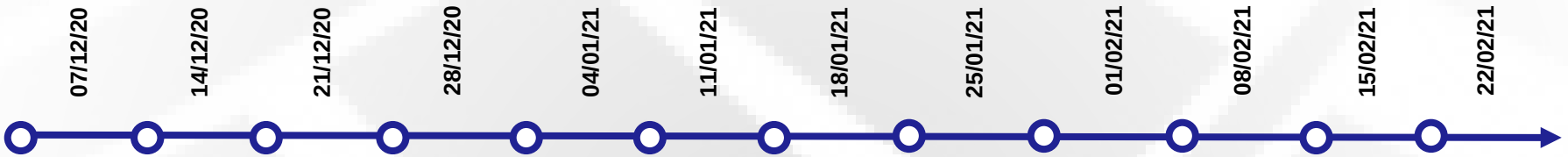
Zero Emission Bus Financing Models

Bus Decarbonisation Taskforce Presentation

February 2021

1 Project Overview

Over the past two months we've undertaken desktop research, extensive stakeholder engagement, and developed a comprehensive analysis of different financing models.



December 2020

- **Team mobilisation** and kick-off meeting to align on project objectives
- **Stakeholder mapping and engagement planning**

January 2021

- **Desk-based research and analysis** to identify existing and emerging financing models, and global case studies
- **21 individual stakeholder interviews** to understand opportunities and challenges in the market
- Detailing of **current, emerging and potential** new **financing solutions**
- Development of our **interim draft output**

February 2021

- Development of **pre-reading material** for workshop participants
- **Workshop on the 16th February** to validate and test ideas with industry stakeholders
- **Bus Decarbonisation Taskforce Presentation**
- **Final Information and Ideas Pack**

2 Financing solutions & models explored

*We have explored a number of different **Existing**, **Emerging**, and **Potential** financing solutions:*

Existing solutions & models	Emerging solutions & models	Potential solutions & models
Finance leases	Component leases	Residual Value Guarantee Scheme
Operating leases	Green Bonds	Revolving Fund
Concessional loans	Integrated end-to-end financing (Bus-as-a-Service)	Mezzanine Loan
Sale-and-leaseback (refinancing)		Partial Risk Guarantee
		Demand Aggregation

Our analysis considers the perspectives of both operators and financiers

Risks

- Performance
- Obsolescence
- Residual Value
- Non-payment

Other considerations

- Upfront costs
- Maintenance costs
- Skills and capabilities
- Access to Funding
- Financing Costs

3 Overview TCO Analysis

*Higher total costs for both battery electric and hydrogen buses, result in a **number of implications which need to be considered, when developing / deploying appropriate financing models.***

£'000	Diesel (Single)	Electric (Single)	Hydrogen (Single)
Capital Cost	180	392	525
Operating Cost	37	23	52
Personnel Cost	35	40	40
Total	**252**	**455**	**617**

*Building on the whole-life costs analysis work conducted by EY, **our research indicates that TCO for Electric Buses has yet to reach parity with Diesel Buses. The TCO of Hydrogen Buses is currently approximately 2.5x that of Diesel Buses.***

Implications for electric and hydrogen financing models

- The **varying reliability** of batteries (/fuel cells) means operators will likely need to swap them more than once, across the life of the bus (e.g. 5-7 year lifespan of battery, 15 year lifespan of bus)
- **Power trains are more likely to fail** (in the early stages of the technology) and are also **more expensive to replace** than diesel engines;
- There is likely to be a **higher Peak Vehicle Requirement** for both types of ZEBs; and
- **Skilled maintenance and active management of batteries and fuel cells** could help to improve battery/fuel cell reliability and residual value, improving affordability of financing.

Additional implications for hydrogen financing models

The **higher costs of hydrogen buses** (due to current lack of maturity and scalability) result in **additional implications** including:

- The need for short-medium term **government support to cover the cost premium of purchasing buses and fuelling infrastructure**
- The need for **greater protection of residual value** (through increased Government funding or risk taken by industry financiers)
- Higher cost of infrastructure – the costs will **include wider costs** associated with making the solution available (e.g. distribution networks)
- The inferior pace of development resulting in a **limited supply chain**, increasing costs for maintenance / training
- Overall significantly higher costs, likely leading to **higher lease premiums** (compared to battery electric) over an equivalent contract period
- Reliability issues with hydrogen buses, potentially **impacting revenue services**, and resulting in a **higher peak vehicle requirement**

Please see Information and Ideas pack for full analysis and list of sources and assumptions.

