

Personal Rapid Transit Systems, PRT

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ULTra Heathrow



2getthere



Vectus



MISTER



Bagtrax



Morgantown

Summary

- PRT concepts
- Sustainability
- Costs
- Candidate sites

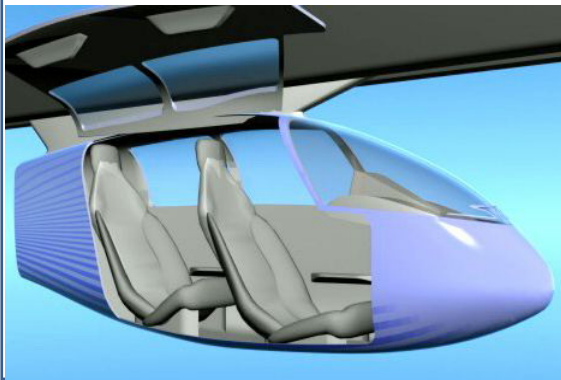
A Personal Rapid Transit (PRT) system comprises of small driverless vehicles running on a dedicated network



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SkyTaxi

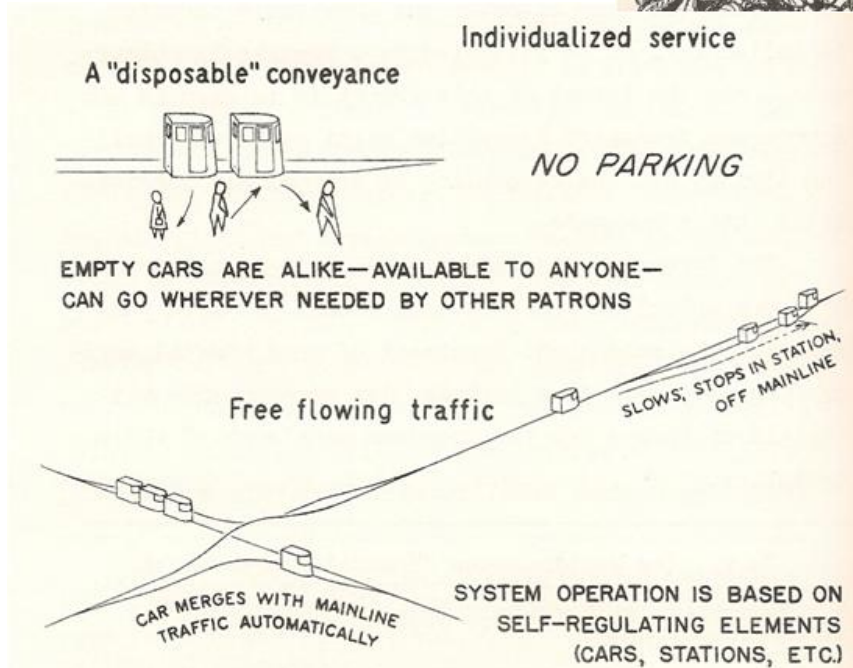
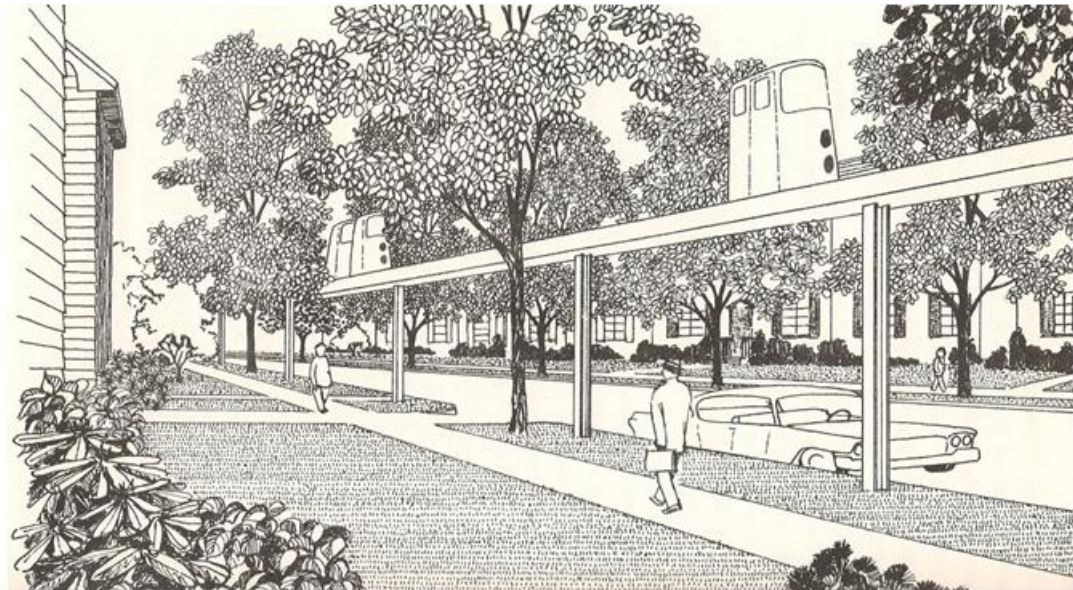
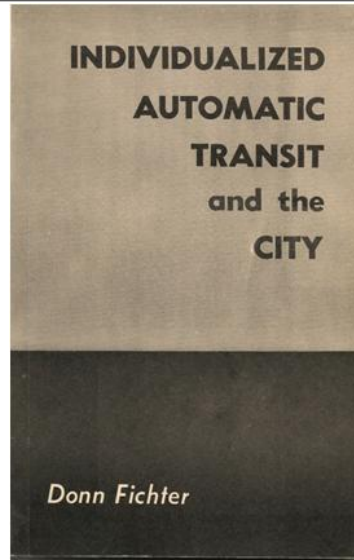


