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EMT MADRID: EXAMPLES OF CUSTOMER CENTRIC- APPROACH

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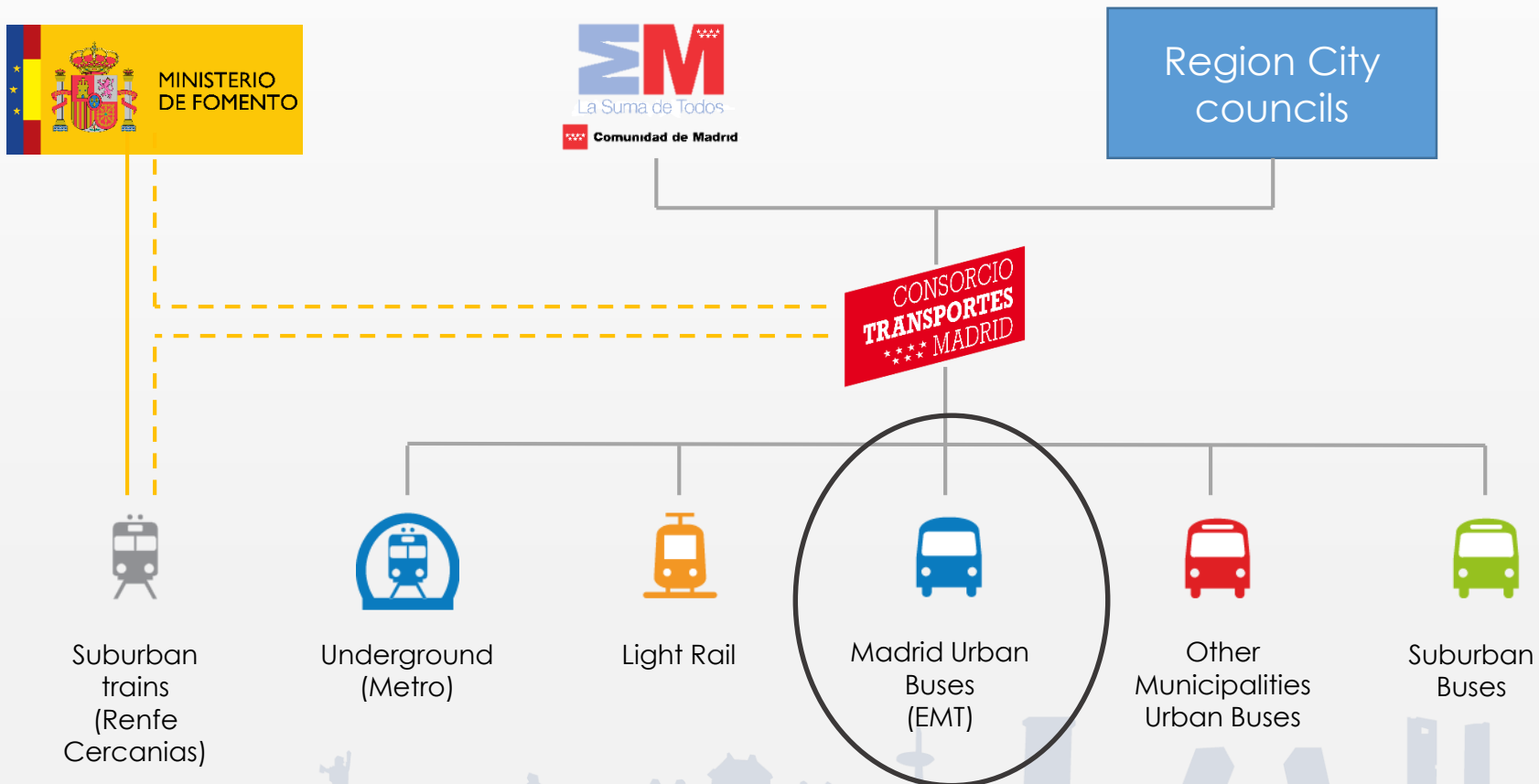
Empresa Municipal de Transportes de Madrid S.A.

Beijing, May 24th, 2016



Public Transport Institutional Framework

Organizational Structure



The Public Transport Authority of Madrid Region

CRTM – Consorcio Regional de Transportes de Madrid



Since May, 1985 the Public Transport Authority of Madrid Region (CRTM) is responsible for providing and managing all public passenger transport services.

