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Technical advice on a broadband USO

Updated cost estimates

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Introduction

In December 2016, Ofcom submitted a report to Government ("the December Report") which set out Ofcom's advice as to how to achieve a decent broadband connection for all. In that document, we set out a range of scenarios for Government to decide which best met its objectives for this policy. The December Report included estimates of the costs of delivering different broadband scenarios modelled across three different points in time: 2016, the end of 2017 and the early 2020s.

The starting point for these cost estimates was modelling work carried out by the consultants Analysys Mason. Analysys Mason's estimates of the deployment costs in 2016 were then extrapolated by Ofcom to derive estimates of deployment costs for the end of 2017 and the early 2020s using assumptions about how the number of eligible premises under each of the broadband scenarios might change over time.

We are today publishing an update to the estimated costs of the different broadband scenarios comprising two documents: a further Addendum to the original cost modelling report carried out by Analysys Mason and a series of updated tables from the December report which reflects those updated cost estimates. As stated in the December Report, the objective of this modelling work has not been to give a precise figure for each of the scenarios examined. Instead, these figures represent preliminary estimates of the order of magnitude of each scenario's cost, and what drives those costs, to inform policy development.

We are also currently considering BT's voluntary proposal, including the specific costs BT would incur in delivering it, within the WLA market review process. We will consult on any changes to the market review and related charge controls as appropriate.

Updated Addendum to the Analysys Mason cost modelling report

Analysys Mason has updated its modelling of the estimates of the deployment costs in 2016 for delivering the scenarios set out in the December Report and – at the request of Government - included the modelling of an additional broadband scenario (see below). There have been two main changes since the report and addendum submitted to Government in December 2016.

Additional broadband USO scenario

The Government asked Analysys Mason to model an additional technical broadband scenario to inform its policy making. Under this new scenario, the download speed was set at 20Mbit/s and the upload speed at 2Mbit/s. The other technical specifications were kept the same as Scenario 2 (i.e. in terms of latency, contention ratios and data usage cap).

The modelling of this new scenario required changes to the modelling of the three broadband scenarios set out in the December report to ensure that all four scenarios were being modelled on a comparable basis. The modifications are explained in more detail in the Analysys Mason addendum (see section 3 and section 4.1).

Correction of modelling errors

In carrying out additional checking of the Analysys Mason modelling work, two errors were found which applied specifically to the modelling of the FTTC technologies. The first error was identified in the FTTC VDSL2 coverage area calculations in the stylised cost model.

The second error was that the FTTC LR-VDSL technology was assumed to be capable of delivering download speeds of 30Mbit/s over radial distances of up to 2.8km when in fact the distance should have been limited to 1.8km.

The upshot of correcting for these two errors is that more infrastructure is required to serve the eligible premises than originally assumed with both FTTC technologies and the result is that the estimated deployment costs have increased. The main impact of correcting for these errors has been to increase the estimated costs for the higher speed scenarios. Again, these corrections are set out in the Analysys Mason addendum (see section 4.1).

Updated tables from the December Report

The second document consists of updated tables from the December Report to reflect the results of the updates to the Analysys Mason cost modelling. The tables contain updated estimates of the deployment costs for all four broadband scenarios for all three time periods (i.e. 2016; the end of 2017; and the early 2020s). It also includes revised estimates of the Reasonable Cost Thresholds for 2016 together with estimates of the eligible number of premises for the new scenario based on a download speed of 20Mbit/s.

Rounding Correction to Estimated Costs in the Nations

We are also correcting an error in the way in which costs estimates for Northern Ireland were presented in the December Report.

In the December Report the estimated costs of serving premises in Norther Ireland under Scenarios 1 and 2 were reported to two decimal places. Scenario 3 for 2016 was also reported as £0.10bn but should in fact have been reported as £0.05bn.

In fact, with the correction to the Analysys Mason modelling referred to above, the new estimates for the 2016 costs of the higher speed scenario in Northern Ireland would now be closer to £0.10bn.

