

Public Charging Infrastructure as a service for sustainable mobility



EVs and their integration into the grid.
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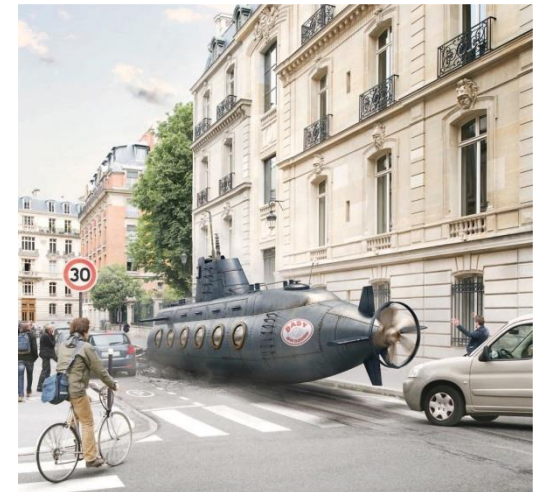
Urban Mobility

Urban mobility is a complex issue that directly affects all citizens

“Urban mobility systems are composed of multiple elements with strong interactions. Thus, use adaptation over prediction, regulate interactions to avoid friction, use sensors to recover real time information, develop adaptive algorithms to exploit that information, and deploy agents to act on the urban environment”
(Carlos Gershenson)



DO THE RIGHT MIX



Did you pick
the right transport?



Challenges due to Urban Mobility

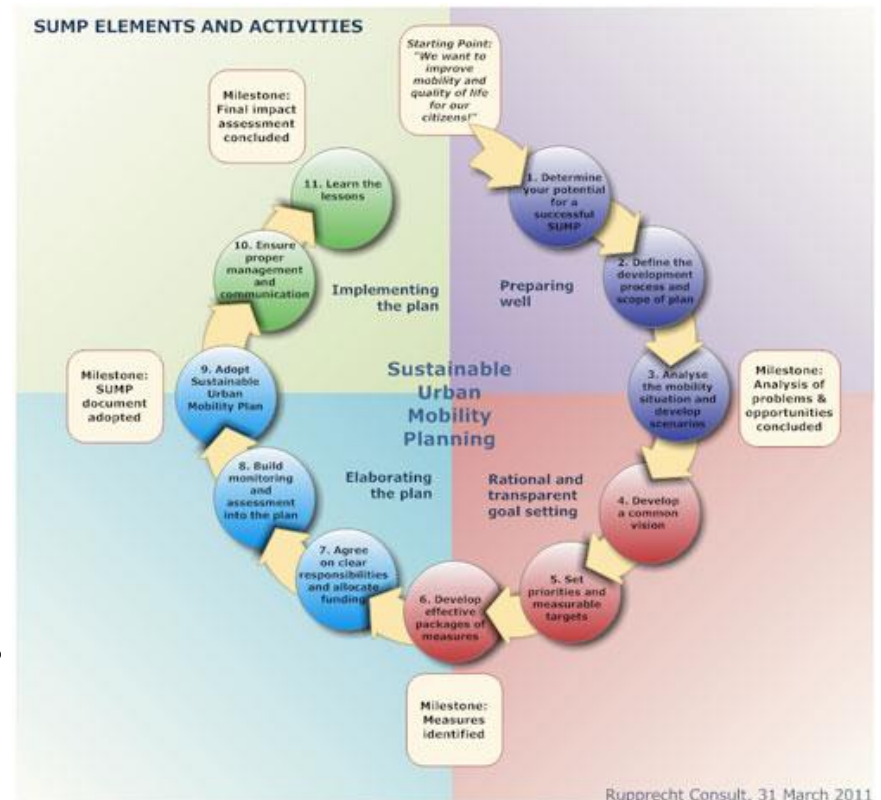
"The air pollution produced by mobility causes more deaths than traffic accidents" (WHO 2014)



The SUMP

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

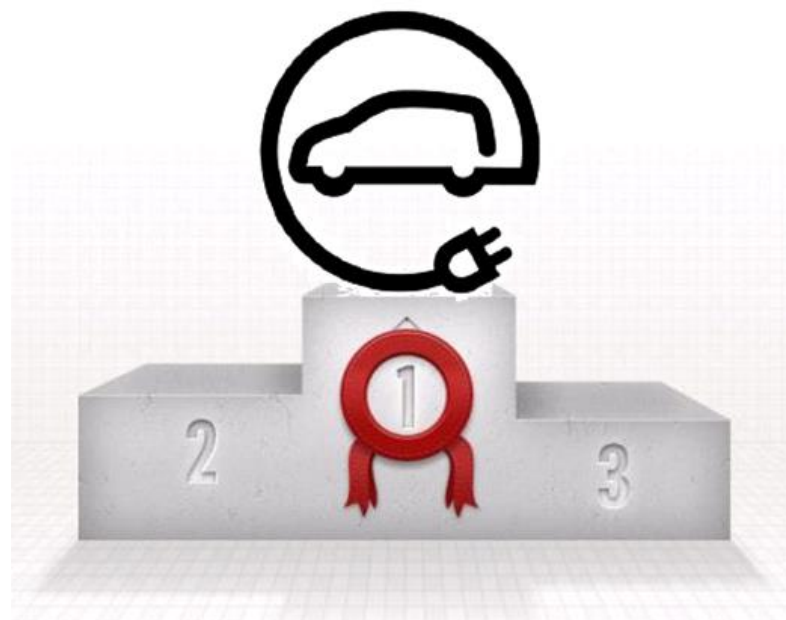
The plan puts forward an integrated set of technical, infrastructure, policy-based, and soft measures to improve performance and cost-effectiveness with regard to the declared goal and specific objectives. (EC 2013)



