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'When the bough breaks': critical questions for the crafting of Australia's bus franchises in the era of electric fleet

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Abstract

Within Australasia bus services are generally let under contract to private sector operators for a finite contract period. Where contestability is seen as possible these contracts are put to the market via public tender; when an incumbent is thought to be unseatable the preferred model of procurement is typically open book negotiation. Contracts are usually gross cost with minimal patronage risk, performance incentives for reliability and punctuality, and in some cases, assets lie with the state so as to maximise market competition. In recent years the drive towards decarbonisation has spawned a plethora of state and federal policy documents committing to the replacement of diesel buses with electric vehicles. In some states ambitious replacement targets have been stated- e.g., no more diesel buses to be purchased after 2025 - and in a handful of instances electric fleet has been mandated in tenders. There are, however, considerable transition risk issues in moving from diesel to electric fleet, ranging from capital cost uplifts, uncertainty in the operating cost profile, and the ability of the electricity grid to sustain mass fleet charging in the off peak. The franchise contracts though are not designed to cope with significant variations in capital and operating cost over their life – traditionally they accommodate only moderate fleet replacement and service variations, not significant spikes in risk, which cannot be priced into a competitive tender. This raises the risk of predatory bidding or a significant uplift in tender prices. This paper probes these issues and asks to what degree the contracting model needs to be modified to accommodate seismic shifts such as a transition to electric fleet.

1.Introduction, rationale, and structure

From the mid-1980s onwards, the outsourcing to the private sector of industries previous publicly owned and operated, rolled out across the world in different forms. Today, the provision of urban transport services by private contractors can be seen in many nations including Australia, Sweden, the United Kingdom, Singapore, Canada, and New Zealand. It *may* be argued, depending largely on one's ideological position and personal experience, that outsourcing bus and rail services (franchising) has brought either significant efficiencies or an erosion of public interest. Some proponents of outsourcing hold to the doctrine the private-sector delivery of public services is inherently more efficient than direct state provision (Fourie

and Poggenpoel, 2017). Others believe 'governments have created private monopolies without sufficient regulation to stop those monopolies from overcharging users' (Hutchens, 2016).
It seems clear franchising is here to stay in the medium to long term in some form. Prior to recent events the franchising contract envelopes provided a relatively stable model by which to operate public transport services to deliver sought outcomes considering moderate service level variations (as decided by the procuring entity or developed in partnership with operators), and significant insulation from various forms of cost and patronage risks.

Previous cases of public transport franchising encountered 'blips' such as the 2003 collapse of the National Express rail franchise in Melbourne as documented in Currie and Fournier, 2021. Now, the world has obviously been 'jolted' at best by the Coronavirus pandemic. It has caused a colossal impact on public transport franchises in an incredibly short period of time. In the United Kingdom it has had lasting effects with the collapse of rail franchising where operators were moved onto management contracts with fixed terms and operating margins (Davies, 2020). That said, the long-term impacts of COVID-19 on public transport remain a moot point (Infrastructure Victoria, 2021). What might be more hazardous for the stability of public transport, notably bus franchising within a competitively tendered environment, however, is the rapid introduction of Zero Emissions Buses (ZEBs) across a region. This is in keeping with jurisdictional policy aspirations (as noted in the next section) but may expose franchise agreements to a degree of capital and operating uncertainty. There will also be the challenge to allocate shared risks within a tendered environment, where there is pressure on price at the bidding phase and where significant risk involving technology, industrial relations and operations, is not accounted for as a mid-life contract event.

Focusing on the Australian urban bus sector and battery electric fleets (not hydrogen fleet) in Sydney and Melbourne, this paper flags a selection of key questions emerging for both the private and public sectors, when moving forward in this challenging and unchartered space. How do bus franchises have to evolve, and how should the services be procured, to enable the necessary risk to be absorbed and managed? How do they have to be strengthened to stop 'the bough from breaking'?

The paper is structured in the following fashion:

- Section 2 discusses bus service franchising models and their key features;
- Section 3 highlights desired policy reforms to transition from diesel to electric fleet, as well as decarbonisation in general;
- Section 4 flags the multiplicity of transition and risk issues in moving from diesel to electric fleet in urban areas;
- Section 5 noting the Sydney and Melbourne Bus Franchise agreements notes if the current agreements have sufficient risk carrying capacity for the changes envisaged, and if the procurement model – tendering – is likely to be most effective;
- Section 6 offers concluding remarks; and
- Section 7 offers references and with this being a practice paper, the authors have cited information which is available in the public domain.