Updated Tables

Please note that the sum of individual elements may not equal the total estimates due to rounding.

Figure 4.3: Estimate of the number of premises that cannot receive the technical specification outlined under each scenario in 2016

Million premises *(as % of total premises in Nation)*	Scenario 1: 10Mbit/s download speed	Scenario 2: 10Mbit/s download + 1Mbit/s upload	20Mbit/s scenario: 20Mbit/s download + 2Mbit/s upload	Scenario 3: 30Mbit/s download + 6Mbit/s upload
England	1.0m *(4%)*	1.9m *(8%)*	2.2m *(9%)*	2.6m *(11%)*
Scotland	0.2m *(7%)*	0.4m *(14%)*	0.4m *(15%)*	0.4m *(17%)*
Wales	0.1m *(9%)*	0.2m *(12%)*	0.2m *(13%)*	0.2m *(16%)*
NI	0.06m *(8%)*	0.08m *(10%)*	0.1m *(14%)*	0.1m *(17%)*
Total UK	**1.4m *(5%)***	**2.6m *(9%)***	**3m *(10%)***	**3.5m *(12%)***

Figure 4.4: Future projection of the number of eligible premises

Million premises *(as % total UK)*	Scenario 1: 10Mbit/s download speed	Scenario 2: 10Mbit/s download + 1Mbit/s upload	20Mbit/s scenario: 20Mbit/s download + 2Mbit/s upload	Scenario 3: 30Mbit/s download + 6Mbit/s upload
Today 2016	1.4m *(5%)*	2.6m *(9%)*	3m *(10%)*	3.5m *(12%)*
End of 2017	~1.1m *(4%)*	~1.8m *(6%)*	~1.9m *(7%)*	~2m *(7%)*
Early 2020s	~0.3m *(1%)*	~0.6m *(2%)*	~0.9m *(3%)*	~1.1m *(4%)*

Figure 7.1: Summary of the technical capabilities of different technologies to meet the scenario requirements

Technology	Scenario 1: 10Mbit/s download speed	Scenario 2: 10Mbit/s download + 1Mbit/s upload	20Mbit/s scenario: 20Mbit/s download + 2Mbit/s upload	Scenario 3: 30Mbit/s download + 6Mbit/s upload
FTTC[1]	Yes	Yes	Yes	Yes
FTTP	Yes	Yes	Yes	Yes
Fixed Wireless and mobile	Yes	Yes	Potentially	Potentially
Satellite	Potentially[2]	No	No	No

Figure 8.1: Estimates of total costs

Total Cost	Scenario 1: 10Mbit/s download speed	Scenario 2: 10Mbit/s download + 1Mbit/s upload	20Mbit/s scenario: 20Mbit/s download + 2Mbit/s upload	Scenario 3: 30Mbit/s download + 6Mbit/s upload
2016	£1.1bn	£1.7bn	£1.9bn	£2.4bn
End of 2017	~£1.0bn	~£1.5bn	~£1.6bn	~£2.1bn
Early 2020s	~£0.7bn	~£1.0bn	~£1.3bn	~£1.7bn

Figure 8.2: Summary of estimated costs based on number of eligible premises in 2016

	Scenario 1: 10Mbit/s download speed	Scenario 2: 10Mbit/s download + 1Mbit/s upload	20Mbit/s scenario: 20Mbit/s download + 2Mbit/s upload	Scenario 3: 30Mbit/s download + 6Mbit/s upload
Potentially eligible premises	1.4m	2.6m	3m	3.5m
Total cost	£1.1bn	£1.7bn	£1.9bn	£2.4bn
Cost per premise connected (CPPC)	£970	£770	£780	£840

Source: Analysys Mason addendum

[1] There are some limitations of FTTC where the line between the cabinet and the premises is very long, which might require alternative technologies to be used in certain circumstances.

[2] Satellite's and mobile's ability to meet (respectively) the requirements of scenario 2, 3 and 1 depends on the number of potential customers being addressed. A significant number of customers will result in a risk of poorer consumer experience than '10Mbit/s'.

