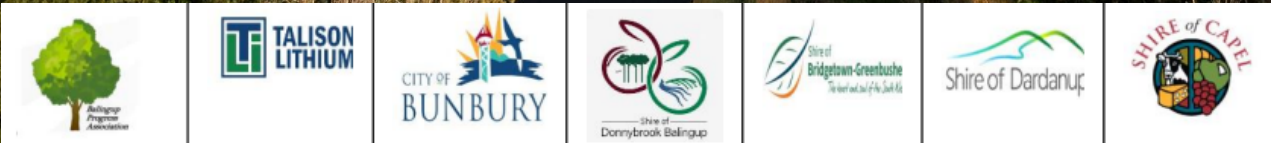


Linqage
International

Balingup Rail Group

Zero Emissions Tourist and Commuter
Railway Feasibility Study and Business Case
Bunbury to Bridgetown Western Australia

August 2024



Preface

The Balingup Progress Association (BPA Inc) was established in 1979 in response to the encroachment of pine plantations onto the town of Balingup, Western Australia.

By working closely with the Shire of Donnybrook-Balingup and the Western Australian State Government, the Shire and the BPA were successful in securing with the Minister for Forests at the time, the Hon David Wordsworth MLC (1971-1993), a two-kilometre exclusion and buffer zone around the townsite to protect the town from further encroachment.

In doing so, the provision of the zone provided a model of timber plantation planning that has brought State-wide community safety and amenity benefits.

The BPA has a long history of leadership in promoting and advocating for the economic and social wellbeing of Balingup and the wider region and this Feasibility Study forms part of that history.

The Balingup Rail Group (BRG)

The Balingup Rail Group (BRG) is a working subcommittee of the BPA. In May 2018, in response to projections of a significant increase in the volume of trucks with the expansion of Talison Lithium's Greenbushes mine and the impact that this increased activity would have on the safety, amenity and wellbeing of the residents of Balingup, the BPA resolved:

'That a sub-committee be appointed to inform the BPA as to the desirability of any further action by the BPA to support reopening of the South-west rail line (Bunbury - Manjimup), and, in particular as to the possibility of establishing a tourist train service on that line.'

It was resolved that the object of the Committee be to make all appropriate enquiries to enable it to provide information and advice to the BPA as to how the BPA may proceed to advance the case that the S.W. rail line in this region should be re-activated and made available for use for freight haulage and also for use by passengers, for example via a tourist rail service.'

Executive Summary

Purpose

This zero emissions tourist and commuter services Feasibility Study adds to the case for the recommissioning of the Greenbushes to Bunbury rail line for the carriage of freight currently under consideration through a joint study commissioned by the Western Australian State Government and Talison Lithium (Reference '*Detailed feasibility study into recommissioning of the Greenbushes to Bunbury Railway Line to begin*' (Cook Labor Government Ministerial Announcement 14 July 2023)).

The study demonstrates that such services on the recommissioned line with extension to Bridgetown would deliver expanded employment opportunities and economic growth in the South West as well as deliver significant social, environmental and safety benefits.

The co-funders of the Feasibility Study are the Balingup Progress Association (BPA), Talison Lithium Greenbushes, the City of Bunbury and the Shires of Donnybrook-Balingup, Bridgetown-Greenbushes, Capel and Dardanup.

BRG Feasibility Study Methodology

- **Appointment of internationally experienced consultants Linqage International** to provide the rigour necessary for the development of a business case for viable, regional zero emissions, high-yield tourist and commuter rail services.
- **Application of integrated transport policy principles** to leverage maximum economic, social, environmental and safety benefits from existing and planned land, sea and air transport services and infrastructure.
- **Application of Asset Based Community Development (ABCD)** principles to leverage off the capability of regional people, the region's built and environmental assets and the unique configuration of towns, villages and attractions along the route of the rail line.
- **Conducting extensive community, local government and industry consultation** involving the cities and towns of Busselton, Bunbury, Boyanup, Donnybrook, Balingup, Bridgetown, Manjimup, Nannup and Perth Metropolitan Area.

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- **Researching historical precedents on the South West railway line (freight and tourist)** where such services had operated from 1891 until the early 2000s.
 - **Advocating for the use of zero emissions technology** thereby providing leadership in the decarbonisation of the Australian transport sector.

Feasibility Study Data Sources

- Ascertaining commuter data along the corridor using Regional Development Australia (RDA) South West fee for service access to Remplan.
- Ascertaining tourist visitation from Australian Trade and Investment Commission data, National Tourism Satellite Accounts, local authorities and organisations, including Bunbury Geographe Economic Alliance (BGEA), complemented by direct interaction with statistics experts at Tourism WA and the Australian Trade and Investment Commission to gain key data.
- Sourcing Australasian Railway Association's Value of Rail Report 2020.
- Estimating commuter, tourist visitation, economic input and growth based on a robust, conservative standard industry methodology.
- Comparing and correlating outputs from various data sources to ensure veracity of the final data.
- Input from extensive public consultation that included the cities of Bunbury and Busselton, and the towns of Dardanup, Balingup, Donnybrook, Bridgetown and Manjimup.
- Input from Rail Heritage Western Australia.
- Input from Regional Indigenous groups.
- Input from respected rail industry infrastructure experts on costings.
- Consultation with local rollingstock providers.
- Consultation with local tour operators.
- Consultation with senior and other State Government officials.

Outcomes of the Study

Proposed Services

- The proposed services would provide four trains daily each way and commence using the existing stations at Bridgetown, Donnybrook and Bunbury.
- Platforms need to be reinstated at Greenbushes, Balingup, Boyanup and Dardanup.
- BRG's preferred option is services operated by the PTA as it enables seamless integration with current and proposed PTA services and operations to Bunbury.

Projected Costs

- Cost of upgrading the track from Greenbushes to Bridgetown is estimated to be \$46.875 million the responsibility for which would be negotiated between Arc Infrastructure and the State Government.
- Four zero emissions battery railcars, based on repurposed surplus rollingstock, are estimated at \$32 million.
- Cost of quick recharging stations at Bunbury and Bridgetown is estimated at \$2 million.
- Cost of new and refurbished stations is \$12 million. Total costs \$92.875 million.

Projected Economic, Social, Environmental and Safety Outcomes

Analysis and modelling in this Feasibility Study indicate that:

- Patronage on the line would initially be in the order of 167,000 per annum and grow over a ten-year period to 283,000 per annum.
- After ten years, the railway operation will directly and indirectly contribute over \$72.2 million annually to the local economy and support over 499 direct and indirect jobs.
- The Net Present Value (NPV) of the economic contribution alone over 30 years using a 7% discount rate is \$927 million, and that figure does not include the accompanying delivery of significant employment, social, environmental, safety, and skilling benefits.
- The BCR for the transformational project is 5.7.
- Using data from the Australasian Railway Association's Value of Rail Report 2020, the zero emissions tourist and commuter railway in the first ten years, will reduce CO2 emissions by over 18,012 tonnes.
- Reduce the cost of motor accidents by over \$26 million.

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- Provide health benefits in excess of \$17 million.

The viability of the business case for the regional zero emissions, high-yield tourist and commuter rail service has been confirmed by detailed cash flow projections.

First Nations Economic Impact, Skilling and Employment

The Bunbury - Bridgetown rail corridor through to Manjimup (road interchange) which will benefit from the proposed tourist and commuter rail services, includes areas covered by two First Nations Noongar Regional Corporations: Gnaala Karla Booja and the Karri Karrak.

Recent significant initiatives spearheaded by the Noongar Economic Participation Steering Group working with the South West Aboriginal Land and Sea Council and the WA Government would realise the opportunities flowing from increased numbers of tourists, many of them internationals, who wish to visit and learn about areas under the stewardship of First Nations people.

A core objective of the Jobs and Skills Australia report, *The Clean Energy Generation: workforce needs for a net zero economy* (October 2023) is to provide workforce opportunities that are sustainable and equitably shared with all Australians, particularly communities impacted by decarbonisation and disadvantaged groups that were underutilised in traditional energy production.

Risk

The proposed investment will carry the same level of risk as other Government transport projects, as the technology proposed is currently already in service. Indeed, in many areas such as utilisation of battery technology in very large mining trucks and heavy haul mining locomotives, it is being spearheaded in Australia.

Consistency and Alignment with Federal and State Government Net Zero Decarbonisation Policies, Guidelines and Standards

This study:

- Provides a practical and replicable model for implementation of the *Transport and Infrastructure Net Zero Road Map and Action Plan*: (Department of Infrastructure,

Transport, Regional Development, Communications and the Arts May 2023: Net Zero in Government Operations Strategy 2023)(Note Consultation Road Map submissions closed 6 August 2024 so policy development in progress).

- Supports the key objectives of the WA Regional Development Framework, specifically Regional Liveability, Economic Development, Diversification and Innovation, Climate Resilience and Low Carbon Transition, Aboriginal Empowerment and Prosperity, and Organisational Excellence (October 2023).
- Identifies present and future employment and education and training needs articulated in *The Clean Energy Generation: workforce needs for a net zero economy*: Jobs and Skills Australia (October 2023).
- Supports Regional Equity: Extension of Government investment in rail infrastructure in this part of the South West would enable the realisation of a substantial latent tourism industry based on scenic rail journeys through environments and places blessed with multiple attractions. The extended rail services would also further strengthen existing tourism businesses and provide greater access to regional medical, employment and social services for commuters.
- Leverages off existing and planned track, road and airport infrastructure in the South West Region and its connectivity to the Perth Metropolitan Region and to Capital City hubs on the East Coast of Australia.
- In the longer-term, has factored in potential high-yield tourism markets entering via direct international services into Busselton Margaret River Airport from Asia-Pacific hubs and beyond.

Conclusion

The zero emissions tourist and commuter services along the Bunbury to Bridgetown corridor as proposed in this Feasibility Study are designed to deliver maximum economic, employment, social, environmental, safety, and skilling benefits to the South West Region of Western Australia.

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1. Background

The Balingup Rail Group (BRG) is a community based group formed to advocate and promote to Government the need to reinstate the railway line between Greenbushes and Bridgetown to enable tourist and commuter trains to operate and “value add” on the Bunbury to Bridgetown line following any proposed upgrade of the line to Greenbushes to transport lithium ore.

1.1 Commissioning the Feasibility Study and Business Case

BRG commissioned this Feasibility Study and Business Case with the aim of consulting with communities, commerce and industry across the South West and in the Perth Metropolitan Area to identify and document:

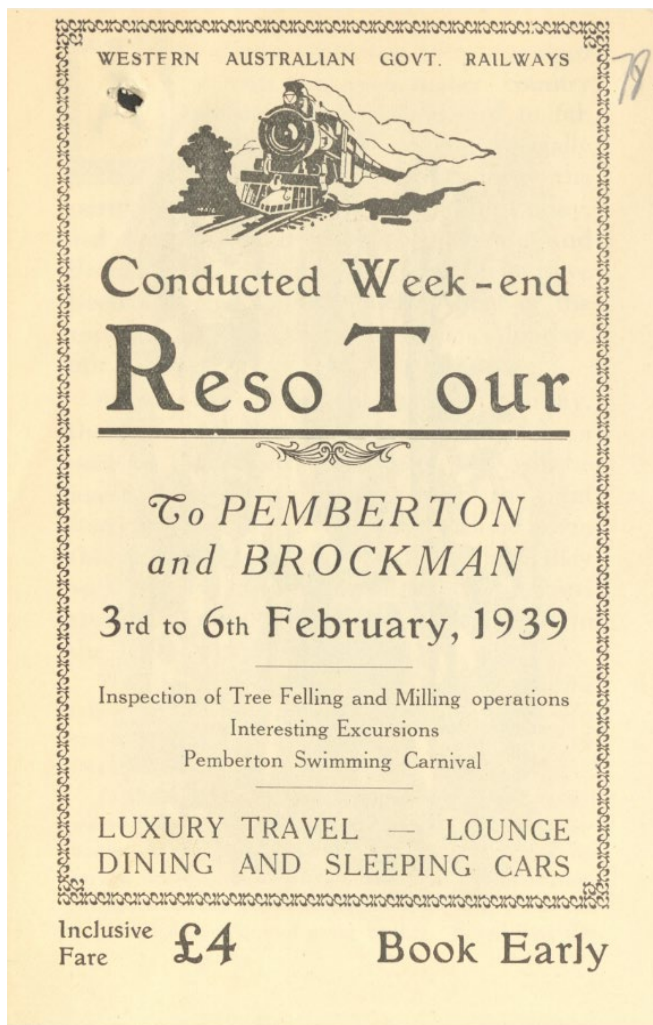
- the scope of the proposed high yield tourism and commuter services
- service options (e.g. type, frequency)
- possible scheduling for both tourist and commuter services
- proven options now available for zero emissions rail
- direct social, economic, environmental and other benefits to South West communities.

Following development of the Feasibility Study and Business Case, BRG will identify and work with key stakeholders to successfully promote its aims.

1.2 History – a Legacy of Successful Tourist Train Operations

The line from Bunbury to Bridgetown, completed in 1898, forms part of the original Bunbury to Northcliffe railway completed in 1933.

Since being built, the line has attracted significant numbers of tourists due to its natural beauty and the concentration of pretty villages along the line, including Dardanup, Boyanup, Donnybrook, Balingup, Greenbushes and Bridgetown which are all now established towns and tourist destinations.



The State Government, seeking to encourage a better understanding of the importance of the regions, instigated Reso Trains, in the period before the Great Depression in the 1930s. The trains did not operate during the Depression, but given their importance, they recommenced in 1939. The trains were specially operated for promotional and social events, primarily aimed at showcasing the State's agricultural and industrial productive capability and the attractiveness of Western Australia's regions.

