

Accelerating High Speed and Faster Rail in SE Australia.

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September 2025



**Fastrack
Australia**

Foreword

FastrackAustralia was formed in 2021 to promote the development of High-Speed Rail in Australia. It has consulted with a range of stakeholders and produced a number of reports outlining the benefits of HSR and suggestions for its implementation in Australian conditions.

Since 2021, the High-Speed Rail Authority (HSRA) has been established. It has produced a Business Case for the First Stage of High-Speed Rail between Sydney and Newcastle, together with a “Product Definition” covering the Melbourne – Brisbane corridor.

Fastrack Australia is obviously supportive of HSRA’s efforts. However, we believe that a number of other actions to introduce high-speed rail are urgently needed while the business case for the first stage is finalised.

This report outlines these actions.

Executive Summary

- More than 30 Countries now operate high speed trains or are planning or building HSR systems. Australia's current interstate passenger rail system is decades behind overseas countries and could be transformed by high-speed rail.
- The establishment of HSRA nearly three years ago is therefore welcome. However, while further studies have been undertaken and a business case developed, there has been no concrete action to protect corridors, establish land value sharing mechanisms, or develop detailed plans for the rest of the Melbourne – Brisbane corridor.
- It is understood that further detailed investigations of the Sydney – Newcastle corridor are still needed to confirm station locations, alignments and other aspects, and that these may take a further two years to be completed. By this time travel demand in S.E. Australia will have grown well past pre-COVID levels, and key parts of the potential high-speed rail corridor could be lost to urban encroachment, especially South-West of Sydney and North of Melbourne.
- This could lead to pressure to build alternative road and air infrastructure. Unfortunately these would further concentrate Australia's population growth in the major capitals, exacerbating housing affordability and increasing carbon emissions.
- Furthermore, the focus on the most expensive part of the overall corridor, and on a dedicated system entirely separate from the rest of the rail network carries substantial risks. It ignores options to begin improvements to our dilapidated long-distance and interstate rail system in parallel with the development of HSR.
- Even if a decision were taken tomorrow to implement High-Speed Rail between Sydney and Newcastle, unless complementary actions suggested in this report are undertaken, it will be decades before any meaningful improvement in long-distance rail is achieved in Australia.
- This report examines some options for accelerating Australia's move towards High-Speed Rail by integrating it with Faster Rail. This will widen and bring forward the benefits from this major national project.

Recommendations

It is recommended that, as complementary measures to the current HSR planning of HSRA:

1. HSRA and Federal Treasury **establish and announce a land-value sharing policy within 12 months**. This is essential before any detailed plans are announced in order to reduce land speculation; to help pay for high-speed rail; and to maximise the affordable housing and other benefits of its introduction.
2. HSRA urgently identify **potential alignments and station locations** for other key parts of the Melbourne – Brisbane HSR corridor, particularly those in the SW exit from Sydney and the Northern exit from Melbourne which are under urban development pressures.
3. HSRA in conjunction with relevant State and Territory governments take concrete steps to **protect these corridors** by appropriate zoning and / or acquisition processes as soon as possible, but after the promulgation of land value capture policies.
4. HSRA examines and develops within 12 months **options for accelerating and expanding longer distance passenger services** in SE Australia utilising tilt train technology and hybrid locomotives as a transition to full electrically powered high-speed services.
5. HSRA develops and publishes within 18 months an **overall 30-year infrastructure and services staging plan** for SE Australia. This should include the staged introduction of fast commuter, fast overnight sleeper, fast regional and ultimately high-speed inter-capital express services and rollingstock, as well as fast light-weight freight services to operate principally at night.
6. A **National Passenger Rail Operator** should be established alongside HSRA within 2 years to implement major improvements to the speeds, frequency and service quality provided on long-distance and interstate passenger services. The Operator should own long-life rollingstock assets, determine service parameters and seek bids from established passenger rail operators to provide the services.

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A variety of high-speed trains at Madrid's Atocha Station, April 2023. Photo: Author.

1 Introduction

It is now more than 60 years since the first Bullet trains began operating in Japan.

More than 15 countries now have high-speed rail*, with at least 15 more currently building or planning them**

Australia holds the record in high-speed rail studies. But we are still at the station, waiting for the green signal

Why?

** Japan, France, Italy, Germany, Sth Korea, Britain, Taiwan, Belgium, Spain, the Netherlands, Turkey, Uzbekistan, China, Morocco, Saudi Arabia, Indonesia*

*** India, UAE, Egypt, Poland, Lithuania, Latvia, Estonia, Finland, Vietnam, Thailand, Algeria, Czech Republic, Portugal, Denmark, USA, Canada*

High Speed trains are defined here as those with top speeds of at least 250kph



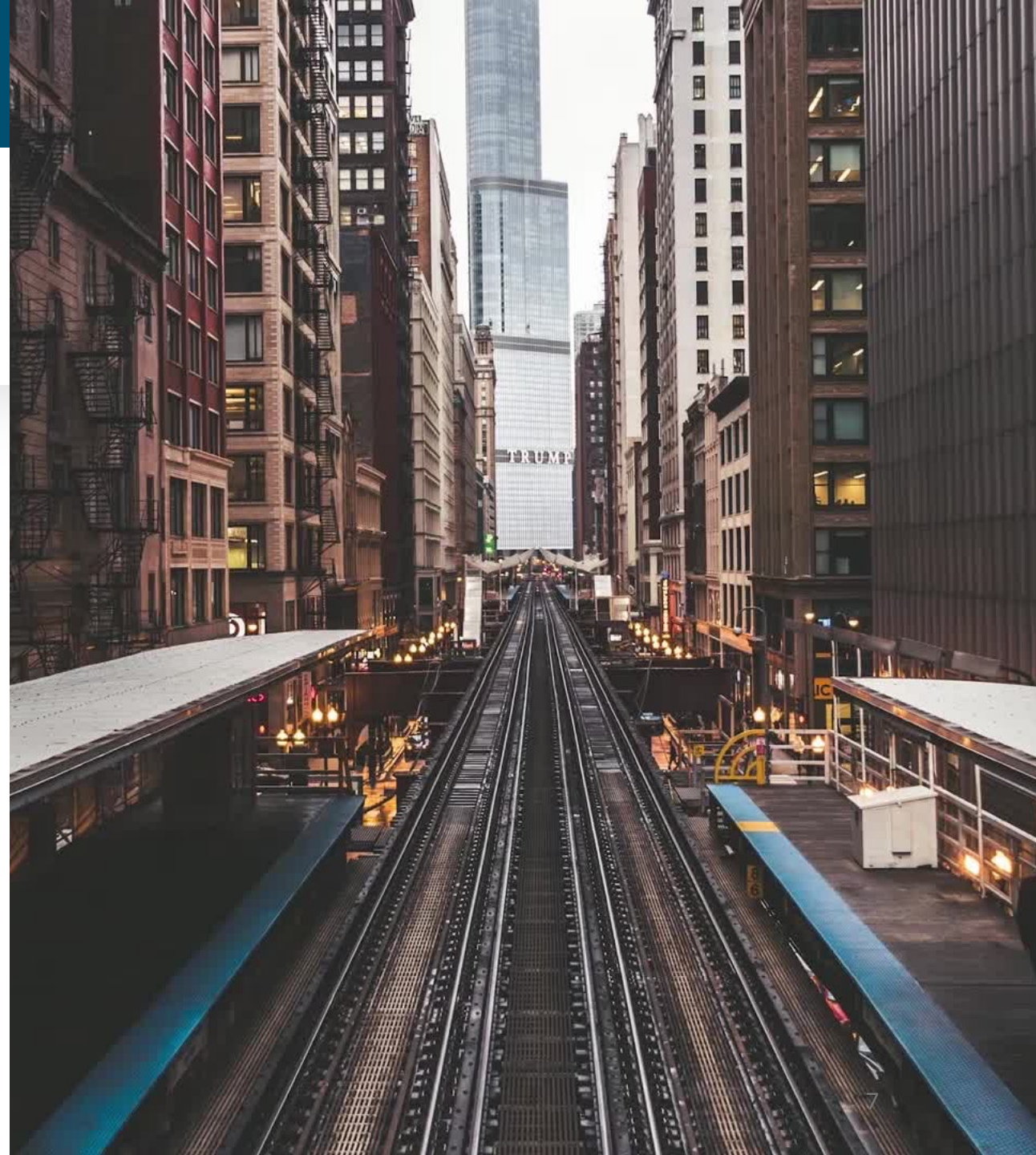
Above: Bullet Train Departs.