The paper does not seek to offer specific regulatory model solutions to the problem described but a range of options will be flagged in the conclusion. The paper will be of relevance to transport practitioners – government, operators, industry and scholars – given the current challenges of implementing fully electric fleet within franchised environments, within relatively short, and arguably politically not market-driven timelines.

2. Bus service franchising models within Australia

Bus service franchising was undertaken with a strongly outsourced model in nations such as the United Kingdom (outside London) in 1985 and New Zealand in 1991. There the model of 'competition within the market' was attempted through the transfer of assets to the private sector and led to a coalescence of private sector monopolies (Gómez-Lobo, 2007; Ashmore and Mellor, 2010). In Australia, noting these instances of anti-competitive outcomes, the form of bus franchising which predominates in urban areas is 'competition *for* the market' (not '*in'*) where assets remain with (or are progressively transferred to) state entities, and private operators bid for term franchises on an operating and maintenance basis (i.e. it is largely recognised that once fleet and depot assets are in the hands of a private incumbent, a meaningful competition through tendering is unlikely to eventuate [Myers and Ashmore, 2007]). This rationale extends to outer metro, and rural and regional bus contracts which within Australia are almost always negotiated on an open book basis. These contracts lack scale and incumbency makes an area sufficiently unattractive for prospective entrants to expend significant resources on a bid.

The typical components of an urban bus franchise within Australia are noted in Figure 1 taken from UITP (2021). Contracts are typically area based, rather than route based, coalesced around certain depots and geographical hubs. In keeping with competition for the market's philosophy, an operator typically bids for an area for a fixed term period, with an option for a mid-life renewal, e.g. seven years plus seven years (this often aligns with the asset life of an urban vehicle). To ensure market contestability it is common for assets to reside with the state, and whilst this is not universal, often incentives are frequently offered to operators. This is usually in the form of extra contract tenure but requiring them to place their assets – depots and fleet into a 'pool' which reverts to the state at the end of a contract term. Revenue or farebox risk is limited as a rule as it is largely recognised that operators generally do not control patronage levers; it is therefore common for service quality to be incentivised through a punctuality and reliability (cancellation) performance regime. Therefore, contract performance is *largely* measured through output-based contracts (as described in UK Department for Transport, 2012).

Figure 1: Typical components of a bus franchise (UITP, 2021a)

- Access and Inspections
- Accreditation and compliance
- Asset Management
- Assignment and Change of Control
- Commercial Opportunities
- Compensation Events
- Conditions Precedent
- Confidentiality
- Data and Systems
- Default and Termination
- Dispute Resolution
- End of Term Requirements
- Fares and Ticketing
- Governance
- Indemnity and Liability
- Insurance
- Intellectual Property
- Key Contracts
- Modifications
- Network Services Coordination
- Objectives
- Payments
- Performance Regimes
- Privacy
- Projects Regime
- Records and Reporting
- Relief Events
- Restrictions on Activities
- Safety
- Security
- Service Changes
- Service Requirements
- Step-in
- Subcontracting
- Term
- Warranties

An illustrative example may be provided for the case of the urban 'metro' contracts within Melbourne (PTV, 2013). There are approximately 1,800 route buses in the metropolitan Melbourne region under three different contract types used by the State Government to deliver services on the bus network. These three different contract types and associated asset ownership structures in operation for the metropolitan route bus network are:

- State government owned assets – Contract period 7 years plus option for 3 years (existing). Contract tendering currently underway in 2021. This contract structure represents approximately 30% of the metropolitan bus fleet.
- Operator owned assets – Contract period 7 years, expires 2025. This contract structure represents approximately 30% of the metropolitan bus fleet.
- Operator owned assets, ownership transferring to the state government at end of the contract period – Contract period 10 years, expires 2028. Operators receive an additional capital payment during the contract as part of the asset transition process. Any new assets procured during this contract period are owned by the state government. This contract structure represents approximately 40% of the metropolitan bus fleet.

