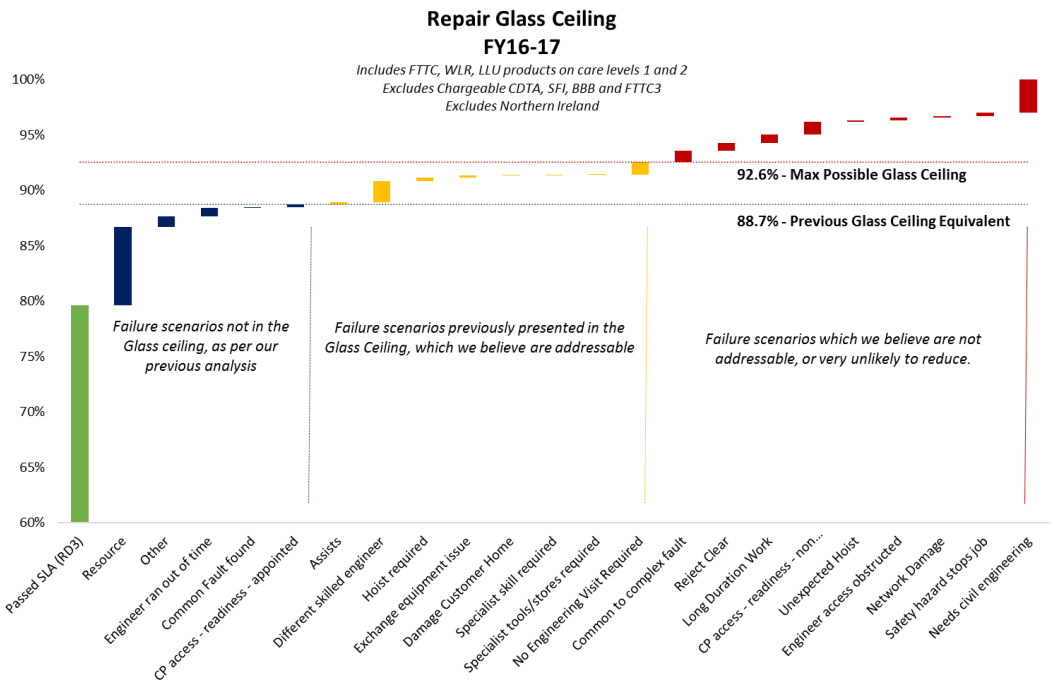
[34] When faults are resolved, Openreach will notify the telecoms provider that the fault is cleared. It is then the responsibility of the telecoms provider to contact its customer and confirm that the problem has been solved to their satisfaction. Telecoms providers can then accept the clear notification update or reject it within a 48-hour window should the end customer advise them that they are not satisfied the fault has been repaired.

[35] According to page 57 of its response to our March 2017 QoS Consultation, 56% of faults in Openreach's revised glass ceiling analysis fail on multiple criteria. See Openreach, 2017. *Quality of Service for WLR, MPF and GEA. Response to Ofcom's Consultation on proposed quality of service remedies.* https://www.ofcom.org.uk/__data/assets/pdf_file/0013/105115/Openreach.pdf.

[36] 'Amber failure scenarios' include the need for a different skilled engineer, a hoist, or specialist tools.

[37] 'Red failure scenarios' include engineer access being obstructed or network damage.

Figure 3.3: Openreach revised view of the repair glass ceiling (national level for 2016/17[38])



Source: Openreach[39]

3.14 While Openreach does not consider it possible to raise the so-called glass ceiling to the level we suggested in the March 2017 QoS Consultation (i.e. 96.6%), it agrees with our view that several key areas of failures are at least partly addressable through operational and process improvements. As shown in Table 3.4 below, Openreach has quantified what improvements (both planned and potential) it estimates could be made to current operational limitations either by itself or through agreement with telecoms providers. Openreach estimates that following improvements made on its side, its operational capabilities could rise to 90.8%, although any further upward shifts would require action from telecoms providers.

[38] Excluding Northern Ireland.

[39] Openreach, Response to Ofcom's Consultation on proposed quality of service remedies, 19 June 2017, Figure 22, page 61, https://www.ofcom.org.uk/__data/assets/pdf_file/0013/105115/Openreach.pdf.

Table 3.4: Openreach estimates of addressability of repair glass ceiling components

	2016/17	Post Openreach improvement	Post industry changes
Amber scenarios – to some extent within Openreach's ability to influence			
	2.63%	1.37%	1.37%
Red scenarios – outside of Openreach's reasonable control			
	4.02%	4.02%	2.61%
Glass ceiling			
	11.3%	9.2%	7.4-7.8%
	(88.7%)	(90.8%)	(92.2-92.6%)

Source: Openreach.[40]

Openreach's views on certain repair jobs which fail because it did not have an appointment to access the customer's premises, and repair jobs which telecoms providers reject as not cleared

3.15 Openreach's evaluation includes two structural changes to operational processes and the repair SLA measures (red scenarios) that it says would together raise its operational capabilities by around 2%:

- CP access/readiness – non-appointed: The existing definition of on-time success or failure against Openreach's contractual SLAs does not include an exemption for instances where the telecoms provider does not explicitly make an appointment with the end customer to ensure that the customer can provide access to an Openreach engineer if, in attempting to resolve the fault, the engineer determines this is necessary. This can arise where, after carrying out testing and diagnosis at various points within the external network, the engineer concludes that the fault cannot be cleared without access to the customer's premises to inspect the master socket (or test from it) or to isolate the customer's internal wiring and equipment.[41] In these circumstances, the engineer will try and contact the end customer on the day but, because no prior appointment has been arranged, access may not be possible. In these circumstances, the repair counts as a failure against the SLA. In contrast, there is an exemption in the current definition of on-time SLA success or failure for cases where Openreach has arranged an appointment to access the customer's premises but the Openreach engineer cannot gain access for some reason. Openreach therefore

[40] Openreach, Response to Ofcom's Consultation on proposed quality of service remedies, 19 June 2017, Table 9, page 62, https://www.ofcom.org.uk/__data/assets/pdf_file/0013/105115/Openreach.pdf.
[41] By master socket we mean the main socket where the phone/broadband line enters the customer's premises. It may feed internal wiring to extension sockets elsewhere in the premises.

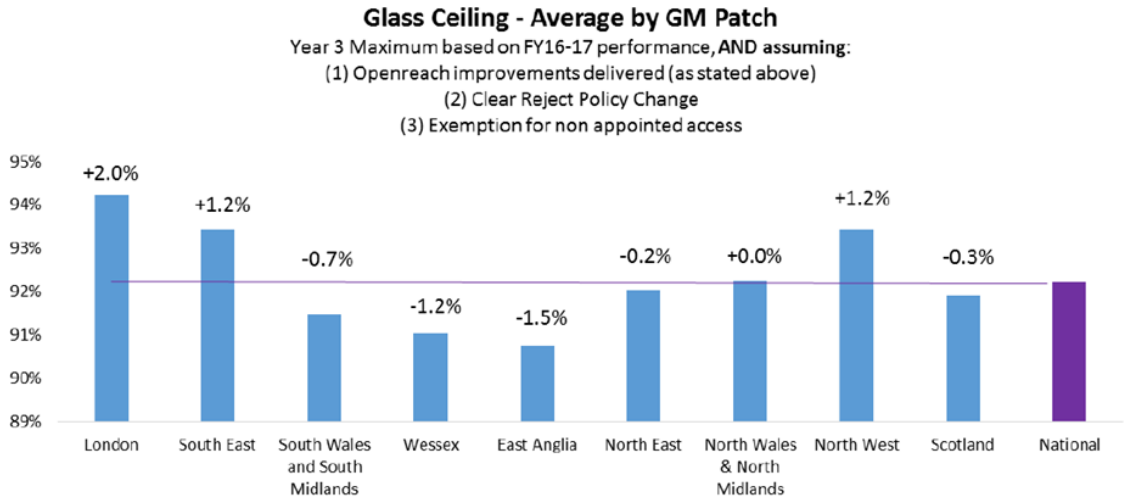
suggests that we amend the regulatory repair standard to exempt instances where customer access and readiness issues are encountered on non-appointed faults.[42]

- Reject Clear: Currently, telecoms providers purchasing WLR and GEA services are able to reject an Openreach fault clear within a 48-hour window should the end customer advise them that the fault has not been resolved to their satisfaction. The contractual SLA timescale is not, however, subsequently extended to give Openreach extra time to investigate the problem further and so this could result in a 'fail' for the purposes of the regulatory standards. Openreach proposes that either the Clear Reject process should be disapplied from the WLR and GEA products, bringing them in line with MPF,[43] or that the SLA counter, or clock, should be reset at the point Openreach receives a clear rejection from a telecoms provider alongside valid notes and proof of dialogue with the customer. Openreach considers that industry engagement on these operational and contractual matters has the potential to raise the glass ceiling, but that this would require more proactive action by telecoms providers.[44]

3.16 Including the two suggestions described in more detail above, Openreach considers that 92.2% provides a reasonable representation of its operational capabilities at the UK level. However, we have proposed that the repair standards apply to each of the ten UK geographic regions based on Openreach operational regions (General Manager, or GM regions).[45] The proportion of repair jobs which exceed Openreach's SLAs, and the reasons why they do so, is not the same everywhere for various reasons (most obviously because of geographical differences). Openreach has therefore also provided its analysis on the variation between the repair performance limits for each GM patch against the national level (see Figure 3.5). Based on actual data from 2016/17, and including the two improvements discussed above, this evidence indicates that the maximum achievable performance for the most challenging region is 1.5% below the national level. Openreach therefore considers that the glass ceiling should be lowered to account for this and that 90.9% reflects its highest operationally achievable level of repair performance based on our imposing repair standards which must be met in each region.

[42] Openreach, Response to Ofcom's Consultation on proposed quality of service remedies, 19 June 2017, page 59, paragraph 173, https://www.ofcom.org.uk/__data/assets/pdf_file/0013/105115/Openreach.pdf.
[43] For historical reasons relating to the provision of broadband in the UK, the Clear Reject process was never applied to the repair of MPF faults.
[44] Openreach, Response to Ofcom's Consultation on proposed quality of service remedies, 19 June 2017, page 63, paragraph 173, https://www.ofcom.org.uk/__data/assets/pdf_file/0013/105115/Openreach.pdf.
[45] They are Scotland, North East, North West, North Wales & North Midlands, South Wales & South Midlands, Wessex, South East, London, East Anglia and Northern Ireland.

Figure 3.5: Openreach revised view of the glass ceiling (regional level)



Source: Openreach.[46]

Our assessment of Openreach's new evidence of operational capabilities

3.17 Openreach has provided worked examples, systems maps, and the query codes it used to interrogate its systems and identify relevant faults to undertake the revised glass ceiling analysis. In addition, we have conducted due diligence to test the information presented by Openreach as well as examining engineer records and practices to further validate the results of Openreach's analysis. To do so, we obtained from Openreach a random sample of 25 repair jobs from a larger data set to examine how this information is used to classify a job failing the SLA, to understand the contribution of failures to their operational capabilities, and to scrutinise the integrity of the methodology.

3.18 Having reviewed Openreach's submission, we consider that, compared to the analysis set out in our March 2017 QoS Consultation, the new evidence on operational constraints is more robust and reliable than our own estimates. It removes the need to make an adjustment for on the day failures in order to estimate failures against the SLA, appears to be better grounded in actual evidence of primary causes of failure, and provides more insight into issues that can lead to failure, for example discussions between a telecoms provider and its customer. We therefore consider it appropriate to refine our proposed repair standards in light of this new analysis on the upper level of what is operationally achievable.

Provisional conclusions on operational capabilities

3.19 For the reasons set out below, we do not consider it appropriate to raise our estimate of Openreach's operational capabilities to incorporate its suggestions relating to customer-

[46] Openreach, Response to Ofcom's Consultation on proposed quality of service remedies, 19 June 2017, Figure 23, page 64, https://www.ofcom.org.uk/__data/assets/pdf_file/0013/105115/Openreach.pdf.

caused failures on non-appointed faults and to the Clear Reject process. In our opinion, these are matters that are not fully in Openreach's control and that therefore industry would first need to discuss and agree upon a resolution.

Customer-caused issues for non-appointed faults

3.20 We acknowledge that appointing a greater proportion of faults could provide some efficiency benefits for Openreach and therefore increase its operational capabilities; however, this needs to be balanced against the potential for inconvenience to consumers who are required to take appointments that may not be necessary (e.g. because the fault can be fixed without access to the customer's premises). Openreach has submitted in its response to our March 2017 QoS Consultation that telecoms providers have resisted its efforts to appoint more orders and are happy to forego greater on-time success if it avoids increasing the possible inconvenience faced by their customers.[47] [48] Around 80% of faults which fail SIN349 (a test of the line from the local exchange) do not require an appointment, and therefore requiring appointments would add to customer hassle and end-to-end costs for industry.[49]

3.21 We consider that there is the potential, with better testing and diagnostics and better inter-working between Openreach and its customers, for Openreach to make some improvements to achieving repair SLAs if repair jobs include visit appointments where there is a high probability that this is necessary in order to resolve the fault. We would encourage industry to engage on this matter given the potential benefit to repair performance as a whole. We consider that it is for industry to agree (potentially on an individual telecoms provider basis) the balance of risk, cost, and delay that it is willing to entertain.

The Clear Reject process

3.22 The Clear Reject process is specific to WLR and GEA-FTTC (including where GEA-FTTC is used with MPF). It is our understanding that this system is an alternative to telecoms providers raising a repeat fault within a 48-hour window of Openreach clearing a fault. We would be concerned if the process, by enabling telecoms providers to reject fault clears that have passed SIN349 without evidence of an unresolved issue, impacted Openreach's ability to meet our quality standards. Further, we would be concerned if this led to a lack of equivalence with MPF and so have considered the possibility that it could skew Openreach's incentive to prioritise WLR and GEA-FTTC repairs over those for MPF.

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[47] Openreach, Response to Ofcom's Consultation on proposed quality of service remedies, 19 June 2017, page 58, paragraph 173, https://www.ofcom.org.uk/__data/assets/pdf_file/0013/105115/Openreach.pdf.

[48] Openreach proposed to telecoms providers to appoint three of the borderline diagnoses where it believed there was a 40-50% probability of access being required – i.e. below the 50% probability on which it will typically appoint orders. This proposal would have generated an additional 1,400 appointments per week (across industry), increasing the percentage of faults that have failed SIN349 that are appointed from 20% to 23%.

[49] The industry agreed standard Openreach uses to test whether a copper line is working or not. Suppliers Information Note 349 Issue 2.5 August 2015, http://www.sinet.bt.com/sinet/SINs/pdf/349v2p5.pdf [accessed 21 August 2017].

However, we have not found any evidence to suggest differential outcomes for consumers due to the Clear Reject process.[50]

3.23 While Openreach considers that there should be changes to the Clear Reject process, it is not necessarily guaranteed that its estimated improvements to repair performance would be realisable. Therefore, we propose to set standards based on the assumption that Clear Reject will remain in place in its current form for the time being. In turn, we consider it appropriate for industry to take the lead and to agree upon any process changes that may be needed.

Summary

3.24 Our provisional conclusion is that Openreach's maximum achievable on-time repair performance has the potential to rise to close to 89% over the course of the review period. We consider that this has obvious implications for the level at which we can justifiably and proportionately set quality of service standards for repairs, as discussed below.

Question 3.1: Do you agree with our revised position on Openreach's operational capabilities for on-time repair? Please provide reasons and evidence in support of your views.

Revised proposals for repairs completed within SLA

Levels of the proposed standards

3.25 In our March 2017 QoS Consultation, and in light of our approach to regulation, we considered it was appropriate to set quality standards equal to or greater than 90%, which is above what we imposed in our last 2014 FAMR review. We then set out our proposals in relation to the levels of the performance standards for on-time repairs, by reference to three considerations: (i) the impact on consumers, telecoms providers, and competition; (ii) Openreach's operational capabilities; and (iii) the costs to consumers and telecoms providers. We have followed the same methodology for this consultation, taking into account our revised view of Openreach's operational capabilities.

Impact on consumers, telecoms providers, and competition

3.26 As set out in our March 2017 QoS Consultation, we remain of the view that customers and competition benefit from a reduction in the time customers spend out of service, and from certainty in the repair service that they will receive. Notwithstanding the updated information presented above, we consider that higher quality standards are needed to afford telecoms providers sufficient certainty and confidence regarding the wholesale services they are purchasing from Openreach. Essentially, the higher the level of repair

[50] We have analysed the time of day WLR, MPF, and GEA-FTTC faults subject to SMLs 1 and 2 were completed in 2015/16. The results of our review provide no suggestion that Clear Reject affects the time of the fault being repaired.

performance Openreach can consistently achieve, the better the outcomes for consumers, telecoms providers, and competition.

3.27 Further, our research suggests that most customers would be satisfied with repairs completed within three calendar days, which broadly aligns with the contractual timescales for SMLs 1 and 2.[51] Increasing the percentage of on-time completions against these SLA targets would result in a greater proportion of consumers receiving repairs within a timeframe that they consider acceptable, thereby closing the gap between expectations and actual performance.

3.28 We also still consider that setting challenging standards on the timeliness of fault repair should have the secondary benefit of incentivising BT to take action to reduce network faults from occurring in the first place (e.g. by investing in proactive maintenance of its network). In our view, quality standards well above current levels will mean that BT has the incentive to meet the targets in the most efficient way, which is likely to include cost savings via reducing faults on its network. In turn, investment in network reliability should have a positive knock-on effect on both telecoms providers and customers.[52]

Operational capabilities

3.29 In our March 2017 QoS Consultation, we proposed that, in light of our analysis of the impact on customers, telecoms providers, and competition, a quality standard of at least 90% would be an appropriate lower bound for repair completion. While on-time repair performance of equal to or over 90% remains Ofcom's ambition for the medium term, we now recognise that it may be unachievable in each of the GM areas by the end of 2020/21. In light of the new evidence on Openreach's operational capabilities described above, in determining the levels of the proposed standards, we have reconsidered the factors which may limit Openreach's ability to resolve faults within the timescales for SMLs 1 and 2.

