



Metrolite – Solution for Sustainable transport

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Who are we?

CAF is International leader in design, manufacture, construction, maintenance, rehabilitation and supply of railway and Turnkey Mobility solutions



1

All Types of Rolling Stock



High and Very High Speed
Trains, Locomotives, Coaches,
Regional and Commuter
Trains, LRVs, Tramways,
Airport Shuttles



2

Components/Spares: Power Inverters, Wheel Sets, Gearboxes, Passenger Information, ...

3

Turnkey developments including Sub-Systems: Electrification, Signalling Operation, ...

CAF is Best Mfgr of Light Rail 2019

GLOBAL LIGHT RAIL AWARDS		2019 HONOUR ROLL	
BEST CUSTOMER INITIATIVE SPONSORED BY 		WINNER Northstar Docklands – DLR Recovery HIGHLY COMMENDED Northstar Docklands – Open Payments	
EMPLOYEE OF THE YEAR SPONSORED BY 		WINNER Tom Houghthorne – Odeon Rail / Midland Metro Alliance HIGHLY COMMENDED Harry Dean – GfP	
ENVIRONMENTAL & SUSTAINABILITY INITIATIVE		WINNER MPT – Making an impact without leaving a mark HIGHLY COMMENDED Northstar Docklands – Creating an environmental-conscious culture	
MANUFACTURER OF THE YEAR		WINNER CAF HIGHLY COMMENDED Stadler Rail	
MOST IMPROVED SYSTEM		WINNER Nottingham Express Transit HIGHLY COMMENDED Edinburgh Trams	
OPERATOR OF THE YEAR SPONSORED BY 		WINNER Northstar Docklands HIGHLY COMMENDED Blackpool Transport Services	
OUTSTANDING ENGINEERING ACHIEVEMENT		WINNER West Midlands Metro – West of Solihull Extension HIGHLY COMMENDED Aarhus Letbane – From tram to train	
PROJECT OF THE YEAR UNDER €50M		WINNER CAF – Newcastle, NSW HIGHLY COMMENDED Douglas Bay Horse Tramway Renovation	
PROJECT OF THE YEAR OVER €50M SPONSORED BY 		WINNER Jabodetabek LRT Project, Jakarta HIGHLY COMMENDED UK Train-Pilot	
RISING STAR SPONSORED BY 		WINNER Steve Mabey – Northstar MetroLink HIGHLY COMMENDED Marta Vachon – Tram Operations Limited	
SIGNIFICANT SAFETY INITIATIVE SPONSORED BY 		WINNER Tram Operations Limited – Total Fatigue Management HIGHLY COMMENDED West Midlands Metro – Driving MetroLink Safety	
SUPPLIER OF THE YEAR SPONSORED BY 		WINNER M&M Ashford HIGHLY COMMENDED Ian Rowe Associates HIGHLY COMMENDED British Steel	
TEAM OF THE YEAR SPONSORED BY 		WINNER South Yorkshire PTW/Network Rail/Sheffield Supertram – UK Train-Pilot HIGHLY COMMENDED West Midlands Metro – HR, Learning and Development Team	
TECHNICAL INNOVATION OF THE YEAR (ROLLING STOCK) SPONSORED BY 		WINNER Profil BLANET ORL HIGHLY COMMENDED Northstar Docklands – Tram Street Brush	
TECHNICAL INNOVATION OF THE YEAR (INFRASTRUCTURE) SPONSORED BY 		WINNER M&M Ashford & MPT – Trafford Park Line EMO Upgrade HIGHLY COMMENDED British Steel – Installation of Redundant Street in Ground Rail (All underground Works)	
VISION OF THE YEAR SPONSORED BY 		WINNER Australia's Light Rail HIGHLY COMMENDED SYSTRA – Automated and Autonomous PT Network HIGHLY COMMENDED Transport for Greater Manchester & Keefley MetroLink – Being 'the best'	
JUDGES' SPECIAL AWARD SPONSORED BY 		WINNER Jan Bouché – Northstar MetroLink	

CAF has picked up two titles,
Manufacturer of the Year and **Project of the Year Under €50m**

The 2019 event, organized by Mainspring and supported by industry publication Tramways & Urban Transit, was hosted by respected broadcaster and journalist Nicholas Owen. The headline supporter for another year was London Trams operator Tram Operations Limited.

