

VERY LIGHT RAIL: TRANSPORT SOLUTIONS FOR THE FUTURE

Thursday 28th
November 2019
9am - 4pm

The Slate, the University
of Warwick, CV4 7AL

WMG
THE UNIVERSITY OF WARWICK

CATAPULT
High Value Manufacturing

RLB Rider
Levett
Bucknall



Very Light Rail: Transport Solutions for the Future

AGENDA

9:00 REGISTRATION AND COFFEE

Session 1

9:30 Welcome and Opening Remarks

- Archie MacPherson, CEO WMG HVM Catapult
- Cllr Jim O'Boyle, Cabinet Member for Jobs and Regeneration, Coventry City Council

9:45 Keynote Address – The need for change

- Steve Berry, Head, Highways Maintenance Branch, Local Transport Funding and Growth Division, Department for Transport

10:05 What is Very Light Rail and what does it offer?

- Nick Mallinson, Programme Manager VLR, WMG

10:25 Coventry Very Light Rail project

- Colin Knight, Director of Transportation and Highways, Coventry City Council
- Nicola Small, Programme Manager for VLR, Coventry City Council
- Grant McKelvie, Commercial Director, Coventry City Council
- Cost of Urban Very Light Rail, Andrew Stamps, Rider Levett Bucknall

11:00 COFFEE AND NETWORKING

Session 2

11:30 The Very Light Rail National Innovation Centre

- Alan Lunt, Strategic Director (Place) & Deputy Chief Executive, Dudley Metropolitan Borough Council

11:50 Very Light Rail Revolution project – the foundations for Coventry VLR

- Tim Burleigh, Head of External Relations, Eversholt Rail
- Martin Pemberton, Managing Director, TDI

12:15 VLR as part of the future West Midlands transport ecosystem

- Mike Waters, Director of Policy, Strategy and Innovation, Transport for West Midlands

12:30 What standards will apply to VLR systems and how will approval be achieved?

- Bridget Eickhoff, Principal Infrastructure Engineer, RSSB

12:45 LUNCH & NETWORKING DRINKS

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13:45 What is best practice for delivery of a safe VLR system?

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14:00 How VLR can inform and complement traditional rail

- Rory Dickerson, Senior Engineer for Traction & Rolling Stock, Network Rail

14:15 Accessible urban rail solutions and the UK housing gap

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- Tours of WMG and drop in sessions with experts

16:00 END

VERY LIGHT RAIL: TRANSPORT SOLUTIONS FOR THE FUTURE

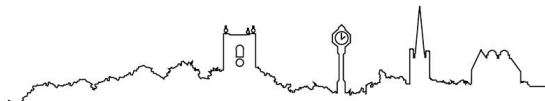
The Very Light Rail National Innovation Centre Dudley

Alan Lunt

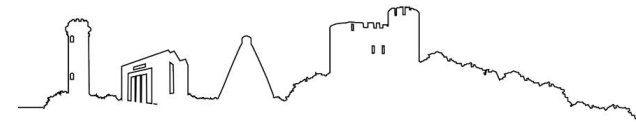
Deputy Chief Executive - Dudley Metropolitan Borough Council

28th November 2019

The Slate, the University of Warwick

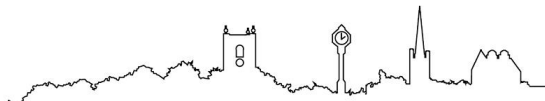


the historic capital of the Black Country



Presentation Content

- Background to the Very Light Rail Innovation Centre (VLRNIC) proposition
 - Why Dudley and the Black Country?
 - Why an Innovation Centre?
- Key features of the VLRNIC
- Features of the business case and business plan for the VLRNIC
- Anticipated next steps



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Black Country Context

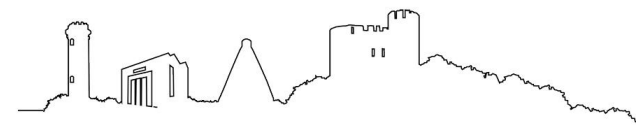
- Rail is an important sector for the Black Country economy
- Strategic interest to identify job creation and safeguarding opportunities for new and emerging sectors that have alignment with:
 - Black Country engineering SMEs that are at the heart of the areas economic makeup
 - Apprenticeship training initiatives of Dudley College
- Familiarity with what VLR offers based on Black Country having a working Very Light Rail system



Stourbridge Town branch line



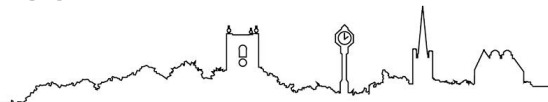
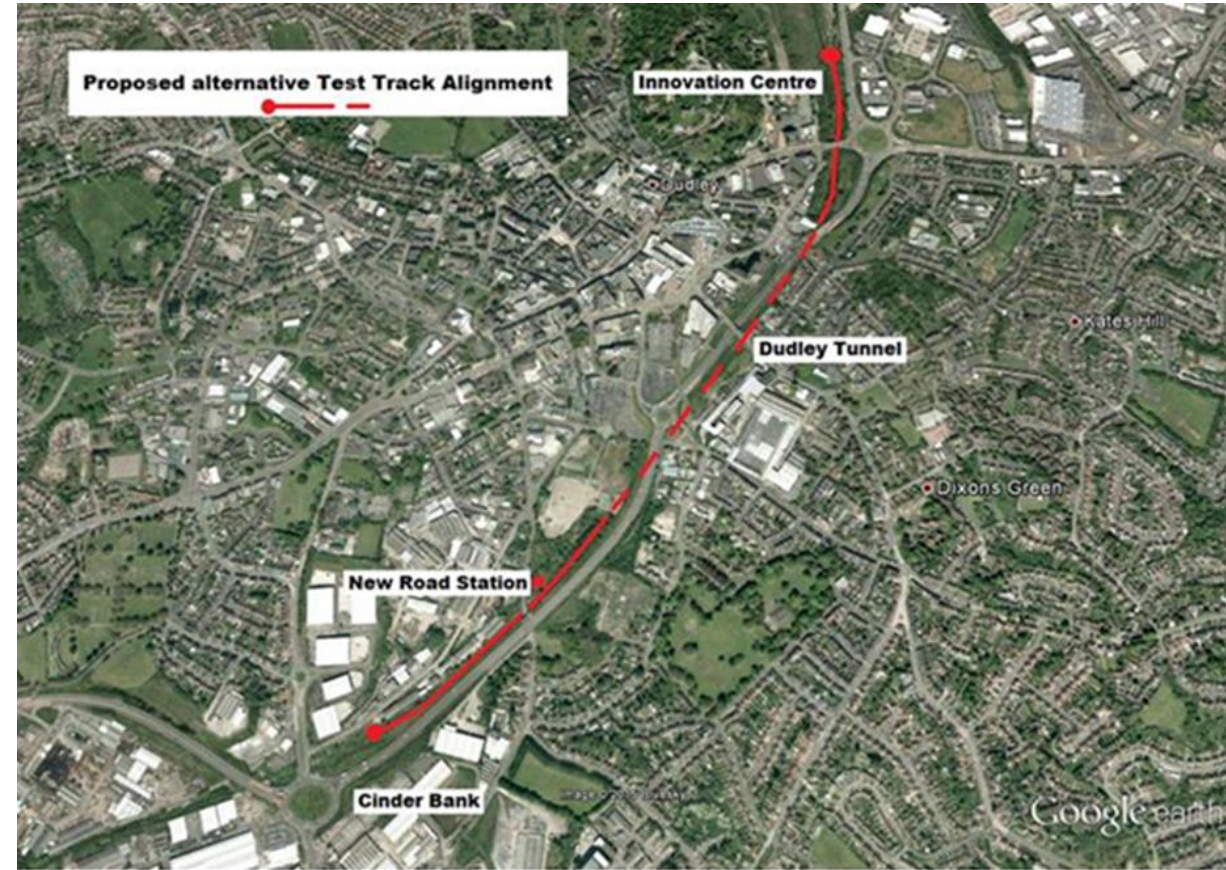
the historic capital of the Black Country



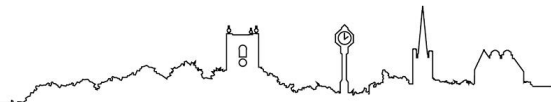
Why Dudley and Rail Innovation



- Dudley has a location within its regeneration zone that is well suited to host a rail Innovation Centre
- Test Track for rail on the mothballed South Staffordshire line, running from Stourbridge to Walsall



The Castle Hill Location



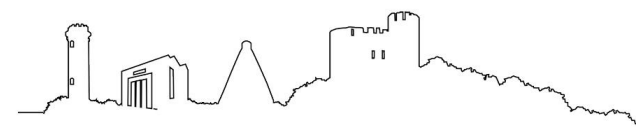
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The VLRNIC Proposition



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Why an Innovation Centre for VLR

Need for an innovation initiative to support a fledgling industry by:-

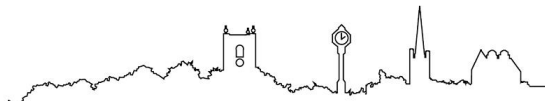
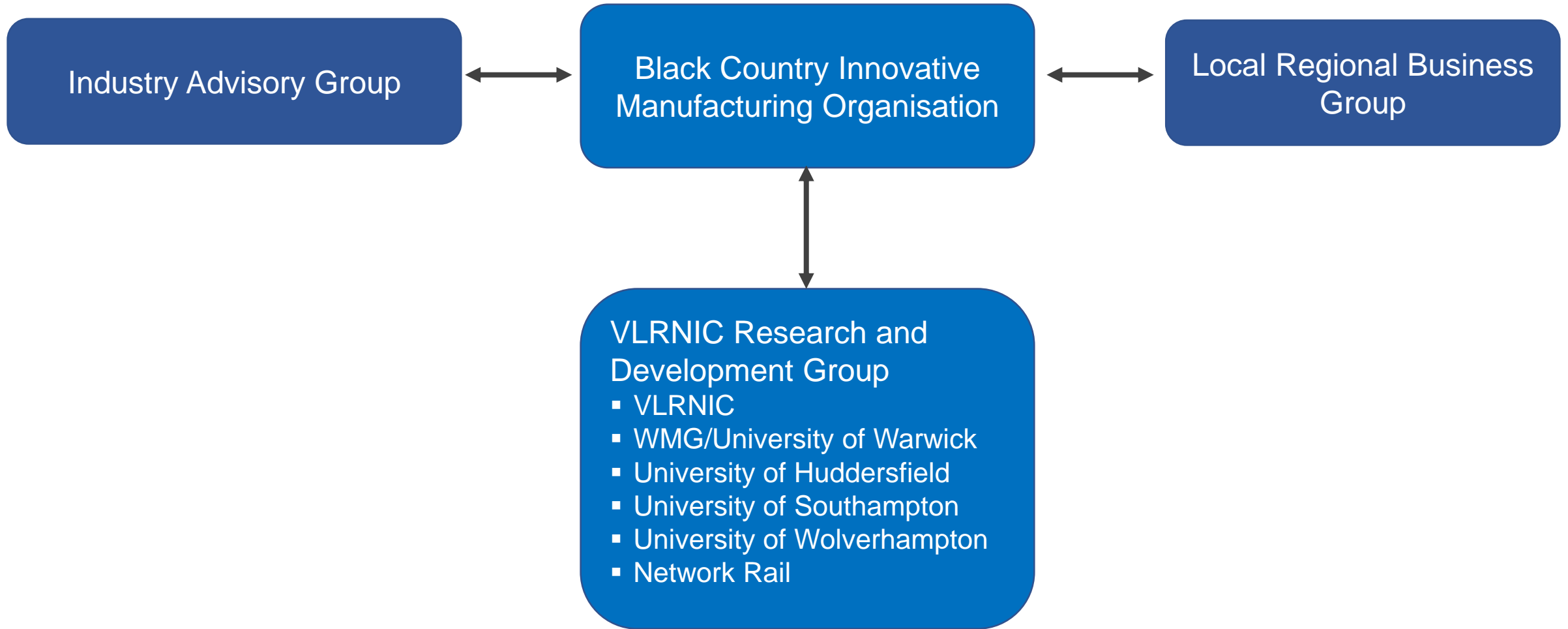
- Creating neutral space
- Lobbying
- Coordination
- Facilities
- Open access
- Supporting education
- SME support initiatives
- Hosting conferences and exhibitions
- Conducting feasibility studies



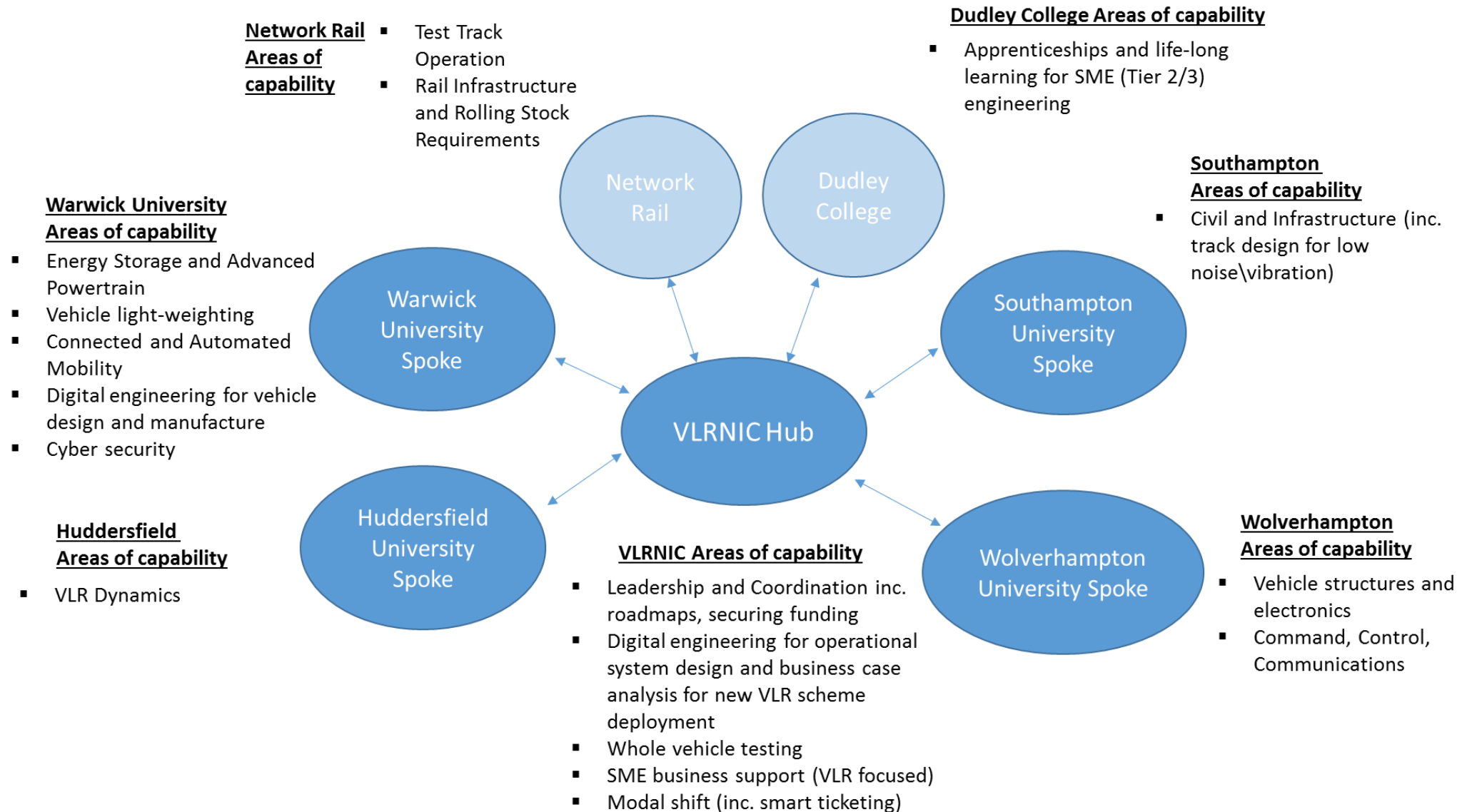
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VLRNIC Governance



Hub and Spoke Model for the VLRNIC



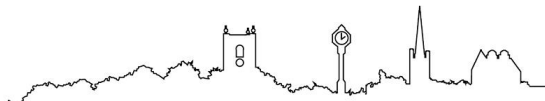
Timing Plan

	2019	2020	2021	2022	2023	2024
Research Centre						
Launch Phase (Virtual Centre)						
Operational Centre						
Test Tracks						
Track 1 Commissioning						
Track 1 Operation						
Track 2 Commissioning						
Track 2 Operation						

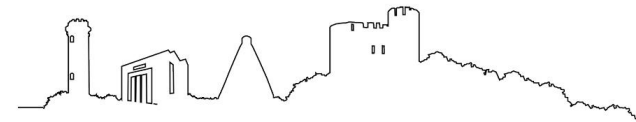
- Funds secured for build phase
- Soft launch phase with recruitment of staff about to commence

