

Fast Rail

For Victoria



Melbourne – Airport Express

\$1.5 Billion

Three eight-carriage trains - **5 minute journey time** - 16,000 seated passengers / hour

Melbourne - Avalon – Geelong Express

\$4 Billion

Seven eight-carriage trains + **15 minute journey time** + 16,000 seated passengers / hour

A proposal for
Infrastructure Australia
made in the absence of official Victorian proposals

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The Proposal



Recent quotes for the Transrapid Fast Rail system by Transrapid Australia indicate that this technology is now financially feasible for Australia.

Melbourne – Melbourne Airport Fast Rail

- An express twin-track fast rail line to Melbourne Airport from Southern Cross station.
- This would provide journey times of about 5 minutes.
- Two trains provide services every 6 minutes.

Melbourne – Avalon – Geelong Fast Rail

- An express twin-track fast rail line to Geelong via Avalon from Southern Cross station.
- This would provide journey times of around 15 minutes.
- Seven trains provide services every 6 minutes.
- The track is 50% elevated to pass over existing infrastructure without the high cost of tunnelling.

Cost Options

- Between 2 and 10 carriage trains can be specified. Intermediate carriages can be added later.
- Less trains could be used initially.
- Either the Geelong or Airport train line could be built first with the second track following in a later financial year.

Transrapid Benefits

- \$34 Million per kilometre on the basis for 50% is elevated, 50% is 'at grade'.
- Easily elevated – avoiding the need for expensive tunnelling
- Fully independent of existing rail infrastructure
- Very low maintenance costs as no vehicle – guideway contact
- Low energy requirements
- Low visual impact – no overhead wires
- Ability to handle freeway gradients and curve radii – so can be routed down existing freeway easements
- In use since 2004 in Shanghai and is now proven in a commercial setting
- Safety – Transrapid fast rail track is fully grade separated and the vehicles cannot derail.
- Operating speeds of up to 500 km/h make this technology ideal for Australian intercity distances.

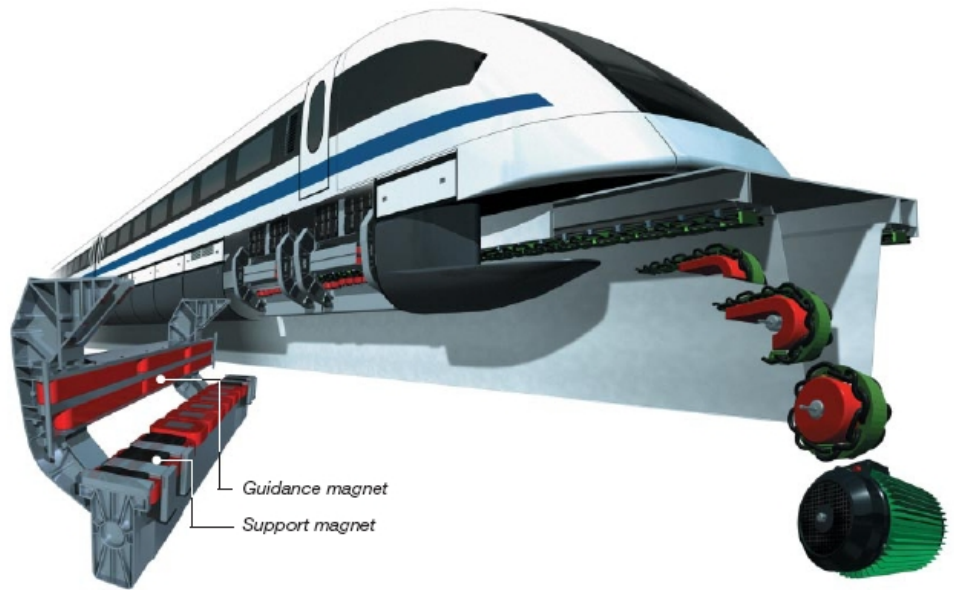
Transrapid Fast Rail

Instead of wheels, Transrapid Fast Rail systems use magnets to levitate the train above the track. The track propels the train along the track at speeds of up to 500 km/h.