3.30 In our view, Openreach's operational capabilities, taking into account all relevant process improvements, is around 89%. We consider that it would be disproportionate to propose a final year standard above this level at this time and, therefore, that this is the upper bound to use in setting the repair standards.

Costs to telecoms providers and consumers

3.31 We consider that higher standards are required to incentivise an improvement in performance over the market review; however, we recognise that repairing a greater proportion of faults within contracted timeframes at SMLs 1 and 2 will require Openreach to increase its available engineer resources. We would be concerned if higher quality of service standards led to materially higher retail prices as our evidence indicates that value for money is an important factor for many consumers.

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[51] Jigsaw Research, 2017.

[52] We note that a number of stakeholder responses to our consultation have commented on our position in this regard. We are currently considering all points raised and will set out our view in the forthcoming statement.

3.32 Since our March 2017 QoS Consultation, we have new evidence for estimating the resource impacts of driving service quality improvements through higher quality standards. As set out in Section 4, we have further considered the level of Openreach resources required in order to achieve our proposed quality of service standards. We have then set out the resource uplift impacts of our proposals to increase performance against the SLAs for SMLs 1 and 2. We have used our resource uplift estimates in our charge control modelling to develop separate estimates of the costs of quality of service improvements for the services we have proposed to charge control (MPF at SML 1 through our top down model for copper services and GEA 40/10 services at SML 2 through our bottom up model for GEA services).[53]

3.33 Our assessment of the resource uplift, which has relied on comparisons between the RPM and Openreach model (see Section 4 and Annex 5), has not allowed us to separately identify the resource uplifts required for our installation and repair proposals. We therefore consider the cost impact of our proposals in the round in Section 6, along-side our proposals for changing fault forecasts (the reasons for which are set out in Section 5). Our assessment is that the higher standards we propose for installation and repair lead to an increase in costs which is proportionate in the light of our objectives, including the customer and competition benefits we have described.

Proposed options for setting repair standards and our assessment

3.34 We consider that the choice of the appropriate level for on-time repair (i.e. within SLA) involves an exercise of regulatory judgement in balancing the factors identified. Effectively, the options open to us are to set repair within SLA standards at a level somewhere in the range between the current 80% requirement and our view of the upper limits on Openreach's performance. Consistent with the above statements and our analysis in our March 2017 QoS Consultation, we consider that higher standards than today would provide better outcomes for competition and ultimately consumers by increasing certainty to telecoms providers regarding Openreach's performance. A higher standard would also directly benefit consumers in terms of improved quality, although it risks increasing Openreach's costs. This may ultimately have an impact on the prices paid by consumers, which is an aspect to which they attach high importance. Overall, we are proposing to place a greater weight on quality and the need for higher standards as part of our balance, setting standards as close to the operational limit as is reasonably possible.

3.35 Therefore, we propose a repair within SLA standard for WLR, MPF, and GEA-FTTC of 88% (prior to making deductions to allow for MBORC events).[54] While a lower standard than we proposed in March, we consider that, taking into account our operational constraints analysis, 88% is as close to our belief that performance should be at least 90% as we are reasonably able to set for each GM area over the next three-year review period. We

[53] See Ofcom 2017, *Wholesale Local Access Charge Control, Further consultation*, https://www.ofcom.org.uk/consultations-and-statements/category-2/wla-market-review-further-consultation-on-charge-control.
[54] MBORC: Matters beyond our (BT's) reasonable control. A *force majeure* clause in Openreach's contacts.

consider that an 88% standard still represents a proportionate yet stretching target that will result in benefits for competition and customers in the form of greater certainty and improved repair times. Further, we consider that Openreach can achieve this level of performance within the timeframe of this market review (through additional engineering resources and process improvements) without giving rise to excessive costs for consumers (see Section 4), or significant risks of failure.

3.36 Due to the new evidence on operational capabilities, we have considered again whether it continues to remain appropriate to set the same standard for each of SMLs 1 and 2 as proposed in our March 2017 QoS Consultation. Our view continues to be that setting different standards risks undermining the differentiation between these two care levels, which would reduce the potential for this remedy to support competition on the basis of quality at the retail level. Setting standards at different levels might also be confusing and counter to our aim of improving industry clarity and certainty regarding Openreach's repair performance. Hence, we propose that an 88% standard applies to fault repairs for each of SMLs 1 and 2 separately.

3.37 Finally, we consider that 88% is justified in that it reflects customers' growing expectations and harm suffered due to service outages, and as it ensures a sufficiently high level of performance against the SLA, thereby meeting the requirement for effective network access. We have incorporated a resource uplift into our charge control modelling to allow time for Openreach to make the necessary changes to its resources and operations to meet the proposed standards.

Question 3.2: Do you agree with the proposed levels of the repair standards? Please provide reasons and evidence in support of your views.

Our glidepath proposals

3.38 In light of the updated levels proposals set out above, we have revised our proposed glidepath for the on-time repair standards to a near-linear increase in performance over the course of the market review period (see Table 3.6 below). We consider the standards in each of the three years to be achievable and factor in Openreach's ongoing multi-skilling programme as well as the need for work to reduce operational limitations and for additional engineering resource.

Table 3.6: Proposed repair within SLA standards showing glidepath (excluding adjustments for *force majeure*)

	Current level	First year (2018/19)	Second year (2019/20)	Third year (2020/21)
Repair completion within SLA timescale	80%	83%	86%	88%

Source: Ofcom.

Question 3.3: Do you agree with our proposed glidepath? Please provide reasons and evidence in support of your views.

Other considerations relating to the design of our proposed on-time repair standards

3.39 For the purposes of this consultation we have not reconsidered our March proposals in relation to the service scope, structure, and geographic application of the quality standards, the period over which compliance with the standards would be measured, and the inclusion of *force majeure* in the standards. We are currently considering stakeholder responses to our consultation and will set out our decisions in a statement in 2018.

Quality standards at five working days over SLA

3.40 In addition to standards for on-time repair performance, our March 2017 QoS Consultation also proposed new quality standards for the proportion of repairs completed five working days after the time promised in the SLA.[55]

3.41 While the proposed levels for these standards were set largely by reference to historical performance, we have also taken into account the new evidence presented above regarding Openreach's operational capabilities. We do not, however, consider that the updated analysis of Openreach's operational capabilities affects our view on what we could reasonably expect Openreach to achieve within this longer timescale. Therefore, within this consultation we have not considered amending our proposals relating to a +5 day standard. We will consider stakeholder responses on this proposal in reaching our final decisions.

Provisional conclusions

3.42 In the above sub-sections, we have outlined revised proposals for standards to regulate Openreach's repair within SLA performance, taking into account new evidence on its operational capabilities. Given that evidence, we consider it appropriate to reduce the

[55] The proposed standards would apply to all WLR, MPF, and GEA-FTTC repairs in aggregate at each of SMLs 1 and 2.

proposed third year (2020/21) standards from 93% to 88%, excluding any adjustment for *force majeure*.[56] We also propose to set standards of 83% in the first year (2018/19) and 86% in the second year (2019/2020), excluding *force majeure*.

Question 3.4: Do you have any further comments on our proposals for regulating BT's service performance for repairs? Please provide reasons and evidence in support of your views.

[56] We will consider the size and scope of any allowance for MBORC in the forthcoming statement.

4. Revised resource uplifts for proposed quality standards

Introduction

4.1 This section sets out changes to the proposals we published in the March 2017 QoS Consultation on how much extra resource we estimate Openreach would need to comply with our proposed higher standards of performance for installing and repairing WLR, MPF and GEA-FTTC services. The costs to customers and telecoms providers of imposing higher standards is a key consideration for us in setting appropriate levels for quality standards. Our evidence indicates that value for money is an important factor for many customers although it also shows a wide range of customer preferences about paying for better service.[57] Estimating the uplift in Openreach's resources over the period of the market review is therefore both a consideration when setting binding standards for quality of service and an important input to our charge control models.[58]

4.2 Estimating this resource uplift is a challenging and complex task. As in our last review (the 2014 FAMR), we have used simulation models to help us to assess and derive resource uplift estimates. In making our March proposals, we relied on a model developed in collaboration with our advisors, Analysys Mason, which we refer to as the Resource Performance Model or RPM. The RPM uses a simulation of Openreach's operations to derive resource estimates.

4.3 Since then, Openreach has provided us with its own simulation of its operations ('the Allocation Model') which we asked Analysys Mason to audit for us. Analysis Mason's report is published alongside this consultation.[59] We have reviewed our March proposals for resource uplift estimates in the light of the Allocation Model. We have also considered further evidence from Openreach in its response to our March 2017 QoS Consultation, including a report it commissioned from Deloitte to review both the Allocation Model and the RPM.[60] [61]

4.4 Furthermore, as set out in Section 3, we are now proposing that Openreach should repair 88% of faults to its WLR, MPF and GEA-FTTC services within its SLAs for SML 1 and SML 2

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[57] We refer to our discussion of the features covered by our proposed standards including consumer research and survey evidence in paragraphs 3.32 to 3.49 on pg 23-29 in Section 3 of our March 2017 QoS Consultation.
[58] We proposed charge controls (as set out in the March 2017 WLA Consultation Annexes 11 and 12) for Openreach's MPF SML 1 and GEA 40/10 SML 2 services. We need to account of the extra costs to Openreach of providing these services at the quality standards we are proposing in setting these charge controls over the market review period (2018-2021).
[59] Analysys Mason, 2017. *WLR/LLU Charge Control 2017 Quality of Service model assessment*. https://www.ofcom.org.uk/__data/assets/pdf_file/0013/106312/model-assessment-wlr-llu-quality-service.pdf.
[60] Openreach, 2017. *Quality of Service for WLR, MPF and GEA. Response to Ofcom's Consultation on proposed quality of service remedies.* https://www.ofcom.org.uk/__data/assets/pdf_file/0013/105115/Openreach.pdf.
[61] Deloitte, 2017. *Openreach Quality of Service modelling.* https://www.ofcom.org.uk/__data/assets/pdf_file/0026/106199/Deloitte.pdf.

by 2020/21 rather than the 93% we proposed in March. Based on the further evidence we have assessed, we consider the operational limits to Openreach's service performance are more significant than our March estimates. We therefore need to re-assess our estimates of resources taking these proposed changes into account.

4.5 In this section, supported with further detail in Annex 5, we:

- summarise the proposals we made in March;
- set out our assessment of the further evidence we have received;
- set out our analysis based on this further evidence and how we propose to estimate the uplift to Openreach's resources; and
- set out our revised proposals on which we invite further comments from stakeholders.

Our March 2017 resource uplift estimate proposals

4.6 We set out our assessment and proposed estimates on the impact on Openreach's field engineering resources to achieve the quality of service standards we had proposed for WLR, MPF and GEA-FTTC in Annex 7 of our March 2017 QoS Consultation.

4.7 Table 4.1 below sets out the resource uplift estimates we proposed in March for each of the three years of the proposed charge control for MPF SML 1 and GEA 40/10 SML 2 services (2018/19 to 2020/21). The Base Year and Year 3 estimates were based on outputs from the RPM. The estimates for Year 1 and Year 2 were derived using a linear interpolation between the Base Year and Year 3.

4.8 The percentage figures shown for fault repair minor fails[62] (in the range of 3% to 5%) were our assessments of the upper and lower bounds of Openreach's operational constraints at that time.[63] Our proposals shown in the table for the charge controls is the mid-point between these two bounds.

[62] As described in A7.41 of our March 2017 QoS Consultation, 'minor fails' represent those jobs that are not completed successfully on the first attempt but which can be successfully completed on a second attempt after a short delay. If there is sufficient time and resources, the RPM allows fault repair minor fails to be completed successfully within the SLA on the second attempt.

[63] Where 5% minor fails reflected what we understood to be Openreach's current operational limit and 3% was our assumption of improvements which could be made to these operational limits. We have reconsidered the level of Openreach's operational limits in Section 3.

Table 4.1: Our March resource uplift estimates for the proposed quality of service standards (excluding MBORC[64])[65]

	Base Year (2015/2016)	Year 1 (2018/2019)	Year 2 (2019/2020)	Year 3 (2020/2021)
SML 1 / SML 2 mix	Actual	50 / 50	50 / 50	50 / 50
Fault repair minor fail	3% to 5%			3% to 5%
FAD (working days)	12	12	12	10
% Orders offered date (FAD)	80%	90%	90%	90%
Provision by Committed Date	90%	92%	92%	95%
Repair within SLA (SML 1 / SML 2)	80% / 80%	83% / 83%	90% / 90%	93% / 93%
% Resource uplift range	-	1.9% - 3.4%	3.8% - 6.8%	5.8% - 10.2%
Proposed values for charge control model		2.7%	5.3%	8.0%

Source: Ofcom.

4.9 Telecoms providers choose what service maintenance level (SML) option they want from Openreach and can switch between these options. Most CPs choose either SML 1 (two day repair, Monday to Friday) or SML 2 (one day repair, Monday to Saturday).[66] We set out in March our proposals to charge control MPF SML 1 and GEA-FTTC (40/10) SML 2. It is therefore necessary to derive separate resource estimates for each service maintenance level to ensure the correct uplift is applied to each service in our charge control modelling. We refer to the difference between the resources required for each service maintenance level as the service level differential.

4.10 Table 4.2 below sets out our estimates for how resource requirements change as the mix between services provided at SML 1 and SML 2 changes, derived from results from the RPM. SML 2, which is the higher repair standard, requires more resources to achieve a given standard of performance than SML 1, and this difference increases as standards increase.

4.11 Consistent with our approach for resource uplift estimates, we took the mid-point between our upper and lower bounds for operational limits to derive the SML factors for the charge control model.

[64] Matters Beyond Our Reasonable Control (MBORC) is a *force majeure* clause in Openreach's contracts.
[65] Table A7.8 of our March 2017 QoS Consultation.
[66] Openreach offers other higher service maintenance level (SML) options but SML 1 and SML 2 are consumed the most.

Table 4.2: Our March service maintenance level mix factors for the charge control model[67]

	Percentage change in resource for each percent change in SML mix		
	(3% minor fail)	**(5% minor fail)**	**Proposed value**
Mix factors for 2015/16 performance	0.0231	0.0265	0.0248
Mix factors at proposed QoS standards	0.0579	0.0767	0.0673

Source: Ofcom.

4.12 The mix factor is the percentage increase in resources required for 1% increase in the mix of SML 2 (or conversely the reduction in resources enabled by a 1% increase in the mix of SML 1). In order to establish the appropriate resource uplift for each care level, we start from our 50/50 care level mix estimate for the resource uplift, and increase this by 50*0.0673 to obtain an estimate for the resource uplift required for SML 2 (or subtract for SML 1). Table 4.3 shows the separate resource uplift estimates which we proposed in March for our charge control model.

Table 4.3: Our March resource uplift estimates for the charge control

	Resource uplift estimate
MPF SML 1	8% resource uplift at 50/50 mix minus 50 percentage points multiplied by 0.0673 = 4.6%
GEA-FTTC (40/10) SML 2	8% resource uplift at 50/50 mix plus 50 percentage points multiplied by 0.0673 = 11.4%

Source: Ofcom.

4.13 The impact on regulated charges from the standards we proposed in March are set out in Table 4.4 below.

[67] Table A7.9 of our March 2017 QoS Consultation.

Table 4.4: Our March outputs from charge control models for our quality of service proposals[68]

	Impact on charge controls (£s per annum)		
	Fault Reduction	Higher Standards	Total
MPF SML 1	£(2.21)	£0.62	£(1.59)
GEA-FTTC SML 2	£(0.54)	£0.36	£(0.18)

Source: Ofcom.

Our assessment of further evidence

4.14 As described above, we have received further evidence, including an additional model provided by Openreach (the Allocation Model), as well as additional reviews and assessments of both the Allocation Model and the RPM. Below we set out our provisional conclusions regarding the new evidence, and how we can use the models to inform our resource uplifts.

The Openreach Allocation Model

4.15 In Annex 5 we provide a detailed review of the new evidence, covering the results of Analysys Mason's audit of the model, and Openreach's response to the March 2017 QoS Consultation including the Deloitte report.

4.16 We found that the Allocation Model is a sophisticated bottom-up simulation that seeks to model Openreach's field operations more closely than previous models. The simulation includes operational factors that are not modelled in the RPM including variation in travel time and task time, resource availability and skilling constraints. However, the Allocation Model lacks some features of the RPM relating to the management of resources to optimise performance including: stress response (mitigating actions taken during periods of exceptionally high demand)[69] and resource loans between SOM areas. (See Annex 5.29 *et seq*.)

4.17 Analysys Mason's audit found the Allocation Model to be broadly speaking well-constructed, but also identified some problems with using it. Analysys Mason's report notes that they found the model to be complex to install and configure, slow in its operation (making sensitivity analysis very slow) and that it was unclear how some input parameters, notably assumptions for operational limits (or 'glass ceilings'), were reflected in the input datasets. In view of these problems, Analysys Mason concluded that it is unlikely that Ofcom could use the model, in its current form, directly or in isolation to predict resource deltas for quality of service improvements. Analysys Mason also

[68] Table A7.10 of our March 2017 QoS Consultation.
[69] The Allocation Model includes 'stress response' functionality but it was not used by Openreach in most of the model runs used to support its Consultation response.

suggested that Ofcom should treat the modelling results with caution given the sometimes counter-intuitive results and the difficulty they encountered with replicating Openreach's model outputs.[70]

4.18 In view of the audit findings we consider that it would not be appropriate to rely on the Allocation Model alone as an input to our regulatory charge control models. The audit has identified several issues that we consider warrant further investigation, including the sensitivity of the outputs to small input changes, the outputs that appear counter-intuitive, the methodology used to derive the model inputs from operational data and the methodology used to manipulate the inputs to reflect changes to the glass ceiling parameters. Moreover, the complexity of the model coupled with the considerable time required to set-up the model and the long run times for simulations, have prevented us from auditing the model to our satisfaction, given the time and resources available to us.

4.19 In view of the audit results, we propose to consider the Allocation Model outputs along-side those generated by the RPM, while taking account of the limitations of the RPM.