Figure 8.3: Summary of estimated costs by Nation based on number of eligible premises in 2016 (core network costs cannot be split)

Costs by Nation	Scenario 1: 10Mbit/s download speed	Scenario 2: 10Mbit/s download + 1Mbit/s upload	20Mbit/s scenario: 20Mbit/s download + 2Mbit/s upload	Scenario 3: 30Mbit/s download + 6Mbit/s upload
England	£0.8bn	£1.3bn	£1.4bn	£1.8bn
Wales	£0.1bn	£0.1bn	£0.1bn	£0.2bn
Scotland	£0.1bn	£0.2bn	£0.2bn	£0.3bn
NI	£0.04bn	£0.05bn	£0.06bn	£0.10bn
Core network costs	*£0.04bn*	*£0.04bn*	*£0.06bn*	*£0.07bn*
Total UK	**£1.1bn**	**£1.7bn**	**£1.9bn**	**£2.4bn**

Figure 8.4: Total number of lines in the lowest cost technology mix

Technology	Scenario 1: 10Mbit/s download speed	Scenario 2: 10Mbit/s download + 1Mbit/s upload	20Mbit/s scenario: 20Mbit/s download + 2Mbit/s upload	Scenario 3: 30Mbit/s download + 6Mbit/s upload
VDSL2	0.9m (69%)	1.9m (76%)	2.0m (71%)	2.3m (69%)
LR-VDSL	0.4m (26%)	0.4m (15%)	0.6m (21%)	0.8m (24%)
FTTP	0.1m (5%)	0.2m (9%)	0.2m (8%)	0.2m (7%)
Total UK	**1.4m**	**2.5m**	**2.9m**	**3.4m**

Source: Analysys Mason addendum

Figure 8.5: Estimated cost per premises connected by technology in 2016

Technology	Scenario 1: 10Mbit/s download speed	Scenario 2: 10Mbit/s download + 1Mbit/s upload	20Mbit/s scenario: 20Mbit/s download + 2Mbit/s upload	Scenario 3: 30Mbit/s download + 6Mbit/s upload
FWA (low frequency)	£1,560	£1,810	£2,650	£6,960
FWA (high frequency)	£1,510	£1,530	£2,050	£4,880
FTTC VDSL2	£1,610	£1,090	£1,110	£1,150
FTTC LR-VDSL	£1,170	£870	£870	£910
FTTP	£6,420	£3,790	£3,480	£3,120
Lowest Cost Option	£970	£770	£780	£840

Figure 8.6: Estimated annualised cost by technology (cost per year)

Technology	Scenario 1: 10Mbit/s download speed	Scenario 2: 10Mbit/s download + 1Mbit/s upload	20Mbit/s scenario: 20Mbit/s download + 2Mbit/s upload	Scenario 3: 30Mbit/s download + 6Mbit/s upload
FWA (low frequency)	£930m	£2070m	£3490m	£11200m
FWA (high frequency)	£890m	£1730m	£2670m	£7810m
FTTC VDSL2	£330m	£450m	£510m	£630m
FTTC LR-VDSL	£250m	£370m	£420m	£520m
FTTP	£920m	£1070m	£1120m	£1210m
Lowest Cost Option	£240m	£340m	£390m	£480m

Source: Analysys Mason addendum

Figure 8.7: Summary of estimated costs based on number of eligible premises in 2017

	Scenario 1: 10Mbit/s download speed	Scenario 2: 10Mbit/s download + 1Mbit/s upload	20Mbit/s scenario: 20Mbit/s download + 2Mbit/s upload	Scenario 3: 30Mbit/s download + 6Mbit/s upload
Potentially eligible premises	~1.1m	~1.8m	~1.9m	~2m
Total cost	~£1.0bn	~£1.5bn	~£1.6bn	~£2.1bn
Cost per premise connected (CPPC)	~£1,140	~£960	~£1,020	~£1,270

