

ATSE National Symposium 2006

'New Technology for Infrastructure - The World of Tomorrow'

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## **The Future for Rail – A perspective for Australia**

**Peter Thornton**

General Manager – Planning and Strategy

WorleyParsons Rail

# Introduction

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- ▶ Perceptions about Rail
- ▶ Technology of Rail
- ▶ Urban Rail
- ▶ Very High Speed Rail
- ▶ Long Haul Freight
- ▶ Conclusions

# Perceptions about Rail

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*“Much of our transport infrastructure is ageing and fixed in outdated technologies”*

- ▶ Is rail’s technology old and, worse, is rail an outdated technology?
- ▶ Nothing much changes in urban rail systems in Australia?
- ▶ Urban rail systems in Australian cities lag behind other countries?
- ▶ Australia needs very fast trains between its big cities?
- ▶ Rail freight is inefficient and can’t compete with road?

Or on the other hand ...

- ▶ Rail is the answer to all transport problems – just build more!  
(Motherhood status of Rail)

# Technology of Rail

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What has happened since Stephenson's rocket in 1830?

Is this the technology that's outdated?

- ▶ Steel wheel on steel rail
- ▶ Track and perway
- ▶ Signalling and train control
- ▶ Vehicles
- ▶ Stations
- ▶ Ticketing
- ▶ Technology research



Source: [http://en.wikipedia.org/wiki/Stephenson's\\_Rocket](http://en.wikipedia.org/wiki/Stephenson's_Rocket)

# Technology of Rail

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# Technology of Rail

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# Rail Technology Realities

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- ▶ Guidance system of a steel flanged wheel on a rail is **the** enduring core technology and primary safety system
- ▶ Every other element of rail technology and technology in the business of rail transport has been revamped in its 176 year history
- ▶ Australia has an active and innovative research industry in rail as does the rest of the world
- ▶ The issue in rail is the availability of funding to keep pace with the technologies that are available and the willingness to adopt them

# Urban Rail

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- ▶ Our perceptions about urban rail are driven by personal experiences
- ▶ Likely to be somewhat neutral usually
- ▶ Rail is **expected** to be safe, reliable and comfortable (reasonably!)
- ▶ Perceptions will be adversely affected when the user is inconvenienced:
  - Train delayed by signal failure – can't get home
  - Train cancelled – long wait time
  - No seats – long standing time
  - Trains or stations are crowded/dirty – personal space impacted
  - Ticket machines don't work – miss train because of queues
  - Ticket prices rise

