



**Council of Australian Tramway
Museums of Australasia
Conference
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Adelaide's New Electric Multiple Units

Adelaide's New Trams

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Adelaide's Electric Multiple Units

Process

Buyer Survey

- 47 Question Survey of all Australian and selected overseas metro passenger rail buyers
- Good advice on requirements definition, tender evaluation, contract structure and approaches, timeframes, resources to deliver (quantum & type), common supplier risks, lessons learnt, general advice (eg use of options)

Process

Request for information (Rfi)

- Provided key elements of specification to Rolling Stock manufacturers
- What do you think? What will work best for you?
- Key learnings included 3 not 2 car sets, State funded, product range

Process – Request for Proposal (RfP)

- Supply of 66 gauge convertible 25kV railcars (permanently coupled as 22 x 3 rail car sets)
- Compulsory and discretionary options (eg selective door opening, tunnel operation, simulator)
- Maintenance (10 years) with a period, if not all, as shared maintenance facility with existing Diesel fleet maintainer

Process – Request for Proposal (RfP)

- Open call vs EoI/RfT
- Functional Specification tendered eg set timetable performance requirements rather than maximum speed, acceleration and braking curves; capacity rather than vehicle dimensions and layouts etc
- Extensive 5-month negotiations to put greater detail to contract and technical specification

Process – Request for Proposal (RfP)

- **Evaluation Structure**

1. **Specialist Technical team** ——— Supported by engineering consultancy Interfleet – highly specialised UK resources - (wheel/rail, HVAC, etc)
2. Specialist Commercial team
3. Primary Evaluation Team
4. Local specialist areas
5. Due diligence

Process – Request for Proposal (RfP)

- **Evaluation Structure**

1. Specialist Technical team

2. **Specialist Commercial team** — Support by KPMG
again with specific Australian
passenger rollingstock experience

3. Primary Evaluation Team

4. Local specialist areas

5. Due diligence

Process – Request for Proposal (RfP)

- **Evaluation Structure**

1. Specialist Technical team

2. Specialist Commercial team

3. **Primary Evaluation Team** ——— Local, full-time team

4. Local specialist areas

5. Due diligence

Process – Request for Proposal (RfP)

- **Evaluation Structure**

1. Specialist Technical team

2. Specialist Commercial team

3. Primary Evaluation Team

4. **Local specialist areas** ————— Signals, maintenance, rolling stock, electrification etc. all provided review and input when required & on preferred bid

5. Due diligence

Process – Request for Proposal (RfP)

- **Evaluation Structure**
 1. Specialist Technical team
 2. Specialist Commercial team
 3. Primary Evaluation Team
 4. Local specialist areas
 5. **Due diligence** — On vehicle and on bidder
- **Executed 31 March 2011**

What we bought...

- **22 Permanently coupled 3-car set Electric Multiple Units**
- **Bombardier Transportation Australia**
- **Modern design**
- **Modern standards**
- **Modern systems**



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Modern Design – VLocity Carshell

- Proven design
- Lessons learned
- Use existing processes
- Less risk



Modern Design – Made in Australia

- Best use of Australian Sub-suppliers
- Keep our investment local
- Similar views:
 - Safety
 - Quality
 - Customer Service



