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Bonsall, P (2014) Final Submission by Peter Bonsall to Public Inquiry on Leeds Trolleybus. North West Leeds Transport Forum.

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My name is Peter Bonsall, I am Professor Emeritus of Transport Planning at the University of Leeds and I am presenting expert evidence on behalf of the NWLTF.

My original Proof (OBJ1719 NWLTF-3) is supplemented by my rebuttal of the Proposer's Proofs and by NWLTF122 which contains my response to the Promoters' rebuttal of my proof and to additional information which came to light during the Inquiry, together with errata for my proof (to which I must add errata for NWLTF122:

- on page 44 at the end of Section C9: replace final sentence beginning "Indeed" by "However Table 59 of C-1-8 shows that the person hours are higher in the NGT scenario than in the Do Minimum scenario throughout the day."
- on page 48: where the 4th line of the middle paragraph beginning "APP103" should read "increase in highway distance travelled in the am peak hour" instead of "fall in highway distance travelled"
- on page 67: where line 8 should read "H7" instead of "G-4-101?")

I will now summarise my relevant experience and expertise and explain how I became involved with NWLTF.

A. Experience and background

1. Curriculum Vitae (section A of NWLTF122)

40 years experience in transport analysis and planning including spells in the private sector and on secondment to local government.

My particular specialism has been in the analysis and modelling of traveller behaviour and in the assessment of transport policy interventions.

Have worked as a consultant /advisor to:

- The Department of Transport – most recently on the potential use of new technologies to replace or enhance the National Travel Survey
- The Highways Agency – most recently on the evaluation and modelling of their Smart Motorways Program
- The Department of Trade and Industry - on E-commerce
- Dept of Energy & Climate Change with Dept of Business, Innovation & Skills - on the market for Electric Cars
- The Cabinet Office on issues of Social Equity in Transport Policy
- Overseas Governments - most recently the Dutch Rikswaterstadt on issues in the interpretation of new evidence on the perceived value of Travellers' Time
- Local Councils including, most recently, an assessment for Liverpool's City Council of their City Centre Traffic management proposals.

I have been called to give evidence on a number of Inquiries and Audits including:

- The Department of Transport's Standing Advisory Committee on Trunk Road Appraisal (SACTRA) on the question of the extent to which new roads generate traffic
- A House of Commons Select Committee to which I gave evidence on Planning Gain
- A House of Lords Select Committee investigation on the effectiveness of a range of methods of influencing behaviour - where my evidence was on the relative effectiveness of pricing and "exhortation" in changing traveller behaviour.
- The US Transportation Research Board's recent investigation of equity issues in Transport Financing

I have worked closely with a number of consultancy companies on a range of projects – my role usually being to advise on the design of surveys, the suitability of models and the interpretation of results. I have led research teams on numerous research projects including, most recently, a European Union funded investigation of transport connectivity and integration.

I have published over 200 papers, books, chapters and reports on wide range of transport topics – the most recent being a book chapter reviewing methods of achieving modal shift. I have specified and programmed a number of Transport Models including models of mode choice and route choice and a strategic planning model which encapsulates the relationship between transport and land use and which is in use as a basic training aid in transport planning courses around the world.

I am a former Fellow of the Chartered Institute of Transport and its successor the Chartered Institute of Logistics and Transport and was, until recently, co-editor of the Journal of Transport Policy.

I had, for many years, a central role in teaching at the Institute for Transport Studies - ITS - and was its Director of Studies from 1996 to 2000. I led courses on Transport Planning and Modelling, Public Transport Planning and on Transport Planning Forecasting and Analysis. A version of this course was developed for mid-career officials in The Department for Transport and has been delivered to several cohorts of DfT staff.