The adjacent poster shows a promotion for a Reso train operated to Pemberton and Brockman.

The Reso trains departed Perth early evening on a Friday night to enable workers to leave work and join the train at Perth station. They returned to Perth on Monday morning in time for passengers to commence work on Monday morning. The trains were self-contained and consisted of kitchen and dining cars, sleeping cars, and sitting cars. The majority of the trains operated to the South West of the State.



The adjacent poster shows a promotion for a Reso train operated for the Apple Festival at Bridgetown in 1962 which attracted over 15,000 people.



In addition to the dedicated Reso trains, vintage trains hauled by heritage steam locomotives were also successfully operated. The adjacent photograph shows one of those trains in 1974 hauled by the Leschenault Lady at Donnybrook Station.

When the Western Australian Government Railways policy changes resulted in discontinuation of Reso Trains in 1972, Hotham Valley Railway, a volunteer based tourist and heritage railway, commenced successfully operating similar trains. Such was their success that in April 1990 they operated the longest narrow gauge passenger train to run in Western Australia, which comprised 22 carriages and accommodated 1,228 passengers. The train ran from Perth to Balingup for the inaugural Balingup Small Farm Field Day. A photograph of that train is shown below.



Hotham Valley Railway continued to operate trains on the Bunbury-Pemberton Line until the early 2000s when a strategic change driven by network issues, not a decrease in demand, resulted in the railway focusing operations on their own branch line, separate from the then franchised rail network. What the above history demonstrates is that the railway line is very attractive as a tourist offering and previous tourist rail operations have been commercially successful. There are major events and attractions in all towns on the line and beyond which attract significant numbers of tourists throughout the year.

Current tourism entrepreneurs operating tourist rail packages based on the PTA services (the Merredin Link, Avon Link, the Prospector and the Australind) would immediately extend like packages to the 'Blackwood Link'. See Attachment 1: Example of Package Tour.

2. Feasibility Study and Business Case

The Group commissioned Linqage International to develop a Feasibility Study and Business Case for the zero emissions tourist and commuter railway. The Group noted the need to highlight the very strong alignment with Government Regional Development Framework priorities including Economic Development, Diversification and Innovation. *“Diversification must leverage existing strengths in resources, primary industries and tourism, and seek to develop and support new industries and careers.”¹*

2.1 Participating Organisations

The Feasibility Study and Business Case is jointly funded by the:

- Balingup Progress Association (BPA)
- Talison Lithium Greenbushes
- City of Bunbury
- Shires of Dardanup and Capel
- Shire of Donnybrook–Balingup
- Shire of Bridgetown-Greenbushes.

The joint funding reflects the widespread community, local government, and industry support for the proposed zero emissions tourist and commuter rail services.

2.2 Government Policy Principles Underpinning the BRG Feasibility Study and Business Case

The Group identified a number of key policies that would underpin the study.

They were:

- Alignment with Federal and State climate change policies
- Alignment with the WA State Government Regional Development Framework priorities²:
 - Regional Liveability - underpinning labour market and community resilience.
 - Economic Development, Diversification and Innovation - Diversification must leverage existing strengths in resources,

¹ WA Regional Development Framework (October 2023) page 5

² WA Regional Development Framework (October 2023) prepared by Department of Primary Industries and Regional Development

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- primary industries, and tourism, and seek to develop and support new industries and careers.
- Climate Resilience and Low Carbon Transition – providing significant opportunity for diversification and job growth in the regions.
 - Aboriginal Empowerment and Prosperity – enabling regions to realise a “future in which all Aboriginal people, families and communities are empowered to live good lives and choose their own futures from a secure foundation.”³
 - Organisational Excellence – collaborative and co-operative delivery of regional development.
- Consideration of integrated transport planning principles, leveraging maximum community, commerce and industry benefits across the entire South West presented by the opportunities to be realised from:
 - the detailed recommissioning study titled Greenbushes to Bunbury Railway Line Feasibility Study (Cook Labor Government announcement 14 July 2023)
 - the potential high speed rail services linking Perth and Bunbury
 - the recent upgrade of the Busselton Margaret River Airport and commencement of interstate direct air services from Melbourne and Sydney (March 2024) and soon from Asia-Pacific hubs and beyond.
 - Alignment with “The Clean Energy Generation: Workforce Needs for Net Zero Economy”⁴ report. It underscores the critical role that workforce development will play in transitioning to a net zero economy and highlights the skills that will be in demand.

The Group also identified the opportunity for development of case studies in multiple zero emissions, rail-linked regional communities on the leadership required in the transition towards a net zero economy.

³ Aboriginal Empowerment Strategy – 2021-2029

⁴ The Clean Energy Generation: Workforce needs for a net zero economy October 2023 prepared by the Australian Government and Jobs and Skills Australia

3. Public Consultation

Balingup Rail Group has undertaken extensive community, industry, and local government consultation across the South West and in Perth.

3.1 Focus of the Public Consultation

The community consultation in the South West and Perth focused on:

- the scope of the study (zero emissions high yield tourism and commuter services)
- service options, the type of service and frequency
- possible scheduling for both tourist and commuter services
- proven options now available for zero emissions rail
- direct social, economic and environmental benefits to South West communities.

3.2 Public Consultation – the Meetings

Over 135 people attended eight public consultation meetings, each lasting in excess of two hours, in February 2024. Meetings were undertaken at

- Bunbury
- Boyanup
- Donnybrook
- Balingup
- Bridgetown
- Busselton
- Manjimup
- Perth.

The Group also met with the Warren-Blackwood Alliance of Councils in Nannup.

Key outcomes from the meetings were:

- There was a general view at all public meetings that the South West had been neglected in terms of public transport services. The overwhelming view was there is inadequate and ineffective public transport infrastructure along the corridor. The current bus service is very slow due to congestion and there are safety concerns as the main road has the highest accident rate in Western Australia.

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- Those at the meetings expressed a strong preference for rail over bus services. All attendees were critical of the decision to cut the Bunbury – Perth Australind rail service for a period of two years.
 - Those at the meetings agreed a three or four train per day service was required to facilitate passengers travelling along the corridor, spending time at their destination, and then returning to their point of boarding. Such a service was identified as being very beneficial for those attending medical or business appointments in Bunbury.
 - Those at the meetings recognised the significant economic, social and environmental benefits to the local towns that would be realised by the transformational project which include:
 - Reduced emissions as those who commute by car migrate to commuting by rail.
 - Increased visitation by tourists who will have the opportunity to transit in zero emission railcars along the corridor alighting as they wish in the centre of towns for short, medium or long stays.
 - The opportunity for local tourist operators and providers to increase the availability of eco-friendly tourism related products and experiences.
 - Improvements in the technological backbone along the corridor driven by commuter, tourist and rail service operational needs will provide greater digital connectivity.
 - Increasing social inclusion through improved connectivity as the commuter line will provide easy access to medical, disability, social and other services that are only available in Bunbury.
 - The ability of students to commute along the corridor to secondary, tertiary and vocational educational institutions.

-
- Increasing attractiveness for those seeking to live and commute along the corridor or work remotely with the option of commuting as required.
 - Improved liveability in towns along the corridor as traffic congestion decreases and air quality improves.
 - Some attendees indicated a preference for “request stops” for both commuters and tourists.
 - There was a general view that the economic, employment, social and environmental benefits of the tourist and commuter service would be far greater than the benefits of only removing freight from road to rail.
 - At Manjimup, the view was espoused that the younger generation is strongly supportive of any initiative to reduce their carbon footprint and that it should be much broader than just transport. The initiative should include eco-friendly hospitality, accommodation and tour service providers.

4. The Services

The service proposed is a zero emissions railcar service travelling between Bunbury and Bridgetown.

4.1 Timetable

A key service criteria identified in the public consultation was the frequency of services. The service should enable commuters and tourists to board a train at their closest station, travel to another station on the route, spend a reasonable amount of time at that destination, and then return to their original boarding station all on the same day.

To meet that criteria, three or four trains each day in each direction are required. To enable commuters from each terminus to arrive at their destination at the start of business, trains will be required to:

- depart simultaneously from each terminus, Bunbury and Bridgetown, at 7AM daily
- cross midpoint along the line
- arrive at the destination terminus approximately 2 hours after departure
- high speed recharge at the arrival terminus
- after an hour, commence the return journey
- the final evening service from Bunbury would be delayed by an hour to enable departure at 5 PM.

As required, additional units could be coupled to the consist to meet passenger demand.

The service would commence using the existing stations at Bridgetown, Donnybrook and Bunbury, with new platforms required at Greenbushes, Balingup, Boyanup and Dardanup.

4.2 Integration with Freight Services

It is understood that four dedicated ore trains will operate each way on the line from Bunbury to Greenbushes. Initial train path analysis shows a passing loop would be required at the approximate midpoint between Bunbury and Bridgetown for the commuter and freight services. Depending on the ultimate timing of freight services, additional loops may be required to accommodate both the freight and passenger paths. Such an arrangement on a single line is well within the capacity of the line to

accommodate the anticipated traffic.

The key inputs required to develop integrated train paths for freight and passenger traffic on the line are:

- Use of a modern automated train control system to facilitate optimal availability of paths and ensure safety.
- Timing of the freight movements, if they are spread over a 24 hour period, the number of freight paths required between 7 AM and 7 PM would be reduced.
- Freight movements would be between Greenbushes and Bunbury, initially freight would not operate to Bridgetown.
- The maximum speed and length of the freight trains.
- Allowance for greater acceleration and higher average section speed of the passenger trains.
- The relatively short length of the zero emissions passenger railcars.
- Future use of the line by charter passenger trains, especially those scheduled to operate in support of local events.

Detailed analysis shows that freight and passenger operations can be successfully integrated to meet the individual freight and passenger train path requirements, and equitable access to the railway network is overseen by the Economic Regulation Authority of Western Australia.

4.3 Operations – Meeting the Service Requirement

The preferred operational model is for the service to be operated by the PTA. It is assumed that the proposed service ('Blackwood Link') would be an extension of existing PTA rail services and operated by the PTA after negotiating access with Arc Infrastructure.

Such arrangements simplify Rail Safety Accreditation, insurance requirements, and provide economies in staffing and maintenance.

Analysis of potential cash flows demonstrates overwhelmingly the viability of the service.

Maintenance. Changes in technology will assist in maintaining the zero emissions battery railcars. Electromechanical technology for control and other systems is being replaced by solid-state technology which has greater reliability and lower cost. That technology is currently used on the Perth C Class suburban trains, and components of that technology would be utilised in the repurposed zero emissions railcars.

Routine light to medium maintenance for the zero emissions battery railcars could be conducted at the current stabling and maintenance facility at Picton. That facility was previously used to service the Australind carriage sets and would be suitable for such activities.

In order to facilitate deep maintenance and major rebuilds which will take place at the mid-point in the lifecycle of the railcars, the range of the railcars in battery mode is adequate for an empty zero emissions battery railcar to transit from Bunbury to join the Perth suburban network. The repurposed railcars should retain one pantograph on each set to enable transit over the Perth metropolitan network to a major maintenance facility in Perth.

A significant opportunity exists to combine the maintenance requirements of the zero emissions battery railcars with those of the new Australind, which will have similar solid-state technology, at a comprehensive facility in the region at Picton. Such a facility would enhance capacity at Picton and could also service the maintenance requirements for the diesel electric freight locomotives hauling the lithium ore from Greenbushes.

4.3.1 Charter/Heritage Trains and Tourist Packages

Charter Trains and Tourist Packages. Charter passenger trains may access the line using paths negotiated by the operator with Arc Infrastructure. In addition, tourist packages using the reservation of seats on regular passenger services may be expected. Modelling of such operations indicates that they are financially viable and provide significant support for key events and attractions. They include:

- Dardanup: Bull and Barrel Festival - held annually in October (20,000 people).
- Ferguson Valley - over 30,000 people annually visit:
 - Wineries, breweries
 - Gnomesville
 - Wellington National Park

-
- Art and Craft Galleries.
 - Boyanup: Rail Heritage WA South West Rail Heritage Centre Steamfest held twice annually each April and October (1,500 people).
 - Donnybrook:
 - Donnybrook Easter Apple Festival (15,000 people)
 - Apple Museum
 - Cherry Harvest.
 - Balingup:
 - Small Farm Field Day - held annually in April (10,000 - 12,000 people)
 - Medieval Carnival - held annually in August (10,000 people)
 - Telling Tales - a festival held annually in July (600 people)
 - Golden Valley Tree Park - open 365 days (85,000 visitations)
 - Bibbulmun Track,
 - Greenbushes:
 - Fun Run and Mountain Bike Event - held annually in May (300 competitors)
 - Eco-Cultural Discovery Centre
 - Lithium Mine Pit Look-Out,
 - Bridgetown:
 - Blues at Bridgetown - a major music festival held annually in November (12,000 people)
 - Blackwood Valley-Southern Forests Festival of Country Gardens: takes place in both autumn and spring across towns stretching from from Kirup to Pemberton (10,000 people)
 - Bridgetown in the Winter - a winter festival typically held annually in July (9,000 people)
 - Blackwood River Arts Trail.
 - Tours from Bridgetown:
 - Manjimup (Truffle Kerfuffle Festival, Truffle Farm Tours, Cherry Festival, Wineries, Craft Breweries)
 - Pemberton (Warren National Park, Gloucester Tree, Wineries, Chocolate and Fine Food Outlets)
 - Nannup (Tulip Festival, Music Festival, Craft Breweries)
 - Donnelly River Mill Village (Karri forest, roaming kangaroos and emus),

Heritage Trains. Rail Heritage WA has a significant investment at Boyanup, where the out of service Capel line joins the line to Bridgetown. As detailed above, the South West Rail Heritage Centre operates two key events annually to showcase its restored carriages and rollingstock. A key exhibit is the Leschenault Lady, a fully-restored steam locomotive. Presently it operates passenger trips within the confines of the Heritage Centre yard but it is the desire and intention of Rail Heritage WA to operate Leschenault Lady excursions on the Boyanup – Capel Line.