SUMPs need EV

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

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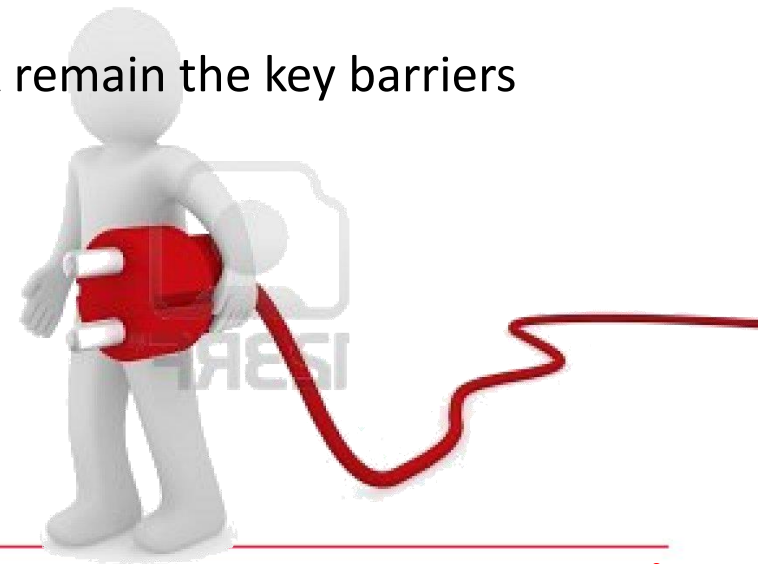
Award for the best technology available

EV new Challenges: Charging Infrastructure

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...

... for now, autonomy and charging network remain the key barriers for drivers of an EV



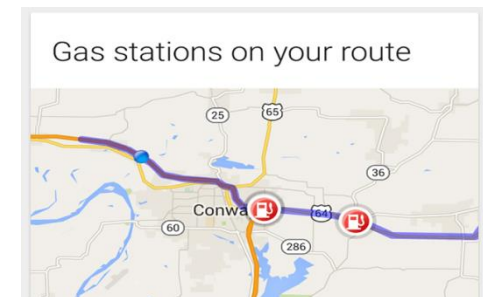


EV new Challenges: Charging Infrastructure

Electromobility don't change the way we move,
but changes WHERE we refuel/recharge ENERGY.



600km/5min



150km/600min (normal charger)

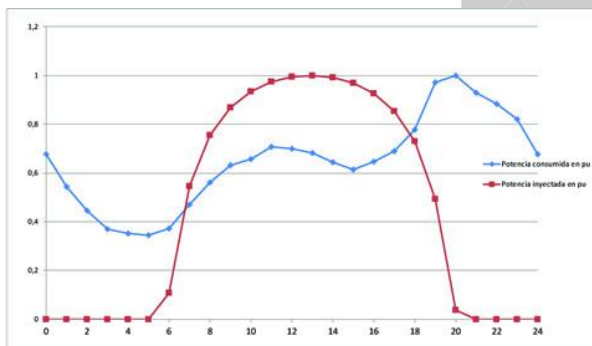
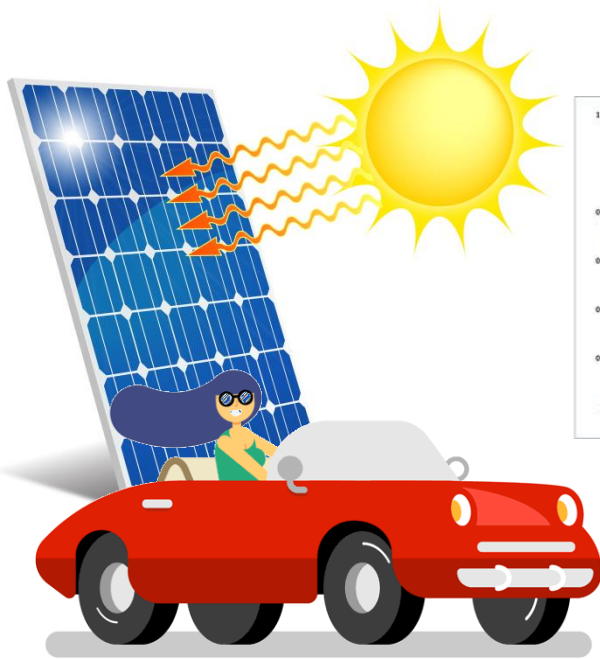
150km/30min (quick charger)

150km/5min (ultrafast charger)



EV new Challenges: Charging Infrastructure

Electromobility can encourage the switch to renewable energies, but WHEN TO CHARGE?