There is no friction between the train and the track, there are no overhead wires.

Inside the train the magnetic field strength is one tenth of the magnetic field of a hair-dryer. The train levitates using on-board batteries which can keep the vehicle floating for up to an hour without any mains power supply to the track.

Outside there is no noise from steel wheels on steel track, no sparking from overhead wires.



System Costs

In 2008 one of the Maglev manufacturers, Transrapid, quoted \$4 Billion for a dual-track Maglev all the way from Geelong to Frankston via Melbourne Airport.

This was comprised of:

- \$34 Million per kilometre for double track – assuming 50% is elevated and 50% is at grade.
- \$16.5 for commuter carriages up to \$20 Million for luxury carriages. Trains may have between 2 and 10 carriages.

These figures were confirmed to me on the 30th October 2010 by Peter Hatcher, General Manager of ThyssenKrupp Transrapid Australia.

This is highly competitive with other transport systems such as conventional rail or motorways and far cheaper than Melbourne's proposed Footscray - Domain rail subways systems (\$900 million+ per km).

Suggested Routes

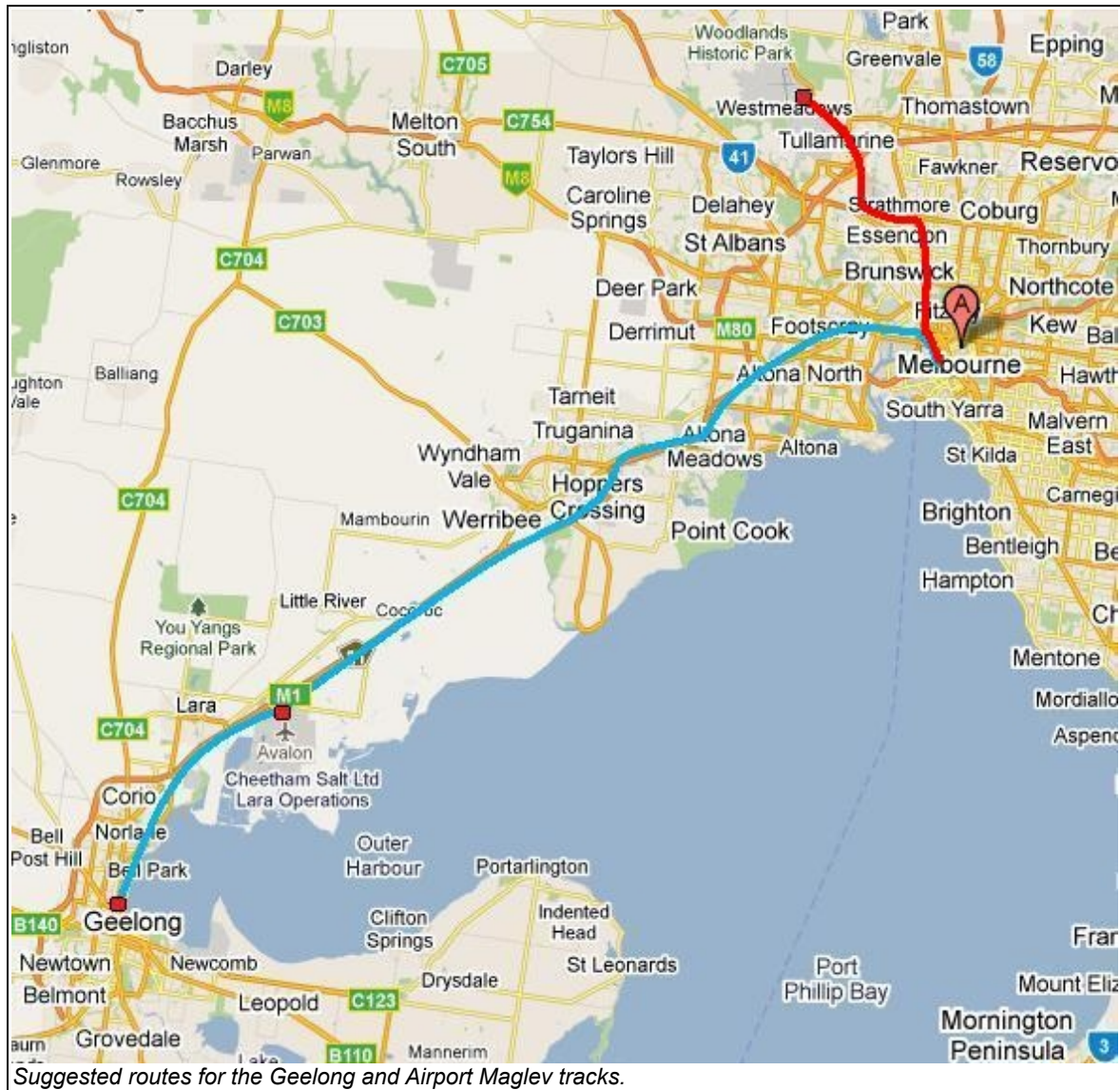
Elevated Transrapid Fast Rail is able to easily traverse existing roads, railway lines, farmland and industrial areas.