4.1 Traditional Financing Options

*The three most common **existing financing options**, based on our own analysis and stakeholder engagement, are:*

1 Operating Lease

Financiers

Asset Owner (Manufacturer, Energy Provider, Private Investor etc.)

Vehicle (and battery) lent to lessee

Asset(s) returned at end of lease period

Users

Either recognised or not recognised on balance sheet, based on accounting treatment (IFRS16)

Regular (monthly) lease payments

Bus Operator

RAG Rating Summary

For Operators	For Financiers

2 Finance Lease

Financiers

Asset Owner (Manufacturer, Energy Provider, Private Investor etc.)

Vehicle (and battery) lent to lessee

Final payment if option to purchase is exercised

Users

Balance sheet entry recorded

Regular (monthly) lease payments

Bus Operator

RAG Rating Summary

For Operators	For Financiers

3 Concessional loans

Financiers

Banks, Building Societies and other financing institutions

Potential loans from other institutions e.g. SNIB or GFI

Low cost "green loan" financing arrangement provided, to better meet ESG targets / commitments

Users

Repayment of loan capital over agreed period, plus interest

Bus Operator or alternative asset owner

RAG Rating Summary

For Operators	For Financiers

Key:

Attractive	Acceptable	Unattractive

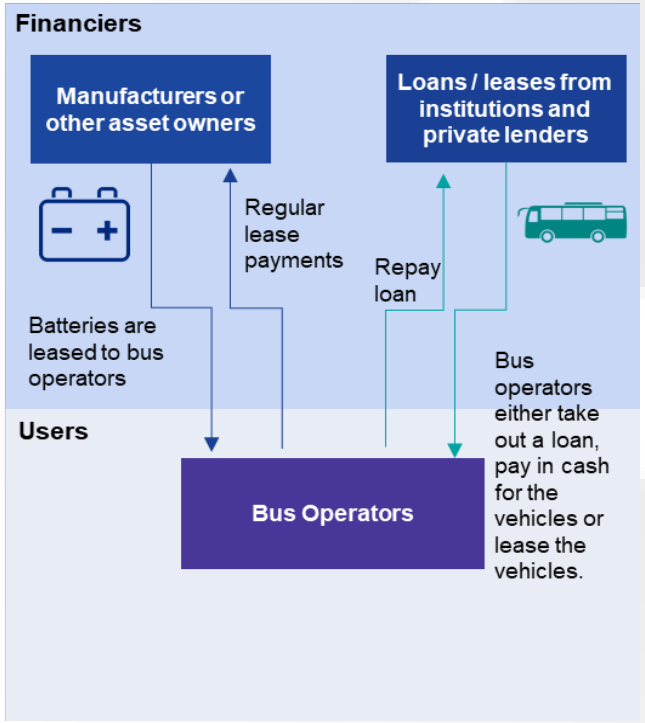
Key:

Financiers	Users

4.2 Emerging Financing Options

*The three most common **emerging financing options**, based on our own analysis and stakeholder engagement, are:*