Principal functions:

- Planning public transport infrastructures.
- Managing an integrated fare system.
- Planning services.
- Controlling the financial management.

Madrid Public Transport Company

EMT – Empresa Municipal de Transportes




- Created in 1947,
- Since 1972, direct management of Madrid urban bus network.
- Limited company owned 100% by Madrid City Council.
- We provide 24/7 service every day of the year.
- Since 2013, management of city parking facilities and towing trucks service.



Main figures

 5 depots

 1,500,000
passengers every
day

 1,904 buses

 85,500,000
kilometers per
year

 204 bus lines: 178
daytime & 26
night services.

 8,559 employees

The fleet

72% of our fleet is “green”



- Diesel (50% with filters and catalizers)
- Compressed Natural Gas
- Fully Electric
- Hybrids: Electric+Diesel and Electric+CNG

The first company in Europe with CNG
and CNG-Hybrid bus



International Presence

Active consultancy activities: exporting know-how



Some activities abroad

We know of main work field: operation projects.



- **Lima (Peru):** Currently operating in Lima by Transvial Company
- **Bursa (Turkey):** Consultancy for asset management, integrated ticketing expansion, public service contract amendment, benchmarking, business planning, etc. for the city of Bursa
- **La Paz (Bolivia):** Generic technical assistance for the transport system
- **Da Nang (Vietnam):** Consultancy for the new BRT system maintenance at Da Nang

Why EMT?

Wide experience in urban environments

- Our knowledge strength is the operation of complex systems of networks.
- We are a global operator of transport in large and complex cities with different social and economic environments.
- Experience in the use of different traction systems and alternative energies.
- Own designs of buses, bus stations, workshops and depots.
- Leader in the application of IT technologies for urban transport with our own developments.



What do we do?

After 70 years of managing a big city as Madrid



Demand studies and design of urban transportation routes



Applications technological tools to transport companies.



Engineering for the design of depots and workshops.



Consultancy in Advanced Maintenance systems,



Working tools for operating complex transport networks.



Buses and chassis settings advice.

