

Charging Infrastructures for Urban ElectroMobility

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eMobility in Barcelona

Background

- Barcelona 1.6M inhabitants within a metropolitan area of 3,2M
- SUMP 2006-2012 & 2013-2018: **BCN needs EV to achieve goals**
- MOVELE, MOVEA, MOVALT PLAN (national subsidies)

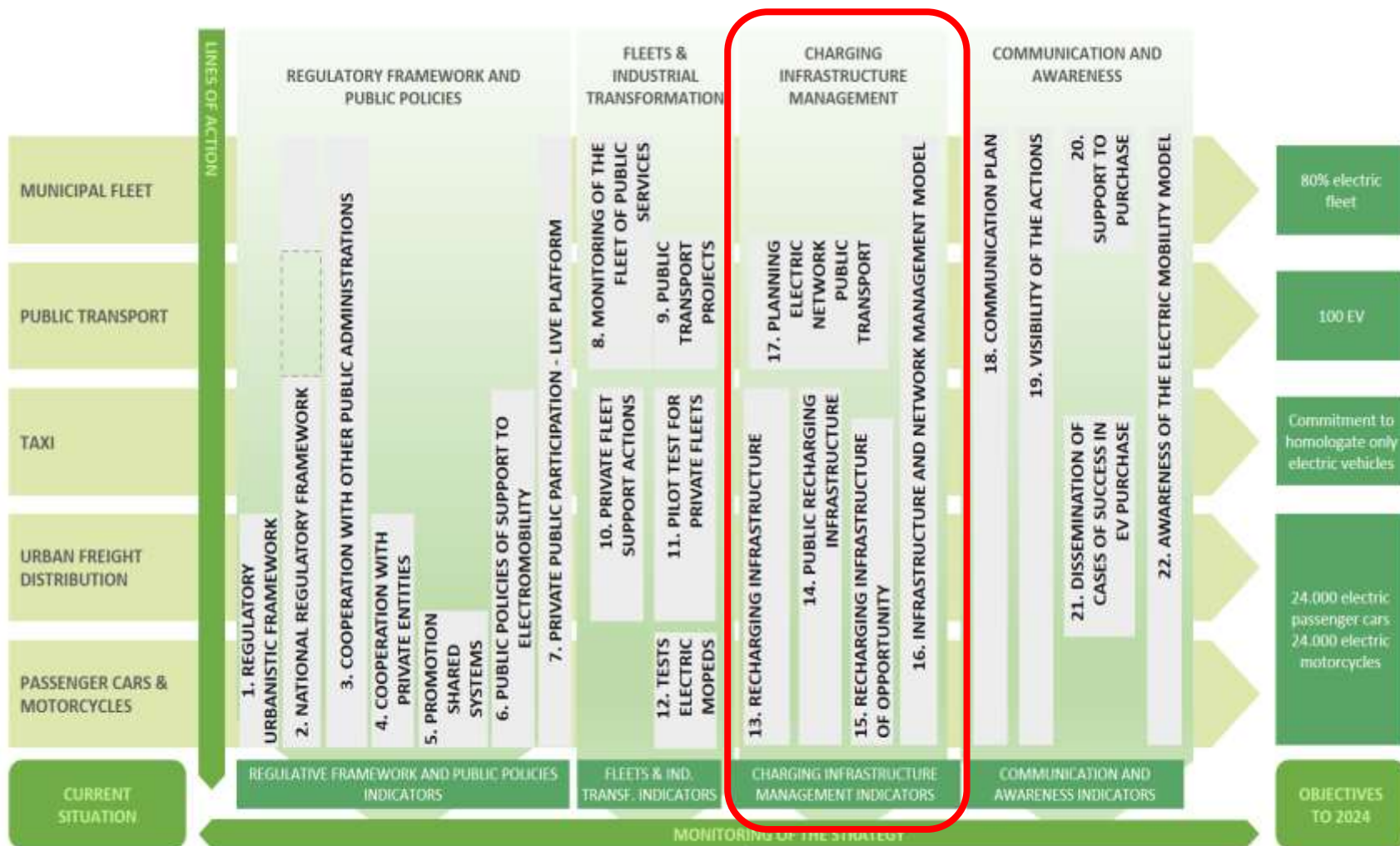
Aims of the EVProgram

- Reduce energy consumption by 10% (transport).
- Reduce by 30% emissions of pollutant
- Reduce the spaces with high noise levels
- Achive a funcional public charging infrastructure
- Logistics chain optimization.





Strategy for the development of electromobility



SUMP needs ElectroMobility

A Sustainable Urban Mobility Plans fosters a balanced development of all relevant transport modes, while encouraging a shift towards more sustainable modes.

The plan puts forward an integrated set of technical, infrastructure, policy-based, and soft measures to improve performance and cost-effectiveness with regard to the declared goal and specific objectives. (EC 2013)



Award for the best technology available



EV new Challenges: Charging Infrastructure

EV technology changes the way that energy is supplied.

All we have heard two tricky promises:

- Electricity distribution grid is the most widespread energy network so recharging EV will be done easily anywhere...
- Cars are parked 90% of the day so there is always enough time for charging...

But... for now, charging network remain a key barrier for ev-drivers





EV new Challenges: Charging Infrastructure



EV Charging Infrastructure – Where?

EV must charge where it park, not park where they charge.
(Land use criteria about parking on/off street)





EV Charging Infrastructure – How long?

EV should charge as long as it needs to be parked.
(Operational criteria)

Residential Charge ($\approx 10\text{h}$, full battery):

Charging at home, overnight, private sphere

Opportunity Charge ($\approx 2\text{h}$, add some km):

“Meanwhile” charging, associated to another main activity, at work, leisure, shopping, restaurant, hospital, Park&Ride... private/public activity

Emergency Charge ($\approx 30'$, in the case of empty):

Battery exceptionally exhausted, needed to get back home or just to enlarge autonomy once (one of the main fears of a novice EVdriver). Public Service. Similar to RoadSide Assistance.