2. How I became involved as expert advisor to NWLTF

- i. I was involved in Metro's strategy discussions some years ago and was among the 77% who, in 2009, expressed support for the concept of a network of BRT routes. I supported the original Southern and Eastern Routes and the idea of a city centre loop but had serious doubts about its appropriateness for the A660 Corridor and about the use of trolleybus technology - I think I annotated my questionnaire to that effect.
- ii. My overall view at that time was that the project was unlikely to get DfT funding and I was surprised when, following intensive lobbying, the NGT project came alive again.
- iii. When I first looked at the PEBC in early autumn 2012, I was initially impressed by BCR and apparent attention to detail. But was surprised at the poor performance of the alternative solutions and could not at first understand what was causing that. It was only after delving into the more detailed reports and documents that the reasons became apparent and I became alarmed at the lack of balance in the case which had been presented to DfT, to the local politicians and to the public.
- iv. It was at about this time (autumn 2012) that a number of people, knowing of my involvement in transport policy issues, asked me to help them understand the NGT proposal. When the NWLTF was formed, I was asked to attend its regular meetings as a co-opted member.
- v. I have studied many, but by no means all, the Proposers' documents. I have concentrated my attention on the transport analyses which underlie the Business Case. Close examination of the documentation has often raised additional questions which required information not apparent in the original documentation. As a general rule, I have found that the closer my examination of the material, the more reason I find to be concerned about the quality of the analysis and about the proposers' interpretation of their own results.

I will now turn to the substance of my evidence.

The Promoters' rebuttal of my Proof (REB2-OB1719) sought to rebut some, but not all, of the points in my original Proof. My response to that rebuttal (NWLTF122 sections B1-B139) concedes that I had misinterpreted four numbers in their data (See NWLTF122 sections B54, B60 & B81), but argues that the remainder of the rebuttal fails to deflect from the points I had originally made. The points I concede in no way diminish the strength of my original conclusions and, indeed, the new information which has come to light during the Inquiry has reinforced them.

In what follows I have modified my original conclusions in the light of the new information. I do not intend to refer to the detailed written evidence which backs up my conclusions in this oral summary but am, of course, more than happy to explain the detail if anything is unclear.

B. The conclusions I have drawn

1. Firstly, given the amount of time and money that has been expended on preparation of the Business Case, there are a surprisingly large number of errors in the analysis (see for example NWLTF122 sections B12, B77, B78, B81, B83, B84 and C12).
 - Some are trivial, others are more serious. Some have been corrected, others have not.
 - Taken together, they must raise some doubts as to the standard of work undertaken.
 - Even more worryingly, there seems to be a tendency for the errors to have inflated the case for NGT – suggesting a lack of balance in the scrutiny applied.

2. My second conclusion is that the NGT scheme fails to meet key objectives:
 - i. An important element of national transport policy (e.g. as embodied in the 2008 Climate Change Act and in the national Door to Door strategy) is the achievement of **reductions in CO₂ and other GHG emissions**. Reduced emission of CO₂ and other GHGs is an objective of the WYLTP (LTP3 2011) and is a specific objective of the NGT scheme (#5 in para 2.6 of C-1-15). However, the LTM predicts that introduction of NGT would result in an increase in GHG emissions.
 - ii. A long standing objective of national transport policy (endorsed in the 2010 Coalition Agreement) which is specifically identified in the WYLTP, is to seek **reductions in road casualties**. However, the LTM predicts that introduction of NGT would result in an increase in accidents (C-1 para 15.85).
 - iii. **Increased use of sustainable modes** is an objective of the **national Door to Door strategy** - which specifically refers to the benefits of travel by the “healthiest” modes, of the **NPPF**, of the **Leeds Climate Change Strategy - Vision for Action – which gives** particular priority to the promotion of smarter choices including walking and cycling, and of the WYLTP. Also, the Department of Health has issued guidelines indicating the desirability of increased physical activity. However, the LTM predicts that introduction of NGT would result in reduced cycling and walking (see detailed figures in NWLTF122 Section C15).
 - iv. An objective of WYLTP (LTP3) is to **encourage economic growth by improving connectivity**. Introduction of NGT would indeed provide lower in-vehicle journey

times for some journeys and, in a few cases, lower door-to-door journey times. However, based on LTM forecasts, it is clear that the broader picture is of reduced connectivity. Viz:

- Average journey times by car - and by goods vehicles - would be higher.
 - Average door-to-door journey times would be longer for most journeys by bus in the NGT corridor and even for some journeys by trolleybus (see NWLTF122 sections C2 and C3)
 - *Perceived* journey times – i.e. actual door to door times weighted to allow for the different values of time spent walking, waiting and standing - would be higher for many journeys by public transport (see NWLTF122 sections C3).
 - These reductions in connectivity will tend to depress, rather than generate, economic growth.
 - The desire for regeneration of specified sites is also a stated objective. However, NGT is very poorly aligned with most of the areas in need of regeneration.
- v. One of the broader objectives of the WYLTP is to improve the quality of life of people living in the region. This aspiration appears in the form of two very specific objectives of the NGT scheme (#6 and #7 in C-1-15 para 2.6). One is to **improve the quality of life through (promotion of) a safe and healthy built and natural environment** and the other is to **improve the quality of life by improving access for all to jobs and services.**