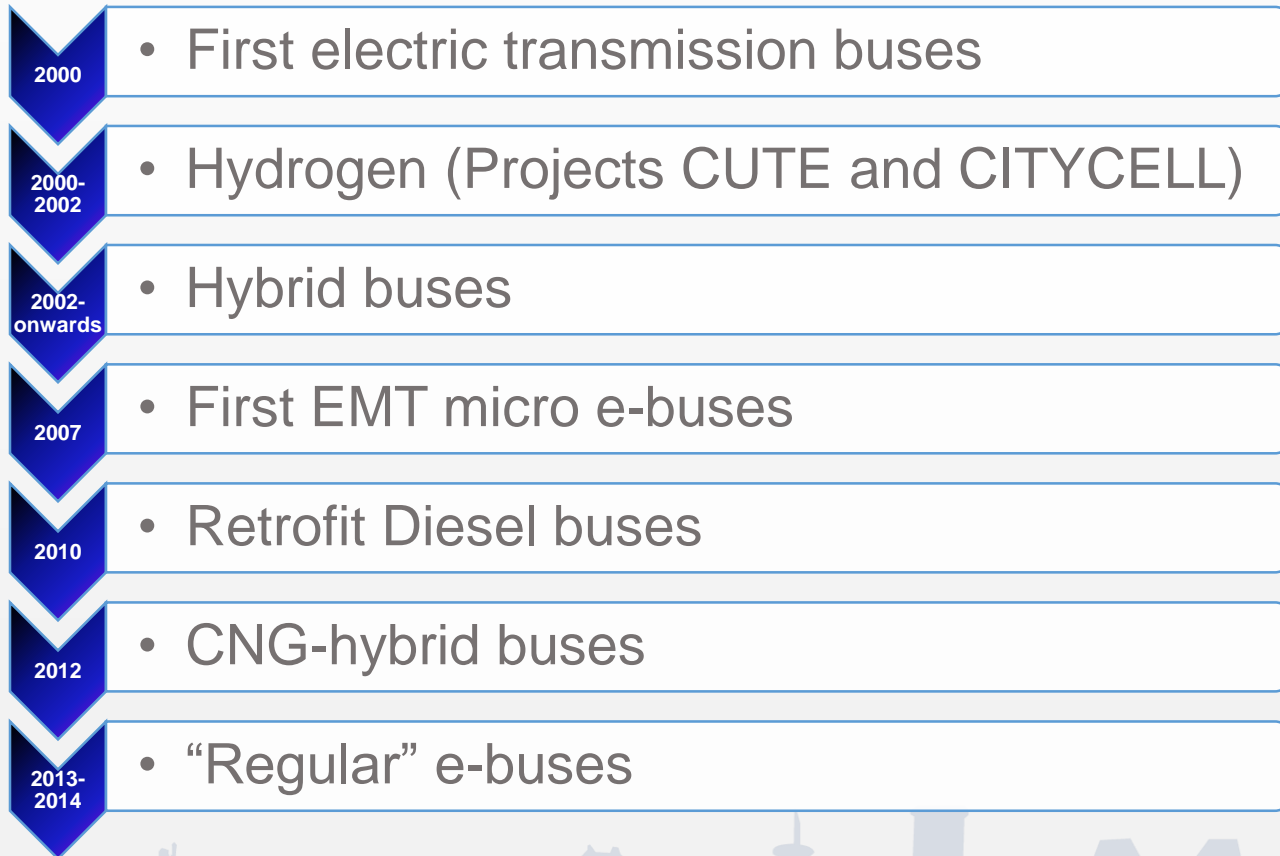
Examples of customer centric- approach

A way to generate new services and to improve
existing ones



- Our experience in e-mobility. Proximity services with clean fleet (fully electric).
- European projects (with active citizen's participation)
- Payment with contactless credit card (for occasional users and tourists)
- Improved information both on board buses and at bus stops
- New website and social media services
- Smart Madrid





Electric transmission buses

No batteries. Diesel engine as generator
Emissions: lower than eq. ICE microbus
More efficient: better performance of
cinematic flow



Mercedes CITO
20 units years 2000/2001
8 and 9 m
12 / 16 seats
45 / 55 passengers