OnRoute Charge ($\approx 5'$, enlarge autonomy):

Long planned trip, charging in route to enlarge autonomy. Similar to gas station. 8



EV Charging Infrastructure. How fast?

EV should quick charge when needed.

Criteria: Land Coverage

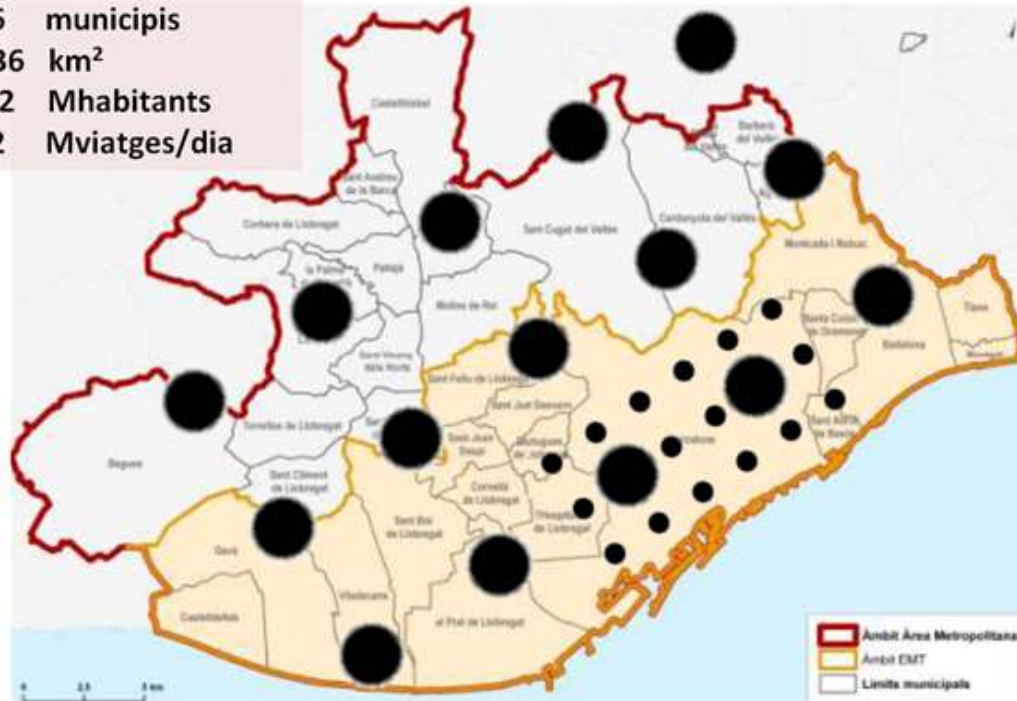
1 QC station/6'

20Km/h -> 2Km

60Km/h -> 6km

EMT vs AMB

18	->	36	municipis
331	->	636	km ²
2,6	->	3,2	Mhabitants
10	->	12	Mviatges/dia





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Criteria: Demand

Number of stands per station
<-> users demand

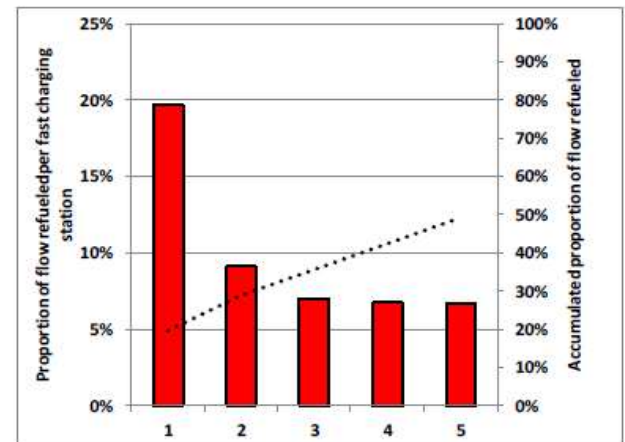
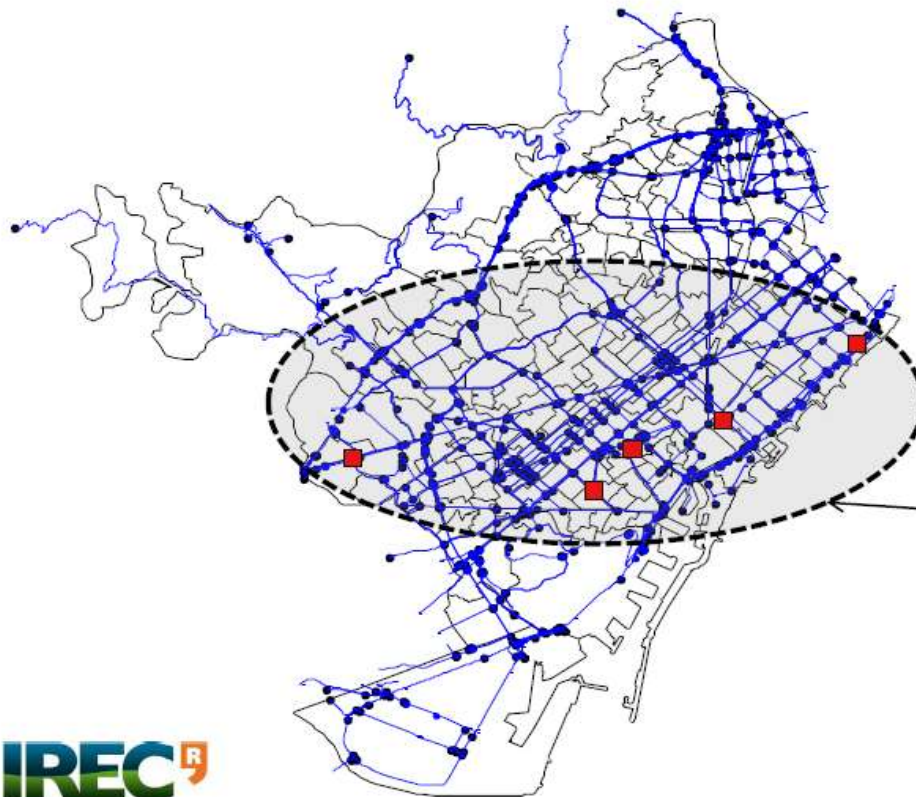




EV Charging Infrastructure OnRoute, how fast?

