MegaRail Australia Patronage Estimates 2019-2051 Working Paper: Some investment parameters

Our joint RMIT-MegaRail Australia paper prepared for the 2019 World Engineers Convention (WEC) has identified key population, distance, and cost characteristics that may limit the case for speedy investment and implementation of intercity High Speed Rail (HSR) proposals in Australia. As a result, an alternative intracity commuter HSR system is put forward. It is based on a staged approach model that favors initial commuter HSR services within major cities, which can be extended into regional hinterland for regional development and population growth. Ultimately, it could also provide the base for connecting such HSR city services with future intercity express services (Stasinopoulos et al. 2019).

For Melbourne, our Intracity HSR model aims to stimulate innovation and encourage discussion about extending the strategic thinking concerning commuter HSR to connect metropolitan and inner regional urban centres. This would provide jobs growth, improve productivity, reduce congestion and provide 'sustainable' improved mobility. The results also demonstrate the economic advantages of an Intracity HSR model. Preliminary estimates of cash flows suggest that fares provide a solid base for the proposed commuter HSR service with upside potential to finance extensions of the network. In addition, "Among the broader benefits, the service would aid resolution of urban sprawl and traffic congestion, while the addition of significant capacity on the east-west transport corridor, in particular, would help overcome limitations of competing transport modes, including already capacity-constrained new infrastructure." (Stasinopoulos et al. 2019).

Preliminary economic (financial) analysis

- Our WEC 2019 Paper analysis indicates that the demand for peak-hour East-West transport services across greater Melbourne is currently high and expected to grow. This forecast is based on statistics that project Melbourne's population to grow to up to 9.8 million persons by 2051, almost double its current level (Australian Bureau of Statistics 2018). Our proposed commuter HSR service contributes to meeting the projected demand by maximising the capacity utilisation of Melbourne's scarce East-West corridor space.
- The preliminary financial analysis included in our WEC 2019 Paper is based on a cash-flow model, which estimates that the fare revenue alone obtained from our HSR proposal, and based on moderate - not premium - pricing levels, is likely to recover all operating outflows and over half of the capital outflow. There may also be obvious opportunities for significant value capture.

Some of our preliminary analysis statistics used and assumptions made, as stated in our WEC 2019 Paper (Stasinopoulos et al. 2019), include the following:

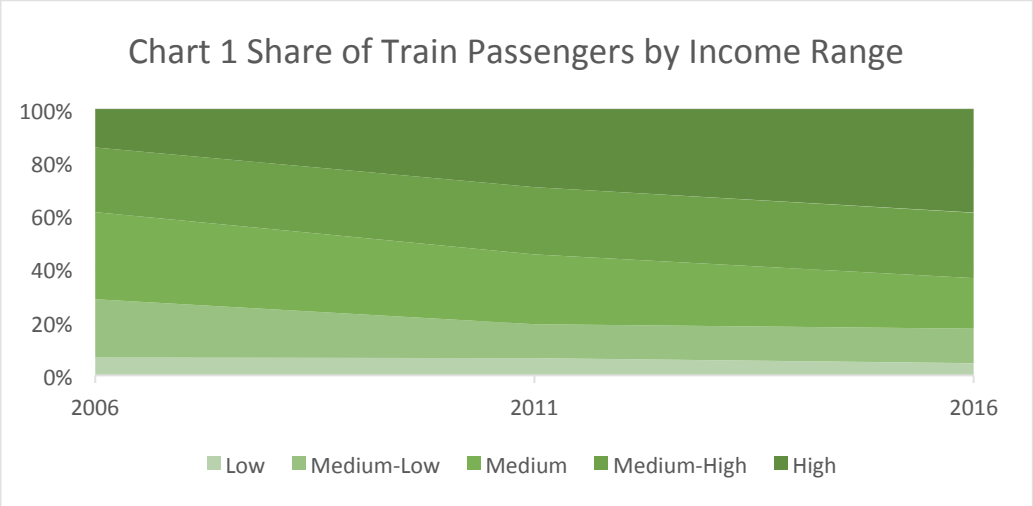
- MegaRail fares start with land-based fares and add a margin, rather than starting with airfares and applying a discount. They are set from a 2017 study of comparable international fares. RMIT School of Engineering undertook a peer review of our fares and found them to be reasonable. Precise forecast fares are commercial-in-confidence today.
- MegaRail fares are applied to our patronage estimates of 160,000 passengers per day. This estimate is based on a Gippsland Study using the Veitch-Lister urban

transport model (Provided by Mr. Jeff Moran of MegaRail Australia Pty Ltd). Furthermore, this patronage estimate was reviewed and discussed at a seminar held at RMIT School of Engineering in May 2019. Expert participants broadly agreed that the estimated patronage represented the lower end, or floor, of the wide range possible.

- MegaRail payments of company tax are excluded in this early pre-feasibility study. Australian large infrastructure projects typically pay little company tax in their early decades. A thorough study would be required at a later stage.
- Non-energy operating costs are unit costs taken from AECOM (2013) and from commercial judgements. Operating labour is the largest cost, followed by ticketing and net advertising, rolling stock maintenance, insurance, infrastructure maintenance, and staff-recruitment training.
- Electricity consumption is as estimated in 'Energy consumption and greenhouse gas emissions analysis' that RMIT Engineers professionally estimated through collaboration with authoritative industry experts.
- Capital expenditure on infrastructure is spread over three years at $5 billion per annum. The rolling stock is estimated at $1 billion.

