Australia Needs
A National Passenger Rail Operator

Dr Garry Glazebrook

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Foreword

Fastrack Australia is a non-profit organisation aimed at supporting the establishment of high-speed and faster rail in South-East Australia. It has now produced a series of publications, presentations and submissions, as well as an extensive database of over 500 articles and references on relevant developments in Australia and overseas. These are available from its website www.fastrackaustralia.net and cover both:

- ***Why** high-speed and faster rail is important (decentralization and regional development, more efficient transport and lower emissions); and*
- ***How** it can be planned and implemented (integrated rail network including freight as well as long distance passengers and commuters); establishment of a National Passenger Rail Operator; changes to Governance; and detailed alignments and staging plans for both infrastructure and services).*

This is the ninth key report produced by Fastrack. Others include:

- *High Speed Rail: A New Approach (Jan 2021)*
- *Population Trends and Decentralization Options (Jan 2021)*
- *High Speed Rail for Regional Growth in Australia (May 2021)*
- *Implementation Plan for High-Speed Rail (Jan 2023)*
- *High Speed Rail for Canberra and the Capital Region (May 2023)*
- *Freight and High-Speed Rail (June 2023)*
- *Governance for High-Speed Rail (October 2023)*
- *High-Speed Rail Through Sydney (November 2023)*

Future reports will cover other issues, such as how to integrate high-speed rail, faster rail and Inland Rail, and the implications of this for the proposed HSR corridor between Sydney and Newcastle.

Executive Summary

- Australia's interstate passenger trains (other than tourist trains) are a national disgrace. Our State-based operators have no incentive to do better.
- Meanwhile rail services internationally are being rejuvenated by high-speed rail, tilt trains, low carbon trains and new sleeper train services.
- A National Passenger Rail Operator is needed to introduce new and faster services between Sydney, Canberra, Melbourne, Brisbane and Adelaide, utilising these new developments.
- The full HSR network will take decades, But we can start improvements now:
  - The first stage is to introduce fast hybrid tilt trains and comfortable overnight sleeper trains on interstate routes.
  - Once the first high speed line (e.g. Sydney – Newcastle or Sydney – Canberra) is completed, full high-speed trains can be introduced, travelling at up to 320 km/hr.
  - As longer routes are completed and traffic builds up, double-deck high speed trains can be introduced to increase capacity as well as speed.
- The National Passenger Rail Operator should:
  - Specify and own the new trains , which typically have a lifespan of 40 years
  - Contract the service provision to a highly qualified private operator
  - Develop a National Rail Services and Rollingstock Plan
  - Co-ordinate the cascading of State-Government-owned rollingstock from interstate rail services to improve regional rail services.
- New Governance arrangements are needed to integrate this with high-speed rail infrastructure provided by the HSRA and to ensure passenger services receive appropriate priority and access charges.

Contents

Most interstate services in Australia are still handled by forty year-old XPT's. These were capable of 200 km/hr, but low-quality track and alignments restrict them to 130 km/hr.

Australia lags the World

Apart from some world class tourist trains, Australia's long-distance passenger trains are currently a national embarrassment.

There are only twelve interstate passenger train services per day serving Sydney, Melbourne, Brisbane, Adelaide and Canberra.

There are now only two daily services each way between Sydney and Melbourne, and they are no faster than they were 60 years ago.

It takes over 14 hours to travel by train from Sydney to Brisbane, at an average of 64 km/hour. The only daily service arrives at 4:53 am.

Sydney – Newcastle services are slower than 60 years ago

- Steam hauled Newcastle Flyer trains in the 1960's took 2 ¼ hours and were timetabled to the half-minute.
- The fastest trains now take 2 hours 24 minutes despite terminating two stations short of the original Newcastle City Station.

There is not even one daily service between Melbourne and Adelaide, and the twice weekly Overland is essentially a tourist train.

Above: C38 Locomotive which once hauled the Newcastle Flyer and other named trains, still attracts attention. Below: The Spirit of Progress from 1937 was world-renowned and one of the first airconditioned trains in the world.

A Tale of Four Cities….

Australia's lag in intercity and long-distance rail is illustrated below with a comparison between the Sydney – Canberra corridor and the Stockholm - Gothenberg corridor in Sweden. In both cases the cities are linked by high quality multi-lane motorways, and with regular air services. The difference is the un-competitiveness of rail travel in Australia with road and air, primarily because of our low speeds.

Sydney and Canberra have only 3 very slow train services per day.

Sydney - Canberra	Route	Stockholm - Gothenberg
5.4 million	Total Population of the two cities	3.5 million
304 km	Distance between the two cities	397 km
4 hours 8 min	Fastest Train Travel Time	3 hours 14 min
75 km/hour	Average Speed	123 km/hour
Diesel, Non-Tilting	Train type	Electric, Tilting
3	Trains per day each way	34

Stockholm and Gothenberg are linked by 34 fast train services daily

An XPT winds through the NSW Countryside

Why is Australia so far behind?

- Our interstate train services are provided by State agencies, with little interest outside their State borders
- Our long-distance rail corridors are 19th century and very circuitous
- Our passenger rail operators are mostly risk averse and un-innovative
- State governments are focused almost entirely on transport within their capital cities and have ignored the potential for decentralization

One Step Forward?

NSW is currently replacing its ageing XPT, Endeavour and Xplorer interstate and regional trains with 29 newly built trains, with a new maintenance centre at Dubbo. While the new trains will have Wifi and improved passenger amenities,

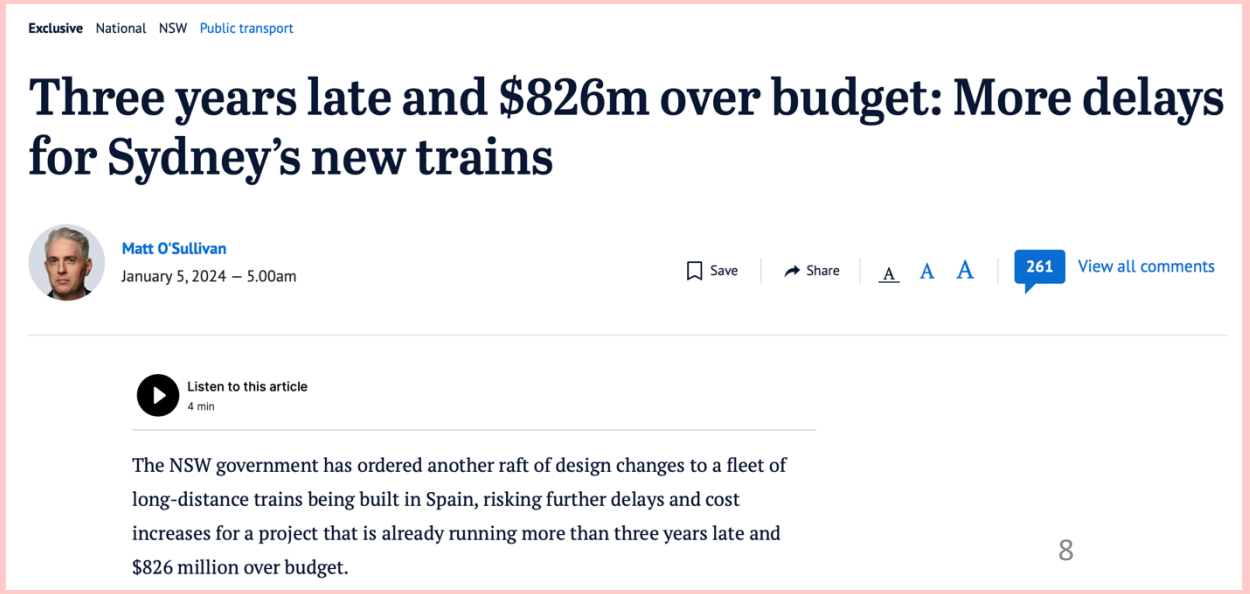
- There will be no increase in fleet size, capacity or the number of services.
- There will be no increases in speed, with a maximum speed of 160 km/hr, as the trains are non-tilting.
- The trains are bi-mode, but can only draw current from 1500V DC overhead, and would need modification to utilise 25 KVAC, the standard for high-speed trains.
- There will be no sleeper car option, as currently exists on overnight XPT services to Melbourne and Brisbane. This will make them even less attractive.