Leschenault Lady" Vintage Train at Dardanup station (c.1970) Photo: J Joyce; Rail Heritage,T04513

Rail Heritage WA has the largest number of heritage locomotives and carriages that could be available for charter use in Western Australia. Rail Heritage WA’s strategy is to continue developing the South West Heritage Centre and its exhibits. In the longer term, Rail Heritage WA heritage locomotives and rollingstock may be available for use along the corridor. Additionally, Rail Heritage WA has a long term strategic goal of operating a dedicated heritage railway between Boyanup and Elgin, a distance of approximately 10 kilometres.

4.4 On-Board Catering

The PTA currently provides excellent On-Board catering. Zero emissions railcars utilised for the service would necessarily include all associated passenger facilities, including toilets, luggage accommodation, and catering for food and beverages.

4.5 Volunteer Guides

The significant proportion of tourist passengers lends itself to the utilisation of volunteer tour guides located on-board the train to enhance the visitor experience by providing a

commentary on places of interest and answering questions. Successful tourist railways such as the Taieri Gorge Railway in New Zealand, the Puffing Billy Railway and Steamrail in Victoria utilise volunteers in that role. Recruitment and co-ordination of on-board volunteers could be undertaken by local tourism industry groups in conjunction with the service operator.

4.6 Future Extensions of the Service

Manjimup. Once established, consideration should be given to extending the tourist and commuter services to Manjimup. Such an extension would significantly add to patronage as Manjimup is a major tourist and commercial hub. BRG has undertaken extensive public consultation in Manjimup related to the proposed services and there is support for a future extension to Manjimup.

Bunbury. Services will terminate at the current rail terminus in Bunbury, which was built in 1985 to relieve congestion in the city. The original station is approximately 4 kilometres to the North West and is located in the city’s Central Business District. The Town Plan for the City of Bunbury reserves development of a train terminal on an existing rail line that runs from Picton Junction to Koombana Bay. Such a development would place the passenger rail terminus adjacent to the Central Business District.



The nature of zero emissions railcars is that they operate independently of overhead power supply infrastructure. Opportunity exists to utilise a shuttle in a manner similar to trams, thus extending the service back to the original Bunbury railway station on a light rail line embedded in the centre of the road. It would significantly improve connectivity for commuters and tourists. The diagram above shows a possible route.

5. Project Scope and Costs

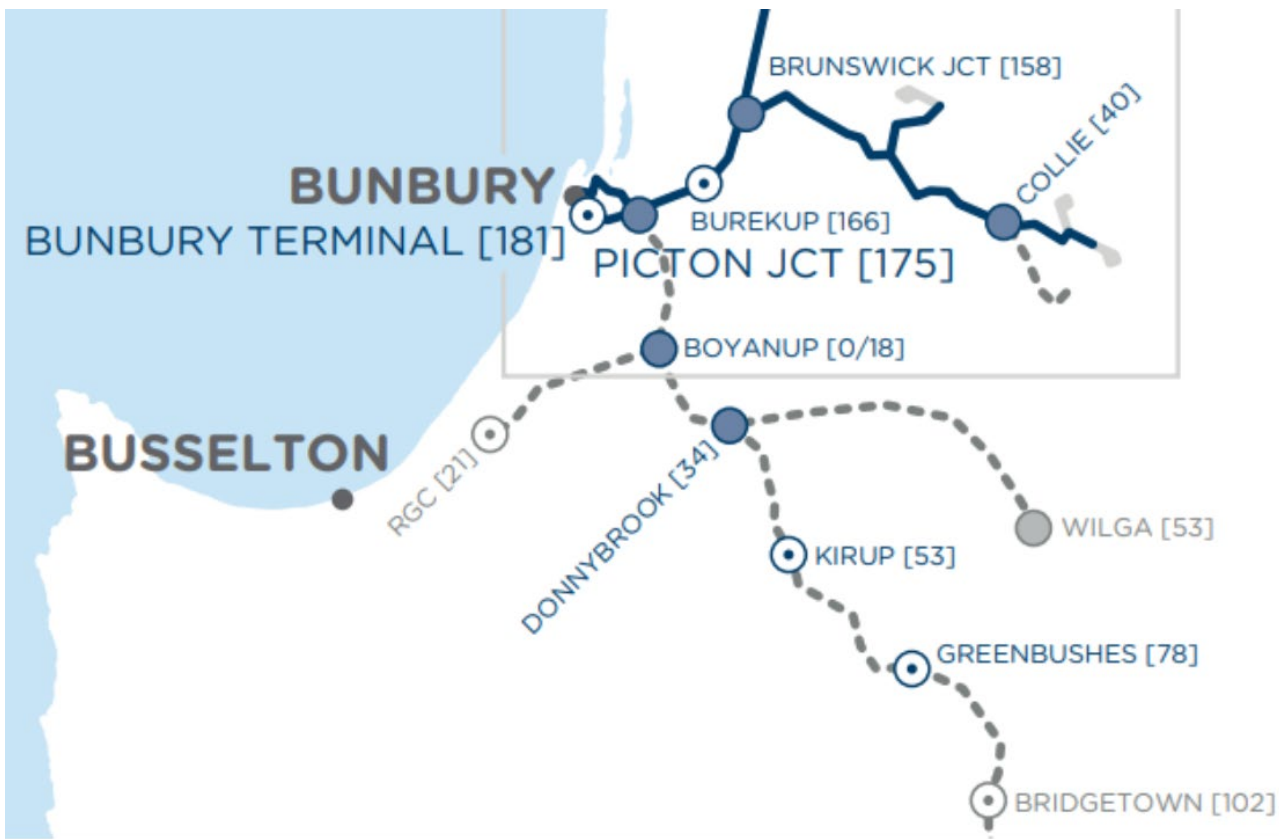
5.1 Track Upgrade

5.1.1 Track – Background

The section of track from Greenbushes to Bridgetown was upgraded in 1980 to facilitate the transport of timber from Lambert, near Manjimup, to Bunbury. In 2005, the line was closed and the timber traffic reverted to road transport.

The line from Bunbury to Greenbushes is currently shown as being part of the Arc Infrastructure network but is not in use.

The Greenbushes to Bunbury Railway Line Feasibility Study⁵ is being progressed to evaluate the feasibility, costs, and potential benefits of restoring the rail line from Greenbushes to Bunbury to support the growing lithium mining industry and other regional freight needs.



Early initial costings based on previous estimates of comparable work, indicated the cost

⁵ Greenbushes to Bunbury Railway Line Feasibility Study (Cook Labor Government announcement 14 July 2023)

of refurbishing the 24 kilometres from Greenbushes to Bridgetown at \$39 million. That comparable work was based around replacing the existing life expired sleepers with wooden sleepers, however, in Western Australia there is very limited supply of wooden sleepers.

Industry experts advise that the best information on which to base the estimate of costs for refurbishing the line from Greenbushes to Bridgetown is the 2020 Agonis Group Tier 3 Grain Lines Engineering Review Report.

Agonis Group Report⁶

The report addressed the need for upgrades and maintenance on the Tier 3 rail lines to meet the operational requirements for transporting grain. A significant focus was replacing the deteriorating timber sleepers with more durable low-profile concrete sleepers. The report found that:

- Of the existing timber sleepers, at least 75% require replacement as timber sleepers are prone to decay and require regular monitoring and maintenance.
- The sections containing 1:4 or 1:2 steel / timber sleepers, often combined with 60lb or 63lb rail, had become fouled and require significant maintenance.
- Low-profile concrete sleepers are significantly more durable than timber sleepers, reducing the need for frequent replacements and maintenance. They provide a cost-effective solution over the 30-year life of the project.
- The cost of low-profile concrete sleepers is lower compared with treated timber sleepers when considering the full lifecycle costs, including replacement and maintenance.

5.1.2 Developing Detailed Track Upgrade Costings

Detailed costings for upgrade of the Greenbushes to Bridgetown section of the railway line would require commissioning of a study similar to the “Greenbushes to Bunbury Railway Feasibility Study”⁷ currently being progressed.

The report would provide a detailed scope, schedule and cost of works including:

- Comprehensive initial assessment of current condition of track infrastructure, including rails, sleepers, ballast, and formation to update asset registers for

⁶ Agonis Group Tier 3 Grain Lines Engineering Review Report September 2020

⁷ Greenbushes to Bunbury Railway Line Feasibility Study (Cook Labor Government announcement 14 July 2023)

bridges, culverts, and other significant infrastructure components.

- Track structure and formation upgrades to prioritise replacement of deteriorated timber sleepers with low-profile concrete sleepers and an assessment of the condition of existing metal ballast.
- Structural assessment of bridges and culverts for replacement or rehabilitation.
- Setting clear minimum operating standards, such as axle load limits and maximum train speeds.
- Bridgetown level crossing analysis utilising the Australian Level Crossing Assessment Model (ALCAM). The change in use for the line between Bunbury and Greenbushes and from Greenbushes to Bridgetown from dedicated freight to mixed use freight and passengers will result in a changed risk profile that will impact on the ALCAM outputs. There may be costs associated with additional active protection measures.
- Environmental and community considerations to address access management and construction issues.
- Use of modern technology for reconstruction processes and systems to monitor real-time data for maintenance of the infrastructure post-upgrade.

5.1.3 Order of Magnitude Costs

In the absence of such a detailed study, an order of magnitude cost with accuracy of plus or minus 25% has been calculated based on advice from industry experts and utilising information gleaned from the Agonis Group report⁸. Costs have been calculated utilising the following parameters:

- Use of low-profile concrete sleepers.
- Cost per metre is \$1,875 (The 2020 cost of \$1,500 per metre adjusted by 25% to reflect increases over the 4 year period).
- 25 kilometres of line to be refurbished including a passing loop.

The total cost of track refurbishment based on the above is \$46.875 million.

⁸ Agonis Group Tier 3 Grain Lines Engineering Review Report September 2020

5.1.4 Station Costs

The service would commence using the existing stations at Bridgetown, Donnybrook and Bunbury and those stations would require some refurbishment. For the other stations, simple “halts” would be required based on a platform to accommodate 6 car trains with solar panels powering platform lighting. As demand ramps up, consideration should be given to the construction of “park and ride” car parks. \$12 million has been allowed for construction of the “halts” and refurbishment of stations.

5.2 Zero Emissions Railcars

Review of current zero emissions railcars around the world indicates that battery railcars utilising fast charging technology are more cost effective and operationally easier for trips that equate to the distance from Bunbury to Bridgetown. Hydrogen fuelled railcars with a fuel cell to convert the hydrogen to electricity have operational benefits when ranges exceed 150 kilometres. For Bunbury to Bridgetown, zero emissions battery railcars would be the preferred option.

Use of zero emissions battery railcars would require quick recharging stations to be built at Bunbury and Bridgetown and are estimated to be \$1 million each. Use of zero emissions hydrogen railcars would require one recharging station to be built at either Bunbury or Bridgetown at an estimated cost of \$5 million. All costs have a plus or minus 25% variability.

5.2.1 Battery Railcars

Attachment 2: Battery and Hydrogen Powered Railcars provides details of recent zero emissions battery and hydrogen powered railcar purchases with capabilities and costs. Analysis of trends overseas indicates that a preferred option for Government consideration is repurposing of the A Class series trains currently being retired from operation on the PTA Perth Network into battery railcars. Such a conversion took place in the UK where Class 379 Electrostar Electric Multiple Units (EMU) were converted to Independently Powered Electric Multiple-Units by Bombardier⁹, now Alstom.

Examples of Alstom’s experience in the repurposing and refurbishment of railcars are set out in Attachment 3: Alstom Case Studies.

⁹ Railway Technology “Independently Powered Electric Multiple-Unit (IPEMU) January 2015

The table below shows a comparison between the Class 379 and an A Class EMU.

Feature	UK Class 379 Electrostar	PTA WA A Class
Manufacturer	Bombardier Transportation (Alstom acquired Bombardier in 2021)	Walkers Limited
Years of Manufacture	2010-2011	1991-1999
Number Built	30 trainsets	48 trainsets
Train Composition	4-car trainsets	2-car sets, can be coupled to form 4-car sets
Car Body Construction	Aluminium	Stainless steel
Train Length	80 metres for a 4-car set	Each carriage 24.88 metres long
Width	2.80 metres	2.9 metres
Height	3.78 metres	3.81 metres
Maximum Speed	160 km/h (100 mph)	110 km/h
Weight	Not specified	Each 2-car set weighs approximately 92 tonnes
Traction Motors	3-phase AC induction motors	AC traction motors
Total Power Output	2.24 MW (4 cars)	Not specified
Power Supply	25 kV AC overhead	25 kV AC overhead
Acceleration	1 m/s ²	Not specified
Passenger Capacity	Approximately 209 seated passengers	Approximately 228 seated passengers
Standing Capacity	Not specified	Around 291 passengers per 2-car set
Accessibility	Accessible with spaces for wheelchairs	Accessible with spaces for wheelchairs
Facilities	Air conditioning, Wi- Fi, power sockets, on- board info. systems	Air conditioning, CCTV, passenger info. systems
Safety Systems	Not specified	Fitted with PTA protection system used on the network
Service Routes	Initially deployed on Stansted Airport services and other regional routes	Perth PTA Network



Comparison shows the similarities between the two EMU designs, including dimensions, traction motors and passenger facilities, that would facilitate repurposing of the A Class EMUs shown above to Independently Powered Electric Multiple-Units (IPEMU).