EV should quick charge when On Route. National Corridors.

Results for refueling 50% of the traffic flow



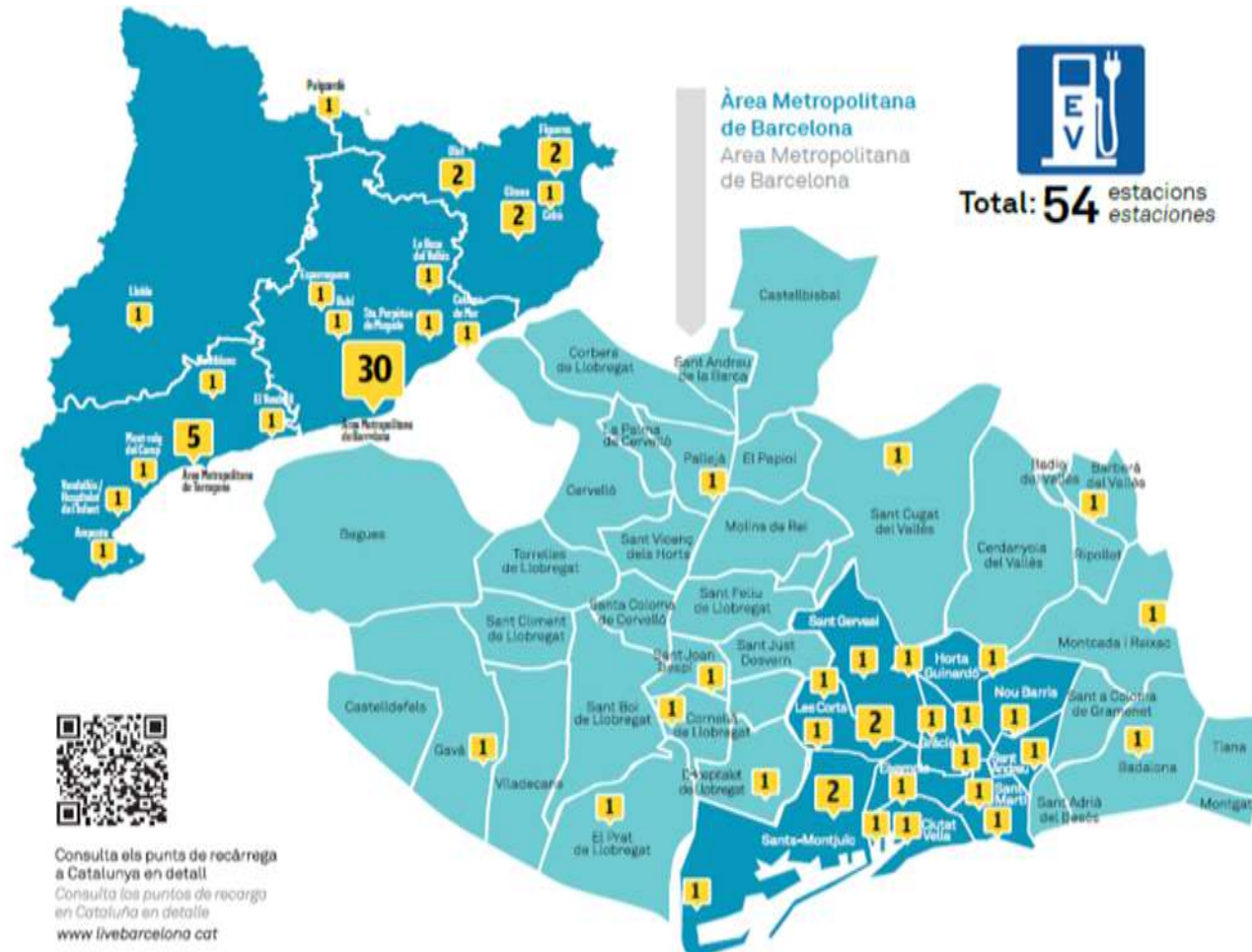
For **N=5** the **50%** of the EV traffic flow could be refueled.