JPods

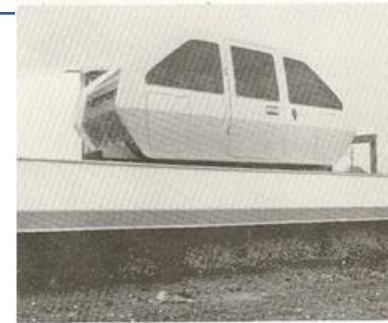


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Early concepts



- Personal/exclusive service
- Available on demand
- Disposable conveyance – no parking
- A network system
- Off-line stations
- Free flowing intersections
- Point-to-point travel



System	Cabtrack	Aramis	Cabinen Taxi	CVS	Aerial Transit System	Raytheon PRT 2000
Country	UK	France	Germany	Japan	US	US
Dates	1966-1972	1967-1988	1969 -1974	1970-1979?	1970-1974?	1990-1999
Track	0.2km	1 km	2 km	4.8 km	0.54 km	~1 km
Vehicles	1	3	5	19	?	3
Passengers	4	4 (++)	3	4	6	4
Payload	400 kg	350 kg	400 kg	330 kg	410 kg	400 kg
Max Speed	40 kph	50 kph	36 kph	80 kph	56 kph	40 kph
Headway	1 sec	0.2 (60) sec	1 sec	0.5-1 sec	10 sec	2.5 sec
Type	Rubber on concrete	Rubber on concrete	Dual overhead support	Rubber on concrete	Monorail wheel on rail	Rubber on steel