Conclusions

- At Dudley MBC we have developed the Very Light Rail National Innovation Centre (VLRNIC) proposition
- Key features include:
 - A rail test track
 - An innovation centre staffed by a team committed to working in partnership with others to help build a new industrial sector
 - A Hub and Spoke model to bring together the research expertise needed to address the product development challenges
 - Advisory groups to ensure a strong industry voice helping steer the priorities of the VLRNIC
- A call to arms
 - We want to work with you, as fellow pioneers of VLR, to help realise the potential of this exciting and affordable alternative to heavy rail, trams, buses and the passenger car



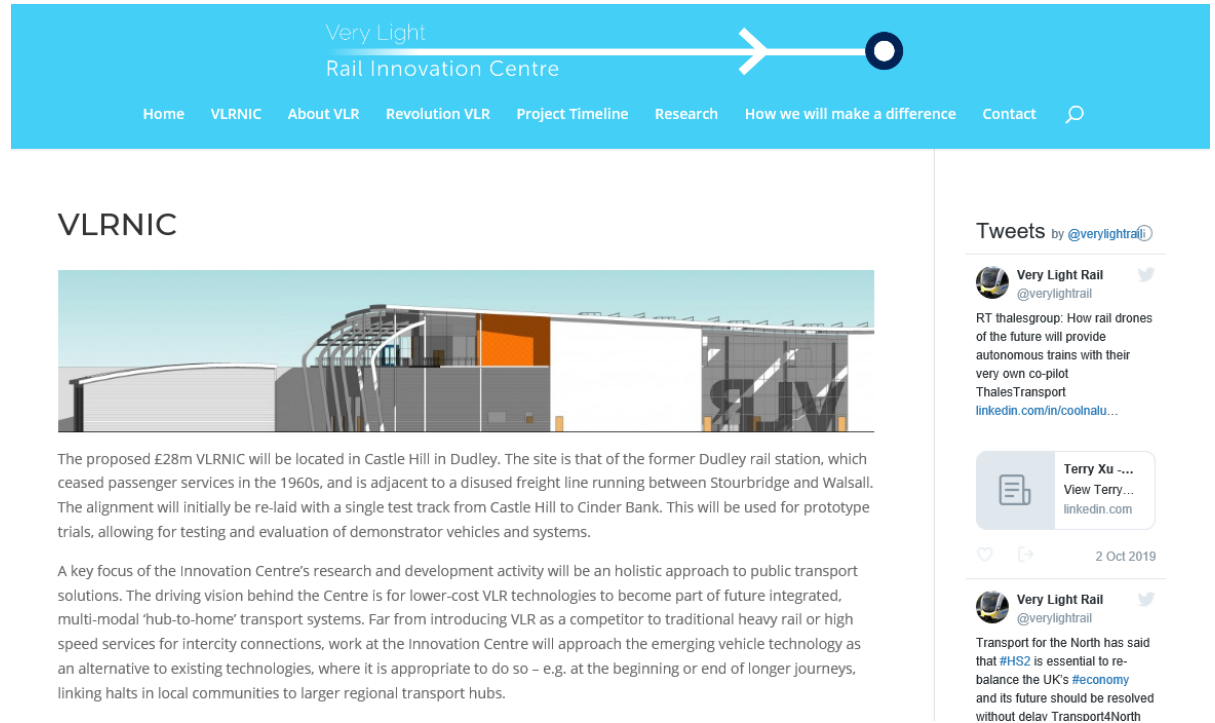
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Thank you for listening

Alan Lunt, Deputy Chief Executive
Dudley Metropolitan Borough Council


email: Alan.lunt@dudley.gov.uk



Very Light
Rail Innovation Centre

Home VLRNIC About VLR Revolution VLR Project Timeline Research How we will make a difference Contact

VLRNIC



The proposed £28m VLRNIC will be located in Castle Hill in Dudley. The site is that of the former Dudley rail station, which ceased passenger services in the 1960s, and is adjacent to a disused freight line running between Stourbridge and Walsall. The alignment will initially be re-laid with a single test track from Castle Hill to Cinder Bank. This will be used for prototype trials, allowing for testing and evaluation of demonstrator vehicles and systems.

A key focus of the Innovation Centre's research and development activity will be an holistic approach to public transport solutions. The driving vision behind the Centre is for lower-cost VLR technologies to become part of future integrated, multi-modal 'hub-to-home' transport systems. Far from introducing VLR as a competitor to traditional heavy rail or high speed services for intercity connections, work at the Innovation Centre will approach the emerging vehicle technology as an alternative to existing technologies, where it is appropriate to do so – e.g. at the beginning or end of longer journeys, linking halts in local communities to larger regional transport hubs.

Tweets by @verylightrail

Very Light Rail
@verylightrail
RT thalesgroup: How rail drones of the future will provide autonomous trains with their very own co-pilot
ThalesTransport
[linkedin.com/in/coolnalu...](https://www.linkedin.com/in/coolnalu...)

Terry Xu ...
View Terry...
[linkedin.com](https://www.linkedin.com)

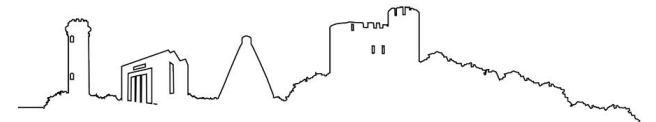
2 Oct 2019

Very Light Rail
@verylightrail
Transport for the North has said that #HS2 is essential to re-balance the UK's #economy and its future should be resolved without delay
Transport4North

Web Address: www.verylightrail.com/the-centre/



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The Revolution VLR and Coventry VLR programmes

Tim Burleigh

Head of External Relations, Eversholt Rail

Martin Pemberton

Managing Director, TDI








Revolution VLR – an overview



About Eversholt Rail

GREAT TRAINS	GREAT PEOPLE	GREAT FUTURE	
			
			
			

ESTABLISHED **1994**
WITH OVER **25** YEARS' EXPERIENCE
IN THE RAIL
INDUSTRY AND A PROUD
HISTORY OF INNOVATION

WE OWN AND MAINTAIN
MORE THAN **3,600**
PASSENGER AND FREIGHT VEHICLES
WITH NEW PASSENGER
VEHICLES FOR THE UK
NETWORK ON ORDER

£3.1 BILLION
INVESTED
IN NEW ROLLING STOCK

ANNUAL INVESTMENT
OF OVER **£100M**
IN OUR EXISTING FLEETS

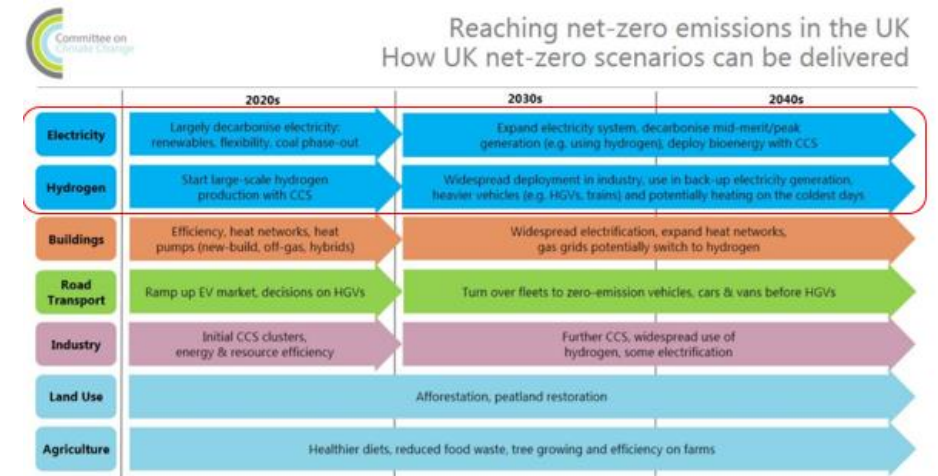
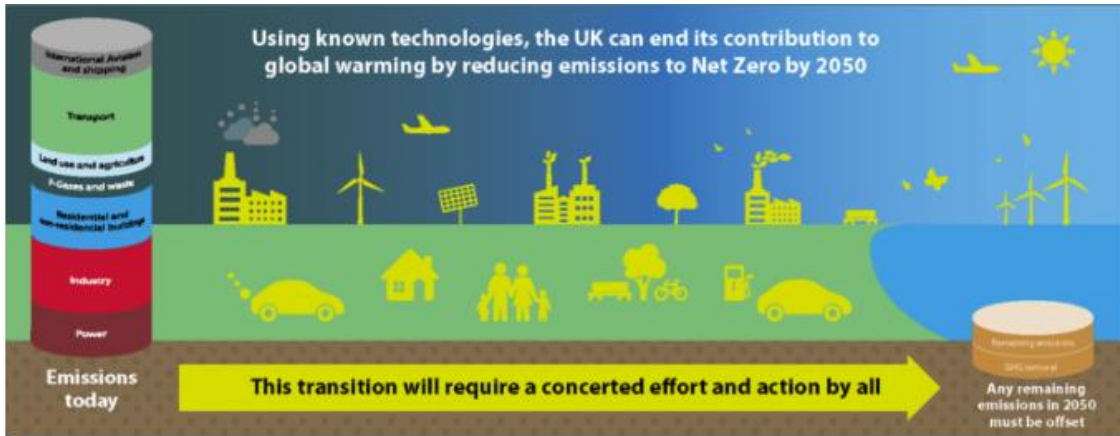


Key challenges for the UK railway

- Ensuring continued demand growth
- Delivering decarbonisation in step with or ahead of other transport modes
 - No 'silver bullet' that solves all the issues
 - A mix of further route electrification and innovative rolling stock solutions and propulsion technologies is required
- Providing better end to end journeys to encourage modal shift
 - Increasing importance of community rail in stimulating overall demand
 - Need for affordable extension of the network



UK Government decarbonisation commitments



Typical UK rural rolling stock

- Traditional rail diesel multiple units (DMUs), mostly around 30 years old
- Powerpacks pre-date even the earliest Euro emissions standards
- Dated interior environment
- Require heavy rail infrastructure, making network extension costly



Photo by mancurian1001 from "Know Your Sprinters: The Class 150 Series of DMUs"



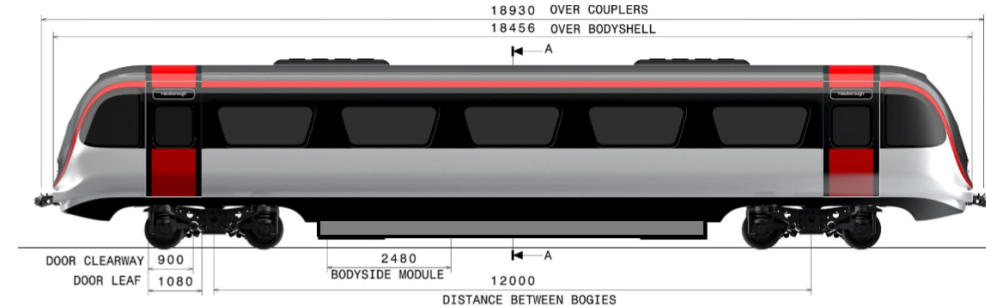
Revolution VLR programme background

- Programme initiated by RSSB/DfT to apply relevant automotive industry technologies to deliver an innovative, affordable and attractive new rail vehicle design
- Targeted at rural service operations and potential line re-openings
- Eversholt Rail joined the consortium in 2018

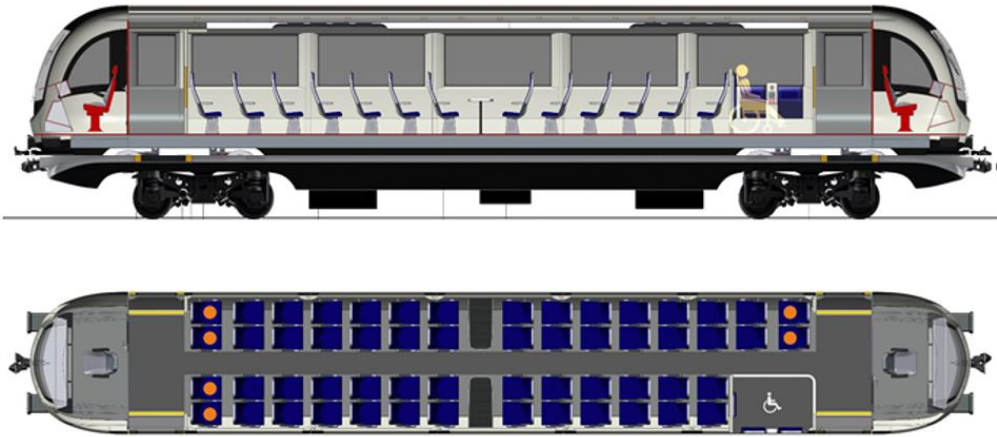


Revolution VLR key characteristics: 1

- Low overall mass - 1 tonne per linear metre
 - Reduced energy consumption
 - Able to operate on lightweight modular slab track
- Self-powered
 - Modular hybrid powerpacks comprising Euro 6-compliant diesel engine, generator and batteries
 - Zero-emissions operation in stations and built-up areas
 - Regenerative braking
 - Low fuel consumption



Revolution VLR key characteristics: 2



- Spacious, modern and accessible interior
 - Air-conditioned
 - Charging sockets for personal devices
 - Aimed at encouraging modal shift



Revolution VLR programme status

- Demonstrator vehicle phase began in January 2018
- Design and procurement of major sub-systems underway
- Powerpack integration and testing well-advanced
- Vehicle build has commenced
- Vehicle testing begins in Q2 2020



Revolution VLR Summary

- Increased market focus on decarbonisation and system cost-effectiveness should favour VLR solutions for rural rail applications
- Revolution VLR design phase has confirmed that it can achieve the desired characteristics
- Programme is on target for testing of the Demonstrator vehicle by early 2020



Coventry VLR design evolution



Martin Pemberton

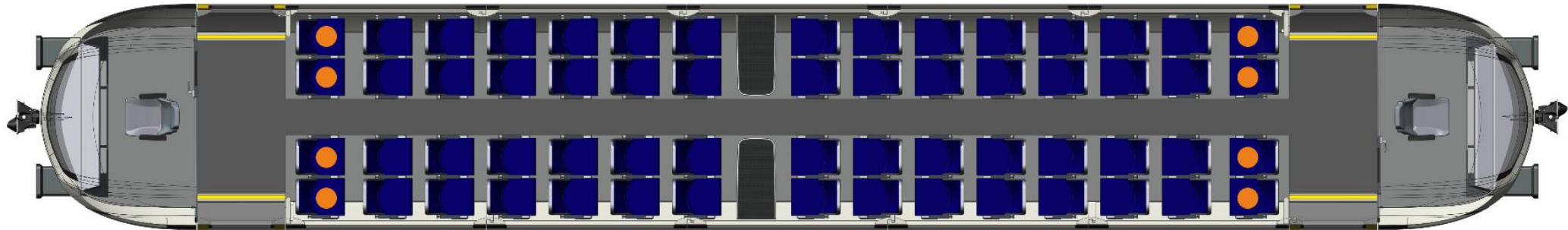
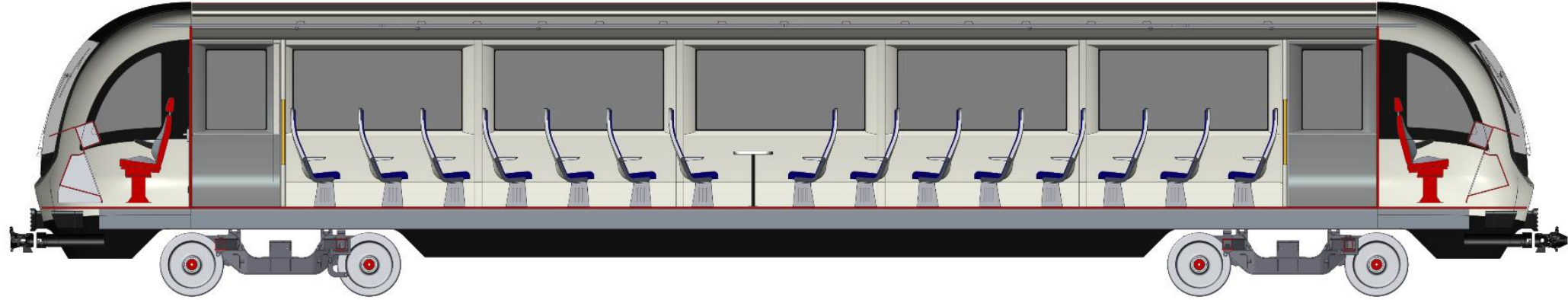
TDI is experienced in mainstream rail & tram projects around the world