Contents

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- Choice of Light Rail
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NEED FOR LIGHT RAIL

**High growth of
population and vehicles**



46 Urban agglomerates > 1 million
population in India

**Improving
inter-connectivity**



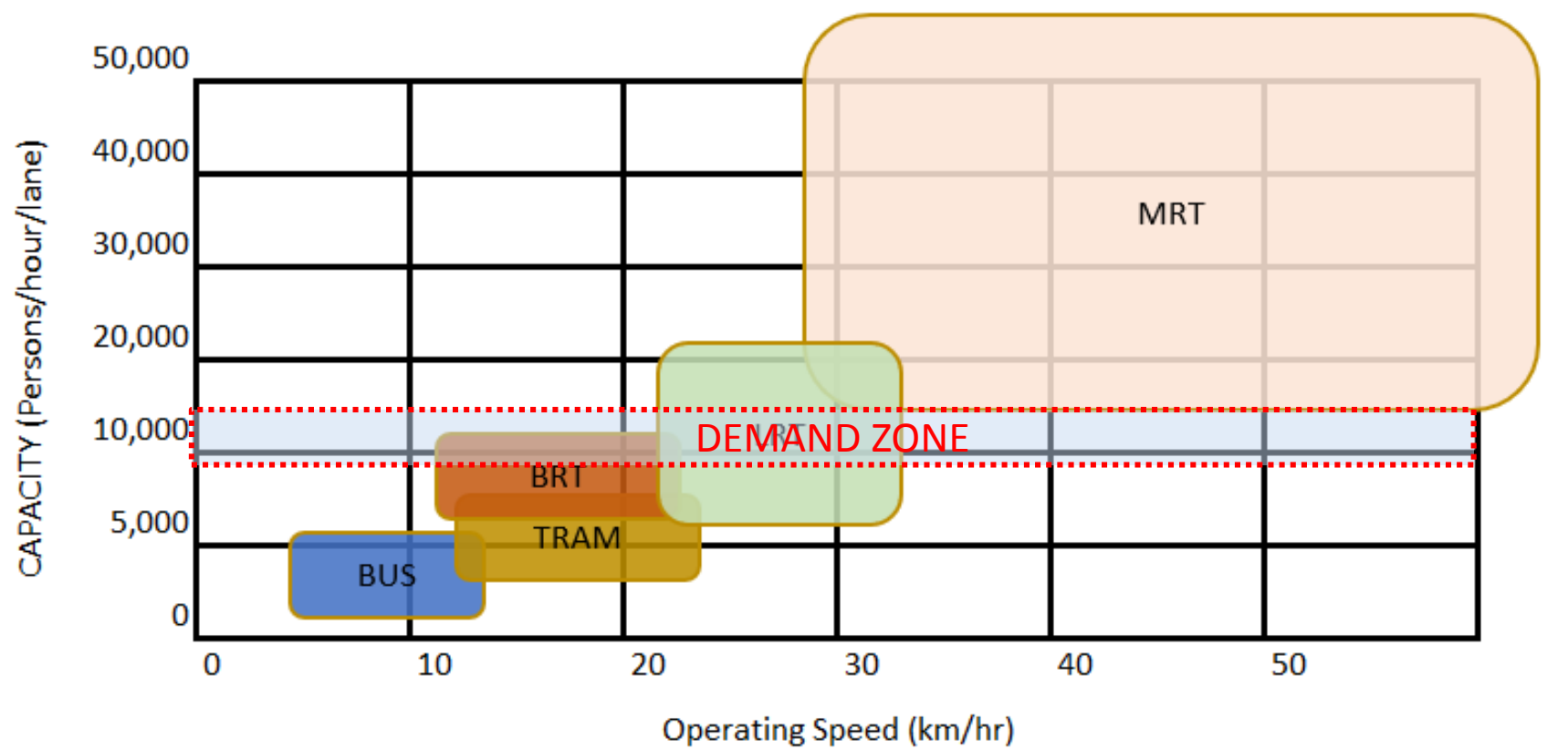
Only public transport mode is Bus/BRT or
Metros in few big cities

**An icon for city, commercial
and private investments**



Public transport need to blend well with
heritage of city

CHOICE OF RAIL TRANSIT



CHOICE OF LIGHT RAIL

LRT



- Definition: Medium capacity metro
- Infra: Elevated
- Capacity: 7-30k PPHPD
- CAPEX: High
- OPEX: High
- Min Curve: 120m
- Availability to use existing Infra: No
- Station spacing: 1km++

