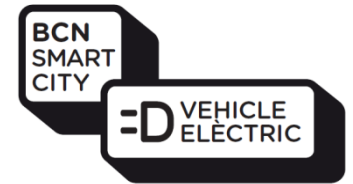


Deployment of a Charging Infrastructure in Barcelona

eCarTec Munich, October 23th, 2014

Àngel López
eMobility Program Manager
Barcelona City Council



FIRST STEPS (2009)

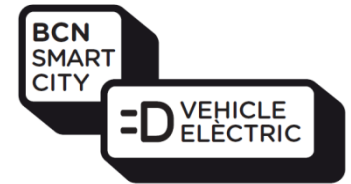
- Installation and commissioning of 10 stations with a total of 20 charging points for ecars and ebikes. AGENCIA DE LA ENERGIA DE BARCELONA.
- Installation and commissioning of 2 stations with a total of 2 charging points for ecars in 22@BCN district.
- Installation and commissioning of 5 stations with a total of 42 charging points for ebikes. MOBECPOINT.



AGÈNCIA D'ENERGIA
DE BARCELONA



mobecpoint



FIRST STEPS (2010)



- Plan Movele to promote infrastructures (1M€, Madrid, Barcelona and Sevilla)
- Agreement with ENDESA for the installation and commissioning of 28 stations with a total of 56 EV charging points.
- Agreement with MOBECPOINT & IBERDROLA for the installation and commissioning of 5 stations with a total of 30 eMotorbike charging points.

- Agreement with Parking operators for the installation and commissioning for a total of 54 charging points on off-street parking lots: BSM, TABASA, REGESA y PCB.





FIRST STEPS: ENDESA





FIRST STEPS: MOBECPOINT



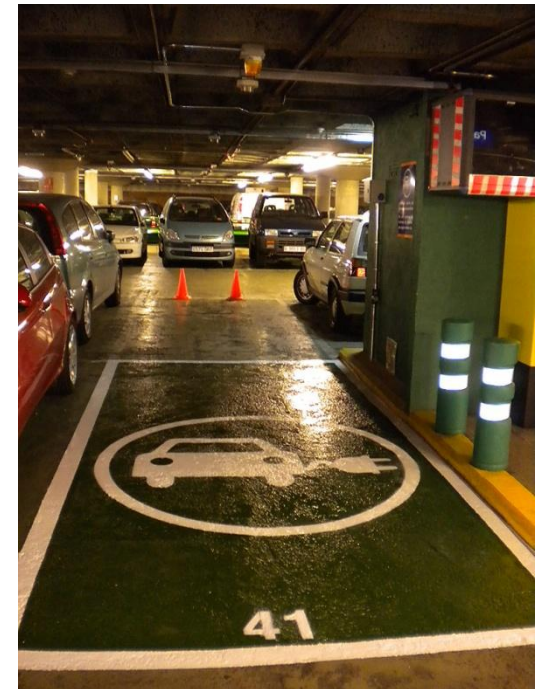


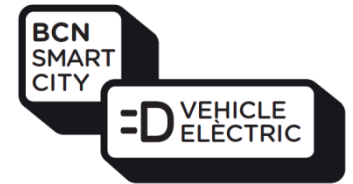
FIRST STEPS: Agencia Energia de Barcelona





FIRST STEPS: PARKING LOTS





EV CityCARD to activate charging points

- The EV Citycard is to identify users of electric vehicles in the city of Barcelona. This card offers the possibility of electric recharging anywhere in the city.
- Moreover, with the identification card of electric vehicles the users can park, for free, in regulated areas of the city (Green Zone and Blue Area), according to the criteria established

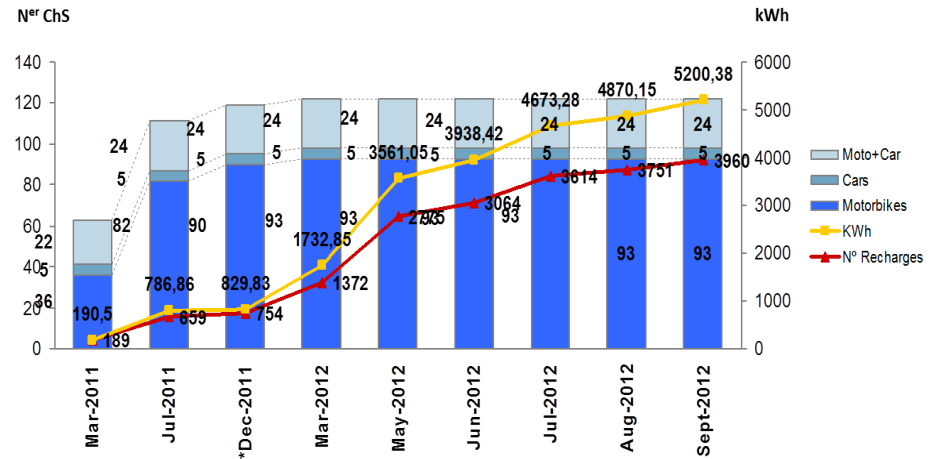




SCARCE SUCCESS



Més de 240 punts de recàrrega PÚBLICS



Anàlisi d'ús i consums punts connectats al Centre de Control



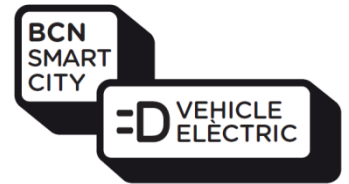


SCARCE SUCCESS (in number of private ecars)



n^{er} EV in Public Fleet	294
Little Van	199
Middle Van	28
Big Van	38
Tourism	14
Special vehicles	2
Motorbikes	13
n^{er} EV Private (estimated by EV user card)	244
Motorbikes	129
Tourism	74
Vans	1
Moped	40
Total EV	538