Revolution VLR Euro 6, 18m diesel electric hybrid railcar



Revolution VLR Euro 6, 18m diesel electric hybrid railcar



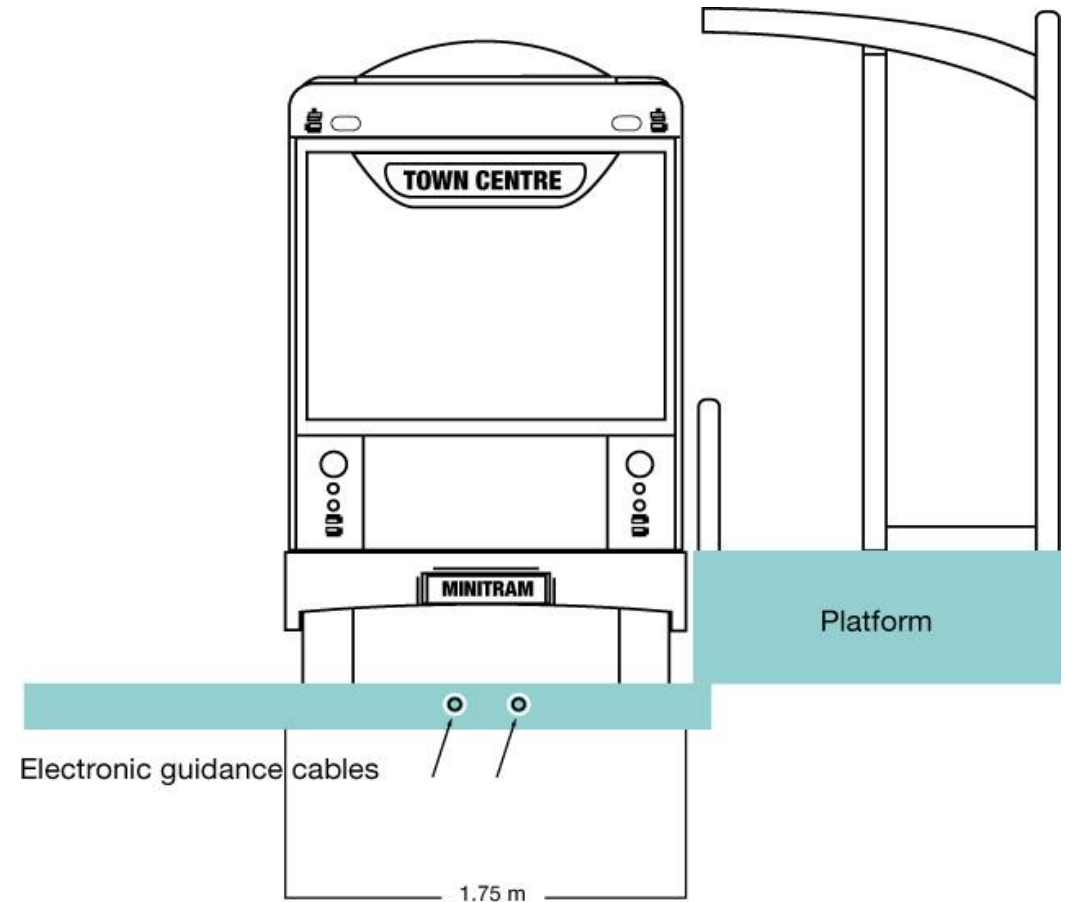
Minitram concept model for ultra light, battery powered tram 1995



Minitram electronically guided, bi-directional electric vehicle 2000



Minitram trials in Althorp, Stratford, Bradford and Coventry



Minitram trial & 'ultra light rail' proposal for Coventry City Council 2003/4



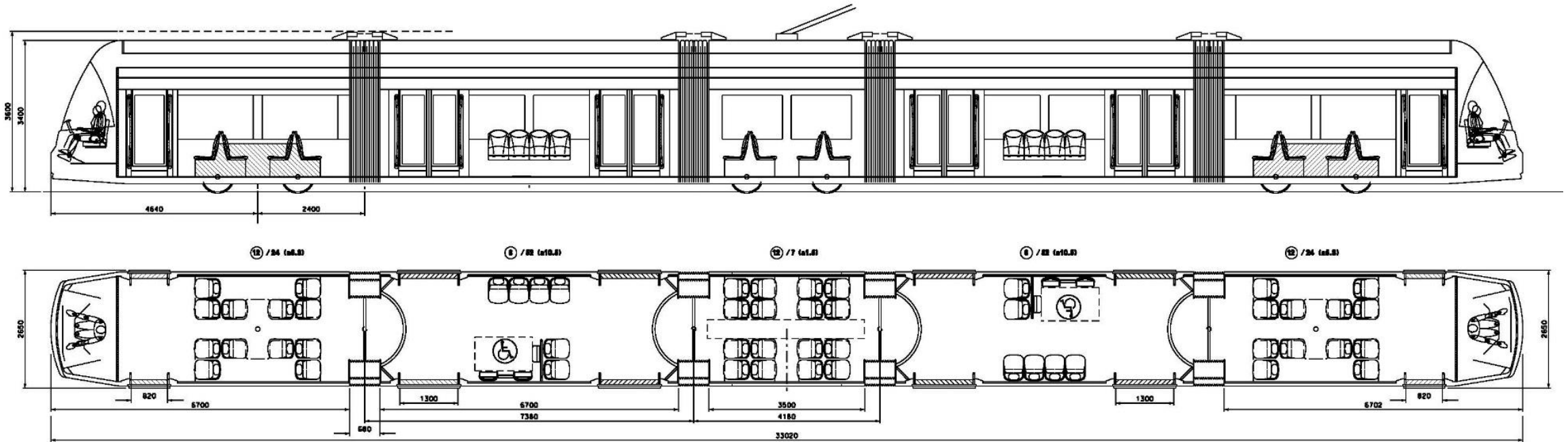
Personal rapid transport (PRT) development begun 2003



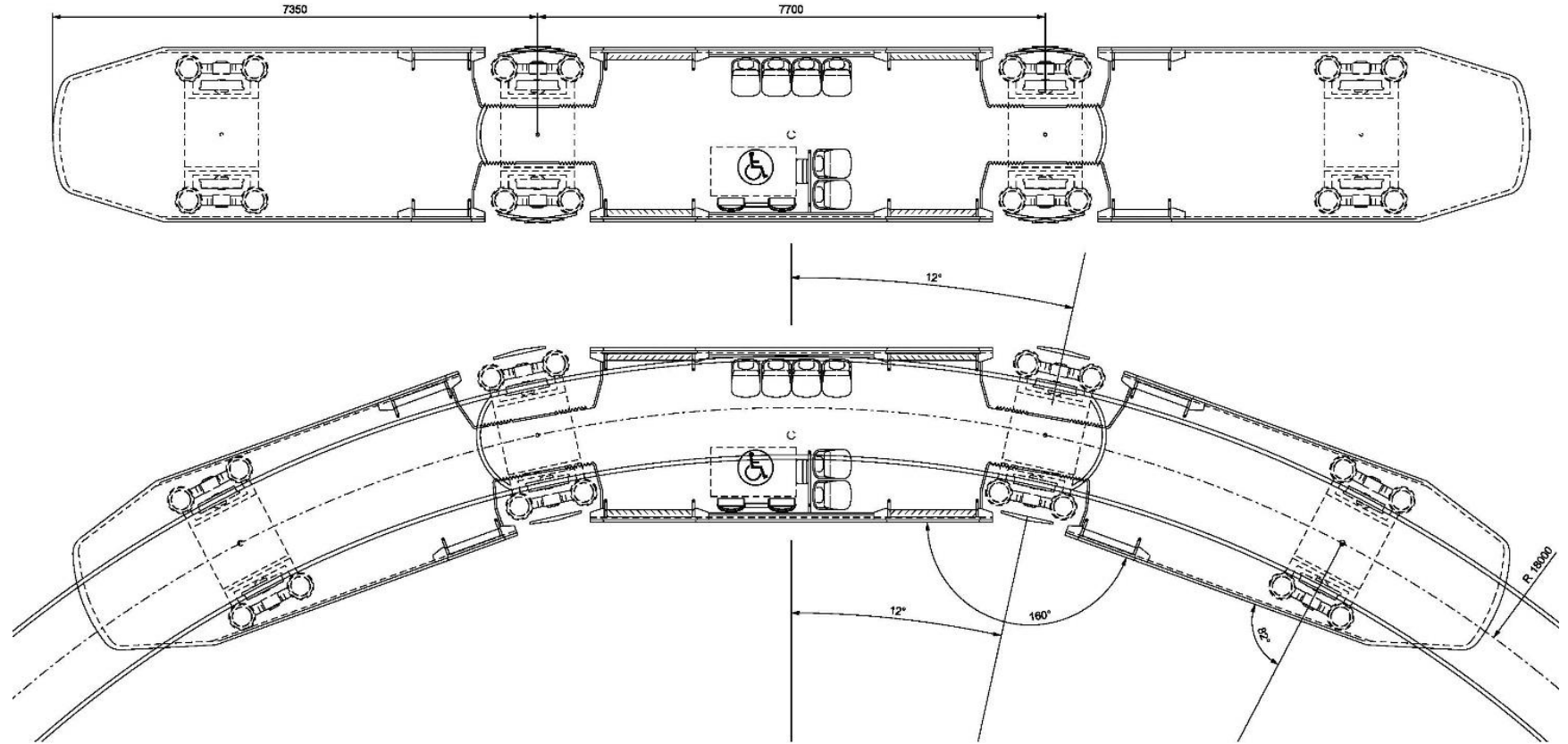
Vectus 'SkyCube' fully autonomous PRT system opens in S Korea 2014



Midland Metro industrial design, ergonomics & branding by TDI 2005



Curving analysis to establish optimal wheelbase & vehicle geometry

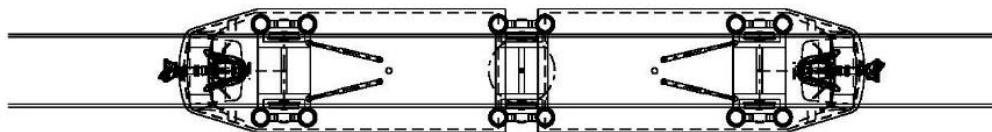


Considerations:

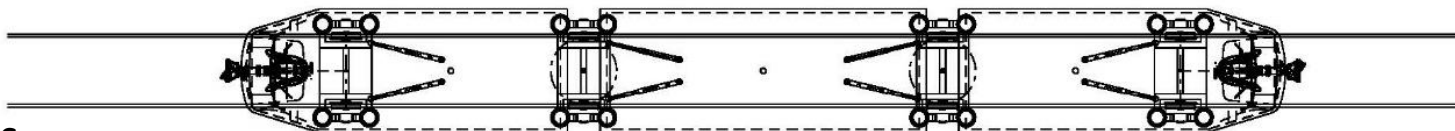
- 15m curve radius
- Single axles versus bogies
- Car size
- Passenger capacity
- Articulated or separate cars