Below: New Madrid-Lisbon high-speed train will cut journey time from 10 hours to 3 hours.



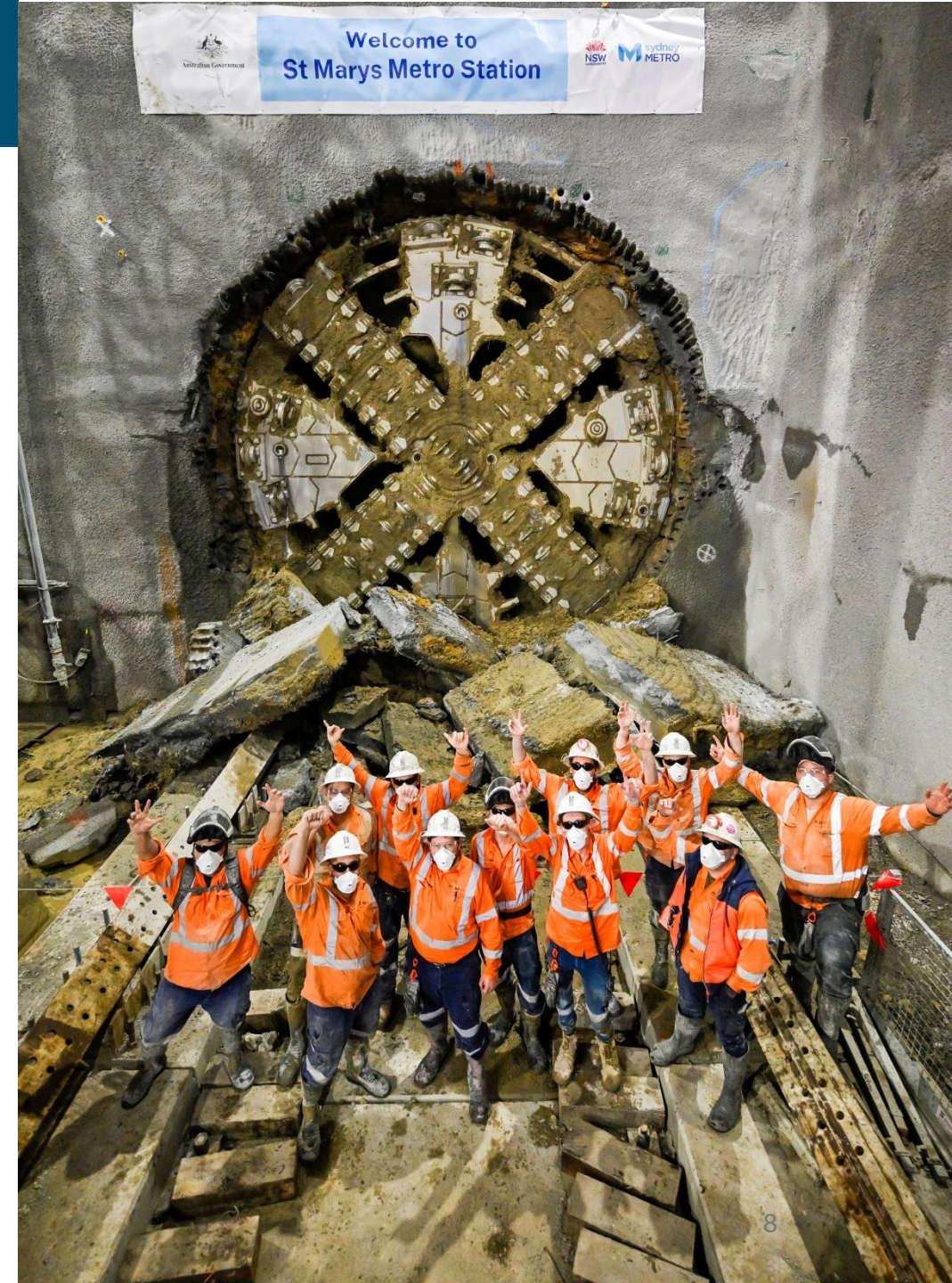
Perceived Obstacles

- **Cost.** Melbourne – Brisbane likely to be expensive.
- **Population.** We are not Japan, Europe, or China.
- **Skills.** Australia lacks high-speed rail experience.
- **Benefits.** Who would use it? We love our cars.
- **Competition.** The Airlines don't want it.
- **Politics.** The votes are in the capital cities.



Counter-Arguments

- **Cost:** HSR is expensive. But so are the alternatives (more roads and airports). And they can't address the challenges HSR can.
- **Population:** SE Australia has similar population density to counties such as Spain, which has built the world's second largest HSR network. SE Australia also has one of the highest growth rates in advanced countries.
- **Skills.** Sydney, Melbourne and Brisbane are building over \$100b of metro lines currently. We now have world class engineering capabilities.
- **Benefits:** Well-designed **public transport is popular**, such as Sydney's and Perth's new metros, even in car-oriented Australia.
- **Competition:** HSR has captured significant shares of many intercity airline markets (e.g. Paris-London; Madrid – Barcelona). We need to **reduce emissions from intercity travel**.
- **Politics:** Regional Australia lacks the population to support high quality educational and health infrastructure. But HSR can change that for SE Australia, addressing housing affordability, congestion, high costs of capital city infrastructure, and regional equity. **Everyone will benefit**.



2 The Current Proposal

Sydney – Newcastle as the first stage of an ultimate Melbourne – Brisbane system.

- Unfortunately, this is the most expensive part of the route per km.
- It is expected to take around 12 years from now before opening (including further investigations / design; construction; and testing and commissioning).

Total separation of HSR from the existing rail system.

- High-speed trains unable to use low speed tracks or vice versa
- No apparent plans to improve services outside of the dedicated HSR system.

It could be decades before Canberra. Melbourne, Brisbane or other cities and towns in or beyond the Sydney-Newcastle corridor see any benefits.

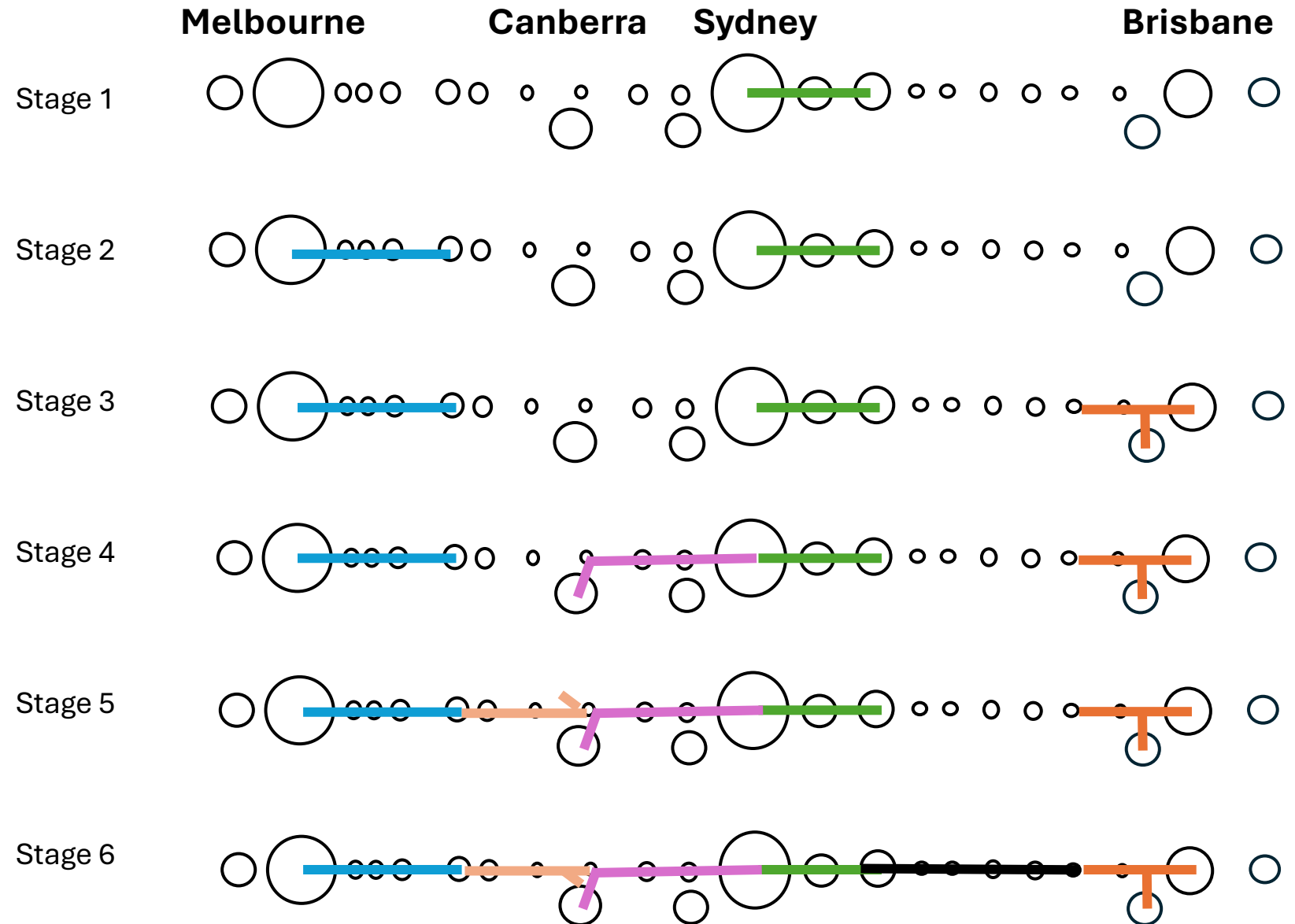


Possible Staging Options: Current Approach

Logically, the HS lines should begin in the major capitals, linking them to neighbouring cities and towns, where the demand is highest.