NEW APPROACH (2013): QC network on-street

Nov2013 The first QC Tristandard

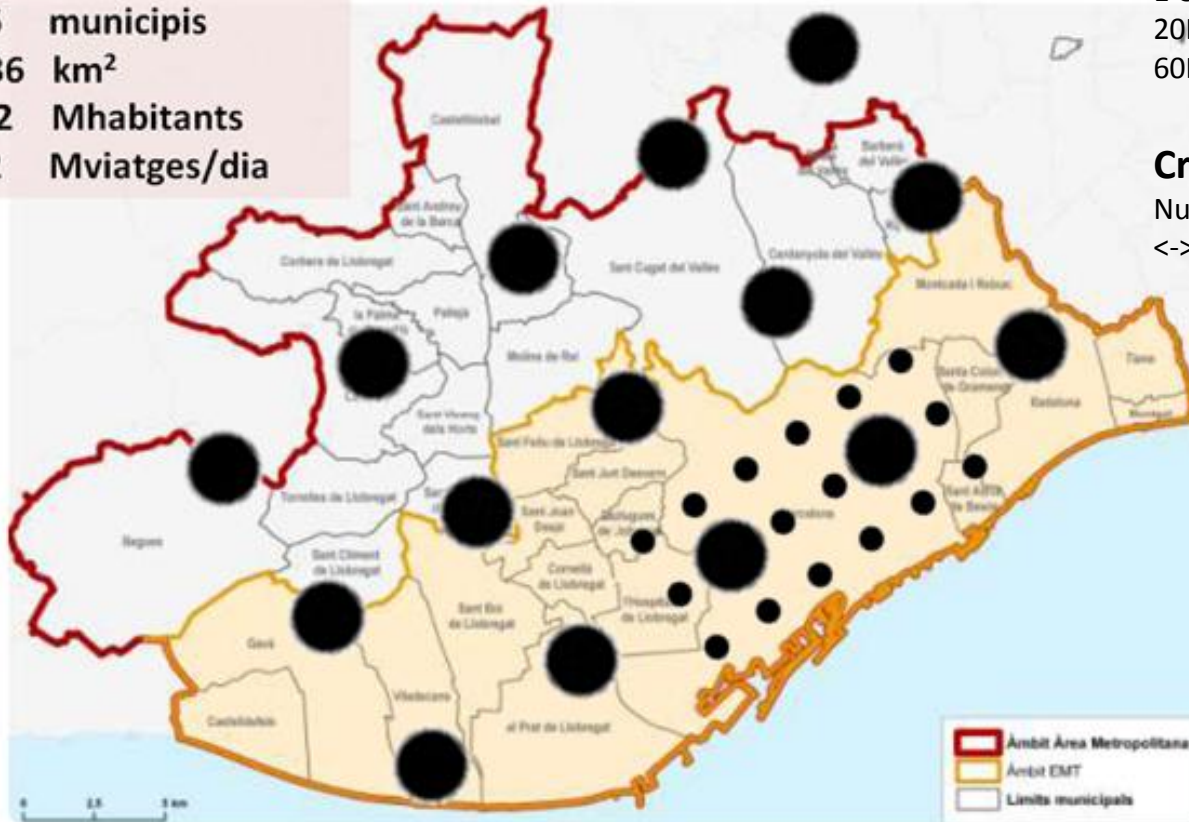




BASIC FIRST LAYOUT

EMT vs AMB

18 -> 36 municipis
331 -> 636 km²
2,6 -> 3,2 Mhabitants
10 -> 12 Mviatges/dia

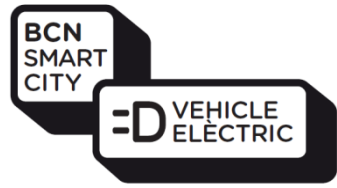


Criteria: Land Coverage

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

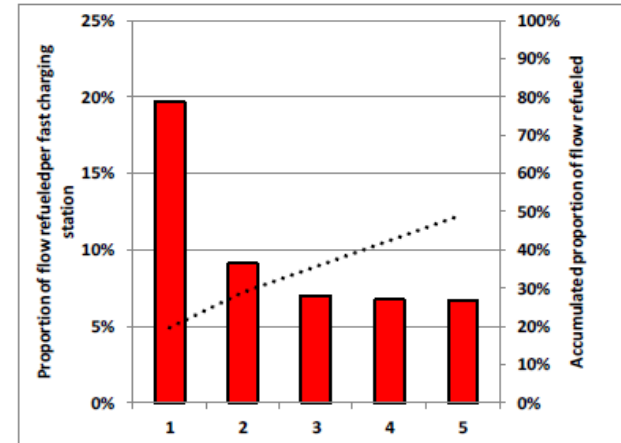
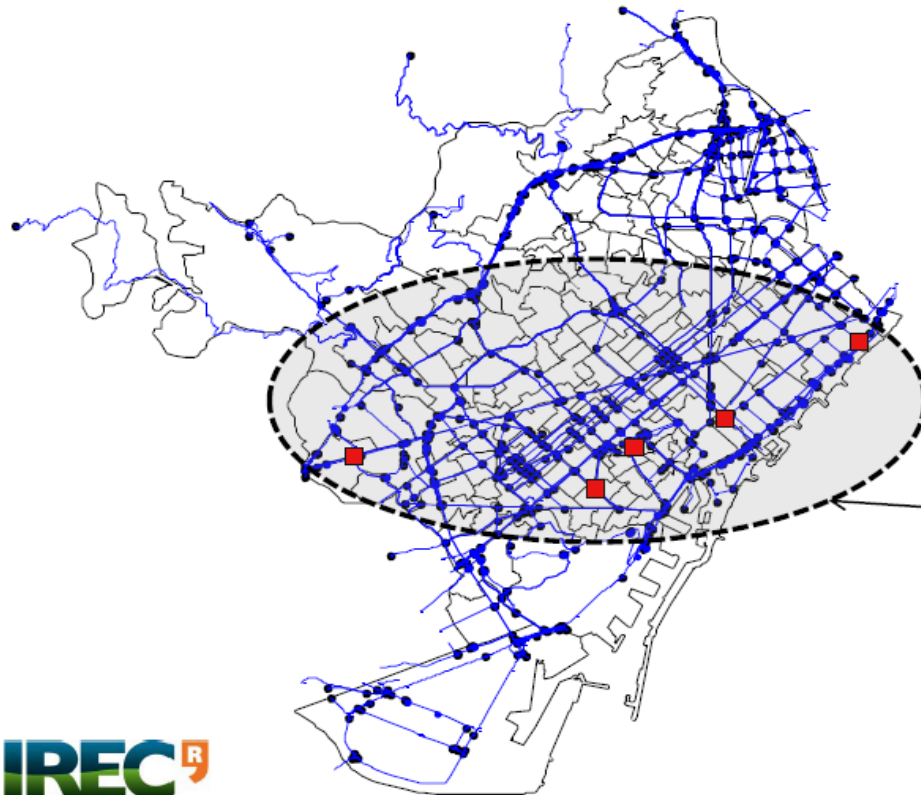
Criteria: Demand