The Resource Performance Model (RPM)

4.20 We have considered evidence regarding the RPM to reach a view on how this model can be further used to inform our resource uplift proposals. A number of limitations have been identified in the RPM model (or factors which are implemented in more detail in the Allocation Model) by Openreach, Analysys Mason and Deloitte (and in our own assessment of the RPM in March).[71] An analysis of the extent to which these limitations can explain differences in the outputs produced by the two models has also been conducted by Openreach, Analysys Mason and Deloitte (see Annex 5).

4.21 Our review of this evidence suggests that, although the Allocation Model models a wider range of operational factors than the RPM, the factors not modelled in the RPM have been shown not to materially impact the resource uplift estimates. The factors that were found to influence the resource uplifts generated by the RPM were: the visit rate assumptions[72], the treatment of resource sharing between Openreach's operational regions, and the operational limits assumptions used in the model.

4.22 We therefore take the provisional view that the RPM could be used to generate resource uplift estimates which are a good approximation of Openreach's operations, providing: it is appropriately configured to take account of Openreach's new evidence regarding its operational limits and careful consideration is given to the configuration of resource sharing and regarding actual visit rates.

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[70] Analysys Mason, 2017. *WLR/LLU Charge Control 2017 Quality of Service model assessment*. Section 10. https://www.ofcom.org.uk/__data/assets/pdf_file/0013/106312/model-assessment-wlr-llu-quality-service.pdf.
[71] See paragraphs A7.50 to A7.52 of our March 2017 QoS Consultation.
[72] Modelling assumptions about the extent to which multiple field engineering activities are required to clear faults.

Configuration of the RPM

4.23 In Annex 5, we explain that the configuration of the operational limits for fault repair is not straightforward. The RPM requires operational limits to be expressed in terms of 'on-the-day' failures (i.e. unsuccessful field engineering activities, some of which could be completed successfully within the SLA on a subsequent attempt, if time and resources permits) whereas Openreach's revised analysis (the glass ceiling analysis) is expressed in terms of faults that fail the SLA. As conversion between the two formats is difficult, we have considered a range of scenarios for the configuration of the 'major fail' and 'minor fail' assumptions used to specify the operational limits in the RPM.[73]

4.24 The RPM models two different forms of resource sharing loans of staff between Senior Operations Manager (SOM) areas: 'adjacent sharing' (loans between adjacent SOM areas) and 'non-adjacent sharing' (loans between non-adjacent SOM areas). Sharing resources with adjacent SOM areas is modelled for periods of high demand and with non-adjacent SOM areas in periods of exceptionally high demand (for example, exceptionally high fault volumes after major storms). These are configurable, and we describe which configurations we have used to generate the RPM results below.

4.25 We have also considered whether the visit rate assumptions needs to be adjusted to align with Openreach's actual visit rate (i.e. the actual incidence of multiple field visits for fault repair). Analysys Mason identify that the difference between the modelled visit rate in the RPM and the actual Openreach visit rate explains some of the difference in the results from the RPM and the Allocation Model), albeit significantly lower in scale than the impact of operational limits. The RPM models visit rates through the 'minor fail' rate assumptions, which is a component of the operational limits assumptions. In calculating the resource uplift we propose operational limits assumptions that closely resemble Openreach's SLA operational limits so that further adjustment may not be necessary to account for actual visit rates. We propose below an estimated range for the resource uplift. To the extent that any residual differences between modelled and actual visit rates affects resource uplifts, we would expect the impact to lie within the estimated ranges, particularly as the modelled range spans the corresponding Allocation Model resource uplift estimates.

Estimating the resource uplift

4.26 We set out below how we have derived an estimate of the additional resources Openreach will require in order to meet the quality of service standards we propose.

4.27 Whereas in March we used the RPM to generate a point estimate of the resource uplift, in this consultation we are proposing a range for the resource impact, and a base case within that range. This reflects our uncertainty over how various operational parameters, such as operational limits and resource sharing should be modelled.

[73] Minor fails are failed field engineering activities that could be successfully completed within the SLA on a subsequent attempt, if time and resources permit. In contrast, 'major fails' are faults that require work such as civil engineering that cannot be completed within SLA timescales.

4.28 Given our concerns regarding the Allocation Model, our starting point is to generate resource uplifts using the RPM, appropriately configured in light of the discussion above. We then compare these results with the results of the Allocation Model with a similar configuration. As described above, we need to carefully consider how we configure the model regarding the operational limits assumptions and resource sharing. We have set out in Annex 5 the results of the various configurations of the RPM that we have run to estimate the resource impact.

4.29 We have established our proposed range by varying the following input parameters in the RPM:

a) The level of operational limits: we have run scenarios at a limit of 90.8%, reflecting the average operational limit across all Openreach General Manager (GM) regions after the process improvements proposed by Openreach as discussed in section 3, and 89.3% representing the operational limit in the worst performing GM, again after process improvements.

b) The level of resource sharing: to assess the impact of resource sharing we have run the RPM with various configurations of its resource sharing capabilities:

i) Non-adjacent sharing: when one area is at risk of underperformance and resources are mobilised to assist nationwide,

ii) adjacent sharing: the sharing of resources between neighboring areas which can happen on a day to day basis, and

iii) no sharing of resources.

4.30 The table below sets out the results of these model runs.

Table 4.5 Resource uplift relative to 2015/16 required to achieve proposed standards in 2020/21

	Operational limit 90.8% Major fails: 9.2% Minor fails: 0%	Operational limit 89.3% Major fails: 10.7% Minor fails: 0%
Non-adjacent sharing: on Adjacent sharing: on	8.1%	11.0%
Non-adjacent sharing: off Adjacent sharing: on	9.1%	14.1%
Non-adjacent sharing: off Adjacent sharing: off	10.8%	17.9%

Source: Ofcom

Setting the range

4.31 Our view is that the configuration of the RPM with both modes of sharing switched on has a tendency to underestimate the resources required to meet our proposed standards. In reviewing the methodology of resource sharing used in the RPM, we note that it aligns

resources efficiently on a day by day basis. Openreach is unlikely to achieve this level of efficiency in practice over the market review period. Nonetheless, we understand that resource sharing is a fact of Openreach operations, and therefore we should take some account of this in our estimates.

4.32 We have been unable to establish the actual extent and efficacy of Openreach's resource sharing, and intend to seek further evidence before making our final decisions. For the purpose of this consultation, we propose the simplifying assumption that the appropriate level of resource sharing is represented by the adjacent sharing only, as this provides a balance between fully efficient on the day sharing represented by both modes of sharing and no sharing at all.

4.33 This gives a range of 9.1% to 14.1%.

Setting a base case

4.34 In setting our base case we also have regard to the results of Analysys Mason's runs of the Allocation Model for our proposed quality standards. These are set out in Annex 5 Table A5.4 where the Allocation Model provides resource uplift requirements of 11% with a 0.75% margin for error.

4.35 As discussed in more detail in Annex 5, Analysys Mason identified several factors that would tend to lead the Allocation Model to overstate resource estimates and also a factor that would tend to understate resource estimates.

4.36 We are reassured that the results from two different modelling methodologies fall in a similar range. Absent a point estimate from the RPM that we can use as a base case, and given the proximity of the results, we have chosen to rely on Openreach's assertion that its Allocation Model is a reliable representation of its operations. We propose to use the result from the Allocation Model, as run by Analysys Mason of 11% as a base case as shown in Table 4.6 below.

Table 4.6: Revised resource increase required to meet our proposed quality of service standards by 2020/21

	March 2017 Proposal	Current Proposal	Resource Uplift
		Base case	Range
Increase in resources from 2015/16	8%	11%	9.1 - 14.1%
Repair completion within SLA timescale	93% repair on time	88% repair on time	

Source: Ofcom.

Establishing a care level differential

4.37 We set out our view in the 2014 FAMR that there is a difference in the resource uplift between SML 1 and SML 2, and that this should be reflected in setting charge controls. Stakeholders agreed with this position.[74] Since we plan to impose charge controls on MPF at SML 1 and FTTC 40/10 at SML 2 we need to understand how the average resource uplifts above translate to each care level.

4.38 In our March proposals, we used the RPM to establish the rate at which additional resources are required as the service level mix shifts from SML 1 to SML 2. This is set out in Table 4.2 above.

4.39 In auditing the Allocation Model, Analysys Mason has found its results do not vary appreciably, or in the manner we would expect, for changes in care level mix. Analysys Mason has not been able to identify the reason for this counter intuitive result, and we will seek further evidence in preparing our final decisions in order to assess the validity of this result and its implications for our estimates. However, at this time we have not been able to use the Allocation Model to verify the care level gradient we established in March.

4.40 For the purposes of this consultation, in the absence of an alternative method of establishing the care level differential, we therefore propose to retain the method we adopted in March.

4.41 We set out in Table 4.7 below the resource uplift for each service level, replicating our prior method.

[74] Ofcom, 2014. Statement. Fixed access market reviews: wholesale local access, wholesale fixed analogue exchange lines, ISDN2 and ISDN30 – Annexes A19.31, https://www.ofcom.org.uk/__data/assets/pdf_file/0026/78812/annexes.pdf.

Table 4.7: Revised resource uplift estimates for the proposed charge control

	Resource uplift estimate	Lower bound of range	Upper bound of range
Average resource uplift required at 50/50 care level mix	11.0%	9.1%	14.1%
Resource uplift for MPF SML 1	7.6%[75]	5.7%	10.7%
Resource uplift for GEA-FTTC (40/10) SML 2	14.4%[76]	12.5%	17.5%

Source: Ofcom.

Results from our charge control models

4.42 In parallel with this consultation we are also carrying out a further consultation on a range of proposed amendments to our charge control proposals[77]. We have updated our base case and consultation range using our above revised resource uplift estimates. We set out below our revised assessment of the impact of this on our charge control proposals.

Table 4.8: Nominal price impact on charge controls in 2020/21

	March 2017 Cost Impact £s per annum per line	Cost Impact £s per annum per line	Percentage impact on proposed charge control
MPF SML 1	+£0.62	+£0.83	c.1%
GEA-FTTC 40/10 SML 2	+£0.36	+£0.60	c.1%

Source: Ofcom.

Question 4.1: Do you agree with our resource uplift estimates as modified from our March proposals? Please provide reasons and evidence in support of your views.

[75] 11% resource uplift at 50/50 mix minus 50 percentage points multiplied by 0.0673 = 7.6%
[76] 11% resource uplift at 50/50 mix plus 50 percentage points multiplied by 0.0673 = 14.4%
[77] Ofcom, 2017. *Wholesale Local Access Charge Control, Further consultation*. https://www.ofcom.org.uk/consultations-and-statements/category-2/wla-market-review-further-consultation-on-charge-control.

5. Revised proposals for network fault rates

Introduction

5.1 This section sets out our revised proposals for our forecast of Openreach's network fault rates over the period to 2020/21. Faults play an important role in customers' experience of broadband and telephony services, and are a significant factor in the costs to telecoms providers delivering these services, and therefore the prices customers pay. A forecast of fault rates over the period of the market review is therefore both an important input to our charge control models and a consideration when setting binding standards for quality of service.

5.2 In our March proposals in relation to fault rates, we used the same forecasting methodology as in our last review (the 2014 FAMR). In addition, Openreach told us that it had started a programme of fault prevention work (the 'Fault Volume Reduction' or 'FVR' programme). We obtained details of the fault reductions that Openreach expected to achieve and incorporated them into our fault rate forecasts.

5.3 The refinements we are proposing in this section relate specifically to the adjustments proposed to account for Openreach's FVR programme.

Our March proposals for forecast fault rates

How we derived our forecast for fault rates

5.4 In Annex 5 of our March 2017 QoS Consultation we considered in detail the fault rates for Openreach services used to provide voice and broadband to develop a forecast for our proposed charge controls (as set out in the March 2017 WLA Consultation Annexes 11 and 12) for Openreach's MPF SML 1 and GEA 40/10 SML 2 services.

5.5 In summary, we derived our forecast as follows:

- Using our statutory information gathering powers we obtained and analysed Openreach's database of fault repairs including records of the services being provided on each line ('the line biography');
- We only included fault repairs relevant to our proposed charge controls;
- Because fault rates for individual Openreach services cannot be derived accurately from fault records[78], we used the same approach as we did in the 2014 FAMR to assume that the difference in fault rates (between combined services and standalone services) gives the fault rate for the overlay service (i.e. MPF + GEA-FTTC minus MPF

[78] Telecoms providers may use combinations of Openreach's wholesale services to provide voice and broadband services (for example, superfast broadband can be delivered using two Openreach services – the copper line (WLR or MPF) and fibre to the street cabinet (GEA-FTTC). Where a fault occurs, it may be inaccurately allocated to either service.

gives GEA-FTTC). Using actual fault records for 2015/16, we derived fault rates for individual services to form our base year;

- We then assessed the trends in fault rates in more detail by determining which faults related to the reliability of services immediately after installation ('Early Life Failures'). The remaining faults are considered 'In Life Failures'. This gave us greater insight into the future fault rate of GEA-FTTC (used to provide superfast broadband services) where volumes are growing rapidly; and
- Because GEA-FTTC is a relatively new service and we do not have sufficient historical fault rate data for this service to derive a reliable fault rate forecast, we assessed the performance of network components used to provide the GEA-FTTC service and compared their performance when used to provide other mature services;
- Lastly, we took account of the information we had obtained from Openreach about the forecasts it had made on the anticipated reduction in fault rates due to its FVR programme.

The FVR fault rate reductions incorporated in our forecast fault rate proposals

5.6 The expected fault rate reductions attributable to Openreach's FVR programme which we factored into our forecast fault rates are set out in Table 5.1 below.[79] We factored these into our forecast fault rates as described in the following subsections.

Table 5.1: Expected fault rate reductions attributable to Openreach's FVR programme (all services)

				First year	Second year	Third year			
	15/16	**16/17**	**17/18**	**18/19**	**19/20**	**20/21**	**21/22**	**22/23**	**23/24**
Overall fault rate (faults per annum per 1000 lines)	110	[✂]	[✂]	[✂]	[✂]	[✂]	[✂]	[✂]	[✂]
Percentage reduction relative to base year	Base Year			[✂ %]	[✂ %]	[✂ %]			

Source: Ofcom analysis of Openreach data.

Forecast fault rates for WLR, MPF and SMPF including FVR

5.7 Prior to taking account of fault reductions attributable to Openreach's FVR programme, our assessment of WLR, MPF and WLR+SMPF (using the methodology summarised above)

[79] Table A5.4 on pg 151 in Annex 5 of our March 2017 QoS Consultation.

led us to the provisional conclusion that we did not expect any substantial change in forecast fault rates for these three Openreach wholesale services. The Openreach FVR programme is a specific intervention to reduce fault volumes on the copper network. As such, we considered it reasonable to assume that it would reduce future WLR, MPF and WLR+SMPF fault rates in line with the reductions shown in Table 5.1 above.

5.8 Therefore, we expected the overall fault rates for WLR, MPF and WLR+SMPF to reduce each year in the charge control relative to the base year fault rate (2015/16) by the percentages shown in Table 5.1. The resulting forecast fault rates for these services are set out in Table 5.2 below.[80]

Table 5.2: Forecast fault rates for copper services over the period of charge control including Ofcom's interpretation of effects of the FVR programme

	Base Year 2015/2016	Year 1 2018/2019	Year 2 2019/2020	Year 3 2020/21
WLR	8.3%	[✂ %]	[✂ %]	[✂ %]
MPF	11.2%	[✂ %]	[✂ %]	[✂ %]
WLR+SMPF	12.0%	[✂ %]	[✂ %]	[✂ %]
SMPF	3.7%	[✂ %]	[✂ %]	[✂ %]

Source: Ofcom analysis of Openreach data.

Forecast fault rates for GEA-FTTC

5.9 Using the methodology outlined above, we provisionally concluded that, before taking into account the FVR programme, fault rates for GEA-FTTC services would reduce over the charge control period as the service matures. Faults for services that include GEA-FTTC faults are comprised of faults on the copper bearer service (MPF or WLR), and faults that are specific to GEA-FTTC, in particular relating to the electronic equipment deployed in street cabinets. We believed that the FVR programme would not yield reductions to faults related to this electronic equipment, hence we applied the FVR reductions in Table 5.1 above to the overall GEA-FTTC fault rate minus the GEA-FTTC equipment fault rate. Our proposed forecast fault rates for GEA-FTTC (including the effect of the FVR programme) are shown in Table 5.3 below.[81]

[80] Table A5.5 on pg 152 in Annex 5 of our March 2017 QoS Consultation.
[81] Table A5.11 on pg 157 in Annex 5 of our March 2017 QoS Consultation.

Table 5.3: Forecast fault rates for GEA-FTTC services over the period of charge control including Ofcom's interpretation of effects of the FVR programme

Charge control period	Base Year 2015/2016	Year 1 2018/2019	Year 2 2019/2020	Year 3 2020/21
WLR + GEA-FTTC	13.3%	[✂ %]	[✂ %]	[✂ %]
MPF + GEA-FTTC	15.6%	[✂ %]	[✂ %]	[✂ %]

Source: Ofcom analysis of Openreach data.

5.10 We asked stakeholders whether they agreed with our forecast and to provide reasons and evidence in support of their views.[82]

Further evidence concerning Openreach's FVR programme in relation to our proposals for forecast fault rates

5.11 In its response to our March 2017 QoS Consultation,[83] Openreach agreed with the principle of taking account of expected reductions in faults arising from the FVR programme. However, Openreach did not agree with our forecast for two main reasons:

a) It said that its own forecast of network fault rates out to 2020/21, taking recent Openreach decisions and Openreach's observation of fault trends into account, was significantly higher than the Ofcom forecast; and

b) It said that the Ofcom forecast was largely based on an aspirational plan for fault reduction (which Openreach shared with Ofcom in July 2016) but not its actual FVR plan.

5.12 Openreach additionally set out what it termed "13 key challenges" arising from its learnings from investment in network health relating to both practical issues with deploying significant resources and factors driving up faults which reduce the net benefits it can deliver through proactive network investment.

