

FTI CONSULTING

THE COMMERCIAL VIABILITY OF MUXCO

REPORT PREPARED FOR OFCOM
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FTI UK HOLDINGS LIMITED HOLBORN GATE 26 SOUTHAMPTON BUILDINGS LONDON WC2A 1PB



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Important notice

This report has been prepared by FTI UK Holdings Limited (“FTI”) for Ofcom in connection with a study on the commercial viability of a new multiplex covering a number of local areas using geographic interleaved spectrum under the terms of Ofcom’s contract number 668 dated 23 September 2011 (the “Contract”).

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Defined terms

In this report a number of defined terms are used as follows:

Distribution: the distribution of the DTT multiplex signal to each transmission site – this is likely to be via satellite.

Multiplexing: the process of blending the channels into a digital signal.

Managed transmission services (“MTS”): this includes the preparation of the signal for transmission and the monitoring of the signal for quality.

Network access charges: combining the DTT multiplexes and transmitting these from the antenna.

Base case assumptions: comprises our mid revenue assumption and our low cost assumption.

Potentially viable sites: these are transmitter sites, where, under the assumptions modelled, a positive contribution is made towards central fixed costs. Although a number of sites are potentially viable, collectively they might not contribute sufficiently to cover all MuxCo’s central costs. It is therefore possible to have a number of potentially viable sites, but for MuxCo as an entity to be non-viable.

Site operating costs: these are the costs that are incurred at a local level at each transmitter site and include, managed transmission services, local coding costs, transmitter electricity costs and local distribution costs. Where local TV stations make a contribution towards costs, they pay one-third of these costs. We have not assumed in any of our scenarios that local TV stations will make any additional contribution towards central fixed costs.

Payments made by local TV stations to MuxCo: two types of payment are assumed:

Cost: where local TV stations pay one third of site operating costs

Cost plus: where local TV stations pay one third of site operating costs, plus a profit margin for MuxCo. In this report we have assumed a mark-up of 10%.



1 Introduction

Purpose and scope

- 1.1 This report has been prepared by FTI UK Holdings Limited (“FTI”) for Ofcom in connection with a study on the commercial viability of a new multiplex (“MuxCo”) covering a number of local areas using geographic interleaved spectrum. There is sufficient spectrum available for MuxCo to provide services for two national commercial TV services and a local TV service(s) at each local TV transmitter. Ofcom will advertise the licence for the new MuxCo and has requested an independent assessment of its potential commercial viability. The policy backdrop is to license MuxCo to enable the provision of local TV services at each transmitter site.
- 1.2 We were engaged to determine the likely costs and revenues of MuxCo. We were not instructed to consider the viability of local TV operations and in particular, their potential revenue streams. We have also not been asked to model the likely revenues and costs of the two national TV channels. However, we conducted research into what the likely willingness to pay for the national Mux slots may be; this implicitly is based on the potential revenues of the two new national channels.
- 1.3 Ofcom has conducted some preliminary research and viability modelling and the purpose of this report is to present the findings of FTI’s research to inform Ofcom’s conclusions on potential viability, based on a certain set of assumptions. We were asked also to consider a number of modelling scenarios including:
- alternative coverage options – essentially flexing the number of locations;
 - incentive modelling – alternative injections of BBC funding (both by amount and at certain time periods);
 - alternative payment options for the local TV operators – zero, cost or cost plus mark-up; and
 - a ‘decentralised’ MuxCo comprising local TV services only.



Context for the study

Digital switch over (“DSO”)

1.4 By the end of 2012, all analogue TV services will have switched to digital transmission – digital switch over (“DSO”), following which there will be two distinct categories of spectrum available for other uses:

- cleared spectrum representing the spectrum that is currently used for existing analogue services; and
- interleaved spectrum or the capacity available within the spectrum after DSO. This spectrum can be used at a local level on a shared basis with terrestrial TV.

1.5 Ofcom’s recommendations following its digital dividend review (“DDR”) in December 2007 included:¹

- to award spectrum on a market led approach and provide flexibility to purchasers over the optimal use;
- not to intervene to reserve spectrum except in a small number of awards; and
- to auction geographic lots of interleaved spectrum (suitable for, but not reserved for local TV).

1.6 Since the review there have been a number of developments including, but not limited to, the decision by Ofcom to align the upper cleared band with the 800 MHz band identified for release by an increasing number of other European countries for mobile services. Ofcom is consulting on UHF to consider, amongst others, the options for the terms and conditions of the 600 MHz award that would be consistent with its longer term UHF framework.

600 MHz spectrum

1.7 The most likely uses for the 600 MHz band (550 to 606 MHz) are DTT and mobile-broadband applications; Arqiva has been asked by Ofcom to provide

¹ “Digital dividend review – a statement on our approach to awarding the digital dividend”, Ofcom, December 2007.



a reference offer for network access and managed transmission services for DTT by November 2011.²

- 1.8 The 600 MHz band will be cleared of all current uses by the end of 2012 and is likely to be available throughout most of the UK, covering most of the UK population. It is expected that new rights of use will commence soon after.
- 1.9 The award of the 600 MHz spectrum presents an issue that could affect the commercial viability of the proposed usage of the geographically interleaved (“GI”) spectrum. As this spectrum will become available around the same time as the GI spectrum (that would cover only 50-60% of the UK population), this may dampen demand and lead to downward pressure on channel providers’ willingness to pay for use of the channels, potentially affecting MuxCo’s ability to generate revenues and hence its viability.

The Secretary of State’s policy for local TV

- 1.10 The Secretary of State believes that the introduction of local TV will represent a step-change in the media market. Following the independent review by Nicholas Shott and his subsequent report in December 2010, a call by DCMS for expressions of interest from potential providers, a review of technical delivery options by Ofcom and the development of the local TV action plan, DCMS published its framework for local TV in July 2011.^{3 4} The Secretary of State believes that the absence of sustainable local TV in the UK to date is something that can be addressed by targeted action by government and industry and has earmarked up to £25 million of funds from the BBC to pay for the project infrastructure. Additional funding of £15 million may be available for content.
- 1.11 Ofcom has undertaken further study to determine the most suitable mode of transmission for local TV and examined a number of possible approaches including:
- satellite;
 - cable;

² “Digital dividend: 600 MHz band and geographic interleaved spectrum”, Ofcom, February 2010.

³ “Commercially viable local television in the UK”, Nicholas Schott, December 2010.

⁴ “A new framework for local TV in the UK”, DCMS, July 2011.



- broadband;
- carriage in an existing multiplex;
- carriage in a new multiplex in the 600 MHz band due to be released as part of the digital dividend; or
- GI spectrum on a new multiplex.

1.12 Government determined that the most appropriate mode of transmission is to utilise the GI spectrum, as this is likely to make best use of the available spectrum at the lowest cost. Under the proposal, it is envisaged that two national standard-definition channels would become available on a new multiplex, with the potential for a further local television channel(s) being transmitted from each transmitter site selected.⁵

1.13 Based on research, Ofcom has determined the likely locations of the transmitter sites and has compiled a shortlist of 65 locations, selected on the basis of technical and commercial feasibility.⁶ In total, coverage will be around 50-60% of the UK population. In contrast, commercial DTT muxes potentially cover more than 90% of the UK population; PSB muxes potentially cover 98.5% of the population.

1.14 The awards for the use of the GI spectrum should be made by August 2013, and it is hoped that the spectrum will be available for use from the start of 2014. Licences would be awarded for twelve years from the start of 2014 to the end of 2025.⁷

The plan for local TV

1.15 Based on government's policy decisions and the research conducted thus far, plans for local TV are currently as follows:

- up to £25 million would be made available for capital upgrading of up to 65 transmitter sites to enable them to make use of the GI spectrum for broadcasting to DTT households. A remainder of this may be made available to cover operating expenses of MuxCo in the

⁵ At some transmitter sites, e.g. Winter Hill, it is possible to configure more than one local TV channel.

⁶ The proposed locations, including the potential maximum population coverage and our calculated adjusted population coverage are set out in Appendix 2.

⁷ Based on discussions with Ofcom.



first years of its operations, but in any case must be spent by 2017 at the latest;

- two standard definition (quasi-)national channels could be broadcast to the population covered by the transmitter sites;
- at each viable transmitter site, there would also be a slot reserved for a local television station;
- a new national multiplex would be set up to carry the three channel slots and the operation of this multiplex would be licensed via a beauty parade;
- the local television station would be given high EPG prominence, most likely channel 8 on Freeview; and
- the two national channels would not be given a high EPG prominence, and would likely appear at page 8 of the EPG.

The role of MuxCo

1.16 It is envisaged that MuxCo will cover all of the services from the receiving of television signal from each of the channels to transmission of this from the economically viable transmitter sites as follows:

- the two national channel providers will provide MuxCo with a signal of a suitable quality for combining (also known as “multiplexing”). The costs of the provision of suitable quality signal will be borne by the channel providers, not MuxCo;
- the signals will then be combined with a dummy slot for the local TV service (to be inserted later) into a single stream for distribution;
- the multiplex signal will then require distribution to each viable transmitter either by fibre by or satellite. As we explain in Section 3, we consider that satellite is likely to be the cheapest and hence most likely option;
- the satellite feed will then be de-multiplexed, the dummy slot removed, the local TV stream broadcast directly to the transmitter site will be inserted and the signal recombined; and



- the signal will then be broadcast from each viable transmitter to the surrounding area using GI spectrum to minimise any interference with existing spectrum users.