The repurposed UK Class 379 IPEMU shown above have the following characteristics:

- Battery Technology - The train was fitted with lithium iron magnesium phosphate (LiFeMgPO₄) batteries.

-
- Battery Capacity - The batteries provided enough capacity to cover non-electrified sections of track.
 - Charging - The batteries could be charged from overhead wires when running on electrified tracks and through regenerative braking.
 - Range on Batteries - Approximately 50-60 miles (80-100 km.) on battery power alone.
 - Battery Placement - Batteries were installed under the floor and in the former pantograph well.
 - Weight - Additional weight due to batteries was managed to maintain operational performance.
 - Speed - Maximum speed remained at 100 mph (160 km/h).
 - Operation - Capable of switching seamlessly between battery power and overhead electrical supply.

The IPEMU underwent rigorous testing on the UK Manningtree to Harwich branch line and other routes where battery life, charging times, and the train's ability to operate reliably on non-electrified sections was verified.

Passenger features include full accessibility, air conditioning, Wi-Fi, and power sockets being retained. The environmental impact was significant as there was a major reduction in greenhouse gas emissions, and additionally, battery operation resulted in quieter journeys that were especially beneficial in urban and suburban areas.

The unit cost of the conversion is not available, but based on publicly available cost information for battery locomotive technology elsewhere the cost would be approximately \$8 million per unit.

Maintenance costs would be less than the existing A Class EMU, in addition to battery change out costs of approximately \$500,000 every 15 years.

Summarising the above, the repurposed Class 379 IPEMU offers an exemplar for repurposing the PTA A Class EMU as they are taken out of service. A further benefit that would lower the risk is the involvement of Alstom, a company that has a significant presence in Western Australia. See Attachment 3: Alstom Case Studies.

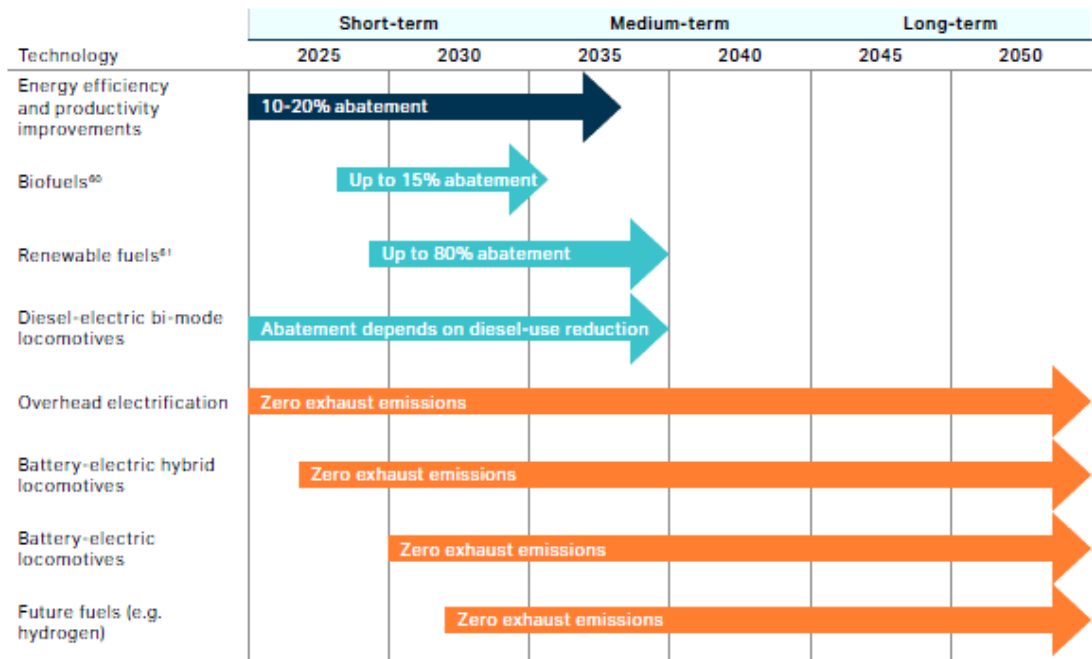
5.2.2 Hydrogen Powered Railcars

The Western Australian Renewable Hydrogen Strategy Mission Update December 2022 details one of the four 2030 goals is the use of renewable hydrogen as a significant fuel source for transportation, particularly in regional Western Australia. Review of the strategy shows most of the focus is on road transport and heavy road vehicles for the mining industry.

Informal discussions with rail rollingstock providers indicate the Western Australian Government has looked at the use of hydrogen power for the next generation of trains for the Perth - Kalgoorlie service. There are no publicly available details.

Use of hydrogen powered railcars for the Bunbury - Bridgetown tourist and commuter service has been considered, however, the higher cost and restrictive operational flexibility compared with battery railcars makes hydrogen less attractive. The high cost of hydrogen powered railcars is outlined in the most recent uses of hydrogen in rail that are detailed at Attachment 2: Battery and Hydrogen Powered Railcars.

The diagram below from the Australasian Railway Association report “Critical path to decarbonise Australia’s rolling stock – Transitioning the rail industry and its supply chain” prepared by GHD in July 2024 reflects the likely suitability and commercial availability of zero emissions technology. It confirms battery electric technology is more advanced in the short, medium and long term than hydrogen technology.



5.2.3 Railcar Costs

There is a vast array of zero emissions motive power options available for the service.

Cost and performance parameters show that for the service proposed, battery technology is the preferred option.

Indeed, the cost and performance parameters are significantly improving as highlighted by advances in battery technology such as the recently reported Hitachi Rail Next Generation Battery Technology that reduces battery sizes by 40% and improves energy density by 22%¹⁰.

Of the battery options available, repurposing of the PTA A Class EMUs as they are retired from service on the Perth suburban service would be the preferred option, especially given Alstom, the company that has undertaken equivalent work in the UK, also has a major presence in WA.

The estimated cost, with an accuracy of plus or minus 25%, of repurposing 4 PTA A Class EMU to battery electric railcars is \$32 million. In addition, \$2 million would be required to provide 1 charging point at Bunbury and 1 charging point at Bridgetown giving a total cost of \$34 million.

5.3 Total Cost

Total cost for the project is shown in the table below:

Project Element	Cost
Track Upgrade	\$47 million
4 Zero Emissions Battery Repurposed Railcars	\$32 million
Station Construction and Refurbishment	\$12 million
2 High Capacity Charging Units	\$2 million
Total	\$93 million

The estimated costs have an accuracy of plus or minus 25%.

¹⁰ Railway-News Hitachi Rail Develops Next-Generation Battery Technology 18th September 2024

6. Patronage

6.1 Data Sources

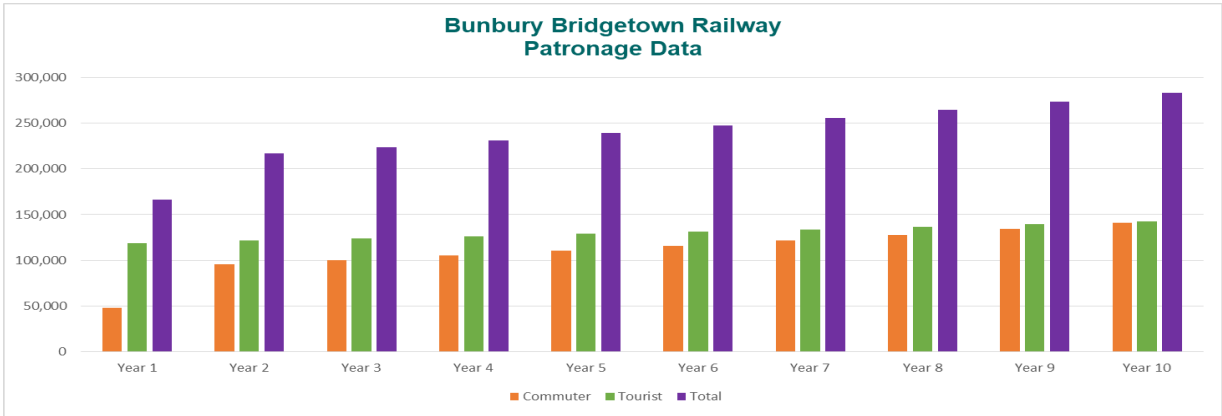
Extensive analysis of statistics from the following data sources was undertaken to ascertain the tourist and commuter patronage, economic input, growth, and other key variables required to progress the study.

Initially, critical data about Local Government Area Profiles (LGA Profiles) from Tourism Research Australia (TRA) was utilised. That data was from 2019 and considered outdated. A senior statistician at TRA was contacted regarding generation of current LGA Profiles. TRA indicated that a lack of post Covid-19 data was impacting on the generation of new figures. TRA did however provide the consultants with limited raw data.

In the absence of definitive LGA Profiles, the consultants liaised directly with the Executive Director Strategy and Engagement at Tourism Western Australia, his statisticians, the Regional Development Australia (RDA) South West Regional Economic Planner and the Tourism Manager at Bunbury Geographe in order to compile a comprehensive data set that forms the basis of this report.

6.2 Patronage Details

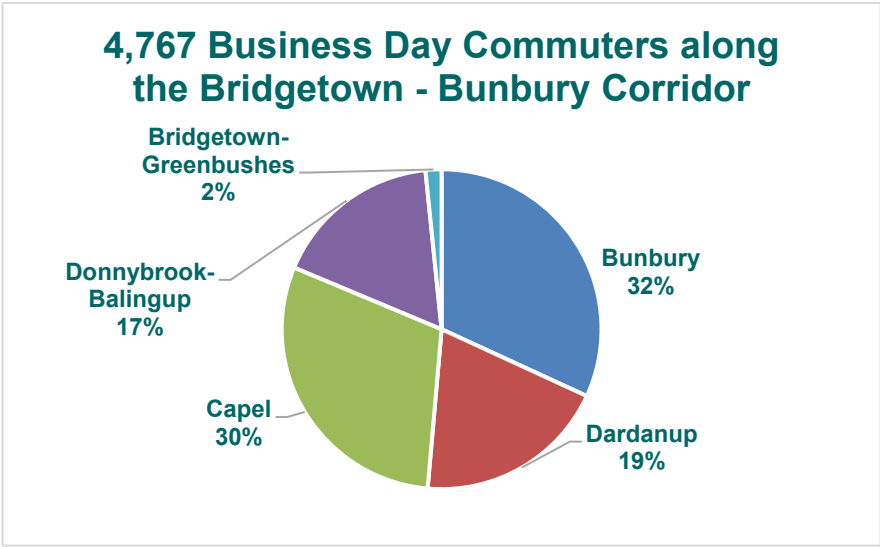
Utilising conservative projections, analysis indicates that annual patronage, the combined number of commuters and tourists travelling would initially be in the order of 167,000 per annum and grow over a ten year period to 283,000. Patronage data is shown graphically below.



6.2.1 Commuter Patrons

As detailed earlier, commuter numbers are based on Remplan data provided on a fee for service basis by RDA South West.

That data showed the 4,767 workers commuted daily along the Bridgetown to Bunbury corridor in 2023. It was assumed that only 5% or 1 in 20 commuters would use the service in Year 1 with take up increasing to 10% in Year 2 onwards. Commuter numbers for Capel and Dardanup were adjusted to reflect the substantially lesser number of commuters that would be within reach of the corridor. Commuter numbers conservatively grow from 48,000 in Year 1 to 141,000 in Year 10 using 5% growth annually after Year 2. The diagram below shows commuter numbers in Year 1.



6.2.2 Tourist Patrons

Tourists encompass domestic day trip visitors, domestic overnight visitors, and international visitors, including many travelling on first-class, bespoke high yield tours. Those tours will not only include destinations along the line, but will extend to include Nannup, Manjimup, Pemberton and the Karri forests.

The new service will also dovetail into potential high speed rail services linking Perth and Bunbury, future Busselton – Bunbury connections, and the important gateway to Margaret River.

The Busselton Margaret River Final Airport Masterplan¹¹ states that the airport will host approximately 200,000 inbound passengers from interstate and overseas in 2024 growing to approximately 420,000 by 2034. The catchment area of the airport, shown in the Masterplan, is detailed below:



Analysis to establish market trends, segmentation and size was undertaken. The 2023 International, Domestic Overnight and Domestic Day tourist visitation figures are shown below by Local Government Area.

LGA 2023 Visitation Data	International	Domestic Overnight	Domestic Day	Total
Bunbury	21,000	482,000	1,159,142	1,662,142
Capel	1,680	33,979	48,107	83,766
Dardanup	1,680	35,238	56,124	93,042
Donnybrook-Balingup	2,520	67,958	100,795	171,273
Bridgetown-Greenbushes	1,680	103,196	53,834	158,709
Manjimup	15,000	260,507	145,465	420,972
Total	43,560	982,877	1,563,467	2,589,904

¹¹ Final Airport Masterplan Busselton Margaret River Airport January 2024 prepared by LEAPP and three Consulting

A total of 2.59 million people visited the LGAs along the corridor in 2023.

Patronage figures were developed based on 5% of tourists visiting towns along the corridor utilising the train. For Manjimup a figure of 2.5% was utilised reflecting the need for visitors to utilise both rail and road.

The resulting patronage in Year 1 becomes 119,000 people. A conservative 2% annual growth figure was utilised to project tourist patronage of 142,000 in Year 10. A 2% growth rate was utilised, as visitation has yet to normalise post Covid-19, especially with respect to International Visitors. The graph in Section 6.2 Patronage shows the growth in tourists over the decade.

