High Speed Rail in Australia
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Proposals / EOI’s / Studies

- 1980s – “VFT” Sydney – Canberra – Melbourne
- Early 1990s – “SpeedRail” Sydney – Canberra
- Late 1990s – VHST Competition Sydney – Canberra with 4 bidders
  - 200-250 km/h High Speed + Tilting Capability
  - 300-350 km/h Very High Speed Non Tilting
  - 500 km/h Maglev
- ARUP-TMG ECVHST Study 2001;
- Rail CRC Study 2009/2010;
- Infrastructure Partnerships Australia/AECOM Report
- September 2010 - Department of Infrastructure and Transport Internal Brief “A profile of high Speed railways”
- 2012 – Stage 2 study awarded
Key Study Objectives

- Is there a place in Australia’s transport strategy and policy for an East Coast VHST?
- To provide the Australian Government with an analysis of VHST potential, approaching the issue from a national benefit perspective and within a longer-term transport infrastructure context.
“…………an EC VHST could have a place in Australia’s transport future. The securing of that place, however, would be dependent on whether it can become an integral part of a vision and action plan for a new paradigm of development, mobility and transportation connectivity in the East Coast corridor.

If it does have a place, an EC VHST will not achieve it in the absence of political vision and leadership, long-term bipartisan political commitment, the full participation of all Governments and the collective will and skills of Australians.”

Full Report available at:
Japan in 1964
- Key Historical National Priorities

- Reduce energy consumption;
- Lessen dependence on imported oil;
- Create new development centres on a national economic spine;
- Reduce pressures on major cities by long distance work commuting.
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France (TGV) 1981
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France (TGV) - Key Historical National Priorities

- Reduce energy consumption;
- Lessen dependence on imported oil;
- Solve lack of capacity between Paris and Lyon;
- Create an export technology.
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Germany (ICE) 1991
Germany (ICE) 1991

- Key Historical National Priorities

- Fast Services for Passengers and Freight;
- Land bridging between Eastern and Western Europe;
- Create an integrated capacity in internal mobility and cross border trade;
- Reunification of East and West Germany.
And now?

China’s Harmony Express

- Guangzhou (10.33 million) to Wuhan (8.97 million);
- terminus to terminus 1023km;
- two 8-car trains each way - non-stop time 3hr8min;
- Average speed 326 km/h;
- limited stop trains - 3 hr42mins to 3hr 56mins;
- fastest top speed in the world of 394km/h.
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And now China - Key National Reasons

- To Increase the rail capacity by separating passenger and freight lines;
- Promote regional development;
- Raise current technology standards, catalyze innovation in its industry, export these technologies;
- National integration through the compression of time and space.

Source: Karl Fung Research, 2010
The Central People’s Government of the People’s Republic of China (2005), ‘Mid-to-Long Term Railway Development Plan’
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China’s Big National Reasons

- To increase the rail capacity by separating passenger and freight lines;
- Promote regional development;
- Raise current technology standards, catalyze innovation in its industry, export these technologies;
- National integration through the compression of time and space.

- 2010 - 7531 kms HSR operational;
- 2010 - 10,000 kms under construction;
- 2012 - 13,000 kms of HSR operational
- 2020 – 16,000 kms and 90% of population
China’s Achievements

- Guangzhou (10.33 million) to Wuhan (8.97 million);
- Terminus to terminus = 1023 km;
- Two 8-car trains each way - non-stop time 3 hr 8 min;
- Average speed 326 km/h;
- Limited stop trains - 3 hr 42 mins to 3 hr 56 mins;
- Fastest top speed in the world of 394 km/h.
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7th World Congress, Beijing

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Beijing South Station and Onboard CRH 380

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Running at 350 km/h

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It’s not about the technology ....

Source: Peter Thornton

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So what are the Australian BIG NATIONAL GOALS?