Number of stands per station
<-> users demand



Methodology I: Flow-capturing planning model

Results for refueling 50% of the traffic flow



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

Further information

Optimal location of fast charging stations in Barcelona: A Flow-Refuelling approach

M. Cruz Zambrano, V. Bernardo, C. Corchero, L. Iguada Gonzalez

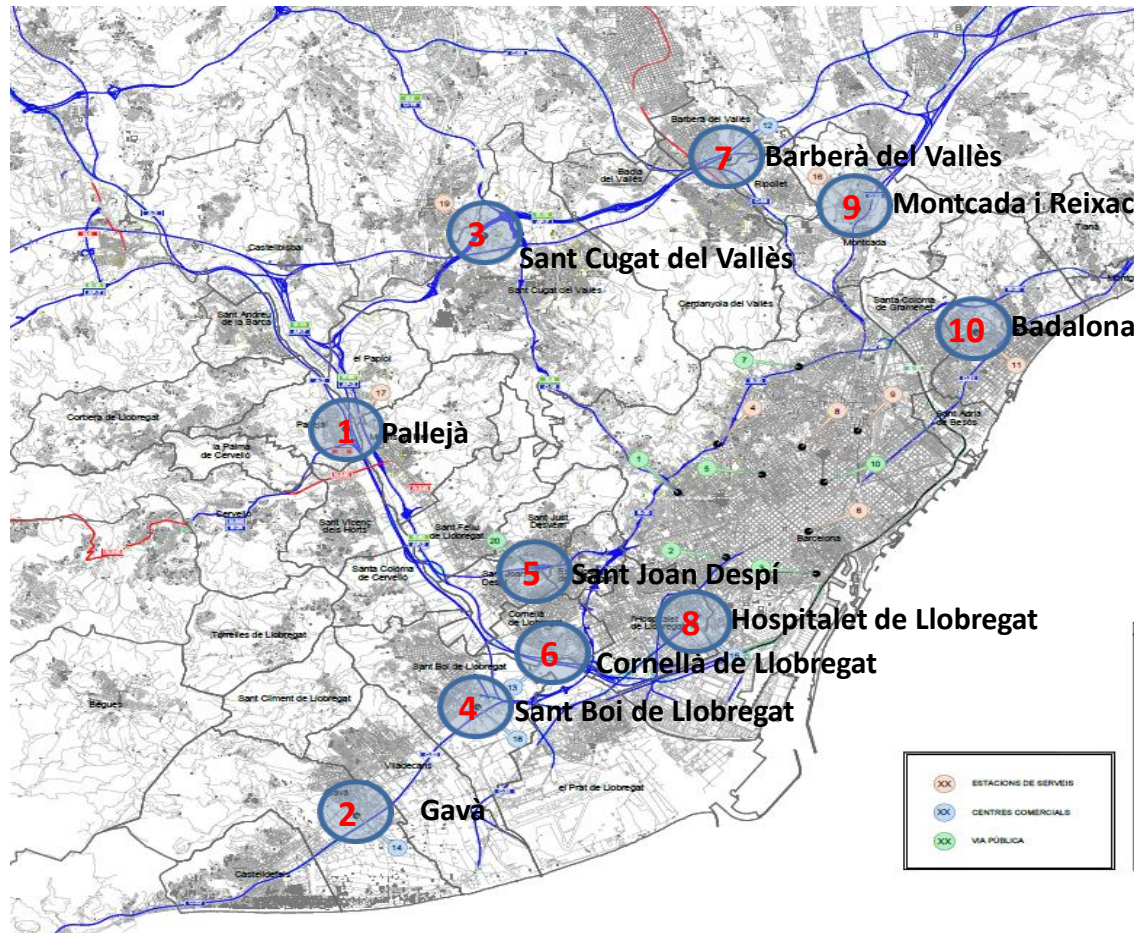
Abstract—The aim of this paper is to find the optimal location of electric vehicle (EV) fast charging stations by means of two methodologies: a classical flow-capturing optimization model involving only mobility needs, and an advanced flow-capturing optimization model including distribution network and location costs. While the first model aims to maximize the public service provided by the fast charging stations, the second one considers the incurred cost for providing it. Results from both models are compared in order to analyze the effect of both planning approaches in total cost of installation. As a case study it has been chosen the city of Barcelona.