Most of the suggested Fast Rail routes would be along existing rail easements or freeways with the Southern Cross Station platforms above Wurundjeri Way.

At Footscray the Transrapid track would need to be over the existing rail tracks and elevated above Hopkins, Nicholson & Albert Streets.

The Geelong Transrapid could travel south from the existing rail line at Tottenham across industrial land to the Geelong Freeway and then follow the Freeway to Avalon Airport before going on to Geelong.

The Airport Transrapid would be over or adjacent to the City Link Tollway and Tullamarine Freeway. The airport station could be between the main airport building and the Hilton Hotel.



Inter State Extensions

The proposed system is valid as a 'stand alone' Victorian network or the start of an inter-State fast rail system. Unlike conventional steel-wheel fast rail systems a Transrapid system could use the existing Freeway median strips for much of the distance. Existing freeway reservations can be used from Melbourne Airport to the Hume Freeway.

A Maglev train could reach Sydney CBD in two hours from Melbourne CBD.

Existing Transrapid Systems

- The Emsland test track has operated since 1984.
- The Shanghai airport Maglev has carried over **27 million** passengers since 2004. The top operational commercial speed of this train is 431 km/h, making it the world's fastest train in regular commercial services. Punctuality is over 99.9% and running costs are much lower than other HSR systems.

The 53km Melbourne-Avalon section of a Melbourne Maglev system could operate at up to 500 km/h making it the world's fastest train.

Station Design



To minimise dwell times I suggest that platforms be provided on each side of the train at the station as shown above at Shanghai. Passengers could then board from one side and alight from the other.

All platforms should have platform railing as shown above. All platforms should be capable of accommodating the ten carriage Maglev trains, or be able to be extended to this length at a later stage. Unlike the manual operated rope barriers on the Shanghai system automatic gates would be used.

Southern Cross Station

The Transrapid station would be above Wurundjeri Way and be integrated into the existing station complex. Two Transrapid tracks would be serviced by three platforms which would become Southern Cross Station platforms 17, 18 & 19. The wide central platform 18 would be for passengers departing for Melbourne Airport or Geelong on either track. Platforms 17 and 19 would be for incoming passengers to alight from Transrapid services.

Other Stations

The three-platform configuration described above is recommended for the other three stations to avoid boarding passengers having to wait for alighting passengers to get off the train.