Which justify investing massive taxpayer funds into an HSR system???
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East Coast Population Centres

- Brisbane 2,000,000
- Gold Coast Tweed 580,000
- Coffs Harbour 52,000
- Port Macquarie 43,000
- Newcastle 540,000
- Sydney 4,500,000
- Wollongong 280,000

Cities/Towns 1996 Population
(Population >=5,000)

Source: ECVHST Study 2001 and Wikipedia
The World Bank “High Speed Rail: The Fast Track to Economic Development?” July 2010

Lobbying by States “South Australia should sit up, take notice and claim a seat at the table of the federal inquiry into high-speed rail”

Lobbying by cities and towns – The Illawarra Mercury collected 70,000 signatures in support of HST going via Wollongong in the ’90s;

“Shepparton left behind as report shows faster rate of growth for cities with VLocity trains”

“The indirect effects of a high speed line do not appear automatically,” Prof E Quinet.
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East Coast Geographic Realities

Sydney – Brisbane Coastal Corridor
770 kms (Actual rail distance 988 kms)

Sydney – Newcastle Corridor
117 kms (Actual rail distance 168 kms)

Sydney – Canberra corridor
250 kms (Actual rail distance 330 kms)

Sydney – Melbourne Inland corridor
730 kms (Actual rail distance 963 kms)

Same as:
Beijing to Shanghai; or Brussels to Madrid; or Sapporo to Hakata; or New York to Jacksonville (FA)

Source: ECVHST Study 2001
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Australia In Perspective - Scale

Source: UIC

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Australia in Perspective - World’s Flattest Continent?

Comparison of Fast Train Route Alignments

Source: PB Thornton Research 2001
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How fast is fast enough?

http://www.copyright-free-photos.org.uk/aircraft/5-BA-Concorde.htm

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Travel Time as a Function of Upgrade Cost
Sydney Canberra ~ 250 kms

- **Existing Service 145 km/h Diesel**
- **200-250 km/h Tilting Trains**
- **350 km/h "TGV" type Trains**
- **500 km/h Maglev**

**Upgrade Cost** $ billions

Source: Press reports
Patronage as a function of Travel Time

- Paradigm Shift in patronage starts at about 2 - 2.5 hours.
- Slow growth initially as transit time reduces.
- Fall off in patronage growth at less than 1.5 hours.

Source: Capital Rail Research
Sydney – Canberra
Investment Sweet Spot?

Source: Capital Rail 1998

Travel Time as a Function of Upgrade Cost

- Insufficient investment to generate patronage
- Paradigm shift in patronage
- Diminishing patronage for rapidly increasing investment
- Investment Target Zone ???

Patronage in Millions

Upgrade Cost $ billions

Travel Time by Rail in Hours

0
0.5
1
1.5
2
2.5
3
3.5
4
4.5

0
1
2
3
4
5
6

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A model for an Australian HST?

Mega city

Regional Growth Centre
Urban Growth Centre
Urban Growth Centre
Regional Growth Centre
Regional city

A City Traversing System

Regional city

A Few Journey Possibilities
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Elements of An Australian HST

- Where first?
- Who owns;
- Who pays;
- Who delivers;
- Who operates and maintains?

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Newcastle to Sydney and then Canberra?

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Canberra – which way next?

20 year old corridor reserved for VFT

To Sydney

To Melbourne

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Unified Plan;
Deliverable in commercial stages;
One technical Specification;
COTS Technology
Common operating systems
One operator?

Delivery Staging for An Australian HST

- Stage 1a
- Stage 1b
- Stage 2a - North
- Stage 2b - North
- Stage 3 - North
- Stage 3 - South
- Sydney
- Canberra
- Melbourne
- Geelong
- Albury/Wodonga
- Sunshine Coast
- Gold Coast/Tweed Shire
- Newcastle
- Brisbane

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Case Study – Sydney - Newcastle

Newcastle
- Regional population 0.54 million
- Largest coal export port in the world

Sydney
- Metropolitan population 4.5 million
- Largest city in Australia

CBD to CBD

Rail - 168 kms 2hrs 45mins ($15.60 rtn);
Road - 164 kms; 2hrs 20mins
Air - 45mins plus 56mins ground access; ($166 rtn);

As the crow flies = 117 kms
Bijing - Tianjin = 120 kms in 30 minutes

Source: Hamilton Lund & Tourism NSW

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Case Study – Sydney - Newcastle

- 27 km Hawkdev tunnel proposal
- Max Altitude ~215m
- Cowan Bank 1:40
- Max Altitude ~215m

Diagram courtesy of my colleague Alex Wardrop

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Case Study – Sydney - Newcastle