Low floor and ramp
Aluminium
Smooth ride



Hydrogen: CUTE and CITYCELL projects



Hydrogen bottles

Feed unit
air-hydrogen

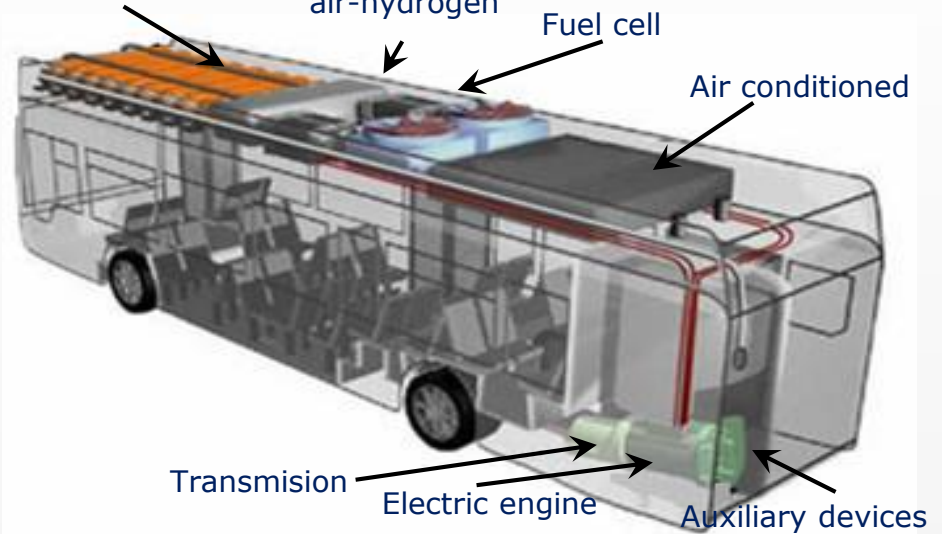
Fuel cell

Air conditioned

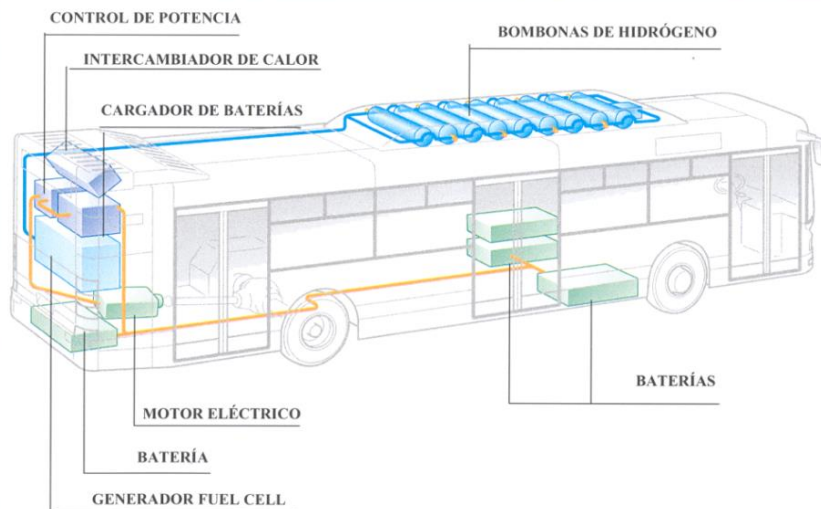
Transmission

Electric engine

Auxiliary devices



PROTOTIPO AUTOBUS



HYBRID buses



Consumption reduction:
between 24 and 30 % (vs. Euro IV diesel bus)

First e-microbuses (2007)

Specially oriented to elderly users



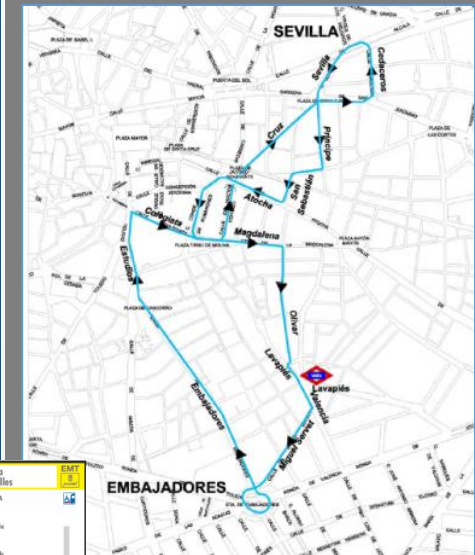
Started in 2007

Narrow streets with lack of other means of public transport

Average consumption: 0.84 kWh/km

Commercial speed: 6 km/h

Silent and no local emissions
20 units



M1 Sevilla Gta. Embajadores

Stations: Sevilla, Plaza Carvajal, Plaza Santa Ana, Plaza Mateos, Plaza San Juan de Dios, Plaza Torre de Babel, Olivo, Plaza Longueira, Miguel Servet.

Line: Sevilla (M1) - Gta. Embajadores (M1)

Legend: M1 Gta. Embajadores

Legend: M1 Gta. Embajadores

M2 Sevilla Arguillas

Stations: Sevilla, Plaza Vieja, Yabudo, Corredera Baja de San Pablo, Pío, Reyes, Anselmi, Alberto Aguilera, San Juan de Dios.

Line: Sevilla (M2) - Arguillas (M2)

Legend: M2 Arguillas

Legend: M2 Arguillas

Legend: M1 Gta. Embajadores M2 Arguillas

Legend: M1 Gta. Embajadores M2 Arguillas

Charging stations at Carabanchel depot for e-microbuses



Retrofit diesel buses (2010)

Financed by IDAE (“Electrobus” strategic project)