This illustrates the lack of ambition of the NSW Government, which currently handles virtually all interstate passenger rail services in Eastern Australia, other than tourist trains.

Meanwhile the cost of the project has increased and is running three years late. Similar cost over-runs and delays have been experienced with the NSW Intercity fleet replacement project.

https://www.smh.com.au/national/nsw/three-years-late-and-826m-over-budget-more-delays-for-sydney-s-new-trains-20240102-p5eunc.html

Animation of NSW New Regional and Interstate Trains. Source: TNSW.



Exclusive National NSW Public transport

Three years late and $826m over budget: More delays for Sydney's new trains

Matt O'Sullivan
January 5, 2024 — 5.00am

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4 min

The NSW government has ordered another raft of design changes to a fleet of long-distance trains being built in Spain, risking further delays and cost increases for a project that is already running more than three years late and $826 million over budget.

Despite the poor service, demand is growing

Around one train passenger for every 20 plane passengers

Showing monthly train passengers between Sydney and Melbourne as a percentage of plane passengers

Guardian graphic | Source: Transport for NSW, BITRE

Baby boomers had become particularly fond of the service, but there had also been a rise in full fare-paying passengers, bucking an assumption the train mostly served concessions.

Transport

Sleeper services may return on Sydney-Melbourne route after new trains arrive, as night patronage booms

Exclusive: NSW government says it is open to all options even though new rolling stock, now due in 2026, will have reclining seats only

Elias Visontay *Transport and urban affairs reporter*

Sat 6 Jan 2024 01.00 AEDT

A Melbourne-bound XPT train prepares to depart Central Station in Sydney. The NSW government is keeping an open mind as to whether the existing XPT sleeper carriages could be refurbished and added to train sets after the new Spanish-built trains arrive. Photograph: Stephen Dwyer/Alamy

https://www.theguardian.com/australia-news/2024/jan/06/sydney-to-melbourne-sleeper-train-services-return

Second Sydney Airport under Construction.

Implications

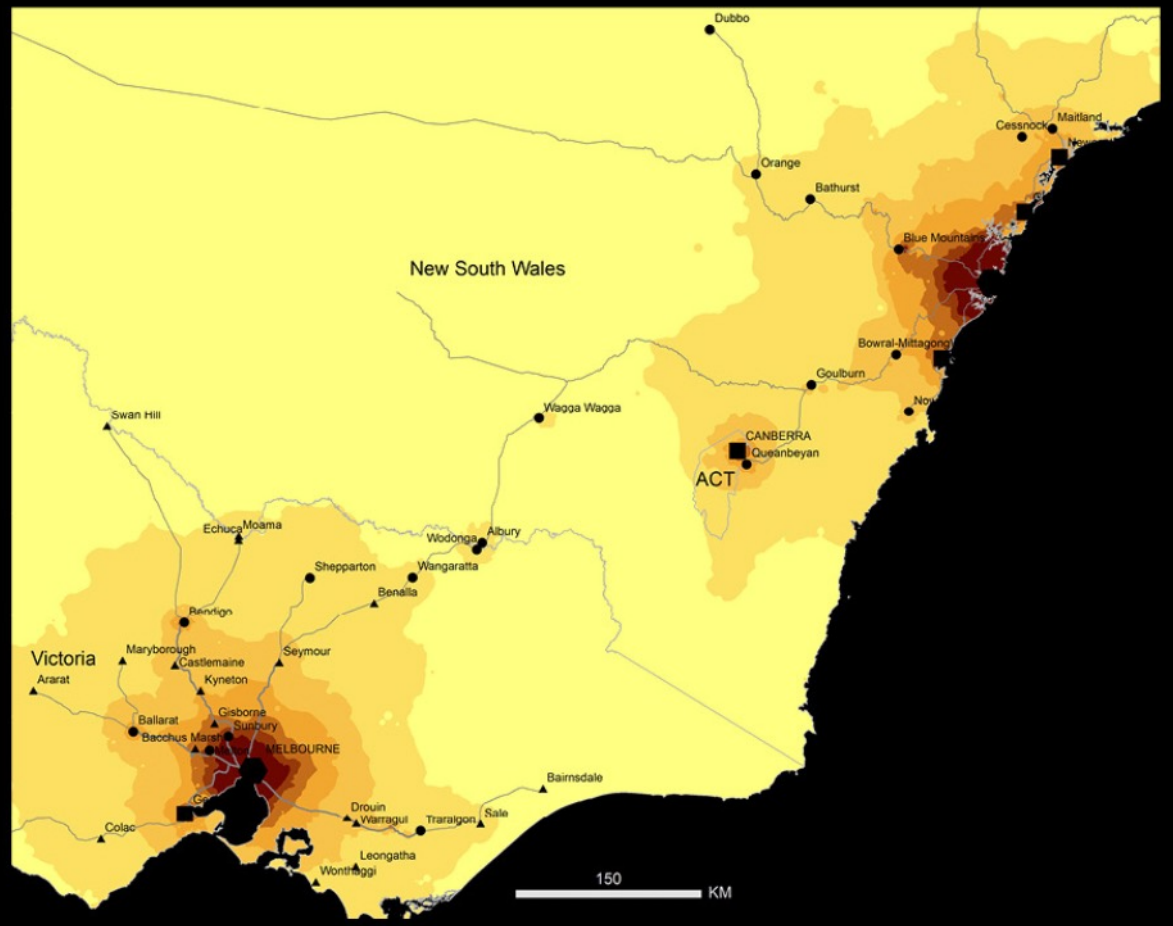
- Airports have been upgraded (and a second airport is under construction in Sydney)
- The Hume and Pacific highways have been duplicated over the last 30 years

But neither of these investments will significantly improve access for regional cities in the long run.