The contract period varies from between 7-10 years and is dependent on whether the assets are government or privately owned. For privately owned assets, the contract term is dependent on the asset ownership transition path selected by the service provider in the recent 2018 contract negotiations. Assets in this context include buses, depots, offices, workshops, and other infrastructure that is used to provide bus services. For contract purposes, route buses have a capital life span of 14 years and an operational service life of 18 years.

Operational performance requirements (OPR) for the metropolitan and regional route bus network are based on punctuality, reliability, and asset availability. An operator's payments may be adjusted depending on the achievement of their OPR. Contract payments for the route contracts are separated into three main payment components: fixed costs to address the capital aspect of the service provision including vehicles, depots, and administration; operating costs cover the variable costs associated with providing actual services. Variable costs are based on the service kilometres delivered and service hours required to deliver the services. Payments are associated with the provision of contracted services. These payments are adjusted when the operator provides less or more services than contracted to do so, whilst margin is a fixed percentage of the contract structure and is dependent on the fixed and variable components.

3 Government policy aspirations for electric bus fleet

Traditionally, urban bus fleets have been propelled by diesel with cleaner, more efficient diesel engines being progressively introduced through mandated Euro emission standards. These standards have evolved from Euro I for very old diesel engines to Euro VI for more modern diesel engines. The LPG fleet operating throughout the Sydney metropolitan area may be seen as the exception. Contemporary concerns regarding air pollution, however, have heavily driven policy shifts in this area to promote electric battery, hybrid (battery plus diesel) or hydrogen fleet. This paper focusses on the policies pertaining to electric fleet, which are increasingly being stipulated within urban bus contracts.

Policy statements abound and this paper can only provide token examples of those issued at both state and commonwealth level in Australia. The '*First Low Emissions Technology Statement 2020'* (Department of Industry, Science, Energy and Resources, 2020) is Australia's Technology Investment Roadmap to accelerate development and commercialisation of low emissions technologies. It prioritises low emissions technologies with potential to deliver the strongest economic and emissions reduction outcomes for Australia. Further, the Federal Government are currently developing a 'Future Fuels Strategy' (Department of Industry, Science, Energy and Resources, 2021) to shape a program of investment in future fuel technologies. Whilst not explicitly referring to bus fleets, a Future Fuels Strategy discussion paper acknowledges that "the future of road transport in Australia will consist of a mix of vehicle technologies and fuels".

At state level the New South Wales 'Net Zero Plan Stage 1: 2020 – 2030' (Department of Planning, Industry and Environment, 2017) is the NSW Government's commitment to a net-zero emission future. Transport for NSW have taken this further through an industry-led and government partnership approach to the development and take-up of more fuel-efficient vehicles through the NSW 'Electric and Hybrid Vehicles Plan' (TfNSW, 2019). This includes a zero-emissions bus trial and the aspirational strategy to transition the entire bus fleet of some 8,000 vehicles to zero emissions by 2030. In Victoria, 'Cutting Victoria's Emission 2021-2025' (DELWP, 2021) is a transport sector emissions reduction pledge seeking a step change to put in place foundational measures delivering significant emission reductions beyond 2030. It sets a target for all new public transport bus purchases to be zero emission vehicles from 2025. Moreover, the Victorian Department of Transport is currently in the process of awarding grants for ZEB trials. It is hoped that this trial, and its equivalent in NSW, are highly didactic, and can help shape future franchise incarnations, provided the intellectual properties emanating from these trials are in the public domain.

Also at state level, the Queensland 'Climate Transition Strategy' (Queensland Government, 2020) outlines how Queensland proposes to prepare for the transition and meet a target of zero net emissions by 2050. The Queensland Government is investigating the potential to trial electric buses in South East Queensland. These trials would be used to assess the feasibility of deploying electric buses in coming years Under Climate Action 21 'Tasmania's Climate Change Action Plan 2017-21' (DPAC, 2017) the Tasmanian Government is taking practical action to support the uptake of electric vehicles. An initiative for emission-free buses is also underway to determine whether hydrogen or electricity is more appropriate. Metro Tasmania will also be tasked to trial zero emissions buses in Tasmania – electric or hydrogen – with both a northern and southern trial underway within the next two years. Finally, within the Australian Capital Territory 'The Zero-Emission Transport Plan for Transport Canberra' (Transport Canberra, 2019) responds to the emissions targets set out in the 2019-2025 Climate Change Strategy to achieve zero government emissions by 2040 and an interim target of 33 per cent reduction by 2025. With the recent achievement of 100 per cent renewable sources for the ACT electricity supply, the transport sector is now the largest source of emissions in the Territory, comprising 62 per cent.