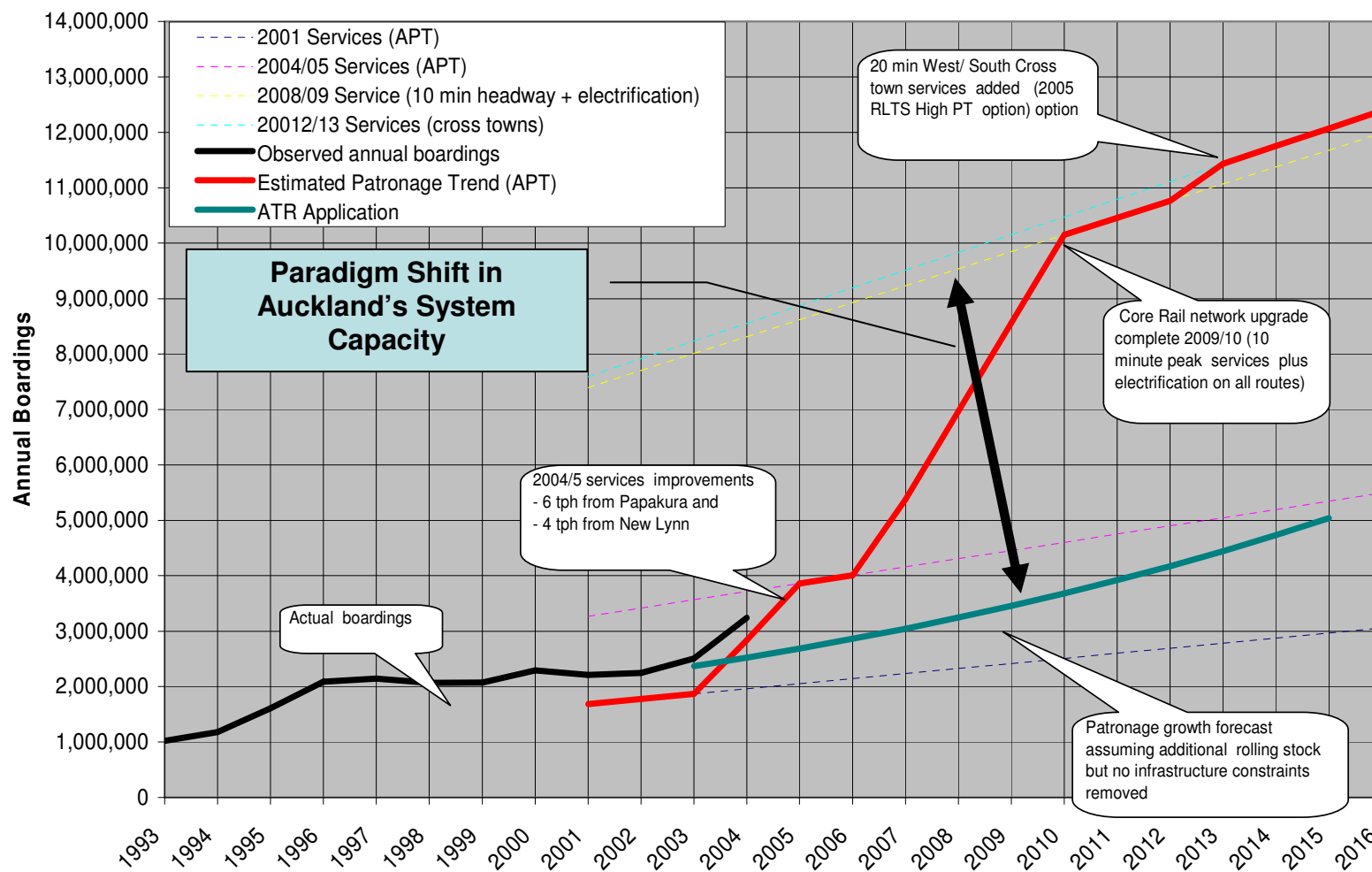


# Urban Rail

- ▶ Easy to miss technological improvement in infrastructure, systems and rollingstock that deliver these benefits
- ▶ The operating timetable is the very core of a railway business
- ▶ “The Service” ie the **total experience** of rail is the key to urban rail success – everything else – all of the technology - is just a means to that end

Hornsby arr	----	----	7.10	7.21	----	----	----	7.36	----
Hornsby dep	6.56	7.04	7.11	7.23	----	7.26	7.31	7.38	----
Waitara	6.58	7.06	7.13	----	----	7.28	7.33	----	----
Wahroonga	7.00	7.08	7.15	----	----	7.30	7.35	----	----
Warrawee	7.02	7.10	7.17	----	----	7.32	7.37	----	----
Turrumurra	7.04	7.12	7.19	7.28	----	7.34	7.39	7.43	----
Pymble	7.07	7.15	7.22	----	----	7.37	7.42	----	----
Gordon	7.10	7.18	7.25	7.33	7.37	7.40	7.45	7.48	7.52
Killara	7.12	7.20	7.27	----	7.39	7.42	----	----	7.54
Lindfield	7.14	7.22	7.29	----	7.41	7.44	----	----	7.56
Roseville	7.16	7.24	7.31	----	7.43	7.46	----	----	7.58
Chatswood	7.19	7.27	7.34	7.41	7.46	7.49	7.52	7.56	8.01
Artarmon	7.22	7.30	7.37	7.43	7.49	7.52	7.55	7.58	8.04
St Leonards	7.24	7.32	7.39	7.46	7.51	7.54	7.57	8.01	8.06
Wollstonecraft	7.27	7.35	7.42	7.48	7.54	7.57	8.00	8.03	8.09
Waverton	7.29	7.37	7.44	7.50	7.56	7.59	8.02	8.05	8.11
North Sydney	7.33	7.41	7.48	7.54	8.00	8.03	8.06	8.09	8.15
Milsons Point	7.35	7.43	7.50	7.56	8.02	8.05	8.08	8.11	8.17
Wynyard	7.40	7.48	7.55	8.01	8.07	8.10	8.13	8.16	8.22
Town Hall	7.43	7.51	7.58	8.04	8.10	8.13	8.16	8.19	8.25
Central	7.47	7.55	8.02	8.08	8.14	8.17	8.20	8.23	8.29
Redfern	7.49	7.57	8.04	8.10	8.16	8.19	8.22	8.25	8.31
Burwood	----	8.07	----	8.20	----	----	----	8.35	8.41
Strathfield	8.01	8.10	8.16	8.23	8.28	8.31	8.34	8.38	8.44