6.2.3 Tourist Patronage - Comparison with Other Tourist Railways

The projected tourist patronage growth to 142,000 in Year 10, is very conservative by national and international standards, as shown by the annual patronage figures for Australian and international tourist railways detailed below:

- Queensland Rail tourist rail experience that operates from Cairns to Kuranda has annual patronage of 400,000.
- Puffing Billy Railway in Victoria has annual patronage of 300,000 in 2024. It will return to its pre Covid-19 patronage of 500,000.
- North Yorkshire Moors Railway in the UK has annual patronage of 350,000.
- Strasburg Railway in the US has annual patronage of 300,000.
- Bluebell Railway in the UK has annual patronage of 175,000,
- Fort William to Mallaig Railway in Scotland has annual patronage of 200,000.

7. Economic and Employment Benefits

7.1 Economic Input

As detailed in the previous section, analysis indicates that patronage on the line would initially be in the order of 167,000 per annum and grow over a ten year period to 283,000. At that time, the railway operation will directly contribute over \$48.1 million annually and indirectly contribute over \$24.1 million to the local economy, with the total contribution annually in ten years being \$72.2 million annually.

Direct and indirect economic contribution ratios were supplied by statisticians at Tourism WA.

7.2 Employment

The economic contribution will support in ten years over 301 direct jobs and 198 indirect jobs, a total of 499 jobs.

Direct and indirect employment ratios were drawn from the WA Satellite Tourism Accounts for 2023.

7.3 Economic Input to LGAs

Outcomes of the analysis show that \$72.2 million will be the annual economic input by Year 10. The split by Local Government Areas is shown below.

LGA Economic Contribution	Direct Contribution	Indirect Contribution	Total Contribution
Bunbury	\$31,049,132	\$15,524,566	\$46,573,698
Capel	\$1,835,863	\$917,932	\$2,753,795
Dardanup	\$1,970,431	\$985,216	\$2,955,647
Donnybrook - Balingup	\$3,632,940	\$1,816,470	\$5,449,410
Bridgetown - Greenbushes.	\$3,970,563	\$1,985,281	\$5,955,844
Manjimup	\$5,643,777	\$2,821,888	\$8,465,665
Total	\$48,102,705	\$24,051,353	\$72,154,058

7.4 Employment Input to LGAs

Analysis showing 301 direct jobs and 198 indirect jobs are the employment benefits by Year 10 which has been split by Local Government Areas as shown below.

LGA Employment	Direct Employment	Indirect Employment	Total Employment
Bunbury	194	128	322
Capel	11	8	19
Dardanup	12	8	20
Donnybrook - Balingup	23	15	38
Bridgetown - Greenbushes	25	16	41
Manjimup	35	23	59
Total	301	198	499

7.5 Net Present Value of Economic Benefits over 30 Years

The Net Present Value of the economic input alone to the local economy utilising a 7% discount rate over 30 years is \$927 million.

The table below shows NPVs of the economic benefits over 30 years at various discount rates of 3%, 5%, 7% and 9%.

Discount Rate	3%	5%	7%	9%
Net Present Value of the Economic Benefits	\$1,630,035,983	\$1,210,275,850	\$926,975,555	\$730,665,049

When the substantial quantum of economic benefits alone is compared with the relative investment cost of \$93 million, it presents a value-for-money opportunity to fund a transformational project. It should be noted that it will also deliver maximum employment, social, environmental, safety, and skilling benefits that have not been factored into the above calculation.

7.6 Benefit Cost Ratio (BCR)

The BCR for this transformational project is 5.7 derived from Present Value Benefits of \$1.045 billion and Present Value Costs of \$182.2 million using a discount rate of 7%.

7.7 Benefits for those with a Disability

The zero emissions railcars will have accessibility features that improve access for those with a disability.

Those living with a disability along the corridor will benefit as they can access improved services and opportunities in Bunbury including:

- Improved health and well-being due to specialised medical services.
- Enhanced employment opportunities as there are a number of providers in Bunbury offering tailored employment services.
- Increased social inclusion as training and employment fosters social interaction, community participation and reduced feelings of isolation.
- Access to skills development opportunities that will impart new skills and improve existing skills to enhance employability and personal growth.
- Opportunity to engage with support networks, including peer groups and disability advocacy organisations fostering a supportive and inclusive community.

7.8 First Nations – Economic Benefits

The Bunbury – Bridgetown rail corridor and Manjimup, which will benefit from the proposed tourist and commuter rail services, include areas covered by two First Nations Noongar Regional Corporations: Gnaala Karla Booja and the Karri Karrak. Each corporation represents a specific area within the broader Noongar nation.

- The Gnaala Karla Booja Aboriginal Corporation covers the Northern part of the rail corridor.
- The Karri Karrak Aboriginal Corporation (South West Boojarah) covers the Southern part of the rail corridor.



The two corporations are members of the Noongar Economic Participation Steering Group, formed as part of the broader framework established by the South West Native Title Settlement, which focuses on enhancing economic participation and opportunities across the Noongar region.

The Steering Group collaborates with the South West Aboriginal Land and Sea Council and Western Australian Government agencies to drive and implement initiatives to ensure the economic benefits of the settlement are maximised for the Noongar community. The framework aims to support Noongar business growth, increase employment opportunities, and foster joint ventures between Noongar and non-Noongar enterprises.

The framework aims to support economic development and the growth of Noongar businesses across the South West region which includes the Bunbury – Bridgetown rail corridor. It includes initial projects and deliverables for the WA Government to progress, focused on business capacity building, government tendering support, and the promotion of early engagement between WA Government agencies and Noongar businesses.

Currently, the framework is establishing the necessary legal, operational and implementation structures to deliver detailed community development activities, including business capacity building.

A tourist and commuter railway operating in the Bunbury – Bridgetown corridor, initially carrying 167,000 tourists and commuters per annum and growing over a ten year period to 283,000 that will directly and indirectly contribute over \$72.2 million annually to the local economy and support over 499 direct and indirect jobs, will underpin implementation of the settlement framework.

Specifically, the railway will streamline access by visitors and others to Noongar lands and significantly increase the numbers of tourists engaging with Noongar enterprises.

8. Environmental and Other Benefits

8.1 Environmental Benefits

As detailed in Section 2.2, Government Policy Principles Underpinning the BRG Feasibility Study and Business Case, the outcomes of the study strongly align with Federal and State climate change policies and WA State Government Regional Development Framework priorities¹².

8.1.1 Federal Environmental Policy and Strategy

The Federal Government of Australia's climate change policies are centred on achieving net zero emissions by 2050 and an interim target of a 43% reduction in emissions from 2005 levels by 2030. The Climate Change Act 2022 mandates regular reporting and transparency, and also implementation of the Safeguard Mechanism to cap emissions from large industrial polluters.

The Government's Net Zero Plan¹³ emphasises renewable energy expansion, targeting 82% renewable electricity by 2030, and advancing technologies like green hydrogen and electric vehicles. Additionally, the plan supports sector-specific strategies across electricity, transport, industry, agriculture, and land use to ensure comprehensive emission reductions across the economy. Australian States and Territories have committed to achieving net zero emissions by 2050, with interim targets set to drive progress.

State and Territory policies focus on key sectors, including:

- a 55% renewable energy target by 2030
- increasing the adoption of electric vehicles
- enhancing energy efficiency in buildings
- addressing emissions in industry, transport and agriculture.

The efforts are complemented by the Federal Net Zero Plan, which sets out a comprehensive strategy to guide the transition to a low-carbon economy, fostering innovation and investment in clean energy technologies. The importance of the development of rail travel to accomplish Net Zero has been acknowledged in UK and Australian commentary.^{14 15}

¹² WA Regional Development Framework October 2023 prepared by Department of Primary Industries and Regional Development

¹³ Australia's Long-Term Emissions Reduction Plan (2021) prepared by the Department of Industry, Science, Energy and Resources

¹⁴ *UK to Net Zero Requires 20% Increase in Rail Travel*, Trainline Reports Railway-News.com 6 March 2024

¹⁵ *The Conversation We compared land transport options to getting to Net Zero. Hands down electric rail is the best* 29 July 2024

8.1.2 WA State Government Environmental Policy and Strategy

The WA State Government's Climate Change Policy and Legislation¹⁶ outlines the priority action areas and practical actions the State Government is taking to enhance climate resilience and support the low-carbon transition. The action areas relate to:

- clean manufacturing and future industries
- transforming energy generation and use
- storing carbon and caring for the landscapes
- lower-carbon transport
- resilient cities and regions
- Government leadership.

The State Government's strategy to implement its comprehensive emission reduction policies are aimed at achieving net zero emissions by 2050. The strategy includes:

- Climate Change Policy and Legislation, detailed above, which outlines practical actions across key areas such as transforming energy generation, promoting clean manufacturing, and enhancing lower-carbon transport.
- The Sectoral Emissions Reduction Strategy (December 2023), details priorities and tangible actions for reducing emissions across major sectors including electricity, industry, transport, agriculture, and waste.

The State legislative framework is designed to ensure accountability, encourage investment, and support the transition to a low-carbon economy while enhancing climate resilience.

8.1.3 Railway Industry Position

The Australasian Railway Association (ARA) Value of Rail report prepared by Deloitte Access Economics in November 2020, emphasises the environmental advantages of rail transport, advocating for policies and actions that recognise and enhance those benefits. The ARA calls for transport investment decisions to incorporate the full range of environmental benefits offered by rail, such as lower carbon emissions, reduced particulate matter emissions, and decreased congestion and road accidents. They support pricing mechanisms that reflect the true social and environmental costs of

¹⁶ Western Australian Climate Policy (2020) and Climate Change and Greenhouse Gas Emissions Reduction Bill (2021)

different transport modes, promoting rail as a more sustainable alternative. The ARA also highlights the potential for rail to contribute to a net zero emissions future, advocating for increased use of renewable energy and the electrification of rail networks to further reduce environmental impacts.

The significant environmental benefits of rail transport highlighted in the report position rail as a critical component in combating climate change and reducing urban pollution. Rail transport, even utilising diesel electric and electric motive power, when compared with road transport, significantly reduces greenhouse gas emissions and particulate matter emissions. For example the report highlights that:

- Cars and motorcycles generate around 0.15 kilograms of CO₂ equivalent per passenger kilometre, while passenger rail (diesel electric and electric) only generates 0.11 kilograms.
- Additionally, rail passenger travel generates 75% less particulate matter emissions per kilometre compared with road travel.

The zero emissions railcars proposed will have even a greater impact in reducing greenhouse emissions.

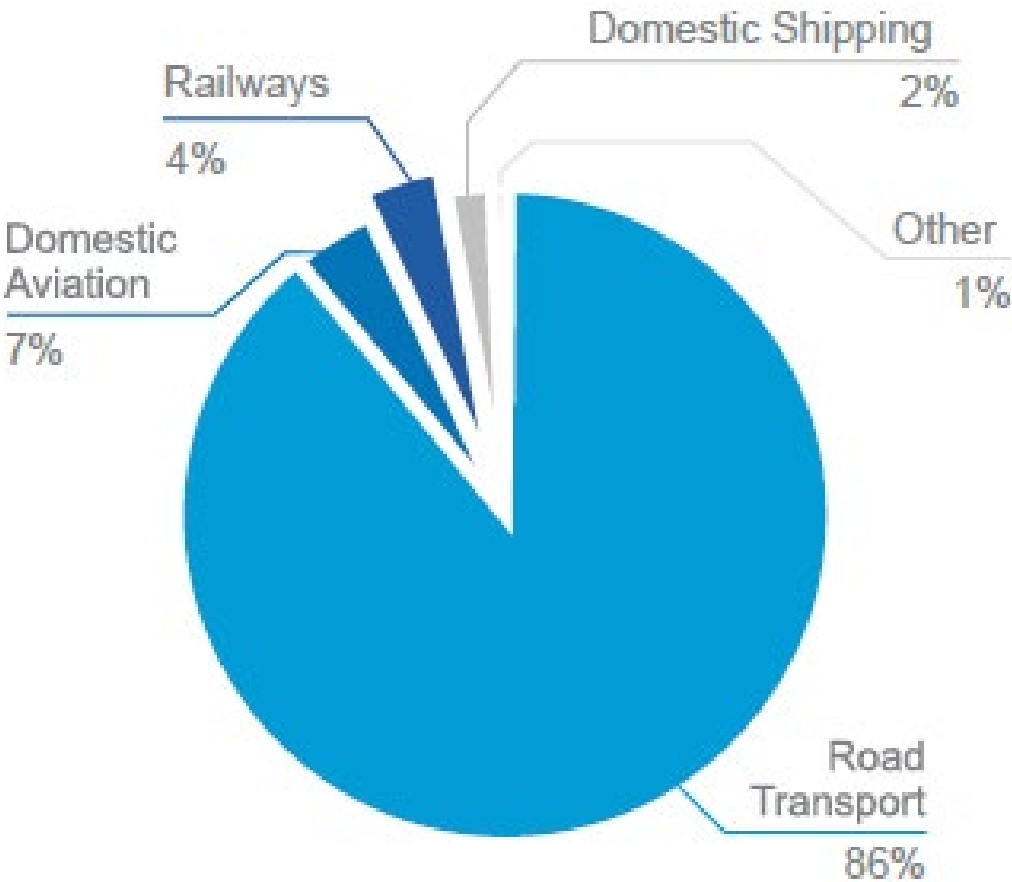
The ARA also emphasises rail's broader environmental contributions, including:

- reduced road congestion
- reduced numbers of motor vehicle accidents
- an increase in associated health benefits.

The ARA report highlights the effectiveness of rail in enhancing environmental sustainability and public health by mitigating the adverse effects of road transport.

The Rail Industry Safety and Standards Board National Rail Carbon Footprint Study June 2022 shows that road transport accounts for 86% of transport emissions indicating that a reduction in the use of road transport, in the short and long term, will significantly reduce Australia's CO₂ emissions, as illustrated in the diagram below from the study.