4 Operational challenges in converting diesel to electric fleet

Making the transition from a diesel to electric bus fleet in the coming years, in the timeframes expected, there will be key challenges of converting existing bus depots and retraining staff, as well as energy network issues. This section of the paper therefore deals with the transition from diesel to electric fleet and the multiplicity of issues involved. To show the sheer volume of interface and transitional risk items – questions that will introduce uncertainty into the franchising process moving forward. Key areas of focus are:

- Choosing the optimal fleet and charger composition.
- Assessing energy requirements and local electricity grid capacity

- Managing depot fit-out requirements.
- Labour force impacts.
- Managing safety risk.
- Understanding and minimising lifecycle costs

4.1 Optimal fleet and charger composition

Transitioning a depot to electric can mean more buses in total are required, each electric vehicle on average covering shorter distances between recharges at the depot compared to the diesel buses estimated at 1.1 to 1.5 Battery Electric Bus (BEB) for every diesel vehicle retired from current operation (Metro Magazine, 2021). This raises several question and issues, illustrating complexities and tradeoffs:

- What type of buses do we need?
  a. How much energy do buses need to service a route for a given time of day, day of the week, or season of the year?
  b. How will the battery size impact vehicle mass, carrying capacity and operational performance?
  c. How much time is required to charge each bus to maintain the bus schedule?
  d. How are buses utilised across the operational network of each individual operator?
  e. What are the future service delivery obligations for the depot (i.e. increased service frequency, new greenfield routes) and does the depot have the capacity to expand to accommodate this fleet composition?
- How are we going to charge the buses?
  a. What type of charging infrastructure will best suit our operations? Plug -in, pantograph or en-route opportunity charging?
  b. When are we going to charge our buses? During the day, during service, overnight or a combination?
  c. How many chargers and charging infrastructure do we need?
  d. How do we manage space constraints and where are we going to accommodate new charging infrastructure within a depot and other locations?
  e. How do we utilise the charging infrastructure to meet operational timetable requirements and avoid queues of uncharged buses?
  f. What role can simulation modelling play in developing scenarios that stress testing the options and optimising bus operations and depot configuration (Systra, 2021)[1].
- How to manage operational and service delivery risk:
  a. Variability in vehicle energy usage – a vehicle's real-time energy demand will be impacted by the specific route (e.g. topography, speeds, number of starts/stops), the number of passengers, climate (e.g. A/C or not), traffic conditions, driving style of each driver, and over time any vehicle wear and tear (e.g. increased parasitic losses)
  b. Power supply outages / blackouts (more common than a fuel shortage).

[1] Simulation tools can help operators study potential scenarios in a cost-effective manner to define risk mitigation actions for inclusion into the upfront design of depot and operational model (Systra, 2021).

4.2 Assessing energy requirements and local grid capacity

In NSW, the Government announced its objective to transition the State's 8,000 diesel buses to zero emissions. This is anticipated to be mostly battery-electric buses. This shift is estimated to increase the NSW electricity demand by 5 to 10 per cent (The Driven, 2019). A key issue to be studied and understood is the local grid capacity and impact from the progressive electrification of bus depots. Further, this issue will be compounded as surrounding commercial and residential areas accelerate adoption of electric vehicles and charging infrastructure for personal and commercial use.

- How much energy do we need and when do we need it:
  a. Smart charging to manage the peaks and troughs of energy demand?
  b. Onsite battery storage be utilised to manage peaks, troughs and backup energy demand?
  c. Will we need an uninterrupted power supply for operational resilience?
  d. How might on-site solar/wind generation be utilised in conjunction with the on-site batteries to both facilitate energy generation during high-cost periods and provide a level of redundancy/back-up into the energy distribution system? ((UITP, 2021b)?
  e. What is the capacity of the local electricity grid infrastructure?
  f. When will fleet need to be upgraded and who will be responsible for funding?
  g. How sensitive is the electricity network to the parallel activity of rising EV demand from both consumers and business?
  h. Increasing energy costs and introducing more sophisticated contracts with energy firms and supplier to share output risk – i.e. the operational performance regime.