# Auckland Rail observed and modelled rail patronage trends 1993-2016

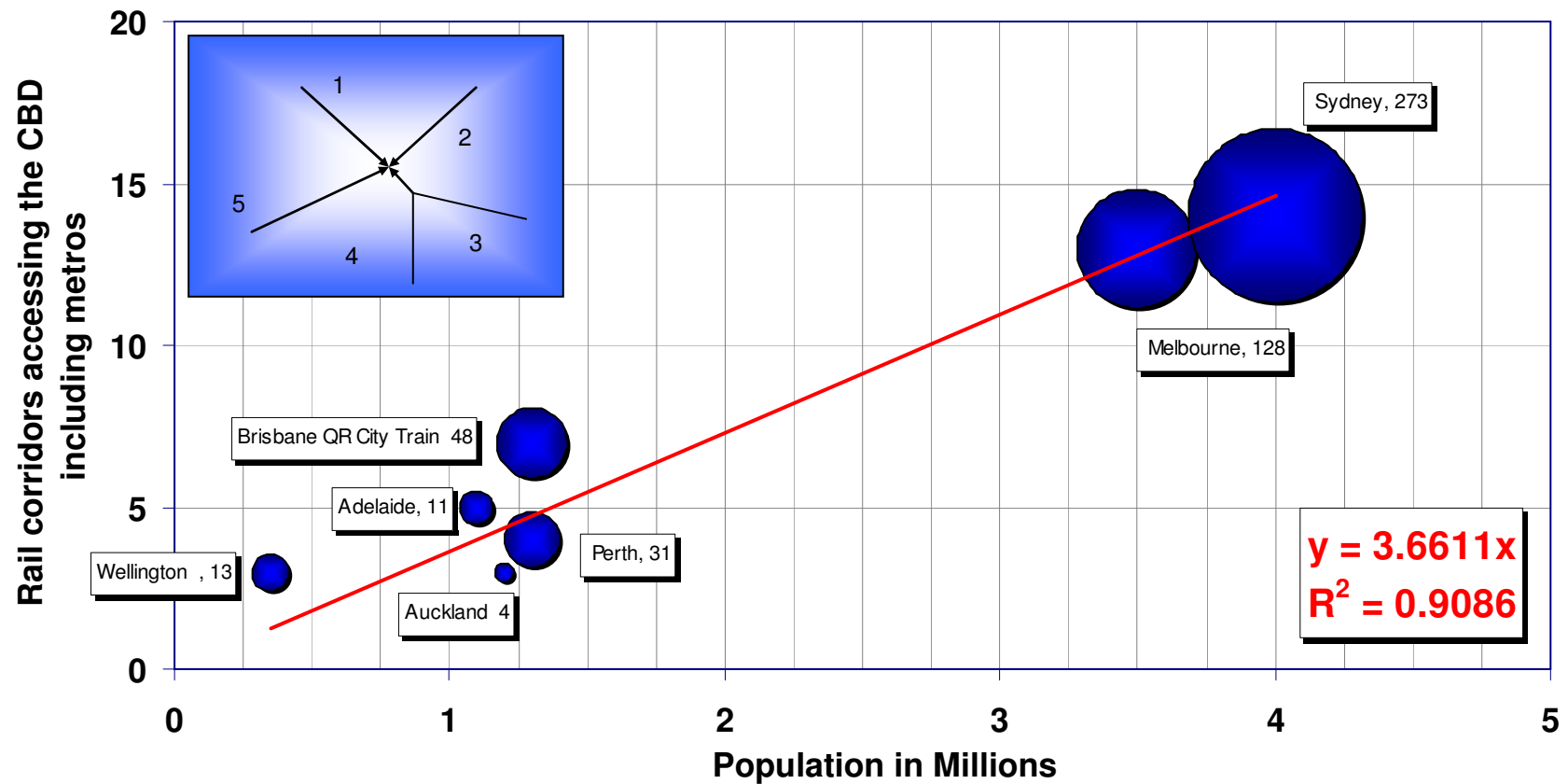


# Urban Rail

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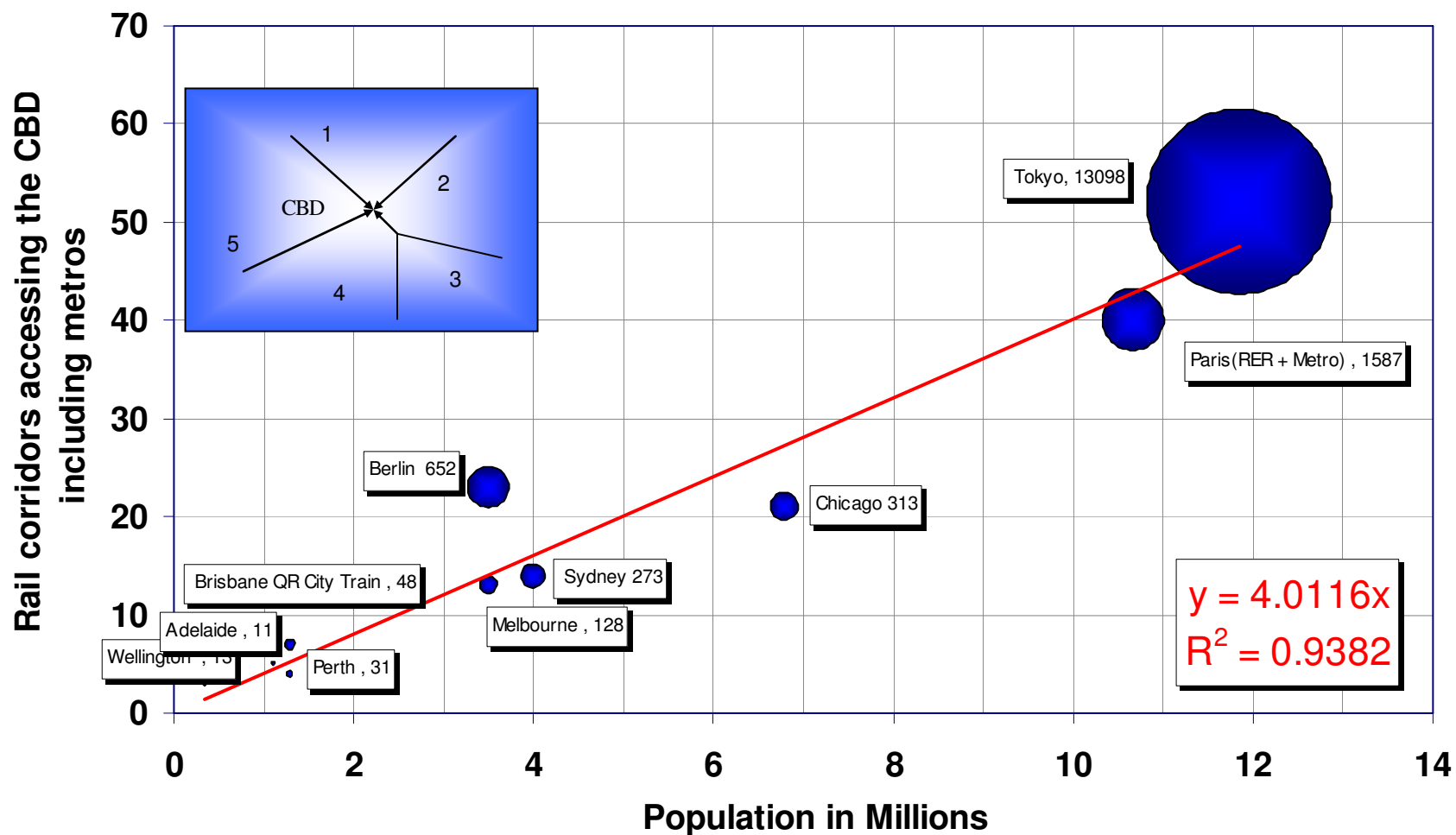
- ▶ Most users experience only a part of the system
- ▶ Rail network seems to have always been as it is – but is it?
- ▶ Sydney 1956 to 2008
  - 1956 City Circle and Circular Quay completed
  - 1979 Eastern Suburbs Railway Opened
  - 1980 Blacktown to St Marys Quadruplication
  - 1984 Electrification to Newcastle and East Hills to Glenfield Extension
  - 1991 Electrification of the Richmond Line
  - 1996 Cumberland Line opened
  - 1999 Olympic Line opened
  - 2000 Airport Line opened
  - 2006 Clearways - Tactical System upgrades
  - 2008 Chatswood to Epping Line
- ▶ Easy to miss network expansion into places where you don't go
- ▶ Rail networks develop at time-lapse camera pace