Patronage and fare estimates and predictions

ABS Census of Population and Housing data shows that there are significantly more and more people using train as a method of travel to work in Melbourne, and that the proportion of passengers coming from higher income range groups has been firmly increasing (See Figure 1). Non-car commuting is becoming the preferred mode of those on the highest incomes.



Source: Australian Bureau of Statistics (2016).

Travellers by train on the current Geelong route told us about the importance of non-fare factors, such as service speed and reliability of travel time. Existing 'snail-rail' services also were perceived to include the deterrents of over-crowding, lack of a seat, cleanliness, aromas, and possibility of some form of harassment. Rail travel service dissatisfaction often causes travellers to choose a more expensive car trip. MegaRail will improve train travel service quality by reducing overcrowding, increasing service frequency, comfortable waiting areas, and better user information availability. Each patron must be strapped-in by an airline-quality seatbelt to be safe in the high acceleration and deceleration phases. There can be no standing patrons and no over-crowding. There will be a safe space between patrons.

Another way of explaining the advantages of a HSR service over an existing rail service and car use in the Geelong—Melbourne CBD—Dandenong transport corridor is by introducing the concept of price and quality of service elasticity of demand. A price or quality of service elasticity denotes the passenger response due to the change in the price of travel on public transport, the price change of a close substitute (e.g. car travel), or, the value placed on quality of service changes. A broad number of available elasticity estimates (Litman 2004; BITRE online database) indicate the significant difference between the responsiveness of existing rail services and car travel. Existing rail services tend to be around three times more responsive to rail fare changes than car use is to car operating costs. This difference is even more significant if the responsiveness to existing rail service quality is taken into consideration. Generally, that is why it has been so hard using conventional rail speeds to incentivise car users (especially discretionary car users) to switch to rail (and other public transport use).

However, HSR service evidence from other countries (Litman 2004), and our expectations, are that HSR passenger responsiveness to fares and quality of service would match that of the discretionary car user. Under these circumstances, the HSR service would be very competitive to car use for many users. It would become even more competitive as the cost of driving in this transport corridor continues to escalate due to congestion costs and the related travel time unreliability, as well as safety concerns and convenience and comfort considerations. These expected passenger shifts to HSR services in the Geelong—Melbourne CBD—Dandenong transport corridor are expected to command a margin over existing fares and thus net revenues above those currently won by the existing rail services.

Quality of service improvements expected of HSR systems are significant and provide further support for our patronage estimates. For example, Litman (2009) states "service quality improvement that reduces travel time unit costs by 20 per cent provides benefits equivalent to an operational improvement that increases travel speeds by 20 per cent". The proposed HSR service for the Geelong—Melbourne CBD—Dandenong transport corridor is expected to significantly increase both travel speed and service quality improvements, from those experienced by passengers using the existing rail services. Passengers will consider a significantly improved rail service, which will denote a major leap from the current 19th century rail system to a 21st century proposed rail facility. As Litman (2007) observes, existing public transport services do not "satisfy travelers willing to pay extra for higher service quality—so they generally shift to driving". This he concludes leads to a situation where "ultimately, everybody loses, since consumer demand is unmet, transit ridership declines, transit becomes stigmatized, and traffic problems increase".

Broader benefits expected from the proposed HSR service

As discussed in our WEC 2019 Paper, there are many broader benefits that are expected from our proposed HSR service such as:

- Lower household transport costs: Expenditure on taxed fuels and compulsory road charges constitute more than 4% of the average household's income and around 8% of the poorest (bottom income quintile) households' income.
- Improved wellbeing: The effects on wellbeing of fast, comfortable commutes on HSR seem to starkly contrast those of long, congested commutes in cars or crowded public transport.
- Less exposure to the hydrocarbon market: The HSR train could be powered by renewable electricity sources that are owned by the HSR operator or, from an economic long-term contract. Early market soundings suggest keen bidders.

- Avoided infrastructure upgrade and costs: Given that up to six trains could simultaneously operate on the line during peak times, reliance on renewable and on-board electricity helps to avoid some upgrade of the mains electrical infrastructure, currently the source of large and increasing costs to electricity consumers.
- Higher transport network redundancy: The commuter HSR service, being a high-capacity alternative to the existing competing modes, provides network redundancy. Capital expenditure to augment capacity on traditional train or road systems can be deferred or avoided.
- Improved road utility for other users: Grade-separated transit reduces delays on parallel roadways (Litman 2007). Initial modelling suggests that, during peak periods, the commuter HSR service will attract 24,000 trips per hour, the vehicle-capacity equivalent of 12 freeway lanes. Thus, roadway utility improves for other users, especially freight operators.
- Reversal of urban sprawl: HSR revitalizes cities by encouraging high-density, mixed-use real estate development around stations.
- Economic growth and employment: HSR fosters economic development in second-tier cities along train routes. It also links population centres to create integrated regions that function as single, stronger economies, broadening labour markets and offering workers a wider industry network.
- Productive technology clusters and increased tourism: HSR encourages and enables the development of technology and other industry clusters, such as education and medical, with fast easy access between locations.
- Fewer GHG emissions: The commuter HSR and the existing V/Line services are likely to operate with nearly full trains because they can add or remove seats to match the demand. Cars lack such flexibility.
- Public transport patronage growth rates in Melbourne since 2000 are among the highest in Australasia suggesting a likely rapid take-up for a new transport mode that delivers a high quality, cost-effective service with significant, and tangible, economic and non-economic benefits.

Finally, as stated in our WEC 2019 Paper, future work would be required to develop and broaden the analyses into pre-feasibility studies that support a complete economic Cost-Benefit Analysis (CBA). Such an analysis would assist in exploring and resolving debates about the feasibility and practicality for Australia.

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