However, respecting **promotion of a safe and healthy built and natural environment**, we note that:

- The LTM predicts that introduction of NGT would:
 - Increase congestion
 - Increase noise, fuel consumption, emissions and KSI (Killed or Seriously Injured) casualties
 - Reduce the use of active modes
- The proposers accept that introduction of NGT would have an adverse effect on landscape, townscape and heritage
- There is a concern - unexplored in the modelling - that local congestion caused by road closures and signalisation might increase local emissions
- There is a risk - unexplored in the modelling - that parking restrictions, some of which appear unnecessary (see NWLTF122 Section C5), may lead customers to drive to more distant facilities. This, together with the disruption during construction and reduced quality of townscape, is likely to undermine the viability of local facilities. Their disappearance would constitute a deterioration in the quality of life for local residents and would tend to result in reduced walking and increased driving - thereby further increasing congestion and emissions.

Respecting improvement in the quality of life by **improving access for all to jobs and services**, we note that:

- the average journeys by car, and many journeys by public transport, would take longer if NGT were introduced.
- NGT would only serve two corridors and does not provide a link to important facilities in and around the city – e.g. many of the city centre

shopping areas, the bus station, the airport, St James Hospital, Elland Road football ground....

- Due to the greater distance between stops and limited availability of seating on the vehicles, NGT would be less “accessible” to people with limited ability to walk or stand.

I conclude that NGT’s impact on the quality of life looks distinctly negative.

vi. An objective of the WYLTP and a specific objective of the NGT scheme (#4 in para 2.6 of C-1-15) is that the **efficiency of the transport networks should be improved**. However, LTM predicts that introduction of NGT would result in an increase in inputs - journey time and costs- to achieve a given level of output – a fixed number of trips. This indicates a reduction in system efficiency. The increased inputs include:

- Increased person hours spent travelling – summed across all modes (see NWLTF122 section C9)
- Increased time spent driving (Table 58 of C-1-8)
- Increased fuel consumption (Table 17.12 mentions the increased fuel duty receipts)
- Increased expenditure on fares (Table 17.12 of C-1 shows increased expenditure of £66m)
- Increased public expenditure on transport infrastructure and services (Table 16.1 of C-1 shows grant and subsidy costs amounting to £532m)
- I acknowledge (in Sections B129 and B130 of NWLTF122) that the definition of “efficiency” envisaged in the WYLTP objective is different from the systematic definition implied above but have demonstrated that, even judged by its own definition, NGT fails to deliver increased efficiency.

vii. A widely quoted objective of the NGT scheme (e.g. para 1.7 of C-1) is that it would provide a *step change* **improvement in the quality of public transport**. However, although it would provide reduced in-vehicle time for those whose journeys are served by the trolleybuses, many aspects of the PT offer would be less attractive if NGT were introduced:

- longer average walks to and from the stops. On average, those who choose NGT would have to walk further because the stops would be more widely spaced and those who choose bus would have to walk further because some stops would no longer exist and others would be moved away from junctions.
- increased stress and potential frustration due to the need to decide, in advance between bus and NGT stops - frustration if the first vehicle arrives at the “other” stop.
- less frequent services at any given stop and hence increased average waiting times - irrespective of whether people choose bus or NGT.
- longer door-to-door journey times for those who choose bus – including all those whose journey passes along the NGT route but is not served by it (see journey time calculations in NWLTF122 section C2)
- a reduced chance of getting a seat and an increased risk of having to stand in crowded condition - for those who choose NGT
- a higher fare for the shortest trips -for those who choose NGT