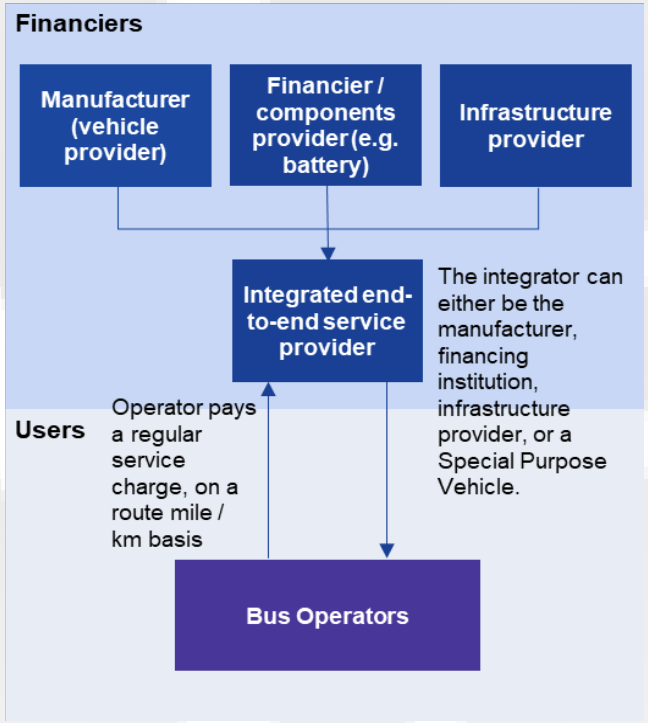
1 Component (Battery) Leasing



RAG Rating Summary

For Operators	For Financiers

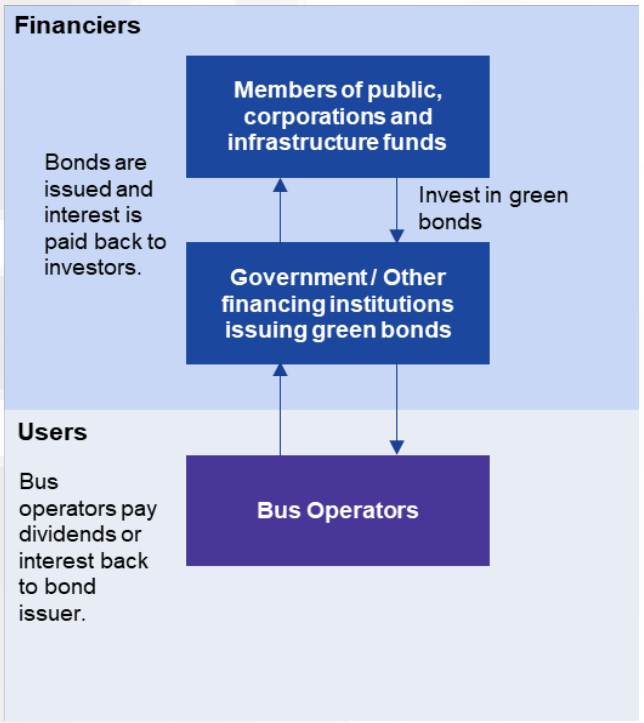
2 Integrated end-to-end financing (BaaS)



RAG Rating Summary

For Operators	For Financiers

3 Green Bonds



RAG Rating Summary

For Operators	For Financiers

Key:

Attractive	Acceptable	Unattractive

Key:

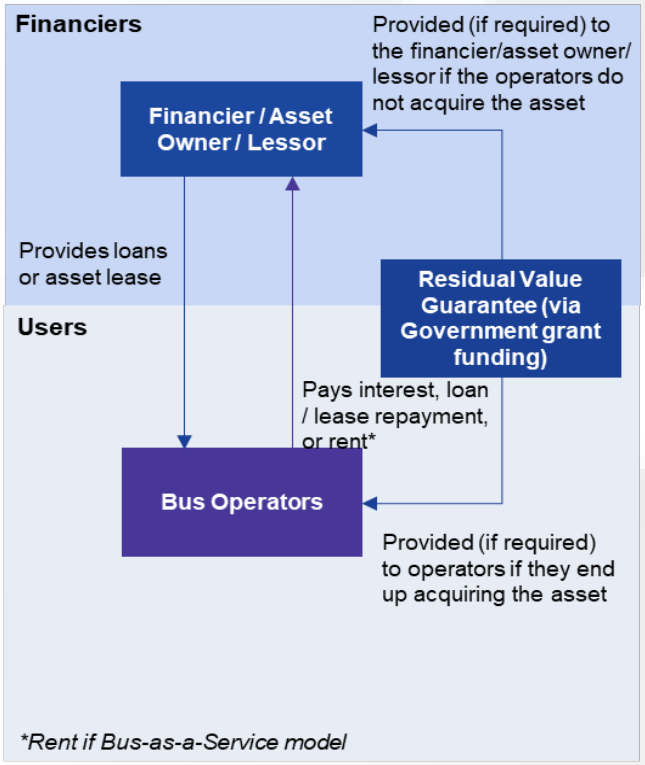
Financiers	Users

4.3 Potential Financing Options

*The three most applicable **potential financing options**, based on our own analysis and stakeholder engagement, are:*

Note: The below options are not mutually exclusive and can be used in tandem e.g. Demand Aggregation combined with a Residual Value Guarantee Scheme.