Monorail



- Definition: Low-Medium capacity Transport
- Infra: 100% Elevated
- Capacity: 7-20k PPHPD
- CAPEX: Medium-High
- OPEX: Medium
- Min Curve: 25m
- Availability to use existing Infra: YES
- Station spacing: 0.5-1km

Metro Lite



- Definition: Low-Medium capacity Transport
- Infra: Partial Elevated, Partial at Grade
- Capacity: 5-12k PPHPD
- CAPEX: Low
- OPEX: Low
- Min Curve: 25m
- Availability to use existing Infra: YES
- Station spacing: 0.5-1km

SUSTAINABLE MOBILITY



1 LIGHT RAIL VEHICLE



3 BUSES



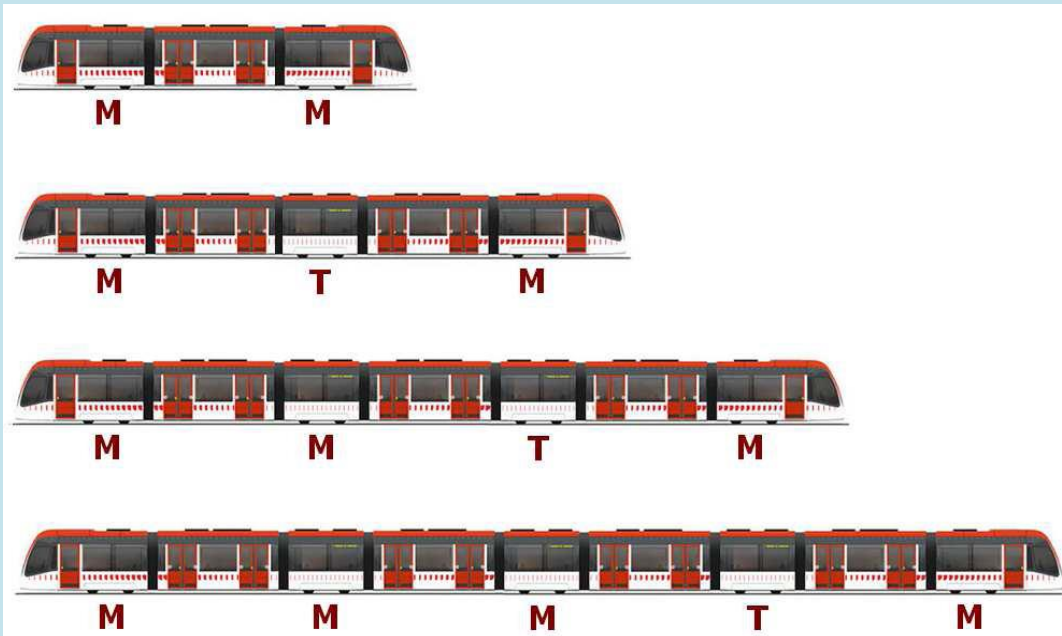
174 CARS

ECODESIGN

- Great Modularity and flexibility; length, width, voltages etc.
- **ECODESIGN** Design Methodology. Zaragoza, the first vehicle in the market to obtain the environmental declaration EPD, according to ISO 14025.
 - Light weight and optimized consumption
 - High recyclability **96,7%**
 - Noise emission reduced to minimum
- Optimized **ACCESSIBILITY: 100% low floor** (without ramps and steps).
- Modular innovative construction
 - Improved assembly and construction
 - Improved maintainability
 - Improved reparability
- Possibility to install energy storage devices (ACR): Energy saving or without catenary



Sizes – suiting various need



Capacity: 150-180

Capacity: 270-300

Capacity: 380-440

Capacity: >500

* Capacity at 6 Pax / m² of standees and varies based on width, interior arrangement etc.

Greentech-EVODRIVE

The logo for Greentech EVODRIVE. It features a green curved line on the left side. The word "GREENTECH" is in a smaller, grey, sans-serif font above the word "EVODRIVE", which is in a larger, bold, dark grey, sans-serif font.

GREENTECH EVODRIVE

Greentech Evodrive is an on-board system that recovers the kinetic energy released in braking, allowing trams to use it and improve the energy efficiency of the vehicle.