Turning biodiesel and CNG buses into hybrids

- 4 buses (currently in service)
- Fuel saving: 18%



Retrofit EMT

Retrofitting diesel buses

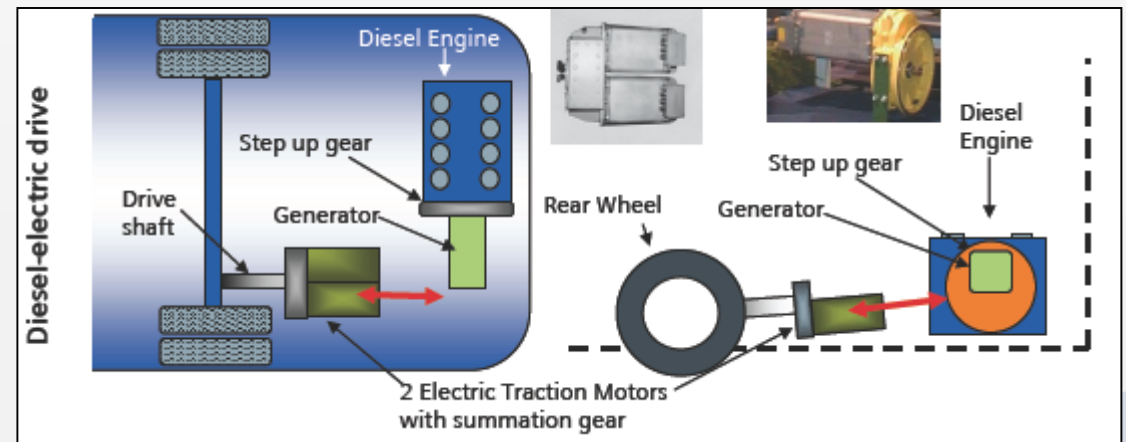
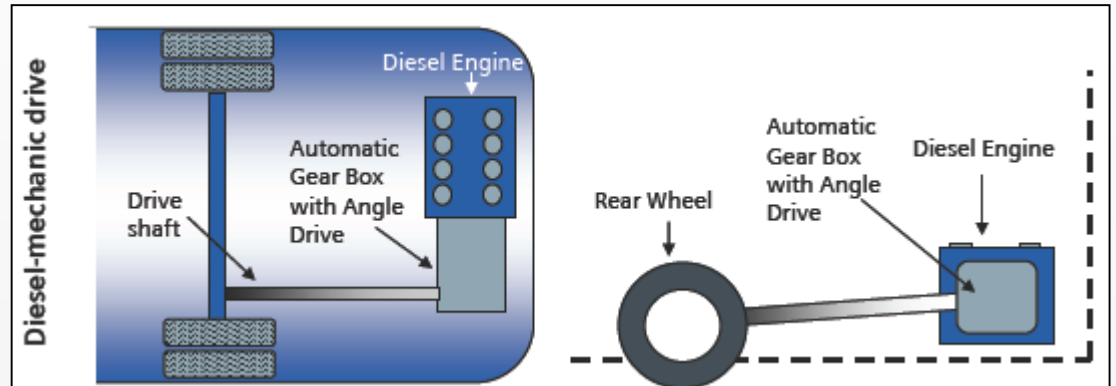
Serial system