TABLE I
TECHNOLOGICAL ALTERNATIVES FOR EV FAST CHARGING STATIONS

Model	AC	DC	AC/DC	AC/DC	AC/DC
Power	100kW	150kW	150kW	150kW	150kW
Voltage	200V	400V	400V	400V	400V
Capacity	100	150	150	150	150
Duration of 200Wh charge cycle	27min	21min	18min	18min	18min



BASIC FIRST LAYOUT



Criteria: Land Coverage

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

Criteria: Demand

Number of stands per station
<-> users demand

Criteria: Main Roads

Stations near strategic points

Legend:

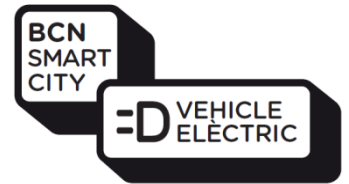
- XX ESTACIONES DE SERVIDE
- XX CENTRES COMERCIALS
- XX VIA PUBLICA

ID	NOM	DIRECCIO	POBLACIO	CODI POSTAL
1	VIA PUBLICA	C/ HORT DE LA VILA ANNI VIA AUGUSTA	BARCELONA	08027
2	VIA PUBLICA	C/ VIRIAT LAPARCAMENT	BARCELONA	08034
3	VIA PUBLICA	AVANGUDA PARAL·LEL, 55	BARCELONA	08004
4	E.S. RESPOL	PG. VAL·L D'HERMIN / COLLSEROLA	BARCELONA	08035
5	VIA PUBLICA	C/ TORRENT DE L'OLIA, 20	BARCELONA	08022
6	E.S. CIPSA-EIP	PASSEIG DE GRACIA 2	BARCELONA	08002
7	VIA PUBLICA	VIA FAVORITA 39	BARCELONA	08042
8	E.S. RESPOL	MAR DE DEU DE MONTSERRAT / FRANCESC ALEGRE	BARCELONA	08024
9	E.S. RESPOL	AV. MERIDIANA / FELIPE II	BARCELONA	08027
10	E.S. RESPOL/VIA PUBLICA	C. MARINA / AV. GALDI	BARCELONA	08025
11	E.S. LLOBREGAT	RAMBLA SANT JOAN, 116	BARCELONA	08914
12	E.S. BARRI CENTRE	CARRETERA N-150, KM. 2	BARCELONA DELS VALLES	08210
13	E.S. BARRI CORNEL·LA	AVANGUDA DEL BARRI LLOBREGAT, S/N	CORNEL·LA	08940
14	E.S. BARRI SUD - GAVA	CARRER DEL PROGRES, 69	GAVA	08820
15	E.S. GRAN VIA 2	AVANGUDA DE LA GRAN VIA 75	HOSPITALET DELS LLOBREGAT	08908
16	E.S. MONTCADA	CTRA. C-37, KM. 4-85	MONTCADA I REIXAC	08810
17	E.S. PALLEJA	AUTOPISTA C-32	PALLEJA	08960
18	E.S. ALCAMPO SANT BOI	CARRER ALBEREDERES, 6-B P·LES SAUINES	SANT BOI	08830
19	E.S. SANT CUGAT	ENCL. CTRA. GRACIA-MANRESA	SANT CUGAT DELS VALLES	08874
20	VIA PUBLICA	CARRER DE LA TIG S/N	SANT JOAN DESPI	08970



PdRR CIRCONTROL Sortida 23 Rda. del Litoral





QC NETWORK – TRiStandard on-street (2013 – today)

Agreement with CarMakers for the Installation of
20 stations with CHADEMO + Mennekes + CCS COMBO



RENAULT





PdRR DBT universal. Conveni NISSAN-BMW-RENAULT



Viriat 25-35 (set-14)

Via Augusta 358 (set-14)

Pl. Alfonso Comín (set-14)

Torrent de l'Olla 203 (set-14)

Mas Casanova 71 (set-14)

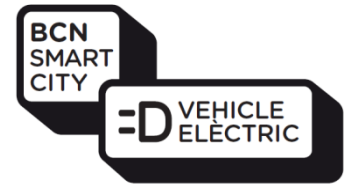
Via Favència 21 (set-14)

Av. Meridiana 408 (set-14)

Mercabarna (MERCABARNA) (des-14)

Pla de Palau 4 (des-14)

Fra Juniper Serra 59 (des-14)



QC NETWORK – TRstandard on-street (2013 – today)

Agreement with Utility Provider ENDESA-ENEL for the Installation of 5 stations with CHADEMO + Mennekes + CCS COMBO





PdRR FASTO universal. Conveni ENDESA



Provença 447 (set-14)

Av. De l'Estatut de Catalunya (fotovoltaica) (des-14)

Av. Diagonal (BIMSA) (feb-15)

Pg. De Gràcia (BIMSA) (feb-15)

Av. Paral·lel (BIMSA) (feb-15)