Our role and approach

1.17 We have thus been engaged by Ofcom to determine whether it is likely that the new MuxCo will be a viable business, given the likely costs that it will incur in its service provision, and the likely revenues that it will be able to generate given the level of population that can be covered.

1.18 In carrying out this assignment, we examined the following issues:

- Potential MuxCo supply chain costs – including the cost of the kit and operations, the procurement of distribution (or uplinking) and managed transmission services, network access costs, local multiplexing costs, SI services and local distribution costs.
- Potential MuxCo revenues – the revenues that MuxCo would receive from national channel providers, based on estimates provided in the press and corroborated by discussions with a number of sector stakeholders.⁸

1.19 In conducting our work we have not considered whether there would be in practice any commercial interest in bidding for MuxCo nor have we identified who the potential bidders may be.

1.20 Our approach comprised:

- Information gathering – comprising desk research, data collection and interviews with a number of stakeholders;
- Modelling – we compiled a profit and loss model of the potential MuxCo business. This is underpinned by a bottom-up cost model covering each transmitter and the overheads for MuxCo together with estimates of MuxCo's potential revenues; and

⁸ We also compiled a bottom-up model to estimate TV advertising revenue based on population coverage, TV advertising revenue per head and potential TV viewing shares of the national channels. This was used to check the reasonableness of our "top-down" assumptions.



- Scenario analysis – we conducted a number of scenarios in respect of costs, revenues, payments by local TV companies and possible cash injections for MuxCo's capital expenditure.

1.21 Our work was principally conducted between 20 September 2011 and 6 October 2011.

Preparation and use of this report

1.22 The information presented in this report has not been subject to independent audit or verification by FTI. We reserve the right to reconsider any opinions in this report in light of additional information that may be made available to us in the future.

1.23 We understand that this report may be made available to interested stakeholders including government. It has been prepared solely for use in this matter. This report should not be used, reproduced or circulated for any other purpose, in whole or in part, without our prior written consent. FTI accepts no responsibility to third parties for breaches of this obligation nor for any opinions expressed or information included within this report.

Sources of information

1.24 In compiling this report we drew on information from a wide range of sources including academic papers, consultancy reports, government policy papers, Ofcom studies, the press and stakeholder consultations. Sources are referenced throughout the report and a list of principal documents consulted is contained in Appendix 1.

1.25 Stakeholders consulted included Ofcom broadcast transmission and spectrum experts, commercial providers of uplinking services, procurers of multiplex services, an independent broadcast transmission expert, and five stakeholders from the media sector with commercial expertise in pay TV channels, free-to-air TV channels and Freeview multiplex slots.

Content of this report

1.26 The remainder of this report is structured as follows:

- Section 2 provides a summary of conclusions;



- Section 3 discusses key modelling inputs and our principal assumption; and
- Section 4 discusses the outputs from our model.

1.27 Additionally, there are four appendices attached covering:

- information sources;
- population coverage of each transmitter;
- TV viewing data; and
- Ofcom's specification for the study.



2 Summary of conclusions

Introduction

2.1 In this section, we set out our overall conclusions on the viability of MuxCo based on the outputs of the model we developed. Our cost modelling approach is based on estimates of operating a three channel national multiplex together with the costs for each of the relevant transmitter. MuxCo's revenue prospects have been based on:

- a top-down approach based on press searches augmented with stakeholder discussions on the most likely channel genres and indicative willingness to pay for up to 50%-60% coverage; and
- a 'test' of how reasonable these are based on potential advertising revenues per channel per transmitter based on plausible assumptions in respect of channel shares and DTT coverage of primary and additional sets.

2.2 We conducted several scenarios to ascertain the impact of varying costs, revenues, payments by local TV companies and the effect of injecting the funding available from the BBC. The scenarios enabled us to identify under what conditions MuxCo would appear potentially to be viable during the period of its licence, all other things equal. We additionally considered a scenario whereby MuxCo provided local services only.

Key risks

2.3 Although our modelling indicates that under certain scenarios MuxCo appears to be viable, we consider that there are several significant risks associated with the proposed venture.

2.4 First we note that all projections are subject to risk and uncertainty. Such risk and uncertainty increases the further in the future projections are made. In particular, we know that absent general economic changes, the media and communications sectors are particularly difficult to project owing to potentially further massive changes in technology and consumer preferences.



- 2.5 Our model implicitly assumes that TV consumption using DTT remains pretty similar to today and that there are no further global financial crises and/or significant and prolonged recessions in the UK.
- 2.6 If on the other hand the state of the UK economy deteriorates significantly to 2014 and beyond, if growth remains sluggish, or the UK slips back into recession, it is likely that there would be further downward pressure on the price that a channel provider would be willing to pay for a Freeview slot using the G1 spectrum.
- 2.7 There would be similar effects if IPTV became consumers' most favoured mode of TV reception. Other technological changes or improvements between now and 2014 or thereafter could significantly affect the profitability of MuxCo.
- 2.8 We note below other risks to the viability of MuxCo.
- We assume that prices do not vary significantly by 2014 or thereafter. Any significant inflation in operating or capital costs may threaten viability and the proposed BBC funding may not be sufficient under some scenarios.
 - It is possible that the proposed BBC funding may only be used for capital expenditure i.e. it cannot be used to meet operating expenses of MuxCo. This would effectively rule out some of the scenarios we investigated.
 - We assume in our model that the demand for the national slots remains consistent during the twelve year licence period and that channel providers are able to pay the projected charges to MuxCo for carriage. Given that only two (quasi-) national channels will be carried on MuxCo, this is a risky business venture. MuxCo's viability would be affected significantly should a single channel fail, leaving a vacant slot, even for a short time.
 - There is a significant risk that the availability of alternative superior (in coverage) and significant (in quantity) Mux capacity from the 600 MHz band at the same time as the G1 spectrum could significantly devalue the G1 spectrum.



- There may be downwards price pressure on Freeview slots from competitor distributors, affecting especially GI spectrum slots.
- The cost assumptions in our model are based on a Mux provision solution that is a minimum or “off the shelf” specification for each site. In reality, it is entirely plausible that this standard specification might not be suitable at all sites and it is possible that more expensive equipment will be required.
- In practice, not all transmitter sites may be feasible due to lack of transmitter space, or due to potential interference. If this occurred at some of the larger sites, there may be a material impact on profitability.
- Any cost overrun on roll out (for example unseasonal weather during a summer) might affect the viability of MuxCo.
- The basis of our cost specification is incremental to that experienced by current incumbents, based on the costs we understand a current Mux operator would pay. In the event that a current Mux operator would not want to bid for the MuxCo licence, then there would be likely to be significantly increased costs to set up MuxCo as a new entrant operator.

2.9 We note that we did not have discussions with commercial Muxes to determine their appetite for running MuxCo as these were beyond the scope of our work.

Principal findings

2.10 In this section we set out the principal findings of the modelling and scenario analysis we conducted.

2.11 We based our analysis on what we consider to be the most likely revenue and operating cost assumptions. Ofcom may consider that higher or lower revenue or cost metrics should be assumed; we have built functionality to vary these into the MuxCo model.

2.12 Based on the scenarios we conducted, our conclusions follow. Scenarios referenced are described in Section 4:



- it does not appear that MuxCo would be a viable commercial business in the absence of BBC money for transmission capital expenditure (see scenarios 1 and 2);
- if the BBC funding is used to pay for transmission infrastructure, then MuxCo could operate as a not for profit entity under base case revenue and cost assumptions (see scenario 3);
- if the £25 million BBC funding can also be used to pay for a cash surplus in the years 2014 to 2016, then rollout could be extended to all 65 sites if MuxCo operates as a not for profit entity. However under high cost assumptions local TV stations would need to make a contribution towards site operating costs (see scenario 4);
- if MuxCo decides to take the commercial decision to spend a larger sum on transmission infrastructure to boost population coverage, then under base case revenue and operating cost assumptions, MuxCo would be able to roll out to up to 25 transmitter sites if local stations make a contribution towards site operating costs (scenario 5); and
- if we assume a stripped down MuxCo with no national channels and 65 sites could be covered, there would be no costs for national multiplexing and distribution. Local TV stations would have to pay the full amount towards the site operating costs as commensurately there would be no revenues from national channels. This would cost each local TV station approximately £31,000 per annum on average. If some small central costs are also included then this would rise to £37,000 per annum (scenario 6).

3 Modelling approach

Introduction

- 3.1 In this section we discuss our approach to the modelling exercise and the principal assumptions we adopted in respect of the costs and revenues that MuxCo is likely to experience during a twelve year licence period. The model has been developed to focus on the likely costs and revenues of MuxCo alone i.e. we have not investigated the potential viability of the national or local TV services.
- 3.2 We assume that MuxCo will roll-out coverage as widely as it makes commercial sense to do so. In practice, this may not fulfil the government's policy proposals for local TV. We therefore developed a sufficiently flexible model to investigate a number of policy scenarios. These include:
- alternative coverage options;
 - incentive modelling of the BBC funding or its absence;
 - alternative payment options by local TV operators – zero, cost or cost mark-up; and
 - a 'decentralised' MuxCo comprising local TV services only.⁹
- 3.3 We note that in respect of payments by local TV operators, we have considered these on a cost-reflective basis only, that is, literally the operating costs that are incurred for the full service at each transmitter. An alternative approach would be to set charges that are not cost-reflective – the more lucrative sites could pay relatively high costs so as to cross-subsidise the less lucrative sites. Charges could be based on potential revenues, for example. Such methods of charging are for the government to determine and we have not considered them further in this report.