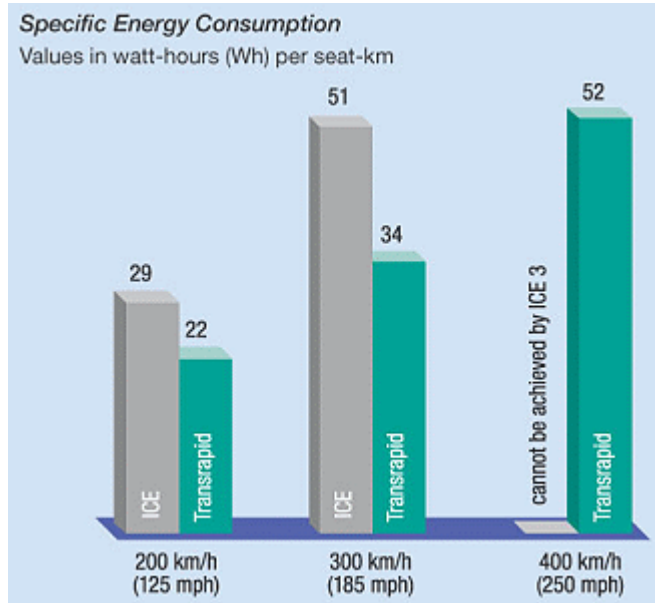
Operation

Transrapid systems have low running costs due to the low power consumption and the lack of contact between the train and the track.

For this reason ticket prices should fall within the normal range of existing Metro tickets. Day-to-day operation of the system could be managed by Metro.

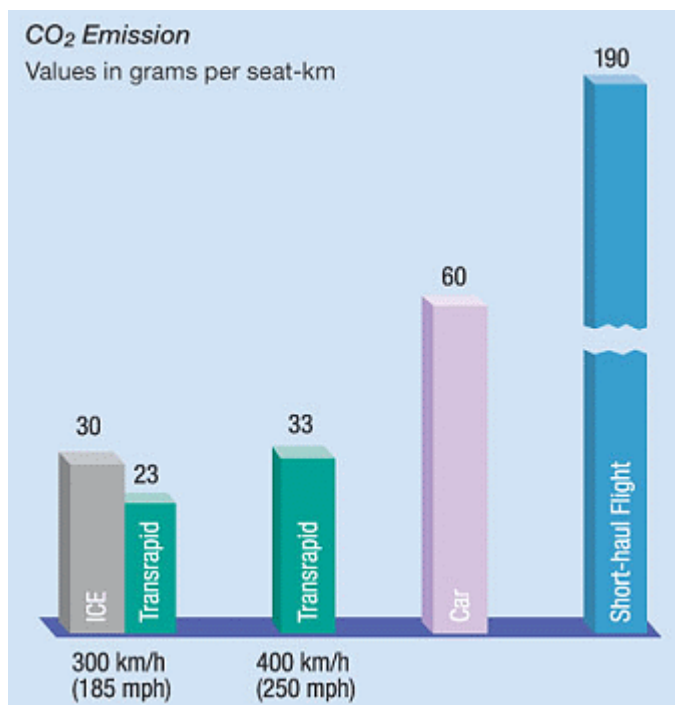
High Energy Efficiency

Transrapid energy efficiency compared to German ICE conventional steel-wheel fast trains.



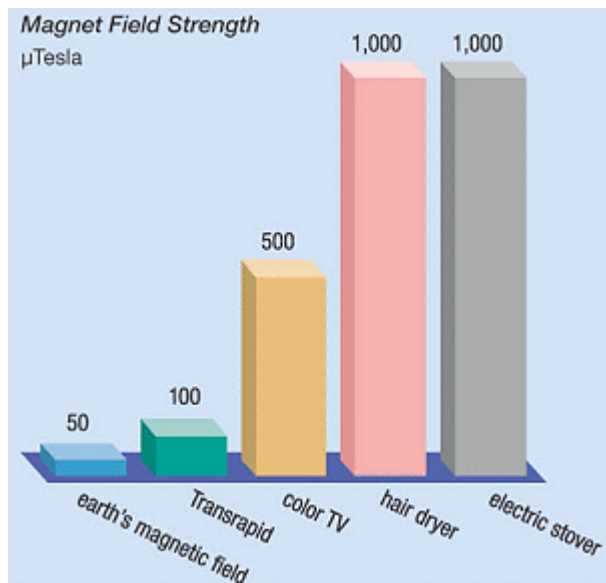
Low Greenhouse Emissions

Transrapid CO₂ emissions compared to German ICE conventional steel-wheel fast trains, cars and aircraft.