Total cost of installation:
517,420 €



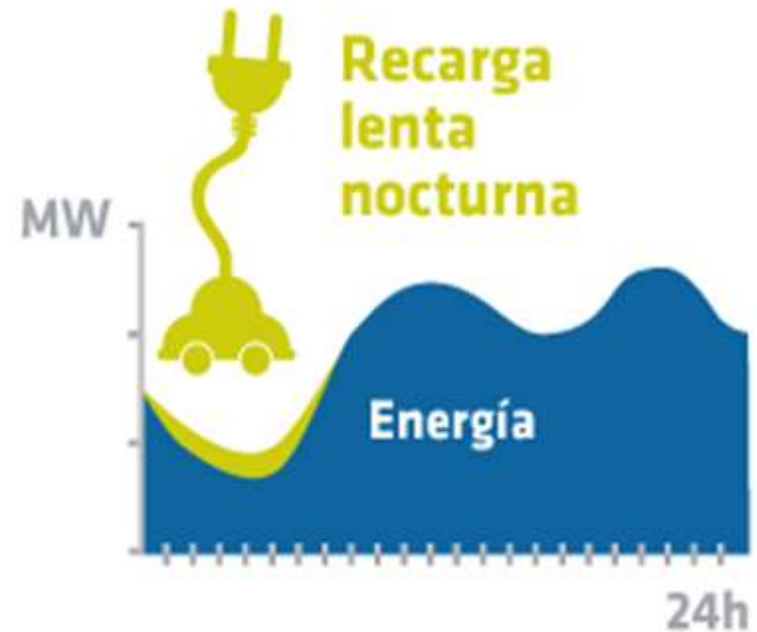
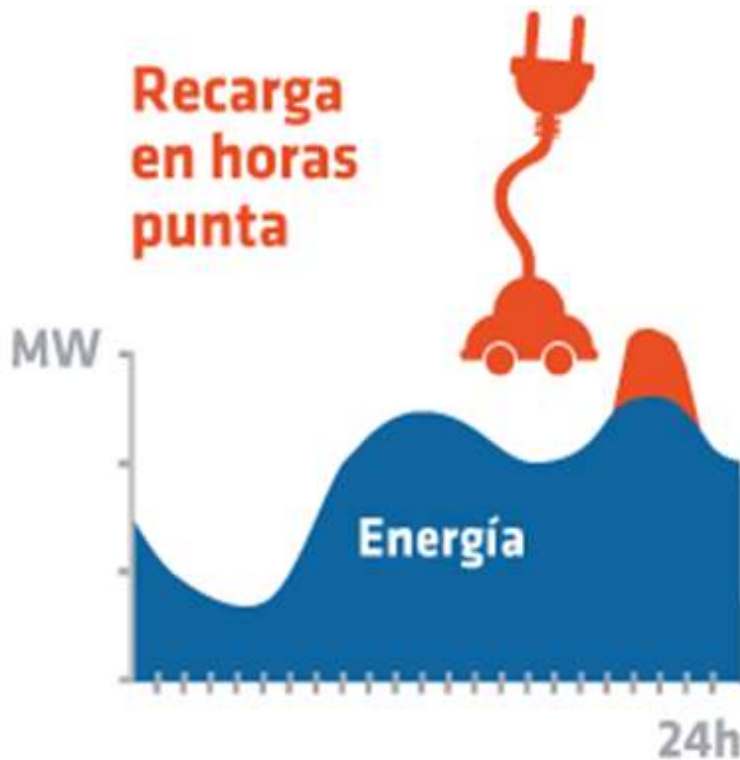
EV Charging Infrastructure. How fast?

Fast charging points in Barcelona/Catalonia



EV Charging Infrastructure – When?

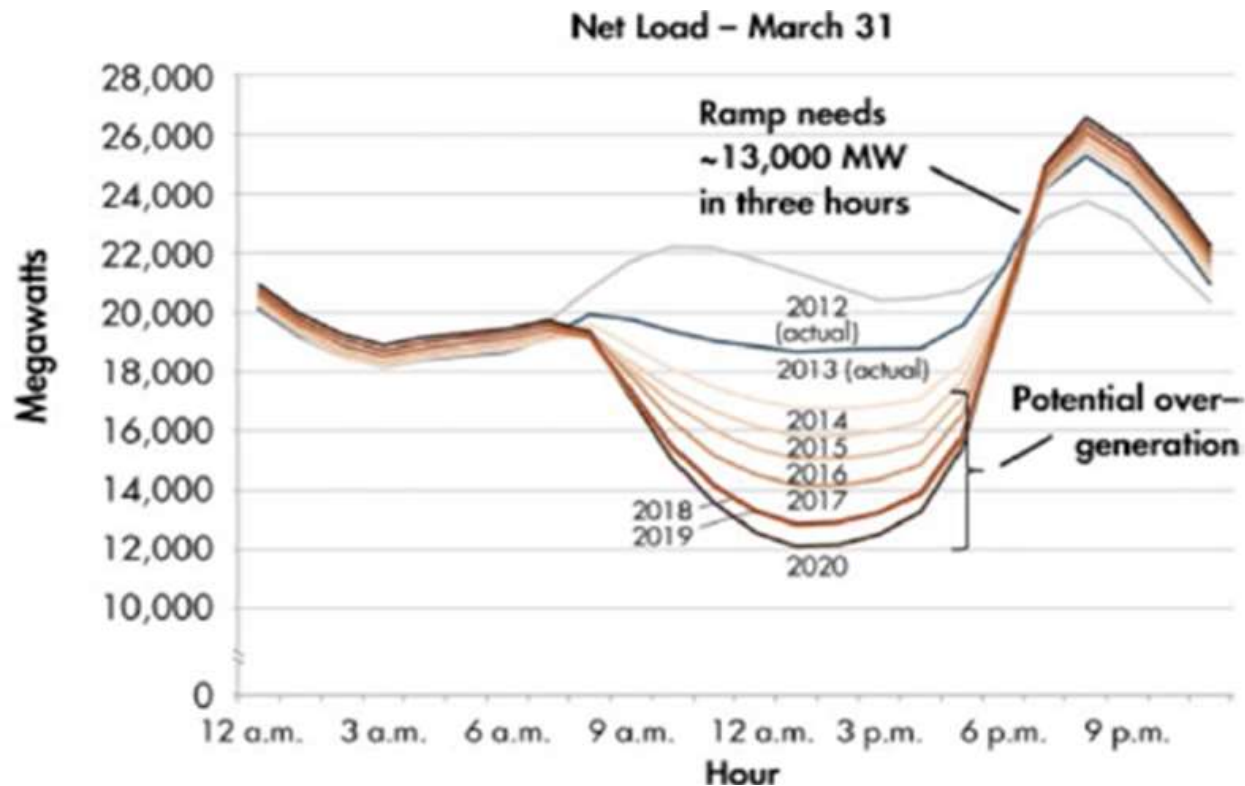
Electromobility should demand electricity in valley hours.
(Grid congestion criteria)