Ultracaps

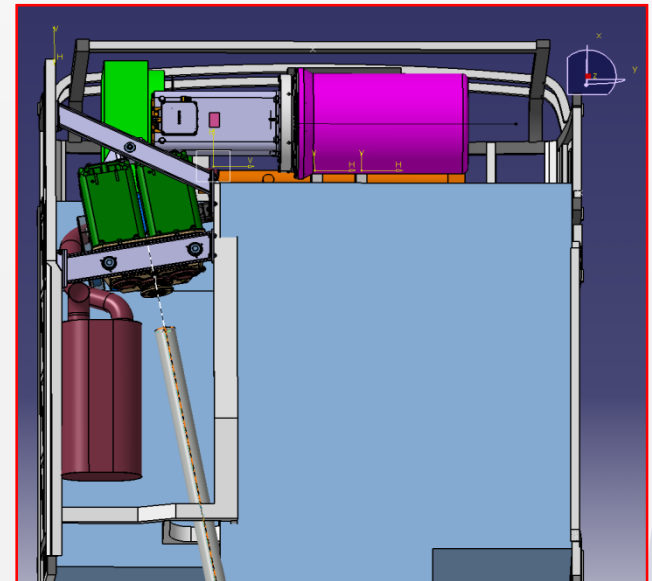
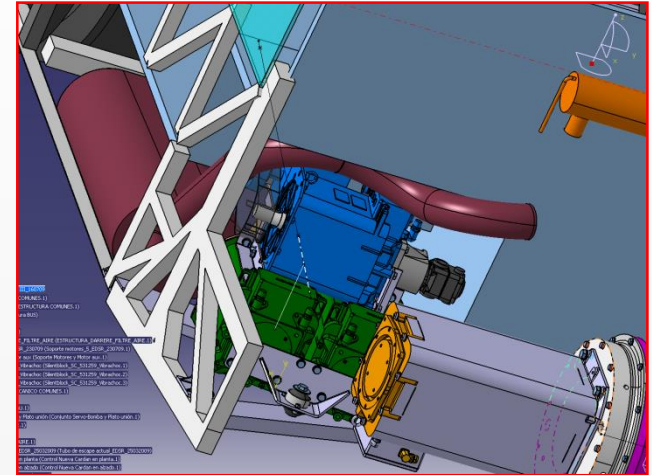
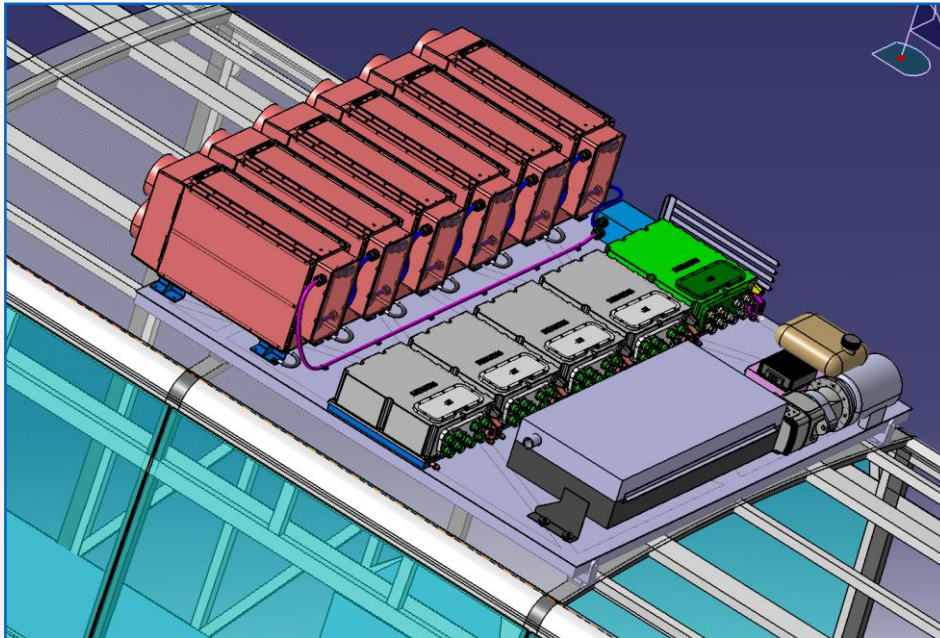
Diesel engine: Stop / Start

2 electric engines

Eliminating the gearbox



MECHANIC INTEGRATION



CNG-HYBRID BUSES (2012)

Spanish made thanks to EMT demand (first units june 2012)

13 CASTROSUA TEMPUS buses

Serial Hybridization

Emission reduction strategy

10 TATA HISPANO buses

Serial Hybridization

Consumption reduction strategy



TATAHISPANO



CASTROSUA

- Two engines:
 - 1 Thermal Iveco Compressed Natural Gas (CNG) 100kW
 - 1 Electric Traction Siemens 134 kW
- Serial hybridization
- Energy recovery in braking
- Plug-in to the grid
- Stop & Start System
- Ability to circulate in pure electric mode.
- Autonomy in pure electric traction (minutes/km): 60/150 km
- Electric transmission only to the rear wheels
- Electric power to the wheel: 67x2 kW



- 3 batteries traction type "zebra" (Ni-Na / Cl2)
- Voltage: 520 V AC
- Max. Intensity: 145 A
- Voltage: 620 V DC
- Power: 19 kW / h
- Intensity: 32 A / h
- Intensity max. A discharge 90
- Intensity max. with regenerative braking load 30 A
- Internal Operating Temperature 245 ° C - 360 ° C
- Max. Environmental temperature 50°C
- Total Capacity: 96 Ah (32 Ah x 3)