Our further considerations

5.13 In this sub-section, we consider:

a) The relevant FVR plan for our forecast fault rate;

b) Our assessment of Openreach's actual FVR plan and how we have interpreted it in revising our forecast of fault rates;

c) Our revised fault rate forecast; and

[82] Question 4.2 on pg 43 in Section 4 of our March 2017 QoS Consultation.
[83] Openreach, 2017. *Quality of Service for WLR, MPF and GEA. Response to Ofcom's Consultation on proposed quality of service remedies.* Pg 34-46. https://www.ofcom.org.uk/__data/assets/pdf_file/0013/105115/Openreach.pdf.

d) The output of our charge control model using our revised fault rate.

The relevant FVR plan for our fault rate forecast

5.14 Respondents to our consultation, in particular Openreach, provided comments on all aspects of our proposed methodology for forecasting fault rates (as set out in Annex 5 of our March 2017 QoS Consultation and summarised above). This further consultation focuses specifically on changes we are proposing to the last step, namely taking into account the expected effect of Openreach's FVR programme. We will address all other consultation responses, together with those received in response to this further consultation, in full in our final statement. In doing so we will also update our forecasts based on the latest version of Openreach's database of fault repairs and line biography. We have recently obtained this information using our statutory information gathering powers and our analysis is ongoing.[84]

5.15 In the light of Openreach's consultation response, we have carefully reviewed all the communications and information obtained under our statutory information gathering powers about Openreach's FVR plans prior to the publication of our March 2017 QoS Consultation. We have subsequently reviewed further information which we required Openreach to provide to us using our formal powers[85] including:

- Internal documents such as minutes and records of decisions of senior management groups concerning network health and proactive maintenance plans;
- Confirmations about the accuracy and completeness of previously submitted information;
- Specific details of Openreach's actual FVR plans such as the derivation of estimates for fault volume reductions, investment budgets and expenditure and resource implications;
- Details regarding workforce levels and recruiting and upskilling plans.

5.16 We have concluded from our detailed review that our proposed fault rate forecast did not correctly reflect Openreach's actual FVR programme.[86]

5.17 Consequently, we set out below the basis upon which we now propose to modify our March fault rate forecast proposals.

[84] Ofcom's Ninth Notice to BT in relation to quality of service requiring the provision of specified information under Section 135 of the Communications Act 2003 dated 29 June 2017.

[85] Ofcom's Fourth, Seventh and Eighth Notices to BT in relation to quality of service requiring the provision of specified information under Section 135 of the Communications Act 2003 dated 26 August 2016, 5 June 2017 and 23 June 2017 respectively. In addition, Ofcom emailed Openreach on the 26 July 2017 with a list of clarificatory questions relating to its responses our Fourth and Seventh Notices where any responses were to be treated as further responses pursuant to those statutory Notices.

[86] There were a number of contributory causes for this, including a coincidence that Openreach's actual investment in 2016/17 happened to be the same as that for the same period in its aspirational plan.

Assessment of Openreach's actual FVR plan

5.18 Openreach has provided us with its actual FVR plan in response to a statutory information request.[87] Openreach has confirmed that this is the best representation of its intentions and expectations regarding FVR over the review period.[88]

5.19 The format of Openreach's actual FVR plan is different from the one we used to inform our forecasts in March and requires a more detailed assessment before it can be applied to forecast fault rates for WLR, MPF and SMPF and separately GEA-FTTC. We set this out below.

Methodology behind the FVR plan

5.20 Openreach has confirmed that it does not forecast fault rates by service. Rather, it looks at network faults in aggregate. In reviewing its detailed FVR plan, we observe the following steps taken in its methodology.

a) Openreach begins by generating a "do-nothing"/ no investment scenario. This takes the previous year's total faults, and adds an assessment of the increase in faults from two sources:

   i) the impact of higher bandwidth services being used on the network, and of specific network interventions, for example preparatory work for the roll out of G.fast,[89] and

   ii) an underlying deterioration of the network if there is no investment.

b) Openreach then amends this do-nothing scenario to account for the gross impact of its FVR plan, which is also in two parts:

   i) an impact on the underlying deterioration of the network, and

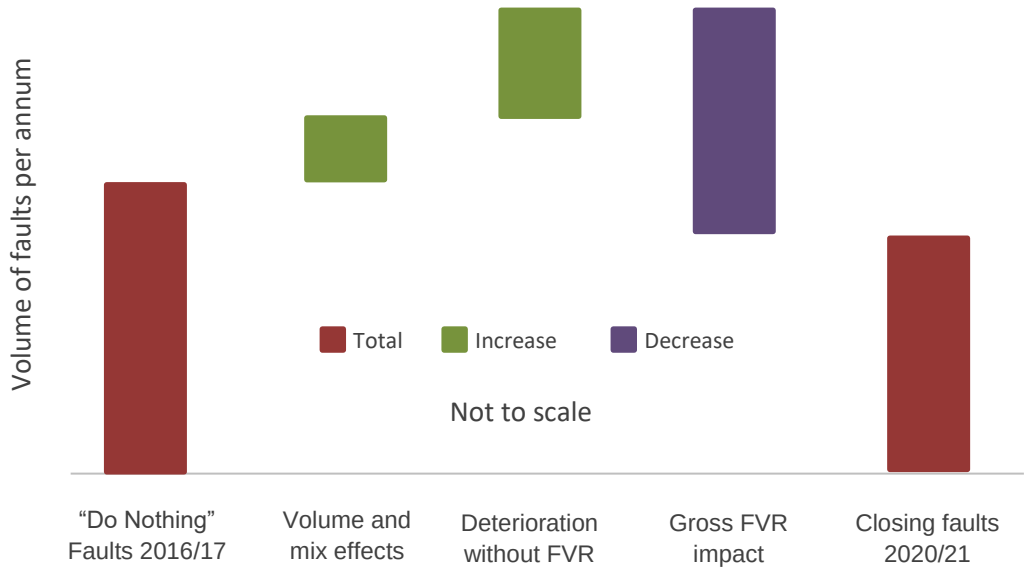
   ii) an impact on the remaining faults in the network.

5.21 The cumulative effects of the service mix change, deterioration in the network and FVR plan give Openreach's planned level of faults for the network over the market review period and beyond. This is summarised in the equation and Figure 5.4 below:

[87] Documented in an Excel workbook called WLA 7 QoS A1.xls and the worksheet entitled "Latest View" submitted as part of Openreach's response of 9 June 2017 to our Seventh Notice.
[88] Openreach's response of 4 August 2017 to Ofcom's Fourth and Seventh Notice in relation to quality of service requiring the provision of specified information under Section 135 of the Communications Act 2003 dated 26 July 2017.
[89] G.fast is a technology that provides higher bandwidth broadband. BT is trialing G.fast at bandwidth variants including 160 Mbit/s and 330 Mbit/s download.

Planned fault volume in 2020/21 = "Do Nothing" fault volume in 2016/17 + changes in volume & mix + deterioration without investment – gross impact of FVR

Figure 5.4: Our illustration of Openreach's forecast movement in faults between 2015/16 and 2020/21.



Source: Ofcom analysis of Openreach data.

Our interpretation of Openreach's latest FVR plan for use in our fault rate forecast

5.22 Our analysis is based on fault rates by service, as our method is used to inform our charge control modelling, which determines cost components for each regulated service. This is different to the Openreach methodology described above, which considers fault volumes in aggregate. It is therefore necessary for us to convert Openreach's aggregated analysis into an assessment of the percentage impact of FVR on the fault rates of relevant services.

5.23 Our starting point is to convert our fault rate forecasts for relevant services (proposed in March) to an aggregated analysis to allow a direct comparison between to the two methodologies. To do this we have taken the forecast fault rates for each service[90], and multiplied them by our service volume forecast to derive total fault volumes for all relevant services.

5.24 Figure 5.5 below shows that between 2015/16 and 2020/21 we forecast the following movements in the total number of relevant faults for WLR, MPF, WLR+SMPF, WLR+FTTC and MPF+FTTC:

[90] We have already discounted faults which are not relevant for the purposes of our proposed charge control.

a) a [✂] in faults due to a [✂] in the number of relevant services supplied – i.e. [✂] volumes of services will lead to [✂] volumes of faults;

b) an increase in faults due to the higher proportion of GEA-FTTC services, which have an inherently higher fault rate than standard broadband and voice only services;

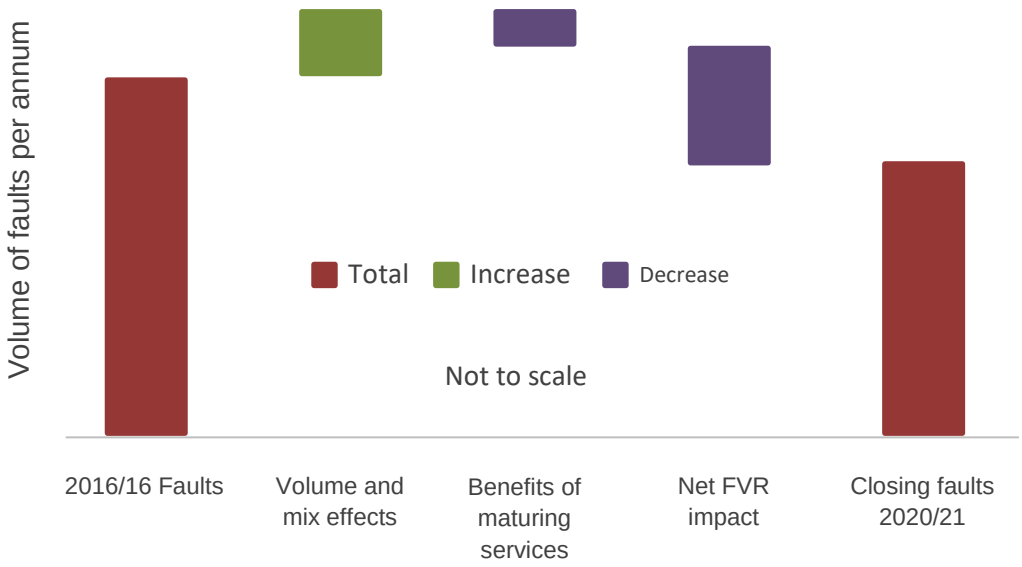
c) a decrease in faults due to our assessment that, over time, the GEA-FTTC fault rate should improve as the service matures; and

d) a decrease in faults due to our assessment of the effects of Openreach's FVR plan.

5.25 The cumulative effects of volume and service mix changes, maturing services and FVR give the total level of faults for 2020/21 derived from our modelling. This is summarised in the equation and Figure 5.5 below.

Forecast fault volume in 2020/21 = 2015/16 fault volume + changes in volume and mix + impact of maturing services + net impact of FVR

Figure 5.5: Illustration of our forecast movement in faults between 2015/16 and 2020/21



Source: Ofcom analysis.

5.26 By setting out the two methods in the same format we can see that the key methodological difference is that Openreach do not identify a reduction in faults as their FTTC services mature. For the purpose of this consultation, it is our assumption that this effect has been incorporated into Openreach's gross effects of FVR.

5.27 Therefore, we can derive the implied net effect of FVR in Openreach's plan through the following calculation:

Net Effect of FVR (Openreach) = Deterioration without FVR – Gross impact of FVR – Benefits of maturing services (Ofcom)

5.28 This 'Net Effect of FVR' is the reduction in the volume of faults that we expect Openreach's latest plan to deliver. We convert it to a percentage by dividing it by the fault volume in our base year (2015/16).

5.29 As a result, we have reduced our forecast for the benefits of FVR in reducing the fault rate in 2020/21 from [✂ %] in our March 2017 QoS Consultation to [✂ %]. This means, for example, that a service with a projected fault rate in our March consultation of 9% by 2020/21 is now projected to have a fault rate of 10%.

5.30 This change to our proposal means that, compared to the forecast in our March 2017 QoS Consultation, we do not expect faults to reduce as much as we first proposed although we do still expect the rate of faults to decrease substantially. We set out at the end of this section a revised forecast for 2020/21, and glidepath to this forecast for each service combination.

Our revised fault rate forecast including our interpretation of the effects of Openreach's latest FVR plans

5.31 In our March 2017 QoS Consultation a significant element of our proposed forecast for fault rates on relevant services was the impact of Openreach's FVR investment plans. We have updated our proposals to ensure that they correctly reflect Openreach's latest FVR plan, the details of which we have confirmed using our statutory information gathering powers. Our revised proposal for fault rate forecasts is as set out in Table 5.6.

Table 5.6: Difference between our March fault rate forecast for 2020/21 and our revised proposals using Openreach's actual FVR plan and our interpretation of its effects

	2020/21 fault rate proposed in March	2020/21 revised fault rate	Change
WLR	[✂ %]	[✂ %]	11.3%
MPF	[✂ %]	[✂ %]	11.3%
WLR+SMPF	[✂ %]	[✂ %]	11.3%
WLR+GEA-FTTC	[✂ %]	[✂ %]	10.2%
MPF+GEA-FTTC	[✂ %]	[✂ %]	10.2%

Source: Ofcom analysis of Openreach data.

5.32 We have updated our forecast fault rate glidepaths as set out in Table 5.7 below:

Table 5.7: Forecast fault rates for copper and GEA-FTTC services over the period of charge control using Openreach's actual FVR plan and our interpretation of its effects

	Base Year 2015/2016	Year 1 2018/2019	Year 2 2019/2020	Year 3 2020/21
WLR	8.3%	[✂ %]	[✂ %]	[✂ %]
MPF	11.2%	[✂ %]	[✂ %]	[✂ %]
WLR+SMPF	12.0%	[✂ %]	[✂ %]	[✂ %]
SMPF	3.7%	[✂ %]	[✂ %]	[✂ %]
WLR+GEA-FTTC	13.3%	[✂ %]	[✂ %]	[✂ %]
MPF+GEA-FTTC	15.6%	[✂ %]	[✂ %]	[✂ %]

Source: Ofcom analysis of Openreach data.

Results from our charge control models

5.33 In parallel with this consultation we are also carrying out a further consultation on a range of proposed amendments to our charge control proposals[91]. We have updated our base case and consultation range using our above revised forecast fault rate. We set out below our revised assessment of the impact of this on our charge control proposals alongside our March 2017 proposals.

Table 5.8: Outputs from charge control models for QoS proposals – Impact of planned FVR investment on unit costs per annum in 2020/21

	March fault reduction[92]	Revised fault reduction
MPF rental SML 1	£(2.21)	£(1.59)
GEA 40/10 rental SML 2	£(0.54)	£(0.43)

Note: Unit cost figures presented represent the impact of Openreach's planned FVR investment programme only (i.e. they do not include the impact of fault rate reductions due to the effects of volume and mix and maturing services).

Source: Ofcom.

Question 5.1: Do you agree with our forecast as modified from our March proposals? Please provide reasons and evidence in support of your views.

[91] Ofcom, 2017. *Wholesale Local Access Charge Control, Further consultation*. https://www.ofcom.org.uk/consultations-and-statements/category-2/wla-market-review-further-consultation-on-charge-control.

[92] Our further analysis has identified a methodological issue with the March 2017 consultation which led to the benefits of FVR being understated. This has been corrected for our current proposals. Further details are set out in the accompanying charge control document.

6. Proposed quality of service remedies

Introduction

6.1 In the preceding sections, we have set out proposed refinements to the quality of service remedies published in the March 2017 QoS Consultation. We are now proposing that:

- the binding quality standard for on-time repair rises to 88% by the third year of the review period as set out in Table 6.2 below;
- the additional resources needed by Openreach to meet the binding quality standard for on-time repair increases the cost of MPF rental at SML 1 by £0.83 and GEA-FTTC 40/10 at SML 2 by £0.60, in 2020/21; and
- our forecast fault rate of [✂ %] in 2020/21 reduces the cost of MPF rental at SML 1 by £1.59 and GEA-FTTC 40/10 at SML 2 by £0.43, in 2020/21.

6.2 We are consulting now on these specific changes to our March 2017 QoS Consultation proposals based on our assessment of evidence which we have received since making our March proposals.

6.3 We have already received a wide range of comments from stakeholders, both positive and negative, regarding other aspects of the March 2017 QoS Consultation, including comments on our proposals to:

a) set a standard on the proportion of repairs that are completed no more than five working days over SLA (see Tables 6.3 below); and

b) set standards for Openreach's installation performance (see Tables 6.4 and 6.5 below).

c) Provide allowances for *force majeure* (or MBORC) for the installation standards and the on-time repair standard (as indicated in Tables 6.2, 6.4 and 6.5 below).

6.4 The consideration of these responses is not within the scope of this further consultation. We will consider all responses to our March 2017 QoS Consultation proposals, and further responses to this consultation on refinements to these proposals, before making decisions in our final Statement, which we expect to publish in early 2018.

6.5 The purpose of this section is to consider how our modified proposals, in conjunction with the wider set of proposals set out in the March 2017 QoS Consultation, satisfy the legal tests in the Communications Act 2003 ('the Act'), while taking utmost account of relevant EC recommendations and BEREC common positions.

Assessment of our proposed package of remedies

6.6 In Section 3, we proposed to set standards for BT's fault repair performance which will rise to 88% of repairs to be completed on time by the third year of the review period. In our March 2017 QoS Consultation, we also proposed standards that would require Openreach to complete 97% of repairs in no more than five working days over SLA timescales. Our proposals are shown in Tables 6.2 and 6.3 below.

6.7 Our March 2017 QoS Consultation also proposed to set standards for Openreach's installation performance, requiring appointments to be available within a ten-day period in 90% of cases by the third year of the market review period. Further, we have proposed that, when an installation date has been agreed with the customer, it should be met in 95% of cases by the third year of the review. These are shown in Tables 6.4 and 6.5 below.

6.8 In assessing the levels at which we should set the standards, we have considered:

- the benefits to competition, customers, and telecoms providers, in particular regarding providing certainty around (i) the quality of the services being purchased by telecoms providers and (ii) the waiting times customers will experience for an installation or repair;
- how operationally feasible it is for Openreach to achieve standards within the timeframe of the review period; and
- the resource implications, and consequent impact on costs for customers and telecoms providers.