4.3 Managing depot fit-out requirements

In terms of the wider depot fit-out consideration, a key decision-factor is whether the charging infrastructure will utilise plug-in chargers or overhead pantographs. A plug-in approach is generally considered to be less costly than an overhead pantograph. However, a plug-in solution has a larger 'footprint' at the ground level taking up space from areas already often congested. This allocation of space for new infrastructure constraints, and changes vehicle movement and parking in the depot. In contrast, the overhead pantographs minimise ground-level real estate but has other requirements on the overhead structure as well as the charging and maintenance processes (Metro Magazine, 2021). As previously noted, grid capacity considerations can lead to substantial fit-out requirements, such as distribution transformers and battery storage. As flagged above, this also impacts on the capacity of the depot to be expanded to incorporate future service requirements.

A key advantage of an electric vehicle over its internal combustion engine-powered counterpart is the vastly reduced number of moving parts across the propulsion unit and drivetrain, in the region of 20 for an EV versus 2,000 for an ICE vehicle (Drive Electric, 2021). Whilst this creates benefits of a reduced maintenance schedule for an electric bus, some maintenance is required nevertheless - an electric bus has different parts: the electric motor, the battery, battery management system, battery cooling systems, the vehicle-side charge ports and the depot-side charging infrastructure. This results in a very different set of maintenance needs versus a diesel equivalent, reaching across the schedule of work, the procedures to be performed, and the tools/facilities needed (ViriCiti, 2020). The balancing of maintenance operations for two parallel systems during a transition period may be considerable and introduce transition risk.

Lastly, all of these changes create new human factors considerations for the depot fit-out. from the buses themselves, the charging infrastructure, the maintenance facilities to the diagnostics systems. These all need close attention and consideration during the detailed design phase of the future depot for safe usage, signage, instructions and error-proofing.

4.4 Labour force impacts

In an electric bus, the type of the systems to be maintained across the vehicle and depot are significantly different from that of a diesel bus, thus impacting the workforce technical skills required. Internationally, various organisations are addressing this issue by providing training courses to become a certified electric vehicle technician (Clean Tech Institute, 2021). Existing diesel mechanics will therefore need retraining, or face the possibility of being made redundant and replaced by new hires with specialist skills. In addition, there will potentially be a need to balance two parallel workforces, or consider new maintenance processes, e.g. outsourcing ZEB maintenance to an external third party.

Managers overseeing depot operations and maintenance will need new skills. With electric buses comes new data and diagnostics capabilities - real-time vehicle and component performance analysis (Proterra, 2021). Operations managers will need to fully understand their service requirements, depot constraints and the resulting bus fleet and infrastructure required. Upskilling is required to understand these new systems, their deployment requirements, and how to integrate them into the daily operations to minimise downtime. Managers will be heavily involved in developing and defining the transition and depot strategy. They will also need to become highly proficient in energy management and negotiating long term energy contracts.

Bus drivers will also need retraining. In December 2020, 750 bus drivers received training in Gothenberg, Sweden, as part of Transdev’s transition of 145 electric buses. Optimal driving means adjusting to the high torque output and regenerative braking, to achieve gentle starts and stops that optimise both user experience and energy use. Overall the impact is positive on drivers – reduced noise and vibration reduces stress and fatigue (Volvo, 2020).

4.5 Safety risk management

A depot’s safety risk register needs considerable updating for an all-electric depot. Electrical safety is paramount during several different EV aspects – charging, maintenance and accident/breakdown response. Additionally, emergency response procedures, equipment and training will also need to be considered (Intelligent Transport, 2016). Further, the silent nature of electric buses can pose a safety risk to pedestrians in the depot.

4.6 Understanding and minimising lifecycle costs

Diesel buses typically have a usable lifespan of 15-20 years (with an engine overhaul at approximately 12 years). In contrast, an electric bus has the disadvantage of its battery pack having a usable lifespan of about five years. An important distinction is made here: the battery pack lifetime exceeds this timeframe, however because the battery pack suffers a slow decrease in charge capacity over time, this results in the battery pack reaching a threshold where minimum performance requirements are no longer met (eg. <80% of full capacity), hence the use of “usable lifetime” as a definition (Canals Casals et al., 2019).