- viii. Policy T1(v) of the **Unitary Development Plan** (See NWLTF SoC appendix E.06d) referred to the intention to “*encourage integration between travel modes through better interchange between and within modes*” and a widely quoted objective of NGT (see for example para 3.7 of C-1 or the NGT website <http://www.ngtmetro.com/about/>) is that it would form part of an integrated transport system. I accept that, in line with this aspiration, the southbound NGT stop would be closer to the rail station than is the existing #1 bus stop but point out that:
- The northbound NGT stop would be further from the station than is the existing #1 bus stop on Bishopgate.
 - NGT does not serve the bus station whereas the #6 bus does.
 - The provision of separate NGT stops bus stops would make interchange with bus services less convenient than it now is (see NWLTF122 section B114.2)
 - The provision of separate NGT stops bus stops, the use of a different fare structure and the separate branding of NGT would result in NGT being perceived as a separate service rather than a fully integrated part of the bus network.
 - This separation would be further re-enforced if some of the tickets accepted on buses were not accepted on NGT – or vice-versa.
 - (See sections B113-114 of NWLTF122 for further detail).
- ix. One of the aspirations of the Leeds Vision (C-1-15 para 2.23) is to **minimise the growth in car use** and NGT has been widely presented as offering an attractive alternative to the car (see for example para 6.7 of C-1-15 or the NGT website <http://www.ngtmetro.com/about/>). However, the LTM forecasts (explored in NWLTF122 Section C15) indicate that introduction of NGT would lead to:
- Increased car use - measured as car miles
 - Minimal reduction in the number of car trips – the reduction is less than that in the number of trips by active modes, and
 - a very much larger reduction in the number of trips by bus and rail.
- x. The Leeds Vision (quoted in C-1-15 para 2.24), in line with Webtag guidance on policy formation, seeks **to make best use of existing transport assets**. However, the promoters accept that the NGT scheme would result in:
- Fewer bus services linking to the bus station
 - Fewer buses stopping at existing bus stops
 - Reduced use of existing bus services
 - Reduced use of existing rail services.
- xi. No transport scheme can be expected to meet all the relevant objectives but NGT’s failure to meet so many objectives is quite remarkable.

3. My third conclusion is that the usage of - and revenue from - NGT services has been seriously over-estimated. This over-estimation is due to exaggerated penalties on bus and train journeys, the failure to allow for the effect of crowding on NGT vehicles, the use of a unjustified adjustments in the P&R model and some peculiarities in the predictions of journey times. I will deal with each of these in turn.

- i. The exaggerated Vehicle Quality Penalty applied to bus and rail (5.5 minutes) which boosts the prediction of trolleybus use because no VQP applied to trolleybus. I note that the Promoters' consultant :
 - ignored the result from SP - which was that there is no significant preference for trolleybus and actually a negative preference - and that his stated reason for so doing is invalid (NWLTF122 section B21).
 - used the preference for verynewbus over oldbus as a proxy for the preference for trolleybus to which the Promoters aspire. This cannot be justified (NWLTF122 section B21).
- ii. The failure to allow for the effect on passengers of crowding and of limited access to seating which will characterise journeys by NGT (NWLTF122 section C7). The consultant decided to ignore this issue despite the fact that:
 - Webtag indicates the importance of this issue and recommends applying penalty equivalent to 50% of journey time (NWLTF122 section C8), and that
 - other studies find lack of seating to be the single most important quality issue (NWLTF122 section C8 para 2).
 - (NWLTF122 section D2 provides a fuller discussion of this important issue)
- iii. The exaggerated penalty used to represent the absence of desirable features at boarding points
 - Average values are 7.1 for bus, 9.4 for rail, 1.3 for NGT
 - Leeds SP gave much higher values than other research - For example the values based on AECOM's research for DfT (NWLTF122 section C6)
 - The Leeds SP's exaggerated values of shelter, CCTV and lighting are probably due to the time of year that the survey was conducted and the high profile security concerns at that time (NWLTF122 section B28)
 - The *poor lighting* value should not have been applied to daylight journeys (NWLTF122 section B26).
 - The rail value is too high – even judged by the values derived from the Leeds SP (NWLTF122 section C12)
- iv. The excessive size of the overall penalty - the vehicle quality penalty and stop penalty combined
 - A net penalty of 11.3 minutes for bus and 13.6 minutes for rail is applied in the LTM
 - These penalties are greater than the in-vehicle journey time for some journeys!
 - They are largely responsible for the predicted shift from bus and rail to trolleybus
 - They are thus the key driver for predicted revenues and “journey time benefits”
 - Their impact may be illustrated by considering that they will mean that someone living midway between Horsforth Rail station and Holt Park and wanting to travel to City Square would be predicted to use the trolleybus rather than the train even if the journey took 13 ½ minutes longer by trolleybus than it would by train.

