

Bus Decarbonisation Taskforce

17 March 2022

Agenda

Item

1. Welcome, updates, actions from previous meeting, and implications of the war in Ukraine (15 minutes)

Action log is on page 5.

An open letter from the Cabinet Secretary for Economy and Finance to the business community, regarding the situation in Ukraine, is on page 6.

An update on circular economy is on page 7.

Information from the International Investors Roundtable is on page 8.

2. Review of draft Pathway (60 minutes) (Paper 5.0)

The taskforce are invited to:

a) consider whether changes to the draft pathway are needed, in particular to encourage and enable smaller and rural bus operators to keep pace with larger urban operators. Changes to the draft pathway may include:

1. recognition of progress made to support bus operators navigate battery options and electricity-grid upgrade processes
2. addition of repowering alongside purchasing of new zero-emission buses
2. addition of a step to "explore the role that Local Authority contract conditions have on fleet investment decisions"

b) raise any remaining gaps in the pathway or concerns about its sufficiency to deliver the vision

c) consider how SME bus operators can be enabled to explore options for decarbonisation, including collaboration and innovative finance models.

3. Steps to finalise the Pathway prior to launch (20 minutes)

The Taskforce is invited to:

- a) comment on the skeleton presentation of the pathway
- b) agree that views of Trades Unions and Passenger Groups should be sought on the draft pathway in advance of it being finalised
- c) agree that the pathway should be finalised and launched to coincide with the Taskforce's next and final meeting.

4. Summary and Conclusions from Chair (5 minutes)

Guiding Vision

In the context of wider decarbonisation of the transport and energy sectors and the broader vision as set out in the Scottish National Transport Strategy, central to which is a vibrant bus sector with increased bus usage as people choose to travel by bus instead of car, the guiding vision of the Bus Decarbonisation Taskforce is a future where:

Bus operators are exclusively running zero-emission battery-electric and hydrogen fuel-cell buses; The bus sector provides an excellent service meeting passengers' day-to-day needs; People enjoy travelling on buses and knowing that doing so is one of the most climate-friendly choices they can make; There are vibrant ownership and leasing markets for buses which benefits operators, manufacturers and the finance sector; The smart technology on buses enables them to be operated in the most energy efficient way; There is an even stronger and diverse domestic manufacturing sector and supply-chain comprised of high-quality skilled jobs with continued innovation reducing manufacturing and supply chain emissions; Energy networks, bus operators and Local Government are used to working together to ensure depots are powered/fuelled and all potential users are able to benefit from the energy provision centred at depots and on-route charging infrastructure; Buses and infrastructure are fully recycled at the end of asset life contributing to the circular economy, reducing waste and supporting further decarbonisation efforts; After an important period of support, the Government has ceased subsidising battery-electric and hydrogen fuel-cell buses, but continue to support innovation in new zero-emission fuels and technologies of the future; Scotland is recognised the world over as a leader in the design, manufacture and operation of high quality zero-emission buses and other large road vehicles, alongside associated green finance solutions.

Reference	Action	Due Date	Status
BDT-11	Zero Waste Scotland, Transport Scotland, Scottish Enterprise and ADL to explore practical actions to establish a circular economy for batteries.	Spring 2022	Closed
BDT-12	Sara Grainger to co-ordinate the following;		Closed
	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 fleet standardisation	November 2021	
	DNOs and CPT to map 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	

Open Letter to the Business Community from the Cabinet Secretary for Finance and the Economy

03 March 2022

We have all watched on in horror at the illegal invasion of Ukraine by Russia. This was an unprovoked and wholly unnecessary attack by the Putin regime on a peaceful, democratic nation that not only breaks international law, but is an affront to our values and decency.

We have seen a wave of revulsion across the world with an overwhelming number of nations coming out in opposition to the invasion of Ukraine. The Scottish Government has made clear it stands in solidarity with the Ukrainian government and its people. We all have a moral duty right now to consider what else we can do to try to stop Putin's aggression, including via economic action.