6.9 We set out our assessment of our complete package of repair and installation proposals against these criteria below.[93]

Our proposals in relation to customer needs and certainty

6.10 Regarding the benefits to customers, telecoms providers, and competition for each of the proposed standards, we consider that our proposals taken in aggregate will have a positive reinforcing effect. Customer confidence in high standards in one aspect of the service they buy can be eroded by poor quality in other aspects of the same service.

6.11 In contrast, generally high quality in all aspects of service delivery should give customers confidence in their use of their services and in their ability to switch without fear of disruption and loss of service. Further, as customers are becoming increasingly reliant on telecoms services and place greater value on them, progressively higher standards prevent a potential escalation in consumer harm.

6.12 High standards should also give telecoms providers the confidence to develop service packages that meet customer needs, without fear of damage to their brand image. At present, an 80% repair standard means that one in five customers will be let down if telecoms providers set expectations of a next day repair. Our proposal to require Openreach to improve its performance such that 88% of repairs are completed on time, although less than our March 2017 QoS Consultation proposal of 93%, still represents a significant and meaningful increase in certainty regarding repair times. Further, our proposed 88% on-time repair standard, combined with our proposals to require 97% of repairs to be completed not later than five working days after the SLA period (one or two days), there is the potential for greater differentiation between telecoms providers in

[93] Our complete package of repair and installation proposals are subject to our consideration of responses to both the March 2017 QoS Consultation and this further consultation.

terms of the service promises they make, that are based on their own service capability, rather than constrained by Openreach.

6.13 Greater certainty over installation performance should also give telecoms providers better control over customers switching to their services, which will reduce the probability that Openreach adversely affects the important first experience a customer has with a new telecoms provider.

6.14 Therefore, we consider that separately, and in combination, our proposals address our criteria in relation to customer needs and certainty.

Our proposals in relation to operational feasibility

6.15 In the 2014 FAMR, we set quality standards aimed at returning performance to previously observed levels. In this review, we propose standards that BT has either not achieved, or has not consistently achieved across all its geographic regions. We recognise that this will require BT to make changes to its operations and potentially its interactions with telecoms providers.

6.16 In Section 3 we describe how we have taken account of new evidence provided by Openreach regarding operational limits to its performance, and that Openreach has confirmed that a final year target of 88% for on-time repair is feasible. We have also proposed glidepaths to reach our proposed final year targets for both the repair and provision targets. Our aim is to balance continuous improvements in the service customers receive with giving BT time to make the necessary changes to its operations to deliver to at least our proposed requirements in an efficient and sustainable manner.

6.17 For on-time repair standards we have proposed a near linear glide path rising to 88% in the third year of the review period. We recognise BT will need to increase its resources and invest in the skills and equipment of its engineers to achieve the final year target. For installations, we have set the proposed standards at a level designed to prevent any deterioration in current performance while BT makes the necessary changes to its operations to achieve higher standards in the final year. We have also set the standards below the limits of the operational capabilities we believe Openreach can achieve.

6.18 Our proposals with respect to fault rates in the accompanying charge control to the WLA market review are also relevant here. Although are assessment of the fault rate reduction is less than our March proposals, when BT undertakes its proposed investment in fault volume reduction the resulting reduction in repair effort should free engineers for any necessary retraining and embedding of new ways of working.

6.19 In effect, we anticipate that there is a potential operational virtuous circle that BT can exploit, and that the glidepaths we intend to use for our proposed increases in the quality standards are designed to give it the opportunity to do so. Therefore, while we acknowledge that our proposals are challenging, we believe it is operationally feasible for Openreach to achieve them over the review period.

Our proposals in relation to costs to customers and telecoms providers

6.20 We set out in Section 4 our methodology for assessing Openreach resource uplifts associated with improving its on-time repair performance. We have used the model outputs in conjunction with our charge control models to estimate the cost impact of our proposed quality of service regulation. Our estimate of the resulting cost impact is set out below for the two services for which we propose to set charge controls.[94]

Table 6.1: Nominal price impact on charge controls in 2020/21

	Service Maintenance Level (SML)	Cost Impact £s per annum per line	Percentage impact on proposed charge control
MPF	1	+£0.83	c.1%
GEA-FTTC 40/10	2	+£0.60	c.1%

Source: Ofcom.

6.21 In our judgement, the direct impact of our proposals on the level of the charge controls on MPF SML 1 and GEA 40/10 services at SML 2 are modest when compared to the significant improvement in the quality of services that customers will receive, as well as the competition benefits of improved certainty. Our research on willingness to pay has shown that the customer base is heterogenous, with some customers willing to pay for better, faster service, and some willing to accept a discount for slower service. We consider that providing more certainty over the quality that Openreach will provide means that telecoms providers can make a meaningful choice between the different service maintenance levels, and thus they can select the price-quality trade-off that is appropriate for their customers. In turn, this should ensure the continued effectiveness of the network access remedies that we have proposed.

6.22 We believe that our strategy of increasing quality standards has increased BT's focus on improving quality. We think that it has spurred BT to look for ways to reduce fault rates to a more efficient level, which should lead to a significant operating cost saving. The effect of this reduction in faults on the cost of MPF SML 1 will be to reduce costs by £1.59 per line per year (nominal terms in 2020/21). As such, the total cost of repairing customer lines on the Openreach network, taking into account the reduction in the fault rate (£1.59 reduction) and the faster speed of repair that we propose (£0.83 increase per line per year), is going down by £0.76, and we would expect this to feed through to lower prices for customers.

6.23 We recognise that, compared to our March 2017 QoS Consultation proposals, the proposals in this consultation result in a lower on time repair standard proposal (see Table

[94] In the 2016 NMR Consultation, we have proposed pricing flexibility for Openreach regarding WLR, and we propose pricing freedom for MPF service subject to SML 2 in the March 2017 WLA Consultation (published alongside this document). Our general access conditions, including the requirement for fair and reasonable prices, continue to apply.

3.1 for the March proposals compared with Table 3.6 for the current proposals), a slight increase in the associated resource uplift (see Table 4.8), and a lower forecast fault rate reduction (See Table 5.8). We have explained why we consider these changes to be necessary to reflect the new evidence we have analysed following our March consultation. Nevertheless, as described above, the combination of these proposals will result in a meaningful improvement to quality of service for the regulated services at a cost which remains proportionate to the benefits to competition and consumers.

Question 6.1: Do you agree with the package of quality of service remedies we are proposing? Please provide reasons and evidence in support of your views.

Consideration of the legal tests for imposing quality of service regulations

6.24 In our March 2017 QoS Consultation we proposed imposing a number on directions in relation to quality of service for WLR, MPF and GEA, including:

- a proposed direction which imposes on BT, for MPF, WLR, and GEA-FTTC, requirements to meet defined service standards, which increase over the forward-looking market reviews, in respect of:
  - completing the repair of faults within SLA timescales;
  - completing the repair of faults which exceed specified SLA timescales within a further five working days;
  - the period within which BT must offer appointments (where required) for the installation of WLR, MPF, and GEA-FTTC services; and
  - completing the installation of WLR, MPF, and GEA-FTTC services on the date agreed with the customer.

6.25 In Annex 6, we set out our proposed amendments to the directions we consulted on in the March 2017 QoS Consultation in relation to the standard for on-time repair, consistent with our proposals in this further consultation.

6.26 Below we describe our proposals in more detail and set out our considerations for how they continue to meet the relevant legal tests under the Act and are consistent with relevant EC recommendations and BEREC common positions, taking into account our revised proposals of repair standards and our approach to fault rates

Proposals to impose quality of service standards

Aim and effect of regulation

6.27 One of the consequences of BT having SMP is that it may not provide the quality of service that customers require. In competitive markets, customers' ability to switch providers signals to providers to choose a cost-quality trade-off that will suit their customers. However, in the case of the wholesale fixed access markets, Openreach is unlikely to

receive such signals, as customers generally cannot switch to alternative networks. Moreover, the lack of competitive pressure may result in Openreach having little incentive to innovate to find ways of improving quality of service. In addition, there is the potential for discrimination issues if Openreach were to provide BT divisions with better quality than it provides to other (non-BT Group) telecoms providers.

6.28 As set out in our March 2017 WLA Consultation, the negative effects on customers of inadequate service quality delivered by Openreach include a greater number of faults, slow resolution of those faults, and frustration resulting from long delays to installations. Inadequate Openreach quality of service also has the potential to undermine the effective functioning of the network access remedy due to the negative impacts on retail competition by, among other things, affecting switching behaviour. For example, long or uncertain waiting times for a provision or repair may discourage switching with consequent implications for retail competition.

6.29 Quality standards will apply to Openreach's performance at the aggregate level over a defined period with the aim of ensuring that quality is maintained at a sufficiently high level to prevent material detriment to competition and customers. Quality standards safeguard against the network access remedy being undermined.

6.30 A further benefit of quality standards is that if they are set at a sufficiently demanding level they give telecoms providers certainty about the level of quality they can expect from Openreach. This contrasts with the SLA/SLG regime, which provides compensation if a specific installation or repair is not dealt with in a timely manner, but gives little assurance to telecoms providers over what will actually be achieved. We believe that certainty over the speed of repairs and installations plays an important role in the functioning of retail competition and contributes to the effectiveness of the network access remedy. It allows telecoms providers to plan their strategies for delivering retail services and differentiating their products effectively.

Our proposals

Proposals in this consultation in relation to repairs

6.31 As set out in Section 3, in relation to on-time repair at SMLs 1 and 2, we propose an increase in the current 80% standard to 88% over the review period.

Table 6.2: Quality standards for on-time repairs (WLR, MPF, and GEA-FTTC)

	Current level	First year (2018/19)	Second year (2019/20)	Third year (2020/21)
Repair completion within SLA timescales	80%	83%	86%	88%
(Adjusted standard for *force majeure*)	(77%)	(80%)	(83%)	(85%)

Source: Ofcom.

Quality standards for repairs

6.32 In the case of SML 1 and 2 repairs completed five working days beyond SLA timescales, we propose setting a 97% standard in the final year of the control.

Table 6.3: Quality standards for repairs completed at +5 working days (WLR, MPF, and GEA-FTTC)

	Current level	First year (2018/19)	Second year (2019/20)	Third year (2020/21)
Repair completion within SLA +5 days	N/A	95%	96%	97%

Source: Ofcom.

Application, compliance, and enforcement

6.33 Consistent with our decisions in the 2014 FAMR, we intend to apply the proposed on-time repair standards on a regional basis, taking account of force majeure by way of a 3% adjustment, and will assess BT's compliance on an annual basis.

6.34 With respect to the +5 days standards, we propose to apply these measures on a national basis taking account of 'High Level MBORCs' (e.g. extreme weather events) only, and will again assess BT's compliance annually.

6.35 Compliance with the two repair standards will be assessed by measuring the combined performance of WLR, MPF, and GEA-FTTC. We are also proposing that the new standards should come into force on 1 April 2018, at the end of the ongoing compliance year for the quality of service requirements currently in force.[95] We are proposing that the standards applicable in the third year (2020/21) remain in force until modified or withdrawn.

Quality standards for installations

[95] Per the 2016 Directions and Consents relating to the WLR and MPF minimum standards and KPIs, the current compliance period for the MPF and WLR Minimum Standards will end on 1 April 2018. See Ofcom, 2016. *Quality of Service direction for WLR. Direction setting further minimum standards for WLR provisions under the SMP conditions imposed in the 2014 Fixed Access Market Reviews*. https://www.ofcom.org.uk/__data/assets/pdf_file/0016/94300/Further-QoS-Statement.pdf.

6.36 In relation to installation date certainty, we propose an increase in the current 90% standard to 95% over the market review period.

Table 6.4: Quality standards for installation date certainty (WLR, MPF, and GEA-FTTC)

	Current level	First year (2018/19)	Second year (2019/20)	Third year (2020/21)
% of installations to be completed by the committed date (Adjusted standard for *force majeure*)	90% (89%)	92% (91%)	92% (91%)	95% (94%)

Source: Ofcom.

6.37 In the case of installations requiring appointments for an engineer visits, we propose:

- a reduction in the lead times for the first available appointment date (FAD) offered by Openreach from 12 working days to ten working days; and
- a requirement on Openreach to offer a ten-working day appointment date 90% of the time rather than the current 80%.

Table 6.5: Quality standards in relation to the FAD for installations requiring an engineer visit (WLR, MPF, and GEA-FTTC)

	Current level	First year (2018/19)	Second year (2019/20)	Third year (2020/21)
Working days within which first date offered for installation appointments	12	12	12	10
Frequency with which regulated installation appointment date must be offered (Adjusted standard for *force majeure*)	80% (79%)	90% (89%)	90% (89%)	90% (89%)

Source: Ofcom.

Application, compliance, and enforcement

6.38 Consistent with our decisions in the 2014 FAMR Statement, we intend to apply the proposed installation standards on a regional basis, taking account of MBORCs by way of specific allowances, and will assess BT's compliance on an annual basis.

6.39 Compliance with the two provision standards will be assessed by measuring the combined performance of WLR, MPF, and GEA-FTTC services. We are also proposing that the new standards should come into force on 1 April 2018, at the end of the ongoing compliance

year for the quality of service requirements currently in force.[96] We are proposing that the standards applicable in the third year (2020/21) remain in force until modified or withdrawn.

Legal tests

6.40 Section 87(3) of the Act authorises the setting of SMP services conditions in relation to the provision of network access. Section 87(5) of the Act provides that such conditions may include provision for securing fairness and reasonableness in the way in which requests for network access are made and responded to and for securing that the obligations contained in the conditions are complied with within the periods and at the times required by or under the conditions. In this regard, we note Article 12(1) of the Access Directive, which provides that national regulatory authorities may attach to conditions relating to network access obligations covering fairness, reasonableness and timeliness. We have set out in the 2016 NMR Consultation and March 2017 WLA Consultation why we consider the proposed SMP conditions regarding quality of service meet the relevant tests set out in the Act.

6.41 At Annex 8 of the March 2017 QoS Consultation we set out our proposed directions for quality of service standards made pursuant to the above proposed SMP conditions. For the reasons set out below, we are satisfied that these proposed directions amended pursuant to our proposals in this consultation (as notified at Annex 7) meet the relevant tests set out in the Act.

6.42 We consider that the directions we are proposing to make meet our duties in the Act, including our general duties under section 3 and all the Community requirements set out in section 4 of the Act. In particular, the proposed directions are aimed at promoting competition and securing efficient and sustainable competition for the maximum benefit of consumers by ensuring that BT provides an improved level of performance in key areas of importance to its customers and to consumers.

6.43 We also consider that the proposed directions meet the criteria in section 49(2) of the Act. In particular, our proposals are:

- objectively justifiable, in that they aim to ensure that BT provides adequate levels of quality of service in relation to the installation and maintenance of the network access on which telecoms providers and their customers rely. For the reasons set out in this document, we consider that, to achieve this level of quality of service, it is necessary to continue imposing quality standards and to set these at the increased levels we are proposing;

[96]According to the 2016 Directions and Consents relating to the WLR and MPF minimum standards and KPIs, the current compliance period for the MPF and WLR Minimum Standards will end on 1 April 2018. See Ofcom, 2016. *Quality of Service direction for WLR. Direction setting further minimum standards for WLR provisions under the SMP conditions imposed in the 2014 Fixed Access Market Reviews*. https://www.ofcom.org.uk/__data/assets/pdf_file/0016/94300/Further-QoS-Statement.pdf.

- not unduly discriminatory, as it is proposed only for BT and no other operator has been provisionally found to hold a position of market power in the wholesale fixed access markets;
- proportionate, in that they are targeted specifically to those areas for which regulation is required. We consider that our proposals are a proportionate means of achieving the objective of ensuring an appropriate level of service in the delivery of key aspects of network access, taking into account our revised assessment of BT's operational capabilities and potential costs to customers and telecoms providers. Further, the requirements that we are proposing are structured to take into account the impact of events outside BT's control on its ability to meet our proposed standards; and
- transparent, in that it is clear that the intention of the directions is to ensure that BT maintains an appropriate level of quality of service in relation to several key aspects of importance to telecoms providers that buy these wholesale inputs and to consumers. In addition, our proposed directions are clear in setting out the standards that we are proposing to impose.

6.44 For the reasons set out above, we consider that the proposed quality of service performance standards directions are appropriate to address the concerns we have identified and are in line with section 49(2) of the Act.

The BEREC common position

6.45 In making these proposals we have also taken utmost account of the BEREC common position.[97] In relation to the objective of achieving a reasonable quality of access services (operational aspects), we note that the BEREC common position identifies, among other things, as best practice that national regulatory authorities (NRAs) should require SMP operators to provide a reasonable defined level of service (BP32) to address the concern that access services may not be of reasonable quality and service levels may not be comparable with those provided by the SMP operators to their own downstream businesses.

Question 6.2: Do you agree that our proposed quality of services remedies (as revised) are objectively justifiable, not unduly discriminatory, proportionate and transparent? Please provide reasons and evidence in support of your views.

[97] BEREC, 2012. *BEREC common position on best practice in remedies on the market for wholesale (physical) network infrastructure access (including share or fully unbundled access) at a fixed location imposed as a consequence of a position of significant market power in the relevant market,* BoR (12) 127, 8 December 2012, http://berec.europa.eu/eng/document_register/subject_matter/berec/regulatory_best_practices/common_approaches_positions/1127-revised-berec-common-position-on-best-practice-in-remedies-on-the-market-for-wholesale-physical-network-infrastructure-access-including-shared-or-fully-unbundled-access-at-a-fixed-location-imposed-as-a-consequence-of-a-position-of-significant-market-power-in-the-relevant-market [accessed 5 September 2017].

A1. Responding to this consultation

How to respond

A1.1 Ofcom would like to receive views and comments on the issues raised in this document, by 5pm on 26 October 2017.

A1.2 We strongly prefer to receive responses via the online form at https://www.ofcom.org.uk/consultations-and-statements/category-2/quality-service-wlr-mpf-gea. We also provide a cover sheet https://www.ofcom.org.uk/consultations-and-statements/consultation-response-coversheet) for responses sent by email or post; please fill this in, as it helps us to maintain your confidentiality, and speeds up our work You do not need to do this if you respond using the online form.

