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SMART INTERMEDIATE TRANSPORT MODE

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Chair, Ultra Light Rail Partners Ltd

Collaborating with **Parry People Movers, Sustraco, Severn Lamb** and **Premetro Operations, designers, producers and operators of the STOURBRIDGE SHUTTLE**

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SMART INTERMEDIATE MODE TRANSPORT

Ultra Light Rail Partners Ltd formed to deliver turn-key solutions for **ultra light rail for on-street or on-rail provision.**

The Board is formed of parties with an interest in promoting this sustainable smart rail transit mode, delivering:

-- **low-cost, sustainable solutions** for cities, towns, inter-urban areas
-- facilitating **modal shift** and **affordable connectivity**
-- drawing on **local supply chain** sourcing.

Partners developing Bristol Biomethane railcar

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- **Ultra Light Rail Partners Ltd** http://ulrpartners.com
- **Parry People Movers Ltd** http://www.parrypeoplemovers.com/
- **Sustraco** Bristol Railcar pioneers http://www.ultralightrail.com/
- **Pre Metro Operations Ltd** https://premetro.co.uk/

Hello and welcome to Pre Metro.

What has been the Stourbridge branch line service performance record?

5 millioneth passenger on the Stourbridge Shuttle

- **10 years in operation in West Midlands**
- **Almost 6 million,** safe and reliable passenger journeys
- **Highest passenger satisfaction levels** and reliability levels of any operator in UK
- Much appreciated, even loved, by the people of Stourbridge
- **£5 million saving** to the Public Purse as private investors made it happen
- **Highly commended** in consecutive **International Light Rail Industry awards**

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Are lightweight railcars now in service?

Innovative technologies deliver **best passenger service and reliability** records through -

- **Flywheel energy with 2.3l Propane (LPG - C_3H_8) engine powertrain,** providing a breakthrough in hybrid technology
- **184 miles drivetime** without refuelling (@20mph)
- **110 miles drivetime** without refuelling (@45mph)
- Delivering major cost savings for operators leading to viability and **business sustainability**
- Delivering **congenial and reliable journeys** for passengers

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Severn Lamb - ULR in service now

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SEVERN LAMB

http://www.severn-lamb.com/ulr-express

PMOL's operating record at Stourbridge

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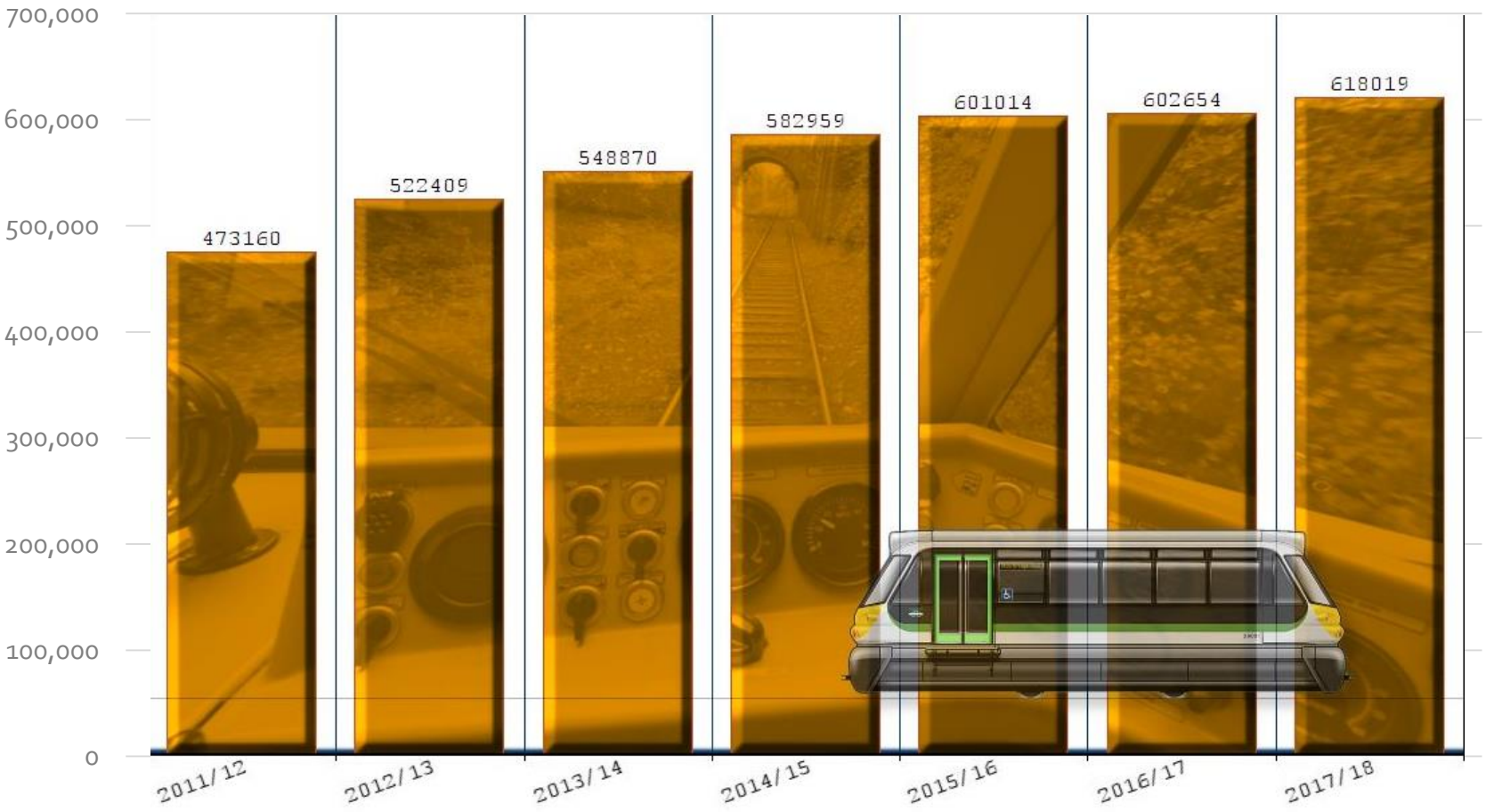
Passenger Numbers