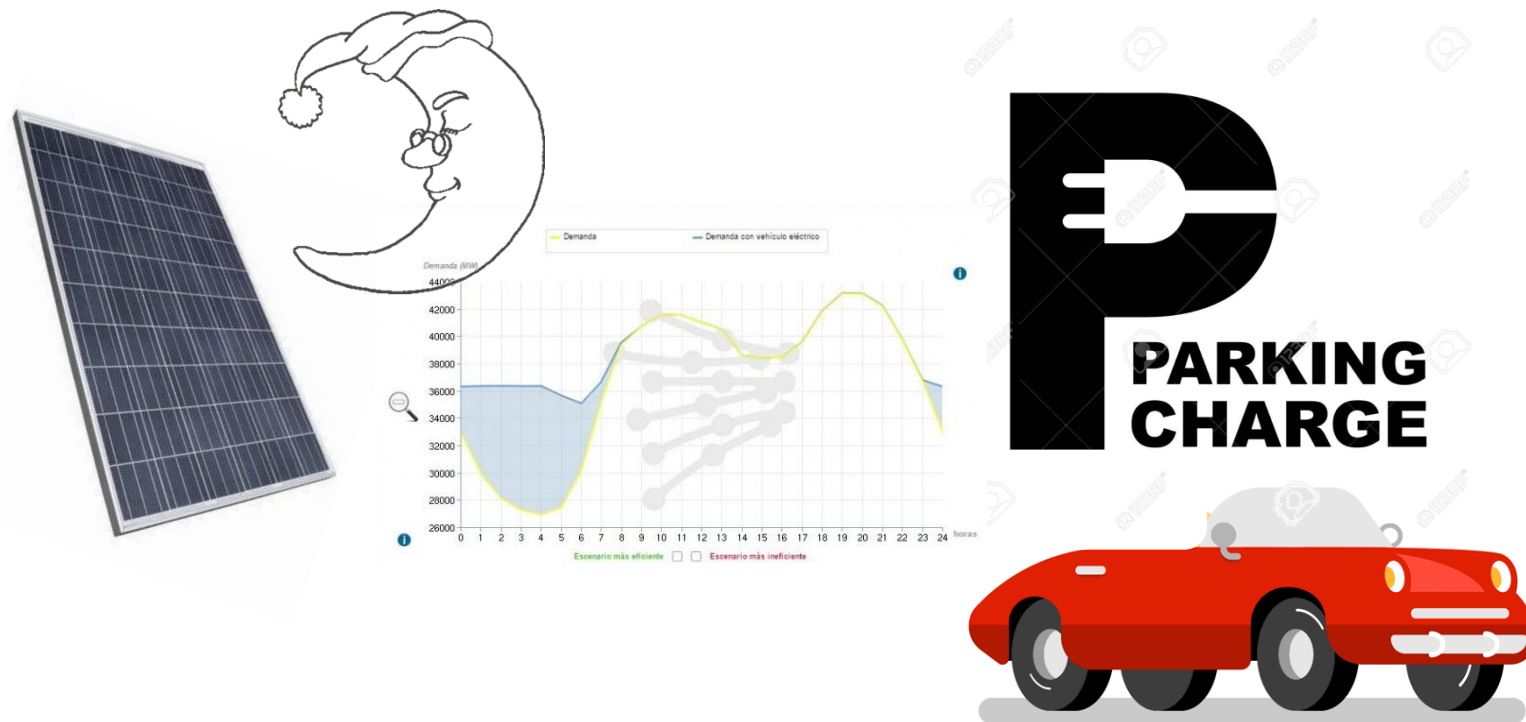


PARKING
CHARGE



EV new Challenges: Charging Infrastructure

Electromobility can take advantage of the hours of low demand, but **WHEN TO CHARGE?**





EV Charging Infrastructure

Kinds of charging infrastructure according to needs:

Residential Charge:

Charging at home, overnight, private sphere

Opportunity Charge:

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

Emergency Charge:

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. Also RACC Road Assistance.

