15/07/2021
10:00 – 13:00
Via MS Teams

Bus Decarbonisation Taskforce – Meeting 4

Taskforce Members		
Organisation	Name	Remark
Scottish Government	Minister for Transport	Chair (rotating)
Transport Scotland	Stuart Greig	Co-chair
Confederation of Passenger Transport (Scotland)	Paul White	Present
Confederation of Passenger Transport (Scotland)	Andrew Jarvis	Present
Confederation of Passenger Transport (Scotland)	Christine McGlasson	Present
Confederation of Passenger Transport (Scotland)	Colin Craig	Present
First Bus	John Dowie	Present
Stagecoach	Martin Griffiths	Apologies
Scottish and Southern Electricity Networks	Chris Burchell	Present
Alexander Dennis Ltd.	Paul Davies	Present
Wrightbus	Tom Greenshields	Present
Switch Mobility (formerly known as Optare)	Robert Drewery	Apologies
Zenobe	Steven Meersman	Present
Scottish Enterprise	Linda Hanna	Present
Scottish Power	Chris Carberry	Present
Scottish National Investment Bank	Alastair McMillen	Present
HSBC	Robert King	Present
Lloyds	Victoria Whitehead	Present
Association of Transport Co-ordinating officers	John Berry	Apologies
Transport Scotland	John Maxwell	Attending in place of Laura Murdoch
BOC	Chris Hampton	Present
KPMG	Ben Foulser Hifzur Rahman Michael Zhan	Guests
Zero Waste Scotland	Charlotte Stamper	Guest
Hitachi	Ram Ramachander	Guest

1. Welcome and introductions

1.1. The Minister thanked the Taskforce for the work done to date and for the enthusiasm, creativity and openness demonstrated thus far. He commended the partnership working already undertaken by the Taskforce and looked forward to seeing this continued.

2. Supply Chain (Paper 4.1)

2.1. Linda Hannah summarised the virtuous circle between Scotland's strong global reputation for bus manufacture, swift transition to bus decarbonisation, and economic opportunities and community benefits. She highlighted three main points: 1. The time is now to capitalise on this opportunity; 2. Significant investment has been made into the innovation ecosystem and capability, which provides the necessary ingredients, and; 3. Partnership – the public and private sectors must work together and agree a collective way forward.

2.2. Linda explained that there are no "barriers" to decarbonisation of the bus sector, but there are a few "rocks in the road", such as the upfront cost of zero-emission buses and infrastructure. She invited Taskforce members to focus on ways in which costs can be addressed (see below) and large scale investment brought in.

2.3. Linda introduced Ian Collinson from the Scottish Manufacturing Advisory Service who summarised the innovation and enterprise support available through the Enterprise bodies. Linda then invited KPMG to present the analysis of the drivers of zero-emission bus costs.

2.4. Regarding cost drivers, Hifzur highlighted:
- The main cost for battery-electric buses is the battery, costs of which are driven by the price of raw materials such as Nickel, Cobalt, Manganese and Lithium which have increased significantly over the previous 24 months.
- The costs of grid connection, which can range from £60,000 – £1.5 million, are driven by the location of the depot and whether local grid reinforcement is needed. Hifzur noted that the bus industry is moving towards DC chargers which cost between £30,000 – £100,000 which is significantly more than AC chargers and must be replaced every 3-5 years.
- Fuel-cell electric buses are more expensive due to the higher number of components and the higher cost of integrating these components which requires more time and more skilled workforce.
-The main cost of hydrogen infrastructure is the electrolyser, which can vary significantly. Off-site refuelling is an option.

2.5. Regarding scope to drive costs down, Hifzur highlighted:
- Investment in skills and training to increase the number of workers who can undertake the necessary engineering and integration for fuel-cell electric buses;

- Standardisation and interoperability of equipment and processes, such as DC charging and CCSU standards to improve economies of scale;
- Maximising the value of batteries through second-use, recycling, and opening new sources of raw materials;
- Import tariffs are a significant factor for component costs as many components used in zero emission buses are high value. On-shoring components or securing trade deals would improve resilience of supply chains.
- Reviewing charging regulations for local grid connection improvements, combining customers for local grid enhancements;
- Sharing and pooling of data and lessons learned could reduce costs by avoiding higher costs from over-specification or 'gold-plating' of vehicles and infrastructure enhancements.