A1.3 If your response is a large file, or has supporting charts, tables or other data, please email it to QoS2017@ofcom.org.uk, as an attachment in Microsoft Word format, together with the cover sheet (https://www.ofcom.org.uk/consultations-and-statements/consultation-response-coversheet). This email address is for this consultation only, and will not be valid after 1 April 2018.

A1.4 Responses may alternatively be posted to the address below, marked with the title of the consultation:

Quality of Service Team
Ofcom
Riverside House
2A Southwark Bridge Road
London SE1 9HA

A1.5 If you would like to submit your response in an alternative format (e.g. a video or audio file), please contact Warwick Izzard on 020 7783 4127, or email warwick.izzard@ofcom.org.uk

A1.6 We do not need a paper copy of your response as well as an electronic version. We will acknowledge receipt if your response is submitted via the online web form, but not otherwise.

A1.7 You do not have to answer all the questions in the consultation if you do not have a view; a short response on just one point is fine. We also welcome joint responses.

A1.8 It would be helpful if your response could include direct answers to the questions asked in the consultation document. The questions are listed at Annex 4. It would also help if you could explain why you hold your views, and what you think the effect of Ofcom's proposals would be.

A1.9 If you want to discuss the issues and questions raised in this consultation, please contact Ali-Abbas Ali on 020 7783 4090, or by email to ali-abbas.ali@ofcom.org.uk

Confidentiality

A1.10 Consultations are more effective if we publish the responses before the consultation period closes. In particular, this can help people and organisations with limited resources or familiarity with the issues to respond in a more informed way. So, in the interests of transparency and good regulatory practice, and because we believe it is important that everyone who is interested in an issue can see other respondents' views, we usually publish all responses on our website, www.ofcom.org.uk, as soon as we receive them.

A1.11 If you think your response should be kept confidential, please specify which part(s) this applies to, and explain why. Please send any confidential sections as a separate annex. If you want your name, address, other contact details or job title to remain confidential, please provide them only in the cover sheet, so that we don't have to edit your response.

A1.12 If someone asks us to keep part or all of a response confidential, we will treat this request seriously and try to respect it. But sometimes we will need to publish all responses, including those that are marked as confidential, in order to meet legal obligations.

A1.13 Please also note that copyright and all other intellectual property in responses will be assumed to be licensed to Ofcom to use. Ofcom's intellectual property rights are explained further at https://www.ofcom.org.uk/about-ofcom/website/terms-of-use.

Next steps

A1.14 Following this consultation period, Ofcom plans to publish a statement in early 2018.

A1.15 If you wish, you can register to receive mail updates alerting you to new Ofcom publications; for more details please see https://www.ofcom.org.uk/about-ofcom/latest/email-updates

Ofcom's consultation processes

A1.16 Ofcom aims to make responding to a consultation as easy as possible. For more information, please see our consultation principles in Annex 2.

A1.17 If you have any comments or suggestions on how we manage our consultations, please email us at consult@ofcom.org.uk. We particularly welcome ideas on how Ofcom could more effectively seek the views of groups or individuals, such as small businesses and residential consumers, who are less likely to give their opinions through a formal consultation.

A1.18 If you would like to discuss these issues, or Ofcom's consultation processes more generally, please contact Steve Gettings, Ofcom's consultation champion:

Steve Gettings
Ofcom
Riverside House
2a Southwark Bridge Road
London SE1 9HA
Email: corporationsecretary@ofcom.org.uk

A2. Ofcom's consultation principles

Ofcom has seven principles that it follows for every public written consultation:

Before the consultation

A2.1 Wherever possible, we will hold informal talks with people and organisations before announcing a big consultation, to find out whether we are thinking along the right lines. If we do not have enough time to do this, we will hold an open meeting to explain our proposals, shortly after announcing the consultation.

During the consultation

A2.2 We will be clear about whom we are consulting, why, on what questions and for how long.

A2.3 We will make the consultation document as short and simple as possible, with a summary of no more than two pages. We will try to make it as easy as possible for people to give us a written response. If the consultation is complicated, we may provide a short Plain English / Cymraeg Clir guide, to help smaller organisations or individuals who would not otherwise be able to spare the time to share their views.

A2.4 We will consult for up to ten weeks, depending on the potential impact of our proposals.

A2.5 A person within Ofcom will be in charge of making sure we follow our own guidelines and aim to reach the largest possible number of people and organisations who may be interested in the outcome of our decisions. Ofcom's Consultation Champion is the main person to contact if you have views on the way we run our consultations.

A2.6 If we are not able to follow any of these seven principles, we will explain why.

After the consultation

A2.7 We think it is important that everyone who is interested in an issue can see other people's views, so we usually publish all the responses on our website as soon as we receive them. After the consultation we will make our decisions and publish a statement explaining what we are going to do, and why, showing how respondents' views helped to shape these decisions.

A3. Consultation coversheet

BASIC DETAILS

Consultation title:

To (Ofcom contact):

Name of respondent:

Representing (self or organisation/s):

Address (if not received by email):

CONFIDENTIALITY

Please tick below what part of your response you consider is confidential, giving your reasons why

Nothing ☐

Name/contact details/job title ☐

Whole response ☐

Organisation ☐

Part of the response ☐

If there is no separate annex, which parts? _____

_____

If you want part of your response, your name or your organisation not to be published, can Ofcom still publish a reference to the contents of your response (including, for any confidential parts, a general summary that does not disclose the specific information or enable you to be identified)?

DECLARATION

I confirm that the correspondence supplied with this cover sheet is a formal consultation response that Ofcom can publish. However, in supplying this response, I understand that Ofcom may need to publish all responses, including those which are marked as confidential, in order to meet legal obligations. If I have sent my response by email, Ofcom can disregard any standard e-mail text about not disclosing email contents and attachments.

Ofcom seeks to publish responses on receipt. If your response is non-confidential (in whole or in part), and you would prefer us to publish your response only once the consultation has ended, please tick here.

Name Signed (if hard copy)

A4. Consultation questions

Question 3.1: Do you agree with our revised position on Openreach's operational capabilities for on-time repair? Please provide reasons and evidence in support of your views.

Question 3.2: Do you agree with the proposed levels of the repair standards? Please provide reasons and evidence in support of your views.

Question 3.3: Do you agree with our proposed glidepath? Please provide reasons and evidence in support of your views.

Question 3.4: Do you have any further comments on our proposals for regulating BT's service performance for repairs? Please provide reasons and evidence in support of your views.

Question 4.1: Do you agree with our resource uplift estimates as modified from our March proposals? Please provide reasons and evidence in support of your views.

Question 5.1: Do you agree with our forecast as modified from our March proposals? Please provide reasons and evidence in support of your views.

Question 6.1: Do you agree with the package of quality of service remedies we are proposing? Please provide reasons and evidence in support of your views.

Question 6.2: Do you agree that our proposed quality of services remedies (as revised) are objectively justifiable, not unduly discriminatory, proportionate and transparent? Please provide reasons and evidence in support of your views.

A5. Resource implications of the revised quality standards

Introduction

A5.1 In this annex, we set out our consideration of the Openreach model (the 'Allocation Model') and further work on our Resource Performance Model ('RPM') to reflect our revised proposals and the new evidence provided by Openreach.

A5.2 This annex is structured as follows:

- our approach to estimating the resource implications of higher quality of service (QoS) standards in the March 2017 QoS Consultation;
- the new evidence submitted by Openreach;
- our description of the Allocation Model;
- our consideration of the Allocation Model;
- our RPM resource estimates; and
- the disclosure of models and associated documents.

Our approach to estimating the resource implications of higher QoS standards in the March 2017 QoS Consultation

Prior to the March 2017 QoS Consultation we considered that a discrete event simulation model could be used to explore the resource implications of higher QoS standards

A5.3 Prior to the March 2017 QoS Consultation, we considered how best to assess the resource and cost implications of the quality of service improvements we are considering for Openreach's voice and broadband services as part of this review.

A5.4 We considered that a discrete event simulation model could be an effective tool because such models are often used to model the operation of queue based processes. With this type of model, the arrival, queuing and processing of individual events (in this case fault repairs and installation orders) are modelled using a time sequence simulation so that the performance characteristics and resource requirements of the process can be assessed.

A5.5 We also considered that Openreach might be best placed to undertake such modelling as it should be better able than us to ensure that the model reflects the operational processes being modelled. In May 2016, we asked Openreach whether it could provide resource estimates for further improvements in service performance and discussed with them how best the performance improvements might be modelled given the limitations identified with the 2013 Distribution Model (an Openreach discrete event simulation model that we used to assess the resource implications of higher QoS performance for the 2014 FAMR).

A5.6 Openreach agreed to provide resource estimates and informed us that it had commissioned EY to develop its resource simulation model, partly in anticipation of our request.

A5.7 In June 2016, Openreach informed us that it was developing two models:

- A replica of the 2013 Distribution Model transferred to a new software platform (using the R programming language) that would enable the resource simulations to run much more quickly. The new model (the '2017 Distribution Model') which would have an option to model performance at more granular level (the 56 Senior Operations Manager (SOM) areas as well as the 9 General Manager (GM) regions) but would otherwise be identical to the 2013 Distribution Model i.e. it would use the distribution approach to simulation with the same simulation logic and should therefore produce comparable results to the 2013 Distribution Model for a given set of inputs.
- A new model (the 'Allocation Model'), that would use the allocation approach to discrete event simulation.

A5.8 The essential difference between the models is the modelling approach. The distribution approach is sometimes described as a top-down approach because the simulation is used to estimate the resources required to deliver a specified performance profile (in the case of the 2013 Distribution Model the baseline performance profile was derived from Openreach's actual performance). In contrast, the allocations approach is sometimes described as a bottom-up approach because the simulation is used to estimate the performance that can be achieved with a given level of resources.

We developed our own high level simulation model because Openreach's model was not available in time for the March 2017 QoS Consultation

A5.9 Development of the models took much longer than expected and Openreach only provided us with sample outputs from the 2017 Distribution Model in February 2017. We did not take these outputs into account in our consultation as we did not have time to review them and we had not had an opportunity to review Openreach's models.

A5.10 In view of the delay with Openreach's modelling, we used an alternative high-level resource simulation model (the 'Resource Performance Model' or 'RPM'), developed in collaboration with our advisors Analysys Mason, to assess the impact of the quality of service standards we had proposed for WLR, MPF and GEA on Openreach's field engineering resources.

A5.11 The RPM provides a high-level simulation of Openreach's installation order and repair activities. Unlike discrete event simulation models, which simulate the execution of individual provision and repair jobs, the RPM simulates the execution of jobs in larger groups or batches, specifically the daily arrivals of new installation orders, SML1 faults and SML2 faults in each of Openreach's 56 Senior Operations Manager areas in Great Britain. The simulation is best described as a book keeping exercise in which the evolution of jobs

is modelled from arrival to completion. A more detailed description is provided in Annex 7 of the March 2017 QoS Consultation and Analysys Mason's report on the RPM.[98]

New evidence submitted by Openreach

Openreach has now completed the Allocation Model and has argued that it is more representative of its field operations than our model

A5.12 Openreach subsequently finished developing the Allocation Model and used outputs from the model to support its response to the March 2017 QoS Consultation.

A5.13 Openreach's view is the Allocation Model is a more accurate simulation of its field engineering operations than the RPM because it models a broader range of factors that influence the level of resources required for field engineering activities.[99] Openreach's view is that the representation of its operations in the RPM is overly simplified and led us to significantly underestimate the additional resources required for higher standards. In support of these claims, Openreach supplied an assessment of the impact on the resource estimates of the differences between the two models[100] and an external review of the models produced by consultants Deloitte.[101]

A5.14 Openreach also considers that the Allocation Model is more accurate and flexible than its 2013 Distribution Model which Ofcom used to estimate the resource uplift required for the minimum standards imposed in the 2014 FAMR.[102] Openreach noted that the 2013 Distribution Model gave good estimates of the resources required for marginal changes in service levels but lacked the ability to accurately assess the implications of a step change in service quality approaching the operational limits to performance. It also noted that certain aspects of the 2013 Distribution Model attracted criticism from Ofcom (such as its use of constant job durations) which Openreach agreed needed to be addressed in future modelling work.[103] Openreach has not provided us with any outputs of the 2017 Distribution Model, other than those described in the March 2017 QoS Consultation.[104]

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[98] Analysys Mason 2017. *Overview of the Quality-of-Service Model and its outputs for WLR/LLI Charge Control 2017.* https://www.ofcom.org.uk/__data/assets/pdf_file/0034/99646/Analysys-Mason-report.pdf.
[99] Paragraphs 352-361 Openreach response to the March 2017 QoS Consultation, https://www.ofcom.org.uk/__data/assets/pdf_file/0013/105115/Openreach.pdf.
[100] Paragraphs 351-367, Openreach response to the March 2017 QoS Consultation, https://www.ofcom.org.uk/__data/assets/pdf_file/0013/105115/Openreach.pdf.
[101] Annex 3, Openreach response to the March 2017 QoS Consultation, https://www.ofcom.org.uk/__data/assets/pdf_file/0013/105115/Openreach.pdf.
[102] Paragraph 34, Openreach response to the March 2017 QoS Consultation, https://www.ofcom.org.uk/__data/assets/pdf_file/0013/105115/Openreach.pdf.
[103] Paragraph 357, Openreach response to the March 2017 Consultation, https://www.ofcom.org.uk/__data/assets/pdf_file/0013/105115/Openreach.pdf.
[104] Meeting with Openreach 27 April 2017.

The new evidence about Openreach's operational limits is also relevant to our consideration of the resource implications of higher QoS standards

A5.15 As discussed in more detail in Section 3, Openreach has submitted new evidence about the operational limits to its field engineering repair performance. For the reasons discussed in Section 3, we have provisionally concluded that the revised 'glass ceiling' analysis provides a more reliable view of Openreach's operational limits.

A5.16 The operational limits are pertinent to our assessment because the resource increments associated with performance improvements are likely to increase significantly as the operational limit is approached.

We have considered whether the Allocation Model produces better resource estimates, for the proposed quality improvements, than our model

A5.17 In light of the new evidence, we have considered whether the resource estimates produced by the Allocation Model could form a suitable input to our regulatory charge control models and whether they produce better resource estimates (for the proposed quality of service improvements) than the RPM. To inform our consideration:

- we commissioned an external review of the Allocation Model by consultants Analysys Mason;
- we made some amendments to the RPM to address some of the limitations identified in the March 2017 QoS Consultation;
- we have produced revised resource estimates using the RPM reflecting our revised proposals for service standards and the new information about Openreach's operational limits; and
- we have conducted additional sensitivity tests with the RPM to explore some of the issues raised by Openreach.

Description of the Allocation Model

A5.18 The Allocation Model was commissioned by Openreach to support its submissions to our consultations on quality of service standards and regulatory charge controls. Openreach has also told us that it intends to use the Allocation Model as an operational planning tool.

A5.19 The model is designed to explore the relationship between field engineering resources and quality of service by simulating the field engineering activities associated with the provision and repair of Openreach's main services: MPF, analogue and digital WLR, SMPF and GEA-FTTC.[105] Some other functions that support installation and repair activities are not modelled. These include exchange jumpering and network construction.

[105] A list of the job types modelled is provided in Openreach's consultation response, page 137, https://www.ofcom.org.uk/__data/assets/pdf_file/0013/105115/Openreach.pdf.

A5.20 As with the RPM, the Allocation Model measures the proportion of orders completed on the appointment date. The availability of appointments is not simulated so the First Appointment Date (FAD) measure cannot be examined directly.

Simulation approach

A5.21 The Allocation Model is a discrete event simulation that uses the allocations approach to discrete event simulation. With this approach, the simulation is used to estimate the performance that would be achieved for a given resource level for a specified pattern of jobs (i.e. repairs and installations).

A5.22 The model simulates the progress of orders and faults through Openreach's field operations from arrival to completion. It includes various functional elements to simulate Openreach's operational processes including:

- simulation of job arrival patterns and queuing of jobs awaiting execution;
- simulation of allocation of work to field engineering technicians based on work priority and skills required;
- simulation of individual field engineering activities including jobs requiring multiple visits and jobs where technicians require assistance from a colleague;
- simulation of variation in travel and task times;
- simulation of variation in the availability of field technicians by skill group; and
- simulation of the operational limits, or 'glass ceiling' to performance.

Model inputs

A5.23 The main inputs to the model are distributions derived from Openreach's operational data. These include distributions relating to job volumes, technician availability, allocation of jobs to technicians and job execution. The model samples each of the distributions randomly.

A5.24 Each model run is in effect a different scenario because each simulated event uses a different combination of the input parameters selected randomly from the input distributions. As a result, the output of each model run is different, unless the pseudo-random number functions[106] used to make the random selections are reset to starting values at the start of the model run.

Model outputs

A5.25 A separate instance of the model is used to simulate each of Openreach's 56 SOM areas in Great Britain. Outputs are subsequently summarised to produce outputs for the 9 Openreach GM regions and for Great Britain. Northern Ireland is not modelled because the input data is not available in the same format as the rest of the UK.

[106] A software function that generates numbers that approximates to a random sequence of numbers.

A5.26 The model is run with a range of resource inputs. The resource increment for a specified improvement is estimated by subtracting the resource estimate for the desired level of performance from the resource estimate for baseline performance (i.e. the performance achieved).

Further details about the model design and operation

A5.27 The discrete event simulation is implemented in the Python programming language and uses the SimPy discrete event simulation software library. An external database is used to hold the input files and the raw output files generated by the simulations. The raw model outputs are 'post-processed' within the database using SQL scripts. Summary outputs are exported from the database to Microsoft Excel for further processing into final outputs.

A5.28 Openreach has provided a more detailed description of the Allocation Model in Annex 2 of its response to the March 2017 QoS Consultation.[107] Analysys Mason has also described the model in its report.[108]

Our consideration of the Allocation Model

The Allocation Model is a sophisticated bottom-up simulation that appears to model Openreach's field operations more closely than previous models

A5.29 Openreach has sought to address concerns about the 2013 Distribution Model and the RPM by producing a sophisticated bottom-up discrete event simulation that in terms of functionality, appears to model its field operations more closely than the other models. The simulation includes operational factors that influence the execution of jobs that are not modelled in the RPM such as variation of travel and task times, resource availability and skilling constraints. Thus, to the extent that these factors influence the resource increases for service improvements, the Allocation Model could produce more accurate results.