OnRoute Charge:

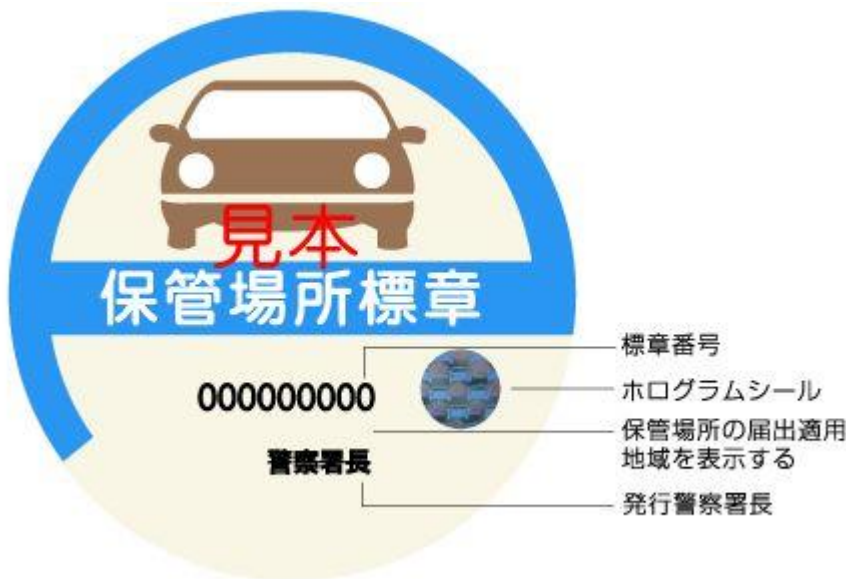
Long planned trip, charging in route to enlarge autonomy

EV Charging Infrastructure. Residential

EV must charge where it park, rather than the reverse

i.e. “Residential Charging is a major barrier...”

NO! Off-Street Residential Parking IS the Challenge



Charging at Home (low power, 15km/h):

- your own private garage
- loan private garage
- granted public garage (*)
- paid place on-street (reserved 22h-08h)(*)

(*) public administration involved

EV Charging Infrastructure. Residential

5 ZONES DE FACILITAT/DIFICULTAT D'IMPLANTACIÓ DEL VE

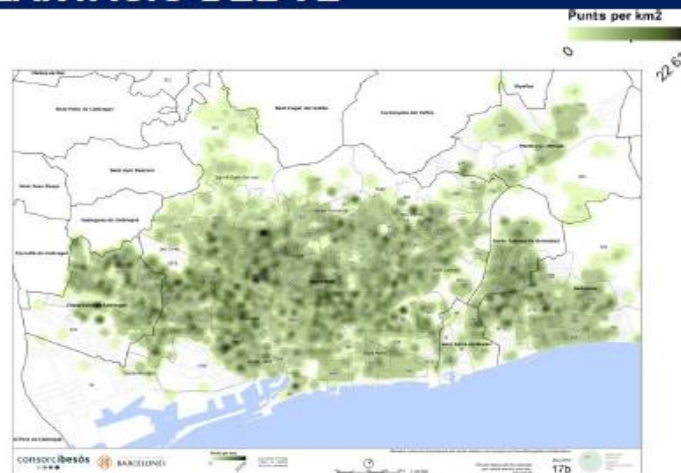
METODOLOGIA

Previsió dels punts de recàrrega per vehicle elèctric instal·lats.

ESCENARI A (21.113 punts)



ESCENARI B (131.804 punts)



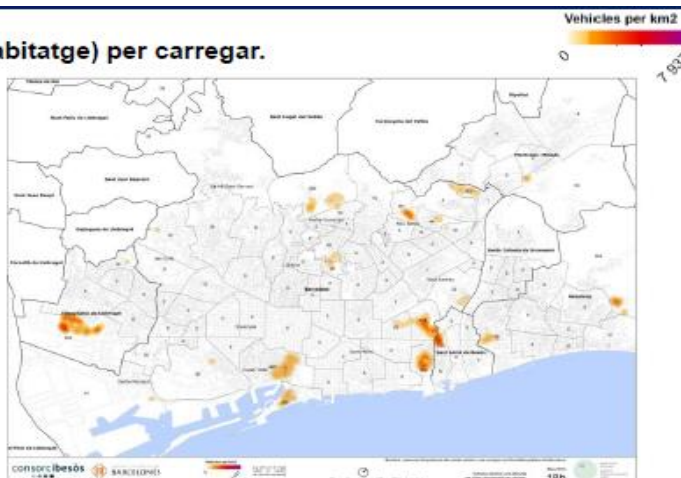
METODOLOGIA

Vehicles elèctrics amb dificultat per robar aparcament (proper a l'habitatge) per carregar.

ESCENARI A (228 vehicles)



ESCENARI B (4.102 vehicles)



EV Charging Infrastructure. Opportunity

EV must charge where it park, rather than the reverse.
Rules may force agents to install charging points in its facilities. (low-semi 15-50km/h)





EV Charging Infrastructure. Emergency

EV should quick charge when needed.

“RemoveFears” for privates, essential for professionals.

(Quick/Fast 100-200km/h)



EV Charging Infrastructure. Emergency

EV should quick charge when needed.

“RemoveFears” for privates, essential for professionals.

(Quick/Fast 100-200km/h) limited to 30’



EV Charging Infrastructure. Emergency

EV should quick charge when needed.