Why they failed

Over emphasis on high capacity systems

Lesson Keep to the design target of personal network transport

Inadequate emphasis on total system design

Lesson Impact goes beyond design boundaries

Inadequate consideration of “soft” issues

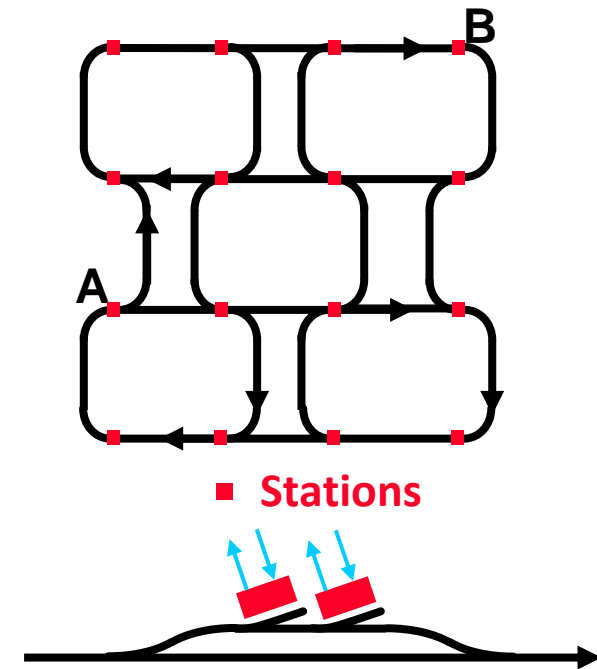
Lesson Fit for purpose, aesthetically pleasing and environmentally acceptable

Mechanical and Information technologies unavailable

Lesson Use the new technology

PRT generic design parameters

- **Network**
 - Dedicated easement
 - Off-line stations
 - Free flowing intersections
- **Track**
 - At grade or elevated
- **Vehicle**
 - Light weight vehicle, ~ 4 persons
 - Simple motor
 - Robust, low cost components
 - Modern batteries + Green Power
- **Control Systems**
 - Sensor based electronic control
 - No mechanical linkages
 - Use Information Technology



Networks

Shared or dedicated easements?



Virtual, George Street



Reality, Hay St., Melbourne



Morgantown

The Track

Typical design parameters

- Width 2 m
- Depth 0.45 m
- Radius 5 m
- Maximum gradient 10% of grade
- Height over a roadway 5.7 m
- Column spacing 18 m
- Linear loading 1.5 kN/m



The Vehicle

Typical design parameters

- Gross weight 1300 kg
- Tare weight 850 kg
- Maximum speed 40 km/h
- Length 3.7 m
- Width 1.45 m
- Height 1.6 m
- Passengers 4
- Continuous power 2 kW
- Battery top-up time 1 minute
- Battery 64 kg (~8% of gross weight)



Control Systems

Typical design parameters

Synchronous control

Computer power

Spatial sensors

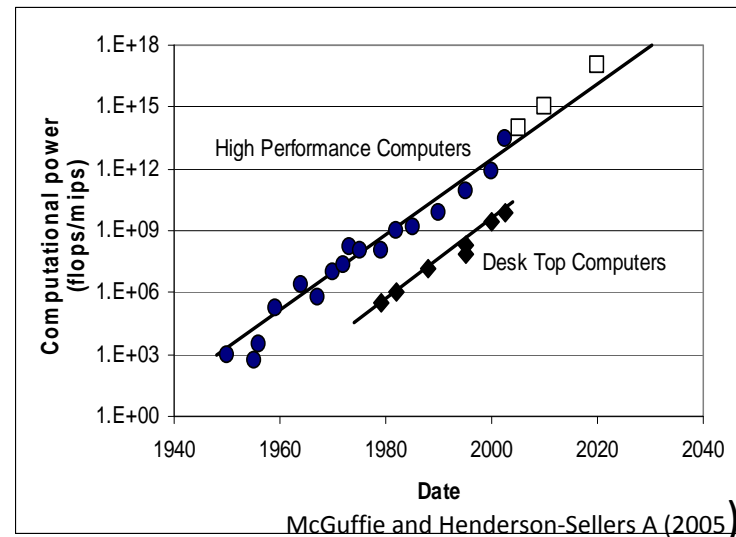
Redundancy level

Empty vehicle management

Headway

At a headway of 6 s a PRT system has the potential to carry as many people as a:

- Lane of high speed road traffic
- 50 seat bus every 75 seconds
- 200 seat light rail vehicle arriving every 5 minutes,