99% +
RELIABILITY

PMOL's operating record at Stourbridge

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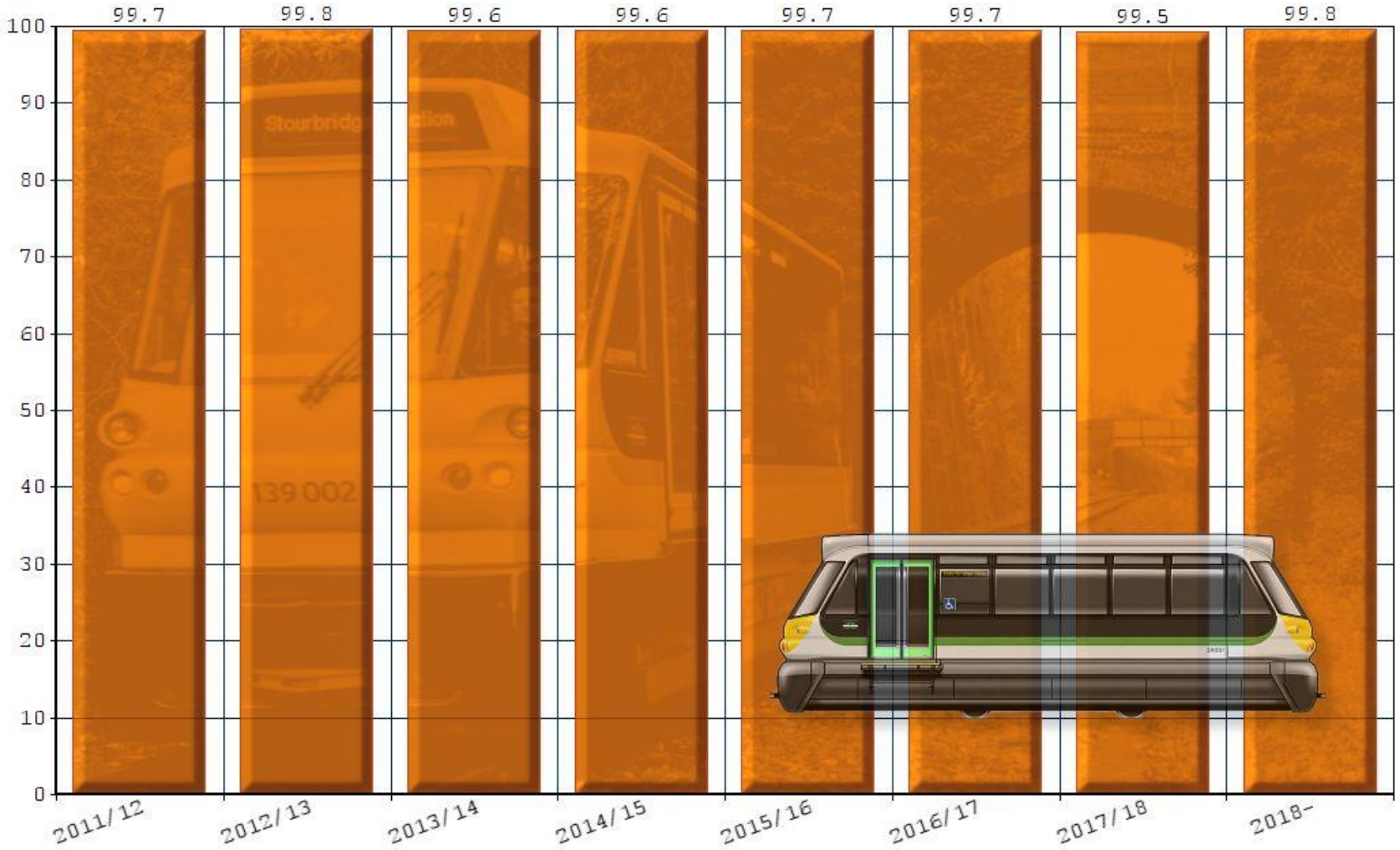