Data sources and principal assumptions

Comments on the data obtained

- 3.4 We obtained cost and revenue data based on discussions with Ofcom, broadcasting professionals, service providers, an independent expert in

⁹ Cost refers to one-third of site specific operating costs, cost plus refers to one-third of site specific costs plus an additional mark-up. In this case we have assumed a 10% mark-up to be an appropriate assumption.



broadcast transmission services, FTI consultants with expertise in broadcasting and multiplexing, and desk research. We discussed our input assumptions with technical experts at Ofcom who consider that our input assumptions appear to be reasonable.

Cost assumptions

- 3.5 It is important to note that we based our cost assumptions on a number of simple assumptions. For example, it may not be technologically feasible to build out to all sites due to unexpected local interference or there may not be sufficient space for the required transmitter at particular transmitter sites; however we have assumed a relatively standard specification at each site. We also based costs on data that are available to us given current market conditions. We have made no assumptions on, for example, the price of electricity in 2014 and whether in real terms this would be significantly higher.
- 3.6 Contemporaneous with the roll out of the proposed local TV services, there will be roll out of infrastructure for the 600 MHz band of channels. This could affect the roll out of the local TV infrastructure as well as leading to fewer sites becoming available. In addition, the increased number of channels that will become available at approximately 90% coverage could have a significant impact on the price that a broadcast provider would be willing to pay to roll out to 50-60% of the population. We have not made any assumptions as to what this impact may be.
- 3.7 We have also not considered the likelihood that satellite subscriptions will continue to grow, and that there may be fewer primary Freeview viewers in 2014, which may put further downward pressure on the price that a third party would be willing to pay for a channel slot.
- 3.8 Such risks are likely to affect the decision as to the formation of MuxCo will be a viable operation, even with the potential £25 million capital injection from the BBC. Any potential MuxCo operator would thus need to perform detailed commercial and technical due diligence together with extensive modelling based on more contemporaneous technological, cost and revenue data, to inform the decision on whether to bid for the MuxCo licence.



Determination of potentially viable sites

- 3.9 The model determines which transmitter locations would be commercially viable given the likely revenues and costs (i.e. the costs of transmission and operations at each transmission location) specific to each site. This assumption is based on whether a transmitter location will provide a contribution towards the central operating costs of MuxCo (i.e. overheads, the operation of the central multiplexing equipment, distribution costs etc).
- 3.10 If the costs of operating the transmitter exceed the likely revenues based on the local population that is covered, then, absent any external incentive, such as the £25 million capital available, MuxCo would not roll out to that site. Transmitter sites that would be able to contribute to the central costs of MuxCo are termed 'potentially viable sites' in this report. We use the term 'potentially' because although these sites might be able to make a contribution towards central costs, they collectively may not generate sufficient revenues to cover all the central costs. While on a standalone, i.e. site by site basis, the transmitters might be profitable, once overheads and central costs are added in, they may not be.
- 3.11 Once the number of viable sites is determined, the total revenues and costs based on the input assumptions are calculated. If these lead to a positive net present value ("NPV"), then we assume that MuxCo would roll out to that number of sites. However, as discussed above, it is possible that profitable sites might not be able to cover all central costs, and the NPV could be negative. In this case, MuxCo would not be viable.

MuxCo revenues from national channels

- 3.12 We estimated revenues from national channels based on discussions with broadcasting professionals and service providers in conjunction with desk research to identify the 'going rate' for commercial slots on Freeview. Our stakeholder discussions indicate that for 50%-60% coverage, a channel operator may be willing to pay approximately 50% of the price for a channel slot with nationwide coverage.
- 3.13 We also tested these estimates with a bottom-up estimation of advertising revenue based on the likely viewing share of the two national channels.



- 3.14 Based on our stakeholder discussions, we consider it unlikely that any of the major terrestrial broadcasters (i.e., the BBC, ITV, C4, and C5) would be interested in bidding for the GI slots.
- 3.15 Also based on the stakeholder discussions, we consider that the demand for the slots would not come from general entertainment channels as these most definitely require 90% coverage. Similarly, for pay TV channels, the 50%-60% coverage would not be a compelling offer. It would, for example be too complex to market.¹⁰ That said, one of the experts we consulted suggested that BT Vision may use the slot to augment its IPTV pay offerings that are not universally available. We have not, however, sought to explore further whether such a suggestion is a realistic one.
- 3.16 Possible other candidate genres for a channel slot could include a time-shifted channel, or that a channel might enter for non-commercial reasons (such as a foreign news channel). Other possibilities include shopping and music channels. It may also be possible to price-differentiate the slots by time of day.
- 3.17 Based on the discussions we had, we understand that a shopping channel is potentially the favoured candidate as Freeview viewers are less exposed to shopping channels than are pay TV subscribers who receive around 30 channels. The propensity to buy from shopping channels in DTT households appears to be greater than in pay TV households. However, we have been unable to identify an appropriate revenue model for such channels so our assumptions on the revenue per channel for MuxCo are based on our understanding of the 'going rate' for Freeview slots (appropriately discounted for the lack of coverage) together with the advertising revenue estimates from our bottom-up model.
- 3.18 We understand from our discussions with industry professionals that currently Freeview slots with national coverage are selling for between £3 million and £4 million per year. This represents a marked decrease from the prices of £10 million purportedly paid by some channel providers around 2005, which we understand may be worth approximately £6 million today. Thus the market value of Freeview slots has declined and the addition of

¹⁰ The pay TV channel would be marketed as available on Freeview but only in certain areas.



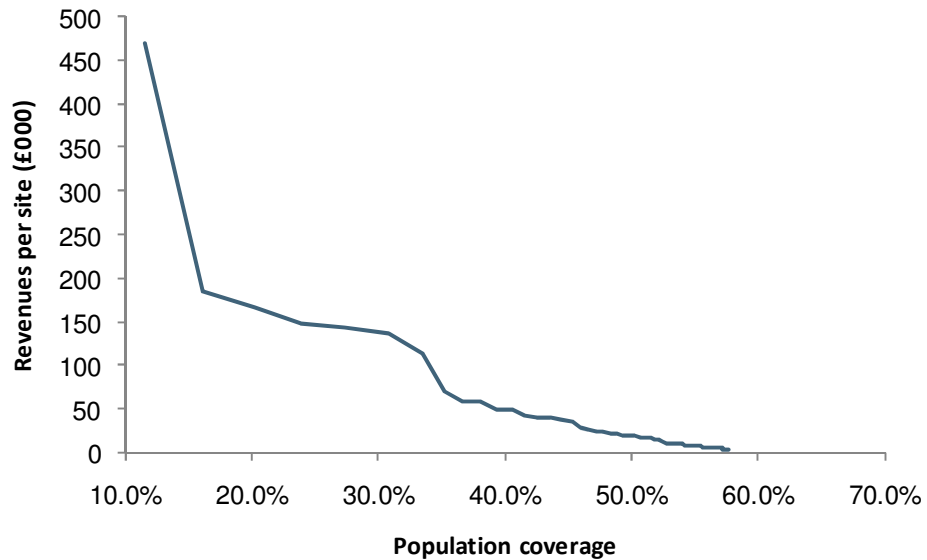
further slots as part of the digital dividend may likely lead to further downward pressure. Additionally, we understand that reasonable terms to potential channels are offered by other platforms, adding further downward pressure on the 'going rate' for Freeview slots.

- 3.19 We also understand that [*REDACTED*] a potential upper range of willingness to pay is between £1 million and £3 million for national coverage. We therefore consider that this sets an appropriate range as to the likely amount of revenues that MuxCo would be able to achieve.
- 3.20 We note that our bottom-up advertising modelling also indicated that a suitable range would be between £1 million and £3 million.¹¹ This is based on the likely advertising revenues that a channel would be able to achieve given its viewing share. Advertising revenues were calculated from the average viewing market share for channels not operated by the BBC, ITV, C4, C5 and Sky which is around 0.19%.¹²
- 3.21 We therefore consider that a suitable range to model would be between £1 million and £3 million per year per (quasi-) national channel pro-rated to the level of coverage achieved.
- 3.22 Under this assumption, we can calculate the likely revenues per transmitter site. Figure 3.1 shows the revenues that are likely to be generated per site given a level of population coverage under our base case revenue assumptions. Higher and lower revenue assumptions generate a similarly shaped graph.

¹¹ See FTI MuxCo model for detailed calculation.

¹² See Appendix 3. Note that the media and modal viewing shares are lower – around 0.15%.

Figure 3.1 Revenue per site expressed as percentage of coverage roll out



Source: FTI model. Assumes base case revenues and no contribution by local TV stations.

3.23 Figure 3.1 demonstrates, as expected, that it is the first few sites that generate significant revenues, thereafter additional sites generate much lower revenues, and hence are less likely to be as profitable.

3.24 We have used the advertising revenue estimates from our research and prorated them on the basis of population coverage. Assuming 50% coverage, we therefore assume that each of the two national channels pays between £0.5 million and £1.5 million per annum. We note that this does not differ significantly to Ofcom's assumptions of £1.75 million per channel slot assuming 60% coverage.