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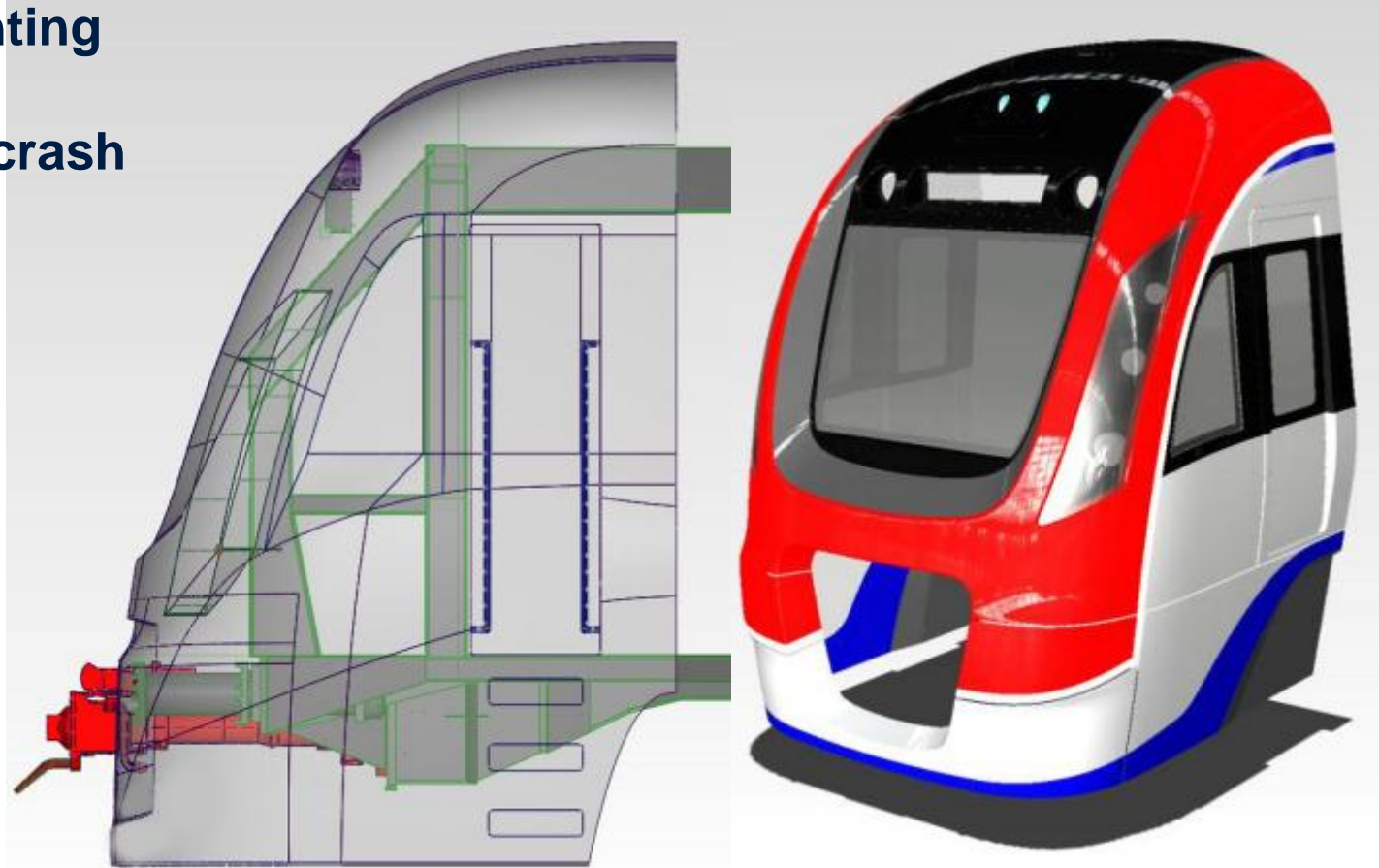
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Modern Design - Crashworthiness

- **Latest European crashworthiness standards**
- **Most crashworthy passenger vehicle built in Australia**
- **New standard EN 15227 protects driver**
- **Disposable elements ensure no damage to vehicle <36 kph**