Figure 8.8: Estimated total costs by Nation at end of 2017 (core network costs cannot be split by Nation)

Costs by Nation	Scenario 1: 10Mbit/s download speed	Scenario 2: 10Mbit/s download + 1Mbit/s upload	20Mbit/s scenario: 20Mbit/s download + 2Mbit/s upload	Scenario 3: 30Mbit/s download + 6Mbit/s upload
England	~£0.8bn	~£1.1bn	~£1.2bn	~£1.5bn
Wales	~£0.1bn	~£0.1bn	~£0.1bn	~£0.2bn
Scotland	~£0.1bn	~£0.2bn	~£0.2bn	~£0.2bn
NI	~£0.04bn	~£0.04bn	~£0.05bn	~£0.08bn
Core network costs	*~£0.04bn*	*~£0.04bn*	*~£0.05bn*	*~£0.06bn*
Total UK	**~£1.0bn**	**~£1.5bn**	**~£1.6bn**	**~£2.1bn**

Figure 8.9: Summary of estimated costs based on number of eligible premises by early 2020s

	Scenario 1: 10Mbit/s download speed	Scenario 2: 10Mbit/s download + 1Mbit/s upload	20Mbit/s scenario: 20Mbit/s download + 2Mbit/s upload	Scenario 3: 30Mbit/s download + 6Mbit/s upload
Potentially eligible premises	~0.3m	~0.6m	~0.9m	~1.1m
Total cost	~£0.7bn	~£1.0bn	~£1.3bn	~£1.7bn
Cost per premise connected (CPPC)	~£2,820	~£2,040	~£1,790	~£1,890

Figure 8.10: Estimated total costs by Nation by early 2020s (core network costs cannot be split)

Costs by Nation	Scenario 1: 10Mbit/s download speed	Scenario 2: 10Mbit/s download + 1Mbit/s upload	20Mbit/s scenario: 20Mbit/s download + 2Mbit/s upload	Scenario 3: 30Mbit/s download + 6Mbit/s upload
England	~£0.5bn	~£0.8bn	~£1.0bn	~£1.3bn
Wales	~£0.1bn	~£0.1bn	~£0.1bn	~£0.1bn
Scotland	~£0.1bn	~£0.1bn	~£0.1bn	~£0.2bn
NI	~£0.02bn	~£0.03bn	~£0.04bn	~£0.07bn
Core network costs	*~£0.02bn*	*~£0.03bn*	*~£0.04bn*	*~£0.05bn*
Total UK	**~£0.7bn**	**~£1.0bn**	**~£1.3bn**	**~£1.7bn**

We have not updated Figures 8.11 or 8.12 as the changes to the model would have had a very small impact on the overall shape of the cost curves.

Figure 8.13: Illustrative effect of different Reasonable Cost Thresholds in 2016

	Scenario 1: 10Mbit/s download speed		Scenario 2: 10Mbit/s download + 1Mbit/s upload	
Reasonable cost threshold	# of premises left unserved	Reduction in costs of USO	# of premises left unserved	Reduction in costs of USO
>£3,400	50K	~£360m	60K	~£400m
>£5,000	30K	~£300m	35K	~£320m
>£10,000	12K	~£190m	12K	~£180m
Exclude last 1%	280K	~£660m	280K	~£740m
Exclude last 0.5%	140K	~£530m	140K	~£570m
Exclude last 0.1%	28K	~£290m	28K	~£290m

	20Mbit/s scenario: 20Mbit/s download + 2Mbit/s upload		Scenario 3: 30Mbit/s download + 6Mbit/s upload	
Reasonable cost threshold	# of premises left unserved	Reduction in costs of USO	# of premises left unserved	Reduction in costs of USO
>£3,400	61K	~£410m	105K	~£590m
>£5,000	35K	~£320m	47K	~£380m
>£10,000	12K	~£190m	13K	~£190m
Exclude last 1%	280K	~£780m	280K	~£940m
Exclude last 0.5%	140K	~£580m	140K	~£680m
Exclude last 0.1%	28K	~£290m	28K	~£290m