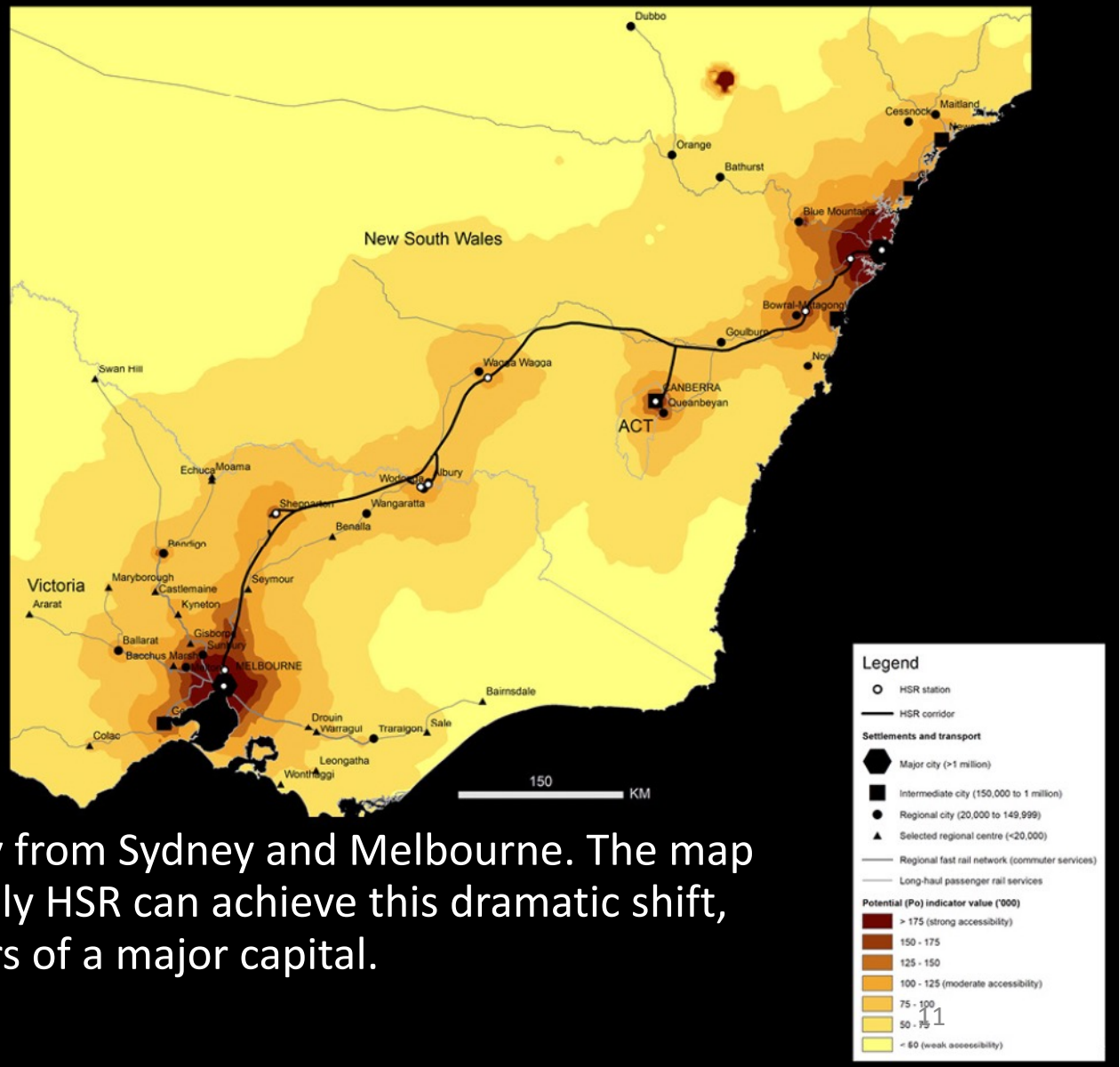
- Regional airlines have always struggled, and highways will keep clogging up as traffic increases.
- Our population accordingly crowds more and more into our three biggest capitals.
- Only much faster rail services can reduce this deficiency.

Why High-Speed Rail is Different from Airports and Highways

Current spatial accessibility (economic potential indicator)



Potential spatial accessibility (economic potential indicator)

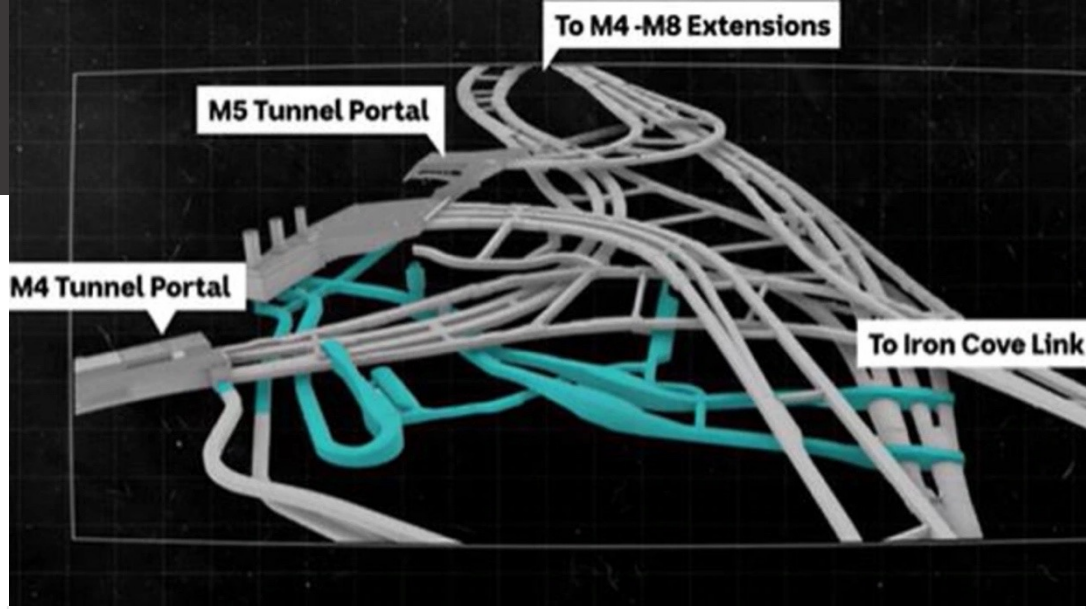


The map above left shows accessibility profiles currently from Sydney and Melbourne. The map above right shows how they would change with HSR. Only HSR can achieve this dramatic shift, which would make all cities in the corridor within 2 hours of a major capital.

Source: Whitten, J (2023): University of Melbourne

Isn’t High Speed Rail expensive?

- <u>Yes, but so are the alternatives of not building high-speed rail.</u>
- Without it, Australia’s future population growth will continue to concentrate in Sydney, Melbourne and Brisbane, requiring
  - Second airports in Melbourne and Brisbane
  - Major highway upgrades of the Hume and Pacific highways
  - Many more metros and tollways in the three big capitals
- Currently Sydney alone is in the middle of spending over $60 billion on metros, $40 billion on tollways, and $26 billion on its second airport plus connecting links. Melbourne is in the middle of its “big build”, with the Suburban Rail link alone costed at well over $100 billion, while Brisbane is building Cross River Rail and numerous highway upgrades.
- All of these are expensive, in part because of land costs, and because many have to be underground. The $3.9 billion Rozelle interchange in Sydney is probably the world’s most expensive road interchange, with multiple underground connections and 24 km of tunnels!
- Since the Interchange opened Sydney’s inner west has experienced traffic chaos, with a total of 10 lanes of traffic now funneled into 4 lanes for motorists headed for the city. Far from relieving congestion, it has simply encouraged more cars with obvious results. The problem is that each attempt to solve our cities’ car-based traffic only makes matters worse, and the temporary fix of more roads gets ever more expensive.
- Channeling some of Sydney, Melbourne and Brisbane’s future population growth to smaller cities will reduce long-term infrastructure costs, including costs for schools, hospitals and social infrastructure because of lower land costs outside the major capitals and the rising cost of expanding facilities on heavily constrained sites in the major capitals.



Rozelle Interchange was meant to ease congestion on Sydney roads. So what went wrong?

By Penny Timms

Posted Yesterday at 6:53am, updated Yesterday at 8:43am

https://www.abc.net.au/news/2023-12-01/rozelle-interchange-explainer-first-week-congestion/103172454

Innovations in Passenger Rail

Internationally a major revival is occurring in inter-city rail, with key developments in four areas:

- **High-Speed Trains**
- **Tilt Trains**
- **Low Carbon and Hybrid Trains**
- **Sleeper trains**

Tilt trains like Alstom's Pendolino are used in many countries.

China's CSR 380 operates regularly at up to 380 km/hour

Sleeper trains are sparking a return to international rail services in Europe.