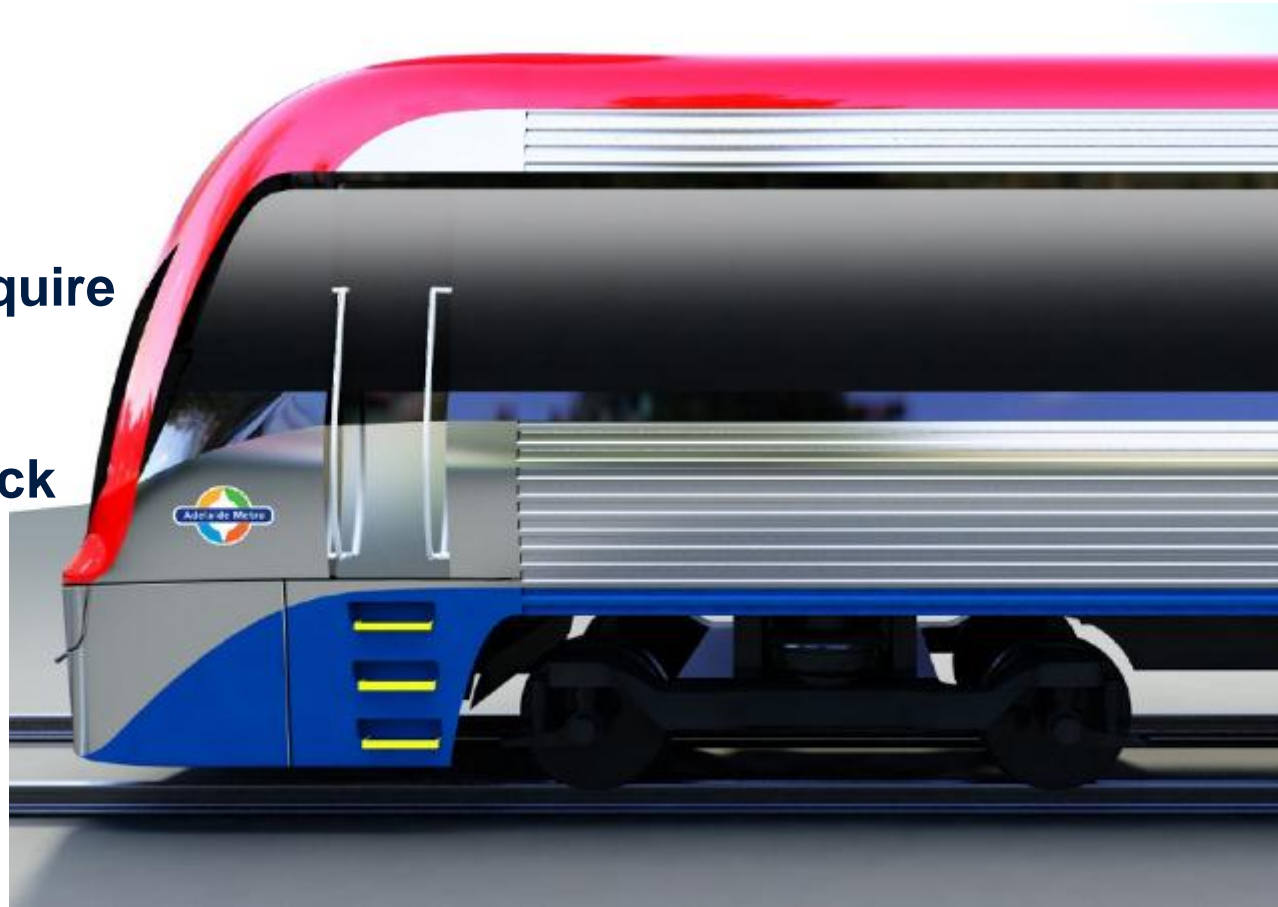
Modern Design – Nose Cone

- **Visibility lighting**
- **Deformable crash tubes**
- **Recessed windscreen**



Modern Design – Cab Access

- Platform access for drivers
- Better response to passengers who require assistance
- Safer entry from track level