This system, based on supercapacitors is specifically designed for

trams with a conventional traction system, the energy recovery of which is difficult to return to the catenary.

This system consists of:

A storage system: supercapacitor modules and/or the latest generation batteries capable of storing energy.

A DC/DC converter: manages the charging and discharging of the storage system.

Control electronics: incorporates advanced strategies for the optimum control of energy flow.

In this way, the energy supply is optimised and energy savings is achieved.

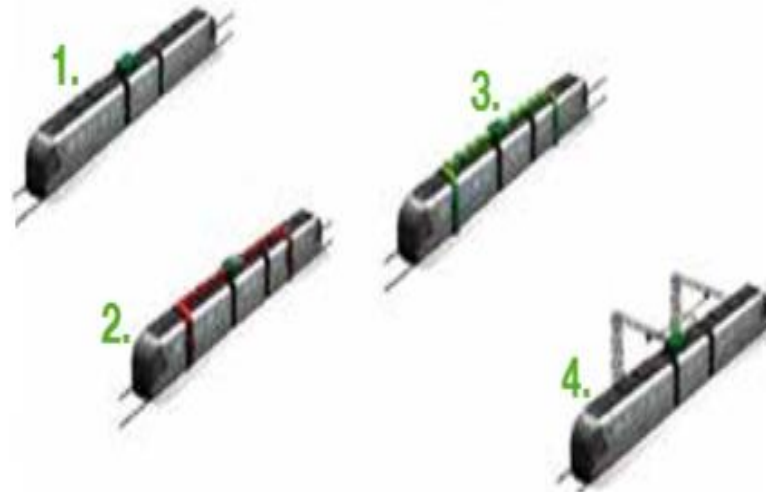
Greentech-FREEDRIVE



Greentech Freedrive is an on-board energy storage system that allows **catenary-free movement**.

This system, based on lithium-ion supercapacitors and batteries, includes Evodrive technological advantages, being easily integrated into new or existing railway systems, regardless of their make and structure.

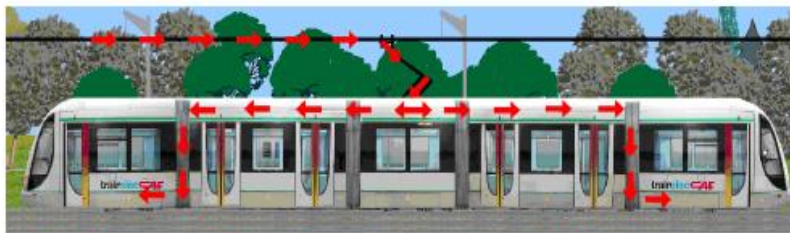
CAF has the ability to adapt to different operational scenarios with catenary-free tram operations, through the hybrid combination of lithium-ion supercapacitors and batteries. In this way, parameters such as performance, autonomy, cost and traffic type are optimised.



1. The vehicle starts to run with the Freedrive system fully charged.
2. While it travels from one stop to another the Freedrive powers the traction system.
3. During the braking process the kinetic energy generated is stored in the Freedrive, starting its recharging process.
4. When the vehicle arrives at the stop the Freedrive system recharging process is completed.

Catenary Free Functionality

CONVENTIONAL



- **Traction phase:** Between stations the energy is supplied by the catenary



- **Braking phase:** A small part of kinetic energy is returned to the catenary. The rest of the energy is dissipated in the brake resistors

CATENARY-FREE



Catenary Free (Catenary Free.mp4)



- **Traction phase:** The tram starts running from the station with ACR system fully charged supplying the energy to the traction system



- **Braking phase:** The whole of kinetic energy is recovered in the ACR system starting the recharge process



- **Station charge phase:** The ACR system is fully charged during the stop

Uninterrupted operations

Kaohsiung and Zaragoza where CAF LRTs were still operational even during floods



Conclusions

Based on current and future needs of Public transport, we feel that Metro lite is the best mobility solution for Indian Tier II cities:

- Best value for money with flexibility, simplicity and safety features
- 25-30 years life cycle with manufacturers being able to provide long term maintenance, spare parts and local support
- Ecofriendly mode, customized to blend with heritage & culture of city
- Most efficient and cost effective for PPP (procurement & maintenance on lease)



Proven Environmental Friendly Mobility solutions for the World



Thanks for your attention