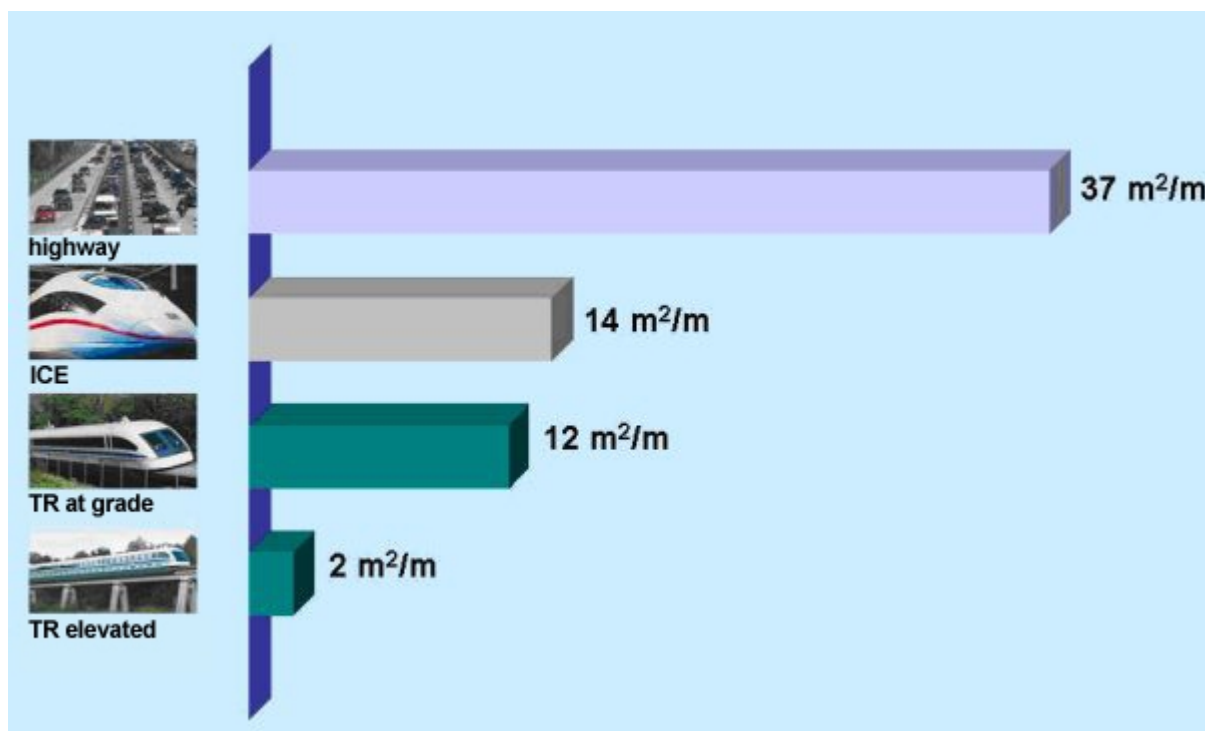
Low Magnetic Field Strength

Transrapid magnetic field strength inside the cabin compared to a hair dryer and other domestic appliances.



Low Land Usage

Transrapid system land use compared to motorways and German ICE conventional steel-wheel fast trains.



High Gradients

As the Transrapid is capable of climbing steep gradients (ten percent compared to four percent for normal railroads) and able to handle tight curves (1950 meters at 300 km/h compared with 3200 meters for normal railroads), it is possible to flexibly adapt its guide way to the landscape and to have it tightly follow existing roads, railroad tracks, and power lines.

Air Turbulence

When the Transrapid passes by it generates minimal turbulence. Thanks to the aerodynamic optimization of the Transrapid vehicle there is no more than a slight gust at a distance of 2 meters when the Transrapid passes by at a speed of more than 380 km/h. There is no air movement under the elevated guide way and the air movement produced by the vehicle on at-grade guide way at a speed of 330 km/h is only as strong as a moderate wind.