In several respects the Allocation Model is less capable than the RPM

A5.30 Analysys Mason found that the Allocation Model takes a much more detailed approach to modelling the relationship between quality of service and field engineering resources compared with the RPM. Analysys Mason also noted there are several areas where the Allocation Model is less capable, or was configured less capably, than the RPM:

- Stress response: job handling limitations primarily relating to the handling of 'stress' situations (periods of exceptionally high demand) mean that the Allocation Model may

[107] Openreach response to the March 2017 QoS Consultation, Annex 2, https://www.ofcom.org.uk/__data/assets/pdf_file/0013/105115/Openreach.pdf.
[108] Analysys Mason, 2017. *WLR/LLU Charge Control 2017 Quality of Service model assessment*. Section 3. https://www.ofcom.org.uk/__data/assets/pdf_file/0013/106312/model-assessment-wlr-llu-quality-service.pdf.

not adequately manage resources to optimise performance. The 'stress' functionality of the Allocation Model was turned off in most scenarios reported by Openreach.

- Inter-SOM loans: resource handling limitations mean that inter-SOM resource loans which may improve performance are not modelled.
- Performance balancing: there is no mechanism beyond the basic job prioritisation rules to balance performance across different types of jobs (installation orders, fault repair SML1 and Fault Repair SML 2 etc.), meaning that resources required to achieve performance targets may be overestimated.
- Modelling errors: model configuration complexity mean that it is hard to guarantee that errors are not introduced in the running of the model.

The audit found that the Allocation Model is broadly speaking well-constructed but also identified problems

A5.31 Analysys Mason concluded that the Allocation Model is broadly speaking, well-constructed, notwithstanding a bug that caused a small proportion of model runs to crash. However, Analysys Mason identified certain problems that led it to conclude that it is unlikely that the model, in its current form, could be used in isolation, to predict resource deltas for performance improvements. These problems were:

- the model is complex to install, configure and run due to a lack of a user interface and insufficiently detailed documentation;
- the model is complex and slow in operation, generating large amounts of data, making sensitivity analysis very slow; and
- it was unclear how some of the input parameters, notably the glass ceiling assumptions, were reflected in the input datasets.

A5.32 Analysys Mason was unable to reproduce Openreach's model results in detail, although this may be due in part to the way in which the model uses random numbers which differs between the versions of Python used by Openreach and Analysys Mason.[109] Importantly, Analysys Mason found that model runs with quite similar input datasets could produce widely varying resource deltas for performance improvements. Although the results were not necessarily incorrect or unreliable, Analysys Mason suggested that Ofcom treat the results with caution given the sometimes counter-intuitive results and the difficulty replicating outputs.[110]

[109] Analysys Mason, 2017. *WLR/LLU Charge Control 2017 Quality of Service model assessment*. Section 4.3. https://www.ofcom.org.uk/__data/assets/pdf_file/0013/106312/model-assessment-wlr-llu-quality-service.pdf.
[110] Analysys Mason, 2017. *WLR/LLU Charge Control 2017 Quality of Service model assessment*. Section 10. https://www.ofcom.org.uk/__data/assets/pdf_file/0013/106312/model-assessment-wlr-llu-quality-service.pdf.

In view of the audit findings we do not intend to rely solely on the Allocation Model as an input to our regulatory charge control models

A5.33 In view of the audit findings we consider that it would not be appropriate to rely on the Allocation Model alone as an input to our regulatory charge control models. The audit has identified several issues that we consider warrant further investigation, including the sensitivity of the outputs to small input changes, the outputs that appear counter-intuitive, the methodology used to derive the model inputs from operational data and the methodology used to manipulate the inputs to reflect changes to the glass ceiling parameters. Moreover, the complexity of the model coupled with the considerable time required to set-up the model and the long run times for simulations, have prevented us from auditing the model to our satisfaction, given the time and resources available to us.

Analysis of the differences between the models has provided valuable insights into the sensitivity of the results to modelling assumptions

Openreach considered that a range of simplifying assumptions and glass ceiling settings used in the RPM give rise to the difference in the resource estimates for performance improvements

A5.34 As noted above, Openreach examined the differences between the Allocation Model and the RPM. Openreach conducted sensitivity tests using the Allocation Model that indicated that the Allocation Model produced similar results to the RPM when similar simplifying assumptions were applied.[111] Openreach summarised its findings in a waterfall chart, reproduced below in Figure A5.1, illustrating how the differences in the modelling approach and the glass ceiling assumptions give rise to the differences in the resource deltas for the proposed quality standards.

[111] Paragraphs 361-367, Openreach response to the March 2017 Consultation, https://www.ofcom.org.uk/__data/assets/pdf_file/0013/105115/Openreach.pdf.

Figure A5.1: Openreach assessment of the impact of differences between the RPM and the Allocation Model on resource deltas

[✂]

Source: Figure 39, Openreach response to the March 2017 QoS Consultation, https://www.ofcom.org.uk/__data/assets/pdf_file/0013/105115/Openreach.pdf.

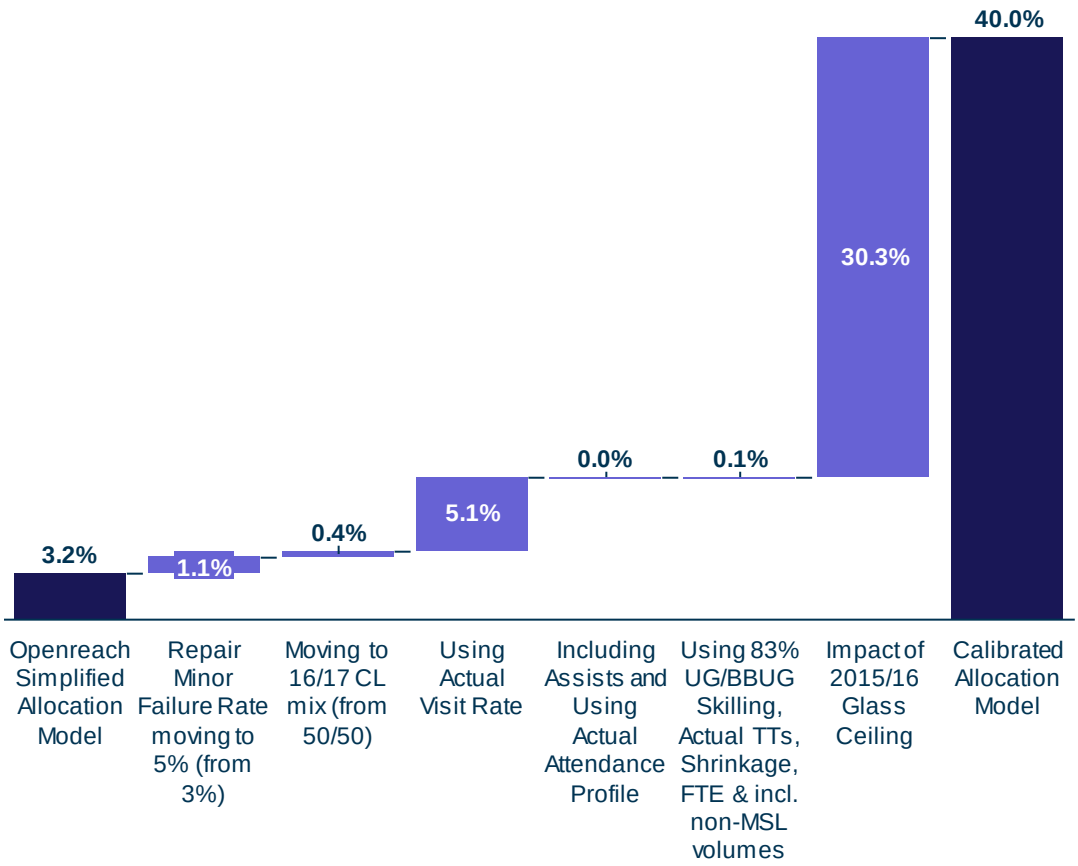
Analysys Mason concluded that the differences in the resource estimates are due primarily to differences in the glass ceiling settings

A5.35 Analysys Mason identified several problems with Openreach's analysis which led it to conclude that Openreach's analysis does not provide solid evidence.[112]

A5.36 Analysys Mason produced an amended version of the waterfall chart illustrating how the methodological differences and the glass ceiling assumptions give rise to the difference between the resource deltas generated by the RPM and the Allocation Model.

[112] Analysys Mason, 2017. *WLR/LLU Charge Control 2017 Quality of Service model assessment*. Section 6.2. https://www.ofcom.org.uk/__data/assets/pdf_file/0013/106312/model-assessment-wlr-llu-quality-service.pdf.

Figure A5.2: Analysys Mason assessment of the impact of differences between the RPM and the Allocation Model on resource deltas



Source: Figure 6.2, Analysys Mason report

A5.37 Figure A5.2 illustrates that the difference in the model outputs is attributable to a smaller number of factors than identified by Openreach, mainly the differences in the glass ceiling assumptions and the 'visit-rate' assumptions. The latter being the assumptions about the extent to which multiple field engineering activities are required to clear faults. These assumptions are modelled through the minor fail rate assumptions in the RPM (a component of the glass ceiling assumptions)[113].

A5.38 The other changes in deltas attributed to differences between the models are small relative to the variability of model outputs between model runs and accuracy limits imposed by the lack of interpolation of the model run outputs (which limits resolution to one modelled step in resources).[114] This led Analysys Mason to conclude that the smaller

[113] Minor fails are failed field engineering activities that could be successfully completed within the SLA on a subsequent attempt, if time and resources permit. In contrast, 'major fails' are faults that require work such as civil engineering that cannot be completed within SLA timescales.

[114] For further details of the variability in model outputs refer to Analysys Mason, 2017. *WLR/LLU Charge Control 2017 Quality of Service model assessment*. Section 5. https://www.ofcom.org.uk/__data/assets/pdf_file/0013/106312/model-assessment-wlr-llu-quality-service.pdf.

figures quoted are not likely to be useful estimates of the impact and it can only be said that the impact of these modelling differences is comparable with the uncertainty in the model results.[115]

Deloitte also found the glass ceiling assumptions to be the main contributor to the differences in the resource estimates

A5.39 As noted above, Openreach commissioned consultants Deloitte to review the Allocation Model and the RPM to investigate the differences in the methodologies, inputs and assumptions and the implications for the model results.[116]

A5.40 Deloitte found that although both models have a similar underlying approach, the RPM makes more simplifying assumptions that understate the complexity of Openreach's operations. Deloitte considered that the greater granularity of the Allocation Model comes closer to capturing the reality of resourcing and task allocation.[117]

A5.41 Deloitte also examined the reasons for the difference between the resource estimates produced by RPM and the Allocation Model for the proposed repair standard of 93% (4.7% and up to 25% respectively). Deloitte identified 6 main differences in the methodology and assumptions that contributed to the difference as summarised in the Table A5.3 below.

[115] Analysys Mason, 2017. *WLR/LLU Charge Control 2017 Quality of Service model assessment*. Section 6.3. https://www.ofcom.org.uk/__data/assets/pdf_file/0013/106312/model-assessment-wlr-llu-quality-service.pdf.
[116] Annex 3, Openreach response to the March 2017 Consultation, https://www.ofcom.org.uk/__data/assets/pdf_file/0013/105115/Openreach.pdf.
[117] Pages 7-11, Quality of Service Modelling, report by Deloitte for Openreach, https://www.ofcom.org.uk/__data/assets/pdf_file/0026/106199/Deloitte.pdf. (Annex 3, Openreach response to the March 2017 Consultation.)

Table A5.3: Deloitte's summary table concerning the factors contributing to the differences between the model outputs

Area	Key finding	Contribution to the difference in the model outputs
Glass ceiling	Assuming a lower failure rate increases the maximum performance possible. Analysys Mason acknowledge that it was initially necessary to reduce fail rates in order to meet Ofcom's requested target.	High
Engineer skill mix	The RPM does not capture the reality of the skill mix, but this does not appear to have a significant impact on the additional resources needed to improve performance.	Low
Resource variability	The RPM approach would tend to reduce variance in resources and therefore costs of performance. However, the impact on outputs of this assumption is moderate.	Low
Task and travel time variability	While the RPM approach oversimplifies the variation in task and travel times, sensitivity testing indicates that this approach may in fact slightly overstate performance costs.	None
Task volume variability	Neither model allows for task assignment at the Preferred Working Area (PWA) level[118]; this suggests that both may understate the costs of performance.	None
Inter-SOM loans	While the Allocation Model may overstate costs by not modelling inter-SOM loans, the RPM may overstate the frequency and ease of these loans.	Medium

Source: Page 11, Quality of Service Modelling, report by Deloitte for Openreach (Annex 3, Openreach response to the March 2017 Consultation). [119]

A5.42 Deloitte found the glass ceiling assumptions to be the main contributor to the differences between models.[120] Except for inter-SOM loans, the other factors had little or no impact on the difference between the model outputs.

A5.43 We discuss Deloitte's findings concerning inter-SOM loans below.

The analyses indicate that differences are primarily due to the glass ceiling, visit rate and inter-SOM loan assumptions

[118] Relatively small geographic areas in which individual technicians normally work.
[119] This table is a reproduction of Deloitte's table. For clarity, we have amended references to the models and other terminology to align with the nomenclature used in this document.
[120] Page 11, Quality of Service Modelling, report by Deloitte for Openreach, https://www.ofcom.org.uk/__data/assets/pdf_file/0026/106199/Deloitte.pdf. (Annex 3, Openreach response to the March 2017 QoS Consultation.)

A5.44 The analyses discussed above indicate that although there are significant differences in approach between the two models, most of the simplifying assumptions used in the RPM, and by implication the high-level approach to simulation, have only a marginal impact on the resource deltas for performance improvement, if at all. The differences in the resource estimates stem primarily from differences in the glass ceiling, visit rate and inter-SOM loan assumptions.

A5.45 In view of these findings, we consider that resource estimates for performance improvements generated by the RPM may be broadly as representative as those produced by the Allocation Model. As we have not been able to fully audit the Allocation Model to our satisfaction, we propose in Section 4 to use the two models in conjunction.

Resource estimates from the Allocation Model

A5.46 As part of the audit, we asked Analysys Mason to prepare resource uplift estimates for the quality of service standards that we are proposing for fault repair and installation orders (as set out in Sections 5 and 6).

A5.47 In its response to the March 2017 QoS Consultation, Openreach indicated that it could achieve a repair standard of 90%, following certain process improvements and definitional changes to the repair measures that would raise its operational limit (the glass ceiling) to 92.6%. From a resource estimation perspective, this scenario is directly comparable to the repair standard of 88% that we are proposing, using our view of the glass ceiling, after process improvements (90.8%). The difference between the scenarios being that under Openreach's proposals, the repair measure would be amended to reclassify reject clear and non-appointment no-access failures (accounting for 1.76%) as successes, whereas we propose not to amend the repair measures.

A5.48 We asked Analysys Mason to model Openreach's proposal since it allows Openreach's input files to be used directly, avoiding the need to modify the input files to reflect our view of the glass ceiling. As noted above, Analysys Mason had some difficulty understanding how the glass ceiling assumptions were reflected in the input datasets. We therefore consider that amending the glass ceiling risks introducing an error.

A5.49 Table A5.4 presents resource uplift estimates, prepared by Analysys Mason for the quality of service standards that we have proposed for fault repair and installation orders in Section 6 respectively for 2020/21.

A5.50 The resource uplift estimates are measured against a base case of Openreach's performance in 2015/16 which is the base year for our regulatory charge controls.

Table A5.4: Allocation Model resource uplift estimates for the proposed QoS standards (excluding MBORC)

	Base case	Proposed QoS standard
Fault repair service mix (SML 1/SML 2)	16/17 actual	16/17 actual
Operational limit (glass ceiling)		Openreach raised glass ceiling
FAD (working days)	12	10
% orders completed within FAD target	80%	90%
Provision by committed date (CDD)	90%	95%
Repair performance within SLA (SML 1/SML 2)	80%/80%	90%/90%[121]
Resource Uplift	-	11% +/- 0.75%

Source: Figure 10.1 Analysys Mason report, modelling scenario HLS112

A5.51 We have specified a range for the resource uplifts, reflecting Analysys Mason's view that the model outputs should be interpreted to have a confidence interval of +/- 0.75% due to the use of resource steps[122] and the run to run variation in model outputs.[123]

A5.52 We also note that Analysys Mason identified several factors that might adversely influence the resource estimates:

- Three factors that would be likely to overestimate the resource deltas for performance improvements, namely:
  - The lack of balancing of resources across different job types (provision, repair SML 1 and SML 2) means that repair SML 1 often appears likely to more than meets its targets at a given level of resource uplift, which suggests that with a different resource distribution repair SML 1 and repair SML 2 could both meet the target with fewer resources.
  - The approach to appointment scheduling or job prioritisation in response to stress, because the stress response mechanisms are turned off in most scenarios.
  - Inter-SOM loans are not modelled.
- A further factor, the overtime post-processing adjustment that could underestimate the resource delta for performance improvements.[124]

[121] As discussed in paragraph above, we consider that from a resource estimation perspective, this scenario is equivalent to the 88% repair standard that we are proposing.
[122] Resource levels are tested at 2% increments with the lowest resource level to achieve SML 2 greater than or equal to a particular performance level being designated the resource level needed to achieve the required performance.
[123] Analysys Mason, 2017. *WLR/LLU Charge Control 2017 Quality of Service model assessment*. Section 5.2. https://www.ofcom.org.uk/__data/assets/pdf_file/0013/106312/model-assessment-wlr-llu-quality-service.pdf.

A5.53 Given the difficulties encountered during the audit, it was not possible to fully investigate the extent to which these factors adversely impact the resource deltas during the audit. We note, however, that Openreach has undertaken extensive testing and calibration and believes that the model is the best simulation of likely service outcomes they have used to date.[125] This suggests that for the actual performance results Openreach calibrated to, these factors have either a small influence on the accuracy of the results or their net influence is small.