Figure 9.3: Illustrative impact on consumer bills per month

	Fixed broadband subscribers only (per subscription)	Fixed broadband and mobile subscribers (per household)
Scenario 1	£0.89	£0.76
Scenario 2	£1.34	£1.15
20Mbit/s scenario	£1.54	£1.32
Scenario 3	£1.96	£1.69

Figure A3.1: Projected estimates of the number of eligible premises, by nation and by rurality: 2016, 2017 and 2020

	Million premises *(as % of total premises in Nation)*	Scenario 1: 10Mbit/s download speed	Scenario 2: 10Mbit/s download + 1Mbit/s upload	20Mbit/s scenario: 20Mbit/s download + 2Mbit/s upload	Scenario 3: 30Mbit/s download + 6Mbit/s upload
Today 2016	England	1m *(4%)*	1.9m *(8%)*	2.2m *(9%)*	2.6m *(11%)*
	Rural	*0.6m (3%)*	*0.9m (4%)*	*1.1m (4%)*	*1.3m (5%)*
	Urban	*0.3m (1%)*	*1.1m (4%)*	*1.1m (5%)*	*1.3m (6%)*
	Scotland	0.2m *(7%)*	0.4m *(14%)*	0.4m *(15%)*	0.4m *(17%)*
	Rural	*0.2m (6%)*	*0.2m (8%)*	*0.2m (8%)*	*0.2m (9%)*
	Urban	*0.03m (1%)*	*0.2m (6%)*	*0.2m (6%)*	*0.2m (8%)*
	Wales	0.1m *(9%)*	0.2m *(12%)*	0.2m *(13%)*	0.2m *(16%)*
	Rural	*0.09m (7%)*	*0.1m (8%)*	*0.1m (9%)*	*0.2m (10%)*
	Urban	*0.03m (2%)*	*0.05m (4%)*	*0.06m (4%)*	*0.07m (5%)*
	NI	0.06m *(8%)*	0.08m *(10%)*	0.1m *(14%)*	0.1m *(17%)*
	Rural	*0.06m (8%)*	*0.07m (9%)*	*0.09m (12%)*	*0.1m (14%)*
	Urban	*0m (0.6%)*	*0.01m (2%)*	*0.02m (2%)*	*0.03m (4%)*
	Total UK	**1.4m *(5%)***	**2.6m *(9%)***	**3m *(10%)***	**3.5m *(12%)***
	Rural	***1m (3%)***	***1.3m (4%)***	***1.5m (5%)***	***1.8m (6%)***
	Urban	***0.4m (1%)***	***1.3m (4%)***	***1.4m (5%)***	***1.6m (6%)***
End of 2017	England	0.8m *(3%)*	1.5m *(6%)*	1.5m *(6%)*	1.5m *(6%)*
	Rural	*0.5m (2%)*	*0.4m (2%)*	*0.4m (2%)*	*0.8m (3%)*
	Urban	*0.3m (1%)*	*1.1m (4%)*	*1.1m (5%)*	*0.8m (3%)*
	Scotland	0.2m *(6%)*	0.2m *(9%)*	0.2m *(9%)*	0.2m *(9%)*
	Rural	*0.1m (5%)*	*0.09m (3%)*	*0.1m (3%)*	*0.1m (5%)*
	Urban	*0.03m (1%)*	*0.16m (6%)*	*0.2m (6%)*	*0.1m (4%)*
	Wales	0.1m *(7%)*	0.1m *(8%)*	0.1m *(8%)*	0.1m *(9%)*
	Rural	*0.08m (5%)*	*0.06m (4%)*	*0.06m (4%)*	*0.1m (7%)*
	Urban	*0.03m (2%)*	*0.05m (4%)*	*0.06m (4%)*	*0.04m (2%)*
	NI	0.04m *(6%)*	0.03m *(4%)*	0.04m *(5%)*	0.08m *(11%)*
	Rural	*0.04m (6%)*	*0.03m (4%)*	*0.04m (5%)*	*0.08m (11%)*
	Urban	*0m (0%)*	*0m (0%)*	*0m (0%)*	*0m (0%)*
	Total UK	**~1.1m *(4%)***	**~1.8m *(6%)***	**~1.9m *(7%)***	**~2m *(7%)***
	Rural	***0.7m (2%)***	***0.6m (2%)***	***0.5m (2%)***	***1.1m (4%)***
	Urban	***0.4m (1%)***	***1.3m (4%)***	***1.4m (5%)***	***0.9m (3%)***