Nations across the world have rightly imposed severe economic sanctions against the Putin regime and its close associates. We fully support the sanctions the UK government has imposed and will do all we can to encourage and enable their strict enforcement. For any sanctions to be meaningful they will also have an impact on the countries and economies that are imposing them. That will be true here, as it will be across the rest of the UK, EU and US, however any price paid here is significantly less than that being paid by the people of Ukraine.

We know that everyone wants to do the right thing here. Many businesses, sporting and cultural organisations have shown commendable corporate values and leadership, in divesting their interests in Russia, their trading relationships with Russian entities and their participation in lucrative Russian contracts. We support these decisions and would encourage all Scottish businesses to follow their example. Beyond direct investments, reviewing operations for links and connections to Russia - however indirect - and then severing them is the right decision. I welcome the effort being undertaken right now by businesses across Scotland to do exactly that, and encourage them to continue to conduct this work at pace, and with due regard for the safety of any employees or individuals you may work with.

The Scottish Government and its economic agencies will use all available powers not to support trade and investment activity with Russia. Businesses will be supported as they adapt to remove links with Russia, and should contact our economic agencies for more advice and support in this regard.

We have all been inspired by the spirit and bravery of the people of Ukraine, led by President Zelenskyy in their fight for freedom. Let's do all that we can to support them and weaken the Putin regime's war effort.

Update on action to explore practical actions to establish a circular economy for batteries

A working group comprised of representatives from Transport Scotland, Scottish Enterprise and Zero Waste Scotland have commissioned two research projects in order to understand how a circular economy of batteries would function in Scotland. The research investigates how a gigafactory and or recycling facility would ideally look for Scotland and which Scottish companies could feature within the battery manufacturing supply chain.

Research project one seeks to understand the Scottish battery supply chain, due to be completed by July 2022. The research is led by Scottish Enterprise and aims to understand which Scottish companies operate within the battery-manufacturing sector and what support is needed for them.

The second commissioned piece seeks to understand the Scottish battery recycling and gigafactory facility capabilities, due to be completed by August 2022. This research is led by Zero Waste Scotland and Transport Scotland and aims to establish the practical actions required to support the establishment of a circular economy for batteries in Scotland. During this research the contractor, Oakdene and Hollins, will be engaging with interested parties to undertake an evaluation of the anticipated battery demand as a result of Scotland's net zero targets and how this relates to the availability of raw materials and recycled feedstock.

Interested Stakeholders will have an opportunity to feed into the development of future projections for passenger and commercial EV batteries in Scotland in the second research. Oakdene and Hollins will be looking to engage with the stakeholders in the remaining weeks in March and early April.

Readout from Institutional Investors' Roundtable (6 November 2021)

This event, held during COP26, brought together institutional investors, governments, transport authorities, bus OEMs and the Climate Group/Under2 coalition to discuss decarbonisation of transport.

Two primary challenges to transport operators adopting zero emission fleets were identified;

1. the high-capital cost of transitioning to zero emissions, despite lower operating cost.
2. The silo effect between operators, utilities, infrastructure companies, and others, which leave important issues unaddressed.

The Roundtable proposed "mobility-as-a-service" model to address the high capital cost of decarbonisation.

Mobility-as-a-Service is a model which provides Operators and/or city/regional governments the option of transforming a "Capex" decision to buy BEVs and associated infrastructure into an "Opex" one, by charging the final client on a per "kilometre-run" or "kWh consumed" basis. This charge would encompass acquisition of vehicle, charging infrastructure, energy use, and financing into one payment.

Mobility-as-a-Service would also address the second issue by integrating all parts of the "chain" of services, into one. An "Opex" approach would:

- (i) provide the final client with the full pack of vehicle, charging infrastructure, maintenance, spare parts, energy and performance guarantees;
- (ii) clarify the roles and responsibilities of all actors involved, optimizing operations, strengthening the long-term viability/sustainability of the structure;
- (iii) produce significant cost efficiencies for all involved in the process as a result.

The roundtable concluded that a model that can be replicable in large cities in most parts of the world is essential to accelerate the global transition towards an electric-based mobility solution through providing a "scalable" solution.

From the perspective of global asset owners, this approach could potentially represent an opportunity for large-scale investments offering a steady stream of long-term cash flows. However this is predicated on whether the resulting opportunities can:

1. Add additional value to what the market can already offer, and
2. Meet the risk/return profile requirements that are imposed on them by their fiduciaries (who are usually states or pensioners).