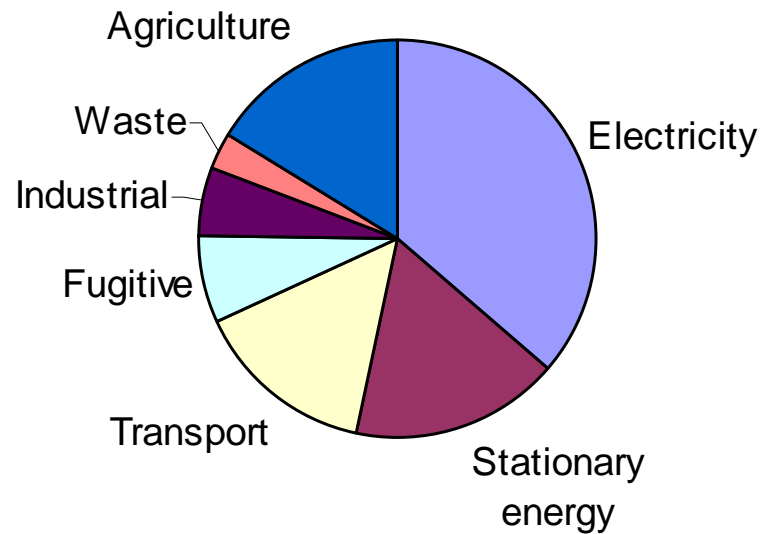


Sustainability



Cima Sella from Sentiero 305

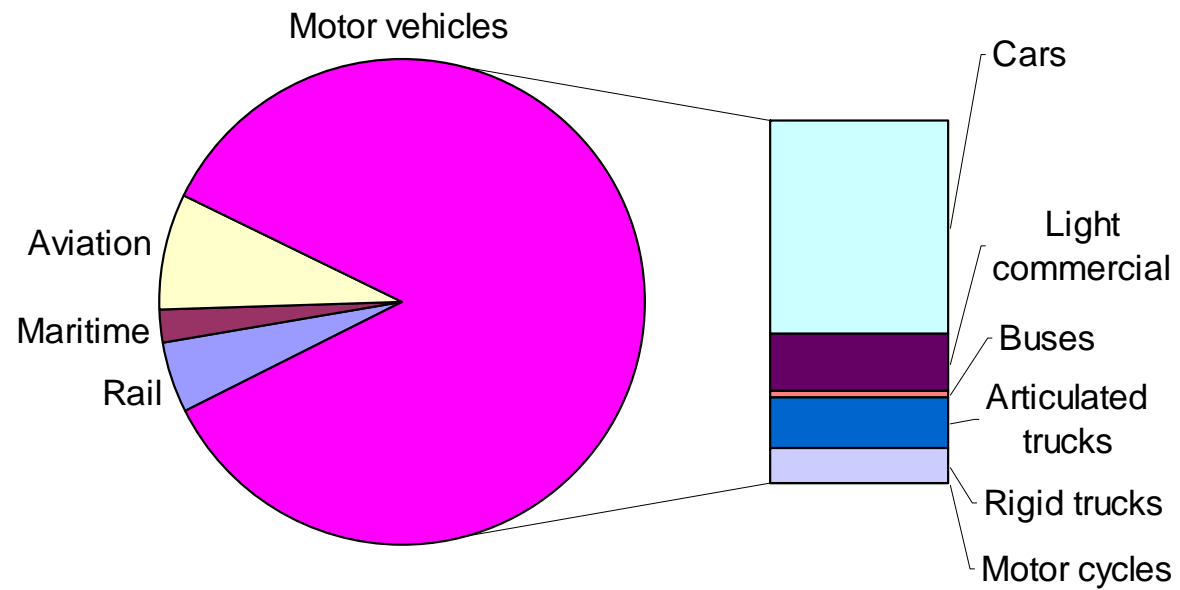
Australia's Greenhouse Gas Inventory by sector, March 2009