'Train set' options

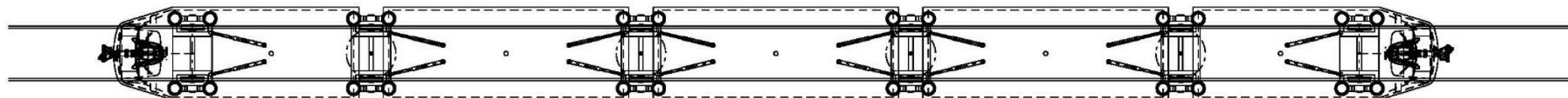
2 car - 61 passengers



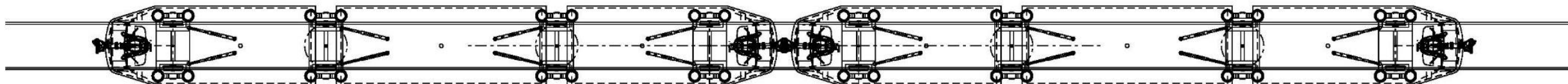
3 car - 106 passengers



5 car - 196 passenger



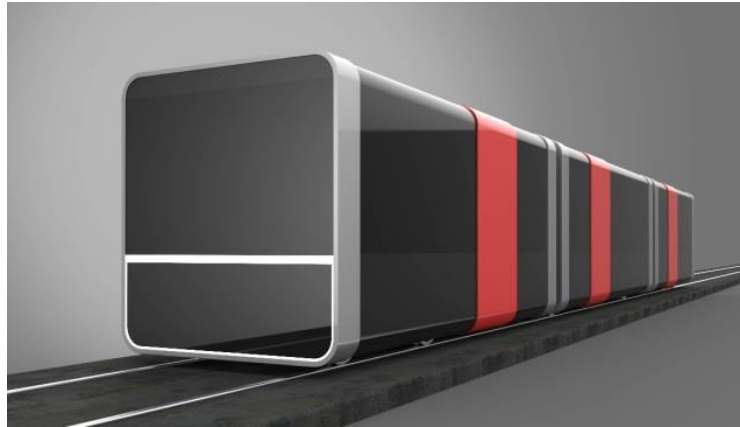
6 car – 212 passengers



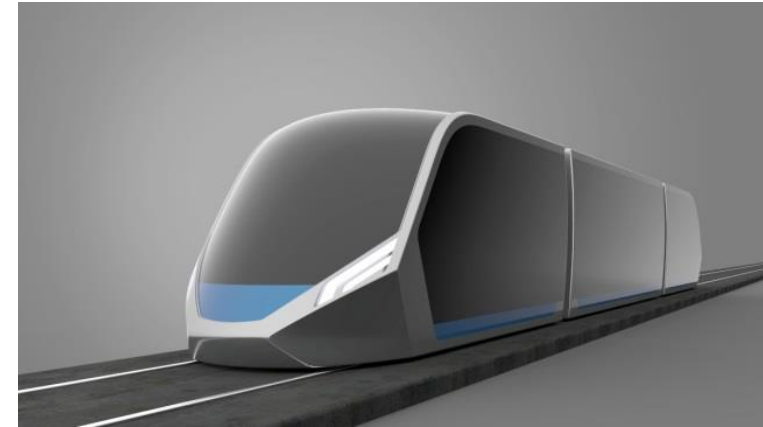
Early vehicle architecture concepts



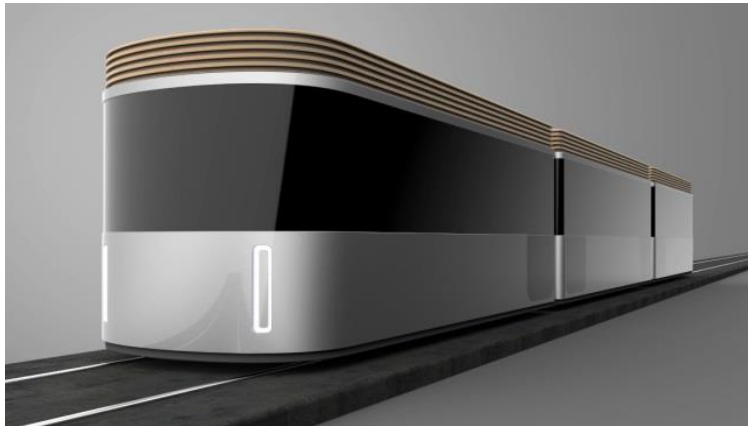
Concept 1



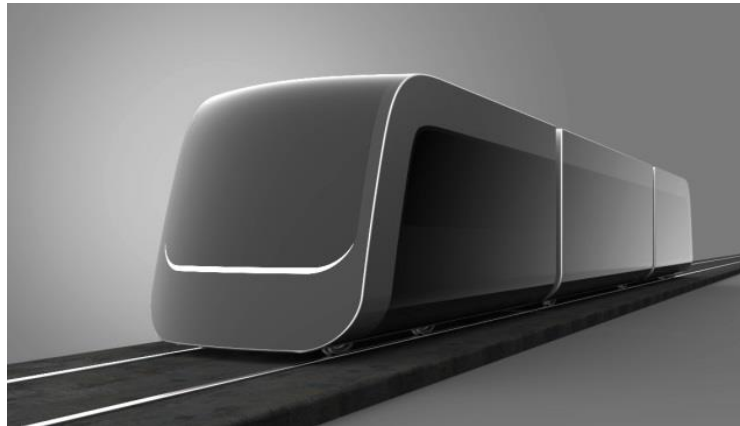
Concept 2



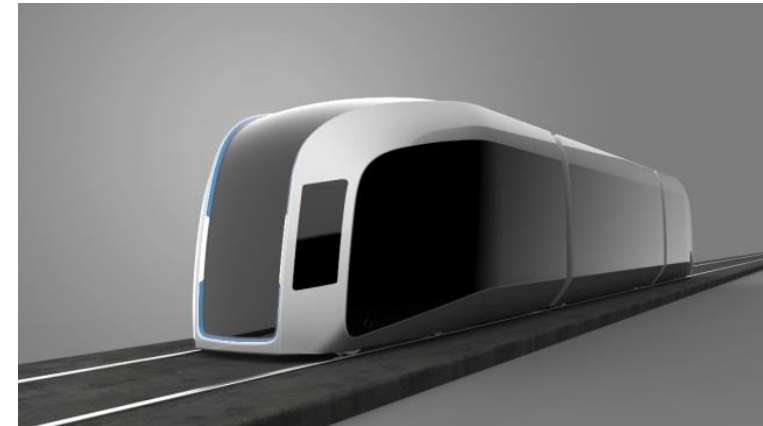
Concept 3



Concept 4



Concept 5



Concept 6

Early design concepts



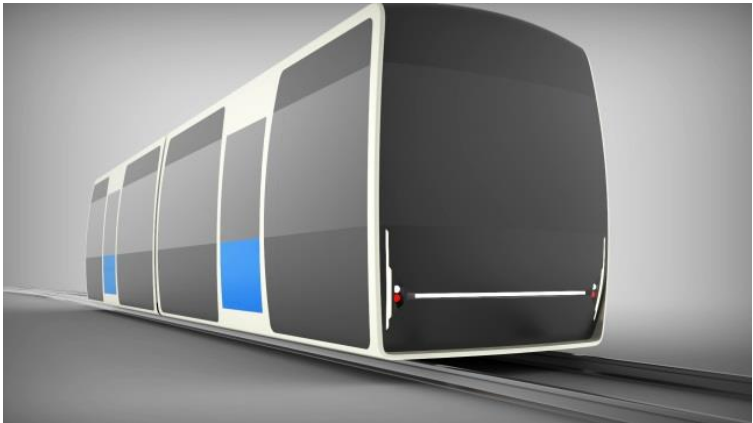
Concept 7



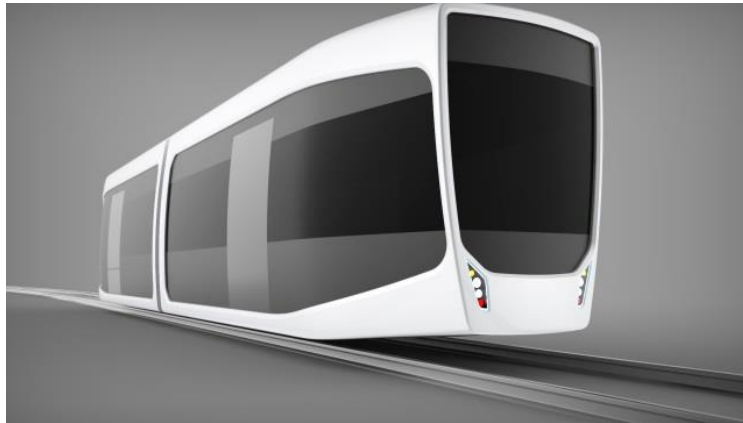
Concept 8



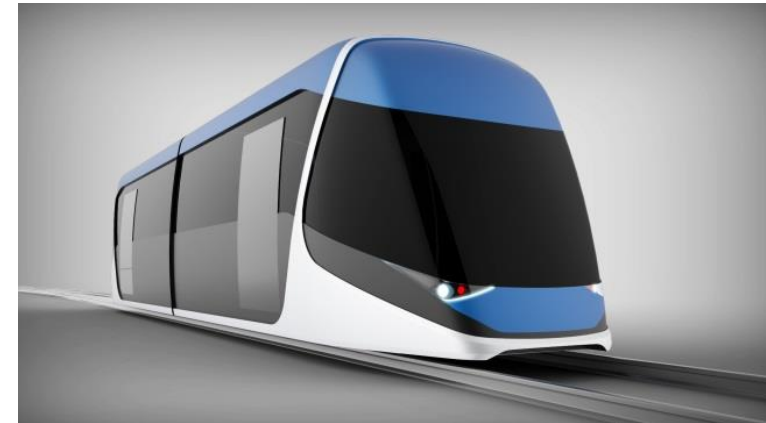
Concept 9



Concept 10

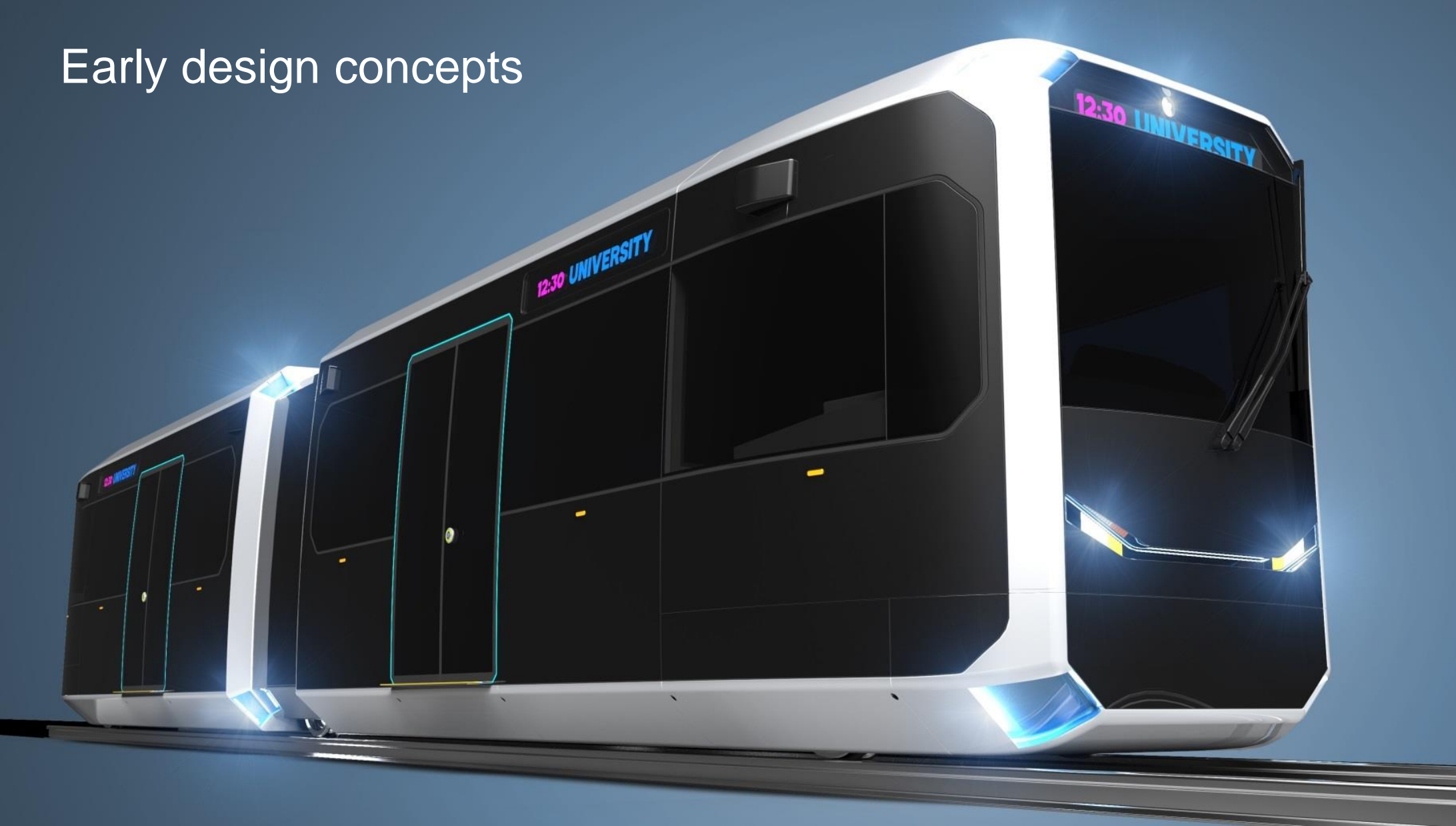


Concept 11



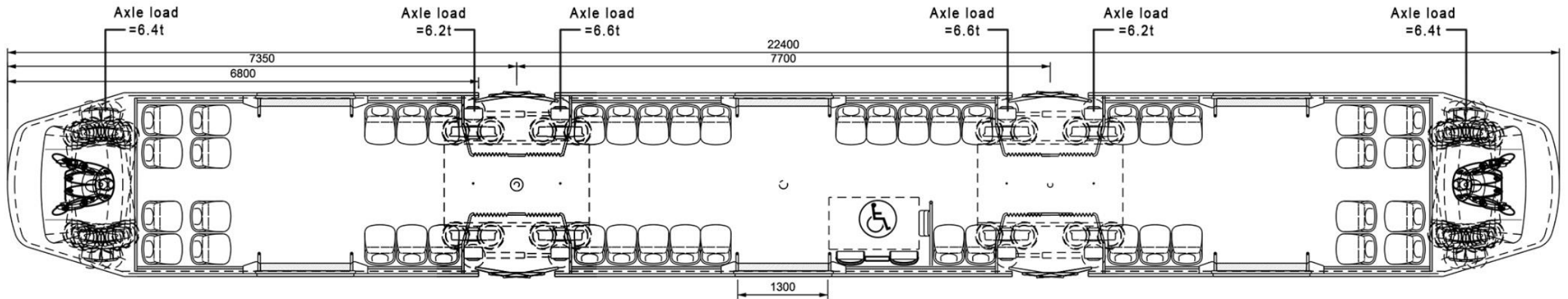
Concept 12

Early design concepts

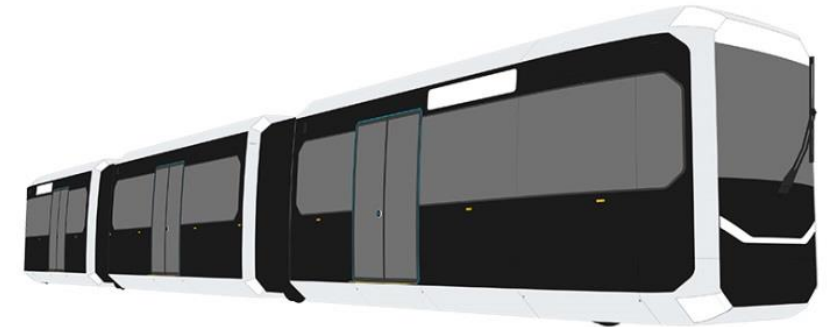


Early design concepts

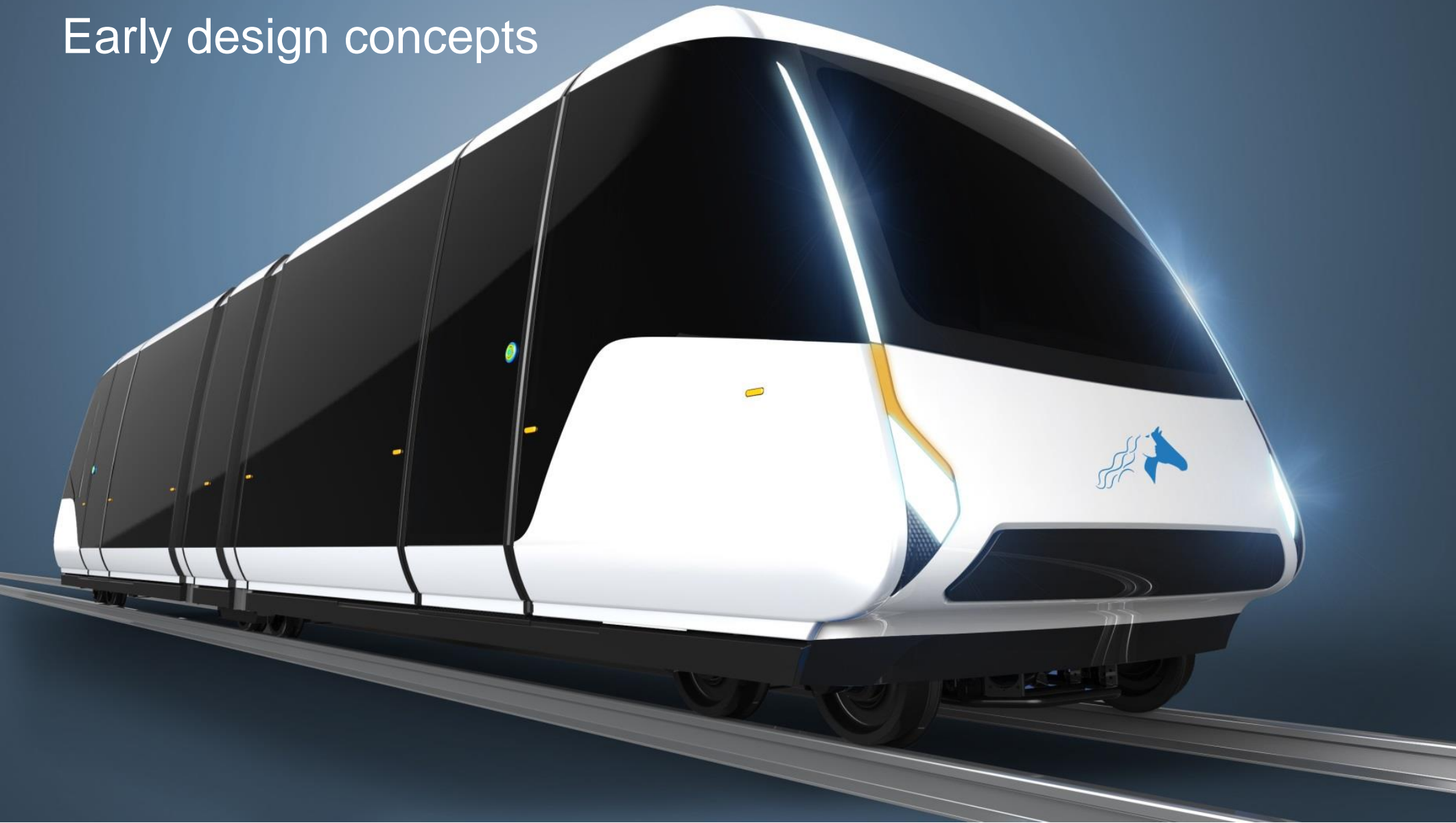


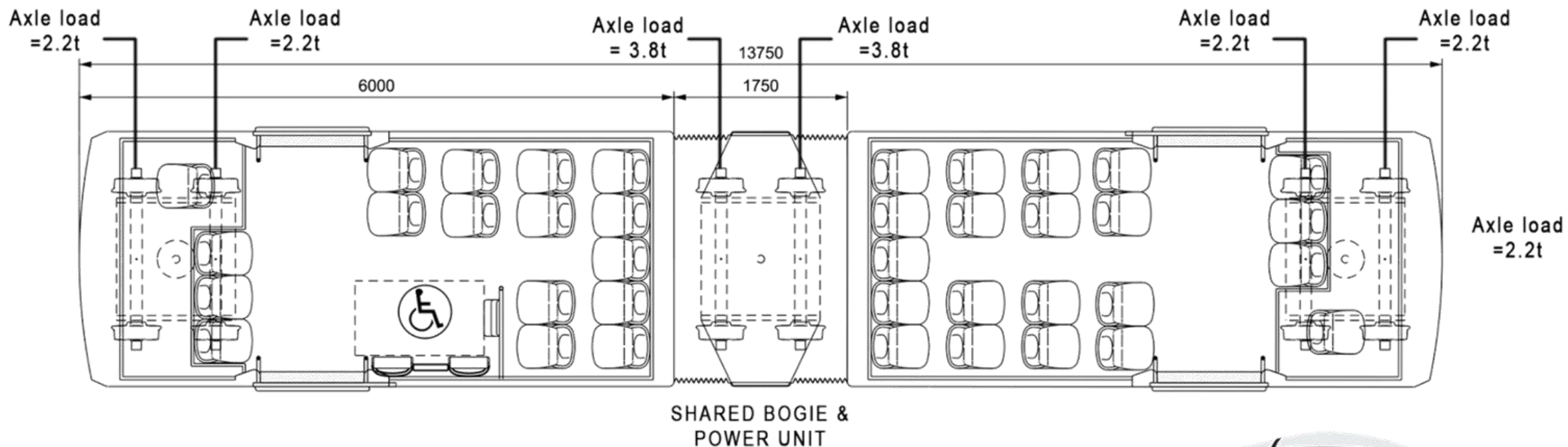


45 Seats + 3 Perch Seats
 104 Standing (5/Msq.)
 Total passengers = 149
 171 standing @crush (8/msq.)
 Total passengers = 216 (crush load)
 Vehicle gross weight = 38384kg