A possible 6 stage approach for the whole corridor is shown opposite, assuming the current approach. New high-speed trains and services would be introduced at the end of each stage, or about every 4-9 years, but very low speed trains would remain on the remaining low-speed sections.

Passengers to destinations beyond the HSR network, and interstate passengers will need to change to the current slow trains to complete their journeys, until the whole corridor is completed.



3 A Modified Approach

This presentation suggests modifying the HSRA approach:

- It preserves the ultimate vision of a highly reliable high-speed rail backbone, transforming travel in SE Australia.
- It uses “bite-sized steps”, including new trains at an early date to reduce travel times, improve frequencies and build patronage.

This accelerates benefits, whilst reducing risks, by:

- Progressive reductions in travel times across many routes
- Steady increase in patronage and service frequency
- Spreading earlier benefits to a wider population
- Improving the ability to stay within budget envelopes and political priorities
- Building public support across SE Australia



Same Aim, Different Approach

KEY OBJECTIVES	HSRA APPROACH	FASTRACK APPROACH
ULTIMATE HIGH-SPEED NETWORK	2,000 KM Network of HSR from Melbourne to Brisbane with branches to Canberra & Gold Coast	2,000 KM Network of HSR from Melbourne to Brisbane with branches to Canberra & Gold Coast
FASTEST TIMES WHEN COMPLETED Sydney – Newcastle Sydney – Canberra Melbourne - Sydney Brisbane - Sydney	1 hour 1.5 hours 4 hours 4 hours	1 hours 1.5 hours 4 hours 4 hours
KEY APPROACHES	HSRA APPROACH	FASTRACK APPROACH
SERVICES	High-Speed Inter-Capital Services Fast Commuter Services	High-Speed Inter-Capital Services Fast Commuter Services Fast Regional Services Overnight Sleeper Trains Overnight Fast Freight
CONSTRUCTION STAGES	Perhaps 6 stages, each 150-400 km	Perhaps 10 stages, each 100 – 250 km



Widening Benefits – Types of Trains

HSRA envisage two main types of train using the system:

- High-speed long-distance trains
- Fast commuter trains for shorter trips into the major capitals

The alternative approach envisages also allowing the following types of trains to use both the high-speed lines (as completed) as well as existing lines:

- Fast tilt trains able to operate at 20-30% higher speeds on existing curvy main lines.
- Fast sleeper trains (mostly at night).
- Fast, light-weight freight trains (mostly at night).

Access and Compatibility

This will widen the market for both HSR and existing rail services, especially as some HSR trains will also operate on existing, slower lines, especially in the first 30 years of the network expansion.

Type of Train	HSRA Approach	Alternative Approach	Max Speed (on HSR Tracks)	Max Speed (on other tracks)	Typical Average Speed
High-Speed Intercapital *			320 kph	180 kph	180 – 220 kph
Fast Regional *			250 kph	180 kph	130 – 150 kph
Fast Commuter *			200 kph	130 kph	100 – 120 kph
Fast Overnight Sleeper **			150 kph	130 kph	90-100 kph
Fast Overnight Freight **			130 kph	115 kph	80-90 kph

* Operates mainly in daytimes.

** Operates on HS tracks mainly at night, subject to track maintenance requirements.

Building in Smaller Stages

The dedicated, stand-alone approach to HSR proposed by HSRA necessitates very large stages, because:

- Passengers will need to change between HS trains and existing trains, since the High-Speed trains are assumed to be unable to operate on existing tracks.
- This will cause delays and problems co-ordinating services
- Lengthy sections of HS lines will need to be built to provide sufficient travel time savings to overcome transfer penalties and inconvenience.
- Dedicated High-Speed Trains will need new servicing facilities as they will be unable to utilise existing facilities.

A more flexible approach to rollingstock design will allow smaller stages to be put into service, since the fast and high-speed trains can utilise existing tracks to complete their journeys, access servicing and maintenance facilities etc until the full high-speed line is completed.

While a more integrated system may involve some increased costs (e.g. using trains able to operate on multiple voltages and with two types of signalling systems), this is relatively cheap compared to infrastructure costs and is common overseas, especially in Europe.

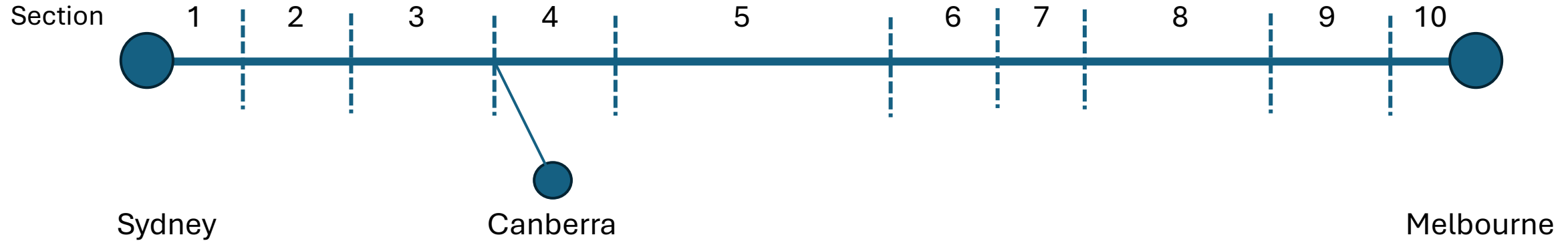
A more integrated approach could provide significant savings in station construction. For example, existing stations can be utilised until patronage build-up necessitates new High-Speed stations.

The smaller stages suggested here also mean that improvements in services can be introduced every 2-5 years rather than every 4-9 years with very large stages. This will bring forward benefits to passengers and maintain public support.

What about Reliability?

- Long-distance and Interstate services in Australia, especially those operated by NSW Trains, currently have very low levels of reliability, with trains arriving on-time only about 70% of the time.
 - This is partly due to current services using 40-year old XPT and Explorer trains.
 - It is also partly caused by maintenance issues on the infrastructure (tracks, signals etc) and also partly due to freight trains failures, which share tracks on the ARTC network outside Sydney.
 - HSRA is aiming for a totally new image for passenger rail, with 98% reliability, and is understandably reluctant to run high-speed trains on the low-speed network, citing experience overseas especially in Germany where HS service reliability has declined due to failure to maintain the infrastructure.
- However, from a passenger perspective, anyone making a journey beyond the dedicated HSR network will need to change to the low-speed trains, hence the overall reliability will be dependent on the reliability of the latter.
- NSW Trains is introducing new regional and intercity trains (see later discussion) which will improve reliability. However much more needs to be done to bring the NSW network, in particular, up to global standards.
- HSRA could in fact be a catalyst for this, if it introduced some trains which used both networks. This would require HSRA seeing its remit as beyond just the sections of HS infrastructure which exist at any given time and instead took responsibility for long-distance interstate passenger services in SE Australia.