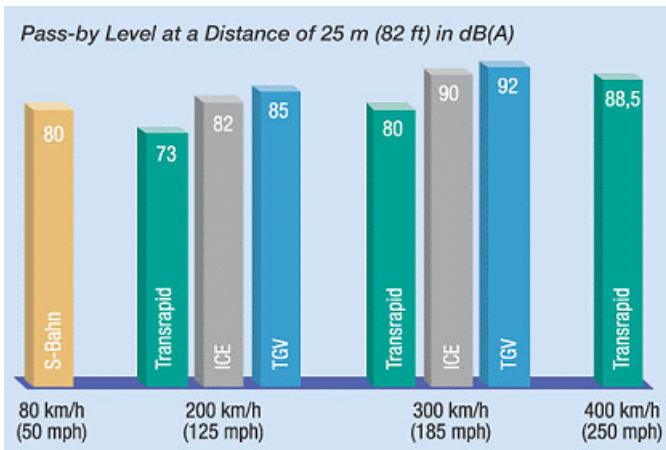
This means the Transrapid system could be placed along motorway median strips without impacting vehicles on the motorway. (Note that even 'at grade' Maglev track is elevated about 1 to 1.5 meters.)



Low Noise

At speeds around 200 km/h, the Transrapid is very quiet because of its non-contact technology. At higher speeds air flow noise increases much as it does for other high speed rail systems.

At 300 km/h, the Transrapid Maglev vehicle develops less noise than a truck, and even at speeds above 400 km/h, it is not much louder than considerably slower railroads.



Inherently Flood Proof

Because Transrapid track is elevated the Transrapid system would be unlikely to be affected by flooding.



Wide Carriages for High Capacity

In Transrapid's 2008 quote for Melbourne a capacity of between 321 and 449 passengers for a three-carriage train is suggested. For this proposal a capacity of about 100 passengers per carriage is used. Note that no toilets would be needed on these trains due to the short journey time.

By way of comparison a Metro Siemens train has 264 seats per 3 carriage train set.



Transrapid vs. V/LOCITY Dimensions & Costs

	Transrapid – end carriage	Transrapid – middle carriage	V/LOCITY carriage
Top Speed (km/h)	500	500	160
Width (m)	3.7	3.7	2.92
Length (m)	25.5	24.77	25.25
Floor Area (m²)	94.35	91.65	73.73
Cost (\$A million)	\$16.5-\$20 (Depending on furnishing)		\$8 (July 2008)

Transrapid Incidents

Because Transrapid trains have been in use for over two decades it is possible to learn from mistakes made elsewhere.

Date	Incident	Cause
2006	Transrapid train collided with a wheeled maintenance vehicle at 200 km/h. 23 Killed, 10 injured.	A court concluded that the tragedy was caused by a chain of human errors, including the failure to set an electronic braking system that would have prevented the train from operating while maintenance work was being carried out. → If high track maintenance vehicles are used concurrently with high speed rail trains of any type fatalities are likely.
2006	Transrapid train compartment caught fire. There were no injuries aboard.	Preliminary reports indicated that an electrical problem may have been the cause. → <i>This incident should be examined to find the exact cause of the fire.</i>

References

- ThyssenKrupp Transrapid GmbH web site: <http://www.transrapid.de>
- East West Transport Options Review, Thyssenkrupp Transrapid Australia submission in response to East West Link Needs Assessment Report - Investing in Transport. 10 July, 2008.
- Train Headway Models and Carrying Capacity of Super-Speed Maglev Systems. He, Song & Easham (JSME International Journal,, Series C, Vol 47, No.2, 2004.)
- US Maglev Coalition website: <http://www.usmaglevcoalition.com/>

About

I am a computer systems development manager working in South Melbourne. I live in Murrumbeena, Victoria.

Transrapid Australia has not contributed to this submission beyond allowing me to use their material and confirming the cost details.

I would not derive any financial benefit from this proposal.

Contact

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