Transport emissions 93.5MtCO2-e in 2020



Supporting the above evidence is the ARA submission to the “Transport and Infrastructure Net Zero Consultation Roadmap” prepared in July 2024 co-ordinated by the Department of Infrastructure, Transport, Regional Development, Communications and the Arts. It confirms that transport is a major source of emissions in Australia and greater use of rail has the ability to drive significant emissions reductions, particularly in the short to medium term.

8.1.4 Outcomes and Benefits

Using data and calculation methodologies from the ARA Value of Rail 2020¹⁷ report, the zero emissions tourist and commuter railway, in the first ten years, will:

- reduce CO2 emissions by over 18,012 tonnes

¹⁷ Australasian Railway Association (ARA) Value of Rail report prepared by Deloitte Access Economics November 2020

-
- provide health benefits in excess of \$17 million.

Additionally, using data and calculation methodologies from the Road Trauma Australia 2020 Statistical Summary prepared by the Bureau of Infrastructure and Transport Research Economics, the zero emissions tourist and commuter railway, in the first ten years, will:

- reduce the cost of motor accidents and fatalities by over \$26 million.

Importantly, the zero emissions nature of the railway's operations will demonstrate a broader commitment to sustainability that is important to all, particularly the younger generation.

The railway will also provide the basis for a real time case study on implementation of zero emissions technology, as a catalyst for accompanying changes in a defined corridor, including the generation of sustainable accommodation, restaurants and all associated providers. It will afford the opportunity to demonstrate leadership that shapes cultural and mindset change.

8.1.5 Climate Change Authority Position

The Sector Pathways Review by the Climate Change Authority released on 5th September 2024 states: "The transition to net zero involves much more than each sector moving along technology-based decarbonisation pathways. A zero-carbon mindset must become the new normal so that it permeates operational, policy and investment and purchasing decisions across governments, businesses and households"¹⁸.

With respect to the rail sector, the review states: "The most promising technologies to decarbonise rail are grid-connected electric, battery electric and hydrogen powered engines. Grid-connected electric rail is a mature technology. Battery electric is maturing now, while hydrogen rail is not expected to mature until the 2030s"¹⁹.

8.1.6 Germany - Lower Saxony – a Case Study

An example where that change has occurred is Lower Saxony in Germany, specifically in the towns of Cuxhaven, Bremerhaven, Bremervörde and Buxtehude that are served

¹⁸ Sector Pathways Review by the Climate Change Authority 5th September 2024 page 9

¹⁹ Ibid., page 51

by zero emissions Coradia iLint hydrogen powered trains. In those towns, the following examples of eco-friendly accommodation can now be found along the route corridor:

- Cuxhaven: The Green Tiny Houses offer sustainable lodging options in natural settings. These tiny houses emphasise minimal environmental impact, with features such as energy-efficient designs and the use of sustainable materials.
- Bremerhaven: Eco-friendly options include accommodations that focus on sustainability and reducing carbon footprints. The area supports green hotels that adopt practices like energy conservation, waste reduction, and sourcing local organic foods for their restaurants.
- Bremervörde: The town supports green tourism with accommodations that emphasise eco-conscious living. Hotels and lodges here often participate in local environmental initiatives, such as promoting cycling and using renewable energy sources.
- Buxtehude: Sustainable accommodations in Buxtehude include boutique hotels that incorporate green practices such as water conservation systems, solar panels, and offering locally sourced, organic meals.

The examples align with the broader goals of the Lower Saxony hydrogen train corridor, promoting sustainable travel and contributing to the overall reduction of carbon emissions in the region.

8.1.7 Alignment with Government Environmental Policy

The environmental outcomes align strongly with Federal and State Government environmental policy principles which underpin the BRG Feasibility Study and Business Case. The outcomes are also strongly aligned with the ARA industry position and the Climate Change Authority. Importantly, the outcomes will also act as a catalyst for eco-friendly development along the rail corridor which will be an example for the rest of Australia.

8.2 Skills Development

Analysis of “The Clean Energy Generation: Workforce needs for a net zero economy”²⁰ report highlights the new skills that will be generated by the repurposing and / or construction of four battery railcars in Western Australia. The relevant skills include:

- **Battery Installation and Maintenance:** Training for electricians in the installation, maintenance, and fault-finding of battery storage systems.
- **Battery Design:** Skills in designing battery storage systems, which would involve both theoretical knowledge and practical application in the construction and maintenance of battery railcars.
- **Electrical Engineering:** Enhanced focus on electrical engineering skills, particularly those related to the integration and maintenance of electrical components and systems associated with batteries and battery management.
- **Mechanical Skills:** Skills related to the mechanical aspects of railcar construction and maintenance, including work with electrical and electronic manufacturing.
- **Technical and Vocational Education and Training (VET):** Increased enrolment in VET units relevant to battery and photovoltaic systems, as there is a broader emphasis on renewable energy and battery technology.

These new skills will be crucial for the successful development and maintenance of battery railcars and for supporting the broader transition to renewable energy technologies in Western Australia.

In addition to the above report, the "Future Battery Industry Strategy Western Australia" report released in January 2019 prepared by the Western Australian Department of Jobs, Tourism, Science and Innovation details actions related to skills development which include:

- **Vision for 2025:** The vision includes a sustainable, value-adding future battery industry that provides local jobs, contributes to skill development, and promotes economic diversification benefiting regional communities.

²⁰ The Clean Energy Generation: Workforce needs for a net zero economy October 2023 report by the Australian Government and Jobs and Skills Australia

- **Government Approach:** The strategy aims to support local jobs, skill development, economic diversification, and regional benefits. It includes aligning with various energy initiatives to facilitate transition to modern, cleaner, and more secure energy and transport systems.
- **Action Themes:**
 - **Action Theme 1: Investment Attraction:** It focuses on promoting Western Australia as a prime destination for investment in the battery value chain. This includes Ministerial missions, promotional materials, market information dissemination, and emphasising the State's environmental and ethical standards.
 - **Action Theme 2: Project Facilitation:** The strategy ensures the State is investment-ready by providing access to land, infrastructure, energy, water, and a skilled workforce. The Government will support projects through the approvals process, strategic industrial areas, and funding opportunities.
 - **Action Theme 3: Research and Technology Sector Development:** Focuses on building Western Australia's globally recognised research capacity in mining and mineral processing. The Government will support industry-led research and technology SMEs, facilitate access to infrastructure and funding, and work with the Federal Government on tax incentives.
 - **Action Theme 4: Adoption of Battery Technologies – New Opportunities:** The strategy encourages the increasing uptake of batteries domestically and globally. The focus is on assembly, installation, management of energy storage systems, recycling, and manufacturing niche battery products.

Considering the above elements, the repurposing and / or construction of 4 zero emissions battery railcars in Western Australia very strongly supports the Future Battery Industry Strategy Western Australia²¹.

²¹ Future Battery Industry Strategy Western Australia report released in January 2019 prepared by the Western Australian Department of Jobs, Tourism, Science and Innovation

8.3 Digital Connectivity

Accompanying the new service will be improvements in the technological backbone along the corridor, as the railway patrons drive demand for advanced high speed data and voice communications. Improved technology will further support entrepreneurial endeavour and people working remotely from home in value added occupations.

The improved technology will support the value added commuter, excursion and high yield products. Food and beverages either consumed on the train or at destinations, will be provided by local suppliers along the line, through utilisation of an online ordering facility.

As the technological backbone improves, opportunity exists to implement developments in rail operations including:

- advanced autonomous train control and its associated technology for real-time monitoring of safety on rail lines
- real time monitoring and reporting of on-train performance of the zero emissions traction systems
- advanced infrastructure safety and maintenance monitoring and reporting systems
- real time emergency reporting and management systems associated with bushfires and other natural disasters.

9. Congruency with Government Policy

9.1 Alignment with Government Regional Development Policy

Provision of the zero emissions tourist and commuter rail service from Bunbury to Bridgetown aligns with the WA State Government Regional Development Framework priorities.²²

The framework was developed to represent the intent of the nine Regional Development Commissions across Western Australia and the Commonwealth Department of Primary Industries and Regional Development to achieve meaningful outcomes for regional WA by collaborating, co-ordinating and aligning actions drawn on their collective expertise that are tailored for regional difference.

The framework prioritises several key areas, and they align with the Government's broader strategic objectives, focusing on sustainable development, economic diversification, and improving the overall well-being, prosperity and sustainability of regional populations.

The five priority areas of focus include:

- 1. Regional Liveability:** The rail commuter service will improve the quality of life in regional communities, specifically those in the rail corridor, Bunbury, Capel, Dardanup, Boyanup, Donnybrook, Balingup, Greenbushes, Bridgetown, and Manjimup will also gain. The benefits will accrue through improved rail infrastructure that supports a 4 times daily zero emissions commuter rail service.
- 2. Economic Development, Diversification, and Innovation:** The service will support economic growth along the corridor, specifically carrying 167,000 tourists and commuters per annum initially growing over a ten year period to 283,000. It will directly and indirectly contribute over \$72.2 million annually to the local economy and support over 499 direct and indirect jobs as detailed earlier in Section 7. Improved access will support diversification of industries, especially service industries, as the providers of those services are attracted to the area as a base for remote working. Many of those who choose to work remotely will be in new innovative industries. The resilience of communities along the corridor will

²² WA State Government Regional Development Framework priorities October 2023 prepared by the Department of Primary Industries and Regional Development

be significantly enhanced as accessibility is improved and increased economic activity improves household incomes.

- 3. Climate Resilience and Low Carbon Transition:** The priority is to promote sustainable practices and support transition to low carbon technologies to build climate resilient communities. Full details of the positive environmental impact of the zero emissions service are provided in Section 8. They are very significant.
- 4. Aboriginal Empowerment and Prosperity:** The priority is to enhance opportunities for Aboriginal communities through empowerment and economic participation. Full details of the positive impact of the tourist and commuter railway are detailed in Section 7. Those benefits are significant as the railway will streamline access for visitors and others to Noongar lands and significantly increase the numbers of tourists engaging with Noongar enterprises.
- 5. Organisational Excellence:** The priority is to ensure effective governance, co-ordination, and collaboration among regional development organisations to achieve these outcomes.

The approach taken by the Balingup Rail Group and its funding participants: Balingup Progress Association, Talison Lithium Greenbushes, City of Bunbury, Shire of Dardanup and Shire of Capel, Shire of Donnybrook-Balingup and Shire of Bridgetown-Greenbushes, facilitates high levels of co-ordination and collaboration. The fidelity of that co-ordination and collaboration has been enhanced by extensive public and industry consultation, which has provided a feedback loop that confirmed very strong support for the concept of operations and the operating parameters of the tourist and commuter railway.

Interaction with key public servants and political representatives has enabled a level of co-ordination and collaboration that is of the highest standard. Liaison with regional development organisations, local government and industry displays exemplary organisational excellence.

To quote the WA Regional Development Framework: “Underpinning our actions is a focus on enhancing climate resilience in communities and enabling regional businesses to thrive in a low carbon future”²³.

²³ WA State Government Regional Development Framework priorities October 2023 prepared by the Department of Primary Industries and Regional Development page 12

The quote summarises many of the benefits flowing from the zero emissions tourist and commuter rail service.

9.2 Australian Government Skills Development Strategy

As detailed in Section 8.2 Skills Development, the repurposing and / or construction of 4 zero emissions battery railcars in Western Australia strongly supports "The Clean Energy Generation: Workforce needs for a net zero economy" report²⁴.

9.3 Western Australian Government Future Battery Strategy

Repurposing and / or construction of 4 zero emissions battery railcars in Western Australia supports the Western Australian Government "Future Battery Industry Strategy"²⁵ report.

The strategy aims to position Western Australia as a global leader in the future battery industry and highlights the state's significant reserves of critical battery minerals, such as lithium, nickel, cobalt, manganese, aluminium, vanadium, and rare earth elements. It is particularly relevant as the railcars will operate on the same track as the trains that carry lithium ore from the Greenbushes mine to port.

The foundation for the strategy is Western Australia's strong industrial base, world-class skills in mineral extraction and processing, and ethical production standards. The strategy also emphasises the need for State leadership to move into further processing, manufacturing of battery components, and energy storage system assembly.

Utilisation of locally constructed zero emissions railcars in Western Australia for operation on the Bunbury – Bridgetown tourist and commuter railway supports and has strong congruency with the strategy, especially Action Theme 4: Adoption of Battery Technologies – New Opportunities.

²⁴ The Clean Energy Generation: Workforce needs for a net zero economy October 2023 report by the Australian Government and Jobs and Skills Australia

²⁵ Future Battery Industry Strategy Western Australia report released in January 2019 prepared by the Western Australian Department of Jobs, Tourism, Science and Innovation

10. Risk

Key risks that may impact on the project, together with management strategies to mitigate the risk are shown below.

10.1 Technical Risk

The project will see battery technology not used previously in Western Australia introduced into service. Successful introduction of that technology is critical to the project. Poor implementation of the technology will significantly impact on operations.

- Likelihood of occurring: LOW
- Likely impact should it occur: HIGH

The threat will be managed through effective migration of the technology that has been successfully implemented overseas, especially in the UK and Europe, to Western Australia. The risk will be further managed by utilising manufacturers such as Alstom that have successfully implemented the strategy overseas.

10.2 Loss of Support By Local Government

The project's ability to influence key decision makers will be severely impacted if the current high level of support from Local Government is lost.

- Likelihood of occurring: LOW
- Likely impact should it occur: HIGH

The threat will be managed by BRG continuing to engage and communicate effectively with Local Government to ensure key benefits and elements of the project are understood.

10.3 Project Mismanagement

In the event that there was a failure in project management with respect to infrastructure planning and refurbishment, the impact on project outcomes would be costly.