Early design concepts

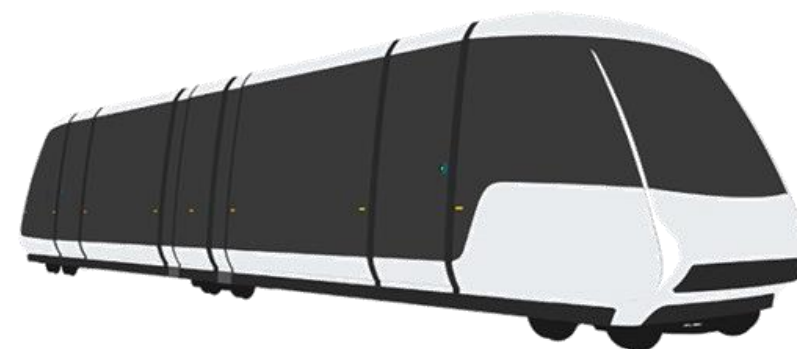


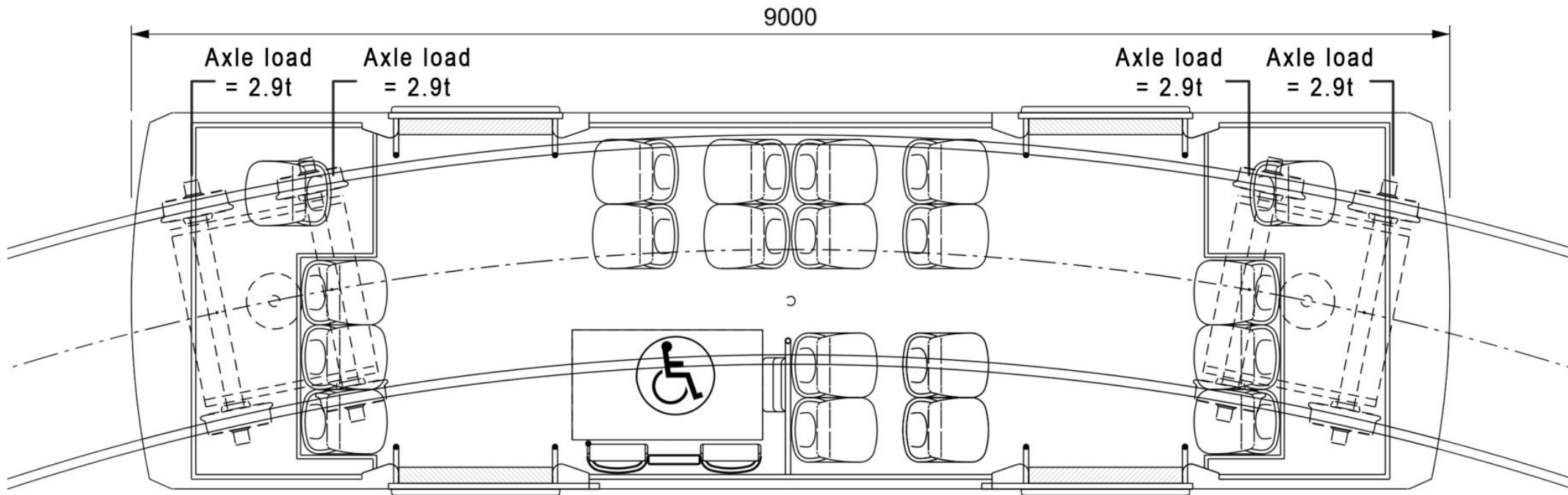


36 Seats + 2 Perch Seats
 33 Standing (5/Msq.)
 Total passengers = 69
 53 standing @crush (8/msq.)
 Total passengers = 89 (crush load)
 Vehicle gross weight = 1647kg

GRT

LIGHT WEIGHT
BODY SHELL





18 Seats + 2 Perch Seats

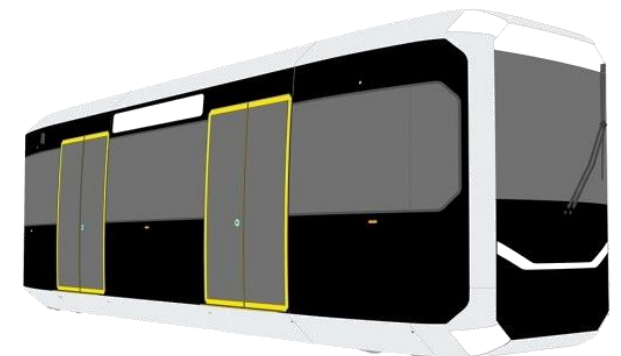
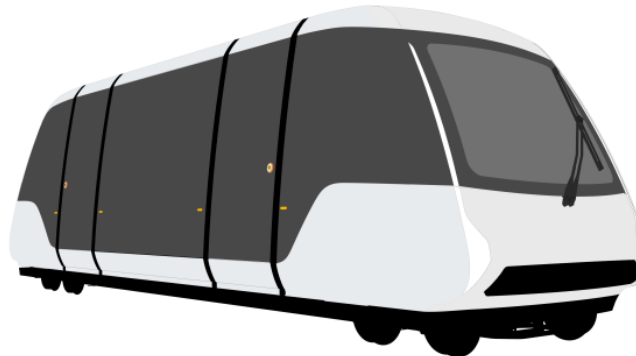
30 Standing (5/Msq.)

Total passengers = 50

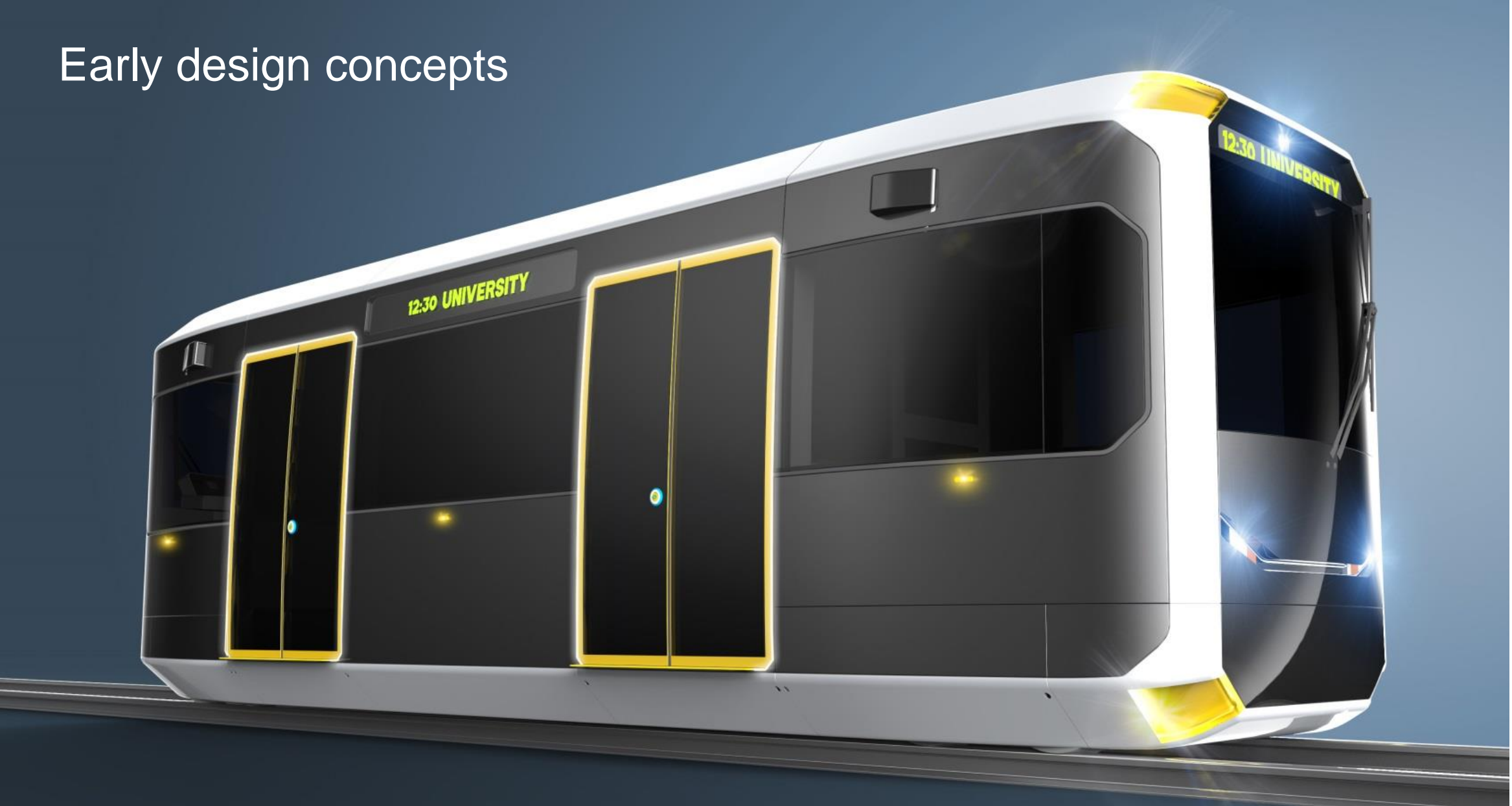
48 standing @crush (8/msq.)

Total passengers = 68 (crush load)