- I would agree with Mr Cheek that an overall value of 5.5 minutes might be justified if one were comparing a 2008 bus picking up at an ill-equipped bus stop to the most modern vehicle picking up at a well-equipped stop, but I do not think 5.5 minutes - still less 11.3 or 13.6 minutes - is justified if passengers on the new vehicle have to anticipate standing - sometimes in very crowded conditions.
 - I do not think that penalties of 11.3 minutes for bus, or 13.6 minutes for rail, are remotely reasonable in the context of the proposed trolleybus scheme. The argument made to DfT (and repeated in C-2-4) that these penalties are reasonable is very misleading (see NWLTF122 section C6).
 - The penalties were derived from SP surveys but have not been scaled down to overcome well-known tendency of SP to exaggerate willingness to pay to use new modes (see NWLTF122 section B27).
 - I do not think that it is remotely reasonable to assume that any initial superiority in trolleybus ride quality would not in due course be achieved by new buses - LTM assumes that the differential continues undiminished for 60 years. (NWLTF122 section B32).
 - If these penalty factors were replaced by more realistic values, the revenue stream and benefits would reduce dramatically and the business case would fail completely.
- v. The large negative alternative-specific constants in the park and ride model (see NWLTF122 section B35)
- Taking approximately 70 minutes taken off the “cost” of park and ride trips will have increased the predicted demand for P&R very markedly - the reduction in generalised time will reduce the total generalised time for an average trip to a fraction of its unadjusted level.
 - The impact of the ASC can be illustrated by considering someone who is choosing whether to park in the city centre or use the P&R site; the model will predict use of the P&R site even if the P&R option involved an extra hour of travel time.
 - The ASCs were apparently used because the P&R model had needed adjustments of this magnitude in order to replicate demand for rail-based P&R at Garforth and New Pudsey - but there is no reason to assume that similar adjustment is appropriate for the trolleybus-based P&R at Bodington and Stourton (NWLTF122 section B35 ii).
- vi. The over-optimistic assessment of NGT’s journey time. No allowance being made for:
- delay to NGT vehicles when behind a bus (OBJ1719-3 para A1 iv and v)
 - degraded priority for NGT vehicles when there are more than 10 vehicles per hour (NWLTF122 last sentence of Section B6)
 - the lower NGT speeds achievable in the shared space outside Leeds University and in the narrow lanes shared with cyclists (NWLTF122 section B4).
- vii. Against this background, I conclude that the patronage and revenue forecasts are very seriously exaggerated.

4. My fourth conclusion is that a number of important impacts of NGT are not known. I will highlight the main ones.
- i. The impact on traffic flows and delays on local links is not known. Although Webtag expects a good fit between observed and predicted flows in the *Area of Detailed Modelling* (see NWLTF122 D1d), the LTM has not been able to replicate local flows accurately (NWLTF122 section C14). This is probably associated with the fact that LTM's network and zoning in the *Area of Detailed Modelling* do not meet Webtag requirements (see NWLTF122 Section D1):
 - The zones are too large and centroid connectors are incorrectly placed, with resultant distortion of local flow patterns (NWLTF122 Sections D1a and B12)
 - Some links are missing. This makes it impossible to predict impacts on those links or on other links and junctions in the vicinity (NWLTF122 Section D1b)
 - There appear to be errors in the coding of the critical junction at Shaw lane (NWLTF122 section C11)
 - The sophistication of the TRANSYT models is not reflected in the strategic LTM (see, for example, NWLTF122 section B10). For example:
 - The failure of LTM to allow for reduced capacity which would result from use of STM to avoid blocking-back
 - The SATURN network is insufficiently detailed to pick up locally-important effects - e.g. “q” turns necessitated by banned movements, and potential loss of A660 capacity due to removal of right turn pockets.
 - The large zone sizes prevented detailed examination of fit between the TRANSYT and SATURN models
 - The consistency check which was employed will not have detected problems only apparent on the side roads.
 - ii. The impact on cycling and walking is not known. There is no proper model of active modes and so it is not possible to estimate the net effect on active mode use with any degree of certainty (NWLTF122 section D1c).
 - iii. The demand for Bodington and Stourton P &R sites is not known with any degree of certainty. Mr Hanson volunteered that the model forecasts had an error of plus or minus 50% but I conclude that the error is likely to be even larger than that because:
 - Use of such large ASCs is a clear indication that the model had failed to capture the factors explaining demand for, or aversion to, P&R services (this is admitted in C-1-3 at the bottom of page 43).
 - The LTM has predicted usage by drivers who would have to drive out to the P&R sites before catching the trolley back in again, but has not predicted usage from the more obvious catchments - e.g. Wakefield for Stourton (NWLTF122 Section B39).
 - iv. The impact of NGT on the Leeds economy not known.
 - The UDM forecasts are flawed (NWLTF122 second paragraph of section B41) – if the model were to be run with more realistic generalised costs it might well show that NGT would lead to a loss of jobs in the city.