Criteria: Land Coverage

1 QC station/6'

20Km/h -> 2Km

60Km/h -> 6km

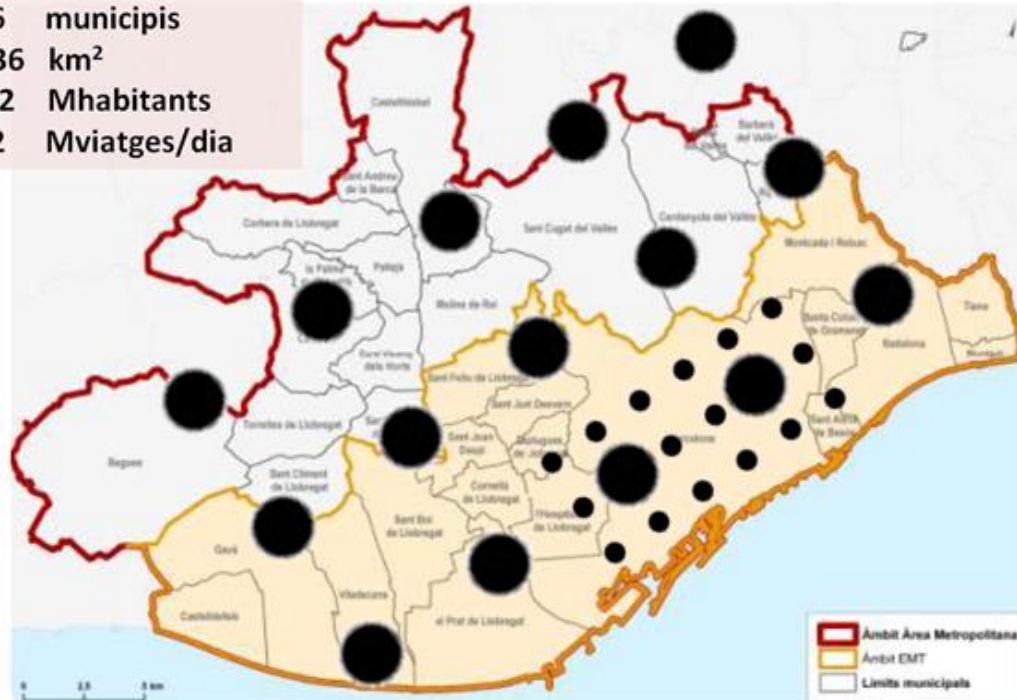
EMT vs AMB

18 -> 36 municipis

331 -> 636 km²

2,6 -> 3,2 Mhabitants

10 -> 12 Mviatges/dia





EV Charging Infrastructure. Emergency

EV should quick charge when needed.

EMT vs AMB

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



Criteria: Land Coverage

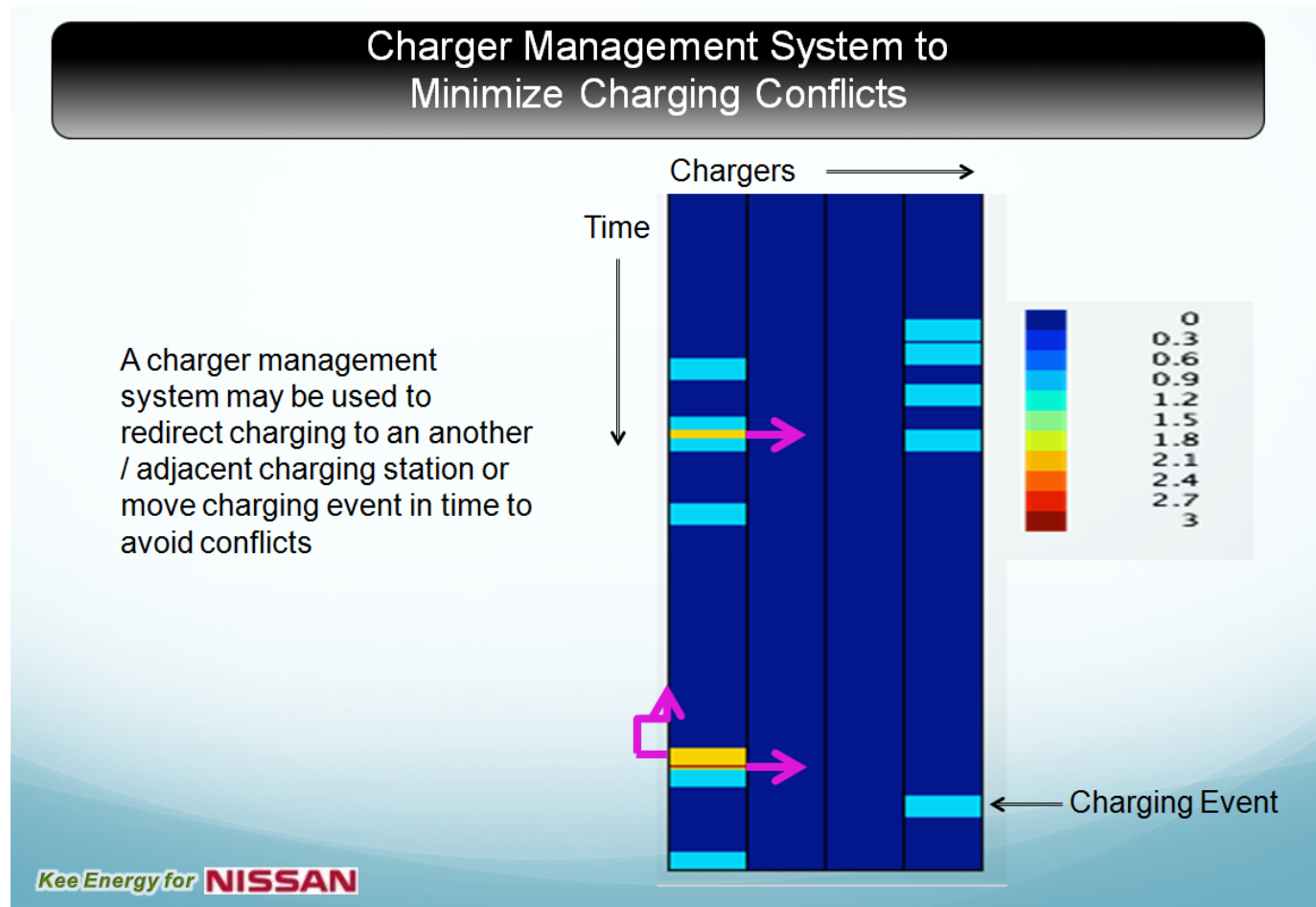
1 QC station/6'
20Km/h -> 2Km
60Km/h -> 6km