Dividing Infrastructure into Sections: Sydney - Melbourne



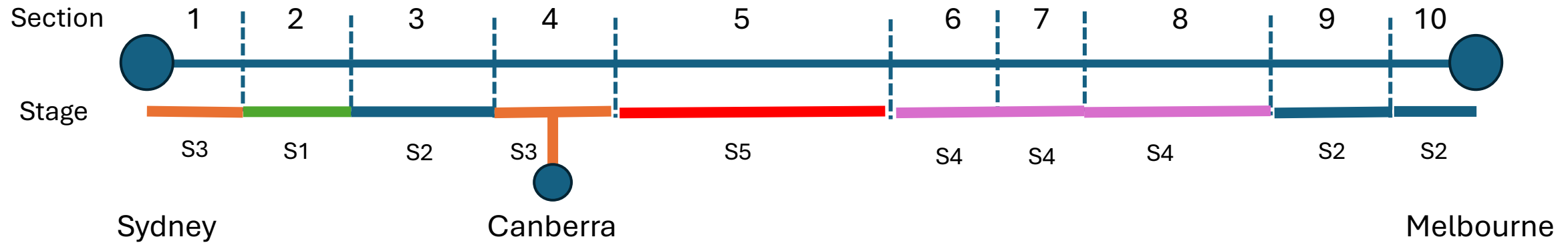
It is suggested that the Sydney – Melbourne HSR Corridor be divided into 10 sections as shown above, both for construction and for operational reasons.

This will facilitate connections to the existing line, and progressive introduction of new services as new sections of HS Line are completed.

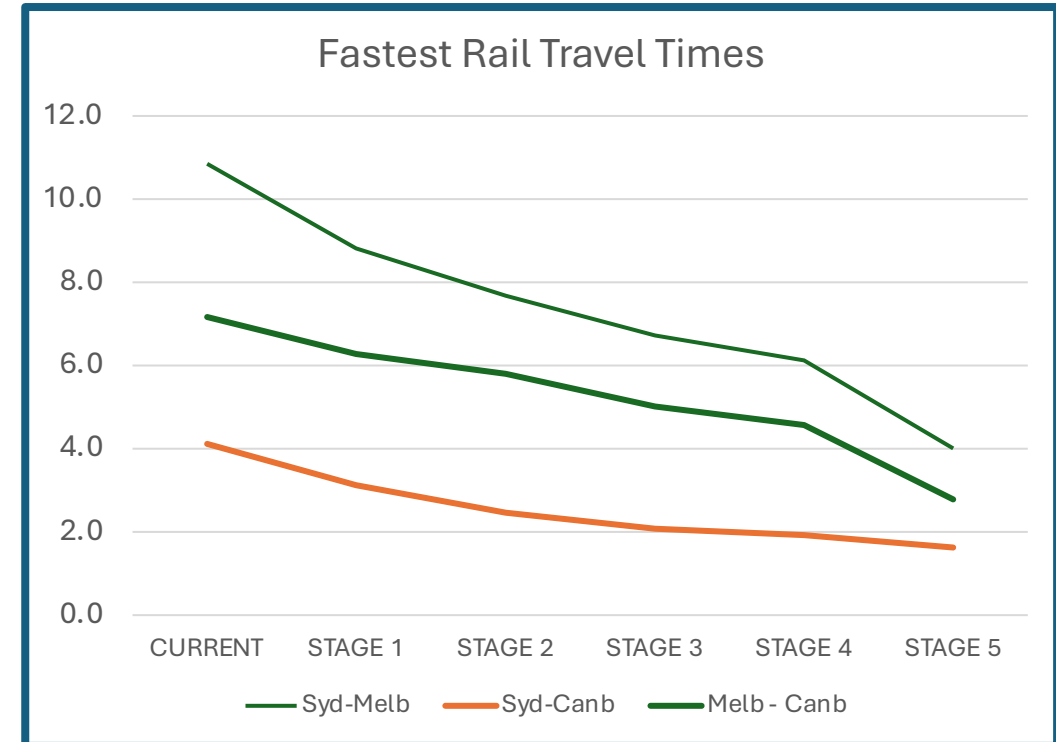
The sections can be combined in various ways into stages. One option and its rationale is presented on the next slide.

No	Section
1	Sydney HS Station – Sydney South
2	Sydney South – Southernth Highlands
3	Southernth Highlands - Goulburn
4	Goulburn – Canberra - Yass
5	Yass – Wagga Wagga
6	Wagga Wagga - Albury
7	Albury - Wangaratta
8	Wangaratta - Seymour
9	Seymour – Melbourne North
10	Melbourne North – Melbourne HS Station

Staged Construction and Faster Travel: Sydney - Melbourne

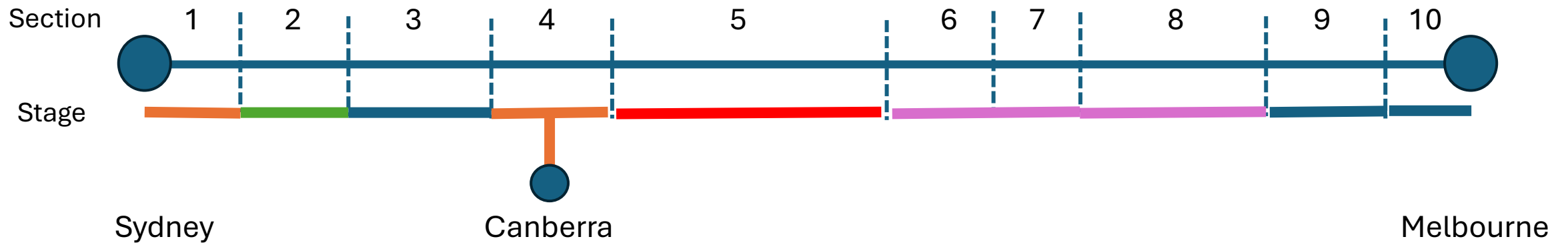


Stages (South)	Code	Sections	Rationale
S 1		2	Wentworth Deviation. Bypasses windy route via Picton; Provides access to Wilton and Southern the Highlands and via bus to Illawarra; accelerates Long Distance services
S 2		3,10,11	Further time savings of 1 hr for Long Distance services; allows new fast commuter services to Melbourne; provides additional capacity in sections with high freight traffic near Melbourne and through the Southern Highlands.
S 3		1,4	Completes Sydney – Canberra HSR. Relieves capacity constraints in Sydney and accelerates fast Commuter Trains.
S 4		6,7,8	Connects Shepparton, accelerates Fast Regional and Interstate trains.
S 5		5	Completes Sydney – Melbourne HS Line with further major time savings with new high-speed trains.



Introduction of New Services: Sydney - Melbourne

The staged completion of infrastructure can be accompanied by the staged introduction of new fast and high-speed services on the Southern Corridor.



Stage	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
Fast Commuter	Sydney – S Highlands	Melbourne - Seymour	Canberra - Goulburn	Sydney – Illawarra*	
Fast Intercapital	Sydney – Canberra, Sydney - Melbourne				
High-Speed Regional	Sydney - Goulburn	Melbourne - Shepparton		Melbourne - Albury	Sydney - Albury
High Speed Intercapital			Sydney - Canberra		Sydney - Melbourne

* Assumes Completion of Maldon – Dombarton Link in Stage 4

Faster Travel : Brisbane – Sydney

A similar approach in the Northern Corridor (Sydney – Brisbane) will allow progressive increases in speed and frequency of services, and reductions in travel time. For example, a possible five-stage approach to the North could be as follows

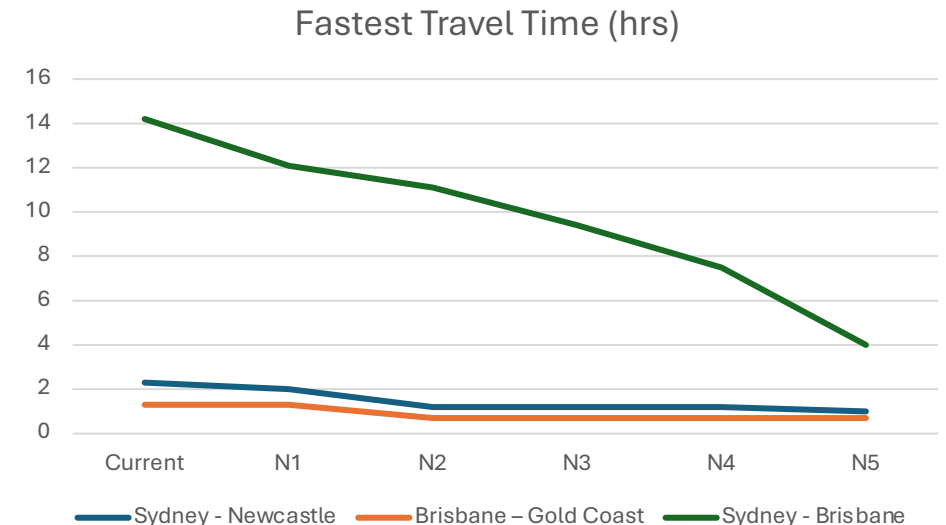
- Stage 1: Introduce Fast Tilt Trains for Inter-capital services (Sydney – Brisbane)
- Stage 2: Completion of Sydney – Newcastle HS Line
- Stage 3: Completion of Brisbane – Gold Coast and Grafton HSL
- Stage 4: Completion of Newcastle - Taree HSL
- Stage 5: Completion of Taree – Grafton HSL and introduction of full High-Speed Inter Capital Trains

Fastest travel times on different northern routes are shown opposite. If each stage took around 7 years, then:

- The whole corridor could be completed by around 2060. By this time the first of the fast tilt trains (which commenced service in 2032) would be phased out and replaced in the northern corridor by full high-speed trains for Sydney – Brisbane and Sydney – Gold Coast Services.
- Fast Commuter trains from Sydney to Newcastle would be in service by 2039, while fast fast commuter services to the Gold Coast and Grafton would commence in around 2046.
- High-Speed Regional Services to Grafton by 2046 and Taree by around 2053.