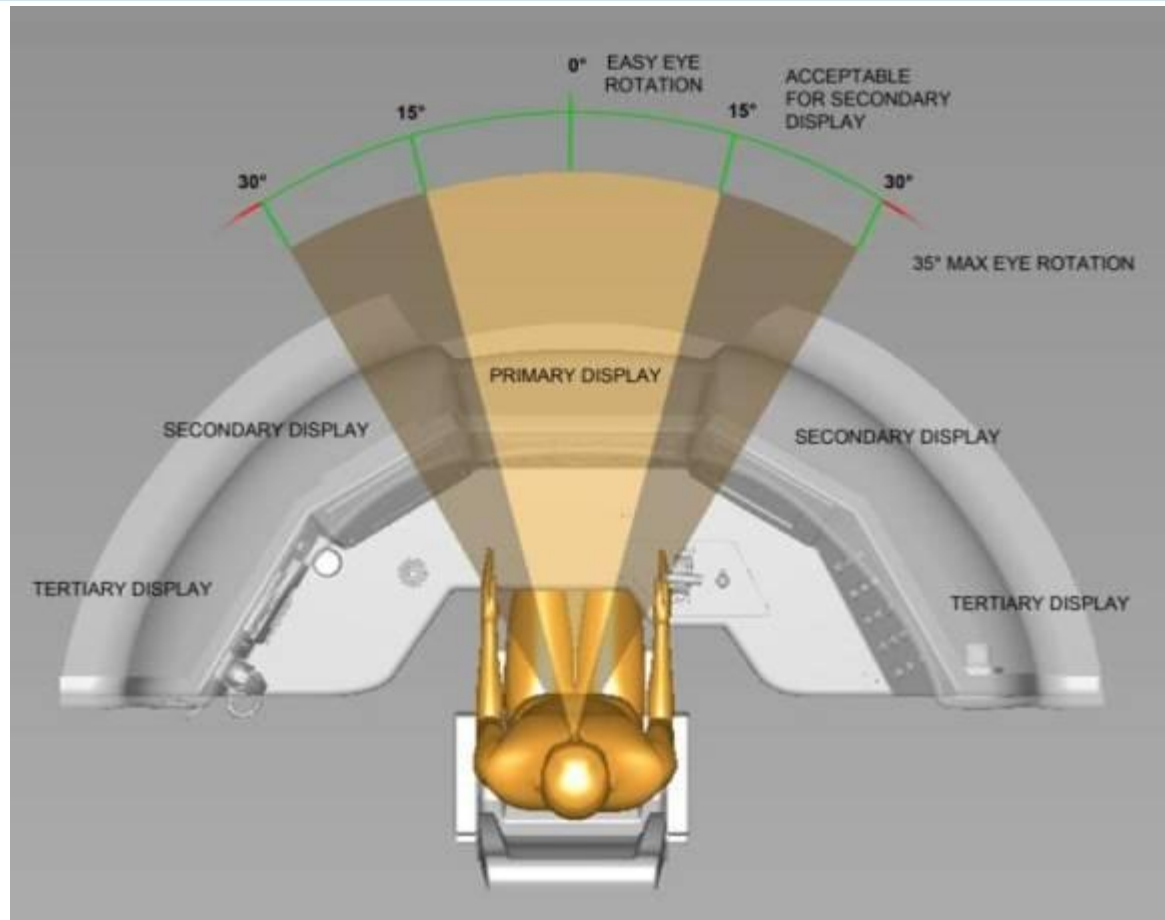
Modern Design – Interior Layout

- **Designed for good passenger flow**
- **Open, modern environment**
- **Seating design will allow full access for wheelchairs and maximises passenger capacity**



Modern Design - Ergonomics

- Ergonomic working environment for all drivers
- Engaged industry professionals
- Drivers involved with every step of the process



Modern Design – DDA

- **Disability Discrimination Act**
- **Disability Standards for Accessible Public Transport**
- **Minimised stepping gaps**
- **Audio and visual announcements**
- **Two way communication with driver**



Modern Standards – Noise

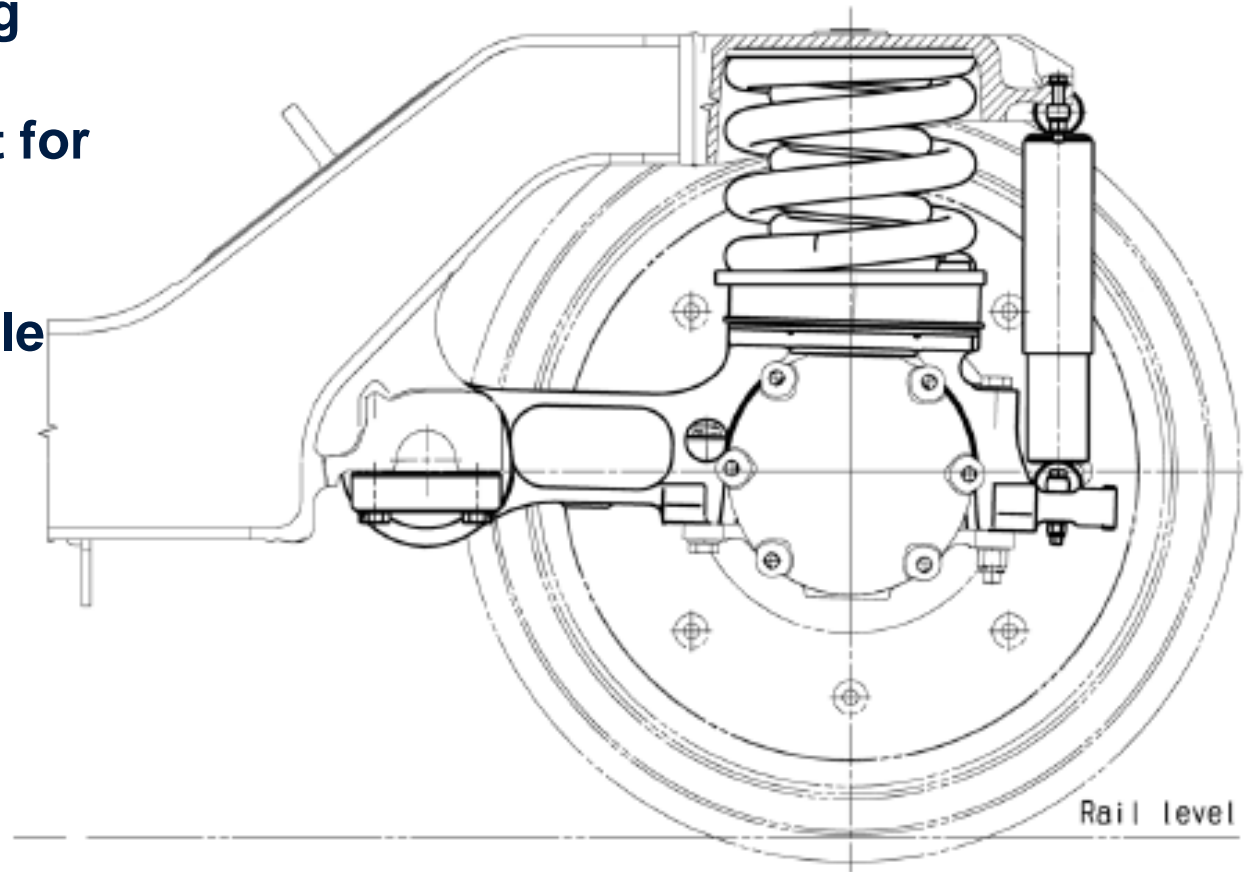
- **Latest Australasian Railway Association noise standards**
- **Quiet operation, minimal impact to customers and the environment**
- **Acoustic insulation inside walls**
- **Rubber isolation mounts under floor**