99% +
RELIABILITY

Modal Shift - SMART INTERMEDIATE MODE TRANSPORT

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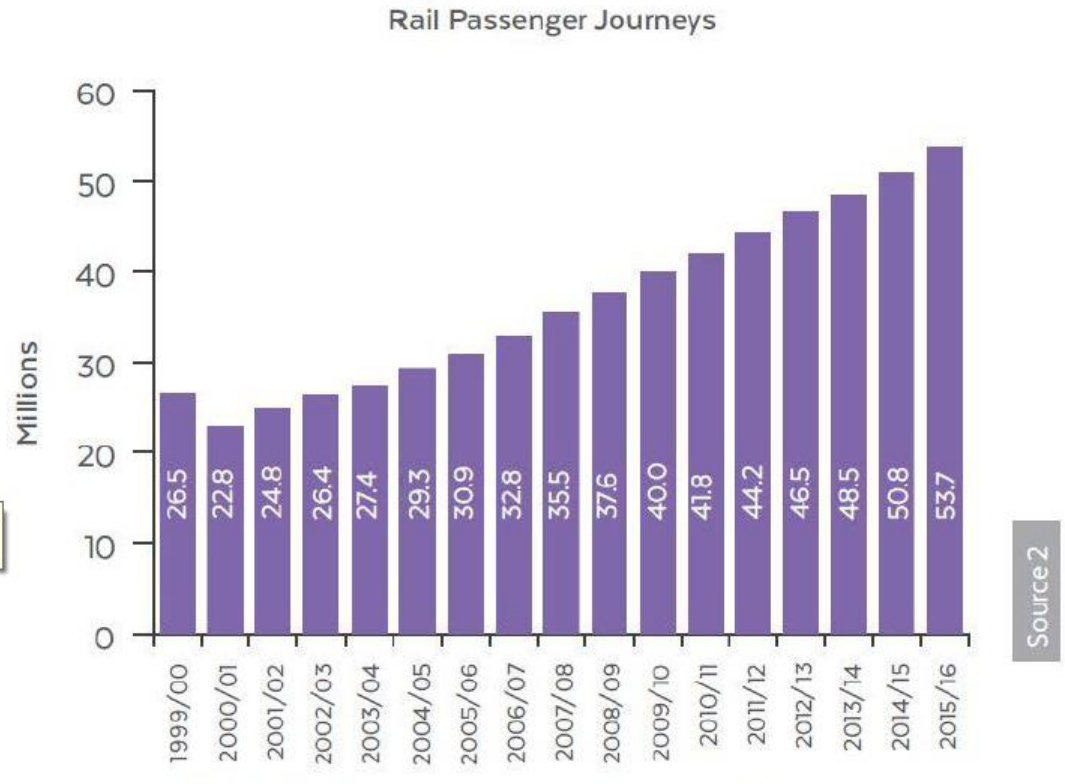
West Midlands travel trends show bus patronage declining at a time when public use of rail services is rising rapidly

'Congestion is the enemy of the bus'



'Reliability/turn-up-and go are key to driving success'

Bus usage increases in West Midlands

Launch of new bus services bus services in Solihull earlier this year. L-R Cllr Bob Sleigh, leader Solihull MBC, West Midlands mayor, Andy Street, Kerry Swingler, Solihull MBC and Danny Matthews, LandFlight.

- Buses important with **260m users** annually in West Midlands
- **The Bus Alliance** - Transport for West Midlands (TfWM), bus operating companies, the Safer Travel team and passenger group Transport Focus, driving improvements
- Fare reductions for 16-18 year olds have driven up usage +0.1%
- Important mode for women, young and elderly
- Connectivity improvements through wifi offer
- **But rubber tyre emissions remain an issue with PM2.5 particulates**
  - 37,800 premature deaths from Particulate Matter (PM 2.5) emissions from road, tyre and brake wear which is 1000 times more harmful than tailpipe emissions
- **Chance to collaborate with APPGAQ** (Air Quality) chaired by Geraint Davies MP
- **Greenpeace -** greater focus on impact of urban buses and particulate pollution

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Modal Shift – SMART INTERMEDIATE MODE TRANSPORT