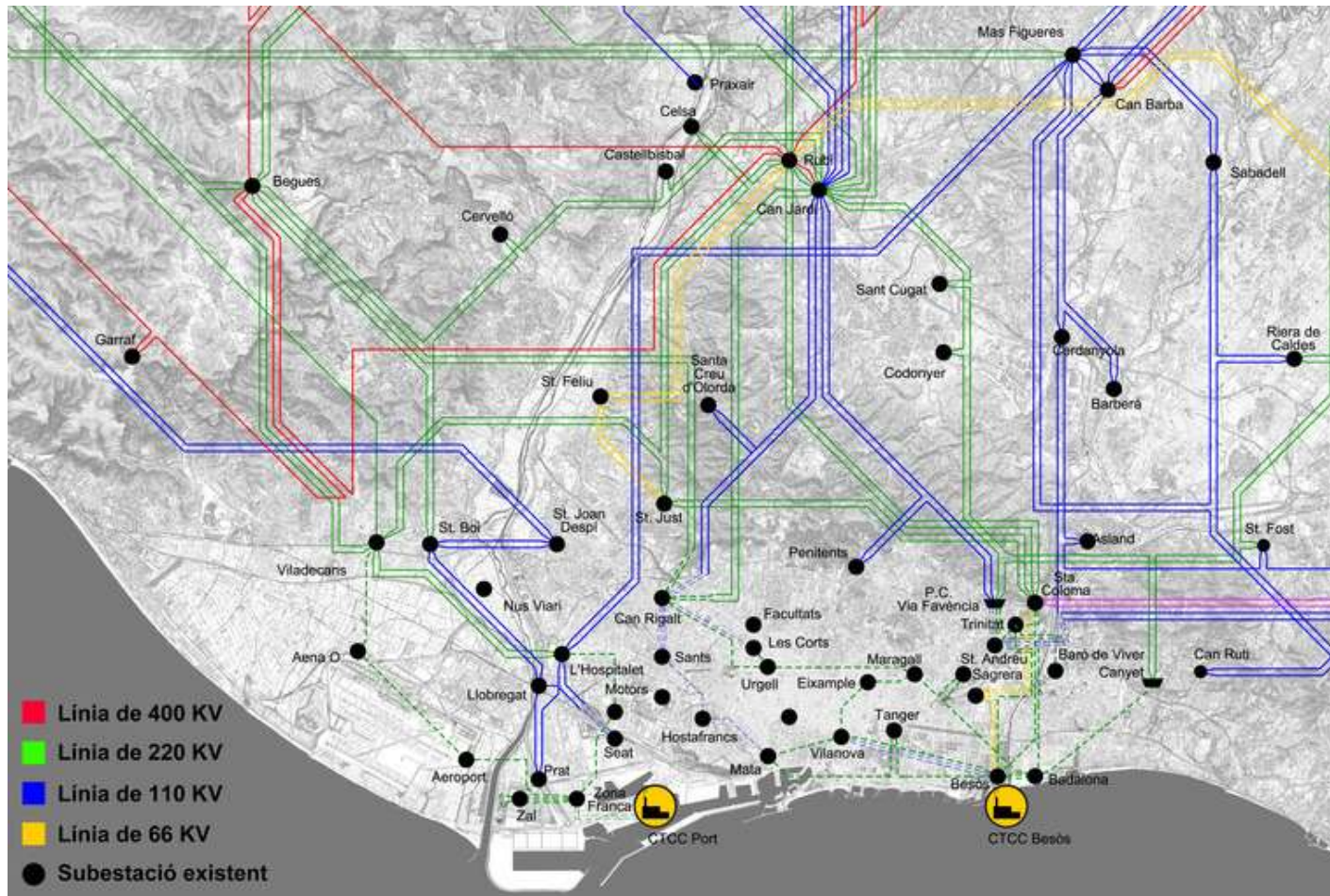
EV Charging Infrastructure – Which?

Electromobility should use renewable electricity
(Decarbonized mobility criteria)