Modern Standards – Fire Protection

- **Latest fire protection standards**
- **BS 6853, SA 2122, AS 3744**
- **Restricts flames, smoke and toxic chemicals**

Modern Standards – Ride Quality

- **Computer modelling**
- **Best in ride comfort for customers**
- **Safe and comfortable for crew**
- **Australian standard tailored to Adelaide requirements**



Modern Systems – Braking

- **Three forms of braking:**
 - Regenerative (Electrodynamic)
 - Electronically Controlled Pneumatic
 - Park brake
- **Measures the weight on each railcar**
- **Full integration with Wheel Slide Protection**



Modern Systems – Wheel Slip/Slide

- **Advanced Wheel Slip system in Australia**
- **Monitors every axle and responds to track conditions immediately**
- **Maximises use of regenerative brake**
- **Maximises adhesion**

Modern Systems – Current Collection

- **High-reach pantograph**
 - 7.2m Maximum wire height
- **Over-height protection**
- **Carbon damage protection**

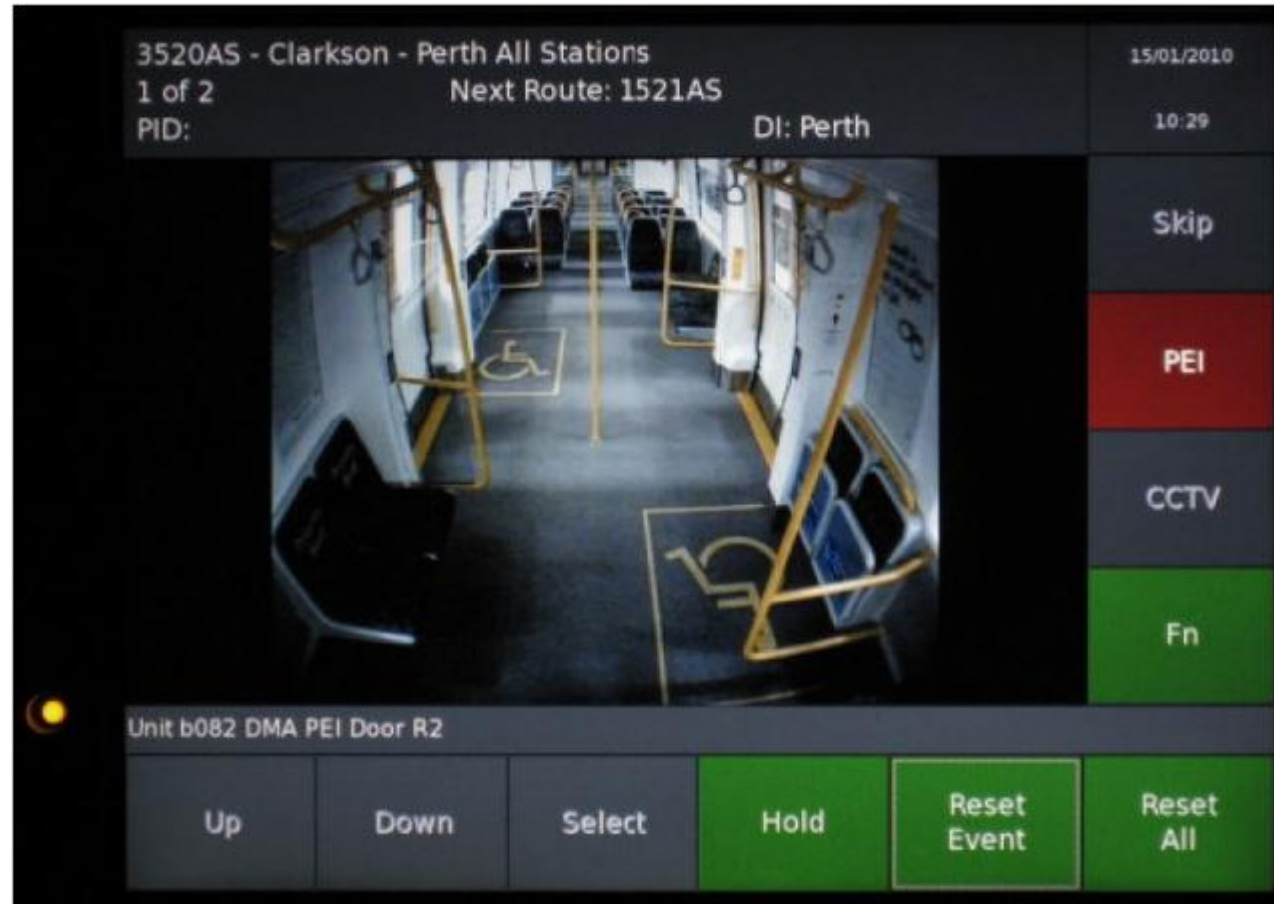
Modern Systems – Air Conditioning

- **Supercharged air conditioning**
- **20°C inside when 40°C outside**
- **Rated for full operation at 53°C**
- **Dual redundant systems**
- **Driver's personal air conditioner**



Modern Systems – CCTV

- Full coverage of saloon, doors and signals
- 20 full-colour digital video cameras per train
- Live viewing from cab
- Passenger Emergency Intercom



Modern Systems – Passenger Info

- **Latest Passenger Information System**
- **Six internal displays**
- **Six side displays**
- **Two end displays**
- **Visual and verbal announcements**
- **Automated, knowledge of timetable**

Modern Systems – Driver's Cab

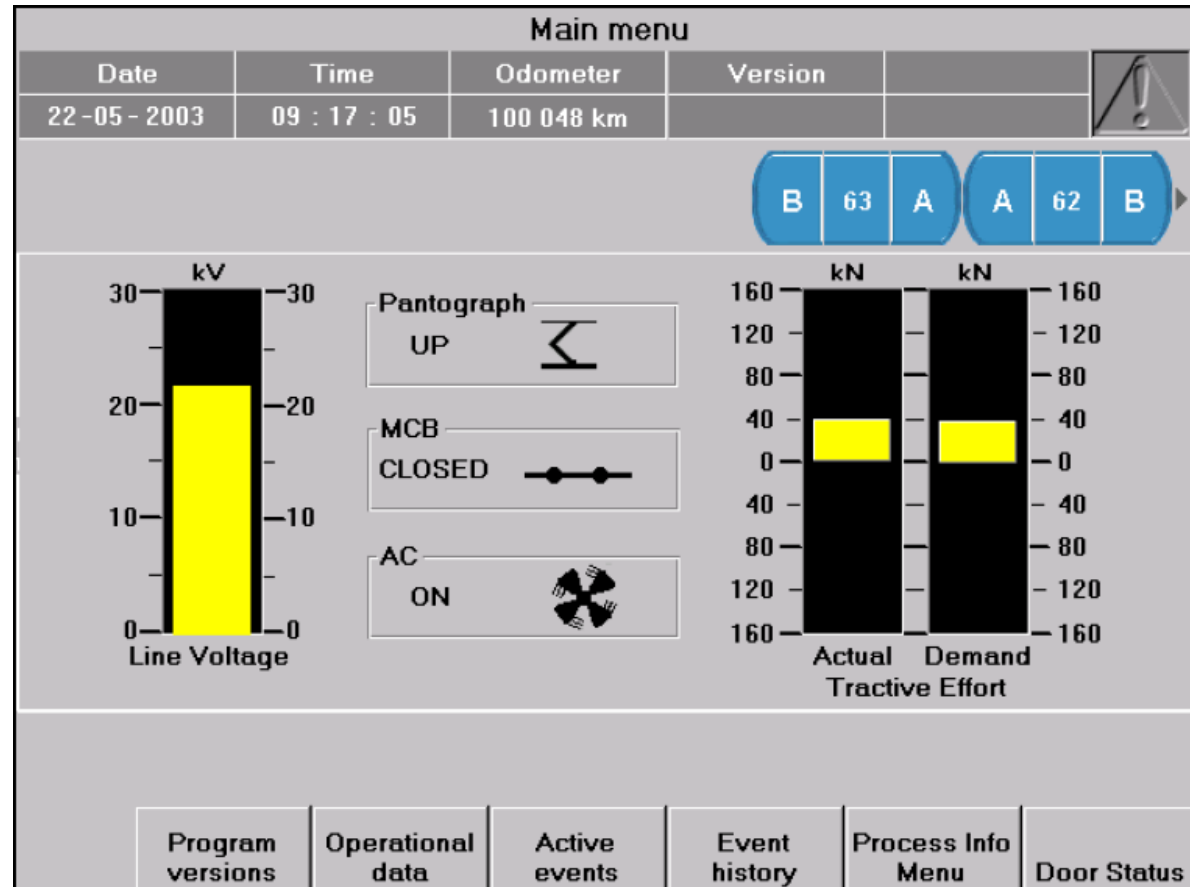
- **Designed for ergonomics and function**
- **Created from scratch**
- **Fully customised for Adelaide**