The implication for bus operators is therefore that additional capital expenditure is required during the vehicle lifetime to replace the battery. Opportunities to recoup this cost through “second-life” usage / repurposing of the battery pack is therefore an important factor in the lifecycle cost calculation and should consider both revenue opportunities and environmental benefits. The other issue to consider here is the residual value of a bus at contract end, the secondary market for electric fleet, and the likely impacts on the price of diesel buses (and on sale value) if the market is flooded with significant volumes of relatively new fleet. Who bears this risk?

5 Procurement and franchising contract issues

Section 4 demonstrates there are considerable risks and uncertainties associated with a transition to BEB fleet from diesel, and, moreover, these risks are likely to manifest themselves in the forms of higher levels of capital and operating cost.

The current bus franchise agreements in Victoria and New South Wales do not envisage large wholesale changes to the franchising environment that would need to occur to transition a bus fleet from a diesel fleet to an electric fleet (PTV, 2013; TfNSW, 2017). To transition from a diesel fleet to an electric fleet would take time given that it is not simply replacing one type of bus with a different type of bus. It would require depots to be refitted, maintenance staff to be either replaced or retrained and possibly the acquisition of new depots closer to high voltage transmission lines. This would create a period of great flux and change during the term of the franchise and at the moment there are no provisions that would give the private operator relief from the performance monitoring regime during any transition phase and there is nothing for example in the Victorian contract that a private operator could rely upon to recoup any extra costs associated with the transition to an electric fleet.

Whilst the Victorian model includes provisions for the acquisition of new buses and a requirement for the private operator to comply with a fleet replacement schedule it has been drafted on the assumption that the buses will be replaced like for like (i.e. one diesel bus is replaced with another newer diesel bus). There is an ability for the private operator to apply to the PTV to deviate from that bus replacement schedule but it is effectively limited to changing the date of replacement (either forward or back) and does not envisage nor contain a contractual framework that enables the replacement of a diesel fleet with an electric fleet. Likewise, there is a general obligation for the operator to provide and maintain enough depots so as to be able to meet its obligations under the franchise agreement. Whilst the contract envisages that new depots may be required and in fact can be acquired by the operator it does not contain any contractual arrangements relating to the refitting of the depots which would be needed as the fleet moves from diesel to electric.

Both the Victorian franchise agreement and the New South Wales service contract include provisions relating to changes in the timetable and the bus routes the subject of the contracts. However, these changes can be made at the request of either the private operator or the relevant Government authority. Whilst these provisions could be used to change the routes as required by the introduction of an electric fleet bearing in mind the different “refueling” times required for electric buses and changes to locations and configurations of depot in order to continue providing the bus services, the provisions do not cater for the types of whole sale changes that would be required to the timetable and bus routes upon the introduction of an electric fleet.

There is also the question of how contracts will be procured. There are traditionally two methods utilised when attempting to ensure value of money with public service contract procurement: tendering and open book negotiation with a single supplier (Myers and Ashmore, 2007). Tendering is designed to ensure competition leads to best value but when there are likely to be single bidders, or if the level of risk cannot be quantified during the life of a contract, tendering is not arguably suitable. The open book approach whilst potentially monopolistic does recognise that where there is unlikely to be competition and great flex is needed during the life of contracts, the building of a public sector comparator by which to negotiate with the incumbent may lead to better value for money. As discussed above if strategic assets for BEBs – depots and fleet – sit with operators, alongside the strategic intellectual property from trials and the development of BEB schemes, then tendering for areas may not be the best approach. If tendering is seen as axiomatic then the state should attempt to ensure that the process is as contestable as possible by being mindful of the strategic asset issue even at trial or pilot phase.

6. Conclusions

Contemporary bus franchises contracts are only expected to withstand a certain amount of flex over the life of a contract, largely through a variation in service kilometres and incremental fleet requirements. The documents are not at present crafted with large disruption at capital or operating level, midway through a contract lifecycle, in mind. It is essential therefore that as significant contract disruption is likely to occur through the transition to electric fleet and infrastructure that the franchise agreements or service contract should include provisions which give the private operator some relief from the performance regime. Whilst the transition takes place there should be recognition operators will have to retrofit the existing depots and perhaps even change the location of the depots, reskill its maintenance workforce and possibly make wholesale changes to the services being provided because of the different range and refueling issues associated with electric buses.