Transport generates 14.5 % of
Greenhouse Gas emissions

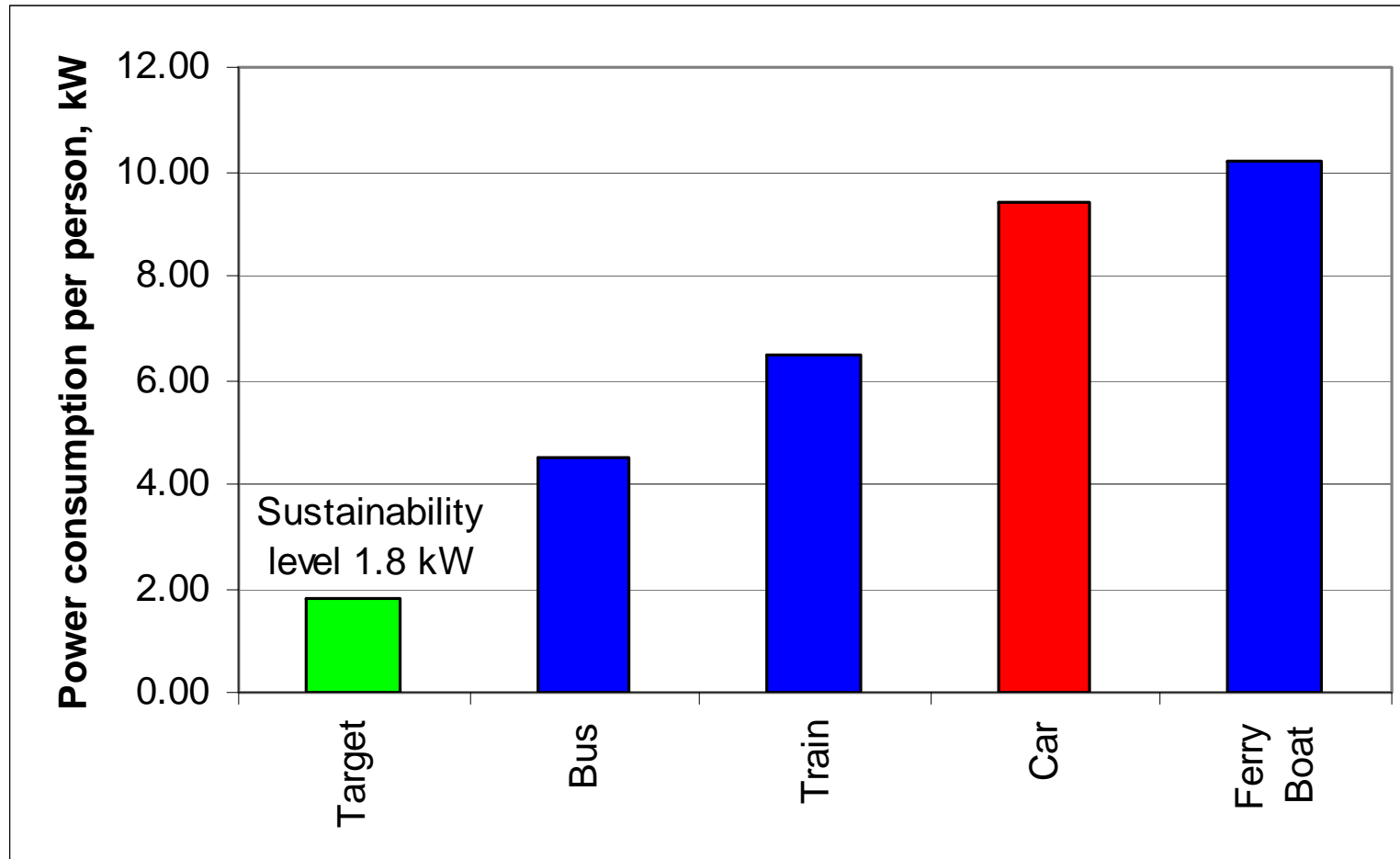
Australian Government, Dept.. Climate Change