# Benchmarking Australasian urban rail systems



patronage in Millions p.a. shown with each City name

# Benchmarking Australasian and international urban rail systems



patronage in Millions p.a. shown with each City name

# Urban Rail - Realities

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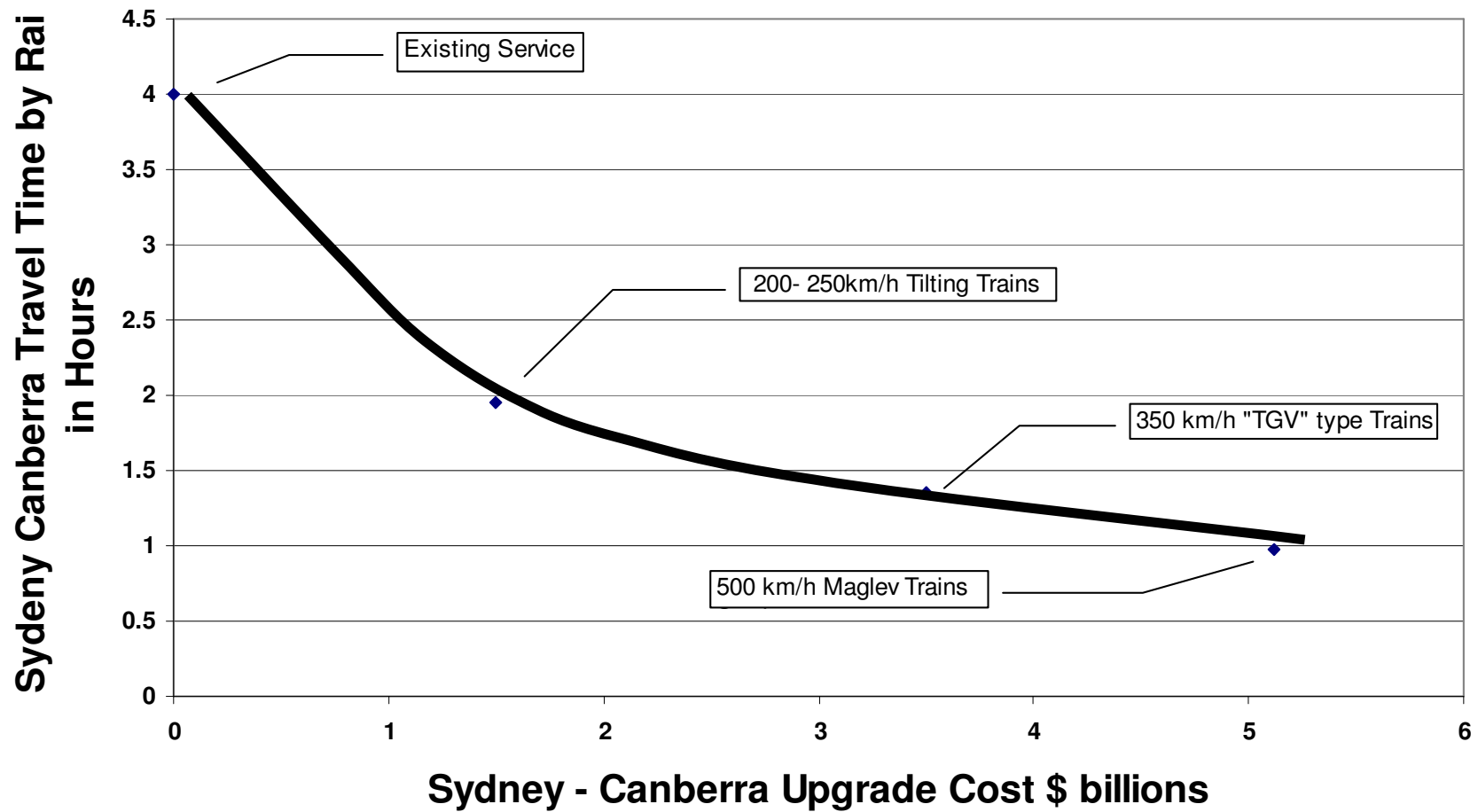
- ▶ Cities support one CBD access rail corridor per 250,000 population
- ▶ Australian Cities are within  $\pm 2$  corridors of global trend
- ▶ Railways develop on about a  $\pm 10$  year cycle – time lapse camera viewpoint needed
- ▶ Changing the service paradigm is key to lifting patronage on existing systems – to create and retain a new market
- ▶ Beyond this, new lines to address new urban areas are needed
- ▶ Reality is that around Australia, urban rail systems are being revamped and expanded – see Table 3