Above: Newcastle is Developing Rapidly





4 New Trains and Services

(a) Fast Regional Services

- Existing interstate rail lines between Sydney, Melbourne, Canberra and Brisbane, as well as other main lines in NSW (e.g. Main Western line, Illawarra line) are all subject to 19th century alignments with curves limiting speeds to 80 km/hr in many places.
- Tilt trains are used overseas (and even in Queensland) to allow 20-30% higher speeds on such alignments.
- A fleet of tilt trains capable of top speeds of up to 250 km/hr (under 25KV electrified power and on high-speed track), and up to 180 kph on existing lines could significantly reduce travel times for regional and current inter-capital services.
- These can utilise existing lines at higher speeds than current non-tilting trains, and services can be further accelerated as new sections of high-speed tracks are built.
- This is how Spain has progressively accelerated and improved its services over the last 30 years, allowing fast regional trains to service many destinations off the HSR network as well as the HSR stations themselves.



higher speeds on curved track than existing trains.



Fast Hybrid Tilt Train – Suggested Specifications

These trains would initiate faster Inter-capital services between Sydney, Melbourne, Brisbane, Canberra and Adelaide when introduced, using existing tracks as well as new HSR track sections as they are completed. They would eventually cascade to provide inter-regional services with more stops on both HSR and existing tracks, as full high-speed trains take over the Inter-capital expresses.

It is suggested that these trains would be loco-hauled (rather than multiple unit), allowing the locomotives to be flexibly used also for fast sleeper and fast lightweight freight train services. Suggested specifications include:

- 250 kph top speed on HS track under 25 KVAC power
- 180 kph top speed on existing track using diesel / hydrogen power
- Able to operate also on 1500V DC Overhead in NSW.
- NSW Structure Gauge and axle load requirements. Most likely single deck.
- Active tilting to allow 20-30% faster speeds on highly curved track
- Approx 300 – 400 seats plus buffet / food service, with accessible toilets, WIFI, power for recharging passenger computers/phones, reversible seating.
- Bidirectional operation (Including from the rear coach) as is common in Europe.



Typical Swiss Intercity Train, showing Driving compartment in rear coach, allowing fast turnaround at terminals.

(b) Overnight Sleeper and Daytime Tourist Services

- Current rail services between our capital cities are slow, infrequent and often inconvenient. For example, the only service between Sydney and Brisbane arrives at 4:55am!
- However, the distances between our major capital cities are ideal for overnight sleeper services, where travel times of around 10 hours are give attractive departure and arrival times.
- Some of the existing rail routes out of our capital cities, especially Sydney and Melbourne, also provide opportunities for scenic daytime rail journeys, focusing on the tourist market.
- Sleeper trains are making a comeback in Europe, whilst luxury and tourist-oriented train travel is now increasingly popular globally.
- **Sleeper trains can be converted to day tourist trains, offering opportunities for higher utilisation of rollingstock (see new opportunity opposite). Cars would typically average 1000-1200km / 24 hours.**

A Potential New Opportunity

- An operator specialising in sleeper and tour services with a fleet of 4 trains could achieve high utilisation of rollingstock as outlined in the schedule below. This would allow a variety of day tourist excursions to destinations such as the Blue Mountains and the Hunter Valley, Western Victoria and NE Victorian wine districts.
- Overnight sleeper services would take 10 – 12 hours allowing convenient departure and arrival times.
- Day excursions would take 6-10 hours depending on the destination and visitor attractions.
- Appropriately designed sleeper trains could accommodate up to 240 passengers (180 sleeping and 60 sitting up), converting to around 360 passengers in day excursion mode.

Set	Day 1	Night 1	Day 2	Night 2
1	Blue Mtns XC	Syd – Bris SL	Maintenance	Bris-Syd SL
2	Maintenance	Syd – Melb SL	NE Vic XC	Melb-Syd SL
3	W Vic XC	Melb - Syd SL	Maintenance	Syd – Melb SL
4	Maintenance	Bris – Syd SL	Hunter V XC	Syd – Bris SL

(c) Fast Commuter Services

- In Europe there are an increasing number of fast commuter trains serving typical routes of 40 – 150 km, from manufacturers such as Siemens, Stadler, Alstom and Skoda.
- These have high speeds and comprehensive amenities such as accessible toilets, WIFI and power outlets, bicycle storage, wide doors and food service.
- HSR will open up new opportunities for such faster commuter services, into Sydney, Newcastle, Canberra, Melbourne, Brisbane and the Gold Coast.

Examples of European High-Speed Commuter Trains

Manufacturer	Stadler	Siemens Desiro HC
Length	150m	210m
Capacity (Seats)	486	820
Structure Gauge	European	European
Max Service Speed	200 kph	200 kph
Power Supply	25 KVAC	25 KVAC

Alstom High-Speed Commuter Trains

Adessia Max™ solutions

High-capacity commuter train solutions with easier accessibility, combining single-deck and double-deck high floor configurations for commuter service from 120 to 200 km/h.

Adessia Stream B™ and Adessia Stream H™ solutions

Green solution for non-electrified commuter networks, offering single-deck battery or hydrogen-powered high floor multiple units for commuter service from 120 to 160 km/h



(Above) Stadler's new High-Capacity Double-Deck Commuter trains recently introduced in Austria.

(Below). Siemens Desiro HC is a modular fast commuter design with single-deck, double-deck and mixed configurations possible.



Suggested Fast Commuter Train Specification

NSW is introducing its New “Mariyung” fleet of Intercity Commuter Trains. These have similar amenities and capacities to European Fast Commuter Trains, but slower speeds as they use 1500V DC Power.



HSRA should consider a modified “Mariyung” design able to utilise 25KVAC as well as 1500V DC, with a top service speed of up to 200 kph, but compatible with the NSW structure gauge etc.

These would be able to utilise existing NSW tracks as well as new High-Speed Tracks as they are built.

The flexibility for 4,6, 8 or 10 car trains provies flexibility – for example lower capacities would be needed for Southern Highlands services or those to Canberra, Brisbane or Melbourne, than for those to Sydney.

Type	NSW Mariyung	Fast Commuter
Design	Double-Deck	Double Deck
Length	205m (10 car set) 123m (6 car set) 82m (4 car set)	205m (10 car set) 123m (6 car set) 82m (4 car set)
Structure Gauge	NSW standard	NSW standard
Door Height	NSW standard	NSW standard
Width, Height	3.03m, 4.40m	3.03m, 4.40m
Weight	500 tonnes (10 car) 300 tonnes (6 car) 200 tonnes (4 car)	500 tonnes (10 car) 300 tonnes (6 car) 200 tonnes (4 car)
Seats	Up to 816 (10 car)	Up to 800 (10 car)*
Design Speed Service Speed	176 kph 130 kph	220 kph 200 kph
Power	1500V DC	1500 V DC 25 KVAC
Features	Accessible Toilets, WiFi, Pass Info etc	Accessible Toilets, WiFi, Pass Info, Food service etc

* Some reduction in seating capacity assumed to allow for additional transformers and food service.