Trains are far less carbon intensive than flying for intercity travel.

https://www.electricandhybridrail.com/content/news/lumo-carbon-data-reveals-its-electric-trains-are-22-times-greener-than-flying

High-Speed Trains

- There are at least 11 manufacturers globally of High-Speed Trains capable of 250 km/hour or above.
- Some 50 different designs have been introduced in the last 8 years alone to cater for the variety of operating conditions in different countries and regions.
    - Most operate using 25 KV AC (some models can also use other electricity supplies)
    - Most models now use distributed power to reduce axle loads and to maximize acceleration (though Talgo trains already have low axle loads with concentrated power)
    - Most have top speeds of 250 km/hour or above.
- The table below provides examples of some of the recent models available.
- There are also a wide range of locomotive-hauled trains capable of 200-250 km/hour.

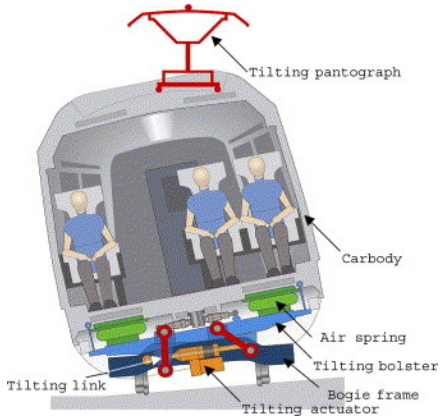
ETR 1000 at Milano Central


Shinkansen to be used on India's new HS Line


Talgo 350 SRO used on Saudi Arabia's HS Line

Examples of Recent High-Speed Trains

Name	Operators	Family	Manufacturer	Power		Maximum Speed (km/hr)			In Service
				Distribution	Supply	Operated	Designed	Test	
AVE Class 106	Renfe (Spain)	Talgo AVRIL	Talgo Bombardier	Concentrated (2 cars)	25 KVAC, 3 KV DC, 1.5 KV AC		350	363	2024
Avelia Liberty	AMTRAK (USA)	TGV and Pendolino	Alstom	Concentrated (2 cars)	25 KV AC, 12 KV AC		350		2024
BR Class 397	Trans Pennine (UK)	CAF Civity	CAF	Distributed	25 KVAC	201	201		2019
CRH 2E (Sleeper)	China Rail (China)		CSR Sifang	Distributed	25 KVAC	250	250		2017
CRH 5G (Tilting)	China Rail (China)		CNR Changchun	Distributed	25 KVAC	250	250		2017
CR 400 AF	China Rail (China)		CRRC Sifang	Distributed	25 KVAC	350	400	420	2017
EMU 320	Korail (Sth Korea)	KTX	Hyundai Rotem	Distributed	25 KVAC		352		2023
ETR 1000	Trenitalia Iryo (Italy)		Bombardier Ansaldo Breda	Distributed	Various	300	360	393	2015
Eurostar E320	Eurostar (Europe)	Valero	Siemens	Distributed	Various	300	320	352	2015
ICE4	DB (Germany)	ICE	Siemens	Distributed	15 KV AC	265	265	292	2017
RABe501	SBB (Switzerland)	SMILE	Stadler Rail	Distributed	15 KV AC, 25 KV AC, 3 KV DC	250	250	275	2019
N700S	JR Central (Japan)	Shinkansen	Nippon Sharyo	Distributed	25 KV AC	300	360	362	2020
E5 Series	NHSRCL (India)	Shinkansen	Hitachi Rail Kawasaki	Distributed	25 KVAC		360		2026
Talgo 350 SRO	SRO (Saudi Arabia)	Talgo	Talgo Bombardier	Concentrated	25 KVAC	300	350		2018



Tilt Trains

- Many countries, including Switzerland, Italy, Japan, the UK, Austria, the US, Sweden, Spain and Australia (Qld) have introduced tilting trains to speed up services on windy track.
- These can typically save up to 20% in travel time in such conditions.
- There are now many manufacturers with offerings in this area.
- Whilst there can be higher maintenance costs than for non-tilting trains, recent design advances are reducing these issues.

Alstom tilting high-speed train for AMTRACK's North-East Corridor.https://www.ft.com/content/77ba6e10-7c36-11e6-b837-eb4b4333ee43

Examples of Tilt-trains




Train	X2U (Stadler/ABB)*	Walkers	Talgo 250 Dual	Alstom Pendolino	Hitachi
Operated in	Sweden	Australia	Spain, US	11 countries	Japan
Operator	SJ	Queensland Rail	RENFE, Amtrack	Various	JR Central, JR West
Power Supply	Electro-Diesel	Electric 25 KVAC	Electro-Diesel	Electric	Electric
Max Service Speed	200 km/hour	160 km/hour	250 km/hour; 180 on non-electrified	250 km/hour	300 km/hour
Tilt	Active	Active; up to 5 deg.	Passive	Active; up to 8 deg.	Active; up to 1 deg.
Max power	4,000 KW (3,200 continuous)		4,800 KW (25KV AC) 4,000 KW (1500V DC) 2400 KW (Diesel)	Varies with configuration	17,000 KW
Seats	360		Approx 260	200 - 600	Up to 1300
Notes	* Refurbished version of original X2000	210 km/hr was reached on trial.			
References	https://www.railvolution.net/news/sj-class-x2000-modernisation-progress		https://www.talgo.com/250-dual	https://www.railway-technology.com/projects/pendolino-train/	https://www.railjournal.com/fleet/jr-central-to-introduce-new-generation-tilting-technology-in-series-385-

Hydrogen and Battery Powered Trains

- An increasing variety of Hybrid Electro-Diesel, Hydrogen-electric and Battery-Electric trains and locomotives are now available which can operate in both electrified and non-electrified territory.
- These typically use batteries to store energy from braking and can reduce emissions to net zero in some cases, for example when using green hydrogen or renewable electricity to charge the batteries.
- Hydrogen powered shunting and mainline locomotives are also under development, including models from Poland, China and Spain

Talgo TPH2 Locomotive (Left). Stadler Battery Powered EMU (Right)

Examples of Hydrogen-Powered and Battery Electric Multiple-Unit Trains and Locomotives

Manufac-turer	Model	Power Details	Cars / Train	In Service/ Ordered	Range (km)	Max Speed
Alstom (France)	Coradia I-Lint	2* 200 Kw Fuel Cells	2	Germany, Austria, Italy, France	800 km	140 km/hour
Toyota – Hitachi (Japan)	Hybari	240 Kw Fuel Cells	2		140 km	100 km/hour
Siemens (Germany)	Mireo Plus H	1.7 Mw Traction System	2-3		800 – 1000 km	140 km/hour
Stadler (Swiss)	Flirt H2	Hydrogen Fuel Cell	2-3	34 trains ordered	460 km (2-car)	
CRRC (China)		Hydrogen Fuel Cell	4		600 km	160 km/hour
Woojin (South Korea)		Hydrogen Fuel Cell			600 km	100 km/hour
CAF (Spain)	Civia 463	Hydrogen Fuel Cell	3			
Talgo (Spain)	TP H2 locomotive	Hydrogen Fuel Cell	Loco-motive		800km	140 km/hour
Stadler (Swiss)	Flirt-Akku	Battery and catenary Powered	2 car	55 trains ordered	140 km range on battery	160 km/hr

https://rollingstockworld.com/passenger-cars/alternatives-to-diesel-what-rolling-stock-producers-offer-today/

Pushing to net zero

- Australia's East Coast Grid is shifting to renewables, with a 2030 target of over 80%.
- Green hydrogen hubs have been announced for the Hunter and South Australia.
- High-Speed lines will be electrified from the outset to achieve high power potential. But many secondary lines will remain unelectrified.
- Rollingstock manufacturers are now selling hybrid battery-electric and hydrogen-electric trains, with more under development. These can use batteries (for regeneration and short-haul applications) and green hydrogen (for long-haul routes).
- Australian conditions will require careful specification of rollingstock to provide sufficient range (see later discussion on rollingstock specifications).