A more detailed overview of the contractual issues - divided between existing and new contracts – would benefit further versions of this paper. At present, however, there is a challenge in understanding how future franchises may be modified to account for EVs - of the two markets with significant scale (Victoria and NSW) only two contracts are in the public domain: Region 6 in NSW, and the current Victorian Transdev contracts (currently being retendered). These may be seen as ‘old’ or based upon the pre-EV era. Regions 7-9 in NSW have recently been awarded, but the details of these contracts and their EV stipulations are not known outside the contract parties. In addition, the nature of the Victorian and NSW tendering exercises in terms of compliant and non-compliant bids, is also unknown. This makes contrasting older and recent documents impossible. The authors would note however, that more robust future franchises, capable of withstanding the commercial shocks associated with EV transition, are likely to include provisions which allow for transparent risk-sharing, and/or derisking. This would apply for assets (reimbursing operators for stranded diesel assets, and the costs of depot conversion), performance risk (as new EV range driven timetables are phased in), and labour costs (the need to run dual diesel and electric mechanics and drivers). These are suggested areas of risk management, and by no means exhaustive.

The difficulty will be striking the contractual balance between keeping the private operator “whole”, whilst ensuring it does not make a windfall gain from the State during the transition process. These provisions will also need to recognise there will be a period of “ramping up” before the full transition to an electric fleet occurs. From a contractual perspective it may be easier for the State to enter into a contract applying only to the transition phase giving the government full transparency of costs associated with transitioning to an electric fleet. Once this has occurred enter into a long-term franchise agreement or services contract similar to the current contractual model. It is clear that the current franchise contracts need revisiting to deliver value for public money by managing risk in this space.

Finally, the authors would flag that whilst we have espoused a plethora of issues pertaining to the seeming incompatibilities between the significant changes required to transition to EV fleet, and the modest ability of the current franchise to accommodate such changes, we have reserved the discussion of potential solutions for a follow-up paper. What seems clear is that a shift in risk transfer is needed at certain points in the franchise and that it would be beneficial when scoping and letting franchises if both the procurer and provider had a strong idea of when this shift would be necessary. The transference of risk from the private to the public sector could be done in several ways: at the outer end of the spectrum sits public ownership, but this would lose the efficiency gains of private operation and is really designed to address matters pertaining to wages and industrial relations not technology shifts; a change in asset ownership clauses within a franchise in exchange for a longer franchise tenure; or, for the private sector to retain its assets but there be clear break points within a contract to gauge risk, and reprice it through a contract variation, as operators cannot be expected to 'wear' the risk of what remains a public policy decision outside their commercial remit.

7 References

Ashmore, D.P., Mellor, A.D., 2010. The 2008 New Zealand public transport management act: Rationale, key provisions, and parallels with the United Kingdom. Res. Transp. Econ., 164–182. https://doi.org/10.1016/j.retrec.2010.07.022

Canals Casals, L., García, B., Canal, C., 2019. Second life batteries lifespan: Rest of useful life and environmental analysis. J. Environ. Manage. 232, 354–363. https://doi.org/10.1016/j.jenvman.2018.11.046

Clean Tech Institute, 2021. Certified Electric Vehicle Technician training program. https://www.cleantechinstitute.org/Training/CEVT.html.

Currie, G., Fournier, G., 2021. Good Practice Public Transport Concessions: the Cases of London and Melbourne. OECD. https://www.itf-oecd.org/sites/default/files/docs/public-transport-concessions-london-melbourne.pdf.

Davies, R., 2020. Covid-19: government suspends rail franchise agreements. The Guardian. http://www.theguardian.com/world/2020/mar/23/covid-19-government-suspends-rail-franchise-agreements.

DELWP, 2021. Climate Plan to Cut Emissions And Create Jobs | Premier of Victoria. https://www.premier.vic.gov.au/climate-plan-cut-emissions-and-create-jobs.

Department of Industry, Science, Energy and Resources, 2021. Future fuels strategy: discussion paper. https://apo.org.au/node/310784.

Department of Industry, Science, Energy and Resources, 2020. Low Emissions Technology Statement | energy.gov.au. https://www.energy.gov.au/news-media/news/low-emissions-technology-statement.