(d) High-Speed Inter-Capital Services

- Once the first full inter-capital HSR route (Newcastle – Sydney) is opened then genuinely high-speed (up to 320 kph) trains can be utilised, while some services could also operate between Newcastle and Canberra (440 km) when that is completed. Specification of such trains will need to be finalised 5-6 years ahead of the expected completion of the infrastructure.
- There is a wide range of high-speed longer distance trains used overseas, from Talgo type trains (without distributed power but with two-wheel bogies and low profile, tilting capability and light weight cars) through to very high-capacity Shinkansen and Chinese high-speed trains. The latter typically have larger dimensions (especially width) which would not fit the NSW structure gauge.
- A stand-alone HSR system could adopt one of the European structure gauges which could allow very similar trains to those used in Europe to be utilised. However, this is wider than the NSW structure gauge, and is generally designed for lower height platforms, so this would prohibit any such high-speed trains from utilising existing NSW tracks.
- **Accordingly, it is recommended that any High-Speed trains for Australia should be specified so as to be able to utilise existing NSW tracks, platforms etc, and to be able to use 1500V DC overhead as well as 25 KVAC. This will allow much greater flexibility in their short-term operation, even though in the longer term they may be restricted to HSR lines.**
- Achieving this flexibility should not provide any major obstacles to the rollingstock designers. There are a multitude of structure gauges used world-wide, and most modern HS trains in Europe are able to accommodate multiple power supply and signaling systems. Any cost increment in doing so is very marginal compared with the cost of HSR infrastructure.



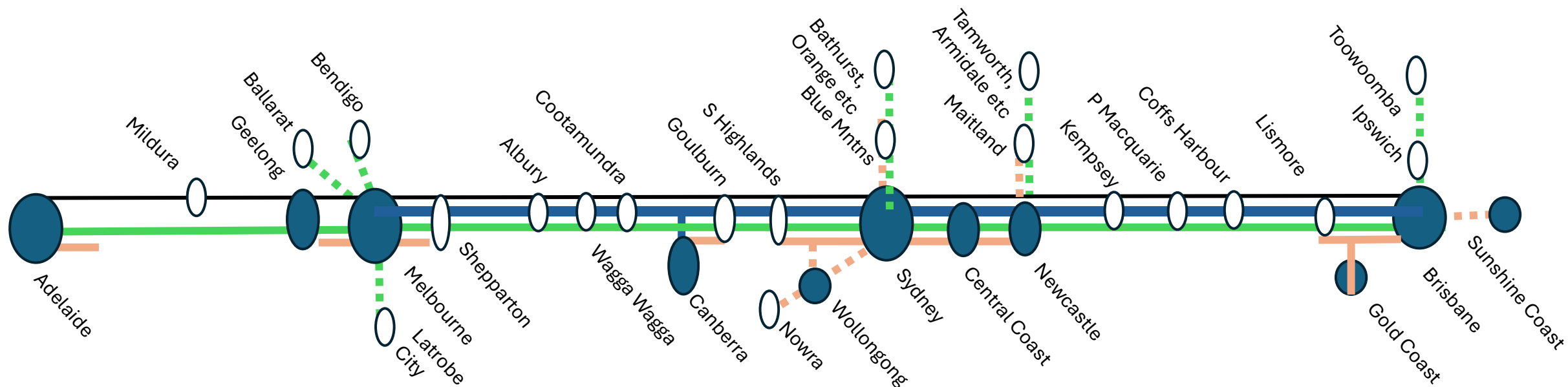
(Top) Alstom Single Deck HS Train in Italy.

(Middle): Siemens derived HS Train in Moscow

(Lower): Alstom Double Deck HS Train in Morocco

Ultimate Service Patterns

When the network is complete, it is suggested that the following services would be provided:



- High Speed Inter-capital
- Fast Inter-regional (HS Lines)
- Fast Inter-Regional (Other Lines)
- Fast Commuter (HS Lines)
- Fast Commuter (Other Lines)
- Fast Sleeper

Note: Not all potential HSR Stations or cities shown

The HS infrastructure would form the spine of a larger system, serving all key cities and towns in the Adelaide – Sunshine Coast corridor, with a variety of services suitable to the local conditions, but allowing fast overall journeys.

Linking Rollingstock with Infrastructure

- Acquiring High-Speed and other Rollingstock can involve significant timeframes, up to 8 years:
 - Although many manufacturers now have standardised designs which can be adapted to specific local requirements (such as structure gauge, platform height, power supply, internal seating configurations etc), it takes some time to fully specify the requirements. Failure to think this through can be costly.
 - There is a surge in orders in Europe for both sleeper carriages and high-speed trains from new rail operators. Even acquiring commuter rollingstock has significant timelines.
 - Maximising local content will also require investment in local capability (both infrastructure and training)
 - Global supply chain issues are affecting rollingstock manufacture along with other industries
 - Once equipment is available there can be significant periods for testing and commissioning, especially for high-speed trains which will be new to Australia.
- Accordingly, specification of rollingstock for HSRA needs to work hand in hand with an overall program of staging infrastructure and also the introduction of new services.
- For that reason, it is recommended that the approach to both infrastructure and services should be finalised as soon as possible, and early discussions with rollingstock manufacturers be held to identify new opportunities, such as hybrid powered trains (hydrogen-electric, battery electric etc).

5 A New Operator

- As discussed in an earlier Fastrack Report, Australia's current long-distance and interstate trains are a long way behind world best practice, in part because of 19th century track alignments which prevent competitive speeds, and in part because there is no national approach.
- A new operator will be needed to lift us to the standards expected in many overseas countries.
- This operator should be selected to operate a long-term franchise (10-15 years) for high-speed and fast services as well as overnight sleeper services.
- However, the actual rollingstock typically has a life of 25-35 years and it is recommended that it be owned by the Federal Government, and leased to the operator.



6 Other Issues

- High Speed and faster rail will alter accessibility significantly,, leading to escalated land (and hence housing) prices in areas near high-speed stations. Failure to anticipate and combat this through appropriate land value sharing policies will :
 - Increase the cost of building high speed rail
 - Reduce the potential benefits from provision of affordable housing
 - Increase the costs of associated urban infrastructure such as schools, TAFE/universities, health facilities etc
 - Miss out on opportunities to help fund high speed rail infrastructure
 - Reduce the ability of HSR to stimulate decentralisation out of the capital cities.
- Measures similar to those which apply in the ACT, which capture 75% of increased land values from rezonings, are urgently needed.
- In addition, rapid urban growth in parts of the Brisbane – Melbourne HSR corridor is likely to further add to construction costs for HSR by requiring more expensive solutions such as tunnelling.
- Urgent action is therefore also needed to protect not only station sites and nearby locations but also the HSR corridor from such development pressures.
- This is particularly urgent in south-western Sydney, where rapid development around Wilton and Menangle has already impacted on potential HSR corridors.



Recent urban development at Wilton (top) and Menangle (Below).