(2014 1T) 1 PdRR públic universal

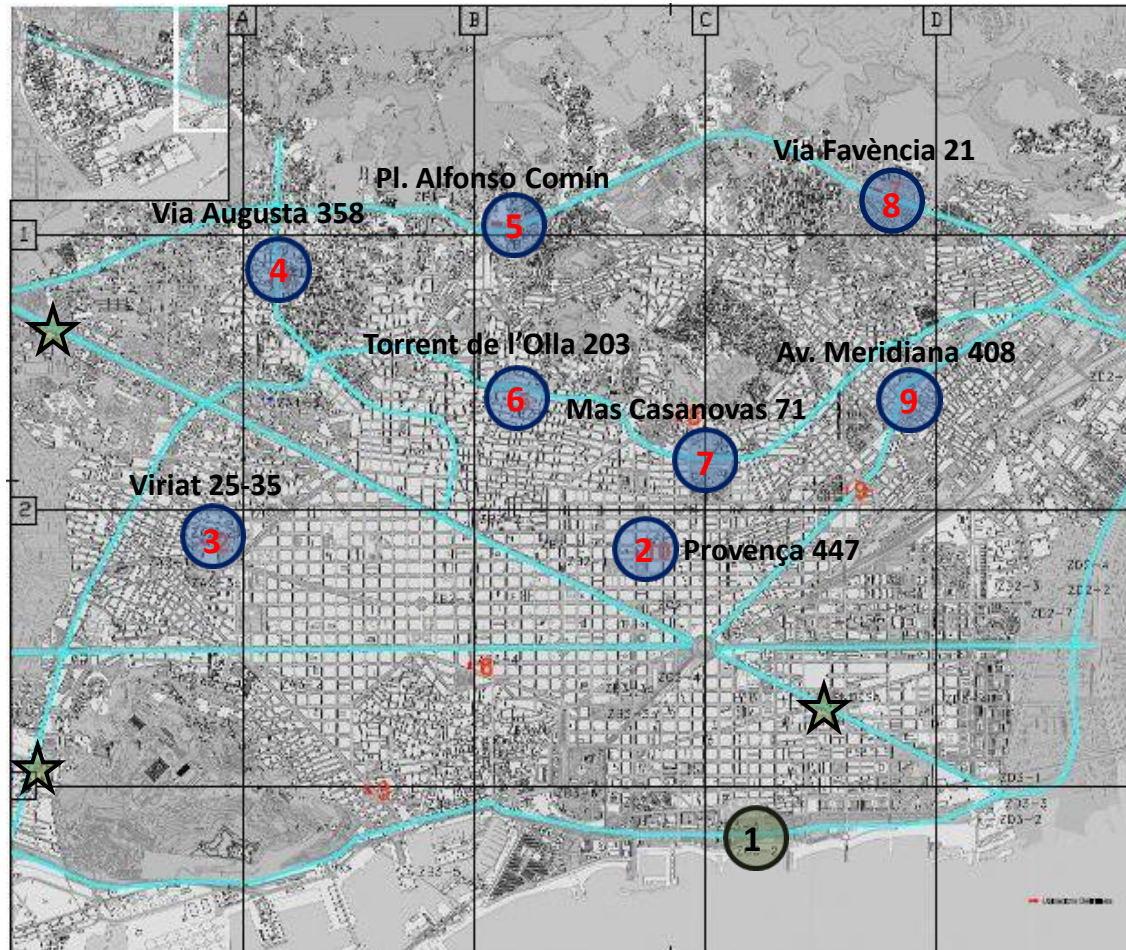
(CHAdEMO + CCS-Combo + Mode3 44kW) i 3 PdRR privats (CHAdEMO)



- ★ 3 PdRR Existents Privats (CHAdEMO)
- 1 PdRR Existent Públic (Universal)



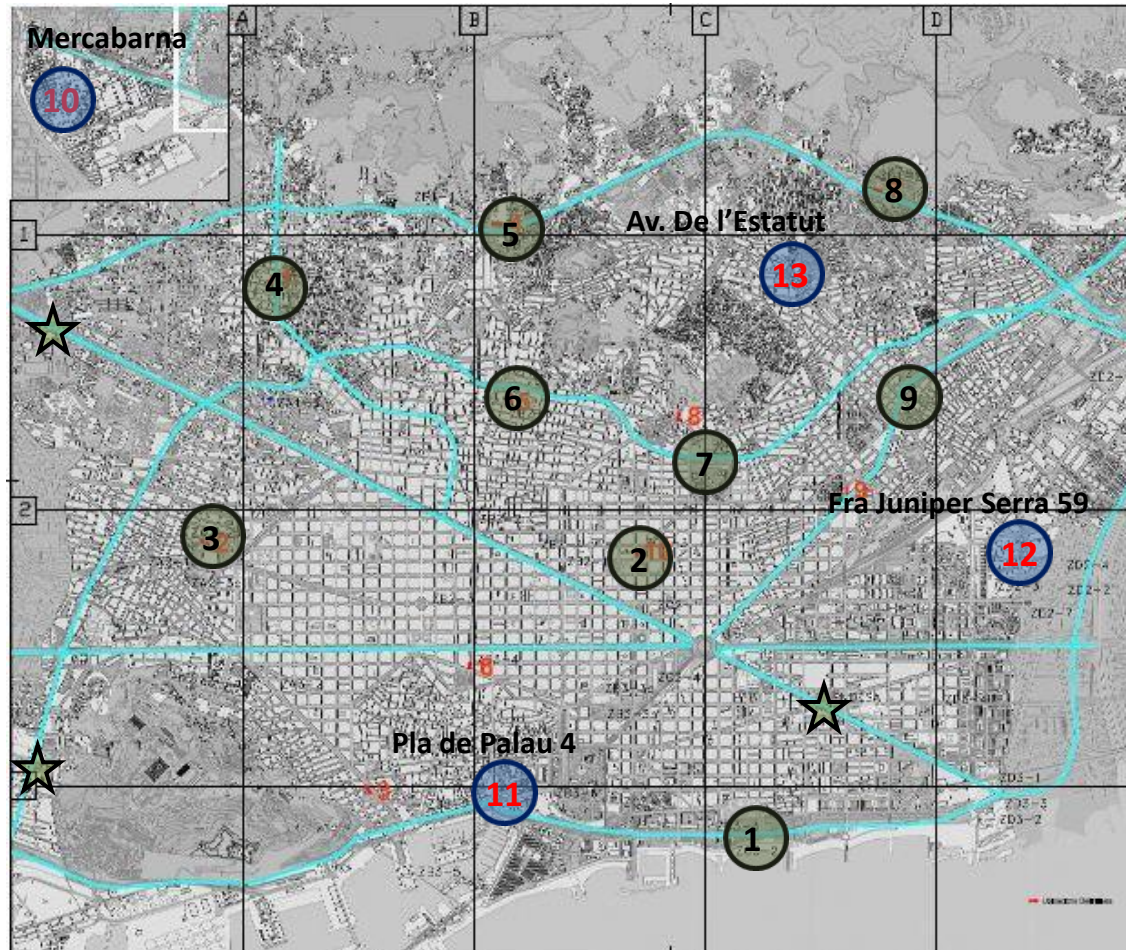
(2014 3T today) 9 PdRR públics universals



- ★ 3 PdRR Existents Privats (CHAdEMO)
- 1 PdRR Existent Públic (Universal)
- 8 PdRR Públics nous (Universal)