# Very High Speed Trains (VHST)

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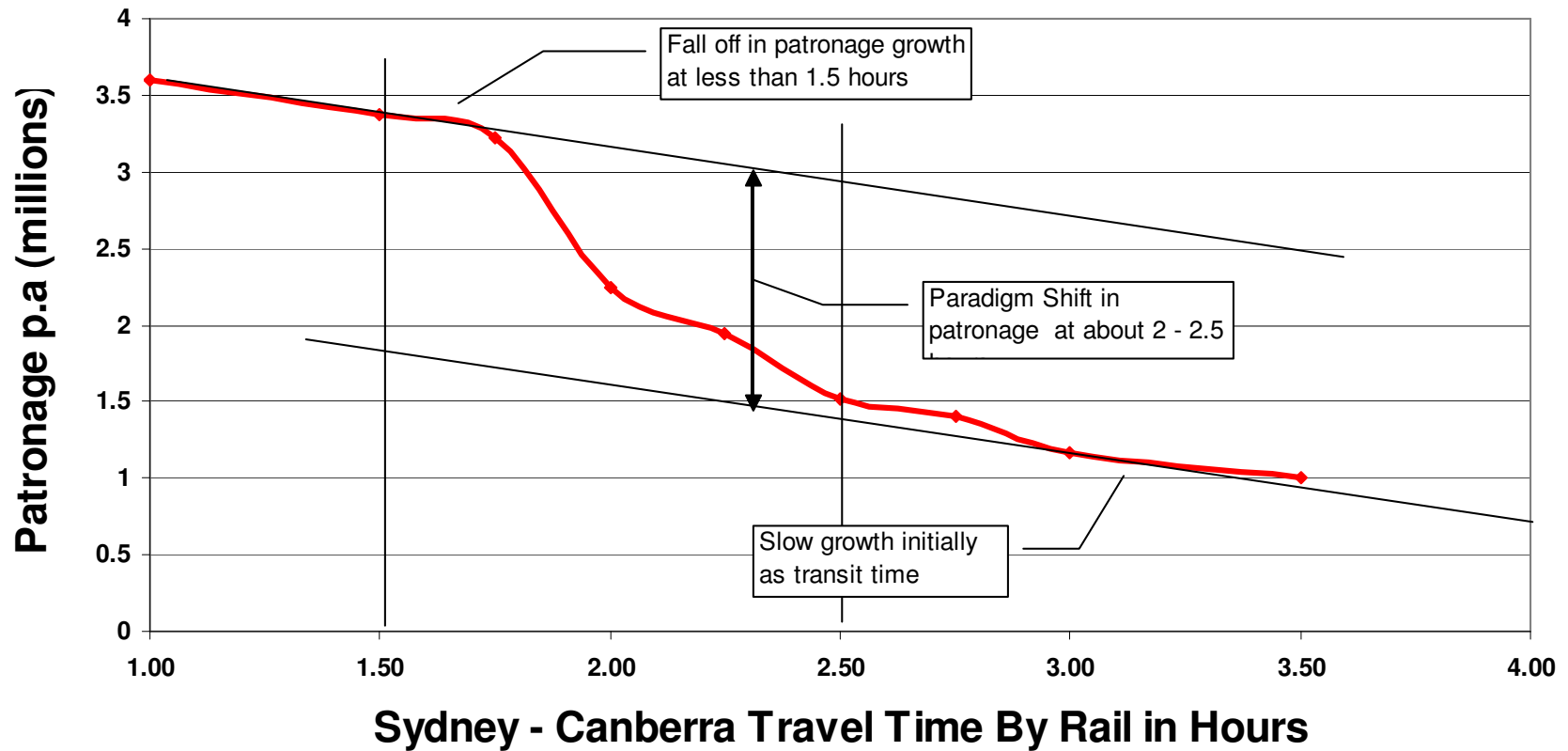
- ▶ 1980s – “VFT” Sydney – Canberra – Melbourne
  - Not financially viable ultimately without concessions
- ▶ Early 1990s – “Speedrail” Sydney – Canberra
  - Generated widespread interest
- ▶ Late 1990s – VHST Competition Sydney – Canberra
- ▶ Bidding driven by rolling stock manufacturers and civil contractors – not transportation enterprises
- ▶ 4 bidders all characterized by rolling stock type and performance
  - 200-250 km/h High Speed + Tilting Capability
  - 300-350 km/h Very High Speed Non Tilting (preferred bidder)
  - 500 km/h Maglev
- ▶ Ultimately no project proceeded – not at “no cost to Government”