MuxCo revenues from local TV channels

3.25 Revenues from the local TV providers may be based on payments towards covering the operating costs at each site. We have calculated these based on the costs that would be incurred on a local site by site basis (i.e. MTS, electricity, local coding and local distribution costs, but not central costs such as satellite distribution or national multiplexing). An alternative approach would be to set charges that are not cost-reflective – the more lucrative sites could pay relatively high costs so as to cross-subsidise the less lucrative sites. Charges could be based on potential revenues, for example. Such methods of charging are for the government to determine and we have not



considered them further in this report. We have, however, included functionality within the model to model the effect of additional income streams.

MuxCo costs

3.26 The key cost elements in MuxCo's supply chain comprise:

- multiplexing – the process of blending the channels into a digital signal;
- distribution of the DTT multiplex signal to each transmission site (likely to be via satellite);
- managed transmission services (MTS) – this includes the preparation of the signal for transmission and the monitoring of the signal for quality; and
- network access charges – combining the DTT multiplexes and transmitting these from the antenna.

Multiplex costs

3.27 We assume that MuxCo will pay the capital costs of the multiplex set up irrespective of the BBC funds – it is unlikely that the BBC funds could be used to set up the actual commercial entity of MuxCo. Based on internal research and discussions with third party technical experts, we consider that the capital cost of the multiplex equipment including: encoders, multiplexers and a reasonable redundancy level using existing server equipment, would cost approximately £438,000. Based on our discussions, we assume that this equipment will need to be replaced half-way through the 12 year operating lease.

3.28 Annual multiplexing costs will consist of the national multiplexing operating costs required to take the two national TV channel feeds and convert these into a uniform signal with a dummy slot for the local television channels at each location. Our estimates indicate that a reasonable operating cost level for this would be approximately £75,000 per annum. This is independent of the number of potential sites covered.

3.29 At each location, costs will be incurred to insert the local TV broadcast stream into the signal at each transmitter site. The insertion of the Local TV



signal requires the signal to be demuxed and then remuxed at each site. We have assumed capital costs of £10,000 per transmitter site for the necessary equipment depreciated over 4 years and operating costs of approximately £10,000 per annum at each site.

- 3.30 In addition to the cost associated with combining the signal into a single stream, there would be a cost associated with including all muxes' SI data into the stream. In our discussion with an independent broadcasting transmission expert, we understand that a cost of around £50,000 per annum would be likely to cover this expense; this does not vary with the number of transmitters used.

Distribution costs

- 3.31 The signal generated at the multiplex site has to be distributed to each of the viable transmitters. We understand from our discussions with Ofcom and an independent broadcast transmission expert that the cost of sending the signal via fibre would be both expensive and unable technically to reach all transmitter sites. We therefore based our cost assumptions on the cost of satellite distribution. Our research indicates that the annual cost of purchasing this service from a third party with an adequate level of redundancy would cost MuxCo £700,000 per annum. It would not be economically feasible to invest in the capital infrastructure for MuxCo to operate this service itself.
- 3.32 In addition, we consider that there will be an element of local distribution costs at each transmitter site, with some small costs associated with Local TV access to the site to ensure the signal is uploaded correctly. We have estimated costs of £1,000 per site per annum for this. However, we assume that the majority of any distribution costs for the local TV signal being distributed to and received at the transmitter site will be met by the local TV station. It is possible that this full cost might prove to be prohibitive especially for smaller operators. As such, the government might decide that this cost should be met by MuxCo and depending on the formulation used, could lead to it being less likely that MuxCo would exist as a viable entity.

MTS and network access charges

- 3.33 Managed transmission services comprise customer specific charges such as equipment (the transmitters and antenna), maintenance of this equipment,



electricity supply to the equipment (but excluding transmitter electricity), and some spare parts etc. Network access charges relate to shared services provided on the transmitter site to all parties that use the transmitter. These include a charge for floor space used, wind loading of the antenna, and other general shared service charges. Network access charges can be included as a subset of managed transmission charges.

- 3.34 MuxCo will have to negotiate MTS and network access charges with Arqiva, the sole terrestrial broadcast transmission company in the UK. Arqiva has published reference offers containing guideline capital and operating charges for MTS and network access charges in the Manchester and Cardiff areas.
- 3.35 For this operation, where MuxCo will have only two national customers and potentially a large number of small local TV customers, the business risk may be seen to be high. It is likely therefore that Arqiva will demand that any capital expenditure is recouped upfront, rather than recouping its capital charges over time, as it typically does with its larger customers.¹³
- 3.36 Based on the published reference offers and our discussions with Ofcom and an independent broadcast transmission expert, we therefore made the simplified assumption that the top ten transmitters by adjusted population coverage will cost £300,000 to upgrade, largely because to guarantee coverage in areas with larger population, higher specification equipment might be necessary.
- 3.37 For transmitters beyond the top 10 transmitter sites (in terms of population size), we decreased costs on a sliding scale to £100,000 for the last remaining transmitters to be upgraded, as shown in Table 3.1. We consider that these values are comparable to the approximately £170,000 capital costs outlined in the reference offers. We do not consider that any material adjustment is required to account for the set up of multiple petals at a particular transmitter site as there are likely to be few synergies in setting up

¹³ Arqiva structured the reference offers for Manchester and Cardiff in this manner. Charges comprised an initial fee covering the capital expenditure and a return to Arqiva, and an annual fee that covers operating costs, excluding transmitter electricity charges.

multiple transmitters from the same antenna. This view was shared by the independent broadcasting transmission expert we consulted.

Table 3.1 Assumed capital charges per transmitter

Transmitter ranking	1-10	11-20	21-30	31-40	41-50	51-60	61-65
Assumed capital cost to upgrade (£000)	300	183	167	150	133	117	100

Source: FTI.

- 3.38 We also modelled a higher transmitter capital cost scenario, where transmission capital costs are increased to £400,000 for the top 10 sites. This would add an additional layer of redundancy that would make commercial sense for MuxCo, and would potentially increase population coverage in certain locations. The most significant population increase would be in London, where the number of households covered would increase from approximately 3.1 million to 4.5 million. This would have a positive impact on potential revenue generation.
- 3.39 In addition to the proposed 65 transmitter sites, there are also some relay transmitters that are proposed to be utilised to maximise population coverage, where appropriate. Where a relay transmitter is included as part of the transmitter for a particular location, we have assumed a capital outlay of £15,000. This lower cost reflects the fact that the relay transmitter merely receives, cleans up and re-transmits the received signal and thus a lesser amount of capital expenditure will be required to upgrade each relay.
- 3.40 We based our assumptions of the likely operating costs of each transmitter on the Arqiva reference offers. These provide annual charges of approximately £13,000. The independent broadcast transmission expert considered that these annual charges were fair and reasonable given the proposed upgrade plan. We thus assume a figure of £13,000 for the annual operating costs per transmitter, although we note that the actual figure is likely to be higher in some locations and lower in others. Given the lower costs required to run a relay transmitter, we assume a cost of £5,000 for annual operating costs per relay transmitter.
- 3.41 We also calculated the electricity cost that MuxCo would likely incur from the operation of the transmitters. This would be charged at cost to MuxCo i.e. no

mark-up. Table 3.2 sets out our assumptions for the electricity costs that would be incurred by MuxCo, indicating that the cost of a 1kW transmitter with 15% efficiency and a net antenna system gain of 4 (6dB) would cost £1,460 per year.

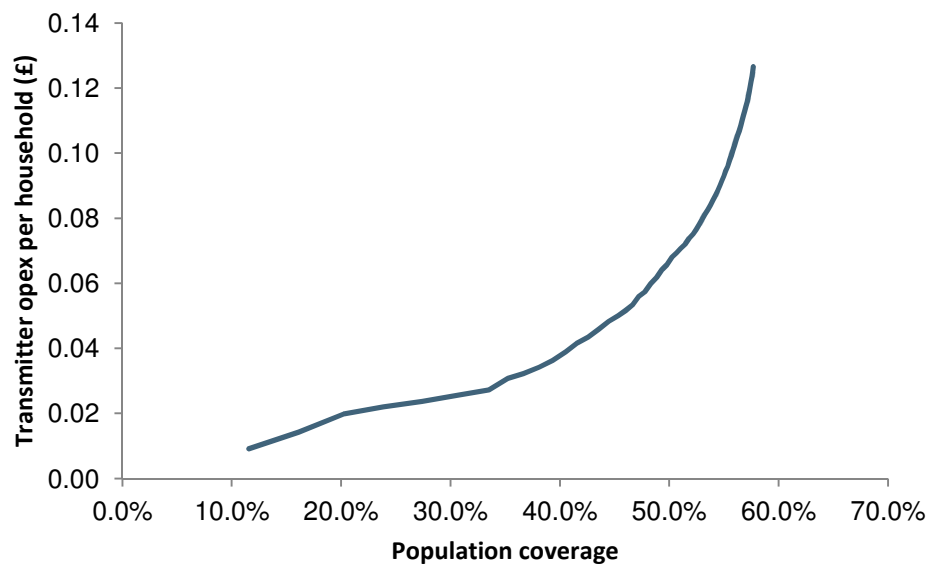
Table 3.2 Transmitter electricity costs borne by MuxCo per efficiency adjusted kW of transmitter ERP

Price per kWh (£)	0.10
Price per kWyear (£)	876.00
Transmitter efficiency	15%
Antenna gain	4 (6dB)
Price per efficiency adjusted kWyear (£)	1,460.00

Source: Electricity price based on current charges, efficiency based on discussions with an independent broadcast transmission expert and Ofcom.