- The impact of parking restrictions and degradation of townscape on the viability of local businesses is not known – it is one of the potentially important impacts which are not easily modelled.
- v. The robustness of the forecasts, most particularly of NGT patronage and revenue, is unknown due to the failure to conduct meaningful sensitivity analysis, despite very clear Webtag guidance on this issue (e.g. in E-3-24, Section 1.8 of E-3-12 and Section 3.4 of E-3-22). Particular aspects which should have been subject to systematic sensitivity analysis include:
- The passengers’ assumed preference for trolleybus over bus and rail
 - The passengers’ assumed lack of concern about lack of seating and of sometimes having to stand in crowded conditions - the test mentioned in the Promoters’ rebuttal of my Proof was not a serious test because the value placed on lack of seating /crowding was clearly too low (see NWLTF122 Section C8)
 - The passengers’ assumed, but unexplained, preference for park and ride – inherent in use of high ASCs in LTM.
 - The assumed ability of NGT to achieve much faster boarding times than could be achieved by conventional buses.
 - The assumed absence of serious and sustained competition from bus operators (see NWLTF122 Section B33).
 - The potential impact of city centre parking policy on demand for P&R (Webtag advice in para 3.4.10 of E-3-22 makes a particular point of mentioning the need to explore the impact of parking policy via sensitivity testing).
5. My fifth conclusion is that NGT’s benefits are exaggerated because the performance of the Do Minimum comparator is under-estimated because no allowance is made for:
- i. Increases in the perceived quality of bus vehicles beyond that pertaining in 2008 - at any stage in the 60 year life of the NGT project - despite clear trends in vehicle quality within the bus industry
 - ii. Improvements in bus boarding times – despite clear trends in the industry respecting cashless fares, smart ticketing and contactless ticket readers (see NWLTF122 section B58)
 - iii. Readily achievable improvements in bus priority at various points along the A660 (see NWLTF122 section B59)
 - iv. Potential improvements in junction performance achieved by optimisation of signals (see OBJ-1719 section A18 i and NWLTF122 section B60).
6. My sixth conclusion is that alternatives to NGT have not been properly assessed.
- i. The *Next Best Alternative* is not a real alternative because, since it differs from the PA only in respect of the power source, it shares many of the PS’s drawbacks - provision of separate stops, limited number of priority vehicles per hour hence lower frequency, deleterious impact on bus services, high capital cost. Its impact on landscape, townscape and heritage is reduced, due to the absence of OHLE but is still significant.

- ii. The *Low Cost Alternative* scheme is not a serious attempt to show what could be achieved at lower cost.
- Mr Chadwick admitted this; he said that the LCA was developed simply to justify the application for funding of the major investment.
 - Much more could be achieved in respect of:
 - Vehicle quality - the LCA assumes no perceived improvement on 2008 vehicles.
 - Bus stop facilities - the LCA includes very modest improvement despite the fact that improvements in bus stop facilities are known to be very cost effective (see NWLTF122 section B102)
 - Reduced boarding times - and hence improvements in journey times and punctuality; the LCA assumes no improvement over the situation pertaining in 2012 despite the clear potential offered by a combination of vehicle design and ticketing and of fare structures designed to accelerate the move to cashless fares (see NWLTF122 sections B33 and B100).
 - Bus priority - the priority included in the specification of the LCA is represented as singularly ineffective (see NWLTF122 Sections B60 and C4)
 - Bus routing; e.g. provision, if justified, of more limited-stop services or of more cross-city links.
 - Promoters were not following Webtag advice respecting generation of alternatives (see NWLTF122 Section D5 for more detail):
 - Attention has been focused on one solution - NGT - seemingly because it was thought similar to Supertram and would be the most prestigious project eligible for funding.
 - The A660 corridor seems to have been chosen because it was thought likely to generate the best revenue not because it needs NGT
 - The Trolleybus technology seems to have been chosen because it allows use of a TWAO procedure - which in turn seems to have been the preferred procedure because it offers the Promoters control over operations of the implemented system.
 - There has never been a detailed examination of alternative means of meeting the transport needs of North West Leeds - in particular, of interventions which could yield significant improvements for all users of public transport much more quickly and at much lower ongoing cost to the public purse.
 - Users' views on the transport needs in the A660/A61 corridors have not been sought. The results of the Leeds-wide survey in November 2008 cannot be said to justify the introduction of a separate public transport service whose particular advantage is reduced in-vehicle time (as noted by Mr Kemp).