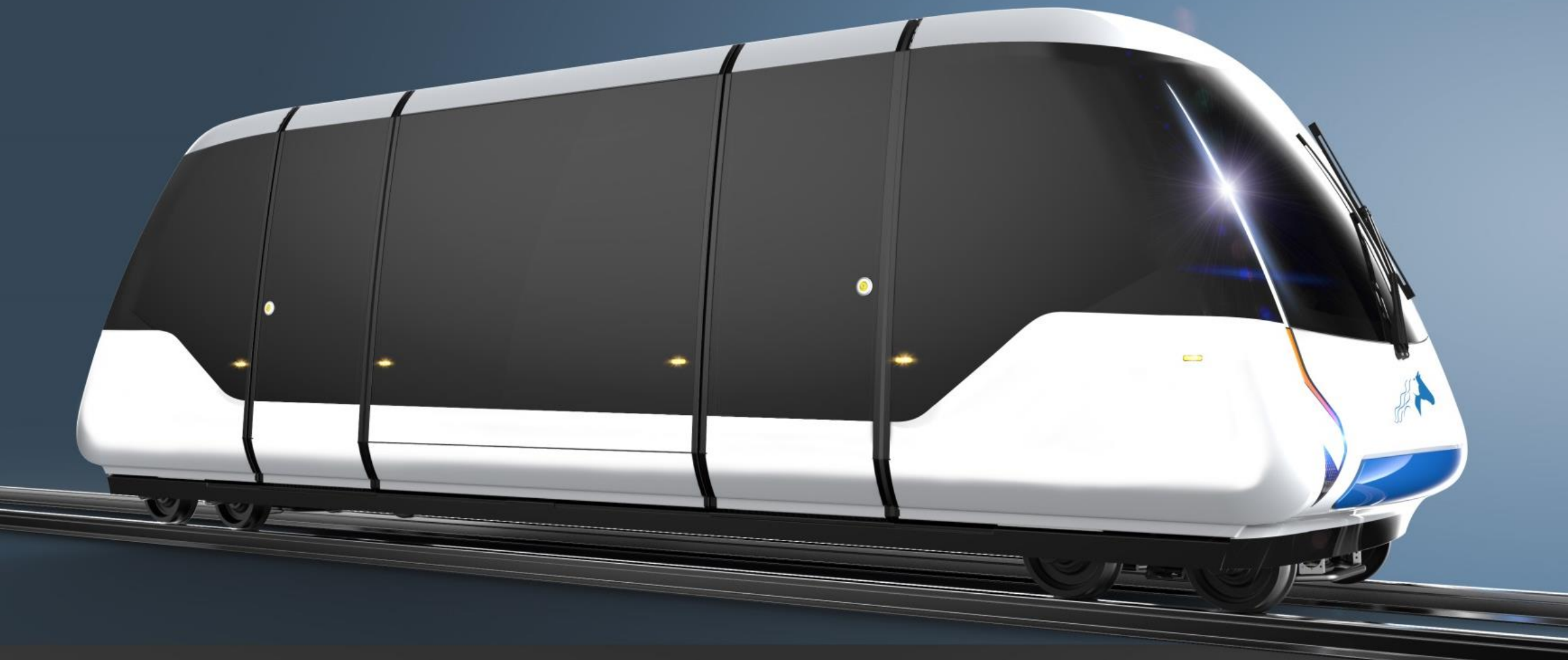
Vehicle gross weight = 11600kg



Early design concepts



Selected design concept





Conceptualised VLR environment



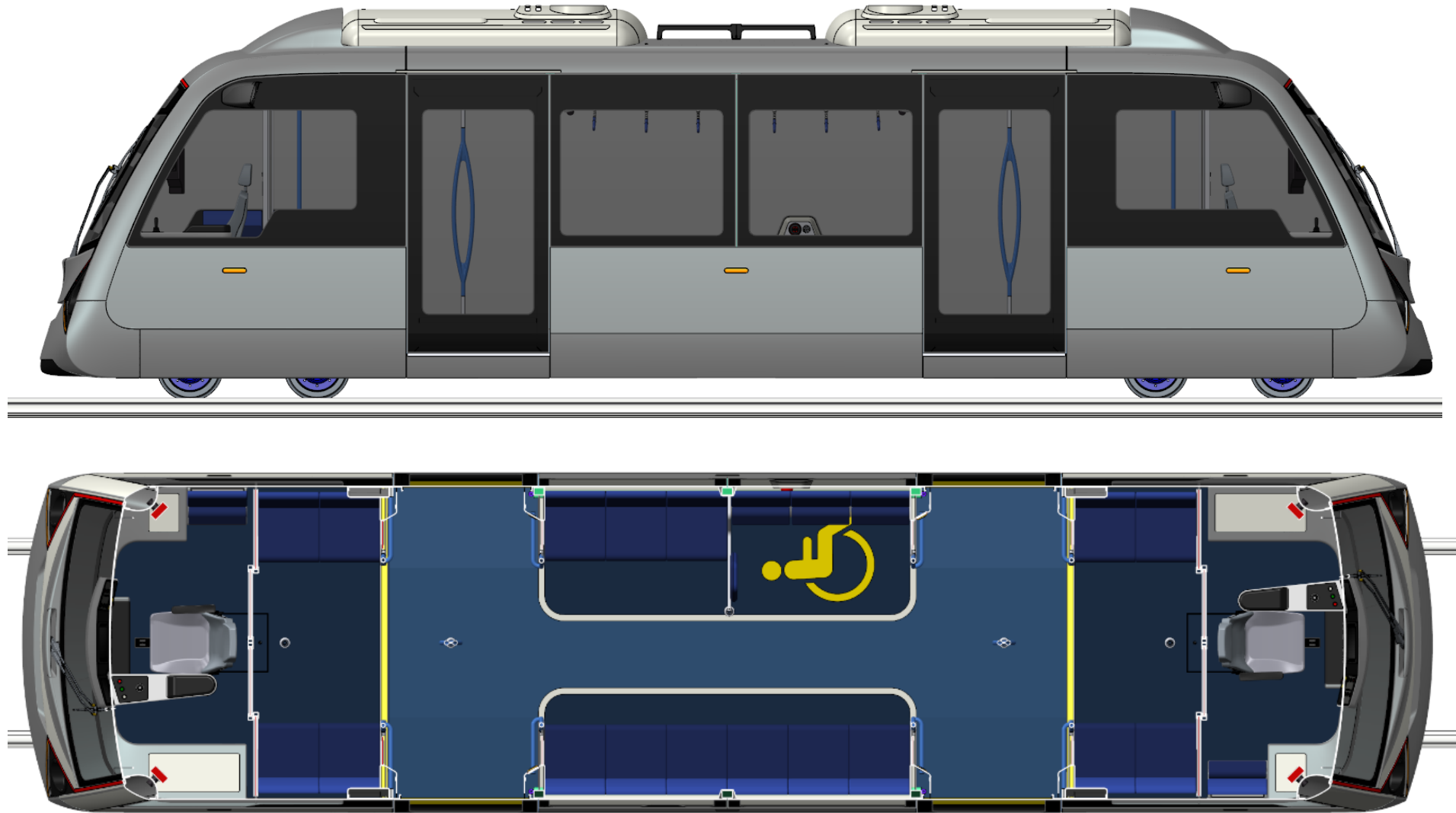




Finalised design

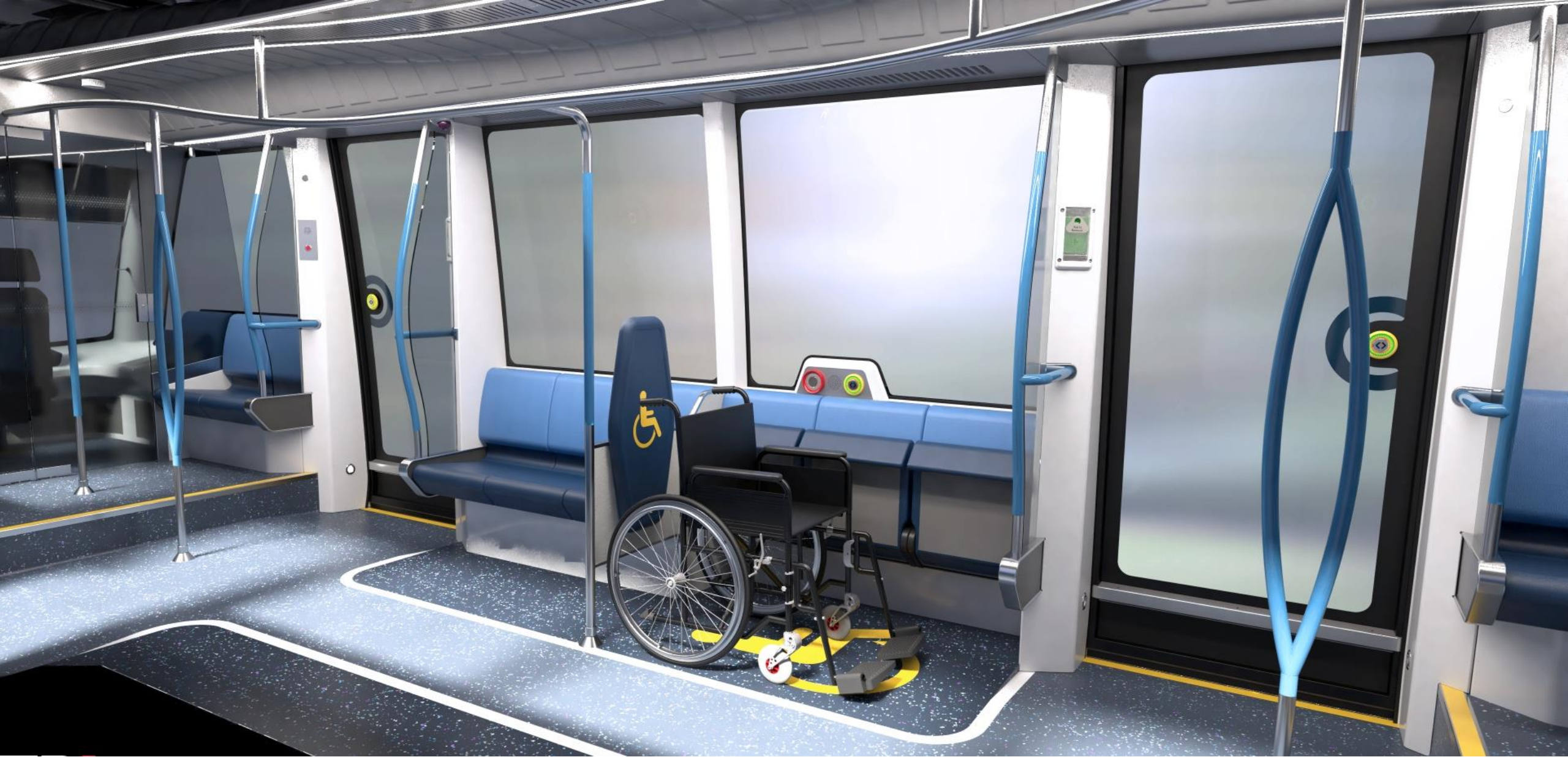


Plan & elevation

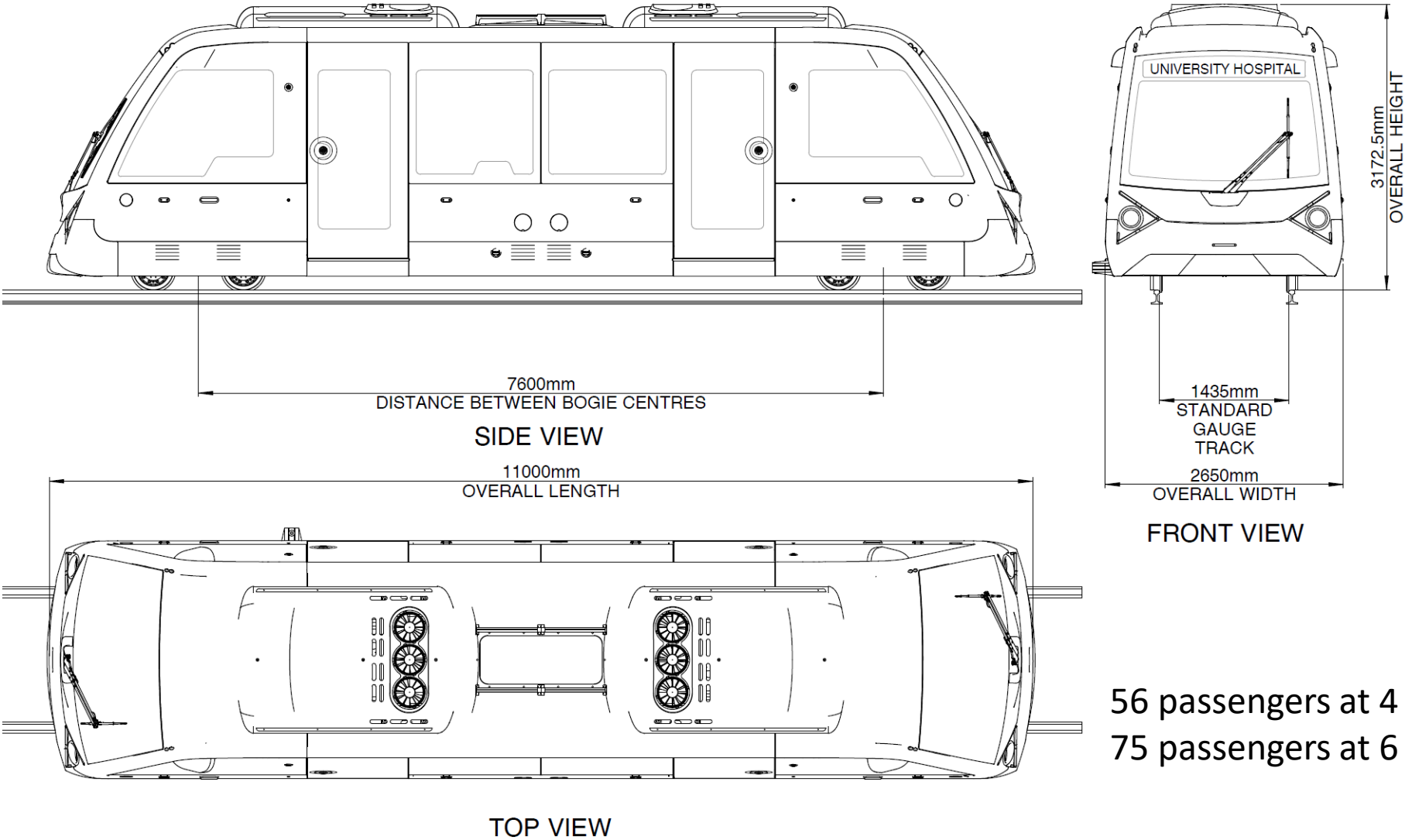




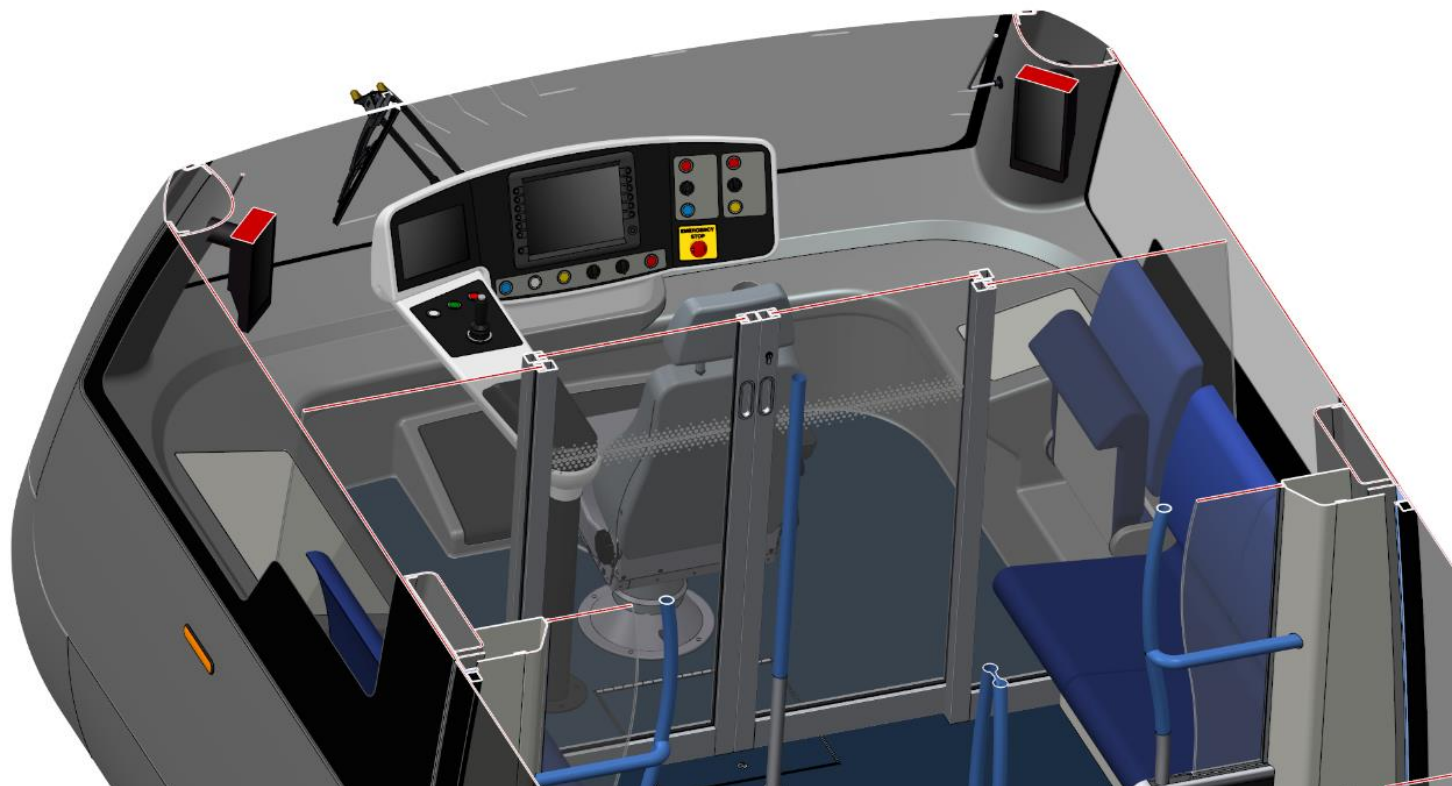




General assembly



Cab both ends, for non-autonomous trials



**Arriving
2021...**

Thank you!



TDi TRANSPORT DESIGN
INTERNATIONAL

Very Light Rail: Transport Solutions for the Future

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Transport for
West Midlands

Very Light Rail as part of the future West Midlands Transport Ecosystem

Mike Waters

Director of Policy, Strategy and Innovation

Transport for West Midlands



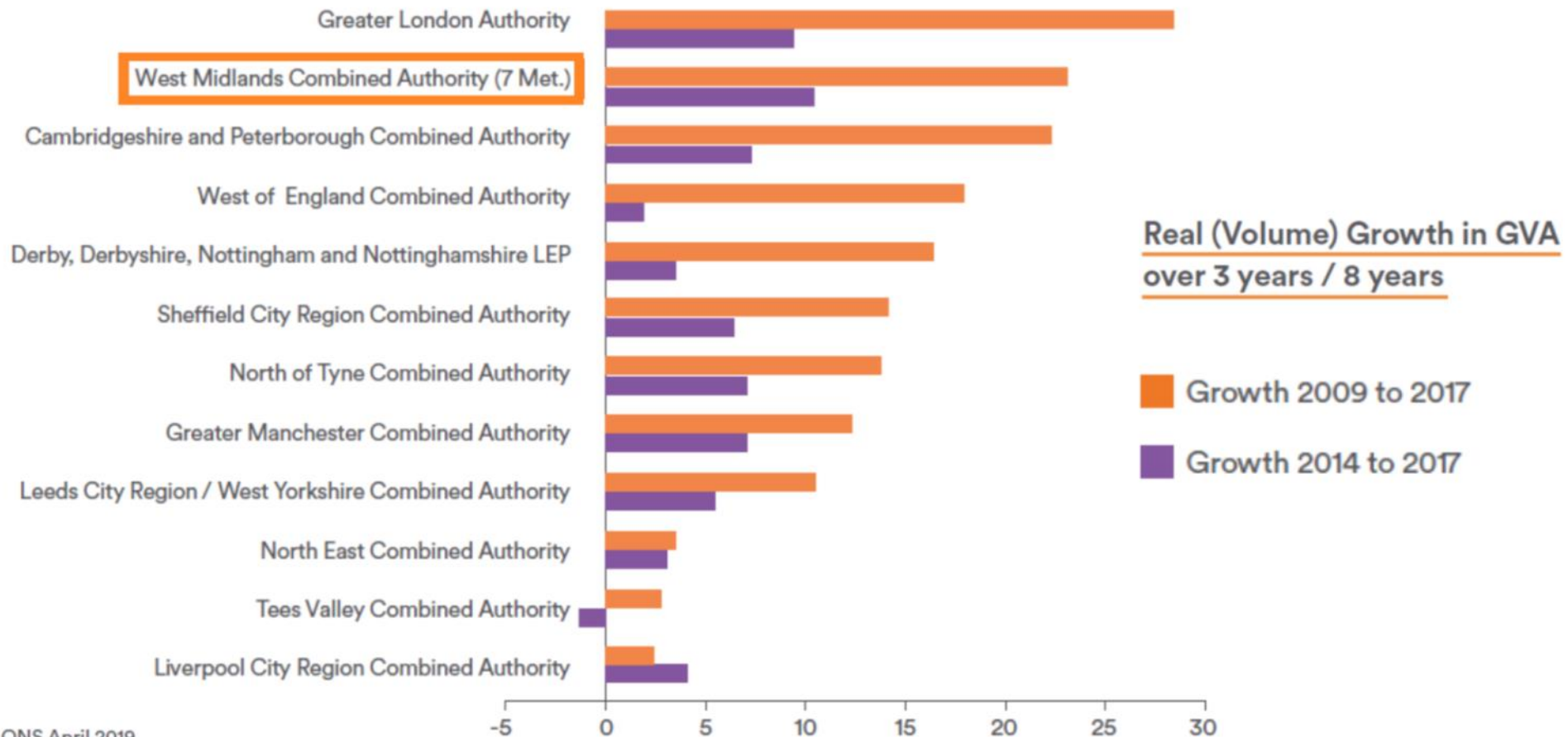
Transport for
West Midlands

West Midlands Combined Authority Vision:

*To drive inclusive
economic growth in the
West Midlands region and
enable a healthier,
happier, better connected
and more prosperous
population*