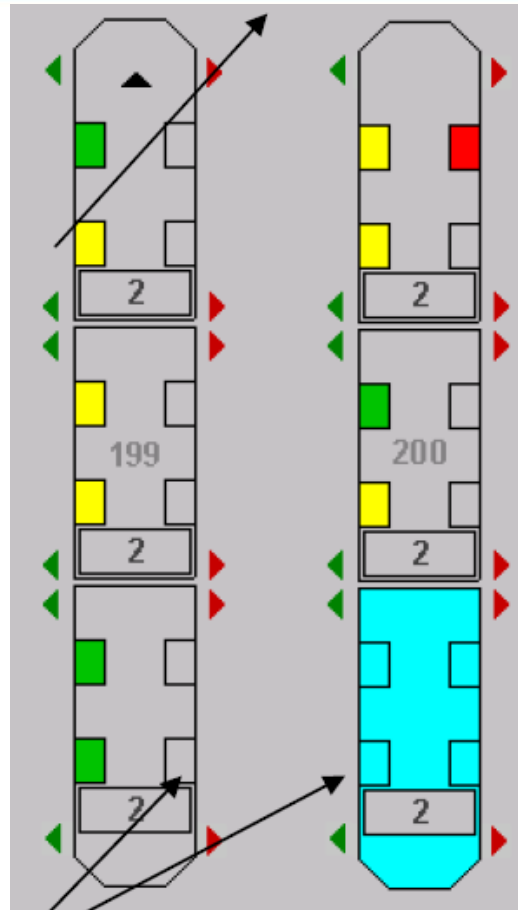
Modern Systems – Train Information

- Fault detection and Information
- Train-critical statuses and measurements



Modern Systems – Doors

- **Electronic plug doors**
- **Failsafe with traction interlocking**
- **Stepping gap minimisation**
- **Selective door opening**
- **Door based passenger counters**



Challenge – Gauge Conversion

- Easily convertible from broad to standard gauge
- Spanner job
- No change to equipment
- Holistic approach to conversion



Where to from here?

- **Design commenced after execution and is near finalisation**
- **Manufacturing began earlier this year**
- **Delivery first half of 2013 through to 2014**
- **Testing on Seaford extension (closed track)**
- **Planned acceptance of first train second half of 2013**

Adelaide's New Trams

Tramcar procurement projects 2004 - 2010

A Brief History...

- **1878** – first trams (horse-drawn) start operating in Adelaide
- **1906** – MTT formed to build and operate an electric tramway system
- **1909** – first electric tramway opened
- First two years – 70 trams procured and 55 miles of overhead wire installed



The Glenelg Tramline

- **1873** – Steam trains operate a service from Victoria Square to Glenelg
- **1929** – Steam service closed down, line re-gauged and electrified over an 8-month period
- 30 ‘**H-Class**’ trams are built locally and operated on the line for the next 80 years
- **1950’s** – tram services are gradually replaced by trolley buses
- Eventually the majority of the network is removed or covered over. Only the Glenelg tramline remains



1950 - 2004



- **1986** – tramline converted to pantograph operation
- Tram Depot relocated from Angas Street to Glengowrie
- Late **1980's** – H-Class trams undergo first major refurbishment – 10 cars in late 1980's (Regency Park)
- Early **2000's** – ATI refurbishment replaces PC-5 chopper with electronic inverter amongst other 'modernisation' and removes asbestos

A New Beginning...