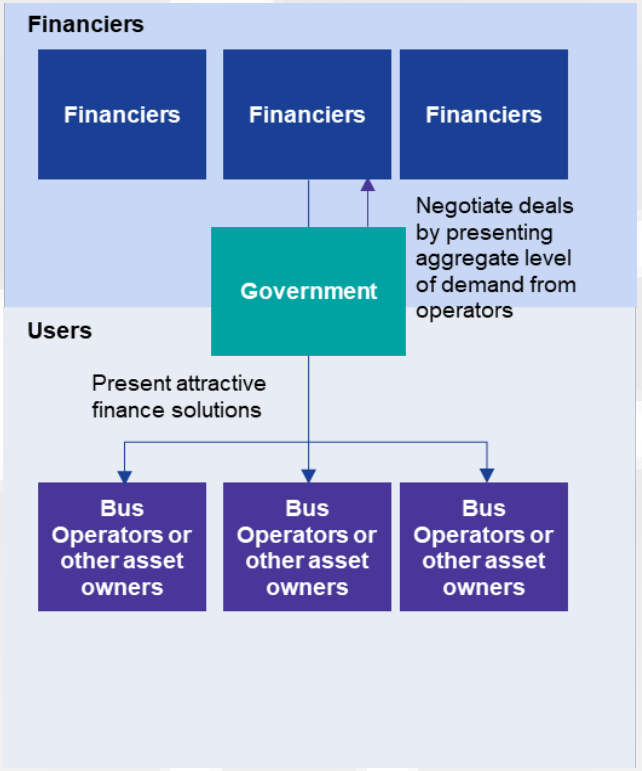
1 Residual Value Guarantee Scheme



RAG Rating Summary

For Operators	For Financiers

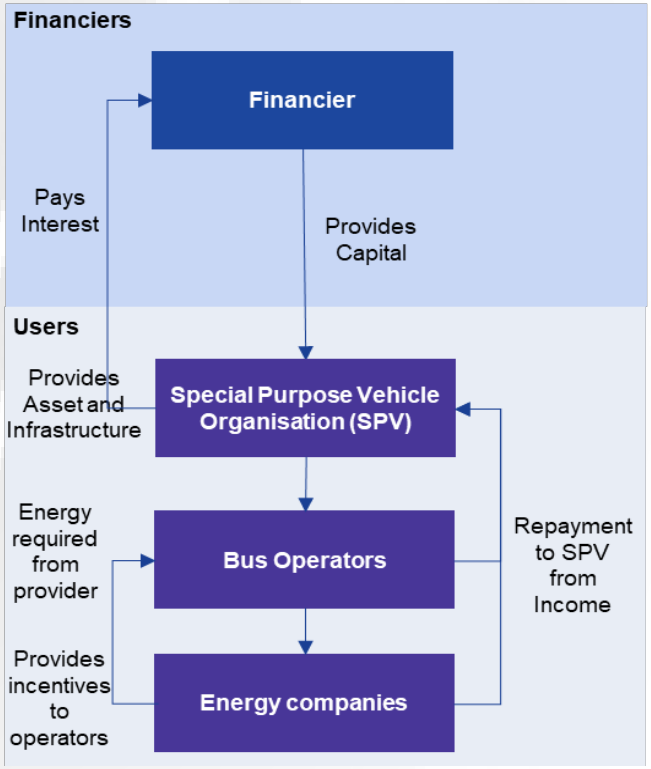
2 Demand Aggregation



RAG Rating Summary

For Operators	For Financiers

3 Revolving Fund Scheme



RAG Rating Summary

For Operators	For Financiers

Key:

Attractive	Acceptable	Unattractive

Key:

Financiers	Users

5.1 Industry Engagement

***Key themes** arising from our engagement with stakeholders focused on:*

*The **up front capital costs** associated with the technology and infrastructure;*

*The **provision of adequate infrastructure** to best meet depot requirements;*

*The **standardisation of assets,** in particular the buses / vehicles;*

*The **protection of the residual value of assets,** namely the technology;*

*The **lack of accessible and accurate industry information,** particularly for operators;*

*The lack of clarity of demand / volume of buses being ordered and operated; this is required to **reduce both manufacturing and financing costs.***

Key Insights

*The consensus amongst industry stakeholders is that **existing financing solutions available are not necessarily unaffordable** but that there are **insufficient offers in the market** and **few proactive offers being made to operators.***

*The issue / challenge is in **addressing the technology risk** associated with zero emission buses, **the revenue uncertainty** (largely as a result of Covid-19), and clarity on **when and how many buses will be ordered and operated**.*

5.2 Industry Engagement

Some direct responses / feedback *arising from our engagement with stakeholders include:*