Alstom's Coradia I-Lint, the world's first hydrogen powered train, is now being sold in various countries..

Sleeper Trains

- Overnight sleeper trains were once common in Europe but became uncompetitive with budget airlines.
- However they are now being reintroduced to provide a low carbon or zero carbon alternative to flying in corridors where travel times suit.
- The main constraint on sleeper trains in Europe is now lack of sleeping cars. There are over a dozen manufacturers however, including Siemens which makes cars suitable for speeds up to 230 km/hr, and 7-car trains combining couchette, cabin and sitting cars with a capacity of 250 passengers. Other manufacturers include Alstom, Stadler, KCSZ (Ukraine), Poznan (Poland), and CAF and Talgo (Spain).
- Austria has led the way in reintroducing sleeping trains, but many more routes and services are now being opened up.

Sleeper Trains in Europe

Modern Sleeper trains in Europe typically:

- Use a mix of sleeping and sitting cars with various configurations and prices
- Include accessible showers and toilets
- Can operate at up to 200 km/hour on suitable track
- Include all modern conveniences such as WIFI, business class meeting rooms, bicycle storage, and a restaurant / dining car with high quality food options
- Are locomotive hauled, given the train composition can vary by route, season, time of week etc.

A similar approach is needed in Australia to bring rail travel up to the current standard of comfort and convenience.

Double-deck cars are also used on some services in Europe but may be too high for current loading gauges on most routes in Australia. This would need to be examined in more detail.

Given Australia's long-distance rail corridors are unelectrified, diesel and later hydrogen powered locomotives will be required. These should have speed capabilities up to 180 km/hour and be able to be utilized for fast freight services as well. In the longer-term hybrid locomotives able to use overhead catenary as well should be used.

Siemens new Sleeping car (top) and deluxe double-deck sleeper (below). See https://www.railwaygazette.com/passenger/nightjet-unveiled-as-the-flagship-of-european-night-train-traffic/65031.article)

A Two-Track Solution

Turning this around will require an integrated, two-track Solution:

Faster, more frequent services

- We should follow other countries who have speeded up services on existing tracks.
- This will require tilting trains, given the curvature of many of our main lines.
- They will also need to have hybrid power to take advantage of new electrified track as it becomes available.
- These can initially supplement existing services allowing service frequencies to be increased.

Upgraded Infrastructure

- Introduction of sections of electrified high-speed track is essential, starting with those routes with the slowest alignments and heaviest traffic
- These sections can then be combined to form complete electrified corridors, which can then use full high-speed trains.
- Rollingstock bought now will need to be compatible with both existing rail and with the new high-speed sections.

Integrated Long-Term Plan, Staged Rollout

- It will take decades to achieve an East Coast High Speed Network, which will always include additional connecting lines which are not built to full high-speed standard.
- As each stage of infrastructure is rolled out, services can be further accelerated and frequencies increased.
- Patronage will increase rapidly from the combination of increased speed and frequency, generating demand for more services and infrastructure upgrades.
- Once full corridors are upgraded to high-speed standard, full high-speed trains can be acquired and the hybrid tilt trains can be cascaded to improve services on other lines.

A Co-ordinated Approach: Early Phases

Timing *	Phase	Faster, More Frequent Services	Upgraded Infrastructure
2024	RS1	Establish NPRO. Study Overseas Experience in Rail Operation and Rollingstock Design. Clarify initial service provision and negotiate proposed services with NSW, VIC, ACT, QLD and SA, and re-allocation plans for NSW Interstate Rollingstock.	Formulate long-term HSR Infrastructure Plan. Identify early stages. Establish and promulgate land value capture mechanisms. Modify Governance arrangements. Establish appropriate standards. Negotiate agreements with States etc.
2025	RS2	Specify Initial Rollingstock for both overnight and fast day interstate services, followed by Full High-Speed Services	Undertake detailed design on first stage(s) of HSR alignments. Protect corridors, potential station locations etc. Finalize environmental and business cases. Initiate related Urban Planning for station precincts etc.
2026-2030	RS3	Call for tenders and procure initial NPRO Rollingstock (Fast Tilt and Sleeper Trains) and a Private Operator with relevant experience and expertise.	Tender construction of first stage(s) of HSR track. (suggested as Canberra – Goulburn and Epping – Hawkesbury River). Complete engineering designs for next stages of infrastructure.
2027-2031	RS4	Call for tenders and procure initial NPRO High Speed Trains	Complete first HSR sections and commence on second sections.
2030-2031	RS5	Undertake tests of new rollingstock on existing and new HSR track. Finalize timetables, marketing, service provision, low carbon energy refueling arrangements etc.	Undertake tests of first completed track sections, modify further specifications etc. for future infrastructure.
2032	RS6	**Launch new sleeper and fast tilt services.**	Commission first section of HSR.
2033	RS7	Test First Full High-Speed Trains	Complete and commission first complete HSR Stage (e.g. Sydney – Newcastle or Sydney - Canberra)
2034	RS8	**Launch First Full High-Speed Services**	Continue tendering Stage 2 of HSR.

* Indicative only – will depend on availability of finance etc.

Sleeper Trains

- The distances between major Australian capitals are highly suitable for sleeper trains given the modest speeds on our main interstate lines, which typically range up to 130 km/hour maximum, and are often down to 80 km/hr.
  - Overnight services are feasible now, allowing passengers to board around 7 – 10 pm and arrive refreshed at their destination between 7 and 8 am next morning, in time for a day's business or other activities.
  - Passengers can also work while on the train if needed, and avoid a night's accommodation in an expensive hotel, making the trip financially attractive.
- Sleeper trains can complement fast day trains, This would allow, for example, passengers to travel from Sydney to Melbourne by overnight train, spend a day and night in Melbourne, and return via a fast day service.
- This needs a co-ordinated approach by a National Operator to achieve economies of scale. Such an operator could share locomotives with fast freight services. It could also offer travel packages combining rail and air travel.
- As new segments of high-speed rail alignment are introduced, travel times for some journeys can be reduced, allowing extended sleeper train options – for example Brisbane/Gold Coast – Canberra; Newcastle – Melbourne – Geelong; or Albury – Adelaide.
- This requires an integrated long-term strategy combining both infrastructure, rollingstock and services. HSRA is in a position to achieve this if it has an appropriate remit which is wider than just "high speed" trains.

Indicative (South or West bound) Sleeper Services

	Short Term Sleeper Services			Long-Term Sleeper Services		
Station	Brisbane - Sydney	Sydney - Melbourne	Melbourne - Adelaide	Brisbane - Canberra	Newcastle - Geelong	Albury - Adelaide
Brisbane	7 pm			9 pm		
Newcastle	6 am			5 am	7 pm	
Sydney	8 am			7 am	9 pm	
Canberra				9 am		
Sydney		8:30 pm				
Albury						8 pm
Melbourne		7:30 am	10 pm		7 am	11 pm
Geelong			11 pm		8 am	12am
Adelaide			7 am			8 am
Total Travel Time	13 hrs	11 hrs	9 hrs	12 hrs	13 hrs	12 hrs

Fast Day Trains

The initial fast interstate day trains will be tilt-trains operating on the existing interstate network (Phase 1). However, these can be accelerated compared to current timetables using:

- Higher operating speeds on curves
- Fewer stops
- Guaranteed priority track access arrangements
- Minor track modifications (e.g. between Erskineville and St Peters in Sydney).

Further accelerations to interstate service timetables can be made progressively following completion of sections of high-speed alignment.

The first fully high-speed services can also be introduced progressively with each stage commencing with completion of Stage 1.