3.42 Figure 3.2 shows how the total site operating costs per household covered vary with the population covered.

Figure 3.2 Operating costs per household expressed as a proportion of population coverage



Source: FTI model.

3.43 As displayed, the operating costs per household covered increase significantly as coverage is rolled out; indicating that with increased roll out,

the addition of incremental sites becomes increasingly expensive, making them less likely to be profitable.

Salaries and overheads

- 3.44 We assume that total salary costs of £225,000 and overheads of £150,000 are consistent with the incremental costs that would be borne by current Mux operators. The overhead costs include items such as legal, regulatory, finance and HR functions.

Summary

- 3.45 Table 3.3 summarises our cost assumptions for each part of MuxCo's value chain.

Table 3.3 Summary of MuxCo's operating costs (£000)

	Capex high	Capex low	Years to depreciate	Opex
Transmission	300 / 400	100	20	13
Local coding	10		4	10
National coding & mux	438		6	75
Distribution				700
Local SI amendment				50
Local distribution				1
Relay masts	15		20	5
Transmitter electricity per kWhr				1.46
Salaries				225
Overhead				150

Sources: FTI analysis.

- 3.46 We consider that the operating costs in Table 3.3 are likely to be sufficient for a 'base case' scenario. We have additionally modelled the effect of increased operating costs (50% greater) on MuxCo's potential viability; our 'high cost' scenario. This scenario accounts both for the possibility of MuxCo being a new entrant, or that there are specific cost overruns and/or specification changes.



Roll out period

3.47 The potential rate at which transmitters can be upgraded would affect the NPV and thus the potential viability of MuxCo. The sooner that a profitable site is able to generate revenues, then the greater the NPV will be, all other things equal, making commercial viability more likely. We based our assumption for the roll out period on discussions with Ofcom and the independent broadcast transmission expert. While the latter considered that it might be feasible for full roll out by the end of 2015, Ofcom considered that a slightly more prudent assumption should be taken, with the achievement of full roll out over a three year period. Any upgrading required for the roll out of the 600 MHz spectrum will occur concurrently with any upgrades required for the G1 spectrum. This may place operational constraints on Arqiva; we therefore consider that a three year roll out period is a reasonable assumption.

Discount rate for NPV analysis

- 3.48 We based the cash flow projections in real terms, and accordingly have used a real WACC. We assume Arqiva's WACC provides a reasonable proxy for MuxCo's WACC and have therefore used Arqiva's real WACC of 7.71%.¹⁴
- 3.49 We note that the WACC assumption is for a well established company that has a significant number of customers and has some degree of diversified business. MuxCo could have a significantly higher WACC if it was not part of an established business and accordingly, would be less likely to be profitable.

¹⁴ "The cost of capital in relation to broadcast transmission", Plum Consulting, July 2010.



4 Model scenarios

Introduction

- 4.1 In this section we set out the main outputs from our modelling analysis, providing the results of a number of scenarios. We provide the principal assumptions together with key highlights of the results.

Scenario 1 – base case

4.2 In this scenario, the key assumptions are as follows:

- we modelled whether MuxCo would be a viable entity in the absence of any external funding;
- base case revenue assumptions are used;¹⁵
- base case operating cost assumptions are used;¹⁶
- local TV stations do not contribute towards costs.

4.3 Table 4.1 shows the key model outputs given these assumptions.

Table 4.1 Key model outputs under Scenario 1

Local TV station does not contribute towards costs	
Number of potentially viable sites ¹⁷	7
Percentage coverage	33.5%
Capital spent (£ million)	2.2
NPV (£ million)	(6.1)
Commercially viable	No

Source: FTI model. Note capital spend is for transmitter upgrading only.

Implications

7 sites contribute towards, but do not cover, central MuxCo fixed costs.

MuxCo is not viable under the base case scenario.

¹⁵ Base case revenues are set at the midpoint of our potential revenue assumptions.

¹⁶ Base case costs are set at our low cost assumption.

¹⁷ The term 'potentially viable sites' is used because these sites are able to contribute towards central costs, but this may not be sufficient to cover all of these costs. See paragraphs 3.9 to 3.11 for full explanation.

Scenario 2 – local TV stations contribute towards cost

4.4 In this scenario, the key assumptions are as follows:

- we modelled whether MuxCo would be a viable entity in the absence of any external funding;
- base revenue assumptions are used;¹⁸
- base operating cost assumptions are used;¹⁹
- local TV stations contribute either one-third of the site operating costs (but not central costs), or one-third of the site operating costs plus a mark-up of 10%.

4.5 Table 4.2 shows the key model outputs for these assumptions

Table 4.2 Key model outputs under Scenario 2

	Local TV pays cost	Local TV pays cost plus 10%
Number of potentially viable sites ²⁰	9	9
Percentage coverage	36.5%	36.5%
Capital spend (£ million)	2.7	2.7
NPV (£ million)	(5.5)	(5.4)
Commercially viable	No	No

Source: FTI model. Note capital spend is for transmitter upgrading only.

Implications

9 sites contribute towards, but do not cover fixed costs.

MuxCo is not viable under the base case scenario where local TV stations contribute towards site operating costs.

¹⁸ Base case revenues are set at the midpoint of our potential revenue assumptions.

¹⁹ Base case costs are set at our low cost assumption.

²⁰ See paragraphs 3.9 to 3.11.

Scenario 3 – BBC capital contribution

4.6 In this scenario, the key assumptions are as follows:

- we modelled whether MuxCo would be a viable entity with external capital funding of transmission infrastructure;
- base revenue assumptions are used;²¹
- base operating cost assumptions are used;²²
- local TV stations contribute either nothing, one-third of the site operating costs (but not central costs), or one-third of the site operating costs plus a mark-up of 10%.

4.7 The model outputs are shown in Table 4.3.

Table 4.3 Key model outputs under Scenario 3

	Local TV pays nothing	Local TV pays cost	Local TV pays cost plus 10%
Number of potentially viable sites ²³	17	23	25
Percentage coverage	45.1%	48.5%	49.4%
Capital cost (£ million)	4.5	5.7	6.0
NPV (£ million)	(1.4)	0.0	0.1
Commercially viable	No	Unlikely	Possible

Source: FTI model. Note capital spend is for transmitter upgrading only.

Implications

MuxCo is unlikely to be viable as a commercial entity even with external funding of the transmission infrastructure.

MuxCo might be viable as a not for profit entity for 25 transmission sites where transmission infrastructure is funded externally and local TV stations pay cost plus 10%.

Under lower revenue or higher cost assumptions, MuxCo is not viable as a commercial, or not for profit entity.

²¹ Base case revenues are set at the midpoint of our potential revenue assumptions.

²² Base case costs are set at our low cost assumption.

²³ See paragraphs 3.9 to 3.11.



Scenario 4a – roll out to all 65 sites

- 4.8 Under our base case revenue assumptions, the model indicates that it is unlikely that MuxCo will be able to be a viable commercial entity. We therefore considered whether it might be possible to maximise the policy goal of maximum population coverage if MuxCo could be run as a not for profit entity and receives not only funding to cover transmission capital costs, but also receives payment to cover any losses over the twelve year operating period.
- 4.9 The possibility of MuxCo also receiving funding to cover operating expenditure is complicated, especially as we understand that any BBC funding must be used by the end of 2016. As such, in order to maximise the policy goal of increasing roll out to as many transmission sites as possible, it is necessary to use any payment as a ‘war chest’ that can be built up over 2014 to 2016 and then wound down to cover operating losses after 2016.
- 4.10 This front loaded three years of excess funding could be provided to cover the costs that would be incurred in the final nine years where no BBC funding would be available. In effect, MuxCo would be given a large cash input each year between 2014 and 2016 and then use the accumulated cash to cover its loss making operations across all 65 transmitter sites. If roll out was extended to all 65 sites, the capital cost would be £10.9 million. This would leave £14.1 million available to fund any operating losses.
- 4.11 In this scenario, the key assumptions are as follows:
- we modelled whether MuxCo would be a viable entity with external capital funding of transmission infrastructure;
 - base revenue and operating cost assumptions are used;²⁴
 - local TV stations contribute either nothing, one-third of the site operating costs (but not central costs), or one-third of the site operating costs plus a mark-up of 10%;
 - any unspent BBC money is front-loaded to pay for future operating losses;
 - MuxCo operates as a not for profit entity.

²⁴ Base case assumptions comprise our mid revenue assumption and our low cost assumption.

4.12 The model outputs are shown in Table 4.4.

Table 4.4 Key model outputs under Scenario 4a

	Local TV pays nothing	Local TV pays cost	Local TV pays cost plus 10%
Capital cost (£ million)	11.1	11.1	11.1
Additional funding required to cover additional roll out (£ million) ²⁵	8.6	3.7	3.0
Total funding used (£ million)	19.8	14.8	14.3
Number of sites	65	65	65
Population coverage	57.7%	57.7%	57.7%
NPV (£ million)	0	0	0

Source: FTI model. Note capital spend is for transmitter upgrading only.

Implications

Roll out to all 65 sites is feasible under low cost assumptions if BBC funding can also be used to fund a cash surplus to be wound down after 2016 as well as transmission capital infrastructure.

We consider that this approach would only be feasible with MuxCo operating as a not for profit entity.