2.6. Linda invited Charlotte Stamper from Zero Waste Scotland to present Annex C. Charlotte explained that the research looks at battery use and disposal in Scotland. Use of batteries is expected to increase significantly and projections are for battery waste to triple over the next thirty years to 60,000 tons of batteries per year in Scotland by 2050. Up to 40% of these batteries may come from electric vehicles. At present, there is no reprocessing capability for batteries within Scotland or the UK.

2.7. A strong market opportunity exists for Scotland to leverage its low-carbon electricity generation as battery production and recycling is energy-intensive. Developing a circular market for batteries would better insulate the Scottish economy from fluctuations in the commodity market and therefore development of a "cradle to cradle" model with recycling and production should be considered together.

2.8. An example of this is already in development by NorthVolt, based in northern Sweden, which will co-locate battery production and recycling and is powered by their own hydroelectric dam via private wire. This facility consumes a significant amount of energy. Scotland has significant renewable energy capacity.

2.9. Linda Hanna thanked the speakers for their contributions and opened up discussion on actions that the Taskforce could take:

2.10. With respect to scale as a driver to drive down costs:

- The scope for some degree of standardisation of bus specification was discussed. Complete standardisation would not be desirable as there is a wide variety of routes that buses run, requiring different types and sizes of buses, and a single type of bus would inevitably be inefficient, or even problematic, in some circumstances. The extent to which standardisation and rationalisation of bus specification could be efficient by allowing a degree of aggregation of orders to achieve efficiencies of scale, needs further exploration.

- Collaboration to signal greater surety of demand for zero emission buses over longer periods of time would assist manufacturers secure finance for retooling, training and bulk purchase for their suppliers.

(**ACTIONS**: CPT to share information about the age, size and route requirements of the public service bus fleet; CPT and OEMs to explore potential for some degree of standardisation).

2.11. With respect to batteries:

- It was recognised that while the cost of vehicle batteries has not fallen significantly in recent years, the quality, power and reliability of the batteries has increased. Zero emission buses are now on the third-generation of batteries, and the yield on investment has improved through longer warranty periods, improved range and lifespans.

- Steven Meersman stressed the importance of batteries being understood as an asset, not a liability. Dissemination of knowledge about optimising battery use to give operators the ability to optimise their electricity grid connection and reduce unnecessary grid enhancements would reduce costs. Dissemination of knowledge to negotiate flexible connections which make use of excess night-time capacity in exchange for restricting daytime capacity was likewise recommended. (**ACTION**: Zenobe to share information about best practice).

- Paul Davies reflected that ADL has a moral obligation to maximise environmental sustainability, and agreed to work with others on the Taskforce to explore the potential for a circular economy for batteries. The second phase of the research presented will look at practical actions to establish a circular economy for batteries and Zero Waste Scotland agreed to incorporate views of the Taskforce into this, and report back on progress. (**ACTION**: Zero Waste Scotland, Transport Scotland, Scottish Enterprise and ADL to explore practical actions to establish a circular economy for batteries).

With respect to collaboration and partnership working:

- The Taskforce agreed that enhanced international marketing of Scotland's capacities and potential for growth is required (**ACTION:** Linda Hannah to lead in partnership with private sector)

- The Taskforce recognised the centrality of bus operators in the decarbonisation of buses, and the operational questions this raises which some operators are not resourced to deal with – such as navigating grid connection costs, technology choice for battery electric v. hydrogen technology and zero emission bus operations. (**ACTION**: SSEN and SPEN to work with bus operators to produce a "how to guide" on navigating electricity grid issues that meets bus operators requirements.)

- Distribution Network Operators agreed that long-term planning and commitments for bus decarbonisation would assist in reducing costs through

reducing civil works and would welcome the opportunity to work with others on local area-based plans to link bus decarbonisation and other fleet decarbonisation, with a view to spreading costs more widely. The possible benefits of regional/area based information about which areas may be better suited to hydrogen fuel-cell or battery-electric buses was discussed. (**ACTION**: DNOs and CPT to map of bus depots against the electricity grid. Subsequent steps to add information about hydrogen supply will be brought back to the Taskforce in November).