7. My seventh conclusion is that, despite Webtag and Green Book emphasis on the need for transparency and even-handedness in the reporting of results, the presentation of the

Business Case is misleading. This issue is discussed in greater length in Section D3 of NWLTF122 but is summarised as follows:

- i. **Mode use** (see NWLTF122 Section C15 for detailed figures)
 - Text in Table 6.1 in C-1 suggests there would be a switch from car use but the LTM actually predicts an increase in car miles. (Measured in trip numbers, car trips are indeed predicted to decrease but less so than active mode trips).
 - Text in Table 17.12 of C-1 suggests that there would be a beneficial impact on physical activity but the LTM prediction is for a reduction in use of active modes.
- ii. **Safety** (respecting the WYLTP target to reduce KSI accidents)
 - The commentary in Table 7.3 of C-1 suggests, without any evidence, that pedestrian and cyclist casualties will fall but fails to mention that, using the accepted calculation methodology, NGT is predicted to result in an increase in road casualties.
- iii. **Emissions**
 - Table 7.2 in C-1 claims a GHG reduction worth £6.2m (corrected in Table B1 of APP-7-3 to an increase of £3.1m)
 - The commentary in Table 7.3 of C-1, discussing the WYLTP objective to reduce CO2 emissions, suggests that NGT would make a positive contribution towards this target – despite the predicted increase in GHG emissions.
- iv. **Connectivity and Access**
 - Tables 6.1, 7.1, 7.2 and 17.12 in C-1 variously claim improvements in connectivity and access and mention reduced journey time and new cross city services.
 - However, despite Webtag’s advice on the measurement of accessibility and connectivity - which refers to the need to consider all elements of door-to-door journeys rather than simply the in-vehicle journey time element of one mode, there is no mention of the fact that:
 - Journeys by car would, on average, take longer.
 - Journeys by bus would generally take longer (NWLTF122 Section C2)
 - The northern extremities of bus routes #1 and #6, whose frequency is assumed to be cut by about half, would not be served by NGT - nor would the northern extremities of bus routes #28 and #97 whose frequency is must also be expected to fall.
 - NGT would provide access to or from a very small part of the Leeds conurbation, would not serve many of the key destinations in the city centre – e.g. The Merrion Centre, St John’s Centre, Grand Theatre, Victoria Gate, Leeds Market, the Bus Station - and, as revealed during the cross-examination of Mr Farrington, would not penetrate the main areas identified for regeneration.
 - Elderly or infirm travellers’ access to facilities would be particularly adversely affected by the longer average walk to public transport boarding points - due to greater distance between NGT stops and the relocation/deletion of bus stops,

the longer average waiting times -due to reduced frequency at any given stop, and the reduced likelihood of getting a seat.

- (See Section A8 of OBJ1719-3 and Section B40 of NWLTF122 for further detail on access and connectivity impacts).

v. **Journey time savings**

- £701m of public transport passenger journey time benefits are claimed in Table 7.2 of C-1. However, about 50% (possibly more - see NWLTF122 Section C1) of the claimed reduction is actually the assumed reduction in quality penalties rather than a real reduction in journey times. This fact was acknowledged by Mr Chadwick during cross-examination but is not mentioned anywhere in the Business Case and indeed, Table 17.4 of C1 goes so far as to suggest that the journey quality benefits have not even been monetised!

In actual fact the LTM predicts that the introduction of NGT would result in an increase in total journey time – summed over all modes (NWLTF122 Section C9)

vi. **Efficiency** (see NWLTF section B129 and B130):

- Table 7.2 of C-1 mentions £701m of public transport passenger journey time saving - much of which is actually the assumed increase in quality factors, together with revenue (!) and punctuality benefits
- but omits:
 - the increased congestion (which can be seen from Table 17.1 of C-1 to cost £12m),
 - the overall increase in time spent travelling - summed over all modes, and
 - the increased fuel consumption.