²⁵ This additional funding is the amount that would need to be paid to MuxCo during the period 2014 to 2016 to generate a sufficient cash reserve to cover the negative cash flow in future years. The estimated additional funding is therefore the result of the calculation with the NPV set to zero. We have assumed that this additional funding could be taken from any amounts remaining from the £25 million BBC funding.

Scenario 4b – roll out to all 65 sites

- 4.13 In this scenario, the key assumptions are the same as scenario 4a, but high cost assumptions are modelled.²⁶
- 4.14 The model outputs are shown in Table 4.4.

Table 4.5 Key model outputs under Scenario 4b

	Local TV pays nothing	Local TV pays cost	Local TV pays cost plus 10%
Capital cost (£ million)	11.1	11.1	11.1
Additional funding required to cover additional roll out (£ million) ²⁷	19.7	12.2	11.5
Total funding used (£ million)	30.8	23.4	22.6
Number of sites	65	65	65
Population coverage	57.7%	57.7%	57.7%
NPV (£ million)	0	0	0

Source: FTI model. Note capital spend is for transmitter upgrading only.

Implications

Roll out to all 65 sites is feasible under high cost assumptions if BBC funding can also be used to fund a cash surplus to be wound down after 2016 as well as transmission capital infrastructure, and local TV stations make a contribution towards site operating costs.

We consider that this approach would only be feasible with MuxCo operating as a not for profit entity.

²⁶ High cost assumptions assume a 50% increase in operating costs.

²⁷ This additional funding is the amount that would need to be paid to MuxCo over the period 2014 to 2016 in order to generate a sufficient cash reserve to cover the negative cash flow in future years. The estimated additional funding is therefore the result of the calculation with the NPV set to zero. We have assumed that this additional funding could be taken from any amounts remaining from the £25 million BBC funding.

Scenario 4c – roll out to all 65 sites

- 4.15 In this scenario, the key assumptions are as scenario 4a, but under low revenue assumptions.²⁸
- 4.16 The model outputs are shown in Table 4.4.

Table 4.6 Key model outputs under Scenario 4c

	Local TV pays nothing	Local TV pays cost	Local TV pays cost plus 10%
Capital cost (£ million)	11.1	11.1	11.1
Additional funding required to cover additional roll out (£ million) ²⁹	18.5	13.6	13.1
Total funding used (£ million)	29.6	24.7	24.2
Number of sites	65	65	65
Population coverage	57.7%	57.7%	57.7%
NPV (£ million)	0	0	0

Source: FTI model. Note capital spend is for transmitter upgrading only.

Implications

Roll out to all 65 sites is feasible under low cost assumptions if BBC funding can also be used to fund a cash surplus to be wound down after 2016 as well as transmission capital infrastructure, provided that all transmitter sites contribute towards site operating costs.

This is however, risky, as not all 65 sites might be able to contribute towards site operating costs. We note that if only 50% of sites have local TV stations that can contribute towards site operating costs, then expenditure is greater than £25 million.

We consider that this approach would only be feasible with MuxCo operating as a not for profit entity.

²⁸ Low revenue assumptions are based on the low end of what a third party would be willing to pay for the available spectrum.

²⁹ This additional funding is the amount that would need to be paid to MuxCo over the period 2014 to 2016 in order to generate a sufficient cash reserve to cover the negative cash flow in future years. The estimated additional funding is therefore the result of the calculation with the NPV set to zero. We have assumed that this additional funding could be taken from any amounts remaining from the £25 million BBC funding.



Scenario 5 – higher transmission infrastructure cost

- 4.17 It may be desirable to spend higher amounts on transmitter infrastructure to ensure coverage, and to build in some level of redundancy, or additional support. This is especially important at transmitter sites covering large population areas. In London, it is possible that by spending higher amounts on transmitter infrastructure, population coverage can be increased significantly – up to 4.5 million households – and hence revenues can also be increased significantly.
- 4.18 In this scenario, we modelled the effect of higher infrastructure costs for the top 10 transmitter sites with a resulting population increase.
- 4.19 In this scenario, the key assumptions are based on scenario 3 with the following difference:
- the top ten transmitters are high cost and this leads to a population and revenue boost in London.
- 4.20 Table 4.7 sets out the results of this analysis.

Table 4.7 Key model outputs under Scenario 5

	Local TV pays nothing	Local TV pays cost	Local TV pays cost plus 10%
Number of potentially viable sites ³⁰	17	23	25
Percentage coverage	50.3%	53.7%	54.6%
Capital cost (£ million)	5.5	6.7	7.0
NPV (£ million)	(0.1)	1.2	1.3
Commercially viable	No	Possible	Possible

Source: FTI model. Note capital spend is for transmitter upgrading only.

Implications

MuxCo may consider increasing capital expenditure to achieve greater population coverage.

Under the assumption that increased capital expenditure can lead to higher population coverage and hence revenues, and local TV stations pay a contribution towards site operating costs, MuxCo appears to be a viable commercial entity for up to 25 transmitter sites.

Note that this scenario is not viable under high operating cost assumptions.

³⁰ See paragraphs 3.9 to 3.11.



Scenario 6 – decentralised MuxCo

- 4.21 Ofcom additionally asked us to model the effect of removing the two national channels, so that only local channels would broadcast from each transmitter site. This results in no central distribution or multiplexing costs. We assumed that all other costs would remain the same. Given there would be no revenues from national channels, the key question is how much would each local TV station have to pay to ensure that the local infrastructure would be operated adequately.
- 4.22 The costs included in this scenario include: MTS and local distribution, SI amendment, local multiplexing, depreciation of local multiplexing equipment and we assumed the same level of central salaries and overhead; it may be possible for these figures to be lower given that MuxCo would now have a smaller operation.
- 4.23 Under this assumption, MuxCo would operate as a not for profit entity and would operate all 65 sites. This would entail £11.1 million in capital expenditure. We calculated the average level of revenue that each local TV station would have to pay to cover these costs assuming that (i) the BBC funding is used to cover central operating expenses and (ii) that the BBC funding is only used to fund transmission capital and local operators are the only contributors to central operating costs. These two scenarios are shown in Table 4.8. We note, however that the actual cost would vary by location.

Table 4.8 Key model outputs under Scenario 6

	BBC contributes to central opex	BBC does not contribute to central opex
Number of potentially viable sites ³¹	65	65
Percentage coverage	57.7%	57.7%
Capital cost (£ million)	11.1	11.1
NPV (£ million)	0	0
Cost to local TV station (£000)	30.7	37.1

Source: FTI model. Note capital spend is for transmitter upgrading only.

Implications

BBC funding is sufficient to cover all transmitter capital costs.

The average cost to local TV stations would range between £31,000 and £37,000 depending on whether the BBC funding could also be used to make a contribution towards central operating costs, or not.

³¹ See paragraphs 3.9 to 3.11.



Conclusions

- 4.24 We developed a bottom-up model using cost inputs sourced from data held by Ofcom, industry data, discussions with an independent broadcasting transmission expert, industry specialists and professionals, and FTI experts. We have used data that are based on a standard 'off the shelf' specification for each site and that an existing Mux would run MuxCo to minimise costs. As discussed in the key risks in Section 2, there are a number of caveats to the modelling under the assumptions used.
- 4.25 We have based our analysis around what we consider to be the most likely revenue and operating cost assumptions. It may be that Ofcom considers that higher or lower revenue or cost assumptions should be considered. We have built the functionality to vary these into the MuxCo model.
- 4.26 Based on the outcomes of the scenarios, our conclusions are as follows:
- it does not appear that MuxCo would be a viable commercial business in the absence of BBC money for transmission capital expenditure (scenarios 1 and 2);
 - if the BBC funding is used to pay for transmission infrastructure, then MuxCo could operate as a not for profit entity under base case assumptions (scenario 3);
 - if the £25 million BBC funding can also be used to pay for a cash surplus in the years 2014 to 2016, then rollout could be extended to all 65 sites if MuxCo operates as a not for profit entity. However under high cost assumptions local TV stations would need to make a contribution towards site operating costs (scenario 4);
 - if MuxCo decides to take the commercial decision to spend a greater amount on transmission infrastructure and thus increases population coverage, then under base case revenue and operating cost assumptions MuxCo would be able to roll out to up to 25 transmitter sites if local stations make a contribution towards site operating costs (scenario 5); and
 - an alternative approach for a not-for-profit MuxCo could be an operation with no national channels, therefore saving on national



multiplexing and distribution costs. With no national TV channel revenue streams, local TV stations would have to pay the full amount towards the site operating costs. This would cost each local TV station approximately £31,000 on average. If some small central costs are also included then this would rise to £37,000 (scenario 6).

- 4.27 We determined that under the working assumptions in the model some scenarios might lead to a viable MuxCo, although we acknowledge that there are significant limitations of this modelling approach. As discussed, our model has had to rely on a standardised approach to setting up the transmitters and in practice, this might not be appropriate for all sites. Additional capital costs (especially if these relate to larger population sites) could lead to alternative results. Our assumptions are based on current market conditions and data – these might be very different in 2014 and thereafter. The key risks associated with this venture are provided in Section 2.

Appendix 1 Sources of information used

A1.1 This appendix lists the sources of information that were used in compiling this report.