Indicative (South or West bound) Fastest Daylight Services

Route	Now	Phase 1	Stage 1 (a)	Stage 2 (b)	Stage 3 (c)
Sydney - Canberra	4.2 hr	3.0 hr	2,5 hr	2 hr	1.5 hr
Sydney - Melbourne	10.8 hr	9 hr	8 hr	6 hr	4 hr
Brisbane - Sydney	14.2 hr	12 hr	10 hr	6.5 hr	4 hr
Melbourne - Adelaide	-	7.5 hr	7 hr	6 hr	6 hr
Canberra - Melbourne	-	8 hr	7 hr	5.5 hr	3.5 hr
Total Services* / 24 hours	**Now**	**Phase 1**	**Stage 1 (a)**	**Stage 2 (b)**	**Stage 3 (c)**
Sydney - Canberra	3	5	8	10	12
Sydney - Melbourne	2	3	6	12	18
Brisbane/GC - Sydney	1	2	4	6	12
Melbourne - Adelaide	0	2	3	5	6
Canberra - Melbourne	0	2	3	5	6
Total Interstate	6	14	24	38	54

- Includes O/N Sleeper, Fast and High-Speed Intercapital Services. Does not include Fast regional, commuter or suburban services.

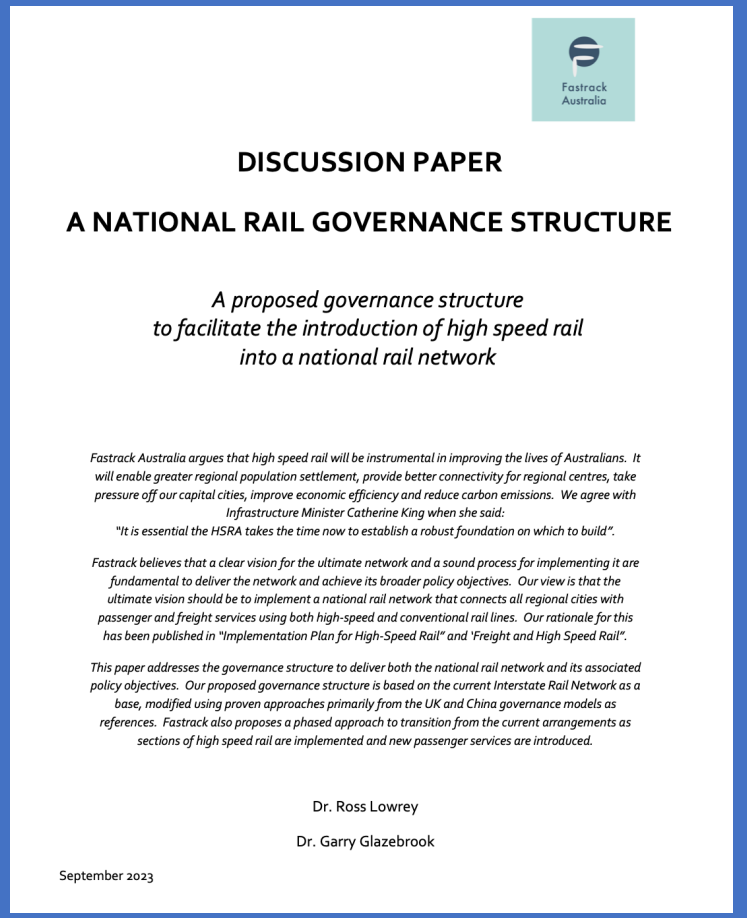
(a) Assumes Canberra – Newcastle HS
(b) Assumes Melbourne – Goulburn HS
(c) Assumes Newcastle – Brisbane / Gold Coast HS

A National Passenger Rail Operator

- Australia lacks an innovative National Passenger Rail Operator like JR, SNCF, RENFE, Trenitalia, or China Rail, which have driven the revolution in passenger rail overseas.
- More recently in Japan and Europe, private operators have emerged as well, including companies like JR Central, Eurostar, NTV, Iryo and Ouigo, with further companies emerging to take advantage of a growing rail market, especially for international high-speed and sleeper services.
- This suggests there would be plenty of potential operators to provide high-quality and innovative interstate and long-distance scheduled (non-tourist) services in Australia.
- However, our market is currently too small to support multiple operators providing similar services. The first step needs to be to establish a National Operator, initially to run regular services between Sydney, Melbourne, Canberra, Brisbane and Adelaide on the interstate standard gauge network. These services should include:
  - faster daytime services, provided by fast tilt trains, and
  - somewhat slower but conveniently timed overnight sleeper services.
- The introduction of these services would allow the NSW and Victorian Governments to re-allocate the trains currently used for longer distance interstate Services to increase service frequencies for intra-state services, e.g.
  - Sydney – Orange, Dubbo, Lismore, Coffs Harbour, Armidale, Kiama, Goulburn, Wagga Wagga and Albury in NSW
  - Melbourne to Shepparton, Seymour, Ballarat, Bendigo, Geelong, Warrnambool and Latrobe in Victoria.
- Existing tourist train operators would continue to provide less frequent long-distance services such as the Indian Pacific, Ghan and Overland, which cater essentially for tourist markets

Governance Arrangements

- A separate Fastrack Australia report “A National Rail Governance Structure” has examined changes to the governance arrangements for rail in Australia to facilitate the introduction of high-speed rail.
- The introduction of a National Passenger Rail Operator was anticipated in that paper.
- In particular, governance arrangements will need to facilitate:
  - Ownership of long-distance interstate rollingstock by the Operator, since these trains typically have economic lives of up to 40 years, longer than the usual franchising arrangements.
  - High-quality train paths for passenger services (unlike the US and Canada, where passenger trains generally have lower priority than freight trains).
  - Maintenance of tracks at a quality appropriate for higher-speed passenger services (expected to be up to 200 km/hour on some existing rail lines, and 250 – 320 km/hour on new high-speed alignments).
  - Access for the National Passenger Rail Operator to appropriately sized and quality station infrastructure, especially at key existing terminals like Central, Southern Cross and Roma Street, and at future High-Speed Stations such as the proposed HSR station in Sydney (See Fastrackaustralia report on “High Speed Rail Though Sydney”)
  - Track Access charges which enable competitively priced rail services


Fastrack Australia

DISCUSSION PAPER

A NATIONAL RAIL GOVERNANCE STRUCTURE

A proposed governance structure to facilitate the introduction of high speed rail into a national rail network

Fastrack Australia argues that high speed rail will be instrumental in improving the lives of Australians. It will enable greater regional population settlement, provide better connectivity for regional centres, take pressure off our capital cities, improve economic efficiency and reduce carbon emissions. We agree with Infrastructure Minister Catherine King when she said:
“It is essential the HSRA takes the time now to establish a robust foundation on which to build”.

Fastrack believes that a clear vision for the ultimate network and a sound process for implementing it are fundamental to deliver the network and achieve its broader policy objectives. Our view is that the ultimate vision should be to implement a national rail network that connects all regional cities with passenger and freight services using both high-speed and conventional rail lines. Our rationale for this has been published in “Implementation Plan for High-Speed Rail” and ‘Freight and High Speed Rail”.

This paper addresses the governance structure to deliver both the national rail network and its associated policy objectives. Our proposed governance structure is based on the current Interstate Rail Network as a base, modified using proven approaches primarily from the UK and China governance models as references. Fastrack also proposes a phased approach to transition from the current arrangements as sections of high speed rail are implemented and new passenger services are introduced.