3. First draft Pathway and next steps for Taskforce (Paper 4.2)

3.1. The Chair invited Sara Grainger to introduce the draft pathway. Sara explained that the draft pathway incorporates the steps already taken to date, and those that the Taskforce has agreed to in its meetings to date, specifically:

bus operators to further develop fleet transition plans, and to further test and demonstrate new business models designed around the characteristics of zero-emission buses and infrastructure;
bus operators and energy suppliers to jointly map depots, grid capacity and hydrogen potential;
energy companies to make processes more transparent, easier to navigate and quicker where possible;
the finance sector to roll-out financial products that will support zero-emission buses and infrastructure;
Scottish Government to support these steps.

3.2. Government has designed a two-phased Zero Emission Bus Challenge Fund to support the steps of others on the pathway. Phase 1 of the Fund will make available £50 million to bidders who bring forward approaches to maximising the value of the money. This aims to encourage partnership and collaboration, innovation and creativity. For example, bidders may wish to explore amalgamation of bus orders from multiple bus operators to achieve efficiencies of scale, the potential for the charging or refuelling infrastructure to support the decarbonisation of other fleets and/or vehicle types and the potential for that to generate revenue stream to the bidder. There will be a cap on the maximum sum that will be awarded per bus, and bidders are encouraged to bid for less than that cap. This will require progress to be made on some of the steps in the pathway discussed, and will enable and stimulate others. Details of Phase 2 of the Fund are subject to review of Phase 1.

3.3. Ram Ramachander explained that senior finance houses are keen to enter the market and would be encouraged by a reduction in risk from a structured and scaled approach. A consortium (or some consortiums) to create scale and longer term planning would address this. Vital that all parties look at the long-term and consider the whole life cost of the buses and benefits of infrastructure changes.

3.4. Those representing the manufacturing and supply chain sector confirmed that the supply of zero-emission buses in the coming months and years will not

be a constraining factor. The OEMs represented at the meeting confirmed an enthusiasm to rise to the challenge of the pathway and to play an active part in delivering it.

3.5. Those representing the finance sector confirmed that the sector as a whole is keen to support a just transition to net-zero in Scotland. Lenders are keen to reduce their exposure to any one operator, so partnerships and collaborations would be beneficial.

3.6. Scottish Power and SSE both highlighted progress that has already been made working with bus operators, and the importance of long-term planning and, where possible, collaboration within areas/regions (including with operators of different vehicle types). Aggregation of demand and strategic planning at regional level would be beneficial.

3.7. Energy companies also reiterated the scope for exploration of flexibility of supply, battery storage and other options to be creative and reduce connection costs.

3.8. Those representing the operating sector pointed out that large operators are better resourced and equipped to rise to the challenge that SME operators, and that SME operators should not be penalised as a result of that. Operators also raised the importance of a just transition to zero emissions, and the importance of passengers not being disadvantaged.

3.9. The Taskforce discussed the potential benefits of regulation, including the very clear signals it provides about sunset dates for diesel vehicles. CPT did not think that regulation should be added to the pathway. The Minister reiterated that his current position is to see how much progress can be made through collaboration and partnership working before exploring regulatory options.

4. Summary of agreement reached and next steps

4.1. The Taskforce agreed to meet again towards the end of the calendar year to sign-off the pathway, and then Spring 2022 to review progress.

Reference	Action	Due Date	Status
BDT-02a	Produce a paper on technology costs and identify opportunities where costs could be reduced		Closed
BDT-02b	Produce a paper on battery residual value risk and possible second-life post automotive use.		Closed
BDT-09	The secretariat will co-ordinate with manufacturers to addressing data asymmetry and comparability regarding component costs.		Closed

BDT-11	Zero Waste Scotland, Transport Scotland, Scottish Enterprise and ADL to explore practical actions to establish a circular economy for batteries	Spring 2022	Open
BDT-12	Sara Grainger to co-ordinate the following:	November 2021	Open
	SSEN and SPEN to work with bus operators to produce a "how to guide" on navigating electricity grid issues that meets bus operators requirements;	November 2021	
	Zenobe to share information about best practice in maximising the value of batteries;	November 2021	
	CPT to share information about the age, size and route requirements of the public service bus fleet;	November 2021	
	CPT and OEMs to explore potential for some degree of standardisation;	November 2021	
	DNOs and CPT to map of bus depots against the electricity grid. Subsequent steps to add information about hydrogen supply will be brought back to the Taskforce in November.	November 2021	