- *"To ensure investments are as worthwhile as possible (particularly in required infrastructure),* ***investment in buses needs to happen at a relatively large scale*** *i.e. purchasing of buses in the hundreds / thousands as opposed to small, individual batches of 10 -20 at a time."*
- *"Developing* ***charging infrastructure and depots with a multi-purpose use capability could provide additional revenue streams*** *– however this would need to be done with health and safety in mind as well as ensuring it doesn't compromise day to day bus operations."*
- *"****Standardisation of bus requirements and specification could lead to a quicker transition*** *and be particularly beneficial for manufacturers / asset producers. In the long term, it would also ensure buses can be used across the market by any operator."*
- *"Transport Scotland / Scottish Government could use grants to* ***provide security against the residual value of assets at the end of contract periods****. Consideration would however need to be given to ensure operators / asset owners are not disincentivised to properly maintain the asset (e.g. condition and performance)."*
- *"There is* ***a lack of sufficient sharing of information across the industry*** *(around infrastructure and technology solutions), leading to higher costs for operators / investors. Uneducated operators are sometimes subjected to higher quotes from DNOs in respect of depot electrification / connection. Those that are able to challenge and/or better educate/inform themselves, have seen significant reductions in connection quotes and costs."*
- *"****No financing model is off-the-table*** *for operators or financiers"*
- *"Regulated DNOs have restrictions which makes investment challenging.* ***IDNOs and ICPs are showing interest in investing in this area****."*

6 Required elements for a practical financing model

Based on findings from our detailed analysis of different models, and views gathered from stakeholder engagement, ***financing solutions should incorporate the following "must have" components:***

1. **Protection of the residual value of assets** (particularly the battery / fuel cell components)
2. **Enabling off-balance sheet** access and use of zero emission bus fleets
3. **Ability to minimise upfront capital costs** of vehicles, technology and infrastructure
4. **Appropriate sharing of risk** between manufacturers, operators and financiers
5. **Incentivisation of vehicle homogeneity –** reducing risk associated with default/hand-back of assets and enabling development of "as a service" models

7.1 Conclusion

Our research, analysis, and stakeholder engagement, suggests that ***the overall market is shifting towards financing models where (the majority of) operators no longer hold to the tradition of entirely owning their assets.***

The **most prominent** financing models within the **current market are leasing models** (namely operating leases).

For operators, leasing models reduce up front costs significantly, whilst providing a predictable and steady cashflow prediction (for budgeting purposes).

Financiers also benefit from premiums via regular lease payments.

However, **changes in accounting standards** (e.g. IFRS 16) present difficulties e.g. having to now recognise most assets on balance sheets (unless certain criteria are met).

Combining this with **infrastructure challenges and costs**, as well as **technology risks and revenue uncertainty**, **operators are becoming more and more attracted to models based on "use and access",** for a particular asset / service e.g. "as-a-service" models.

There are currently a **limited number of market players** providing "battery / fuel cell / bus **as-a-service models**". 'Traditional' **financiers** (e.g. banks and equity houses) are **willing to invest** in this space but **require comfort** around the **residual value risk** of the technology. Costs can also be reduced by providing **clarity and certainty of demand**

It may be that a **combination** of the models explored in this pack, is needed to facilitate the transition. However, some form of security needs to be provided for any investment(s) made, be it in the form of a residual value guarantee or a guaranteed level of demand from operators. This is an area where **Scottish Government / Transport Scotland** could intervene.

7.2 Next steps

To progress this further, particularly in better understanding and considering the different implications some of these models may have for all stakeholders involved, ***there are a number of key next steps which could be undertaken****.*

1. Extend engagement, through CPT, with SME operators - including coach / minibus operators providing public transport services to **understand fleet transition plans and additional/further challenges to be addressed.**

2. Undertake the first steps in a **Demand Aggregation exercise**, working with CPT to develop a scenario-based analysis of potential transition / adoption rates across the industry, considering fleet / vehicle age, demand scenarios, infrastructure roll-out scenarios, cost/affordability scenarios of the vehicles, and manufacturing/vehicle availability constraints.

3. Develop **information resources to help address the information gaps/barriers** in the market and better inform operators, energy companies, financiers, and wider stakeholders.

4. Engage with financiers and energy companies to **explore opportunities to provide long-tenor financing solutions for infrastructure components**, giving consideration to a revolving fund operating model

5. Work with existing pathfinder projects to **capture comprehensive and independently verified Whole Life Cost data** for Zero Emission Buses (Battery & Fuel Cell Electric)

6. Consider **trialling a Residual Value Guarantee proposition** with a short-term pathfinder project

7. Continue **engagement with industry counterparties to support effective collaboration**, and progress relevant actions.

Transport Scotland, Buchanan House,
58 Port Dundas Road, Glasgow, G4 0HF
0141 272 7100
info@transport.gov.scot
http://www.transport.gov.scot