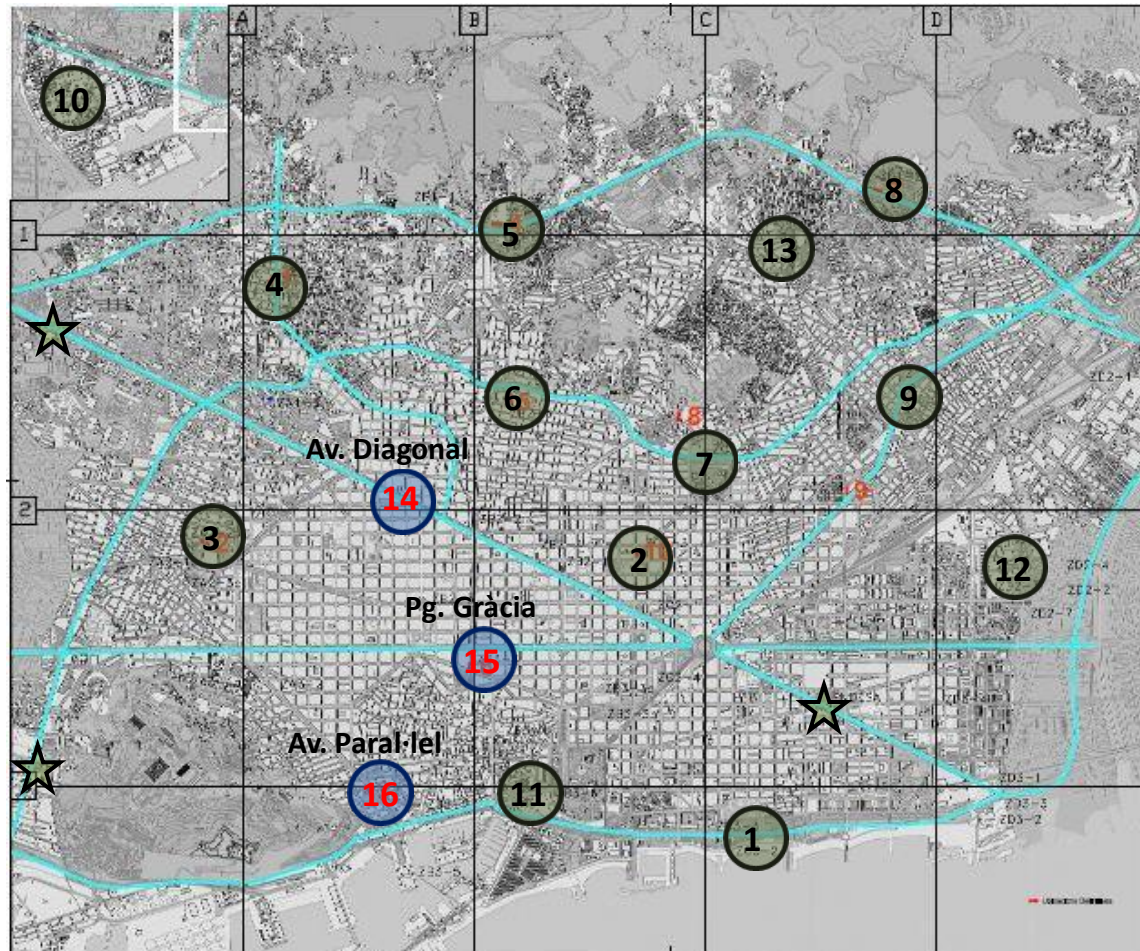
(2014 final 4T) 12 PdRR públics universals



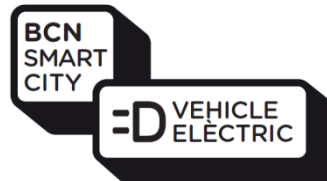
- ★ 3 PdRR Existents Privats (CHAdEMO)
- 9 PdRR Existent Públic (Universal)
- 4 PdRR Públics nous (Universal)