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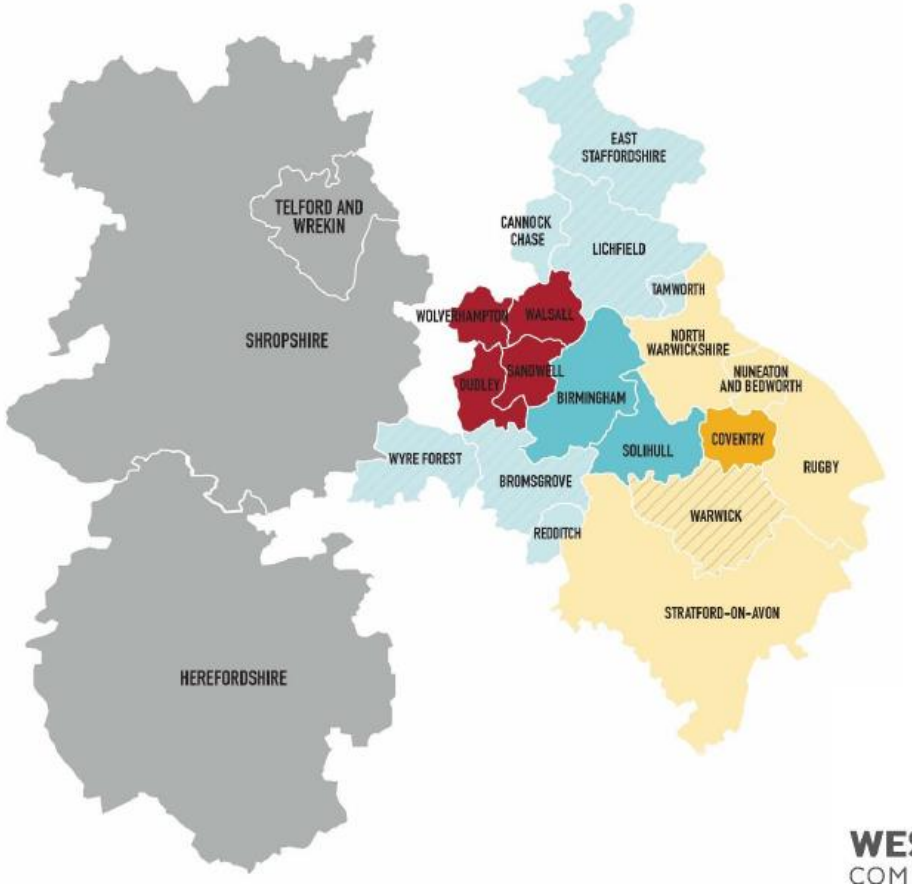
Alternative to rail: Articulated 'sprint' buses?



Problems encountered by UK operators include

- **fare evasion** with multiple doors
- Increased garage space
- difficulties rescuing broken down vehicles
- **maintenance costs** of articulation mechanism
- accidents involving cyclists
- awkwardly **long boarding platforms**
- **PM emissions 1000 times** more harmful to human health than tailpipe emissions

Question: Might plans to introduce 'Sprint' be amended to include one or more light tramways?

WEST MIDLANDS
COMBINED AUTHORITY

Can new routes be created across UK?

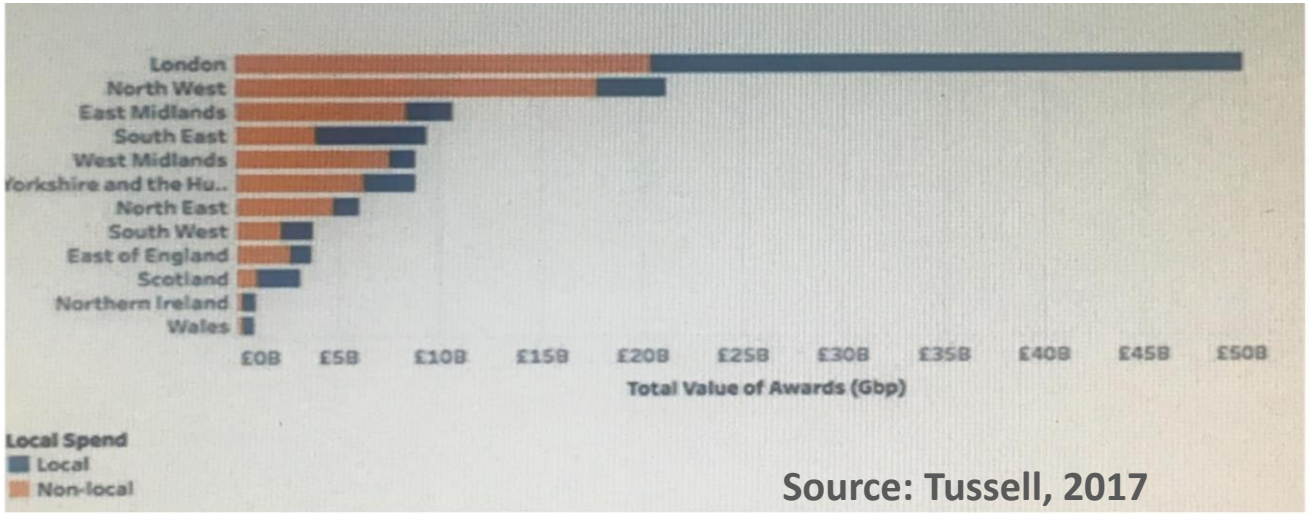
Best technology solutions to resolve

- Congestion
- Air Quality – delivering Clean Air Zones
- 14,100 premature deaths in UK from NOx emissions pollution
- 37,800 premature deaths from Particulate Matter (PM 2.5s), the 'Oslo Effect'

Why **SMART** **Intermediate Mode Transport** can help:

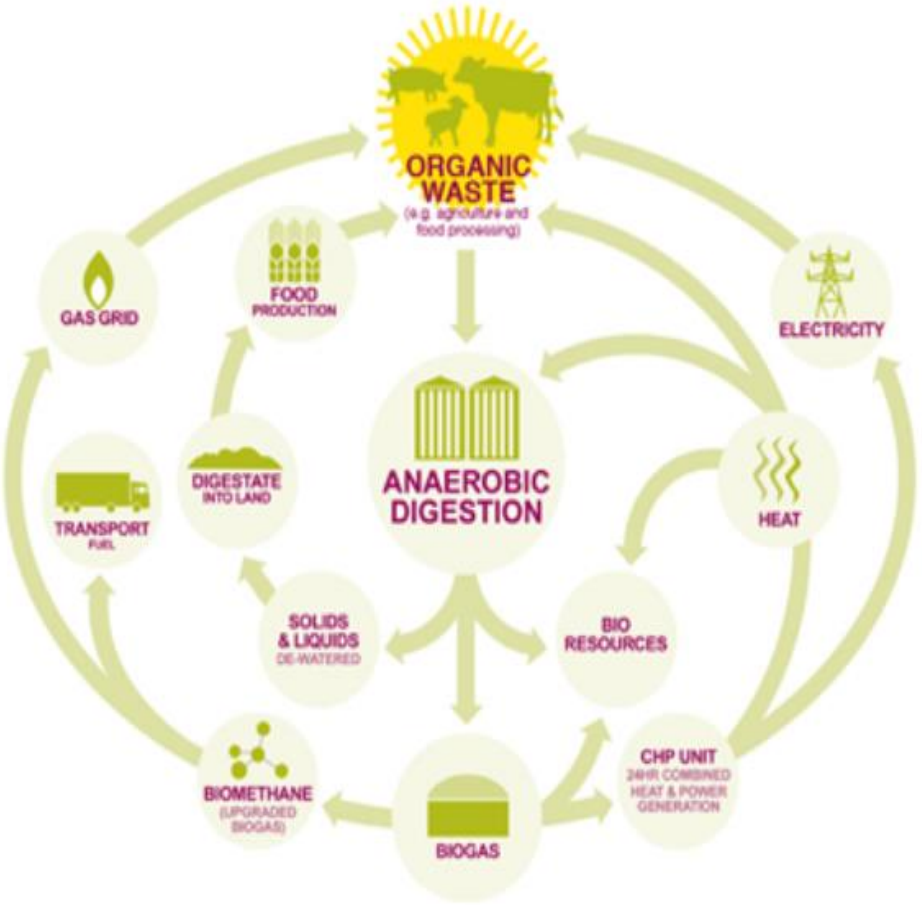
- Locally sourced providing more opportunity for public pound to deliver a multiplier effect

West Midlands has the lowest level of public procurement



Source: Tussell, 2017

Ultra light rail partners – the green fuel solution



Multiple products of anaerobic digestion (Modified from ADBA with permission)

Circular Economy Solution

Gas accounts 40% UK energy supply. Between quarter and a half could be sourced from the green gas, biomethane.

Biomethane – CH_4

Clean biogas, 98% methane.

- Eliminates methane emissions
- Interchangeability with existing natural gas
- Use for electricity generation, water heating, space heating, cooking, fuelling vehicles
- Economic opportunity for regional areas
- Produce biomethane from sewage sludge, food and plant and organic waste, red-meat processing waste, poultry and cattle manure.
- Generation of skilled jobs in planning, engineering, operating and maintenance of biogas and biomethane plants.

Electric vehicle powertrains

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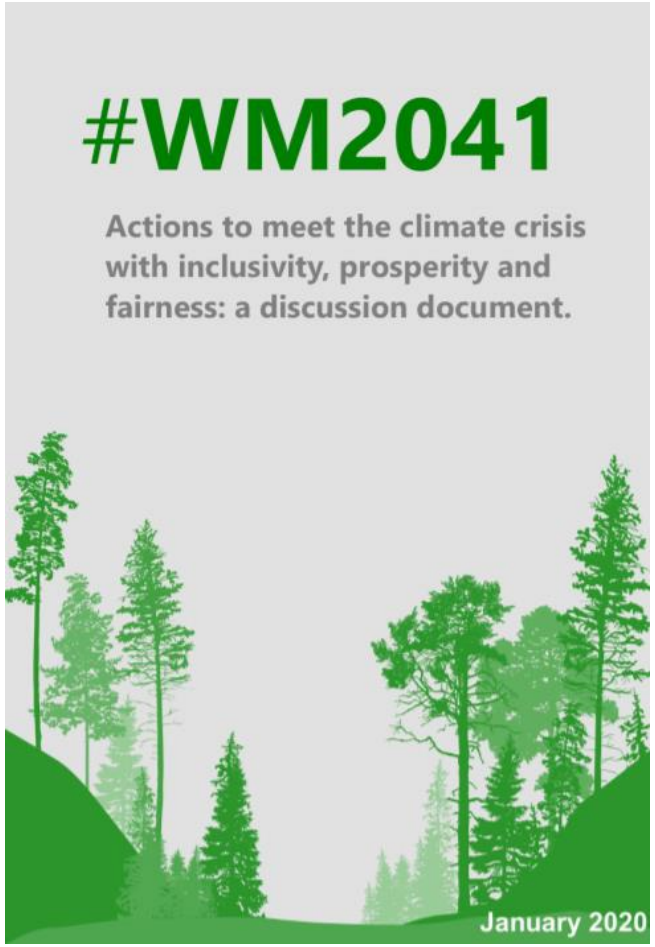
"It is not practical to transfer this use (of car journeys) over to electric vehicles.