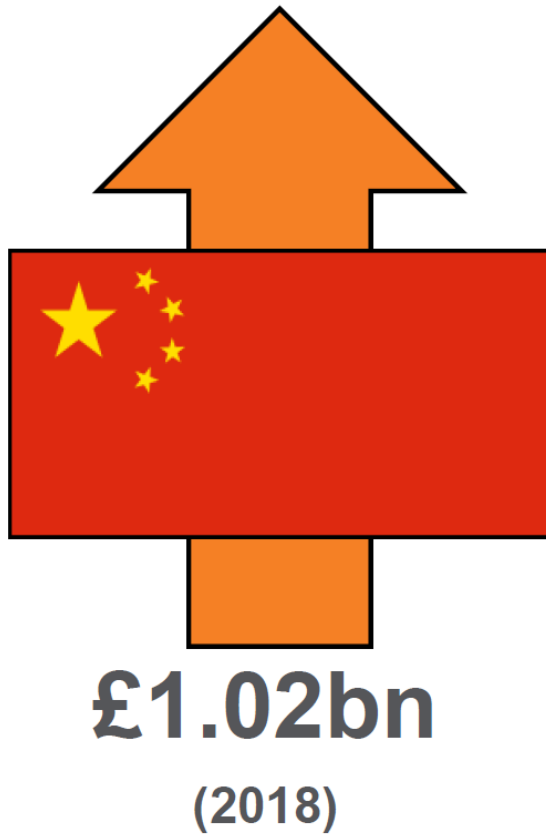


A growing region



Source: ONS April 2019

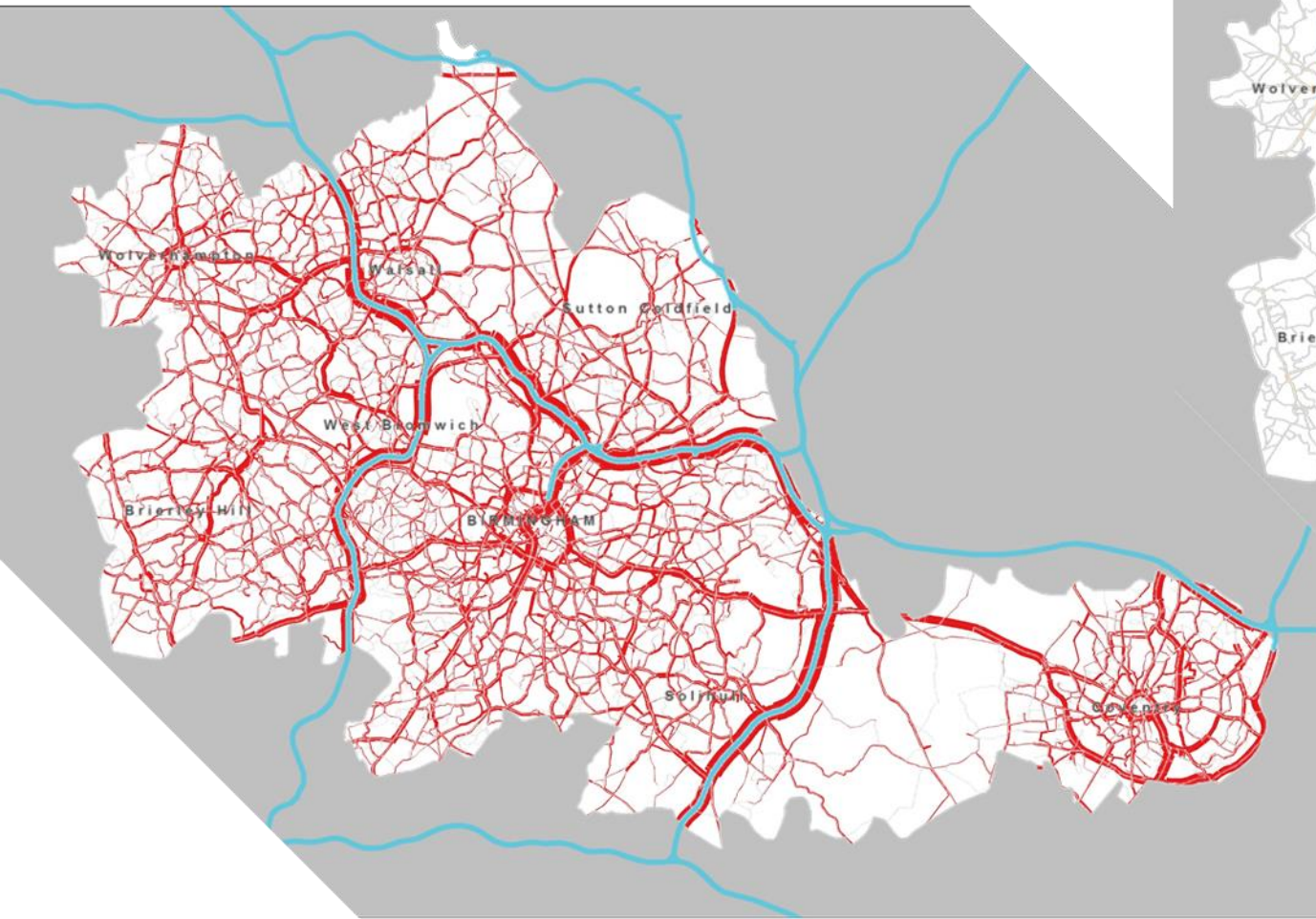
Trade surpluses



Source: DIT 2018

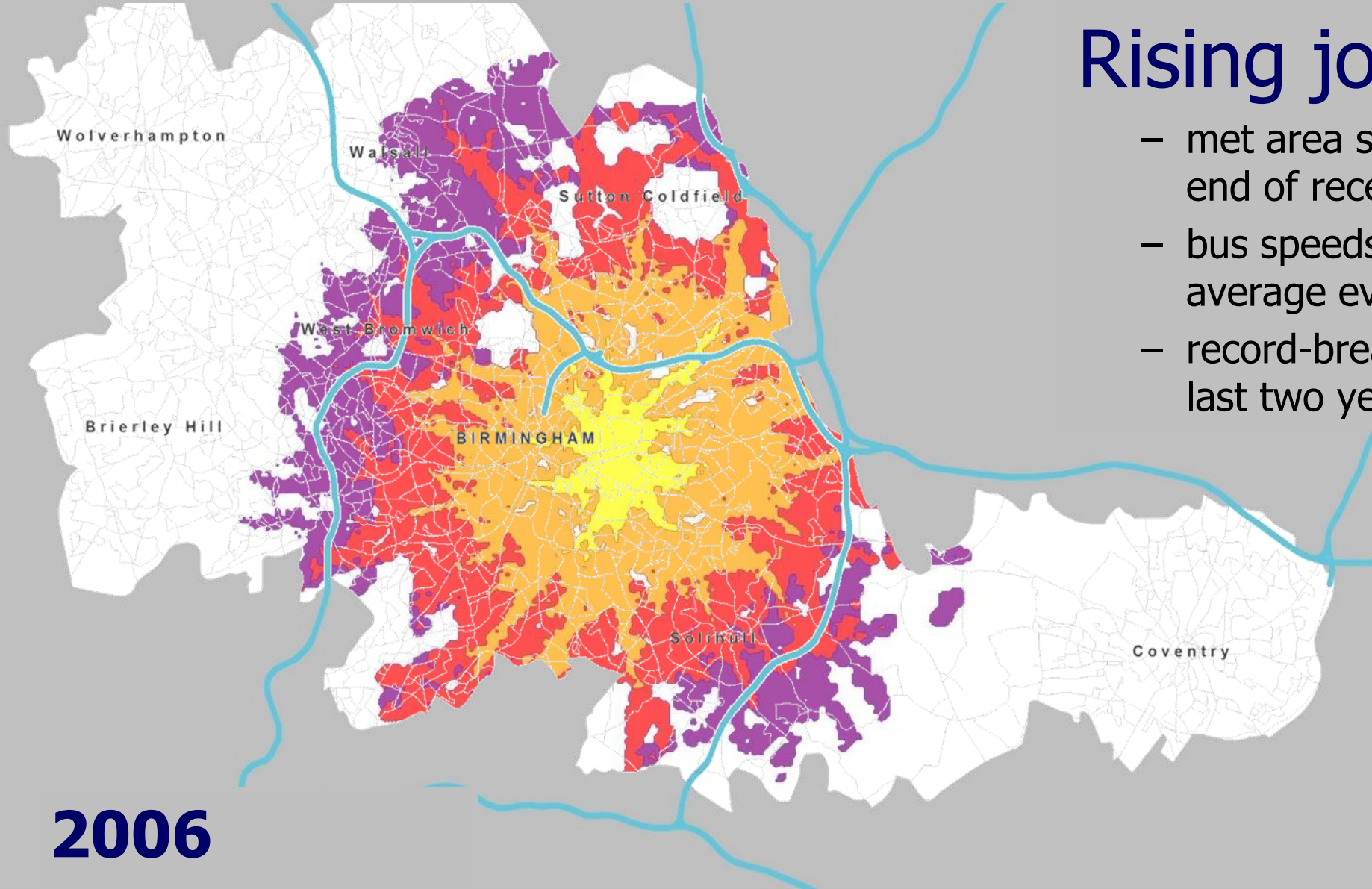
Changing travel behaviour is critical

Car occupancy low, utilization high in West Midlands



Despite the longest urban bus network in Europe

Bus journey time to Birmingham City Centre



2006

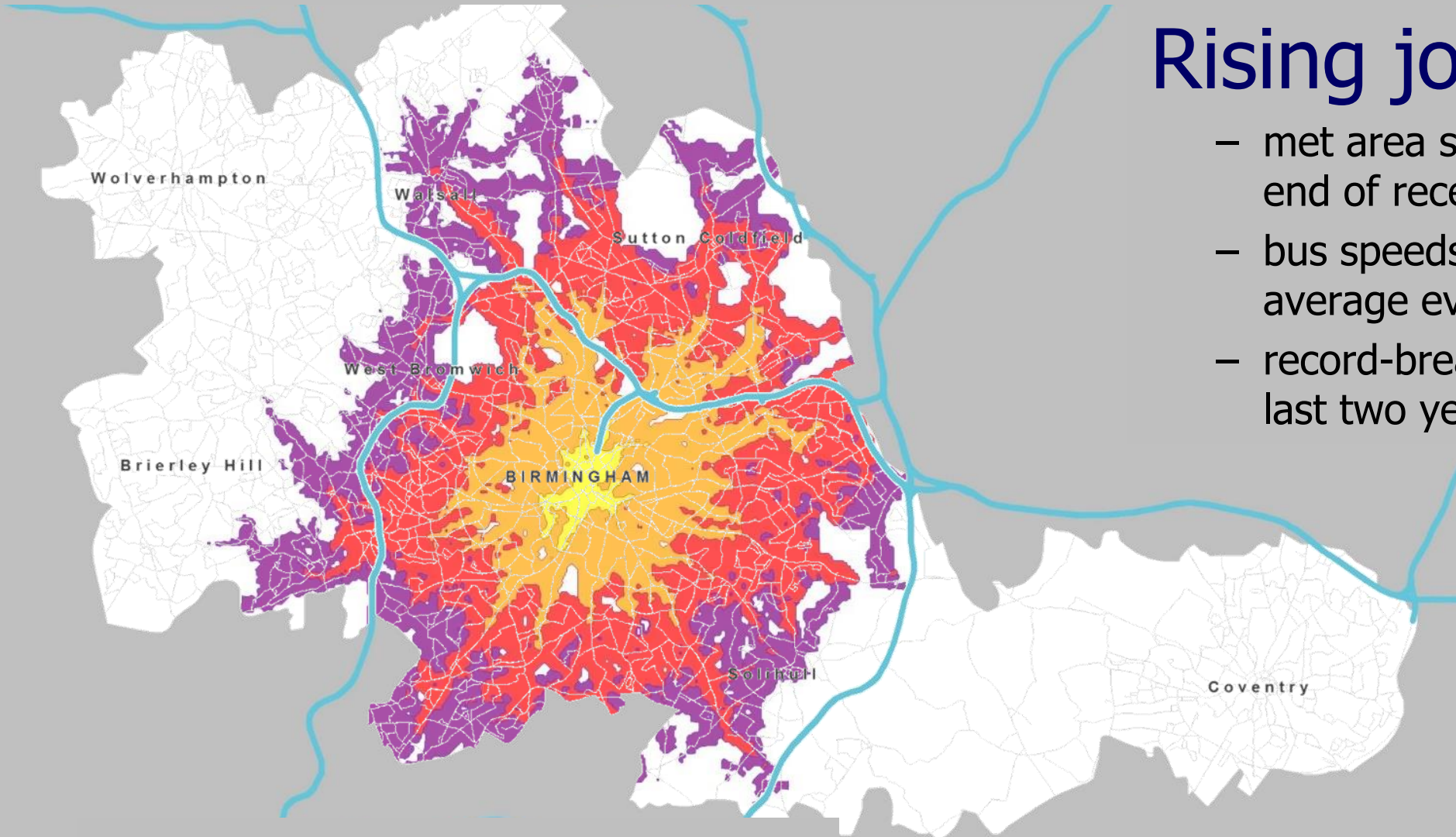
Rising journey times

- met area speeds fell 10% since end of recession
- bus speeds have fallen 1% on average every year since
- record-breaking traffic volumes in last two years

Bus journey time to Birmingham City Centre

Rising journey times

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- record-breaking traffic volumes in last two years



2016 – 200,000 people no longer covered

Challenges

444,000
more
people
within 15
years

Population Growth

1,500
premature
deaths

2664
Collisions

Safety & Air Quality



Infra- structure

215,000 new
homes by 2031
150,000 new
businesses by
2030

Congestion

£400m p.a. lost
Journey times
10% slower in
last 10 yrs

2041 Zero
Carbon!

The Strategic Response

Improve effectiveness



Increasing Capacity:

This involves providing more capacity on the public transport and road networks.



Improving Efficiency:

We aim to improve efficiency of local roads through better integration across modes, reducing roadwork delays, optimising traffic signals and improving responses to disruptive incidents.



Managing Demand:

Overall demand to move people and goods across the transport network will continue to grow. We can better manage this by influencing the choices by residents businesses and visitors to make more sustainable journeys.

Reduce the impact



Ensuring the system is safe for all and we accelerate the use of clean energy and low carbon solutions

Enable inclusive growth



Ensuring that all those who can benefit from access to opportunities and services can do so efficiently and fairly without needing to own a vehicle

Mobility Innovation Cluster



West Midlands Assets



ECONOMY

The WMCA has the largest
ECONOMY of any
combined **GVA of £92
billion**



LOCATION

The region is at the **HEART**
of the UK, with 90% of the
UK's market within 4
hours drive



INDUSTRY

Global centres for engineering
development and
manufacturing across various
sectors inc. Automotive and
Aerospace



FACILITIES

World class facilities for
R&D, manufacturing and
study, inc. NAIC and BIC



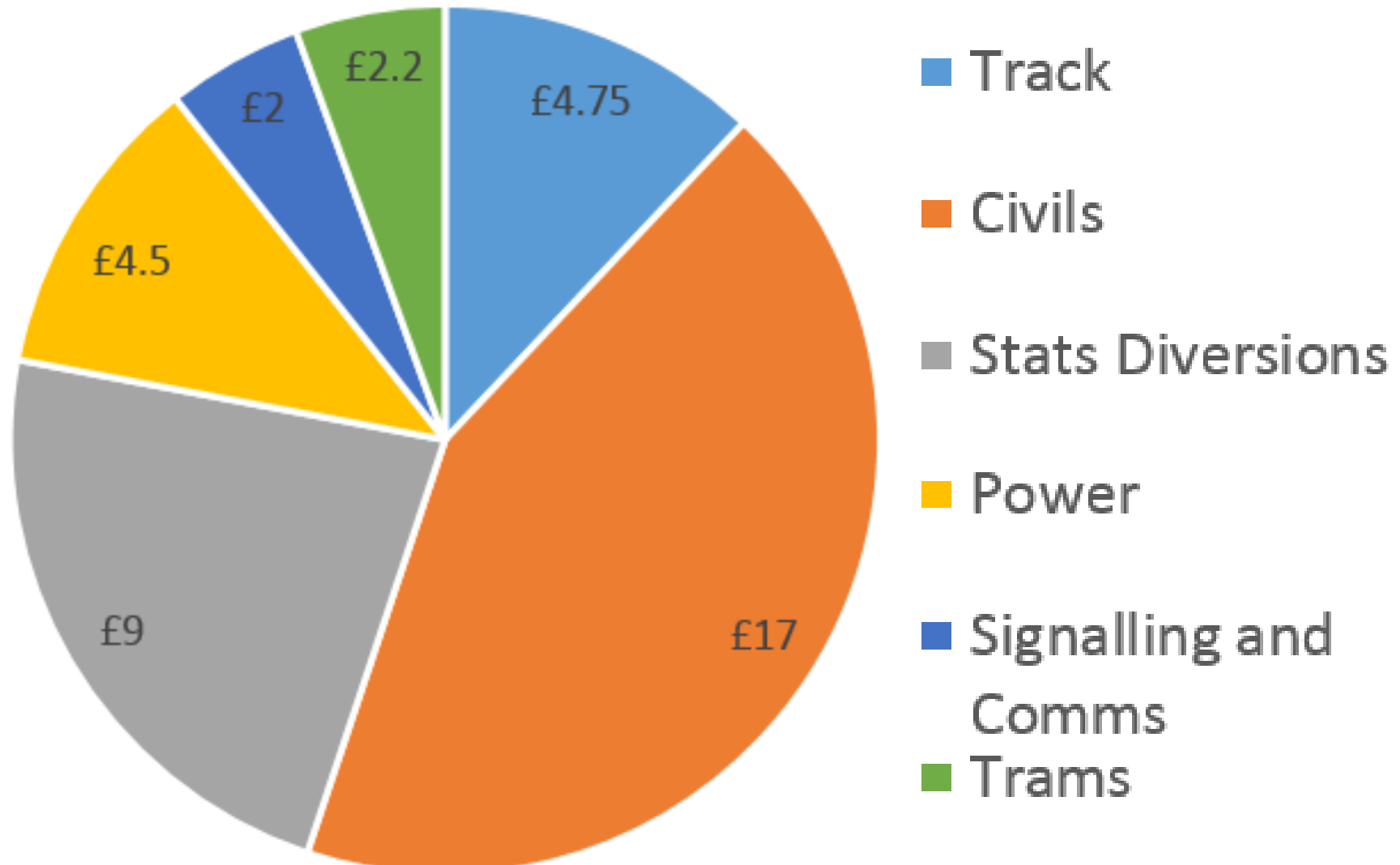
INVESTMENTS

In the last **FIVE** years, the
WMCA area has attracted
over 675 foreign Direct
Investment projects,
creating 35,000 jobs



EVENTS

Costs of traditional urban tram lines



Operational costs

- Driver
- Staff
- Energy
- Renewals
- Maintenance

Total = approx. £40m per km (urban)

Very Light Rail could help (a lot)