Australia's Transport Greenhouse Gas Inventory 2006-2007

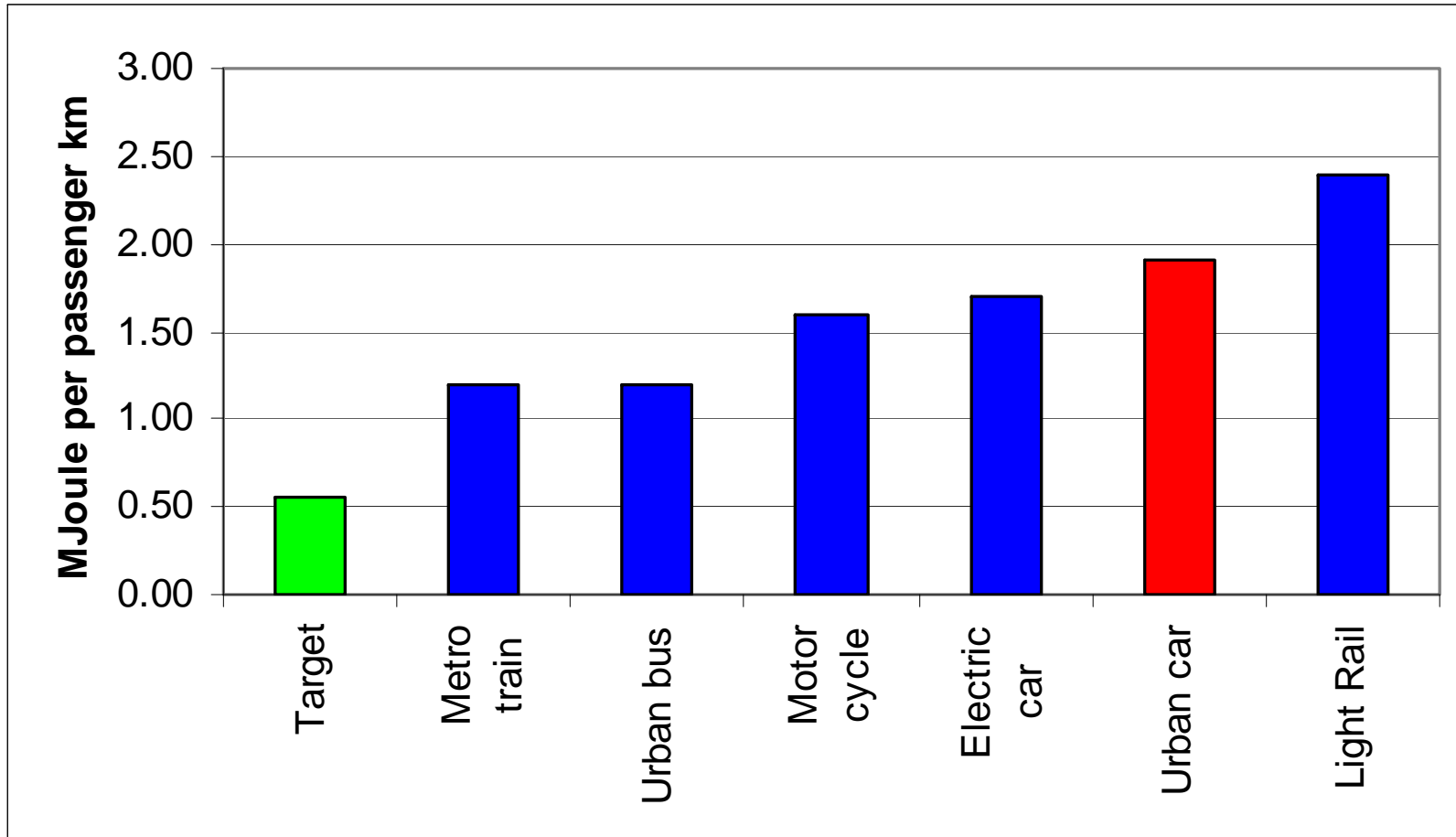


Cars generate 50% of transport
Greenhouse Gas emissions

Power consumption target



Energy demand



Sustainability



	Target	PRT
Power consumption, kW/person	1.8	2
Energy demand, MJ/person km	0.55	0.55