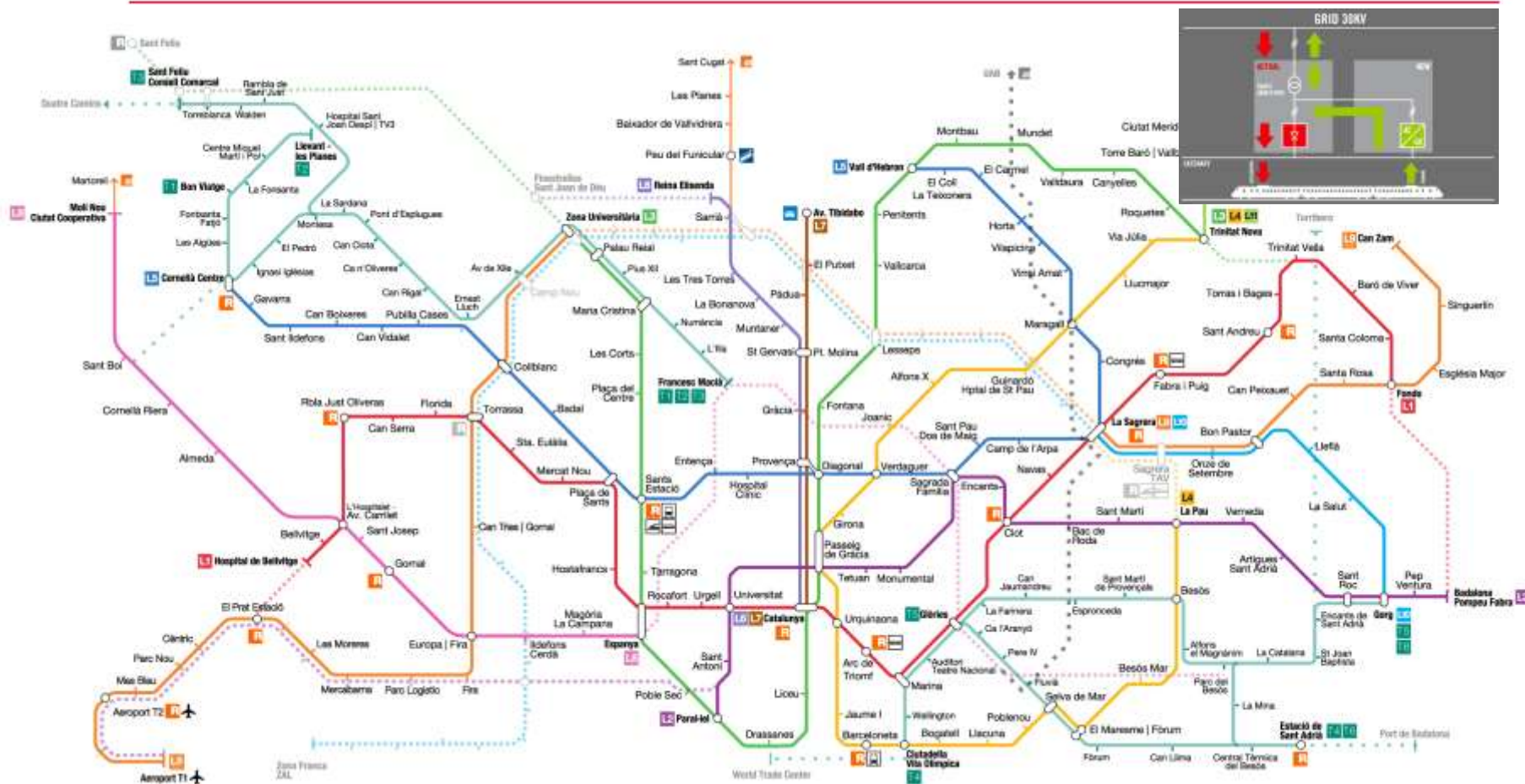


EV Charging Infrastructure – Who?



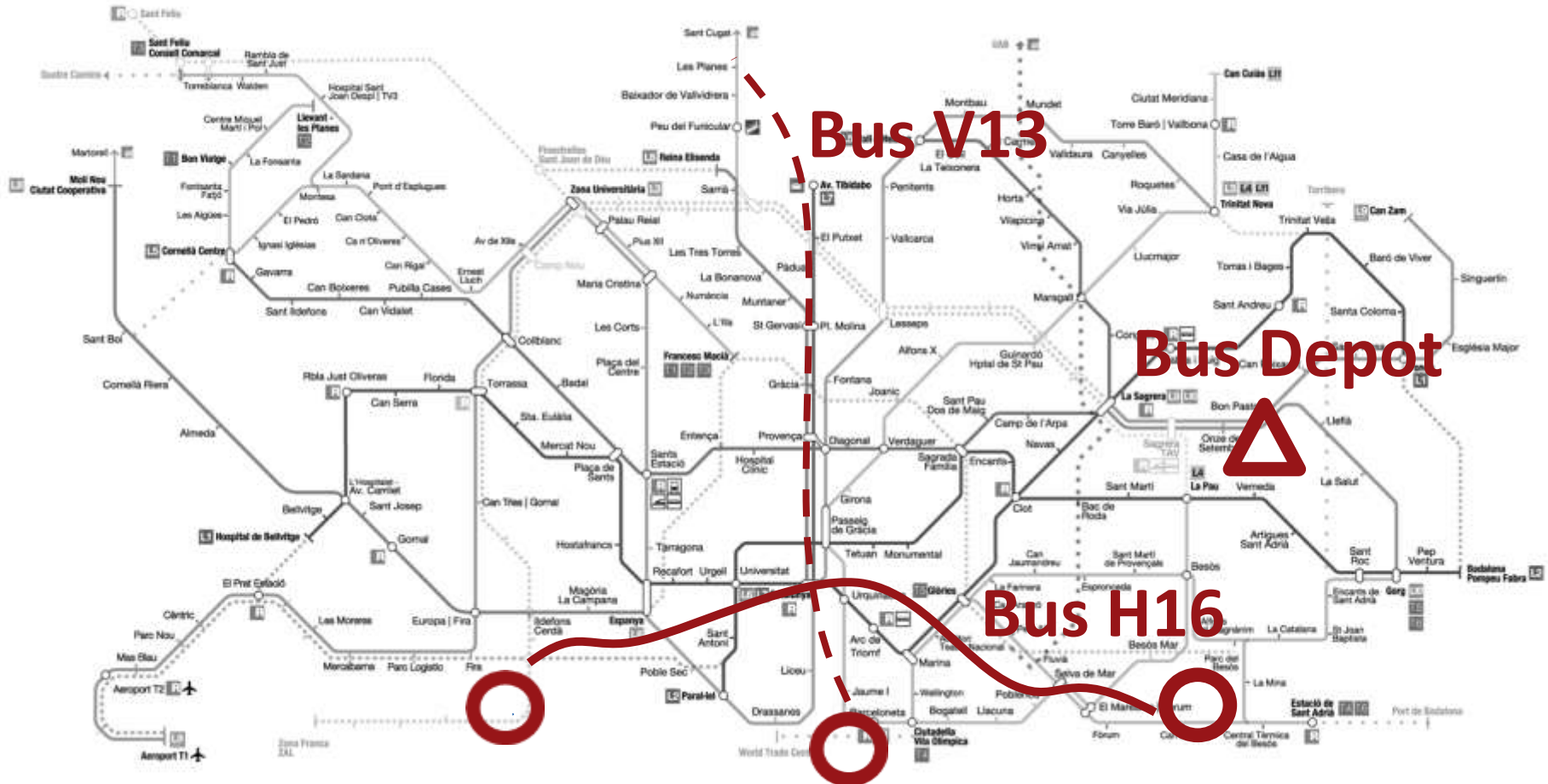


EV Charging Infrastructure – Who?