**Consumption saving (€) up to 45% (vs. Diesel),
and about 25-30% vs. CNG**

TATA HISPANO TML CS25 CNG

- Two engines:
 - 1 “Cummins” Thermal Compressed Natural Gas (CNG) to 145 kW
 - 1 Electric Traction “Siemens” with 134 kW
- Serial hybridization
- Energy recovery in braking
- Stop & Start System
- Rear wheels only Electric
- Electric power to the wheel: 67x2 kW



- 8 modules of lithium ions
- Voltage: 520 V AC
- Max. Intensity: 145 A
- Voltage: 660 V DC
- Intensity: 8.8 Ah
- Internal Operating temperature: 16°C - 40°C
- Max. ambience temperature: 50°C
- Total capacity: 58 kWh

**Consumption saving (€) up to 30%
(vs. Diesel)**

Charging stations at Carabanchel depot for CNG hybrids buses



15 charging points at 25 A
1 charging point at 50 A
(own engineering design)



“REGULAR” e-BUSES TEST IN EMT



Fostering public participation

A wide range of research projects.



development of
applications;
open and standard
platforms,

Sustainable

SmartCity
through

move US 

Foster mobility services using a more
intelligent use of ITS resources.

ikaos
internet
health

Smart City applications +
of Things applied to



Attending customer needs

Tourists and occasional users oriented

1



2



3



- Easy way to pay, being tested now in two bus lines: number 27 and Airport express one
- Target group: 5-6% total EMT passengers
- Launched in March'16



Improved information both on
board buses and at bus stops

The better information, the higher client
satisfaction

Hyper connected information = higher value for the client



Wifi on board and at bus stops

800 PMV

- These media channels allow us numerous real time features providing fully updated information to our users, specially for those who don't use portable devices (waiting time, incidents, connections, interesting information, warnings, weather information, etc.)

Plan to install information TV
screens on board buses

Open data policy since 2011



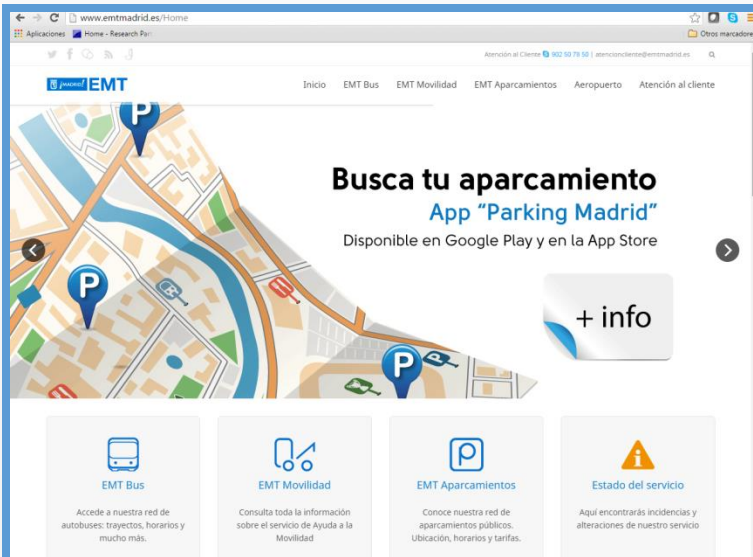
Empresa Municipal de
Transportes de Madrid



New website and social media services

The better information, the higher client satisfaction

Hyper connected information = higher value for the client



Launched in december'16

Integrating all services (buses, parking, tow trucks, etc.)

Transparency portal (openness)

Responsive web design (RWD)

Specific contents for visitors in 8 languages

www.emtmadri
d.es

Empresa Municipal de
Transportes de Madrid



New website and social media services

The better information, the higher client satisfaction

Hyper connected information = higher value for the client

Essential information and communication channel between EMT and users

Facebook: 30.000 followers

Twitter: 60.000 followers

Instagram, Youtube and corporative blog

Continually updating our users on the service (changes, incidents, information of interest, etc.)

These channels are a basic tool of active listening; they allow us to have a permanent feedback from our users about complaints, needs, suggestions, etc.



ALL INFORMATION AT A "CLICK"

In cooperation with Connecthings



"Smart Madrid" labels at all bus stops
(5.500)

NFC and QR technology

Free of charge

Real time

All information available about EMT
service (including tourist information
and cultural activity)



Thank you very much!

Sergio Fernández
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Empresa Municipal de
Transportes de Madrid