Dr. Ross Lowrey

Dr. Garry Glazebrook

September 2023


Discussion Paper

High Speed Rail Through Sydney

Dr Garry Glazebrook

V7: September 2023

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Fastrack Australia

Rollingstock Specifications – Fast Tilt Trains

- Interstate Corridors in Australia are lengthy (300 – 1000 km) and essentially unelectrified except for sections of 1500V DC in the Sydney and Melbourne metropolitan area (the latter on broad gauge track).
- Accordingly, a hybrid, high-powered train with a range of at least 1200 km is required.
- It should be also be able to access overhead power (both 1500V DC and in future 25 KVAC, which will be the choice for new high-speed sections).
- It will need to be bidirectional because of stub-ended terminals at Melbourne, Canberra, Sydney and Brisbane.
- It will need tilting capability, which should enable up to 20% reductions in travel time (25% increases in speed) on highly curved sections, together with a top speed capability of at least 180 km/hour on suitable non-electrified track and 250 km/hour on suitable track electrified at 25 KV.
- It should have regenerative braking capability and high acceleration. This suggests a battery / Hydrogen/Electric locomotive would appear to be a likely solution.
- Subject to further analysis a train capacity of approximately 350 – 400 seats is suggested.

Could this be Australia's Future Fast Tilt Train?

The Talgo 250 dual is already the world's only hybrid fast tilt train which can also change gauge between Standard and Broad Gauge while moving. A consortium of companies including Talgo is to modify this train to also run on hydrogen.

Talgo developing first hydrogen-powered high-speed 'Hympulso' train

A consortium of ten Spanish companies will fit a Talgo 250 train with hydrogen fuel cells.

Noah Bovenizer | January 31, 2024

The Hympulso project will work with Spanish rail infrastructure manager Adif. Credit: Talgo

https://www.railway-technology.com/news/talgo-first-hydrogen-high-speed-train/#:~:text=A%20consortium%20of%20ten%20Spanish,train%20with%20hydrogen%20fuel%20cells.&text=Spanish%20rail%20manufacturer%20Talgo%20is,its%20kind%20in%20the%20world.

Spanish rail manufacturer Talgo is developing a high-speed train system powered by hydrogen fuel cells in collaboration with nine other companies, set to be the first of its kind in the world.

The consortium of Spanish companies, operating under the Hympulso project, is developing a dual-hybrid battery traction system for use on Talgo's 250 train model, replacing one of the two diesel "technical end cars" with one equipped with green hydrogen fuel cells and batteries.

In addition to Talgo, other Hympulso partners include Golendus, Ingeteam, Optimus3D, Repsol and Sener, while Universidad Pontificia Comillas and Tecnalia are listed as collaborators and Spain's national rail infrastructure manager Adif is an observer.

Adif's involvement in the project will also allow the project to explore the impact of a transition to greener energy on rail infrastructure and develop safety requirements around issues such as the hydrogen-powered vehicles themselves and refuelling facilities.

Outlining the full scope of Hympulso, Talgo said: "The project will result in a joint output of hydrogen supply installations adapted to railways -both mobile and static- and a pioneering prototype of a hybrid bimodal train for passengers with automatic track-gauge change, which will be able to run both on conventional and high-speed networks, using catenary supply when available, or hydrogen and batteries in those corridors that are not electrified."

Rollingstock Specifications – High-Speed Trains

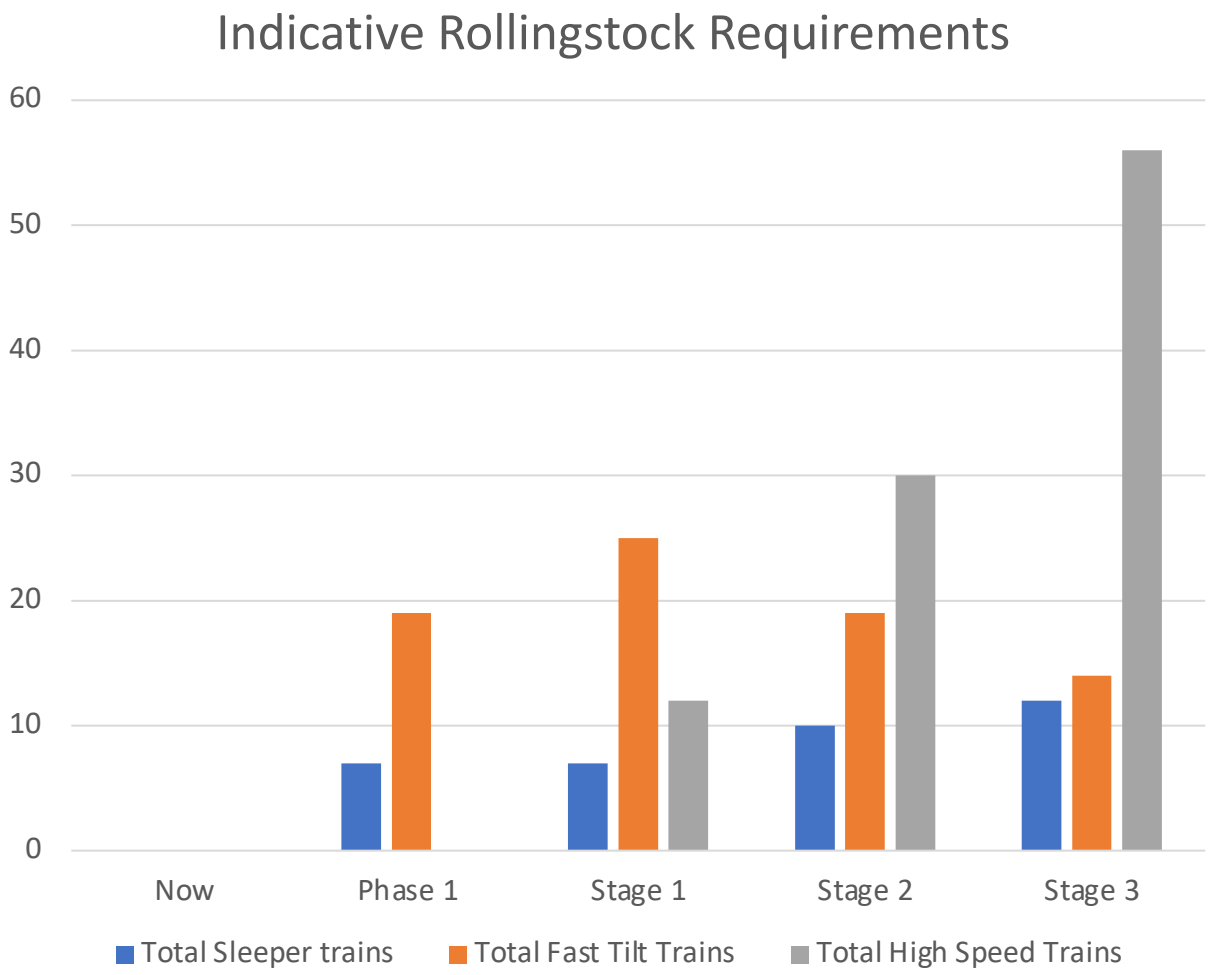
- The initial high-speed sections are likely to be Sydney – Newcastle (150 km); Sydney – Canberra (300 km); and Melbourne – Albury (300 km). These will be electrified at 25 KVAC, but some sections in the Sydney Metropolitan area will be electrified at 1500V DC.
- There is potential for through-running – e.g. Newcastle – Canberra once several early stages are completed
- An electrified, high-powered train will be required, able to utilise both 25 KVAC and 1500 V DC, and with regenerative braking.
- Most such trains currently being delivered have distributed power, which enables very rapid acceleration and minimises axle loads.
- It will **not** need tilting capability, since these trains will be limited to high-speed alignments, which will be designed for commercial operating speeds up to 320 km/hr on straight or large-radius track.
- It will need to be bidirectional because of stub-ended terminals at Melbourne, Canberra, Sydney and Brisbane.
- Subject to further analysis a train capacity of approximately 350 – 400 passengers is suggested (all seated) for the initial trains, with buffet car and luggage space etc.
- In the longer term high-capacity trains up to 900 seats could be required, especially on the Sydney – Melbourne corridor. These could utilise double-deck cars of suitable design (similar to Alstom's latest high-speed trains). Loading gauge on the high-speed lines should be designed to accommodate this possibility in future.