**Target
Cost: £10m
per km**

*A post-
Beeching
renaissance?*




Core routes
for medium
sized cities
and larger
towns

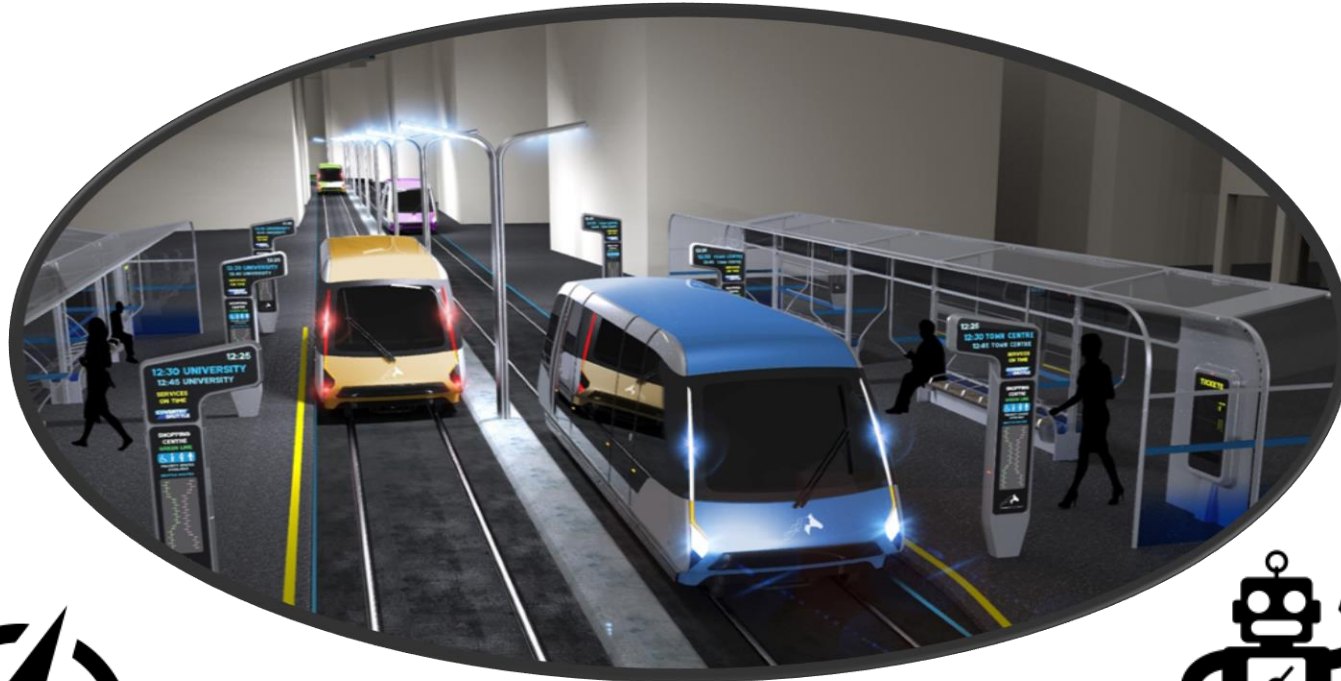
Feeder
services to
core mass
transit
corridors

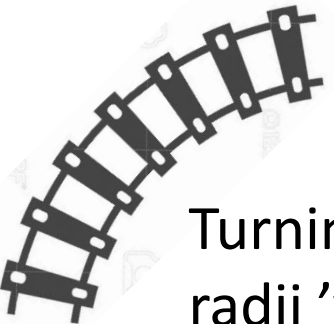
Connecting
sustainable
urban
extensions

Light freight
e.g. Cologne

Technical Challenges



Road interfaces




Turning
radii 'v'
comfort


Stats under track form

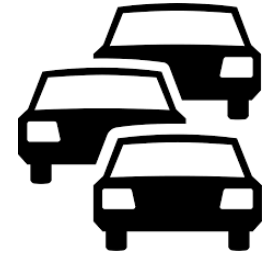
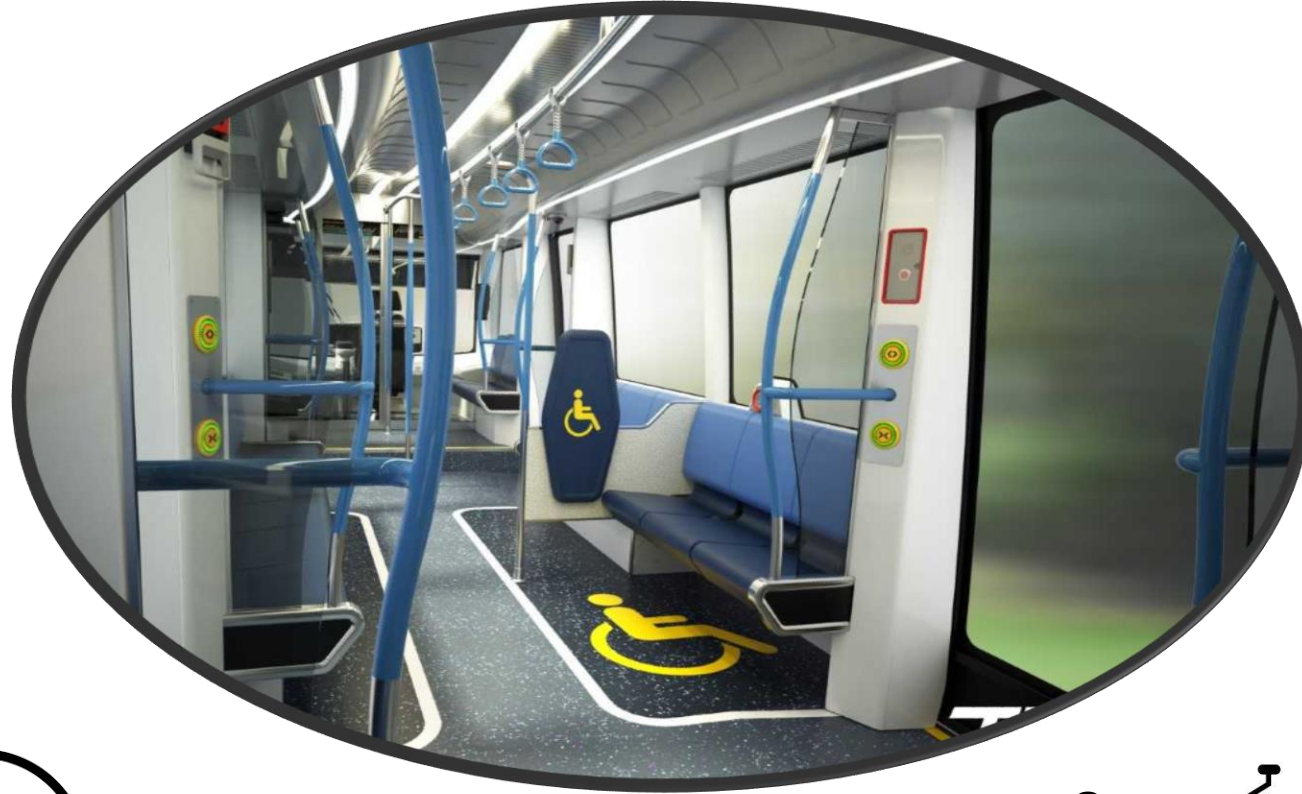

Compatibility with heavy rail


Automated control

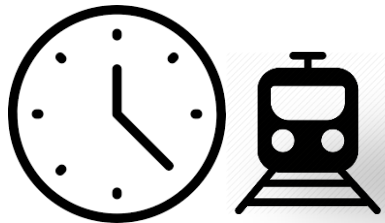
Business Case Challenges



Volumes and
efficiency



Avoiding wider
network
disruption



Optimising frequency 'v'
Service level



Vehicle size
and cost

VLR – making it real



- Addressing real world challenges
- Global potential, local application
- Transformative potential for our region
- Learning can optimise many aspects of rail based transit

Reinventing the West Midlands as the home of future mobility





Further Information

Mike Waters

Dir. Policy, Strategy &
Innovation

Transport for West Midlands

mike.waters@tfwm.org.uk

<https://www.tfwm.org.uk/strategy/innovation-future-mobility/>



Transport for
West Midlands





Transport for
West Midlands

Very Light Rail: Transport Solutions for the Future

AGENDA

9:00 REGISTRATION AND COFFEE

Session 1

9:30 Welcome and Opening Remarks

- Archie MacPherson, CEO WMG HVM Catapult
- Cllr Jim O'Boyle, Cabinet Member for Jobs and Regeneration, Coventry City Council

9:45 Keynote Address – The need for change

- Steve Berry, Head, Highways Maintenance Branch, Local Transport Funding and Growth Division, Department for Transport

10:05 What is Very Light Rail and what does it offer?

- Nick Mallinson, Programme Manager VLR, WMG

10:25 Coventry Very Light Rail project

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16:00 END



VLR Approvals

What standards will apply to VLR systems and how will approval be achieved?

Bridget Eickhoff

Principal Infrastructure Engineer RSSB

Legal framework for approvals

- ROGS (The Railways and Other Guided Transport Systems (Safety) Regulations 2006 (as amended))
- Safety Verification
- SMS (Safety Management System)
- CSM RA (Common Safety Method for Risk Evaluation and Assessment)
- Essential requirements from TSIs (Technical Specifications for Interoperability): high level principles
 - Safety
 - Reliability & availability
 - Health
 - Environmental protection
 - Technical compatibility
 - Accessibility to persons with disabilities or reduced mobility

Scope of ROGS

- Exclusions
 - Track gauge below 350mm
 - Guided buses or trolley buses
- What is non-mainline (see ORR Approved List)
 - Metro / light rail system
 - Separated networks solely for local, urban or suburban services
 - Heritage, museum or tourist railways
- Differences for non-mainline railways, what does NOT apply:
 - Common Safety Targets
 - TSIs / NTRs (National Technical Rules)



The Railways and Other Guided Transport Systems (Safety) Regulations 2006 (as amended) (ROGS)

Approved list of systems excluded from the scope of the mainline railway requirements

... extract from list ...

Glasgow Underground (Subway)

London Underground vehicles and heritage vehicles, and other structural subsystems provided predominantly for the provision of London Underground services, or provided predominantly to ensure the compatibility of other services using LU infrastructure

Tyne & Wear Metro (including vehicles running over Network Rail infrastructure)
Docklands Light Railway

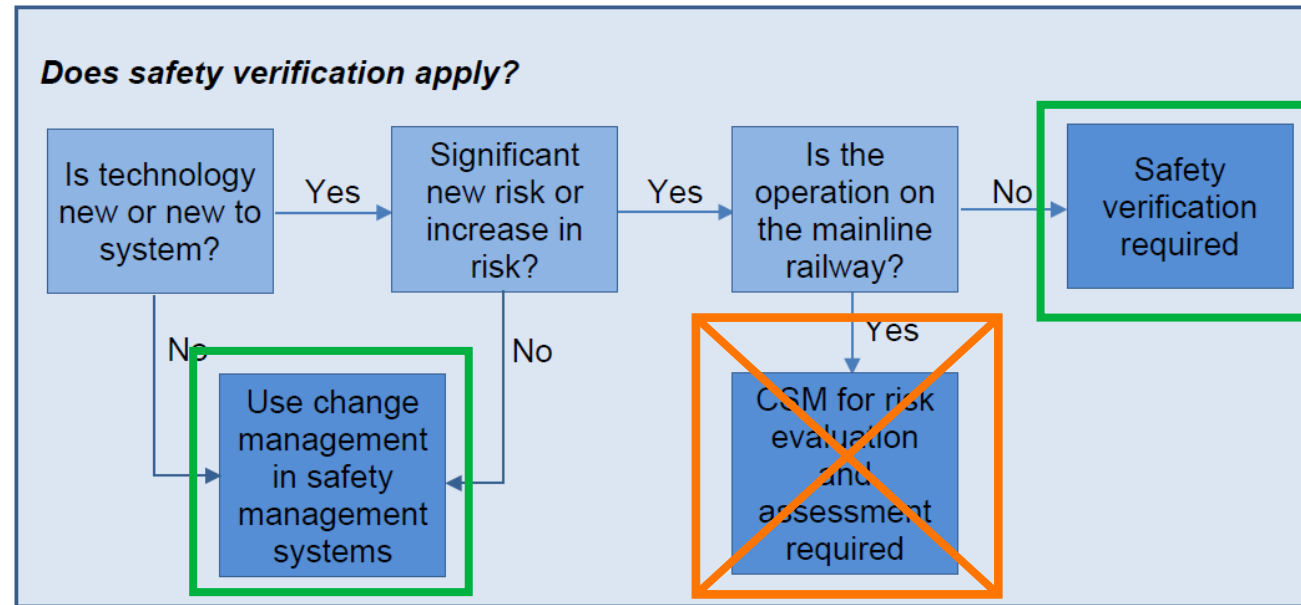
ROGS duties and scope of influence (ORR Guidance)

	Duty of co-operation	Managing safety critical work	Risk Assessment	Safety Management Systems	Safety certificate / authorisation	Annual safety report	Entity in Charge of Maintenance
Mainline railway							
Non-mainline railway & light rail / metro >40km/h						N/A	N/A
Non-mainline railway & other systems <40km/h					Mainline operation only	N/A	N/A
Tram-train systems					Mainline operation only	N/A	N/A
Tramways					N/A	N/A	N/A

Question: Does VLR require a Safety Certificate / Authorisation?

- Assume not (unless mainline operation) but topic for discussion with ORR

Safety Verification / Change Management (ORR Guidance)



- VLR operation assumed not on the mainline railway
 - CSM not required but still provides a useful framework – process is ‘scalable’
 - Safety Verification requires:
 - A written process & Independent Competent Person (ICP)
 - SMS Change Management would follow similar principles

Safety Management System

- Safety policy statement
- Safety targets
- Risk assessments and risk controls (especially any new risks)
- Procedures for meeting relevant standards (if appropriate)
- Clear responsibilities
- Safety verification process (if appropriate)
- Managing safety-related information
 - Including accidents and near misses
- Emergency planning
- Internal audits

Common Safety Methods: Risk Evaluation and Assessment

- CSM RA is not mandatory for non-mainline operation
 - But provides useful framework
- Risk Assessment is mandatory for 'significant' changes
 - CSM principles can help decide if 'significant' or not
- ROGS key requirements for risk assessment:
 - Be systematic in identifying hazards / consequences / risks / mitigations
 - Record keeping for process / findings / mitigations / monitoring / review
 - Cooperate with other related operators / parties
 - Covers rail specific risks (eg derailment) and non-specific risks (eg assaults)
- Risk evaluation / assessment can use:
 - Codes of practice (standards)
 - Comparison with existing (reference) system
 - Explicit risk estimation
- See RSSB Guidance Note GEGN8646

Guidance Note

GEGN8646

Issue: One

Date: December 2017

Guidance on the Common Safety Method for Risk Evaluation and Assessment

Synopsis

This document gives guidance on application of the principles in the Common Safety Method for Risk Assessment and Evaluation.

VLIR Approvals – Key principles

- Understanding of the hazards and appropriate mitigation
- Safety Management Systems
 - Appropriate to control the risks from transport system
- Involvement of all involved parties in risk mitigation
 - Risks can be mitigated by application of appropriate standards
 - Some standards incorporate options depending on usage
- Safety Verification
 - Assume ORR safety certificate / authorisation NOT required
 - CSM RA can help determine if a change is 'significant'
 - Use of Independent Competent Person (ICP)
 - Needs relevant skills / knowledge / experience & must be objective / unbiased

VLIR Approvals – Some key technical areas to consider

- TSI main headings (as a checklist)
- Structural integrity of the vehicle and components
- Braking performance
- Fire safety
- Safety of electrical systems
- Facilities for mobility impaired passengers
- Adequate clearance to other vehicles and fixed structures
- Interfaces / intersections / level crossings / pedestrian crossings
- Appropriate audible and visible warnings
- Evacuation and control procedures in case of emergency

VLR Approvals – useful resources

LRSSB-LRG-1.0 : Tramway Principles and Guidance (TPG)

<https://lrssb.com/lrssbportal/>

The Railways and Other Guided Transport Systems (Safety) Regulations 2006 (as amended) SI 2006/599

<http://www.legislation.gov.uk/ukxi/2006/599/contents/made>

The Railways and Other Guided Transport Systems (Safety) Regulations 2006 (as amended) - A guide to ROGS – April 2018

https://orr.gov.uk/data/assets/pdf_file/0020/2567/rogs-guidance.pdf

The Rail Vehicle Accessibility (Non-Interoperable Rail System) Regulations 2010 SI 2010/432

<http://www.legislation.gov.uk/ukxi/2010/432/contents/made>

RSSB document T1049 Operating non-mainline vehicles on the mainline infrastructure: Guidance on the regulatory requirements Dec 2014

<https://www.sparkrail.org/>

GEGN8646 Guidance on the Common Safety Method for Risk Evaluation and Assessment

<https://catalogues.rssb.co.uk/railway-group-standards>



Thank you



Very Light Rail: Transport Solutions for the Future

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