Previous consultation rounds with IIR organizations earlier in 2021 informed us that large-scale de-risking mechanisms and/or incentives will be needed to meet these requirements.

There was a consensus among participants (industry leaders, IIR organisation and governments) of the need for a structured “tri-lateral dialogue”, between bus operators, institutional investors, and the supply chain to design strategies, and implement large-scale de-risking models to address challenges of high capital costs, and the silo effect.

Paper 5: Review of the draft Pathway in light of recent developments

This paper reconsiders the draft pathway, agreed by the Taskforce at its meeting on 15 July 2021, in light of:

[The publication of guides by Taskforce members;](#)

[Views and capacity of SME bus operators;](#)

[Developments in repowering;](#)

[The Scottish Zero Emission Bus Challenge Fund Phase 1.](#)

The taskforce is invited to:

a) consider whether changes to the draft pathway are needed, in particular to encourage and enable smaller and rural bus operators to keep apace with larger urban operators. Changes to the draft pathway may include:

1. recognition of progress made to support bus operators navigate battery options and electricity-grid upgrade processes

2. addition of repowering alongside purchasing of new zero-emission buses

2. addition of a step to “explore the role that Local Authority contract conditions have on fleet investment decisions”

b) raise any remaining gaps in the pathway or concerns about its sufficiency to deliver the vision

c) consider how SME bus operators can be enabled to explore options for decarbonisation, including collaboration and innovative finance models.

Background

The purpose of the Bus Decarbonisation Taskforce is to:

- agree a vision for a zero-emission bus sector in Scotland;
- co-design the solutions for ending the bus sector's contribution to climate change;
- set out a collaborative pathway for achieving zero-emissions.

The Taskforce agreed a vision (Annex A) at its first meeting on 11 November 2020; agreed solutions relating to finance on 25 February 2021, energy on 29 April 2021, the supply-chain on 15 July 2021; and agreed a draft pathway, summarising the steps agreed at each of those issue-specific meetings, on 15 July 2021 (shown in Annex B for ease of reference). The Taskforce agreed that the draft pathway should be reconsidered following the first Phase of the Scottish Zero Emission Bus Challenge Fund.

The results of The Challenge Fund were announced on 28 February 2022. Other developments have also occurred since the last meeting that may need reflected in the pathway.

Publication of Guides

SSE, SPEN and Zenobe co-ordinated the launch of two guides on 24 February (note that the SSE and SPEN guide are identical in content, with only the branding differing):

- [SSE Guide for connecting your EV fleet](#)
- [SPEN Guide for connecting your EV fleet](#)
- [Leading the charge: a guide to electric vehicle batteries and battery performance for fleet operators](#)

The guides had been developed with input and feedback from bus operators both directly and through CPT, and gained coverage in The National, Build Scotland, Current News, Electric Energy Online and 24hr Tech.

SSEN and SPEN are hosting a webinar on 23rd March 2022, that will discuss the published guides, outlining the various charging solutions and smart technology available, the key steps to consider before electrifying a fleet, and sharing case studies of some real-life examples.

These actions go some way to achieving the step on the draft pathway for the energy sector to make processes for working with bus operators more transparent, easier to navigate and quicker where possible. It is proposed that the final pathway recognises this by showing a recent step as having been “production and sharing of guides to support bus operators understand battery options and requirements, and electricity grid connection processes” with the future step being reworded as “electricity and hydrogen producers and distributors to continually improve advice and processes to help make decarbonisation of fleets and depots as simple as possible for bus operators”.

Views and capacity of SME bus operators

Previous Taskforce meetings have agreed that CPT and Transport Scotland should work with bus operators across all of Scotland to collate information about fleets, depots and bus stations, to enable consideration of locations where electric-grid capacity may need to be enhanced and/or where hydrogen may be the optimal solution, and to assist in bringing together collaborative decarbonisation projects. Information has been forthcoming from 40 bus operators, out of a total of nearly 300. This is likely a consequence of the very limited capacity that many small bus operators have to engage in activity outwith core functions of running their services.