- Disability Discrimination Act (DDA) established in **1992**
- Disability Standards for Accessible Public Transport (DSAPT) released **2002**
- **2003** – newly-elected Government announces the revitalisation of the Glenelg tramline and intent to purchase of modern low-floor vehicles
- Tender for new 100% low-floor vehicles made difficult due to small order and a compromised market
- **Bombardier Transportation** awarded a contract to supply nine (9) **Flexity Classic** trams on the back of a large order made by VGF, Frankfurt Germany



From Germany with Love

- **2004** – Manufacture commences in Bombardier’s LRV plant in Bautzen, Germany
- Project inspection role outsourced to local Dresden-based firm with intimate knowledge of Bombardier processes
- TransAdelaide Operations and Maintenance personnel visit Bautzen and Frankfurt to observe construction and operational requirements
- Vehicles transported via road to Hamburg, then by boat to Melbourne. Road transport to Adelaide into Victoria Square (first 11), then Adelaide Entertainment Centre



Flexity Classic - Construction



Flexity Classic - Construction



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Flexity Classic - Testing



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Flexity Classic - Transport



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Flexity Classic - Transport



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Network Expansion

- **2005** – tramline upgrade works completed (tramline closed for 8 weeks). First two (2) Flexity trams arrive in November
- Shortly before arrival, the Government announces an extension of the tramline from the geographic centre of Adelaide to the ‘City West’ precinct
- Two (2) additional Flexity trams are placed on order



Network Expansion

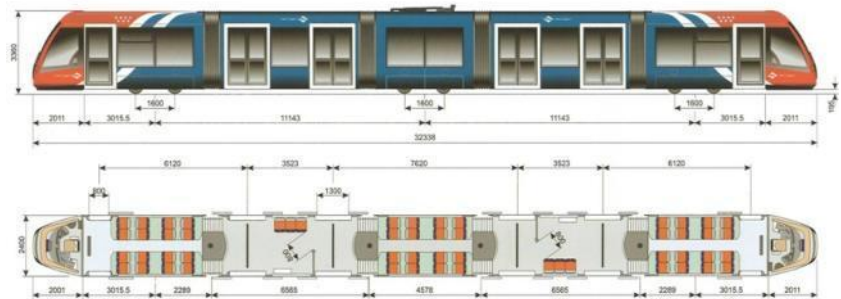
- **2007** – Services commence along 1.2 km extension to new City West terminus
- Project is received poorly initially, but trams quickly become crowded, with patronage levels well above pre-upgrade levels
- **2008** – State Government announces a second 2.8 km extension to the Adelaide Entertainment Centre, and the purchase of four additional trams to service it
- An order is placed for 4 additional Flexity trams, but these will not arrive until 12 months after the extension opening



Alstom Citadis 302



- International tender call in mid 2008 for new or second hand trams
- This brought about the discovery of 23 ‘almost’ new Alstom Citadis trams in Madrid
- Madrid had been in the process of installing new light rail infrastructure, but had cut back on initial plans, resulting in surplus rolling stock



Alstom Citadis 302



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Madrid Negotiations

- Negotiations with local transport authority, **Mintra** in **March 2009**
- Transacted under Spanish law, Madrid administrative law (with the help of some Spanish solicitors – and no thanks to Heathrow Airport)
- Same Germany-based project inspectors utilised on Flexity procurement to conduct technical & quality inspections
- Trams formally purchased in **July 2009**.



Transport & Modification

- **TransdevTSL** – then operators of the Melbourne tram franchise – engaged to manage transport and modification, commissioning and staff training activities
- Sea transportation to Melbourne Docks
- Modifications conducted at Preston Workshops, Melbourne
- Road transport directly into Glengowrie Tram Depot – first unit delivered **November 13, 2009**



Transport & Modification



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Transport & Modification



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Additional Flexity Trams

- Four (4) additional Flexity trams, ordered in 2008 were scheduled for delivery late 2010
- 100-years flooding of a small river adjacent to the Bautzen plant
- Delayed delivery – 2 trams in mid 2011, and remaining 2 trams mid 2012
- Final fleet composition:
 - **15 x Bombardier Flexity Classic** trams (100 Series)
 - **6 x Alstom Citadis** trams (200 Series)
 - **2 x H-Class** trams* (300 Series)



Specifications

	Flexity Classic	Citadis 302
<i>Built</i>	Bautzen, Germany, 2005	Barcelona, Spain, 2007
<i>Length</i>	30m	32m
<i>Width</i>	2.4m	2.4m
<i>Vehicle mass (tare)</i>	40t	39t
<i>Max Speed</i>	70 km/h	70-km/h
<i>No. of Modules</i>	3	5
<i>No. of Bogies</i>	4 (2 powered)	3 (2 powered)
<i>Passenger Capacity (peak)</i>	179	186
<i>No. Seats</i>	70	58
<i>No. Doors per side</i>	3	6 (2 single)
<i>Boarding Device</i>	Built-in	Portable type
<i>% Low Floor</i>	70%	100%

Questions?



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