vii. **Employment**. Section 13.80 of C-1 claims 3687 new jobs would be generated as a result of NGT. This prediction comes from SDG's Urban Dynamic Model. But this prediction is extremely dubious because it ignored the increases in highway costs and times and treated the assumed increase in quality factors, which I have shown to be wholly unjustified, as if they were real time savings (the Promoters have accepted that only about 50% of the "time savings" are real time savings).

viii. **Service Reliability**. Table 17.4 in C-1 identifies a benefit of £84m from improved reliability. This result is quoted several times in the Business Case but is an exaggerated estimate because:

- It does not allow for the fact that the difference between journey times in and out of term time is allowed for by most travellers (see NWLTF122 section B67)
- It is based on stop-to-stop variation and so ignores the relatively invariant walk element (see NWLTF122 section B69).
- It does not allow for the possible reduction in bus punctuality due to removal of the current signal priority for late-running buses noted by Mr Robertson during cross-examination (see NWLTF122 section B70).

ix. **The calculated BCR**, quoted in Table 17.4 of C-1 as 2.96 although subsequently corrected to 2.90, excludes:

- Cost of disruption during construction – despite clear Webtag guidance (see NWLTF122 section B56)

- Cost attributable to the predicted reduction in active mode use (see NWLTF122 section C17)
- x. **The adjusted BCR** – which includes the “wider benefits” which DfT does not accept within the basic BCR - is quoted in Table 17.10 of C-1 as 3.72. This value is misleading because:
- It includes benefit from the forecast increase in employment and reliability - both of which I challenge.
 - It excludes the cost of degraded landscape - which DfT guidance now includes within the adjusted BCR and which might exceed £100m (Section C16 of NWLTF122)
8. Finally, I conclude that there must be doubts over achievability of funding (See NWLTF122 section D6)
- i. It is unreasonable to expect DfT to be unperturbed by revelations on:
 - Quality Factors – viz: the actual result on willingness to pay to travel on Trolleybuses, Leeds being out of line in respect of the assumed size of quality factors, penalties being applied to rail, no scaling of SP-derived penalties.
 - Increased cost to public sector – required grants and subsidies have increased from £290m in the 2012 PEBC to £532m in the 2014 BC.
 - Increased cost to Transport Budget - The loss in rail franchise value was £21m in the 2012 PEBC but has risen to £38m in the 2014 BC.
 - LTM’s failure to replicate local flows
 - UDM’s predictions being based on PT journey times and the controversial quality factors without any account being taken of increases in highway costs/times
 - Negative impacts on the PT offer – viz: crowding, longer journey time for many people.....
 - (See NWLTF122 section D4 for more detail on this point)
 - ii. The projected revenue stream cannot be regarded as robust (D6c)
 - iii. Local political support is necessary to secure the local funding (D6b), but:
 - Several key individuals have already withdrawn their support.
 - There is no apparent awareness among key local politicians of weaknesses in the Business Case and, most particularly, of the fragility of the projected revenue stream.
 - Despite claims by the promoters, public opposition to NGT is clear and is likely to increase further once key weaknesses in the business case become more widely known.
9. Overall, I can only conclude that the business case for NGT is weak, flawed and misleading and that the supposed benefits have been grossly exaggerated.
- My considered conclusion is that the deficiencies in the proposed scheme are fundamental rather than cosmetic; the corridor simply does not have the space to accommodate a new, separate and distinct mode of public transport which is prioritised over all other modes but, in attempting to do so, the scheme causes significant damage to the existing public transport offer as well as to the area’s ambience and community assets.

The proposed allocation of priority and roadspace is fundamentally inefficient; rather than give absolute priority to up to ten public transport vehicles per hour, a much better approach would be to give significant priority to all buses and to users of active modes.

I have concluded that the decision to introduce a trolleybus scheme was ill-considered and precipitous in the wake of the refusal of funding for Supertram. I believe that decision makers were blinded by the prospect of DfT funding for something similar to Supertram and of being able to adapt much of the modelling and design work which had been conducted for that scheme. Interestingly, the dangers of too rapid a commitment to a trolleybus-based approach were identified in the 2007 Gateway review (C.4.7). One of the consequences of the early attachment to a trolleybus approach has been that progress on consideration, let alone implementation, of the solutions identified in the 2006 review of problems (G-4-5) has been delayed - Mr Haskins indicated during my cross questioning (8th May, 11 minutes into early pm session) that the lack of action on the measures identified in G-4-5 was due to the decision to proceed with NGT proposal. The sooner the NGT scheme is finally put out of contention the sooner attention can be turned to implementation of better alternatives.