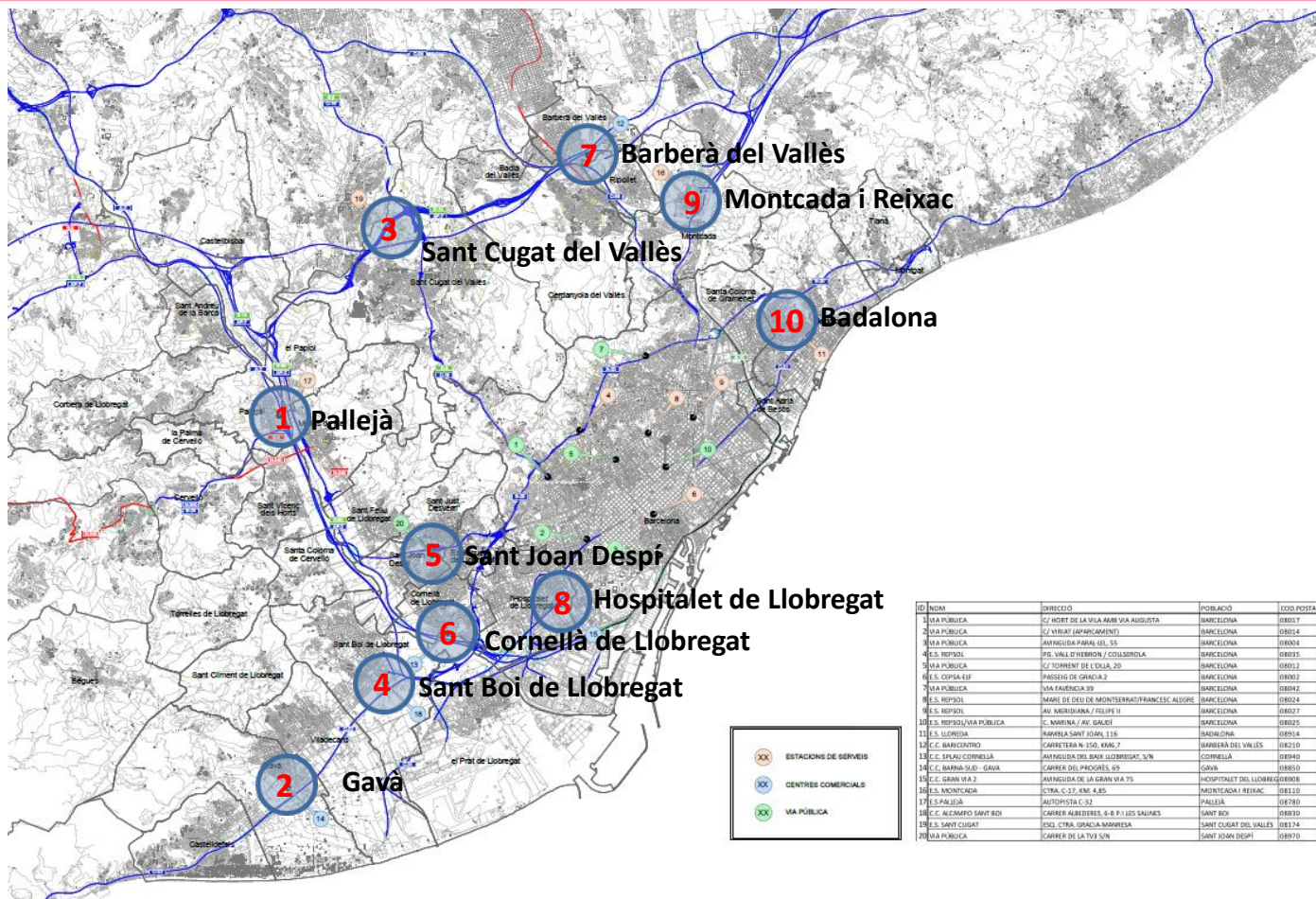
(2015 1T) 16 PdRR públics universals



- ★ 3 PdRR Existents Privats (CHAdEMO)
- 13 PdRR Existent Públic (Universal)
- 3 PdRR Públics nous (Universal)



(2015 T1) 10 PdRR públics universals a l'Àrea Metropolitana de Barcelona

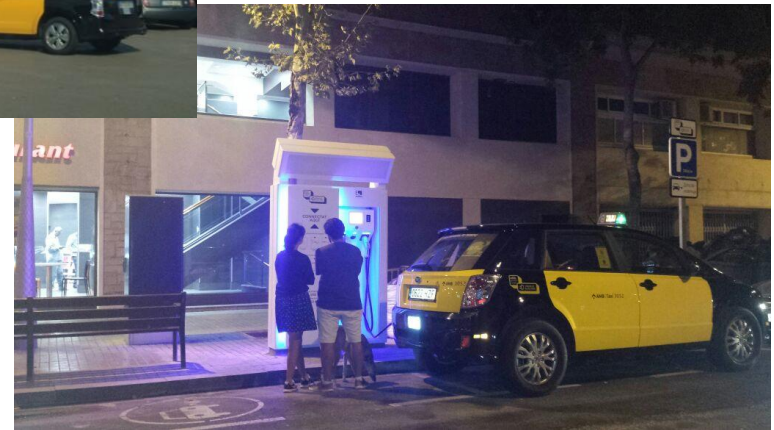


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1	VIA PÚBLICA	C/2 HORT DE LA VILA AMB VIA AUGUSTA	BARCELONA	08017
2	VIA PÚBLICA	C/2 VIRIAT (APARCAMENT)	BARCELONA	08014
3	VIA PÚBLICA	AMANGUDA PARAL. 01	BARCELONA	08004
4	S. RESPOL	PL. VILA D'HERBES I COLLEROLA	BARCELONA	08015
5	VIA PÚBLICA	C/2 TORRENT DE COLLA 20	BARCELONA	08012
6	S. CEPSA-EIF	PASSEIG DE GRACIA 2	BARCELONA	08002
7	VIA PÚBLICA	VIA FAUCONIA 39	BARCELONA	08042
8	S. RESPOL	MARÍ DE DEU DE MONTSERRAT/FRANCESC ALDRE	BARCELONA	08014
9	S. RESPOL	AV. AMERIGIANA / FELIPE II	BARCELONA	08027
10	S. RESPOL/VIA PÚBLICA	C. MARINA / AV. GALDI	BARCELONA	08025
11	S. LLOPDIÀ	RAMBLA SANT JOAN, 138	SADADIANA	08914
12	C. BARCELONINO	CARRETERA N.130, KM.7	BARBERÀ DEL VALLES	08210
13	C. C. S'PLAU-CORNELLÀ	AMANGUDA DEL BARRI LLOBREGAT, S/N	CORNELLÀ	08940
14	C. C. BARRA-SUD - GAVÀ	CARRER DEL PROGRÉS, 69	GAVÀ	08850
15	C. C. GRAN VIA 2	AMANGUDA DE LA GRAN VIA 75	HOSPITALET DEL LLOBREGAT	08908
16	S. MONTCADA	CTRA. C.17, KM. 4, 85	MONTCADA I REIXAC	08110
17	S. PALLEJÀ	AUTOPISTA C-32	PALLEJÀ	08780
18	C. C. ALCAMPO SANT BOI	CARRER ALBERDERS, 6-B P. LES SAUNES	SANT BOI	08830
19	S. SANT CUGAT	ENCL. CTRA. GRACIA-MANRESA	SANT CUGAT DEL VALLES	08174
20	VIA PÚBLICA	CARRER DE LA TIVÀ SUN	SANT JOAN DESPÍ	08910