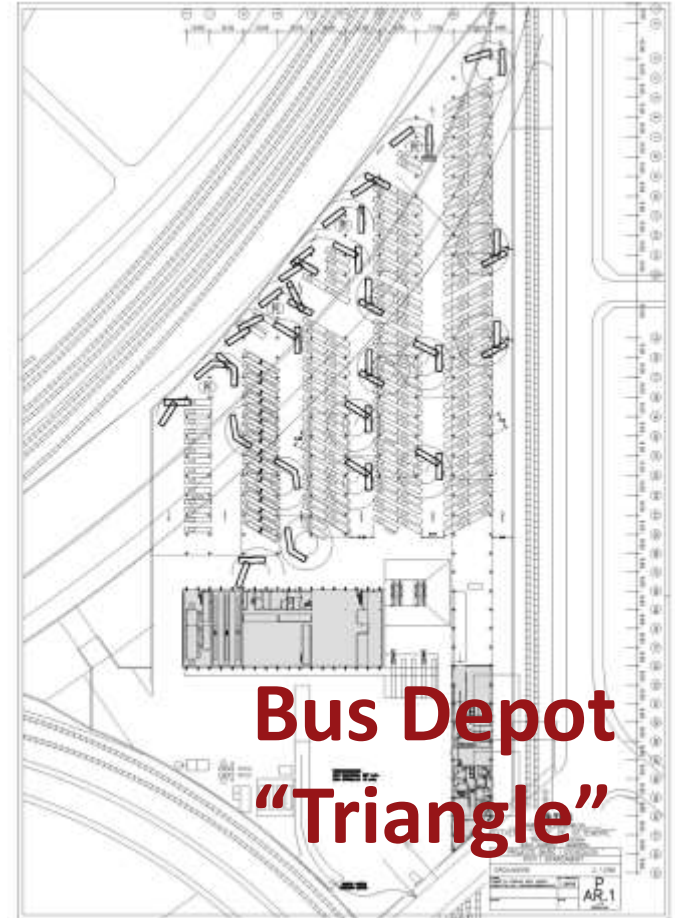
EV Charging Infrastructure – Who?





EV Charging Infrastructure – Who?

H16 (ZeEUS Project)



EV Charging Infrastructure – Why not?

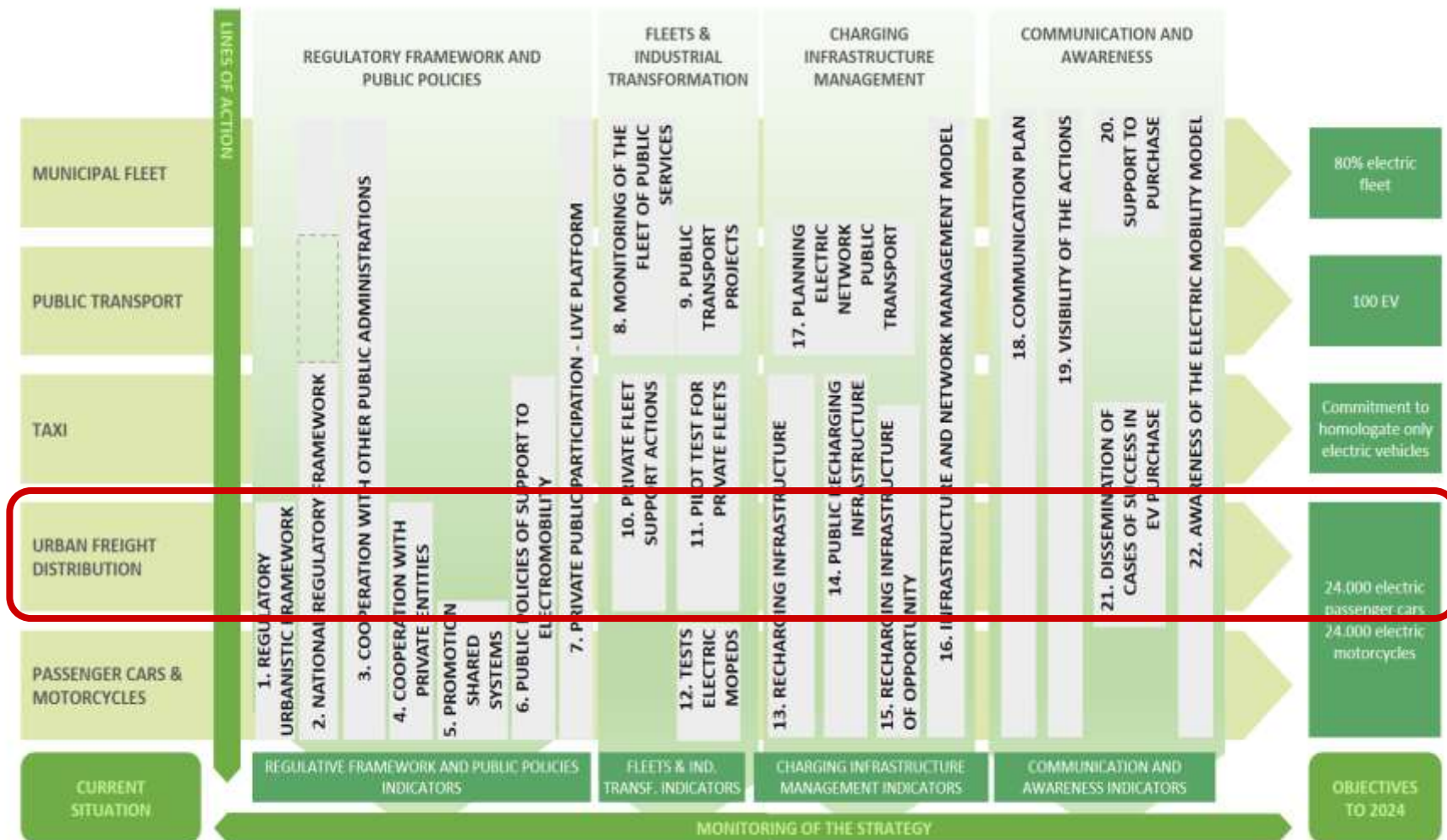


Garages and other Public Services
charging from public transport
infrastructures? Why not?
ELIPTIC & ASSURED projects