# VHST travel time as a function of upgrade cost

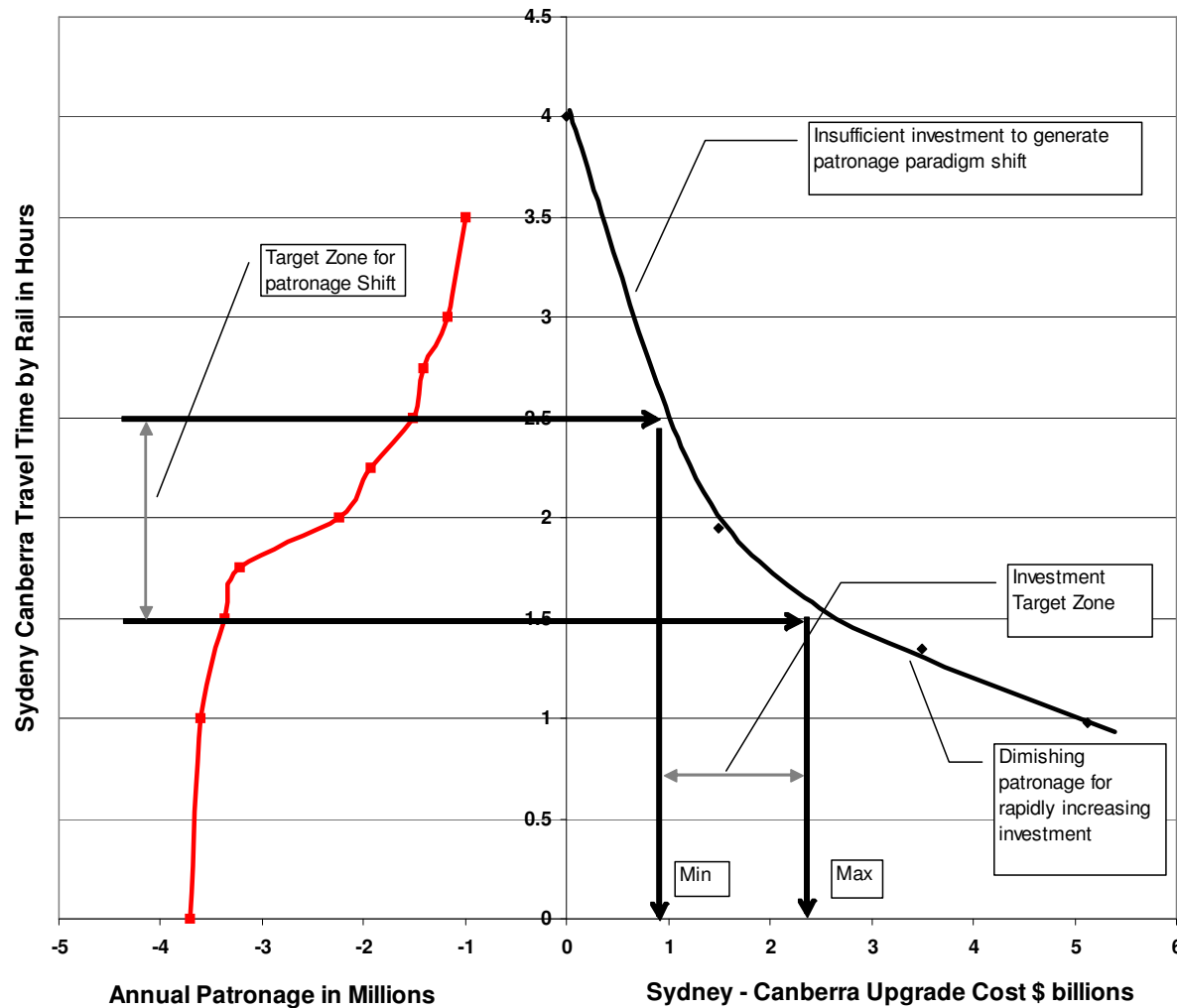




# VHST patronage as a function of travel time



# VHST upgrade investment based on patronage



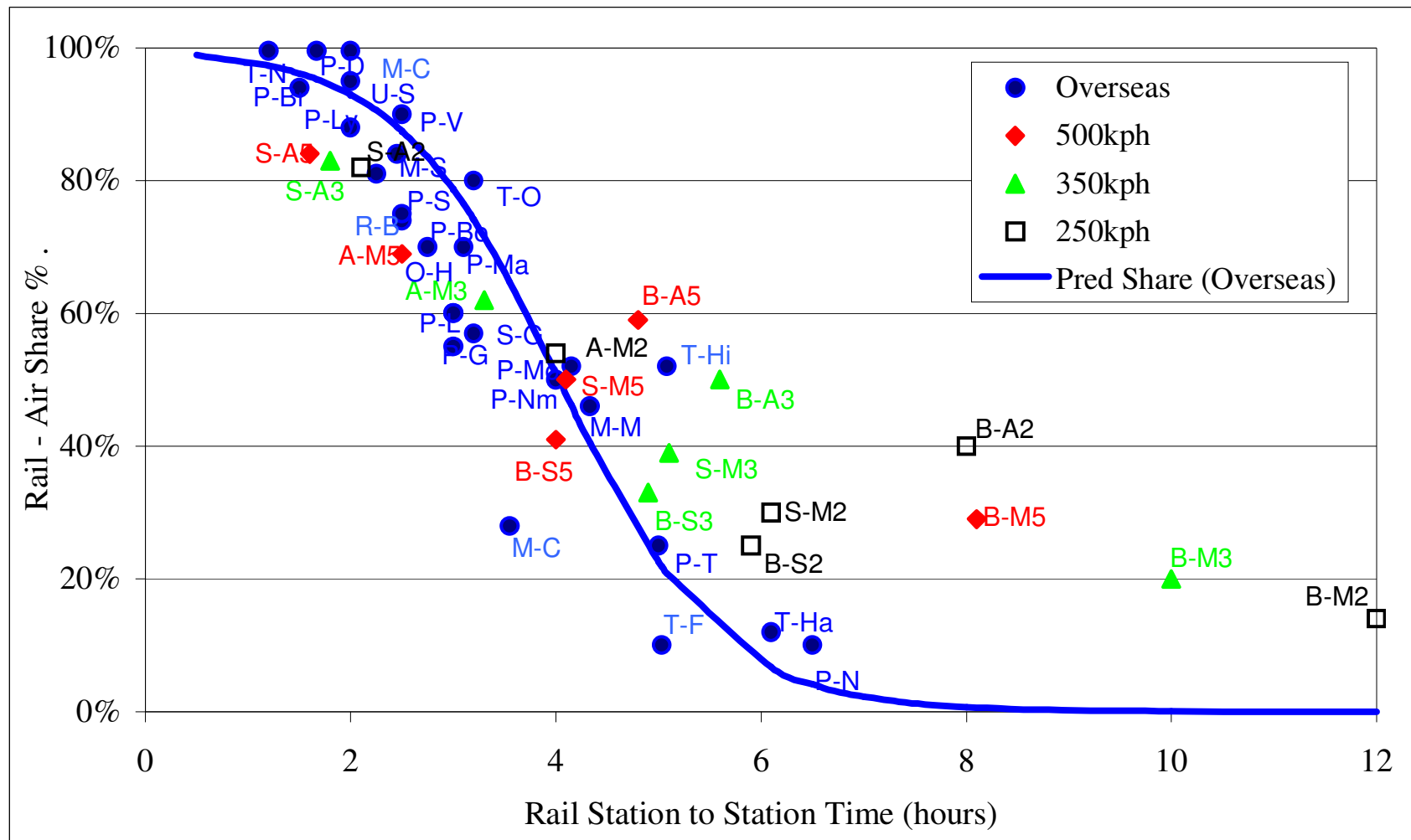
Photos courtesy of UIC & Transrapid

# East Coast Very High Speed Train Study 2001

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- ▶ Melbourne – Sydney – Brisbane Corridor examined (2000 km)
- ▶ A “National Interest” perspective
- ▶ Simple but powerful national goals a rationale for investment
  - Europe – VHST connectivity a unifying force
  - Japan – National axis transport spine for economic development
- ▶ No VHST fully viable on a purely commercial basis
- ▶ \$33 to \$59 billion for full corridor for 250 km/h to 500 km/h
- ▶ Substantial government funding (~80%) inevitably required to create VHST infrastructure
- ▶ Above rail operations paying access fees can be commercial
- ▶ Partial regional corridors can be economic - particularly if operated with 250 km/h technology able to utilising existing or cheaper new alignments

# VHST Rail-air mode split versus rail travel time



# Very High Speed Trains - Realities

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- ▶ In 2001 there was no overarching national vision of the future urban and industrial structure of the corridor – is this changing?
- ▶ VHST's Australian future is in “regional rail” as the spine of major conurbations over 100-300 km, e.g.
  - Newcastle – Sydney – Wollongong – Canberra
  - or Gold Coast – Brisbane – Sunshine Coast
  - or Geelong – Melbourne – Latrobe Valley
- ▶ *‘...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.’*
  - [www.dotars.gov.au/transinfra/vhst.htm](http://www.dotars.gov.au/transinfra/vhst.htm)
- ▶ Australia, as a nation, in 21st century will linked by air not rail

# Long Haul Freight

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- ▶ Massive industry restructuring driven by competition policy, above rail privatisation and, more, recently Auslink
- ▶ Role of ARTC to develop and manage below rail infrastructure of the DIRN and now country NSW and Hunter Valley