Criteria: Demand

Number of stands per station
<-> users demand



EV Charging Infrastructure. Emergency



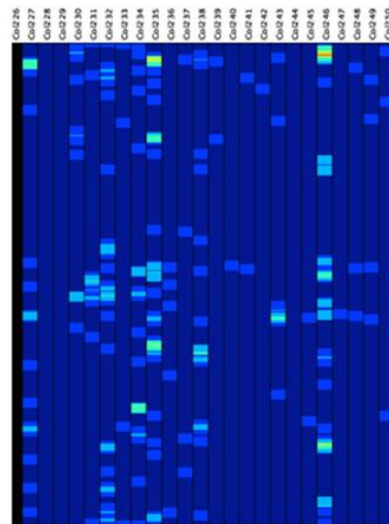


EV Charging Infrastructure. Emergency

Performance Improvement & Conflict Resolution Through Intelligent Charger Locations & Additions

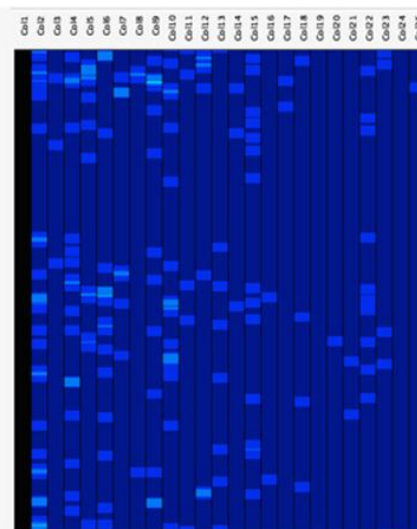
Comparison with 3 Undesignated Chargers Added to the Network

23 Chargers with 150 Taxis



40 Conflicts

26 Chargers Including 3
Additional and 150 Taxis



23 Conflicts

KeeEnergy for **NISSAN**



EV Charging Infrastructure. PHEV's hogging



Plug-in EV could use Opportunity and Emergency Chargers but there is the risk of hogging infrastructure while they aren't in a critical situation.

PHEV and EV without quick charger capabilities will be **banned** on QC Emergency Chargers



EV Charging Infrastructure. eMoto

EV motorbike should charge when needed. On-street.
(30-50 km/h)