- Likelihood of occurring: LOW
- Likely impact should it occur: HIGH

The risk will be managed by Government employing skilled and experienced infrastructure planning and construction personnel / project managers who can mitigate risk, and by utilisation of contractors with a record of achievement. It will also be possible to leverage the existing freight study currently being progressed in relation to the line.

11. Conclusion

From a Government investment perspective, funding the tourist and commuter railway will leverage the significant private sector investment to be made in upgrading the line from Greenbushes to Bunbury to migrate lithium ore traffic from road to rail.

Providing an even greater quantum of benefits, the zero emissions tourist and commuter services along the Bunbury to Bridgetown corridor, as confirmed by the conservative patronage estimates, will deliver maximum economic, employment, social, environmental, safety, and skilling benefits as detailed in this document.

This report clearly articulates the needs and expectations of communities along the corridor between Bunbury and Bridgetown.

Attachment 1 – Example of Package Tour

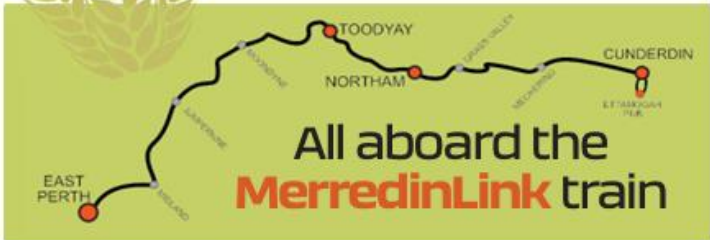
SEP 30, 2024

Kevin Pearce Tours



FULLY ESCORTED

Wheatlands Escapade Rail Tour



All aboard the **MerredinLink** train

3 DAYS / 2 NIGHTS

SPECIAL FARES : Senior Smartrider \$1258,
Adult full fare \$1290 Single room supplement \$298

INCLUDES:

- Return travel aboard the MerredinLink train to Toodyay, Northam and Cunderdin
- Two nights accommodation at the historic **Rec Hotel** in Northam with ensuite facilities
- ALL meals are included**
- includes one meal with drinks and entertainment by "Popera Star" Jay Weston
- Lunch in the famous cartoonist-inspired **Ettamogah pub** in Cunderdin
- A visit to the **York Motor Museum**
- Beverley sights and enjoy a CWA luncheon at the Station Arts Centre,
- Porterage of your suitcase
- Services of your tour managers Kevin Pearce & Rory Oktaviono

All Aboard this little-known rail link from East Perth to our rural heartland. The MerredinLink train is ready to take you on a 3-day journey of history and discovery.

Our Wheatlands Escapade tour features a two night stay at the popular **Northam Rec Hotel**. There's nothing more Aussie than a character-filled pub, ... a cold one and a bit of banter with locals. Aussies have been doing just that for centuries ... - if only the walls at the Rec could talk.

The hotel started as McCarthy's Hotel, and was the eighth and last hotel opened in Northam in the 1900's. It was known as the railway workers' hotel. The stables behind the hotel were important, as it had its own horse cab which would meet the passenger trains that utilised the *original eastern railway line* at the old Northam station in the 1920's. The hotel and the stables have been transformed into modern, ground floor accommodation.

Coach tours to

YORK AND BEVERLEY



SEE OVER FOR OUR DAILY ITINERARY ►

ALL MEALS ... ALL ACCOMMODATION ... ALL TRAIN AND COACH TRAVEL ... ALL SIGHTSEEING. Great Value!

ALL MEALS ... ALL ACCOMMODATION ... ALL TRAIN AND COACH TRAVEL ... ALL SIGHTSEEING. Great Value!



Day 1 MONDAY PERTH - CUNDERDIN - NORTHAM

All aboard the MerredinLink train at the East Perth rail terminal in readiness for departure at 08.45am.

Enjoy the views as the train winds its way through the picturesque Avon Valley. On passing Northam we leave the valley and continue through the wheatlands region before reaching Cunderdin. Our waiting coach will transfer us to the famous Cunderdin Pub designed on the 'Ettamogah' cartoons by the famous cartoonist Ken Maynard.

There's time to take photos as we enjoy lunch in the hotel, and then head back to the station to reboard the Perth bound MerredinLink to continue our journey to Northam. We transfer to our accommodation at the delightful country style Rec Hotel for the next two nights. Dinner is served in the hotel's dining room.

THE REC HOTEL (LD)

Day 2 TUESDAY YORK - BEVERLEY SIGHTSEEING

After a leisurely country-style, hearty breakfast, we board our coach and head to York to visit its famous Motor Museum. It showcases a fascinating collection of cars and bikes from over 100 years of motoring history.

As the oldest, inland European settlement in WA, York was established to grow cereal crops to feed the Swan River Settlement in 1829. We next continue our tour to Beverley, another vibrant country town located near the Avon River. Early passenger trains ceased to run through Beverley in 1978, but the beautiful station has been preserved and today it functions as an Arts Centre. The local CWA ladies will provide lunch for us inside the Arts Centre.



Jay Weston

This evening we visit another historic Northam hotel - The Riverside, for dinner and drinks including our entertainer - Jay Weston.

THE REC HOTEL (BLD)

Day 3 WEDNESDAY NORTHAM - TOODYAY - PERTH

Following breakfast, we check out from our hotel and visit the old Northam Railway Station established in 1900. The station closed in 1996 when the new Avon Valley rail route was opened. The station has since been preserved as a museum housing interesting railway memorabilia including a restored steam locomotive. We continue our sightseeing to Toodyay - first settled in 1836, and originally known as Newcastle until renamed Toodyay in 1910. Lunch is provided at a local pub before we transfer to the station for our homeward journey aboard the MerredinLink. The train is scheduled to arrive at East Perth at 04.30 pm.

(BL)

BOOKING CONFIRMATION & CONDITIONS

PAYMENTS

Full payment is required together with a completed booking form when seven days of making a reservation, to secure your booking. Failure to do this may result in the cancellation of your reservation.

CONCESSIONS

Senior travellers must quote a valid nine-digit Smartlink number to travel at the Senior Concession rate.

TRAIN TRAVEL

The MerredinLink train departs from the East Perth Rail Terminal at 08.45 am on the Monday and arrives back at 04.30 pm on Wednesday.

CANCELLATION CHARGES

30 Days or more before departure, 25% less of tour cost.
Less than 30 days before departure, 100% of tour cost.

Travel insurance is available.

REFUNDS

No refunds can be given to any passenger who joins the tour after its commencement, or for early departure from the tour. Additionally, no refunds can be given for any accommodation, meals or excursions not partaken during the tour.

YOUR TOUR MANAGERS

Experienced Train buff Kevin Pearce and photographer Rory O'Donnell will assist you throughout the special rail tour.

ITINERARY CHANGES

Tour de Force Travel reserves the right to change the itinerary or mode of transport due to any operational reasons beyond its control.



Kevin

Rory

Tour departs
Perth Sep 30
2024

Kevin Pearce Tours



BE QUICK! - BOOK HERE!

Suite 4 Carine Quarter, 437 Beach Rd, Duncraig WA 6023
Phone 9246 2177 Email: carol@tourdeforce.com.au

Attachment 2

Battery and Hydrogen Powered Railcars

Detailed below are recent zero emissions battery and hydrogen powered railcar purchases with capabilities and costs.

1. Battery Railcars

1.1 Stadler Class 777 Battery Trains UK

Stadler, a Swiss company, was awarded the £700m (\$945m) contract to build and maintain 52 Class 777 trains in February 2017. Seven of the 4-car trains have initially been equipped with battery technology, enabling them to travel beyond the electrified third rail to stations on the non-electrified part of the network including Headbolt Lane station, a new train station situated between Rainford and Kirkby in the UK.

The project involved an estimated investment of £80m (\$152 million AUD), which was provided by the Transforming Cities Fund. Each 4-car train has an estimated cost of \$13.4 million AUD. The final testing of the battery-powered train was completed in March 2023, while services were opened for the first time in October 2023. The trains represent the UK's inaugural fully electric, battery-powered passenger fleet and consume up to 80% less energy compared with their diesel counterparts, which positions them as a crucial element in the Liverpool City Region mayor's pledge to achieve net zero by 2040 and surpass the national government's targets by at least ten years. The new trains commenced operating on the entire network in December 2023.



1.2 Alstom Diesel Electric to Battery Electric Railcar

In 2021, the French company Alstom, converted five high-capacity, dual-mode multiple units, originally powered by electric catenaries and diesel, to fully electric, dual-mode units (powered by catenaries and batteries). The conversion process began in late 2021 at Alstom's Crespin facility in Northern France. The units will operate on a number of regional lines between 60 and 105 kilometres in length.

The units that were converted were over 20 years old, and the conversion project is intended to give them a further 20 years of operational life. The batteries are expected to have a life of at least 10 years.

A total of five trains were converted at a cost of \$62.7 million AUD. The cost for each train was \$12.54 million.



1.3 Siemens Desiro ML Cityjet eco (Austria)

The Austrian Federal Railways (ÖBB) has converted one of its Siemens Desiro ML trains into a battery-electric multiple unit branded as Cityjet eco. The 3-car train seats 140 passengers.



The train is capable of operating both on batteries and under overhead wires, with a battery-only range of up to 80 kilometres. The cost of the conversion was approximately \$9 million AUD.

Siemens Mobility

Siemens Mobility is assembling battery trains in the UK with the aim of replacing diesel fleets now in use. Siemens contends that its battery railcars could save Britain £3.5billion (Sterling) by such replacement.’¹



¹ Rail UK Siemens' British battery trains set to save 3.5bn and consign diesel trains to history, 3 June 2024

1.4 Stadler Battery Electric Multiple Unit (BEMU)

Following receipt of a \$170 million US government grant in October 2023, Metra Chicago commuter rail operator, has placed an order with Stadler to purchase eight two-car battery-electric trainsets for \$154 million US. The purchase covers design, training, and spare parts. Additionally, Metra has the option to purchase up to eight more trainsets and as many as 32 trailer cars, which could increase the total cost up to \$181.4 million US.



The battery-electric trainsets, scheduled for delivery between 2027 and 2028, will operate primarily on the 16.6 mile Beverly Branch of the Rock Island Line. Each two-car set can seat 112 passengers, and the additional trailer cars will provide seating for about 46 more passengers each. The trains are designed to have a range of 45 to 65 miles (72.4 kilometres to 104.6 kilometres) on a full charge, with a recharge time of approximately 20-30 minutes to reach 80% battery capacity from 20%.

Costings, if the options are exercised, for the 16 trainsets (power car plus a single trailer), 32 additional trailer cars and support are \$184 million US or \$276 million AUD. The full purchase would consist of 16 trainsets of 4 cars at a total unit cost, with support, of \$11.5 million US or \$17.25 million AUD. 3 car sets with support would be \$12.9 million AUD.

1.5 Hitachi Rail Tests Battery Train

Hitachi Rail, a major participant in the rail industry, has replaced a diesel engine on a TransPennine Express Class 802 Intercity train with battery technology and has commenced an eight-week trial operating solely on battery power on routes from York to Manchester and Leeds to Liverpool.²

The image below shows testing of the Hitachi Rail Intercity Battery Train on the UK Rail Network



Intercity battery train starts testing on rail network

© Hitachi Rail

² Railway News *Hitachi Rail Tests Intercity Battery Train on UK Rail* 29 August 2024

1.6 Massachusetts Selects Battery-Electric Commuter Trains

The Massachusetts Bay Transport Authority has approved a \$54m (USD) plan to operate battery-electric trains from early 2028 on a commuter line carrying 3200 passengers per day.³



A rendering of a possible electrified MBTA electrified commuter rail trainset. The MBTA board has approved a plan for battery-electric service on its Fairmount Line. MBTA

³ Railway News US MBTA Approves Plan for Battery-Electric Commuter Trains 26 July 2024

1.7 Stadler Battery Trains Selected By Danish Operator

Danish train operator Lokaltog has accepted Stadler's tender to supply 14 battery trainsets with options for 10 more sets.⁴



1.8 Siemens Mireo Plus B Battery Units Selected By Danish Operator

Danish train operator Midtjyske Jernbaner accepted Siemens mobility tender to supply seven two-car battery multiple units to replace diesel trainsets. The procurement was backed by the regional authority and by the national government for the use of battery trains to support carbon neutrality targets.⁵



⁴ Railway Gazette International *Danish local railway operator selects battery train supplier* 9 August 2024

⁵ Railway Gazette International *Danish battery train supplier selected* 9 March 2022

2. Hydrogen Railcars

The high cost of hydrogen-powered railcars is highlighted if the most recent uses of hydrogen in rail are analysed. Those projects and their costs are shown below.

2.1 FNM and Alstom's Coradia Stream Train in Italy

That project involves the deployment of six hydrogen fuel cell trains by Trenord, with an option for an additional eight. The hydrogen-powered Coradia Stream train is set to enter commercial service between the end of 2024 and early 2025 along the 103 kilometres Brescia-Iseo-Edolo line. The total cost for the initial six trains is approximately €160 million, \$258 million AUD or \$43 million AUD each.

The project aligns with Italy's Hydrogen Valley initiative in Valcamonica.



2.2 Alstom's Coradia iLint in North America

Alstom's Coradia iLint, the world's first hydrogen-powered train, recently completed a demonstration project in Quebec, Canada. The project, which operated from mid-June to September 2023, helped save approximately 8,400 litres of diesel and averted 22 tons of CO2 emissions. Detailed pricing for the Canadian units is not publicly available.