Cima Margherita, Campanile Basso, Cima Brenta Bassa on Sentiero 358

Cost and Capacity Comparison

	Cost AUD\$/km	Capacity passengers /hr
PRT	5.5-14.5	900-2500
Guided bus way	4.5-7.2	450-1500
Light Rail	18-27	900-2500
APM	36-54	1000-5000
SLPT	6.5-11.3	300



Cardiff

Capital Costs	AUD\$m
Design	6.2
Project Management	7.2
Infrastructure	27.9
Vehicles (including spares)	8.9
Control System	2.9
Planning/TWA	0.9
Testing and Commissioning	4.2

Capital Expenditure Total **\$58.5m**

Capital Cost per km **\$7.6m /km**

Annual Operating Costs	AUD\$m
Staff	1.4
Maintenance	2.2
Energy	0.5
Professional Fees and Insurance	0.3

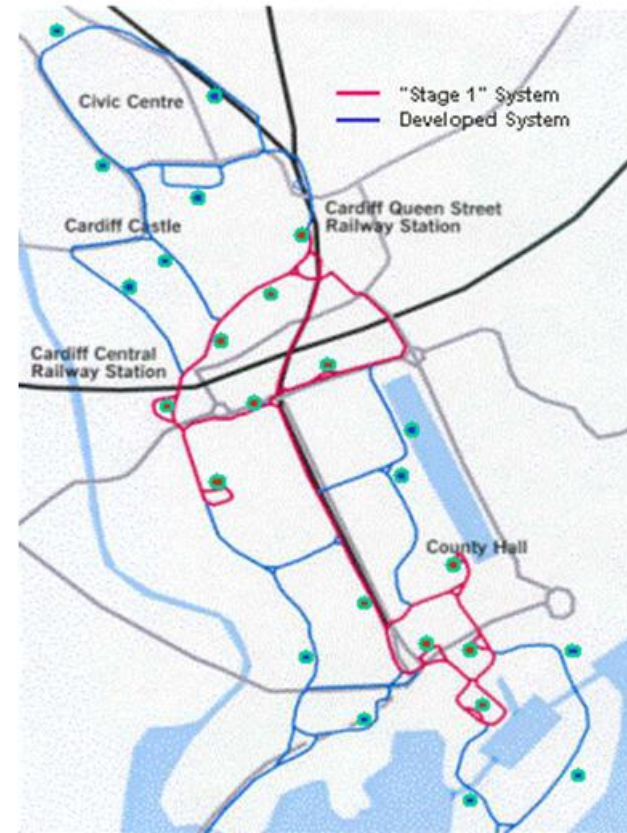
Total Operating Costs **\$4.3M**

Operating Costs per Vehicle Trip \$1.10/trip

Annual Revenue **\$10.3M**
 at a fare of \$2.70 per vehicle trip
 and average 1.4 passengers /vehicle

Annual Operating Profit **\$5.9M**

ULTra Cardiff Routes



"Stage 1"	
Distance km	7.7
Vehicles	160
Stations	16
Passengers per year	5.3M
Vehicle trips per day	70

Sydney Airport



Cost of a PRT ~ \$300M

Barangeroo



Newcastle



PRT development



The European Commission has studied four potential schemes and concluded that hesitant local authorities are the only significant obstacle.

Economist, March 10th 2007, Technology p. 10-12

Summary

Available on Demand

Point-to-point

Goes any where within a network

Integrates with other modes

Safe and Secure

Low Cost

Equivalent Capacity to alternative systems

Meets 21st century sustainability targets

Is in production

PRT is a transport solution for cities, airports, large campuses, urban renewal and new urban development



ULTra



Personal transport for a sustainable future

The image shows the rear of a white train with a black upper section. Two sets of taillights are illuminated, each consisting of a red light and an amber light. A small red light is visible on the right side of the white section. The background shows a blue sky with clouds and a fence.

Thank You

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