EV Charging Infrastructure. OnRoute

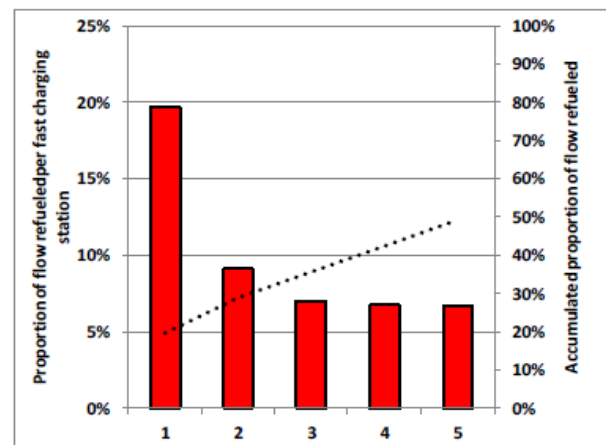
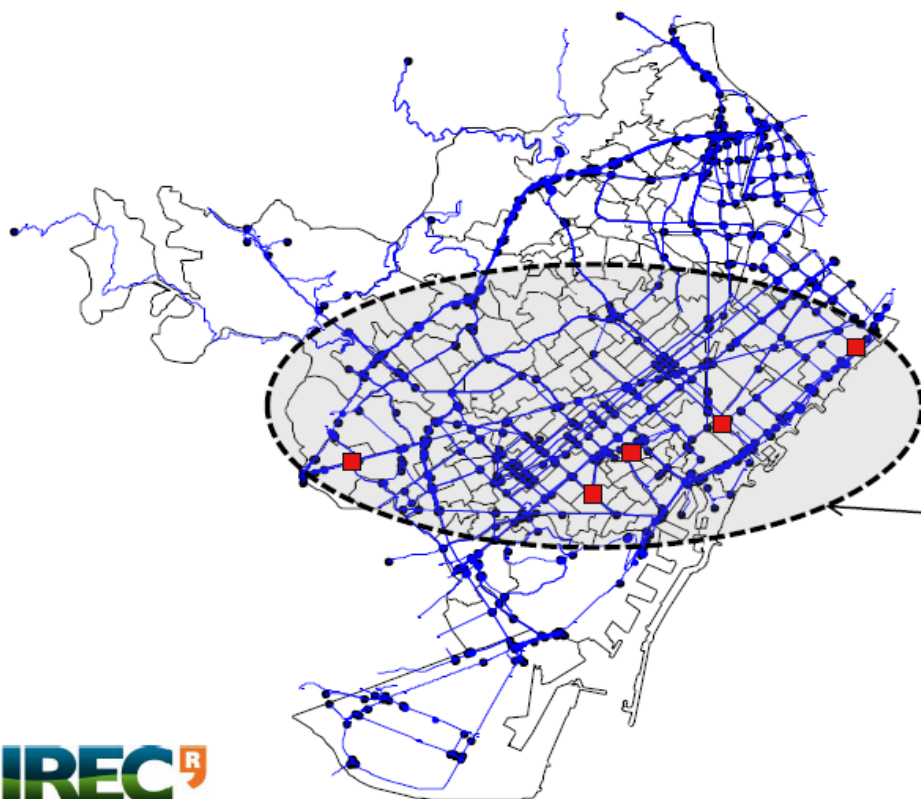
EV should quick charge when On Route. National Corridors.
Essential for professionals and long trips. “electrostation”
(Fast/Super 200-300km/30min)



EV Charging Infrastructure. OnRoute

EV should quick charge when On Route. National Corridors.

Results for refueling 50% of the traffic flow

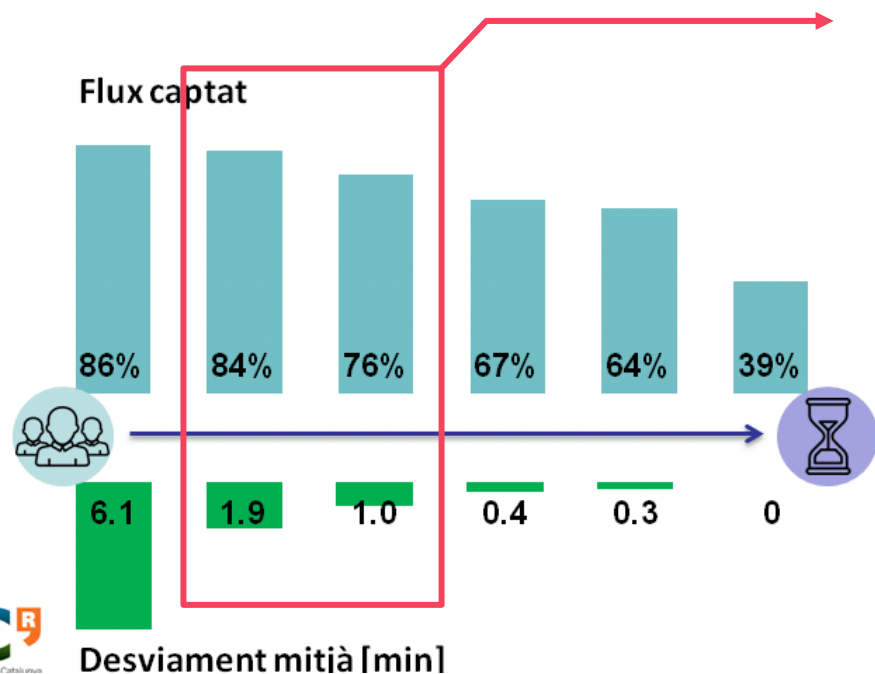


For **N=5** the **50%** of the EV traffic flow could be refueled.

Total cost of installation:
517,420 €

EV Charging Infrastructure. OnRoute

EV should quick charge when On Route. National Corridors.