Rollingstock Specifications – Summary

Type	Sleeper Trains	Fast Day Trains	High-Speed Trains
Range	1500 km	1200 km	Not relevant as electrified
Max Operating Speed	200 km/hr	250 km/hr	320 km/hr
Tilt Capability	No	Yes (active)	No
Power source	Diesel / Hydrogen / Electric	Diesel/ Hydrogen/Electric	Electric
Voltages	1500V DC, 25 KVAC	1500 V DC, 25 KV AC	25 KV AC, 1500 V DC
Power Type	Loco Hauled	Loco Hauled	Multiple Unit (Distributed)
Power / Weight Ratio	Low-Medium	Medium	High
Configuration	Driving Cab in End Car / Dual Locomotives	Driving Cab in End Car / Dual Locomotives	Double Ended
Capacity	200 -250 passengers	350 – 400 passengers	350 – 900 passengers
Configuration	Sleepers, Couchettes, Sitting Cars + Buffet	Sitting Cars (2 classes) + Buffet	Sitting Cars (2 classes) plus Buffet/Restaurant Car

Indicative Rollingstock Requirements

- The number of trains required for the assumed indicative **interstate services** indicated earlier, is shown on the graph, based on an analysis of likely timetables and allowing 15% reserve for maintenance etc.
- The number of sleeper trains would increase slowly with additional sleeper services.
- The number of fast tilt trains required would likely peak at Stage 1 and fall after the completion of a fully electrified High-Speed line between Sydney and Melbourne at Stage 2.
- However, these could be re-assigned to fast regional services which would also be growing. These could also be utilized to replace ageing Vlocity trains in Victoria, and the regional trains currently being purchased by NSW Trains.
- The number of full high-speed trains would grow rapidly in Stage 2 and 3 to cater for the main interstate services between Melbourne, Canberra, Sydney, Brisbane and the Gold Coast.
- The productivity of the rollingstock would steadily improve with the faster speeds possible as the new HS lines are introduced to traffic.



Scale of Operations and Ultimate Scope for NPRO

- If the National Passenger Rail Operator was limited to Interstate services only, it could expect to grow to be a middle-sized operation in terms of rollingstock, with around 80 trains by the completion of the high-speed infrastructure. For comparison:
  - California's High Speed Rail Authority has just gone to market to procure its first 6 high speed trains, which will be utilized on the central part of the San Francisco – Los Angeles HS line in a few years' time.
  - SNCF in France is a large, established HS rail operator, with a fleet of around 350 high-speed trains in operation, and more on order.
- If the NPRO took over the current regional rail services provided by NSW and Victoria, the total fleet could eventually amount to perhaps 250 trains, which would be a sizeable fleet. This would make sense from both an efficiency and customer perspective, as it would increase fleet utilization, improve economies of scale in procurement, simplify timetabling and operations, and allow a more uniform quality of service for customers.
- However, the State Governments may not be keen for this to happen, and it is not strictly necessary. There are now several places in the world (including Italy, Spain, the Netherlands etc.) where several different passenger rail operators run trains over the same tracks.
- Any decisions on this can therefore be left for the future. On the other hand, it typically takes 3-6 years to procure high-speed rollingstock or sleeper trains (which are in high demand) once the requirements are specified.
- **Accordingly, the Federal Government needs to begin considering rollingstock issues now if it wishes to have any improved services in operation by the early 2030's.**

Need for In-House Expertise

- For well over a century, Australia built its own trains. State Governments encouraged this with subsidies and procurement policies favoring manufacturers in their own State. Ultimately, this led to too many assembly plants for the volume of trains being built.
- However, some States over-reacted to this, notably NSW, which has followed a policy of buying overseas-built trains for the last decade, direct from China, Korea and Spain, with only final assembly being done in Australia.
- Unfortunately, this has led to major problems. Lack of local rollingstock expertise within the rail agencies, coupled with union disputes, has led to contractual delays, major alterations from the original specifications, and significant cost over-runs (see box).
- Both local and overseas experience strongly suggests that
  - Any National Passenger Rail Operator should have in-depth local knowledge of rollingstock design, manufacture and requirements. This needs to be located in the agency, not outsourced to consultants.
  - Rollingstock can be assembled in Australia, but it is likely that the more advanced technologies required, for example for high-speed trains or tilt trains, will need to be sourced from experienced overseas manufacturers, utilizing their global market experience and R&D capabilities.
  - Australian long-distance passenger rail operations have some distinguishing features, such as relatively long distances, lack of electrified track, a mix of signaling and safety systems, various loading gauge and structure gauge issues, different operating rules etc. This can make procurement complex, but can be overcome provided local experience is combined with awareness of world's best practices and emerging technologies.
  - Australia does have organizations with the capability to examine, specify and procure appropriate long-distance passenger rollingstock, for example RISSB. However, this would need to combined with up-to date knowledge of the latest developments overseas, for example in design of sleeper trains, ETCS and other safety/ control systems, design of tilt trains, knowledge of track characteristics on different parts of the current and future networks, knowledge of current and potential market demand etc.
  - In particular safety standards become more stringent as speeds increase, and for genuine high-speed trains (250 km/hr and above) are quite challenging for Australia which has no track record in this area.

The cost of a fleet of new Spanish-built trains for NSW has blown out by $826 million due to a dispute with the manufacturer over design changes to the fleet and inadequate planning.

Budget papers show $873 million had been spent on the botched rail project up to June this year, while a further $1.4 billion has been allocated for it over the next four years.

It will take the cost of the 29 trains and rail infrastructure upgrades to accommodate them to $2.29 billion, up from a previous estimate for the project of $1.48 billion which included financing costs.

The NSW budget papers also show the cost of the state's new intercity trains, which were at the centre of a prolonged industrial dispute last year, has increased by $660 million to $3.54 billion.

The blowout in that project is due to modifying and storing the Korean-built fleet, which will start running on lines to Newcastle, the Blue Mountains and the South Coast in 2024, more than four years later than originally planned.

Source: (https://www.smh.com.au/politics/nsw/bungled-nsw-trains-project-blows-out-by-826-million-20230918-p5e5mi.html).

Conclusions

- **Australia's current interstate rail services are a national disgrace.**
- **High-Speed Rail is the ultimate solution to this problem, but wlil take decades to complete**. The planning, design and construction of high-speed rail infrastructure in Australia will take considerable time and resources, especially if the Government remains fixated on the Sydney – Newcastle corridor, the most difficult and expensive part of the Melbourne – Brisbane route, as its only priority.
- **In the meantime, Australia needs a National Passenger Rail Operator** (NPRO) to begin bringing Australia's long-distance passenger rail services into the 21st century.
- **The NPRO should procure new sleeper trains and tilt trains in the first instance** to operate an expanded range of faster, more comfortable and high-quality interstate services between Sydney, Canberra, Melbourne, Brisbane and Adelaide. High-Speed services can then be added as sections of high-speed alignment are completed.
- **NSW Government trains currently used on Interstate services can be re-allocated** to provide enhanced regional services within NSW.
- **The HSRA should develop a two-track strategy, embodying both high-speed rail and the the establishment of the NPRO .** Current Australian operators are not considered to have the necessary experience to make the necessary transformation in the industry.
- **Expertise in rollingstock design, manufacture and operation will be needed by HSRA**, as it is essential to any attempt to improve passenger rail services and to introduce high-speed rail technology which is appropriate to Australian conditions. This expertise needs to be in-house, not outsourced to consultants.