- ▶ Two basic markets – bulk and intermodal – plus specialized technologies for number of specialized markets
- ▶ Bulk dominated by iron ore and coal
- ▶ Pilbara - investment and technology driving efficiencies
- ▶ Coal lines - upgrading in NSW, new lines in Queensland
- ▶ >\$3 billion being invested in ARTC's network for intermodal freight  
- \$820 million on North-South Corridor

# Long Haul Freight

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[http://www.riotinto.com/library/reports/PDFs/corpPub\\_Iron\\_Ore.pdf](http://www.riotinto.com/library/reports/PDFs/corpPub_Iron_Ore.pdf)

# Long Haul Freight Realities

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- ▶ Industry now wholly privatised (corporatised in Queensland)
- ▶ Challenged to handle forecast doubling of freight task
- ▶ Unassailable technology for hauling bulk commodities
  - But must always be revamped and made more efficient
- ▶ Dominant player in East-West Intermodal freight
  - Sustainable position achieved?
- ▶ Improving position in East Coast North-South intermodal freight
  - Driven by a focus on customer needs, improving infrastructure by targeted investment, integrated logistics and investing to build market share
- ▶ Above and below rail investment driven by strictly commercial imperatives and returns on capital – no “free kicks” in the future



# Conclusions

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- ▶ Technologies – 176 years of innovation whose application is limited only by investment funds
- ▶ Urban Rail – an unchallengeable position as the fixed link mass people mover – continually expanding in Australian cities
- ▶ Very High Speed Rail – requires a national vision of development in SE Australia – but likely to be first viable in corridors of major conurbation not intercapital – prime corridor is Newcastle – Sydney – Wollongong (or Sth Highlands) – Canberra
- ▶ Freight Rail – unmatched line haul capacity now coupled with innovation, “private” sector drive and infrastructure investment = increasing competitiveness and market share

And finally - plenty more of these in the 21<sup>st</sup> Century!!

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