All stops Inner Suburban
Tight curves / steep grades

Limited stops Outer Suburban
Urban environment

Limited Stops Interurban
Many stations

Bulk materials
Level crossings

Long Distance passenger
160km/h diesel hauled

Intermodal/General Freight
Old locos back in service

All photos Courtesy of my colleague Alex Wardop

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Case Study – Sydney - Newcastle

Source: Department of Planning
New South Wales State and Regional Population Projections: 2008 Release

- Sydney (4.5 million)
- Everywhere except Sydney, Newcastle and Wollongong (1.54 million)
- Newcastle (0.54 million)
- Wollongong (0.29 million)
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Case Study – Sydney - Newcastle

Central Coast by 2031

- 100,000 more people to +400,000
- But >65 yr olds >24%
- 56,000 new jobs
- 7 town centres, 1 regional city – Gosford
- No new transport corridors currently
- 25% commuting out
- Any commuting in?
- Will they pay a commercial fare???


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**Case Study – Sydney - Newcastle**

- Part of heaviest freight and commuter corridor in Australia
- Multiuser Corridor: 4 basic sectors;
  - Passengers – ~ 36000 all day e/w
  - Freight – Practical capacity 16 paths per day e/w; Excluded from passenger peak hours;
  - 168 kms long; 1 in 40 grades;
  - Minimum Curvature 240 m;
  - 8 tunnels - 3.8 km in length
  - 1500V dc electrified;
  - Mostly double track with short sections of triple and quad;
  - 52 Stations.
Case Study – Sydney - Newcastle

Diagram courtesy of my colleague Alex Wardrop

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Case Study – Sydney - Newcastle

Source: Tourism NSW

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Case Study – Sydney - Newcastle

Source: Hamilton Lund & Tourism NSW
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Case Study – Sydney - Newcastle

- “A new paradigm of urban development, mobility and transportation connectivity” – changing the way we live;
- Demographic trends –corridor population increasing;
- Rail Freight set to grow “explosively”;
- Peak Passenger rail demand high and increasing;
- Rail corridor capacity issues and upgrade costs;
- Newcastle Freeway also reaching peak hour capacity;
- Airport connectivity & capacity constraints;
- Sustainable transport – Energy, Safety, “Value for money travel”.

Speed/time records
“On the 28 June 1964, 3801 was specially booked to run the Newcastle Flyer in an attempt to run non-stop from Sydney to Newcastle in under 2 hours time ……a new record of 2 hours, 1 minute and 51 seconds was posted by the class leader. This is a record that remains unbroken by any other steam locomotive.”
http://en.wikipedia.org/wiki/Newcastle_Flyer
Phase 2 HSR Study Conclusions

- 1748 kms dedicated route – Melb-Can-Syd-Bris; 20 stations;
- Mix of express and limited stops services;
- Connectivity to other transport systems;
- 2012 $ 114 billion - Melb-Syd $50b; Syd-Bris $64b;
- 46m -111m pax intercity & regional trips central forecast - 83.6m pax pa; 40% of the intercity air travel market; Syd – Mel 19 m pax pa
- Staging – Syd- Can; Can- Mel; Syd- New; Bris-Gold; Gold- New; Syd-Mel = operational by 2035?
- Govt required to fund upfront infrastructure costs;
- Funding gap of 86% if commercial funding maximized;
- If pax forecast achieved, above rail operation self funding – if fares comparable to airfares
- Economic BCR 2.3 to 2.5 at 4% discount rate
- FIRR 0.8 – 1. and EIRR 7.8%
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So where are we at?

- Government commitment; ✓
- New HSR Study Completed ✓
- Confirm “Big National Reasons”; ?
- Successful 1st Stage; ?
- Define next stages of an East Coast HST; ?
- Corridors reservations now - city entries and exits; ?
- Create defendable zonings; ?
- Create an HSR business NOT an HSR construction project; ?
- "the big difference between Spain and other European countries is that the others plan services while we just plan spending."

Http://www.Coshoctontribune.Com/article/20110206/OPINION02/102060311/1014/OPINION/the-spanish-example-warning
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Keeping an open mind on the subject

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Is there light at the end of the HSR tunnel?!