2.3 Rhine Main Transport Authority (RMV) in Germany

RMV has ordered 27 Alstom Coradia iLint hydrogen trains at a cost of € 500 million or \$800 million AUD to replace diesel multiple units (DMUs) on lines around Frankfurt. The German government supported the purchase with a €74 million program to cover 40-60% of the additional costs compared with diesel trains. The cost of the Alstom Coradia iLint trainsets are €10 million each or \$16 million AUD.



2.4 H2goesRail Project by Deutsche Bahn and Siemens Mobility

The project will use Siemens Mireo Plus H hydrogen-powered train and will start passenger services in 2024 between Tübingen, Horb, and Pforzheim. The Federal Ministry for Digital and Transport (BMDV) is funding this project with over €13 million

through the National Innovation Program (Hydrogen and Fuel Cell Technology). The Siemens Mireo Plus H hydrogen-powered two car train cost is approximately €13.74 million, \$22 million AUD each.



2.5 Lower Saxony Opts For Battery Rather Than Hydrogen

As noted in Item 8.1.6 of the Feasibility Study, Lower Saxony introduced hydrogen powered trainsets on one of its lines in 2018. However, in 2023, after extensive research, it concluded that battery traction trains were cheaper to acquire and operate and more efficient than the hydrogen alternative and decided to call for tenders for the supply of 102 battery-electric multiple units for use on non-electrified lines. The objective was to make all lines emissions free by 2037.⁶



⁶ Railway Gazette International *Transport authority opts for battery rather than hydrogen trains* 10 August 2023

Attachment 3 – Alstom Case Studies

4.1 Alstom awarded £12 million overhaul contract for ScotRail trains¹



9 January 2023 – Alstom, global leader in smart and sustainable mobility, has been awarded a £12 million contract to carry out mileage-based modernisation on ScotRail's Class 334 fleet of 40 trains that serve the Edinburgh to Glasgow line. The contract was placed by Eversholt Rail who lease the trains to ScotRail.

The Class 334 trains were originally built by Alstom for ScotRail and entered service in 2001. The scope of work under the new contract includes the overhaul of pneumatic and electrical components such as auto couplers, gangways, batteries, underframe air valves, toilets and heating ventilation and air-conditioning (HVAC) in the drivers' cabs.

This work builds on the previous modernisation performed by Alstom from 2015 to upgrade the passenger experience for Scottish passengers, by retrofitting full air conditioning, at-seat charging points and wi-fi throughout the trains as well as adding CCTV for driver only trains to help with passenger security.

Peter Broadley, Services Managing Director, at Alstom UK & Ireland said:

"Alstom has a proud history of supporting Scotland's rail network. We're pleased to once again be able to overhaul the Class 334 fleet, providing ScotRail's current and future passengers on the Edinburgh to Glasgow line with an improved rail experience."

The overhaul project is scheduled to commence in January 2024 at Alstom Polmadie Depot in Glasgow.

¹ <https://www.alstom.com/press-releases-news/2023/1/alstom-awarded-ps12-million-overhaul-contract-scotrail-trains>

4.2 Commuter trains to be repainted and repaired²



Trenitalia-owned Essex to London commuter operator c2c has awarded Alstom an £8.8m contract to repaint and repair its Class 357 Electrostar EMU fleet

“The forthcoming paint and refurbishment work will see all of our 74 Class 357 trains refreshed with the distinctive look and feel of our new Class 720 trains” said c2c Managing Director Rob Mullen on May 15.

The work is to be undertaken at Alstom’s Ilford depot over 24 months. It will include the repair of huck bolt covers and addressing body end, side vent, sole bar and roof corrosion.

The four-car EMUs owned by leasing companies Angel Trains and Porterbrook were built by Bombardier Transportation in Derby in 1999-2002 and have travelled an average of 3 million km. per train since entering service.

² Rail Business UK, 21 May 2024

4.3 Alstom-completes UKs largest fleet upgrade for Avanti West³

Alstom has delivered the UK's largest-ever fleet upgrade, completing a 117 million GBP refurbishment programme for Avanti West Coast's Class 390 Pendolino trains. The final refurbished train departed from Alstom's Transport Technology Centre in Widnes on 24 June, concluding the delivery of 574 refurbished carriages. Throughout the project, the refurbished trains were completed at a rate of one train every two weeks.



The last refurbished Pendolino, numbered 390020, entered service on 24 June

Peter Broadley, Services Managing Director for UK and Ireland at Alstom said:
“Alstom’s successful completion of the UK’s biggest ever fleet upgrade demonstrates our commitment to enhancing the journey experience for fare-paying passengers while, at the same time, supporting the growth of sustainable rail travel in the UK.”

The Pendolino trains, which have served routes between London, Birmingham, Manchester, Liverpool, Glasgow, and Edinburgh for nearly 20 years, have been upgraded to an as new condition.

³ <https://railway-news.com/alstom-completes-uks-largest-fleet-upgrade-for-avanti-west-coast/>



New seats onboard the Pendolino trains

The overhaul provides numerous customer benefits, including:

- 25,000 new, ergonomic Standard Class seats
- Conversion of one First Class carriage on each of the 35 11-carriage Pendolinos, adding over 2,000 extra Standard Class seats
- Introduction of a new onboard shop
- Improved lighting
- Refurbished First Class and Standard Premium seats
- Enhanced passenger information screens
- Additional luggage space in Standard Class
- Power points at every seat
- Refurbished toilets
- New carpets made from sustainable British wool

Andy Mellors, Managing Director at Avanti West Coast said:

“The Pendolino is an iconic train, and now even better than before, offering customers a much improved travel experience, with innovation and sustainability at its heart.”

This project supported around 100 roles at Alstom’s Widnes facility, the UK’s largest and most sophisticated train modernisation centre, which opened in 2017. The centre’s capabilities and digital advancements facilitated extensive work on the intercity trains.

4.4 Alstom refurbished Class 458 trains enter service on SWR network in the UK⁴



- Refurbished trains each feature 234 seats with seat back tables and charging points to provide customers with better journeys
- Work supported almost 70 roles between Alstom's sites at Widnes and Crewe

28 June 2024 – South Western Railway (SWR) has introduced the first of its Alstom refurbished Class 458 on its UK network.

Units 458415, 458420 and 458422 – all in their updated SWR livery – will initially be used to operate eight-car services between London Waterloo and Weybridge via Brentford, and London Waterloo and Twickenham.

“The refurbishment of these Class 458 units not only highlights our expertise in train modernisation but also our dedication to sustainable transport solutions, as we work

⁴<https://www.alstom.com/press-releases-news/2024/6/alstom-refurbished-class-458-trains-enter-service-swr-network-uk>

in partnership with operators and rolling stock leasing companies to encourage more people to travel by rail.” John Clerk, Head of Operations for Widnes at Alstom.

Seventeen of SWR’s Class 458 fleet have been refurbished at the Alstom Transport Technology Centre in Widnes, with a further 11 to follow. Each four-car unit has 234 seats in a two-by-two formation – all with seat back tables and charging points – as well as space for two wheelchair users. Each carriage also has two tables fitted with wireless charging points.

Taking two weeks to complete each set, work by Alstom at Widnes has also seen the reconfiguration of the vehicles to enable faster acceleration and laid new carpets throughout. Meanwhile, additional work at Alstom’s historic Crewe facility has seen the Class 458’s powered wheelsets overhauled. This has enabled the trains to operate at a top speed of 100mph – up from 75mph.

Opened in 2017, Alstom's Widnes facility is the UK’s largest and most sophisticated centre for train modernisation, while its Crewe site is home to Alstom’s UK Centre of Excellence for Bogie and Traction Motor Overhaul. The Crewe facility has overhauled over 20,000 bogies – which house the train’s wheelsets – during the past ten years for the UK rail market. In the future, all the bogies for the 225mph trains for High Speed Two (HS2) will be assembled and maintained in Crewe by Alstom.



Refurbished trains each feature 234 seats with seat back tables and charging points to provide customers with better journeys

£25 million investment

The work on the Class 458 trains has supported almost 70 roles at Widnes and Crewe, while UK suppliers have also benefitted from the £25 million investment. The refurbishment has been financed by Potterbrook, one of the UK's leading train asset management companies.

"The team at Widnes has worked diligently to install new seating, tables and at-seat power throughout the trains, which all meet the evolving needs of fare-paying passengers in the South of England," said John Clerk, Head of Operations for Widnes at Alstom.

He added: "The refurbishment of these Class 458 units not only highlights our expertise in train modernisation but also our dedication to sustainable transport solutions, as we work in partnership with operators and rolling stock leasing companies to encourage more people to travel by rail."

The trains were originally intended for use on the route between London Waterloo and Portsmouth Harbour via Guildford. However, following the COVID-19 pandemic and subsequent changes in customer travel patterns, the fleet will temporarily operate services on SWR's suburban network, as the company works towards the full introduction of its fleet of 90 new Class 701 Avenra trains – built by Alstom in Derby and branded Arterio by the customer.

"We are very pleased to introduce the first of our refurbished Class 458 units. Their interior refresh, including improved seating and newly installed tables and charging points, will make a noticeable difference to our customers' journeys," said Neil Drury, South Western Railway's Engineering and Infrastructure Director.

He added: "The Class 458/4 fleet will play an important role as we work towards the full introduction of our fleet of 90 new Arterio trains. The first unit to enter service today will operate services between London Waterloo and Weybridge via Hounslow, with subsequent units being deployed where customers need them most."

The 28, four-car Class 458 trains will be designated as Class 458/4. The eight remaining five-car units will be designated as Class 458/5.

Returning for passengers on Monday 24 June, these initial units will operate the following services, all via Brentford:

- 0531 Hounslow to London Waterloo
- 0622 London Waterloo to Weybridge
- 0802 Weybridge to London Waterloo
- 1522 London Waterloo to Weybridge
- 1703 Weybridge to London Waterloo
- 1837 London Waterloo to Twickenham.

The Class 458 Juniper (5-JUP) electric multiple units (EMUs) were originally built by Alstom at Washwood Heath in Birmingham between 1998 and 2002 for South West Trains.

The refurbished Class 458 units enter service in the same week that Avanti West Coast's final Class 390 Pendolino left Widnes following the completion of the UK's biggest fleet upgrade.

4.5 Alstom to overhaul Buenos Aires metro cars⁵



ARGENTINA: Buenos Aires metro operator EMOVA has awarded manufacturer Alstom a contract to overhaul 60 Metropolis 300 cars used on lines D and H.

Alstom is to undertake the three-year project at its Los Hornos plant in La Plata.

“This contract is the first maintenance agreement for the Metropolis 300 concluded between EMOVA and Alstom since 2016, when Alstom sold a fleet of 180 cars to Subterráneos de Buenos Aires”, said Ernesto Garberoglio, General Manager of Alstom Argentina, on July 24.

In 2022 EMOVA awarded Alstom contracts to overhaul 15 Metropolis 100 cars and 25 cars built by the former China Northern business, now CRRC.

⁵https://www.railwaygazette.com/metros/alstom-to-overhaul-buenos-aires-metro-cars/66997.article?utm_source=rss&utm_medium=Sendible&utm_campaign=RSS

4.6 Alstom to Refurbish CrossCountry Voyager Fleet in Derby⁶

Alstom has been contracted to refurbish CrossCountry's Voyager fleet to enhance the customer experience.

This 60 million GBP upgrade will refresh the interior and exterior of the trains at Alstom's Derby facility. The work will see the vehicles equipped with new seats, tables and flooring from 2025.

In addition, the trains will gain improved lighting and a new passenger counting system, while the exteriors will be repainted in CrossCountry's new livery.



The refurbished interior for Standard Class

Peter Broadley, Services Managing Director, UK and Ireland at Alstom said: “For more than 20 years, CrossCountry's Voyagers have proudly served towns and cities across Great Britain – travelling millions of miles in the process. We now look forward to giving these iconic Alstom-built trains some well-deserved TLC with a comprehensive overhaul that will include new seats, on-board technology enhancements and an exterior repaint.”

⁶ <https://railway-news.com/alstom-to-refurbish-crosscountry-voyager-fleet-in-derby/#:~:text=Alstom%20has%20been%20contracted%20to,tables%20and%20flooring%20from%202025>

The undertaking will refurbish 312 cars, comprising 136 Voyager (Class 220) and 176 Super Voyager (Class 221) vehicles.



A visualisation of the new livery

252 of these cars belong to the existing CrossCountry fleet, while an additional 60 additional carriages, forming 12 trains, will be added following their release from Avanti West Coast.

To enhance sustainability, the new seats will be at least 95% recyclable and 98% recoverable, while lighter materials used throughout the trains will help reduce fuel and carbon emissions.



The refurbished interior for First Class

Design work is set to begin immediately, prior to the physical work commencing in Derby from 2025 until 2027. Around 100 Alstom staff will work on the contract.

Broadley added:

“Not only will the refurbishment delight fare-paying customers with increased levels of comfort and accessibility, the overhaul programme will support UK suppliers and skilled jobs across the country.”

The Voyager trains are owned by Beacon Rail and operate across the CrossCountry network, from Aberdeen to Penzance.

Last year, Alstom and CrossCountry signed an eight-year extension to their Train Services Agreement (TSA). This extension is valued at around 825 million GBP and sees Alstom continue to maintain, overhaul, service and clean CrossCountry’s Voyager and Super Voyager fleet until 2031.

Adrian Hugill, Fleet and Engineering Director at CrossCountry said:

“We’re delighted to be moving forward on the refurbishment of our Voyager fleet which will transform the passenger experience for customers on our long-distance routes.

“We look forward to working with colleagues at Alstom and Beacon Trains to give the ever-impressive Voyager fleet a new lease of life on the CrossCountry network.”

The Voyager and Super Voyager intercity trains were built by Alstom and have already served passengers across the UK for over two decades.

They operate at speeds of up to 200 km/hour and have travelled over 427 million miles of service.



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