"The Regional Energy Strategy sets this out: the 42,547 GWh of energy currently delivered to vehicles in the region as petrol and diesel is nearly equal to the amount of energy delivered through the entire gas network in the region and almost twice that delivered by the electricity system." (p.40)



Biomethane – the green gas circular economy solution
£350k FOAK Innovate UK and DfT funded project

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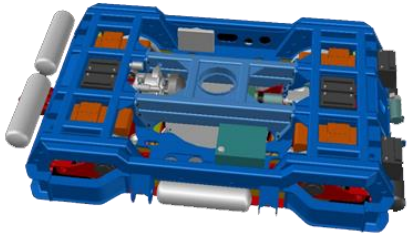
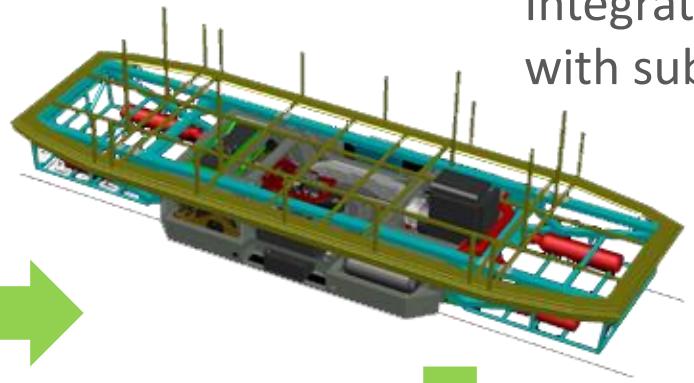
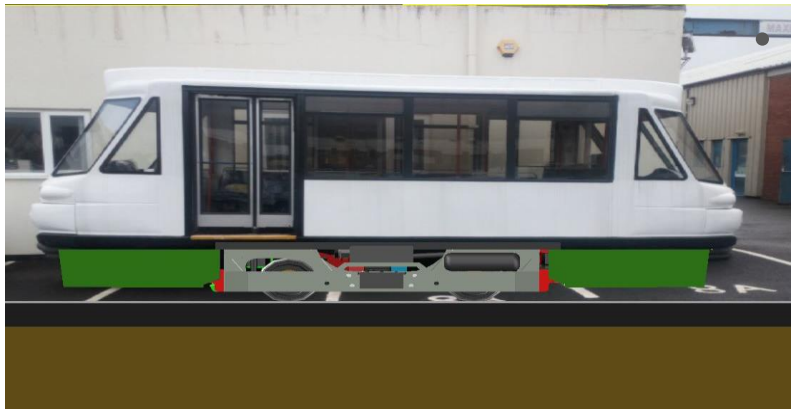


Integrated Bogie Frame with positioned green gas biomethane cylinders



Integrated Bogie Frame with subframe attached



Final Railcar Design for Proof of Concept trialling in July 2020

Current status of biomethane powertrain

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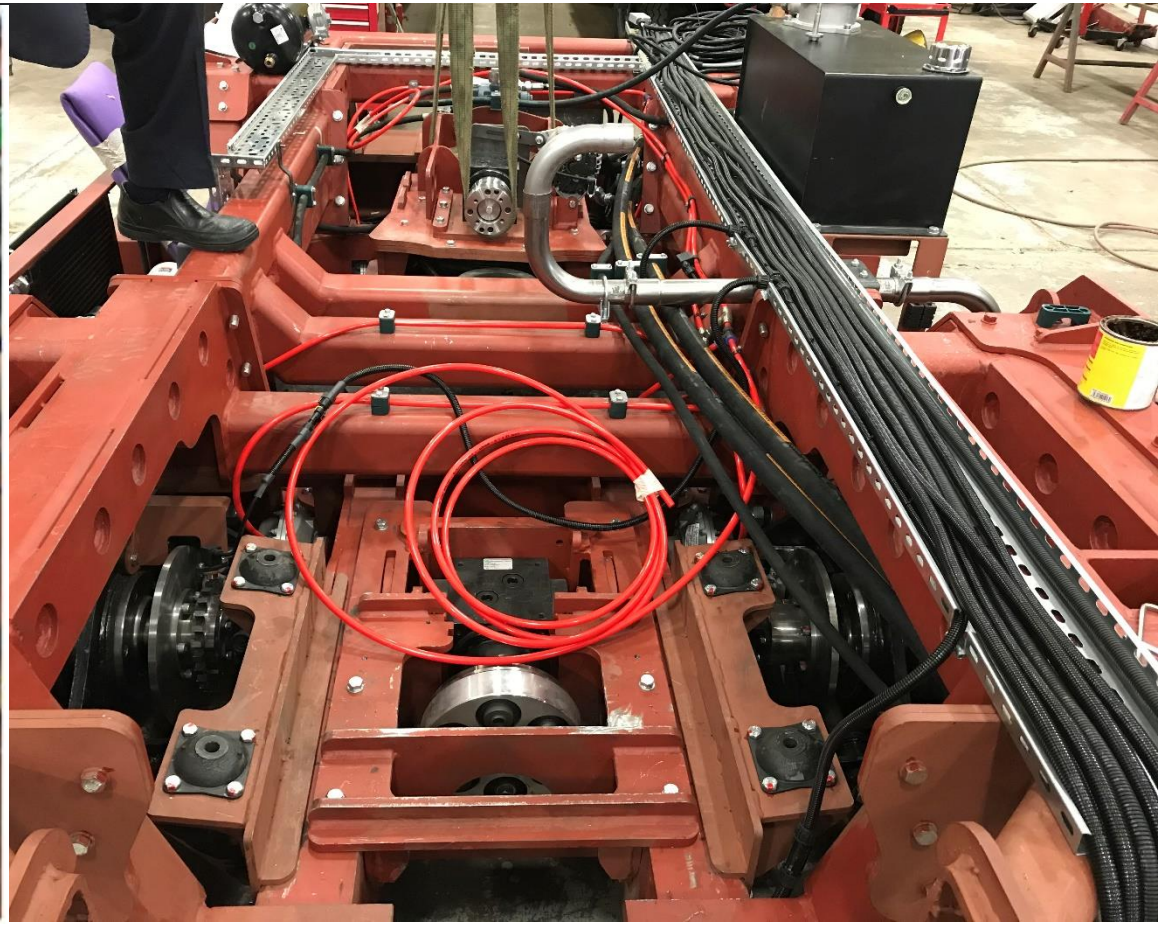