Reference Offer for the provision of Transmission Services in respect of Ofcom's recent award of a licence in the frequency band 758 to 766 MHz covering Manchester	Arqiva	8 June 2009
Reference Offer for the provision of Network Access in respect of Ofcom's recent award of a licence in the frequency band 758 to 766 MHz covering Manchester	Arqiva	8 June 2009
Reference Offer for the provision of Transmission Services in respect of Ofcom's recent award of a licence in the frequency bands 742 to 750 MHz (transitional arrangement) and 542 to 550 MHz (final arrangement) covering Cardiff	Arqiva	8 June 2009
Reference Offer for the provision of Network Access in respect of Ofcom's recent award of a licence in the frequency bands 742 to 750 MHz (transitional arrangement) and 542 to 550 MHz (final arrangement) covering Cardiff	Arqiva	8 June 2009
"Bid media puts new Freeview slot up for sale"	Broadcast	4 August 2011
Multiplex Service Licences: Application Documents	ITC	22 May 2002
The BBC's investment in Freeview	NAO	May 2004
Cost Benefit analysis of digital switchover	DTI/DCMS	5 April 2005
Commercially viable local television in the UK	Nicholas Shott	December 2010
Carriage options for a TV service in Wales	Welsh Assembly	10 December 2008
UK DTT features for support of local TV services	DTG	21 March 2011
A new framework for local TV in the UK	DCMS	July 2011
Macquarie UK Broadcast Ventures Limited/ National Grid Wireless Group Completed acquisition – Final report	Competition Commission	11 March 2008
Digital TV update, Q1 2011	Ofcom	July 2011
Indicative locations for local television multiplexes: Initial technical assessment	Ofcom	9 August 2011
Technical delivery options for local television services in the UK	Ofcom	September 2011
Ofcom Technology Tracker Wave 1 (accessed at http://stakeholders.ofcom.org.uk/market-data-research/statistics/)	Ofcom	5 May 2011
RTENL Proposed schedule of tariffs for digital terrestrial television services	RTENL	

RTENL Schedule of tariffs	RTENL	
RTENL Tariff model	RTENL	
Exploiting the digital dividend – A European approach	Analysys Mason	14 August 2009
The economics of delivering local digital audio-visual and interactive services	Spectrum Strategy Consultants	18 November 2005
Report and recommendations by the Broadcasting Authority of Ireland on the exercise of its functions under Statutory Instrument No.67 of 2011	BAI	August 2011
The sustainability of local commercial TV	Oliver & Ohlbaum Associates Ltd	
Production of reference offers in relation to 600 MHz spectrum award – requirements specification	Arqiva	September 2011
The impact of TV 2.0 on viewer behaviour	3 Reasons Ltd	July 2009
Digital dividend: 600 MHz band and geographic interleaved spectrum	Ofcom	18 February 2010
Digital dividend review – a statement on our approach to awarding the digital dividend	Ofcom	December 2007

Appendix 2 Calculation of the adjusted population at each transmitter site

A1.2 In this appendix, we calculate an adjusted population coverage to take account of the relative wealth of the target population (wealthier populations would be preferable to less wealthy ones as greater revenues would be possible) and to take account of the level of DTT viewing that occurs in each area.

A1.3 The table below sets out the relative wealth of different UK locations.

Table A1.1 Relative wealth of UK regions

Region	GDHI per head indices (2009)
United Kingdom	100.0
North East	85.0
North West	90.2
Yorkshire and The Humber	87.0
East Midlands	91.3
West Midlands	89.5
East of England	103.9
London	128.2
South East	112.8
South West	98.7
England	101.4
Wales	87.9
Scotland	97.2
Northern Ireland	88.2

Source: NUTS1 Regional GDHI 1995-2009 30-Mar-2011.

A1.4 The table below calculates our propensity to view DTT based on the UK average DTT viewing population.

Table A1.2 Calculation of propensity to view adjustments

Region	% DTT main set [A]	% have DTT [B]	DTT secondary view [C]=[B]-[A]	DTT viewing D	Propensity to view E
United Kingdom	38%	56%	18%	29%	1.00
North East	41%	67%	26%	34%	1.18
North West	41%	67%	26%	34%	1.18
Yorkshire and The Humber	34%	56%	22%	29%	0.99
East Midlands	37%	53%	16%	28%	0.95
West Midlands	36%	55%	19%	28%	0.98
East of England	28%	45%	17%	23%	0.79
London	35%	40%	5%	22%	0.74
South East	34%	52%	18%	27%	0.92
South West	51%	76%	25%	39%	1.36
England	37%	56%	19%	29%	1.00
Wales	39%	56%	17%	29%	1.00
Scotland	42%	62%	20%	32%	1.11
Northern Ireland	26%	70%	44%	34%	1.17

Source: Ofcom technology tracker wave 1 main set, FTI analysis. The impact of TV 2.0 on viewing behaviour, 3 Reasons Ltd, July 2009.

A1.5 Using these metrics, we have adjusted the DPSA population of each site to generate an adjusted population that we have then used to determine likely revenues per site. The adjusted population is calculated as DPSA population x GDHI per head indices x propensity to view. This is shown in the table below.

Table A1.3 Calculation of adjusted population coverage

Primary Location	DPSA population (households)	Region	Adjusted population (households)	Adjusted population ranking
London	3,100,000	London	2,954,684	1
Birmingham	1,200,000	West Midlands	1,049,551	3
Manchester	1,100,000	North West	1,170,646	2
Leeds	1,000,000	Yorkshire and The Humber	857,076	6
Newcastle	900,000	North East	902,584	5
Liverpool	870,000	North West	925,874	4
Glasgow	660,000	Scotland	710,084	7
Cardiff	351,000	Wales	309,675	12
Falkirk	340,000	Scotland	365,801	10
Preston	340,000	North West	365,802	9
Bristol	330,000	South West	441,344	8
Edinburgh	290,000	Scotland	312,007	11
Nottingham	290,000	East Midlands	251,604	15
Grimsby	270,000	Yorkshire and The Humber	231,410	16
Belfast	250,000	Northern Ireland	258,018	14
Southampton	250,000	South East	260,511	13
Middlesbrough	220,000	North East	220,632	17
Dundee	150,000	Scotland	161,383	19
Norwich	149,000	East of England	122,944	24
Maidstone	140,000	South East	145,886	21
Reading	140,000	South East	145,887	20
Aberdeen	130,000	Scotland	139,865	22
Gloucester	130,000	South West	173,863	18
Sheffield	120,000	Yorkshire and The Humber	102,849	28
Stoke on Trent	120,000	West Midlands	104,955	27
Ayr	110,000	Scotland	118,347	25
Oxford	110,000	South East	114,625	26
Plymouth	100,000	South West	133,741	23
Brighton and Hove	98,000	South East	102,120	29
Carlisle	91,000	North West	96,844	30

Cambridge	83,000	East of England	68,485	33
Burnley	82,000	North West	87,266	31
Reigate	74,000	South East	77,111	32
Swansea	73,000	Wales	64,405	36
Telford	73,000	West Midlands	63,848	37
York	71,000	Yorkshire and The Humber	60,852	38
Basingstoke	64,000	South East	66,691	35
Bedford	64,000	East of England	52,808	41
Haywards Heath	64,000	South East	66,692	34
Guildford	53,000	South East	55,228	39
Inverness	50,000	Scotland	53,794	40
Malvern	50,000	West Midlands	43,731	45
Tonbridge	45,000	South East	46,892	42
Shrewsbury	44,000	West Midlands	38,484	48
Hereford	43,000	West Midlands	37,609	49
Dover	42,000	South East	43,766	44
Lancaster	42,000	North West	44,697	43
Carmarthen	40,000	Wales	35,291	53
Hemel Hempstead	37,000	East of England	30,530	55
Derry / Londonderry	36,000	Northern Ireland	37,155	51
Limavady	36,000	Northern Ireland	37,156	50
Greenock	34,000	Scotland	36,580	52
Keighley	34,000	Yorkshire and The Humber	29,141	56
Scarborough	33,000	Yorkshire and The Humber	28,283	57
Barnstaple	32,000	South West	42,797	46
Salisbury	31,000	South West	41,460	47
Bromsgrove	29,000	West Midlands	25,364	60
Elgin	29,000	Scotland	31,201	54
Stratford upon Avon	29,001	West Midlands	25,365	59
Mold	25,000	Wales	22,057	61
Haverfordwest	24,000	Wales	21,174	62
Luton	23,000	East of England	18,978	64
Kidderminster	22,000	West Midlands	19,242	63

Poole	21,000	South West	28,086	58
Bangor	17,000	Wales	14,998	65

Source: Indicative locations for local television multiplexes: Initial technical assessment 9 August 2011, Table A1.1 and above Table A1.2.

A1.6 The table below shows the profitability per site under base revenue assumptions and assuming that the BBC's £25 million pays for the transmission capital upgrades. The FTI MuxCo model can be used to determine similar outputs under differing assumptions.