2020s	England	0.2m *(1%)*	0.5m *(2%)*	0.7m *(3%)*	0.8m *(3%)*
	Rural	*0.1m (1%)*	*0.2m (1%)*	*0.4m (1%)*	*0.5m (2%)*
	Urban	*0.1m (0%)*	*0.2m (1%)*	*0.3m (1%)*	*0.4m (1%)*
	Scotland	0.04m *(1%)*	0.07m *(3%)*	0.1m *(4%)*	0.1m *(5%)*
	Rural	*0.03m (1%)*	*0.05m (2%)*	*0.07m (3%)*	*0.08m (3%)*
	Urban	*0.01m (0%)*	*0.03m (1%)*	*0.03m (1%)*	*0.04m (2%)*
	Wales	0.02m *(2%)*	0.04m *(3%)*	0.07m *(5%)*	0.09m *(6%)*
	Rural	*0.02m (1%)*	*0.03m (2%)*	*0.05m (4%)*	*0.07m (5%)*
	Urban	*0.01m (0%)*	*0.01m (1%)*	*0.01m (1%)*	*0.02m (1%)*
	NI	0.01m *(2%)*	0.02m *(3%)*	0.04m *(5%)*	0.06m *(8%)*
	Rural	*0.01m (2%)*	*0.02m (3%)*	*0.04m (5%)*	*0.06m (8%)*
	Urban	*0m (0%)*	*0m (0%)*	*0m (0%)*	*0m (0%)*
	Total UK	**~0.3m *(1%)***	**~0.6m *(2%)***	**~0.9m *(3%)***	**~1.1m *(4%)***
	Rural	***0.2m (1%)***	***0.3m (1%)***	***0.5m (2%)***	***0.7m (2%)***
	Urban	***0.1m (0%)***	***0.3m (1%)***	***0.4m (1%)***	***0.4m (1%)***

Figure A5.3: Estimated deployment costs in 2016

	Scenario 1: 10Mbit/s download speed	Scenario 2: 10Mbit/s download + 1Mbit/s upload	20Mbit/s scenario: 20Mbit/s download + 2Mbit/s upload	Scenario 3: 30Mbit/s download + 6Mbit/s upload
Potentially eligible premises	1.4m	2.6m	3m	3.5m
Total cost	£1.1bn	£1.7bn	£1.9bn	£2.4bn
Cost per premise connected (CPPC)	£970	£770	£780	£840

Figure A5.5: Estimated deployment costs in 2017 and 2020s

		Scenario 1: 10Mbit/s download speed	Scenario 2: 10Mbit/s download + 1Mbit/s upload	20Mbit/s scenario: 20Mbit/s download + 2Mbit/s upload	Scenario 3: 30Mbit/s download + 6Mbit/s upload
End 2017	Potentially eligible premises	~1.1m	~1.8m	~1.9m	~2m
	Total cost	~£1.0bn	~£1.5bn	~£1.6bn	~£2.1bn
	Cost per premise connected (CPPC)	~£1,140	~£960	~£1,020	~£1,270
Early 2020s	Potentially eligible premises	~0.3m	~0.6m	~0.9m	~1.1m
	Total cost	~£0.7bn	~£1.0bn	~£1.3bn	~£1.7bn
	Cost per premise connected (CPPC)	~£2,820	~£2,040	~£1,790	~£1,890