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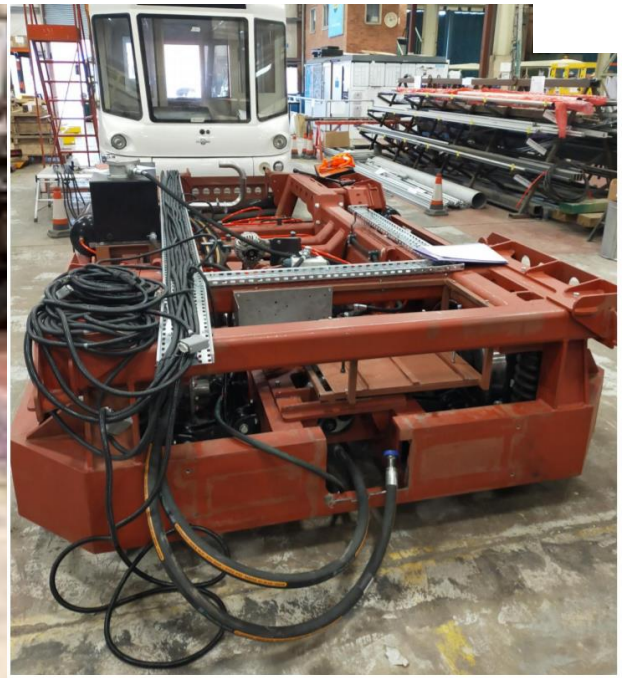

Challenges to implementation:

1) Introducing the 'third mode of rail transit' – **SMART** Intermediate Mode Transport including Ultra Light Rail and Very Light Rail as alternative to heavy rail and LRT

2) Procurement – too often 'locking out' SMEs and innovators e.g. via 'web-tag'

3) Primary focus on electric mode in UK; Ultra Light Rail Partners focussed on **gas mechanical solutions** as diversified mode

Heritage tram styling

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Flexible tram – train usage

Intermediate styling

The Stourbridge Shuttle

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Introducing the Ecotram – a new mode

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Lightweight composite materials Ecotram as a four-wheel drive easily accessible tram.

Features include –

- flat floor
- self-powered vehicle using biomethane engines
- a high speed lightweight flywheel
- individually driven independently suspended wheels
- without the conventional bogie arrangements
- allowing kneeling chassis providing easy passenger access and egress
- capable of operating on long distance routes
- suitable for both on-rail and on-street urban duties
- urban and inter-urban tram-based transport

Lightweight Community Transport

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Opportunities for greater collaboration – local development consortia