Table A1.4 Profitability of each site under base case revenue assumptions

Ranking by operating profit	Location	Operating profit by site if no local TV contribution	Operating profit by site if local TV contributes site operating costs	Operating profit by site if local TV contribution is cost plus 10%
1	London	437	448	449
2	Manchester	149	161	163
3	Birmingham	130	142	143
4	Liverpool	112	123	124
5	Newcastle	111	122	123
6	Leeds	100	112	113
7	Glasgow	81	92	93
8	Bristol	34	46	47
9	Falkirk	27	37	38
10	Preston	26	37	38
11	Edinburgh	18	29	30
12	Cardiff	11	23	25
13	Belfast	10	20	21
14	Nottingham	4	16	17
15	Southampton	4	16	17
16	Middlesbrough	3	14	15
17	Grimsby	1	11	12
18	Gloucester	(2)	10	11

19	Maidstone	(2)	6	7
20	Dundee	(5)	5	6
21	Ayr	(7)	2	3
22	Stoke on Trent	(7)	1	1
23	Sheffield	(8)	0	1
24	Plymouth	(8)	(0)	1
25	Brighton and Hove	(10)	(0)	1
26	Reading	(11)	(2)	(1)
27	Burnley	(12)	(3)	(1)
28	Aberdeen	(14)	(4)	(2)
29	Reigate	(15)	(4)	(3)
30	Carlisle	(15)	(6)	(4)
31	Norwich	(15)	(6)	(5)
32	Swansea	(15)	(6)	(5)
33	Cambridge	(16)	(6)	(5)
34	Telford	(16)	(6)	(6)
35	Oxford	(16)	(7)	(6)
36	Haywards Heath	(16)	(7)	(6)
37	Basingstoke	(17)	(7)	(6)
38	Guildford	(17)	(8)	(7)
39	York	(17)	(8)	(7)
40	Inverness	(17)	(8)	(8)

41	Tonbridge	(17)	(9)	(8)
42	Lancaster	(18)	(9)	(8)
43	Malvern	(18)	(9)	(8)
44	Bedford	(19)	(10)	(9)
45	Salisbury	(19)	(10)	(9)
46	Dover	(19)	(10)	(9)
47	Greenock	(19)	(10)	(10)
48	Shrewsbury	(19)	(11)	(10)
49	Hereford	(19)	(11)	(10)
50	Derry / Londonderry	(20)	(11)	(10)
51	Hemel Hempstead	(20)	(11)	(10)
52	Keighley	(20)	(11)	(11)
53	Poole	(20)	(12)	(11)
54	Scarborough	(20)	(12)	(11)
55	Limavady	(20)	(12)	(11)
56	Bromsgrove	(20)	(12)	(11)
57	Stratford upon Avon	(21)	(12)	(11)
58	Carmarthen	(21)	(12)	(11)
59	Elgin	(21)	(13)	(12)
60	Kidderminster	(21)	(13)	(12)
61	Luton	(22)	(13)	(12)

62	Barnstaple	(23)	(14)	(13)
63	Mold	(23)	(14)	(14)
64	Haverfordwest	(24)	(15)	(14)
65	Bangor	(25)	(15)	(14)

Source: FTI model.

Appendix 3 Television viewing data

In this appendix we show our television viewing calculations.

Table A1.5 Television viewing shares average June 2011 to August 2011

Channel	Viewing share
BBC 1	20.8%
ITV 1	13.6%
BBC 2	6.5%
Channel 4	5.7%
Channel 5	4.5%
ITV 2	2.2%
ITV 3	2.0%
BBC 3	1.6%
Film4	1.4%
Cbeebies	1.4%
BBC News	1.3%
Sky Sports 1	1.2%
ITV 4	1.2%
More4	1.1%
Sky 1	1.0%
Channel 4+1	1.0%
5 USA	0.9%
Pick TV	0.9%
CBBC	0.9%
Dave	0.9%
Sky News	0.9%
Yesterday	0.8%
ITV 1 HD	0.7%
ITV 1 +1	0.7%
BBC 4	0.7%
Sky Sports News	0.6%
Sky Living	0.5%
Challenge TV	0.5%
5*	0.5%
Watch	0.5%
Sky Sports 2	0.5%
Disney Channel	0.4%
G.O.L.D.	0.4%
ITV 2 +1	0.4%
4Music	0.4%
CITV and GMTV2	0.4%

Comedy Central	0.4%
Quest	0.4%
Disney Junior	0.4%
Universal	0.4%
Star Plus	0.3%
Sky Movies Premiere	0.3%
Alibi	0.3%
FX	0.3%
Nick Jr	0.3%
Viva	0.3%
Sky Atlantic	0.3%
BBC HD	0.3%
Boomerang	0.2%
Dave ja vu	0.2%
Sky 2	0.2%
Pick TV +1	0.2%
Sky Living +1	0.2%
Sky LIVINGit	0.2%
BBC RB 6881	0.2%
Cartoon Network	0.2%
Cartoonito	0.2%
Discovery	0.2%
Disney Channel +1	0.2%
Film4 +1	0.2%
More4 +1	0.2%
Nickelodeon	0.2%
Nick Jr 2	0.2%
Really	0.2%
Syfy	0.2%
Sky Movies Family	0.2%
Sky Movies Showcase	0.2%
Sky Sports 3	0.2%
BBC RB FREEVIEW 301	0.2%
CBS Reality	0.2%
Comedy Central +1	0.2%
Disney Junior Plus	0.2%
Eurosport	0.2%
ESPN	0.2%
Sky Movies Action & Adventure	0.1%
Disney XD	0.1%
Eurosport 2	0.1%
Imagine Dil Se	0.1%
MTV	0.1%
Nicktoons	0.1%
True Movies 1	0.1%

Sky Box Office Events	0.1%
Sky Living Loves	0.1%
Sky LIVINGit +1	0.1%
Sky Movies Comedy	0.1%
Sky Movies Crime & Thriller	0.1%
Sky Movies Drama & Romance	0.1%
Sky Movies Modern Greats	0.1%
Sky Movies Premiere +1	0.1%
Sky Movies SciFi-Horror	0.1%
Sky Sports 4	0.1%
5 USA +1	0.1%
5* +1	0.1%
Alibi +1	0.1%
Animal Planet	0.1%
attheraces	0.1%
BBC Parliament	0.1%
Bio	0.1%
Boomerang +1	0.1%
Cartoon Network Too	0.1%
CBS Action	0.1%
CBS Drama	0.1%
CBS Reality+1	0.1%
Challenge TV +1	0.1%
Chart Show TV	0.1%
Comedy Central Extra	0.1%
Crime & Investigation Network	0.1%
Discovery +1	0.1%
Discovery Home & Health	0.1%
Discovery Knowledge	0.1%
Discovery Real Time	0.1%
Discovery Science	0.1%
Discovery Shed	0.1%
Discovery Turbo	0.1%
Disney Cinemagic	0.1%
Disney XD +1	0.1%
DMAX	0.1%
DMAX+1	0.1%
E!	0.1%
Eden	0.1%
Eurosport HD	0.1%
Food Network	0.1%
FX+	0.1%
G.O.L.D.+1	0.1%
Good Food	0.1%

Good Food + 1	0.1%
History	0.1%
Home	0.1%
Home +1	0.1%
Horror Channel	0.1%
Investigation Discovery	0.1%
ITV 3 +1	0.1%
Military History	0.1%
Movies 24	0.1%
MTV Base	0.1%
MTV Hits	0.1%
MTV Shows	0.1%
National Geographic	0.1%
National Geographic +1	0.1%
National Geographic Wild	0.1%
Nickelodeon Replay	0.1%
Pop	0.1%
S4C	0.1%
Star Gold	0.1%
TCM	0.1%
The Box	0.1%
Tiny Pop	0.1%
Tiny Pop + 1	0.1%
True Entertainment	0.1%
True Movies 2	0.1%
Universal +1	0.1%
Watch+1	0.1%
Discovery HD	0.0%

Source: BARB.

A1.7 The table below calculates the average viewing share for non BBC, ITV, C4, C5 and Sky channels.

Table A1.6 Average viewing share for other channels

Mean	0.19%
Median	0.10%
Mode	0.10%
Maximum	1.40%

Source: Table A3.1 above.

Appendix 4 Study specification

Below we reproduce Ofcom's terms of reference for the study.

SPECIFICATION OF SERVICE

Background

The Government published a Framework for Local TV³² in July 2011 which describes its proposed policy for broadcast transmission of local television services via a single licence holder, termed MuxCo, which will operate a national Freeview multiplex covering a number of local areas using geographic interleaved spectrum.

More information on this policy can be found on the DCMS' Local TV web page³³.

It is proposed that Ofcom will licence MuxCo through a 'beauty contest' process in which bidders will be incentivised to cover as many local areas as economically viable.

It is also proposed that the BBC will provide up to £25m for capital support for MuxCo.

Currently, orders are being drafted by Government counsel to implement local television, and Ofcom is advising on these, particularly on the technical inputs and the creation of this new transmission layer.

Ofcom is also anticipating its role licensing MuxCo and the local TV services, and expects to publish a consultation as the orders are laid before Parliament.

There is some urgency to the timetable.

Objectives

We are proposing an economic study to achieve a technical and commercial understanding of this new TV multiplex market.

We envisage the creation of a (relatively simple) financial model which can be used to investigate a number of policy and market scenarios (to be discussed), and their implications for the commercial viability of MuxCo, and in particular, for the number of local TV areas which would be viable.

We think that key inputs into the model would be:

- Commercial revenues for MuxCo
- Costs of broadcast infrastructure roll-out

(For these variables we are looking for expert input, possibly backed up with some desk and telephone research.)

- Payments from local TV service providers to MuxCo

³² http://www.culture.gov.uk/images/consultations/Local-TV-Framework_July2011.pdf

³³ http://www.culture.gov.uk/what_we_do/broadcasting/7235.aspx

- Public (BBC) spend in capex

(These are the variables we are seeking to investigate in our policy scenarios.)

Deliverables and timescales

We need a fast turn-around for this work due to Government timetables, and the study must be completed by the end of September.

The model itself would be one deliverable, as would a written report. We are open to discussion regarding what would be possible within the timescale.