Department of Planning, Industry and Environment, 2017. Net Zero Plan. Stage 1: 2020-2030 40. https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Climate-change/net-zero-plan-2020-2030-200057.pdf

DPAC, 2017. Tasmania's Climate Change Action Plan 2017–2021. http://www.dpac.tas.gov.au/divisions/climatechange/tasmanias_climate_change_action_plan_20172021.

Drive Electric, 2021. What is an EV? https://driveelectric.org.nz/individuals/what-is-an-ev.

Fourie, D., Poggenpoel, W., 2017. Public sector inefficiencies: Are we addressing the root causes? South Afr. J. Account. Res. 31, 169–180. https://doi.org/10.1080/10291954.2016.1160197.

Gómez-Lobo, A., 2007. Why Competition Does Not Work in Urban Bus Markets: Some New Wheels for Some Old Ideas. J. Transp. Econ. Policy JTEP 41, 283–308.

Hutchens, G., 2016. ACCC's Rod Sims says privatisations 'severely damaging' economy. Guard. Aust. https://www.theguardian.com/australia-news/2016/jul/27/acccs-rod-sims-says-privatisations-severely-damaging-economy.

Infrastructure Victoria, 2021. Transporting Melbourne's Recovery. 2021. https://www.infrastructurevictoria.com.au/wp-content/uploads/2021/01/Transporting-Melbournes-Recovery-January-2021-final.pdf.

Intelligent Transport, 2016. Bus Fire Safety: Safer battery systems in electric buses Intell. Transp. https://www.intelligenttransport.com/transport-articles/19587/bus-fire-safety-battery-systems-electric-buses.

Metro Magazine, 2021. Electric Buses Renew Attention on Transit Maintenance Facilities. https://www.metro-magazine.com/10136949/electric-buses-renew-attention-on-transit-maintenance-facilities.

Myers, J., Ashmore, D., 2007. When to tender, when to negotiate: why are we ignoring the elephants in the room? Thredbo 10 - International Conference Series on Competition and Ownership in Land Passenger Transport, Hamilton Island.

Proterra, 2021. Proterra Diagnostics Tool. https://www.proterra.com/proterra-diagnostics-tool.

PTV, 2013. Transdev Metro Bus Contracts Melbourne, https://www.tenders.vic.gov.au/contract/view?id=55887.

Queensland Government, 2020. Queensland Climate Transition Strategy | Transition to a zero carbon economy, https://www.qld.gov.au/environment/climate/climate-change/transition/queensland-climate-transition-strategy.

Systra, 2021. TESS helps decision-making while planning the electrification of your fleet. https://www.systracanada.com/en/services-expertise/tools/article/tess.

TfNSW, 2019. NSW Electric and Hybrid Vehicle Plan | Future Transport, https://future.transport.nsw.gov.au/plans/nsw-electric-and-hybrid-vehicle-plan.

TfNSW, 2017. Metro Region 6 Bus, https://www.transport.nsw.gov.au/node/4552.

The Driven, 2019. NSW unveils plan to switch Sydney's 8,000 buses to all electric, http://thedriven.io/2019/10/28/nsw-transport-minister-wants-all-of-sydneys-8000-buses-to-go-all-electric.

Transport Canberra, 2019. Zero-Emission Transition Plan For Transport Canberra - Transport Canberra. https://www.transport.act.gov.au/about-us/planning-for-the-future/zero-emission-transition-plan-for-transport.

UITP, 2021a. Frameworks for our Networks: A review of public transport service contracts in Australia and New Zealand. https://cms.uitp.org/wp/wp-content/uploads/2021/02/FINAL-UITPANZ-Allens-Report-Frameworks-for-our-Networks-February-2021.pdf.

UITP, 2021b. Zero Emissions Bus Forum Report and Key Findings 2020 https://www.uitp.org/publications/zero-emissions-bus-forum-report-and-key-findings-2020.

UK Department for Transport, 2012. Railways Act 2005 Statement, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/3641/railways-act-2005.pdf.

ViriCiti, 2020. Electric Vehicle Maintenance Skills for Maintenance Technician, https://viriciti.com/blog/new-electric-vehicle-maintenance-skills-for-maintenance-technician/.

Volvo, 2020. 750 drivers prepare to go electric, https://www.volvobuses.com/en/news/2020/nov/750-drivers-prepare-to-go-electric.html.