Relocatable ‘Waybeam’ Track Development

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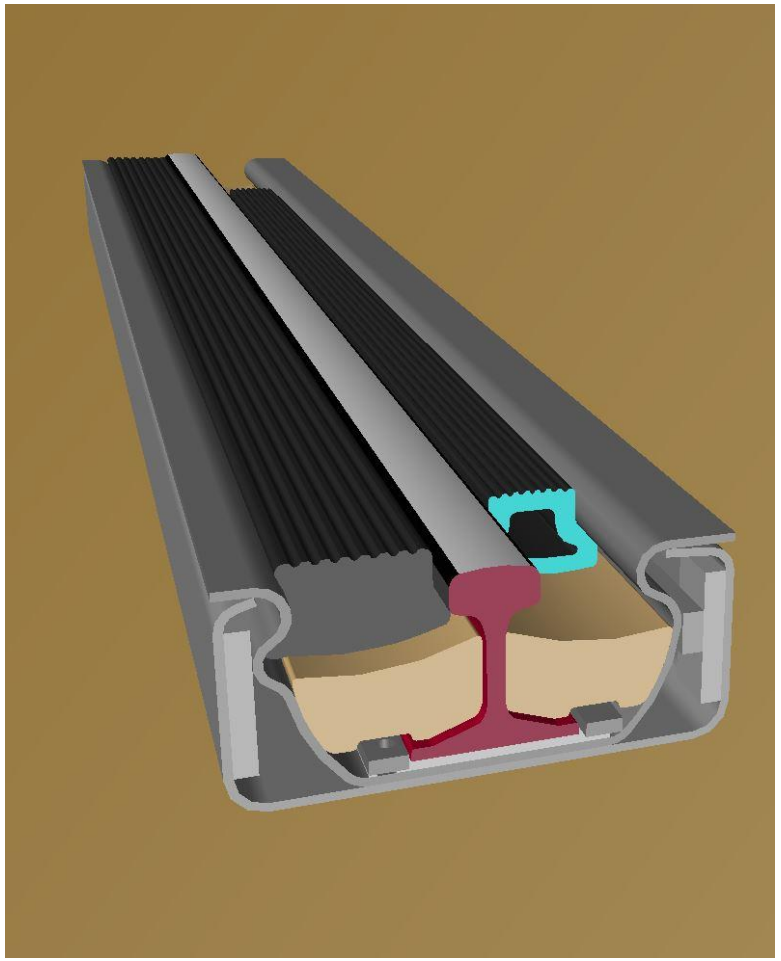
- The **waybeam relocatable track, part of a carpet track concept**: developed to install a tramway through road-surface using ‘dry technology solutions’ avoiding the need to create deep foundations, disturbing the road base and removing any utilities.
- **Carpet track**: introduced in the early 1990s. A precursor to the waybeam track, based on top of the road involving no disruption to the road surface laying the rail as a railway with ties on top of a series of precast concrete infilling elements.
- The **waybeam relocatable track:** for long-term installations, designed to be located in a slot cut into the road surface black top, enabling quick removal + providing access to statutory equipment and utilities. Utilities are left in place underneath the waybeam track.
- The waybeam approach and carpet track innovations **comprise the use of two single rails** installed separately but with provision for accurate gauging, making the handling and transportation of the precast track elements easier to perform.



patent pending ©

Illustrations - Relocatable ‘Waybeam’ Track Developments

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Why the Smart Intermediate Transit Mode?

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- **Durability** - working life of trams is normally 3-4 times that of buses, so low monthly leasing cost
- **Energy efficiency** - trams normally use around one third of the energy per passenger required for buses
- **Pollution** - ultra low carbon and toxic emissions; no particulate pollution from rubber tyres; not dependent on electricity generated from fossil fuels; incentivises generating biomethane from waste.
- **Safety** - able to operate in pedestrianised areas; UKTram claim travel by tram is 24 times safer than by car
- **Reliability** - exemplary over 10 years in service, possibly best in industry
- **Capital costs** - no catenary system; lightweight vehicles use lighter railtrack; underground services remain in situ; system cost estimated to be one fifth of cost of electrified LRT
- **Operating cost** - long life, low energy use, light weight, increased patronage combine to reduce costs
- **Popularity** - trams encourage increased rate of modal shift from private to public transport
- **Traffic disruption** - greatly reduced by using quickly laid track
- **Appearance** - no overhead wires; heritage and contemporary body designs available
- **Versatility** - ULR vehicles can run on-street or on heavy rail track

Ultra Light Rail Partners

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- **Feasibility from development to operation including design, QS, engineering, manufacturing, sustainable and autonomous operation, ticketing, customer service and maintenance**
- **Budget guidelines (estimated) for light rail**
  - **Rail costs (estimated)**
    - £800k per km for ballasted rail
    - £1m per km for slab track
    - £1m per km for waybeam relocatable track
  - **Railcar costs (estimated depending on specification)**
    - 60 person railcar @ £1m each
    - 90-120 person railcar @ £1.8m-£2m each
  - **Operating costs (Stourbridge)**
    - £2,000 per day per railcar (incl. margin)
  - **‘Turn-up and go’ - Operating 1300 journeys a week 7-days a week**
  - **Pax cost (Stourbridge)**
    - £1.10 per 1km journey ; £2.10 return fare ; 80% Season tickets and OAP passes etc
    - Typical journey fare £3 for 4km and £5 return fare (6km)

Creating new solutions for the UK

Best technology solutions for city region leadership

- **Circular economy solution:** Using anaerobic digesters to process local organic wastes: producing fertilisers and compressed biomethane to power the local tram fleet
  - Minimal Disruption: no overhead gantries or wires
- **Air quality:** Delivering Clean Air Zones, cutting traffic, emissions and improving quality of life
  - 14,100 premature deaths in UK from NOx emissions pollution (BMJ based on WHO, 2012)
  - 37,800 premature deaths from Particulate Matter (PM 2.5) emissions from road, tyre and brake wear which are 1,000 times more harmful to human health than are tailpipe emissions (BMJ; Emissions Analytics 2020)
- **Linking local economy:** Connectivity for sustainable growth and opportunity

Why the **Smart** Intermediate Transport Mode can help

- **Value for money**: Much less expensive – third of the cost of heavy rail/Metro technologies but able to integrate with both of the mainline systems and deliver 'on-street' options
- **Proven track record:** 10 years operation by Pre Metro and excellent reliability
- **UK-sourced:** Using the skills and production capacity of people and businesses in West Midlands and our regions.