Resource Performance Model resource estimates

Modifications to the model

A5.54 Since the March 2017 QoS Consultation we have amended the RPM to address two of its limitations:

- Resource distribution – a single national resource level is specified as an input to each modelling scenario. Resources are then distributed to SOM areas according to historical fault volumes and 'working system size' (the number of services in operation). As fault and installation order volumes do not necessarily follow historical patterns, there is a risk that resources may be distributed sub-optimally.
- Resource uplift calculations – the resource levels for both baseline and improved performance components of resource deltas for performance improvements are calculated on a 'worst GM' basis. For each component, a single national resource level is selected that is just sufficient to ensure that the desired level of performance is met in every GM region. This approach is likely to raise performance more than necessary in some GM regions, potentially affecting resource deltas for performance improvements.

A5.55 The amended version of the model selects resource levels (for both baseline and improved performance components of resource deltas) on an individual GM basis. GM level outputs are then aggregated using the working system size of each GM area to produce weighted average national results.

A5.56 This approach avoids the risk of raising the performance of some GMs more than necessary. Although the resource distribution algorithm is retained selecting resource levels on an individual GM basis negates the impact of any sub-optimal distribution of resources.

A5.57 This amendment brings the RPM more closely into alignment with the Allocation Model which estimates resources for each SOM area independently.

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[124] For further details of the overtime post processing adjustment refer to Analysys Mason, 2017. *WLR/LLU Charge Control 2017 Quality of Service model assessment*. Section 4.1. https://www.ofcom.org.uk/__data/assets/pdf_file/0013/106312/model-assessment-wlr-llu-quality-service.pdf.

[125] Paragraph 353, Openreach response to the March 2017 QoS Consultation, https://www.ofcom.org.uk/__data/assets/pdf_file/0013/105115/Openreach.pdf.

A5.58 Our sensitivity tests indicate that this change tends to increase the resource deltas for performance improvements.

Glass ceiling assumptions

A5.59 As discussed in more detail in section 3, we have provisionally concluded that Openreach's revised glass ceiling analysis is an improvement on its earlier analysis of its operational limits.

A5.60 The revised glass ceiling analysis is expressed in terms of Openreach's performance against the repair SLA measure. This format is problematic for the RPM as it requires glass ceiling parameters in terms of 'on-the-day' failures (i.e. unsuccessful field engineering activities), the format used in Openreach's previous analysis.

Converting Openreach's glass ceiling figures into a format suitable for the Resource Performance Model is not straightforward

A5.61 Conversion from SLA failures to on-the-day failures is not straightforward because on-the-day failures classified as 'minor fails' can be successfully completed within the SLA provided that a subsequent visit can be executed within the SLA timescales.[126] Thus, the on-the-day glass ceiling is a function of modelling parameters such as fault dispatch patterns as well as the corresponding SLA glass ceiling. Consequently, it is difficult to determine the on-the-day glass ceiling parameters corresponding to the SLA figures.

Given the uncertainty about the appropriate minor fail assumptions, we used two different approaches

A5.62 In view of the uncertainty about the appropriate minor fail assumptions, we have used two different approaches:

- We have used an estimate produced by Analysys Mason which used information from the Allocation Model about the proportion of jobs requiring multiple visits and assumptions about fault dispatch patterns to estimate the level of on-the-day minor fails corresponding to the SLA minor fails in Openreach's updated analysis; and
- We have modelled SLA minor fails as major fails.

A5.63 Using the first approach the estimated on-the-day minor fail rate corresponding to the SLA minor fail rate of 1.8% is 5.5% +/- 0.65%. Using the second approach we set the major fail rate at 9.2%, the sum of minor and major SLA failures after process improvements.

A5.64 Our sensitivity tests indicate that modelling SLA minor fails as major fails produces higher resource estimates for performance improvements than using estimated values for on-the-day minor fails.

[126] In contrast, jobs classified as 'major fails' require work such as civil engineering that cannot be completed within SLA timescales.

The Inter-SOM loan functionality of the Resource Performance Model

A5.65 As noted above, the RPM incorporates functionality to model the sharing of resources between adjacent SOM areas in periods of high demand and between non-adjacent SOM areas in periods of exceptionally high demand (e.g. exceptionally high fault volumes after major storms). The inefficiencies arising such as additional travel time are also modelled.[127]

A5.66 The Allocation Model does not have directly comparable functionality. Instead, resource sharing between SOM areas and GM regions is taken into account in the calibration of the model. The weekly resource shrinkage inputs are adjusted to reflect the hours worked by technicians outside their SOM area or GM region. As the shrinkage adjustment reflects the hours work out-of-area, any associated inefficiency is also captured.[128]

Openreach and Deloitte raised concerns about the inter-SOM loan functionality of the Resource Performance Model

A5.67 Drawing on the Deloitte report, Openreach concluded that it is unclear whether the level of resource loans modelled in the RPM is consistent with Openreach's practices.[129]

A5.68 Deloitte noted that the loan functionality in the RPM went beyond that incorporated in the Allocation Model. It found the resource deltas produced by the RPM to be highly sensitive to the use of the patch loan functionality.[130] However, it considered that it had insufficient information about the frequency of loans modelled by the RPM to determine whether the modelling approach is accurate.[131]

A5.69 Deloitte also reviewed operational information about loans which indicated that although loans appeared to be very common, most are small with almost half relating to three or less Full Time Equivalents (FTE).[132]

A5.70 Deloitte concluded that the Allocation Model might overstate costs by not modelling loans and that in contrast, the RPM might overstate the ease and frequency of loans.[133]

The operational information suggests that inter-SOM loans may be a less significant factor than modelled in the Resource Performance Model

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[127] See pages 14-15, Overview of the Quality-of-Service Model and its outputs for WLR/LLU Charge Control 2017 (Analysys Mason Report) for more details. https://www.ofcom.org.uk/__data/assets/pdf_file/0034/99646/Analysys-Mason-report.pdf.
[128] Paragraph 369 Openreach response to the March 2017 Consultation, https://www.ofcom.org.uk/__data/assets/pdf_file/0013/105115/Openreach.pdf.
[129] Paragraph 384, Openreach response to the March 2017 Consultation, https://www.ofcom.org.uk/__data/assets/pdf_file/0013/105115/Openreach.pdf.
[130] Page 38, Annex 3, Openreach response to the March 2017 Consultation, https://www.ofcom.org.uk/__data/assets/pdf_file/0013/105115/Openreach.pdf.
[131] Page 10, Annex 3, Openreach response to the March 2017 Consultation, https://www.ofcom.org.uk/__data/assets/pdf_file/0013/105115/Openreach.pdf.
[132] Page 37, Annex 3, Openreach response to the March 2017 Consultation, https://www.ofcom.org.uk/__data/assets/pdf_file/0013/105115/Openreach.pdf.
[133] Page 10, Annex 3, Openreach response to the March 2017 Consultation, https://www.ofcom.org.uk/__data/assets/pdf_file/0013/105115/Openreach.pdf.

A5.71 Our sensitivity tests indicate that both the adjacent SOM loan and non-adjacent SOM loan functions have a significant influence on resource estimates for performance improvements, both in the order of 15%.

A5.72 Whilst it is difficult to give a definitive view from the summary presented in Deloitte's report, the operational information reviewed by Deloitte suggests that inter-SOM loans may be a less significant factor than modelled in the RPM. Conversely, the fact that inter-SOM loans are very common suggests that they are an important element of resourcing and would therefore have some impact on resource requirements.

A5.73 On balance, our view is that the inter-SOM loan functionality may overstate the influence of loans, leading the RPM to understate resource deltas for performance improvement to some extent.

A5.74 Given the uncertainty about the actual influence of inter-SOM loans on resource deltas we have calculated resource deltas with the inter-SOM loan functionality turned on and off and assume that the correct figure lies somewhere in this range.

Resource estimates

A5.75 Table A5.5 below presents a series of resource uplift estimates for the revised quality of service standards that we have proposed for fault repair and installation orders in Sections 5 and 6 respectively. Five modelling scenarios are presented to illustrate the sensitivity of model outputs to glass ceiling and inter-SOM loan settings:

- Scenario 1 – uses the estimate of on-the-day repair minor failures and has inter-SOM sharing turned on;
- Scenarios 2-4 – have repair minor fails modelled as major fails and explore output sensitivity to inter-SOM sharing;
- Scenarios 5 and 6 – has a 1.5% higher major fail rate (reflecting the differential between the national average glass ceiling and the worst GM) to illustrate the output sensitivity to movement in the glass ceiling.

Table A5.5: Revised resource uplift estimates for the proposed QoS standards

	Base Case (2015/16)	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6
Fault repair minor fail		5.5%	0%	0%	0%	0%	0%
Fault repair major fail		7.4%	9.2%	9.2%	9.2%	10.7%	10.7%
Installation order minor fail		1.4%	1.4%	1.4%	1.4%	1.4%	1.4%
Installation order major fail		3.6%	3.6%	3.6%	3.6%	3.6%	3.6%
Adjacent SOM loans Non-adjacent SOM loans		Yes Yes	Yes Yes	Yes No	No No	No No	Yes Yes
Fault repair service mix (SML 1/SML 2)	50/50	50/50	50/50	50/50	50/50	50/50	50/50
FAD (working days)	12	10	10	10	10	10	10
% orders offered date (FAD)	80%	90%	90%	90%	90%	90%	90%
Provision by committed date (CDD)	90%	95%	95%	95%	95%	95%	95%
Repair performance within SLA (SML 1 / SML 2)	80%/80%	88%/88%	88%/88%	88%/88%	88%/88%	88%/88%	88%/88%
Resource uplift	-	13.1%	8.1%	9.1%	10.8%	17.9%	11%

Source: Ofcom

A5.76 We discuss our consideration of these resource estimates in Section 4.

Disclosure of models and associated documents

A5.77 In developing our proposals on model disclosure, we have had regard to our obligations under the Communications Act 2003 (the "Act") and our Framework for Disclosure of Charge Control Models. In doing so, we have considered carefully the confidential nature of the cost modelling relevant to our proposals and the need to ensure appropriate transparency.

Allocation Model

A5.78 In view of the difficulties that Analysys Mason encountered with their audit of the Allocation Model we consider that it would be difficult for stakeholders to effectively review the Allocation Model in its current form and use it to contribute towards their consultation response. We have not therefore disclosed the Allocation Model with this consultation.

A5.79 Analysys Mason's report published alongside this consultation contains a description of the Allocation Model and their assessment of the capabilities and limitations of the model.[134] Annex 2 of Openreach's response to the March 2017 QoS Consultation includes a description of the model.

Resource Performance Model

A5.80 Analysys Mason's report published alongside the March 2017 QoS Consultation contained a detailed description of the Resource Performance Model.[135] We also provided further details about the model in response to stakeholder queries.[136] We also made the model available to stakeholders upon request and will continue to do so.

[134] Analysys Mason, 2017. *WLR/LLU Charge Control 2017 Quality of Service model assessment*. Section 6.3. https://www.ofcom.org.uk/__data/assets/pdf_file/0013/106312/model-assessment-wlr-llu-quality-service.pdf.
[135] Overview of the Quality-of-Service Model and its outputs for WLR/LLU Charge Control 2017 (Analysys Mason Report) for more details. https://www.ofcom.org.uk/__data/assets/pdf_file/0034/99646/Analysys-Mason-report.pdf.
[136] Clarification on the Ofcom Resource Performance Model. https://www.ofcom.org.uk/__data/assets/pdf_file/0022/102568/Clarifications-on-the-Ofcom-Resource-Performance-Model.pdf

A6. Draft legal instruments

NOTIFICATION OF AMENDMENTS TO PROPOSED DIRECTIONS UNDER SECTIONS 49 AND 49A OF THE COMMUNICATIONS ACT 2003 AND PROPOSED CONDITION 9.1A AND CONDITION 11.1 RELATING TO THE IMPOSITION OF QUALITY OF SERVICE REQUIREMENTS ON BT IN RESPECT OF THE PROVISION OF NETWORK ACCESS TO WHOLESALE ANALOGUE LINE RENTAL, METALLIC PATH FACILITIES AND CERTAIN VIRTUAL UNBUNDLED LOCAL ACCESS SERVICES

Background

1. On 1 December 2016, OFCOM published a document titled "Narrowband Market Review: Consultation on the proposed markets, market power determination and remedies for wholesale call termination, wholesale call origination and wholesale narrowband access markets" (the "2016 NMR Consultation")[137]. In that consultation, OFCOM set out its provisional view that BT has Significant Market Power in the market for the provision of wholesale fixed analogue exchange lines, including the provision of Wholesale Analogue Line Rental services, in the UK (excluding the Hull Area).

2. In the 2016 NMR Consultation, OFCOM proposed to impose a number of obligations on BT, including a requirement to provide network access on reasonable request[138] and to comply with all such quality of service requirements in relation to the provision of network access, as OFCOM may from time to time direct[139].

3. On 31 March 2017, OFCOM published a document titled "*Wholesale Local Access Market Review Consultation*" (the "2017 WLA Consultation")[140]. In that Consultation, OFCOM set out its provisional view that BT has Significant Market Power in the market for the supply of copper loop-based, cable-based and fibre-based wholesale local access at a fixed location in the UK (excluding the Hull Area).

4. In the 2017 WLA Consultation, OFCOM proposed to impose a number of obligations on BT, including a requirement to provide network access in the form of Local Loop Unbundling and Virtual Unbundled Local Access[141]. OFCOM also proposed to

[137] https://www.OFCOM.org.uk/consultations-and-statements/category-1/narrowband-market-review.
[138] Condition 1A.1 at Annex 6 of the 2016 NMR Consultation.
[139] Condition 9.1A at Annex 6 of the 2016 NMR Consultation.
[140] https://www.OFCOM.org.uk/consultations-and-statements/category-1/wholesale-local-access-market-review/.
[141] Condition 1 at Annex 23 of the 2017 WLA Consultation.

impose an obligation on BT to comply with all such quality of service requirements in relation to the provision of network access, as OFCOM may from time to time direct[142].

5. On 31 March 2017, OFCOM published a document titled "*Quality of Service for WLR, MPF and GEA: Consultation on quality of services remedies*", setting out the specific quality of service requirements that it proposed to impose on BT ("the 2017 QoS Consultation"). Annex 8, Part I, of that document contained a notification under section 49A of the Communications Act 2003 ("the Act") in which OFCOM set out, for domestic consultation, its proposals to give a direction to BT requiring it to comply with specified quality standards when providing network access to Metallic Path Facilities and Virtual Unbundled Local Access by way of its Generic Ethernet Access services provided through BT's Fibre-to-the-Cabinet network ("the **QoS Notification**").

6. Paragraphs 4 and 6 in the Schedule to the Annex of the QoS Notification (titled "*Quality of Service Standard 3*" and *"Quality of Service Standard 5"* respectively), Ofcom proposed to require BT to comply with specified standards in relation to the completion of repairs in line with the timeframes set its service level agreements with its customers.

Proposed amendments to paragraphs 4 and 6 in the Schedule of the Annex to the QoS Notification

7. OFCOM hereby gives notice of its proposals, in accordance with section 49A of the Act, to set the quality of service standard proposed in paragraphs 4 and 5 of the Schedule to the Annex of the QoS Notification, pursuant to their powers under section 49 of the Act, amended as follows:

Quality of Service Standard 3

4. The Dominant provider shall complete the repair of Faults that are subject to Service Maintenance Level 1 such that, in aggregate, the percentage of repairs which are completed by the end of the second Working Day after such Faults have been placed on the Equivalence Management Platform is—

(a) greater than or equal to ~~80%~~ **80%** in the First Relevant Year;

[142] Condition 11.1 at Annex 23 of the 2017 WLA Consultation.

(b) greater than or equal to ~~87%~~ **83%** in the Second Relevant Year;

(c) greater than or equal to ~~90%~~ **85%** in the Third Relevant Year.

Quality of Service Standard 5

5. The Dominant provider shall complete the repair of Faults that are subject to Service Maintenance Level 2 such that, in aggregate, the percentage of repairs which are completed by the end of the next Level 2 Working Day after such Faults have been placed on the Equivalence Management Platform is—

(a) greater than or equal to ~~80%~~ **80%** in the First Relevant Year;

(b) greater than or equal to ~~87%~~ **83%** in the Second Relevant Year;

greater than or equal to ~~90%~~ **85%** in the Third Relevant Year.

8. Consequently, the QoS Notification should be read accordingly.

9. The effects of, and reasoning for making, the amendments set out in paragraph 7 above are set out in the consultation document accompanying this Notification.

Ofcom's duties and legal tests

10. OFCOM considers that the proposals set out in this Notification comply with all the applicable legal tests, including the requirements of sections 45 to 47 of the Act.

11. In making the proposals referred to in this Notification, OFCOM has:

a) considered and acted in accordance with its general duties set out in section 3 of the Act and the six Community requirements in section 4 of the Act;

b) taken due account of all applicable recommendations issued by the European Commission in accordance with section 4A of the Act; and

c) taken utmost account of any relevant opinion, recommendation, guidance or regulatory practice adopted by BEREC in accordance with Article 3(3) of Regulation (EC) No 1211/2009.

Making representations

12. Representations may be made to OFCOM about any of the proposals set out in this Notification and the accompanying consultation by no later than 26 October 2017.

13. A copy of this Notification and the accompanying consultation document have been sent to the Secretary of State in accordance with section 49C of the Act.

Interpretation

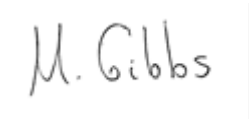
14. For the purposes of interpreting this Notification:
    a) except as otherwise defined, words or expressions used shall have the same meaning as they have been ascribed in the QoS Notification and otherwise any meaning as it has in the Act;

    b) headings and titles shall be disregarded;

    c) expressions cognate with those referred to in this direction shall be construed accordingly; and

    d) the Interpretation Act 1978 (c. 30) shall apply as if this Direction were an Act of Parliament.

Signed



Marina Gibbs
Competition Policy Director, Ofcom

A person duly authorised in accordance with paragraph 18 of the Schedule to the Office of Communications Act 2002

14 September 2017