Strategy for the development of electromobility

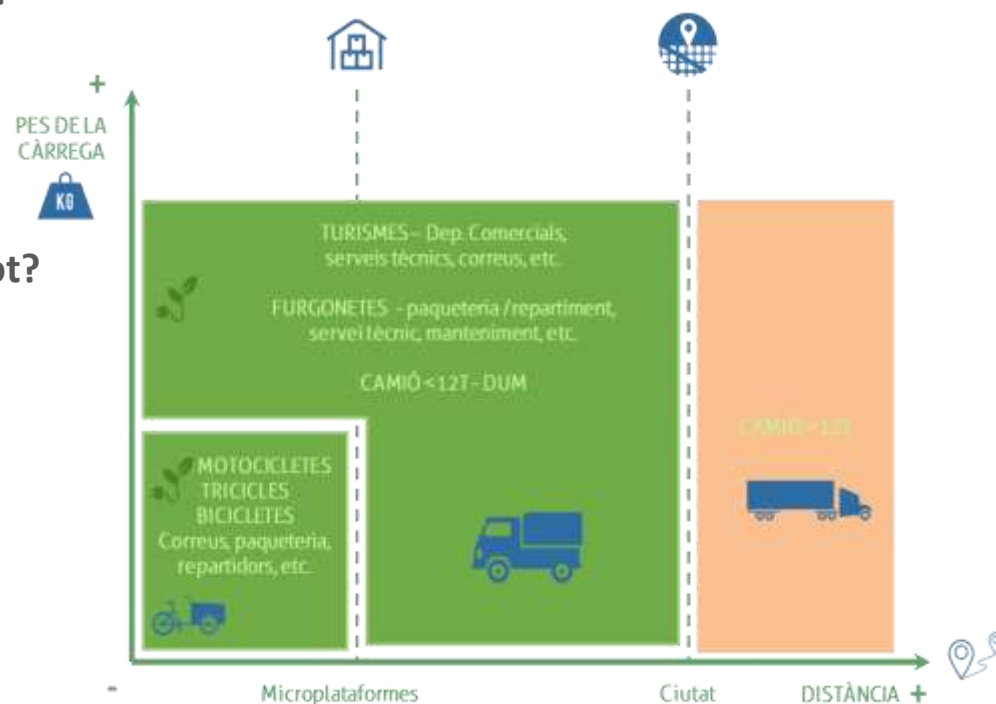




Strategy for the development of electromobility eFV

Identification of the potential commercial mobility segments to electrify:

- Is there EV technology for the type of vehicle?
- Does VE meet the daily need for autonomy?
- Is there a possibility of recharging on route?
- Is there a possibility of recharging at the depot?





Strategy for the development of electromobility eFV LEVs

Goord Practice ARAVINC (Urban freight distribution)

Currently 39 e-scooters for delivery



LEVs Charging Infrastructure.

EV motorbike should charge when needed. On-street.
No QC available





LEVs Swapping

The critical point of this business model was how to solve the recharging of vehicles.
The development of a system of swapping of batteries became essential.



Removable Battery System S02





LEVs Charging Infrastructure.

LEVS MUNICIPAL FLEET (URBASER)

(Cleaning, water, and garden services, ...)

Roughly **200 LEVs**





Charging Infrastructure specific for eFV?

Failed Pilot... ☹️

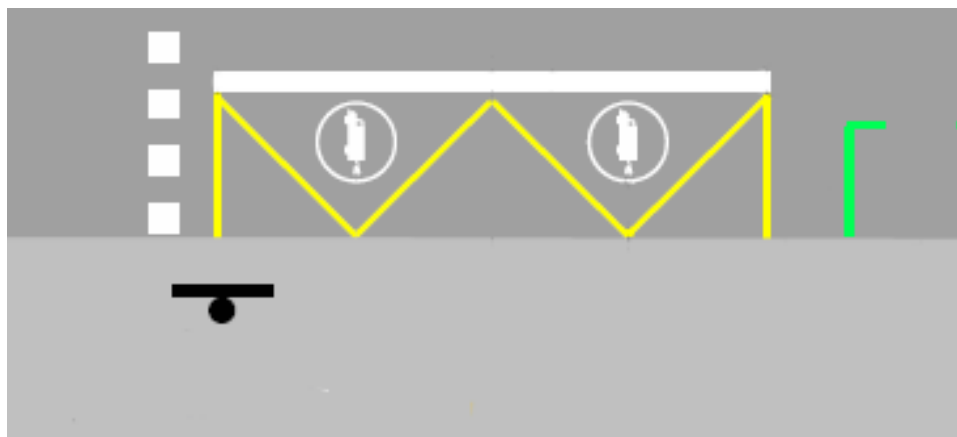




INNOVATIVE MEASURE failed

•RECHARGING AREA

- Places for loading and unloading
- Exclusive to eDUM (30 min)
- Possibility to reserve a place
- Sensor fraud - monitoring



Horizontal signs in the area



Vertical signs in the area



TECHNICAL SOLUTION

Reservations management

Booking before 4 hours





TECHNICAL SOLUTION

- SENSOR FRAUD - MONITORING



Induction Coils



Infrared Camera

EV Charging Infrastructure for eFVs

Electric Vans prefer to charge in depot, but will use QC when necessary



eNV200 manufactured in Barcelona

Bigger trucks needs other solutions...





Ajuntament
de Barcelona

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