- ESTACIONS DE SERVEIS
- CENTRES COMERCIALS
- VIA PÚBLICA

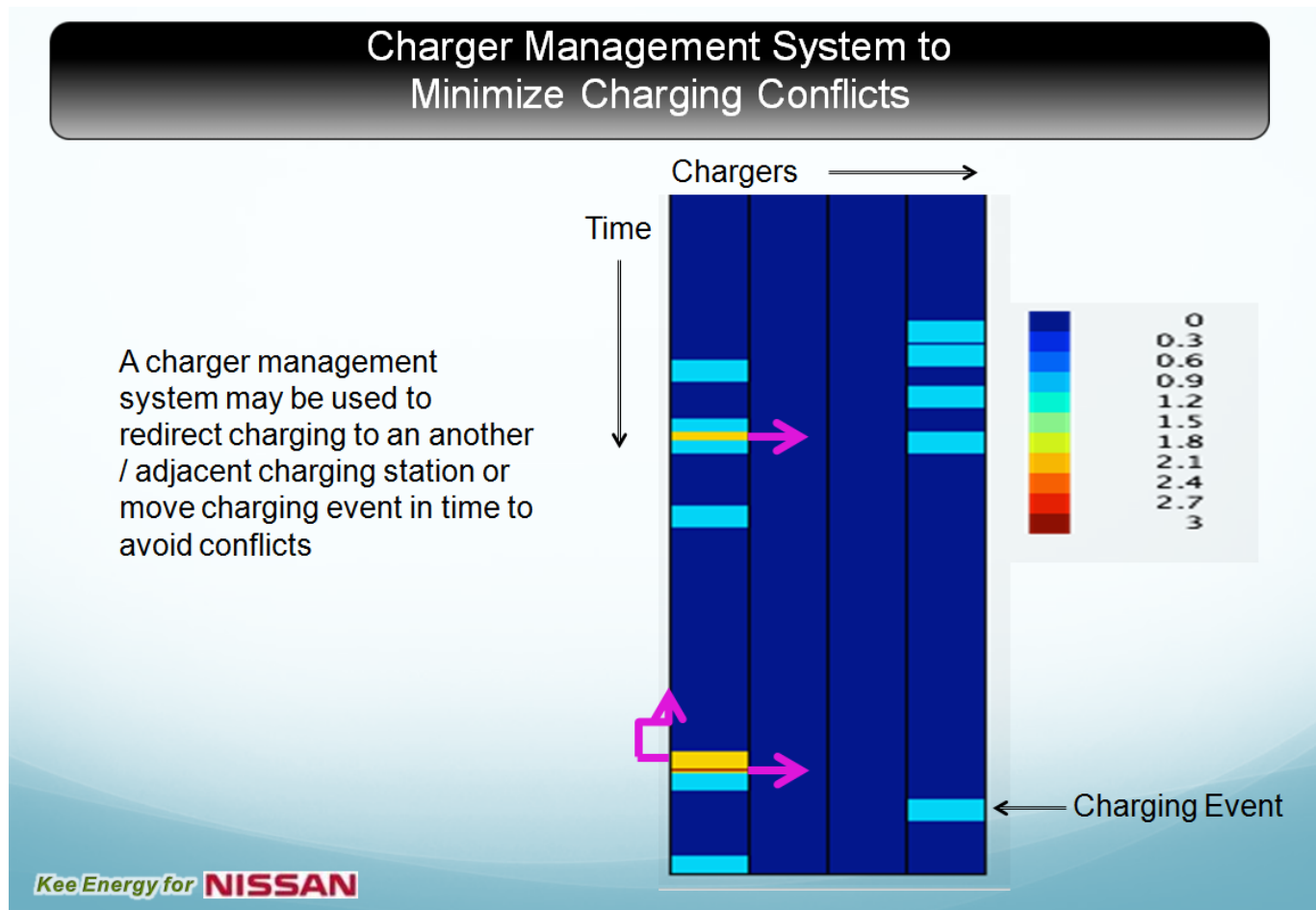


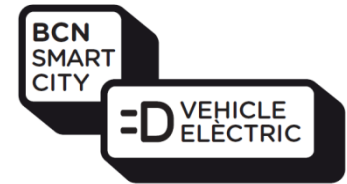
SOME INITIAL RESULTS





SOME INITIAL CONSIDERATIONS



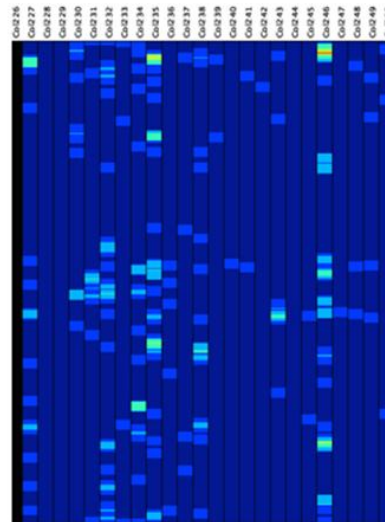


SOME INITIAL CONSIDERATIONS

Performance Improvement & Conflict Resolution Through Intelligent Charger Locations & Additions

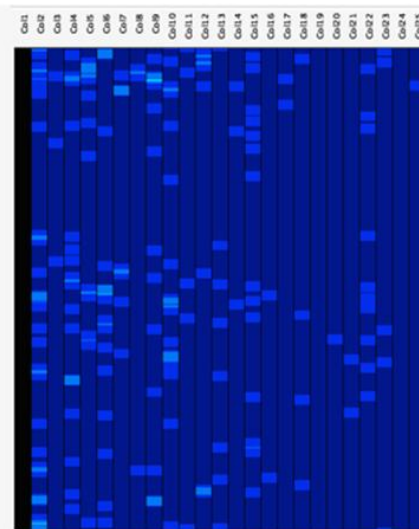
Comparison with 3 Undesignated Chargers Added to the Network

23 Chargers with 150 Taxis



40 Conflicts

26 Chargers Including 3 Additional and 150 Taxis



23 Conflicts

Kee Energy for NISSAN



Ajuntament
de Barcelona

B