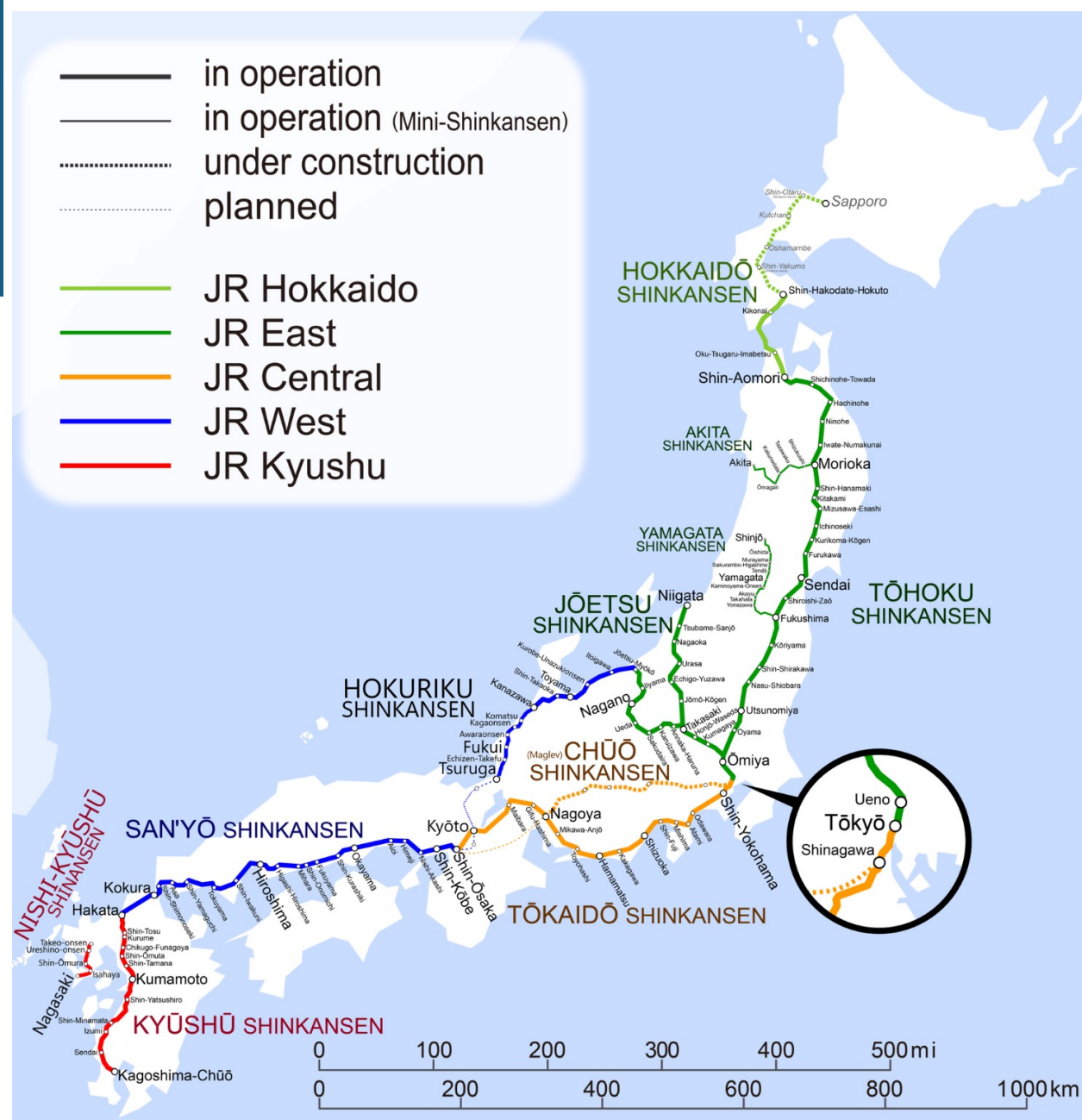
7 Starting the Journey

- HSRA has undertaken a detailed business case of the first stage of Australia's High-Speed Rail network. A decision on it is expected soon.
- This presentation has suggested that a modified approach be taken to the following stages, with the next priority being the "Wentworth Deviation" in the Sydney – Canberra corridor.
- This corridor in particular needs to be defined and protected urgently, and policies need to be put in place to capture and share appropriately the increments in land value expected along the high-speed rail corridors.
- At the same time, the specification of new rollingstock to introduce fast regional, fast commuter and overnight sleeper trains should be begun urgently, and steps taken to establish a national passenger rail operator to lift the standard of our interstate and long-distance rail services.
- Hopefully after 30 years of studies, the journey is finally about to begin.

Attachment 1: Evolution of High-Speed Rail Networks

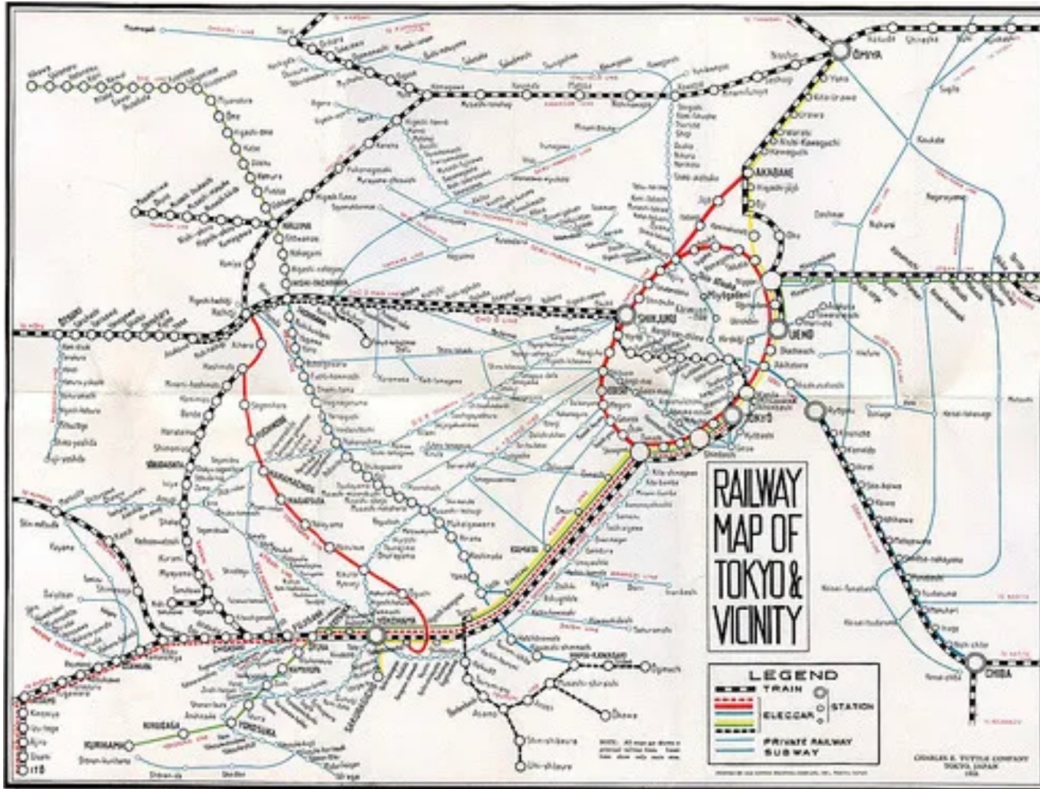
Japan

- Japan pioneered High-Speed Rail in 1964 with the first HSR Trains, with a maximum speed of 220 kph.
- The Shinkansen started as a dedicated line in the most densely settled corridor in Japan (Tokyo – Nagoya – Osaka), as the existing railway was narrow gauge and already at capacity.
- The system has gradually been expanded over 60 years to a 3,000 km network. Top speeds on some links are up to 320 kph.
- There are up to 17 trains per hour in the busiest part of the system in peak periods. Specially designed stations allow expresses to overtake slower trains making more stops.



https://upload.wikimedia.org/wikipedia/commons/thumb/a/a1/Shinkansen_map_202405_en.png/960px-Shinkansen_map_202405_en.png

Japan (continued).



Tokyo Rail Map 1959. Metros in light blue, longer distance narrow gauge lines in black and red. These lines were already congested in 1959. Hence the decision to build a totally separate Shinkansen system.



Mini-Shinkansen Train in Tokyo

- Japan developed its Shinkansen between Tokyo and Osaka as a dedicated system. This followed because the existing lines were narrow gauge (3 foot 6 inches) and already overcrowded in the 1960's, as well as being slow.
- But some routes to smaller cities and with lower patronage have been converted from narrow-gauge and operate special “Mini-Shinkansen” trains at low speeds on these lines (130 kph max) while also running onto and off the high-speed lines.
- They are also narrower than the standard Shinkansen trains and have special devices to assist with overcoming the gaps at platforms on the Shinkansen.

Spain

- Spain has the World's second largest HSR network, with well over 3,000 km by 2025. The first stage from Madrid to Cordoba) was built in 1992
- By 2015, there were high-speed links between Madrid, Barcelona, Sevilla, Malaga, Alicante, Valencia, Cadiz and other cities, with the network beginning to be built in the north and north-west.
- The network is still being expanded with a new link to Oviedo in the North recently opened, links to France via San Sebastian and to Portugal planned, and recent plan for a tunnel link under the Mediterranean to Morocco.
- As with other countries, the network has been extended and progressively linked up, including a new underground link in Madrid connecting the two high-speed rail stations.



Development of Spain's HSR Network

- Spain's existing broad-gauge network led to the development of special gauge-changing trains, plus trains able to operate on both electrified and non-electrified lines.
- For example, hybrid powered high speed tilting trains operate all the way to Ferrol in the North-West using high speed electrified and low speed non-electrified segments.
- Spain's HSR network evolved over many stages across five main corridors plus branches, in some cases with isolated sections joined by sections of low-speed lines (See Table).

Examples of Spanish cities and when first connected to HSR.