Scottish Futures Trust, Transport Scotland and CPT hosted a virtual workshop, aimed mainly at SME bus operators, on 2 February. This was attended by 85 people, of which 16 were from SME bus operators. The remainder of the attendees were from other interested stakeholders

including financiers, DNO/IDNOs, OEMs, bus re-powering companies, consultants / advisers and local authorities.

The purpose was for lessons learned about decarbonisation to be shared between those attending, and for small and medium sized operators in particular to share their views about how we collectively ensure the whole industry is part of the transition.

Several key points emerged from the discussion:

1. Where bus services are supported through Local Authority contracts, the length of those contracts need to be considered in relation to the investment needed to transition buses and infrastructure from diesel to zero-emission. Relatively short contracts, of 2 to 3 years, may not be sufficient to allow SME operators to transition to zero-emission, in addition to which tender costs may increase to meet the costs of fleet renewal.
2. Repowering should feature as a significant part of the pathway to zero emission buses, as it is more affordable for smaller operators and it aligns with investments made in recent years into EURO VI buses. Repowering is discussed in more depth below.
3. Given the limited capacity within SME bus operators, support to explore decarbonisation options, costs and business cases would be warmly welcomed.
4. There is appetite and interest amongst some operators in island communities for a working group to look specifically at island opportunities and hurdles.

A commitment was made by the President of CPT at the workshop that CPT Scotland Engineering Group will help the knowledge gained by early adopters be shared with SME operators.

It is proposed that the points above are incorporated into the Taskforce's final pathway, to ensure that that the pathway reflects the requirements of SME operators.

Repowering

Vehicle repowering is complete removal of the diesel engine and drivetrain, to be replaced with either a fuel-cell electric, or a battery-electric drivetrain.

Repowering is a specific type of vehicle retrofitting. This type of retrofit is referred to as 'repowering' to distinguish it from exhaust retrofitting, which is for vehicles to meet local air quality standards such as Low Emission Zones.

Repowering also involves vehicle integration, which is to ensure that the drivetrain, power source, electronic controls and auxiliary systems interface with each other.

Costs

The upfront costs of repowering a bus are about half as much as purchasing a new one, as shown:

	New	Repower
Fuel-cell electric	~£450k	~£200-300k
Battery-electric	~£350k	~£125-200k

(figures provided by Zemo)

Note that the costs of charging infrastructure are unaffected by repowering versus purchase of a new zero emission bus.

Supply

The supply chain for batteries and motors is maturing rapidly, however, the market for vehicle repowering is undeveloped internationally as most state subsidies have historically targeted new bus purchases. There are only a handful of repowered vehicles running at present, however policy

in Europe is changing¹ which represents a significant opportunity for growth and exports.

At present there is only one businesses focussed on repowering in Scotland – Ballard-Motive solutions, based at the Michelin Scotland Innovation Parc - and two suppliers for fuel-cell electric repowers and five battery-electric suppliers in England. Estimates from Zemo suggest that the repowering supply chain at present has a maximum throughput of 1000 repowers per year.

If all diesel buses currently under 8 years in Scotland were repowered at 8 years, this would give a market volume of approximately ~2,500 buses to be repowered in six years with an average of 416 buses repowered per year, representing an opportunity for supply chain development in Scotland (this opportunity could extend to repowering of coaches, HGVs and HDVs as well).

The UK Government have provided funding to Zemo to develop certification for vehicle repowers.

ScotZEB Phase I

The Scottish Government launched the first phase of the Scottish Zero Emission Bus Challenge Fund (ScotZEB) in July 2021, inviting bids by 29 November. The Fund replaced previous funding streams and was designed to support swift, and significant, change in the bus market in favour of zero-emission technologies, particularly by encouraging the market to agree and implement new and innovative ways to finance zero emission buses.

¹ The French government has announced a [€1 million project](#) to build a prototype repowering kit to repowering urban diesel buses to battery-electric propulsion.

The European Commission has confirmed that Member States may provide intensive subsidy for transitioning to zero emissions under the Clean Vehicles Directive. The following items are eligible for funding: the procurement and retrofitting of buses with alternative drive systems and the procurement of the infrastructure necessary for operation; feasibility studies.