EV Charging Infrastructure. BCN Public Network

- 26 Residential services in public garages overnight
- 154 Opportunity services in public garages off-street
- 16 Opportunity services for taxis/delivery in public space on-street
- 54+129 Opportunity services for eMoto in public off-street/on-street
- 17 QC Emergency services in public space on-street

PUNTS SUPERFÍCIE



Places per a MOTOS
en SUPERFÍCIE: Càrrega lenta.

- [illegible]



Places per a MERCADERIES
en SUPERFÍCIE: Càrrega semiràpida.

1. Liecurea, 140
2. Sant Adria, 11-21



Places per a TAXIS
en SUPERFÍCIE: Càrrega semiràpida.

- 3. Dressena - Av. Joan de Borbó
- 4. Villarroi, 277 - Av. Diagonal
- 5. Pg. García i Farió - Carrer de Josep Pla
- 6. Llànça, 1 - Av. Paral·lel



Places per a COTXES
en SUPERFÍCIE: Càrrega ràpida.

- 1 Ronda Litoral, Sortida 73 - Av. Litoral, 49
- 2 Via Augusta, 352
- 3 Aparcament Virtual, 5-25 - Guizard, 1
- 4 Pl. Altamira Corrió, 12
- 5 Torredà de l'Olí, 203
- 6 Via Favència, 21 (Mercat Canyellas)
- 7 Mas Casanova, 69
- 8 Av. Meridiana, 400 E
- 9 Provença, 447 - Marina
- 10 Passeig de Gràcia, 5

PUNTS SOTERRATS



Places per a MOTOS
SOTERRADES.

- 36 C/ Gran de Gràcia, 190



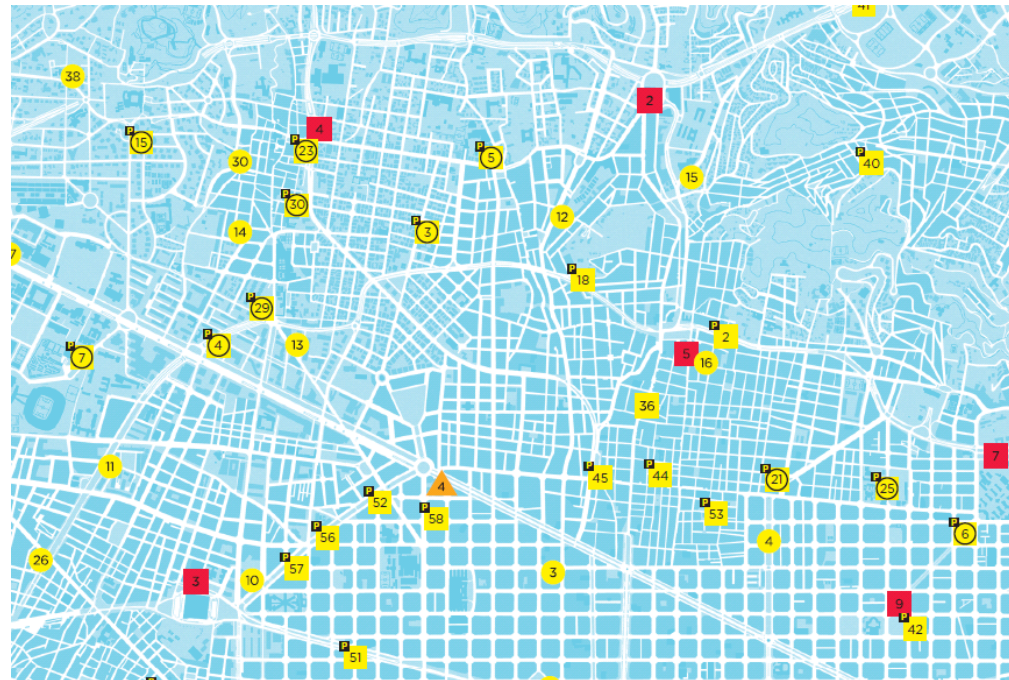
**Places per a COTXES
SOTERRADES.**

- C/ El Moribón de la Hambría, 8 S
C/ Torment de l'Oliva, 221
C/ de la França Xosa, 35
Pg. García Fariña, 71 (entre Josep Pla i Selves de Mar)
Av. Litoral, 34
Ronda del General Mitre, 203
C/ Gálvez, 36
C/ Clafut de Granada, 173-175
Rambla del Poblenou, 150-185
C/ Ramón Trias Fargas, 19 (C/ Vilanova)
Pl. Salvador Alendà
Pg. Vall d'Hebron, 130-176
C/ Mallorca, 425
C/ Sancho de Austria, 72
Pl. del Sol, 5
Pl. del Pàcciu, 2
C/ Santa Urgel, 12
C/ de Santa Rafael, 15
C/ de l'Alcal Sadoni, 2
C/ Valencia, 77
Av. Josep Terradellas, 139
C/ Encarnació, 3
C/ Valencia, 20
Avda. Josep Terradellas, 64
Avda. Josep Terradellas, 46
C/ Lluïssia, 55



**Places per a COTXES I MOTOS
SOTERRADES.**

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Ajuntament
de Barcelona

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