Year	South	North-West	North	North-East	East
1992	Sevilla				
2003				Zaragoza	
2005	Toledo			Huesca	
2006				Lleida	
2007	Malaga		Segovia		
2008				Barcelona	
2011		Santiago			
2013				Figueres	Alicante
2015	Cadiz	Vigo	Leon		
2018					Castellion
2019	Granada				
2021		Ourense	Burgos		Alicante
2022					Murcia
2025			Oviedo		
2027			Bilbao		
2030	Almeria				36

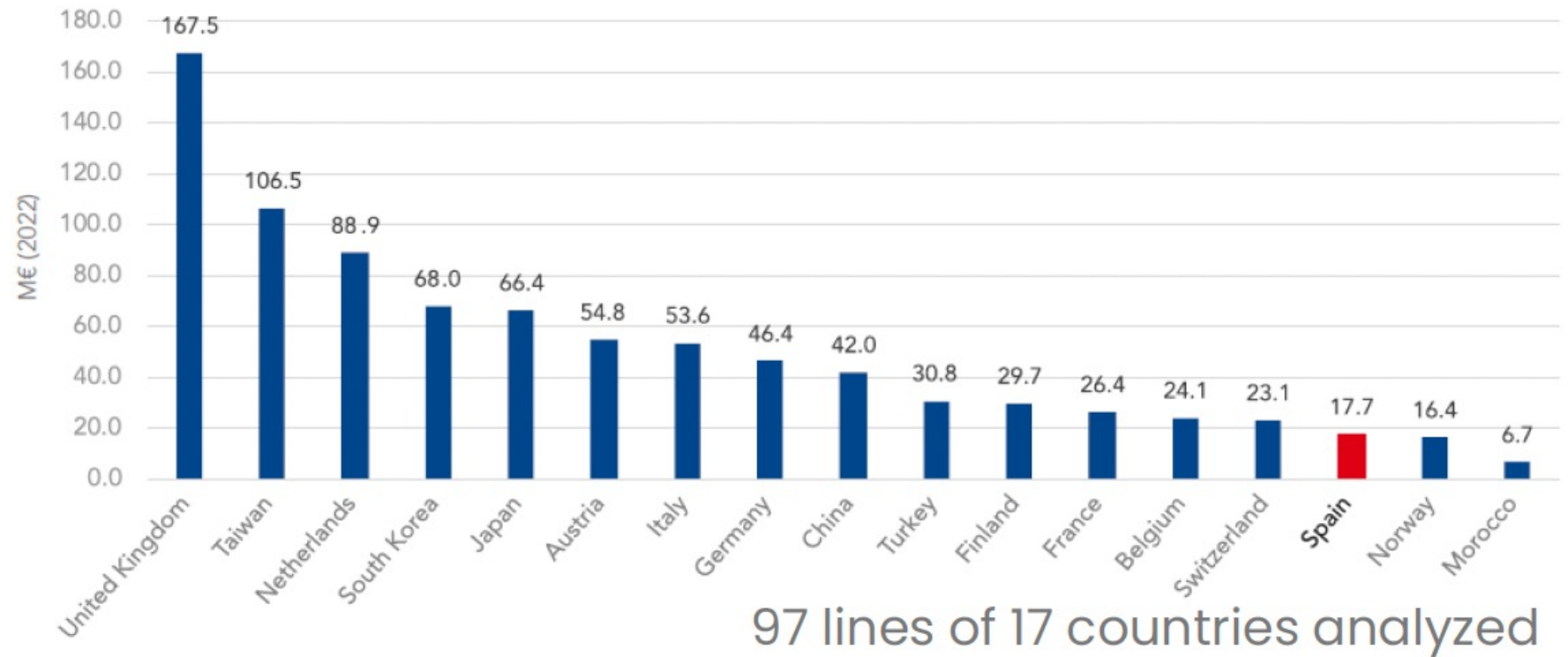
Spain (continued)

Spain also innovated in infrastructure.

- Long-term infrastructure plan
- Government body to plan and contract out construction
- Innovative construction methods

As a result, Spain has some of the lowest infrastructure costs for HSR in the world despite having challenging topography in many areas.

Construction costs/km (weighed) by country



China

- China's High-Speed Network is also not a “one size fits all” system:
- It is the World's largest HSR network, 50,000 km by 2025 with target of 70,000 km.
- It started as a series of small segments but expanded as a nationally planned system.
- The HS Network Includes lines capable of maximum speeds of 400 kph, 350kph, 250 kph and 200 kph.
- There are a range of trains and services even on the same line. E.g. Beijing – Shanghai accommodates very-high-speed expresses (5 hrs) down to trains with many more stops and taking 10-11 hours, and even overnight sleeper services.
- On some routes trains will operate every 3-4 minutes and perform as high-speed commuter trains.
- On other lines trains are slower and less frequent. But the aim is to connect all cities >500,000 to the network.
- Some high-speed trains operate only on high-speed lines; others also run on lower speed lines.

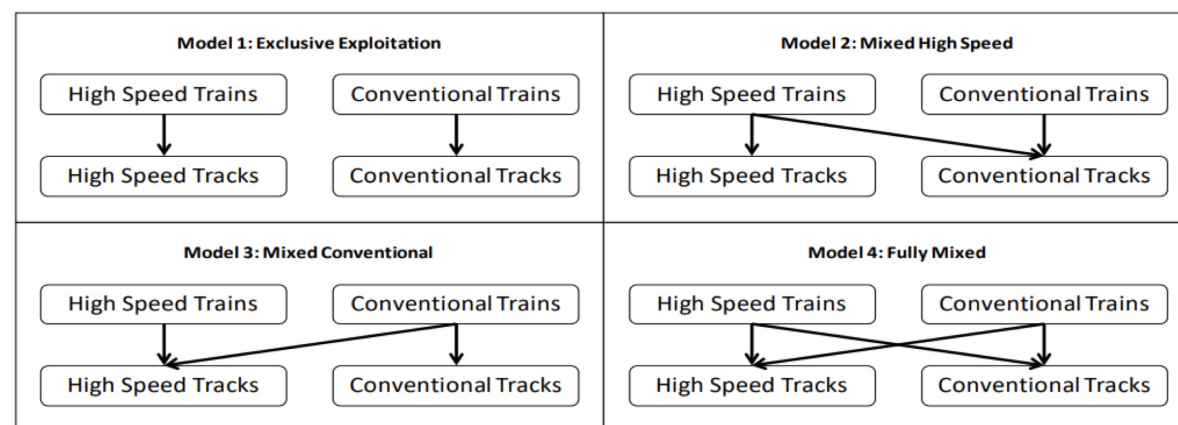


Attachment 2: Stand-Alone or Integrated?

The CER Proposal for European High-Speed Rail (1) identifies four models for building and operating HSR, describing them and their advantages and disadvantages as follows:

When designing a network, European policy makers should take into account that in some Member States long-distance and high-speed trains share the infrastructure with slower regional and freight trains. CER members know from their operations that dedicated high-speed infrastructure is very important especially for providing attractive travel times. But as this infrastructure does not exist in some parts of Europe today, railway undertakings need to be able to operate as fast as possible also on mixed-use infrastructure. CER therefore does not support ideas of harmonizing the speed of all trains on mixed-use infrastructure, since that would lead to high-speed trains slowing down to the speed of regional or freight trains. This would make travel times a lot less attractive and, as a consequence, probably lead to less passengers choosing the train.

Addressing the high-speed rail integration requires balancing efficiency, cost, infrastructure constraints, and operational complexity. In Europe, there are several models that differ in the degree of usage of conventional and dedicated tracks by High-Speed services, respectively:



Model 1: Exclusive Exploitation – In this model, high-speed trains operate only on dedicated high-speed tracks, while conventional trains remain on conventional tracks. This ensures optimal speed, efficiency, and reduced infrastructure wear for high-speed services but requires significant investment in separate rail networks, limiting flexibility and increasing overall costs. France's and Spain's high-speed network partly follow this model.

Model 2: Mixed High-Speed – High-speed trains primarily use high-speed tracks but can switch to conventional tracks when needed, while conventional trains stay on their own lines. This approach allows high-speed services to extend beyond the high-speed network, improving coverage at a lower cost, though it may cause operational inefficiencies when speeds vary between shared tracks. France's TGV, and Italy's Frecciarossa operations as well as Alvia services in Spain which use rolling stock that changes gauge when passing between high-speed (standard gauge) and conventional track (Iberian gauge) apply this model.

Model 3: Mixed Conventional – In this system, conventional trains operate on high-speed lines in addition to their regular routes on conventional tracks. This approach optimizes infrastructure use, allowing more trains to benefit from high-speed corridors without requiring dedicated high-speed rolling stock. While it enhances network connectivity and flexibility, it may also introduce operational challenges, such as managing speed differentials between high-speed and conventional trains.

Model 4: Fully Mixed – Both high-speed and conventional trains share tracks freely, allowing full integration of rail services. This provides maximum network flexibility and reduces infrastructure costs but introduces significant operational challenges, including potential delays and complex scheduling. This model is applied on the majority of the German ICE network.

https://www.cer.be/images/publications/positions/250505_CER_Position_Paper_HSR_Master_Plan.pdf