Bids were assessed against the published criteria of:

Wider benefits (20%)

- community benefit (scores were higher for bids that set out creative and innovative ways that the bid will deliver wider benefits, over and above those of a zero emission bus services)
- air quality (bids received higher scores if buses operate on roads known to have poor air quality)

Financial (80%)

- subsidy per bus (bids requesting less funding than the allowed maximum for their bus class received higher scores)
- infrastructure (non-contestable costs were removed from consideration of the score, scores were based on value for money including any future buses/other vehicles the infrastructure would support fuelling of).

The total Government budget to support zero-emission buses from 2021/22 for 5 years is £120 million. Phase 1 of ScotZEB had been advertised as being for up to £50 million, with £70 million being available for a Phase 2, should there be one. Scottish Ministers chose to award a total of £62 million at Phase 1, reducing the sum available for any subsequent phase to a maximum of £58 million.

ScotZEB Phase 1 appears to have been reasonably successful in supporting swift, and significant, change in the bus market in favour of zero-emission technologies, but there remains significant scope for any Phase 2 to have a greater positive impact on market dynamics.

Bids were received from a wider range of operators than previous schemes, including smaller operators, operators in rural areas, and Local Authorities. Inevitably, bids from larger operators were larger in scale than those from smaller operators, and it should be noted that Scotland's

5 largest bus operators own around 80% of Scotland's total bus fleet. Nevertheless it is important that smaller and more rural operators do not get left behind in the transition to a carbon-neutral economy and any Phase 2 of ScotZEB would need to address this. On 2 March 2022, the Minister for Transport informed Parliament that she intends future funding to prioritise support for smaller and more rural operators, in order to ensure a just transition to net zero for the bus operating sector.

No bids were received from companies other than bus operators; from collaborations; or for hydrogen fuel cell buses or infrastructure. Bids included some examples of innovations that would support the Taskforce's Guiding Vision of all potential users being able to benefit from the energy provision centred at depots, though this was relatively limited in scale and ambition.

The average subsidy per bus (excluding infrastructure) awarded was £176k, compared to £216k for SULEBS 2 and £250k for SULEBS 1. This shows clear progress towards the Taskforce's vision that in the future the Government will cease subsidising battery-electric and hydrogen fuel-cell buses, but detail within the bids suggests that the reduced subsidy requirement is a result of negotiation between operators and manufacturers, with no evidence within the bids of the finance sector bringing forward improved financial products. This may indicate that, should there be a second round of ScotZEB, it will need to do more to deliver the Taskforce's vision of a future with vibrant ownership and leasing markets for buses which benefits operators, manufacturers and the finance sector.

On 8 March The Minister for Transport informed Parliament, through her response to a written question (S6W-06558), that she wants to consider how the "local benefits" criterion might be strengthened in the future. There is the option to increase the prominence of "wider benefits" in the overall scoring of bids, from 20% to a higher figure, and/or to remove air quality as part of that scoring criteria. One impact of the air quality

criteria is that it leads to higher scores for bids for buses in urban areas, where air quality is a problem, over rural areas where it is less so, so removing that criteria would help to create a more level playing field between urban and rural areas. A further possibility could be to require bids to provide more detail and assurances in relation to the supply-chain involved in decarbonisation.

If strengthening the criteria relating to community benefits is desirable, then the case for SME operators being given support to develop explore decarbonisation options, costs and business cases, as raised at the SME workshop on 2 February, would be increased. Smaller bidders, by definition, have less time and resource at their disposal to develop and set out ideas as to how their bids could secure wider community benefit. Some level of support could help to address this.



A zero-emission bus fleet that people enjoy travelling on and knowing that doing so is one of the most climate-friendly choices they can make; There are vibrant ownership and leasing markets for buses which benefits operators, manufacturers and the finance sector; There is an ever stronger and diverse domestic manufacturing sector and supply-chain; Energy networks, bus operators and Local Government working together to ensure depots are powered/fuelled and all potential users are able to benefit from the energy provision centred at depots and on-route charging infrastructure; components are fully recycled at the end of life; the Government has ceased subsidising battery-electric and hydrogen fuel-cell buses.