VPPC 2014
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"Spreading E-Mobility Everywhere"
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EV ECOSYSTEMS
Charging infrastructure-past and future

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COIMBRA
29.Oct.2014

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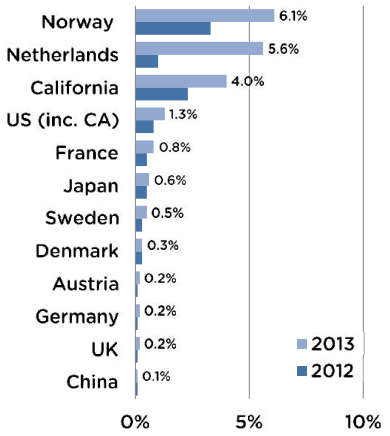
electric mobility: (a) market perspective

electrification of mobility beyond the point of no return

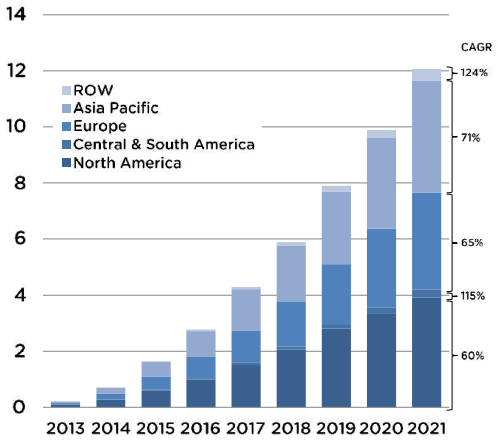
Sustainable EV adoption?

Market penetration (% of new car sales) reach 4-6% levels in some markets (BEV+PHEV)



Source: ICCT

Projected CAGR of 66% estimates sales of 10 M EVs by 2020 (20 M on global roads)



Source: zpryme

Infrastructure

+ 54 000 EVSE globally, with ambitious targets ahead (EU: 800 000 by 2020)

+ 50 000 public EVSE deployed globally

+ 4000 quick chargers

Sources: IEA, EVI, CHAdeMO

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infrastructure: connecting the EV ecosystem

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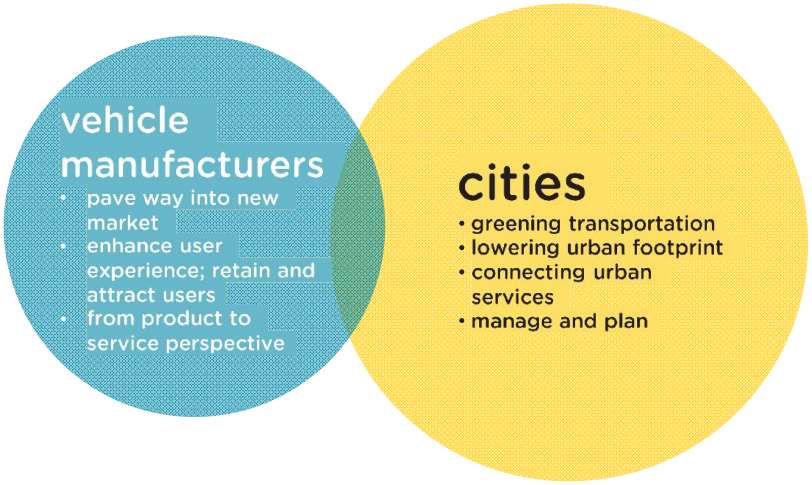

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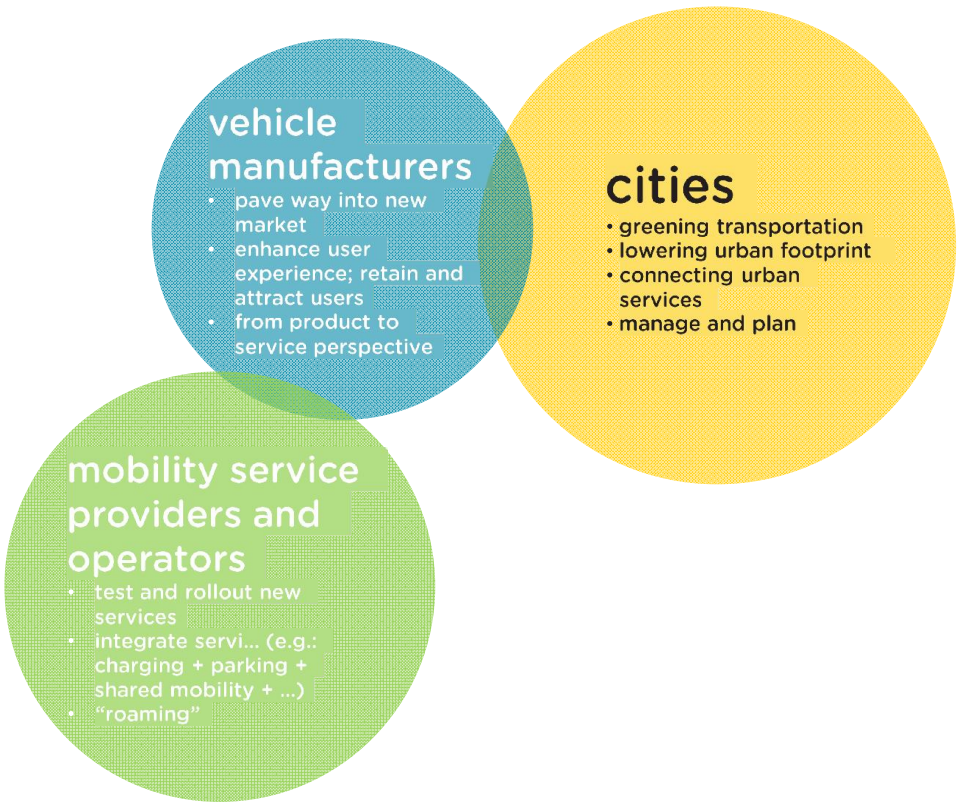
infrastructure: connecting the EV ecosystem



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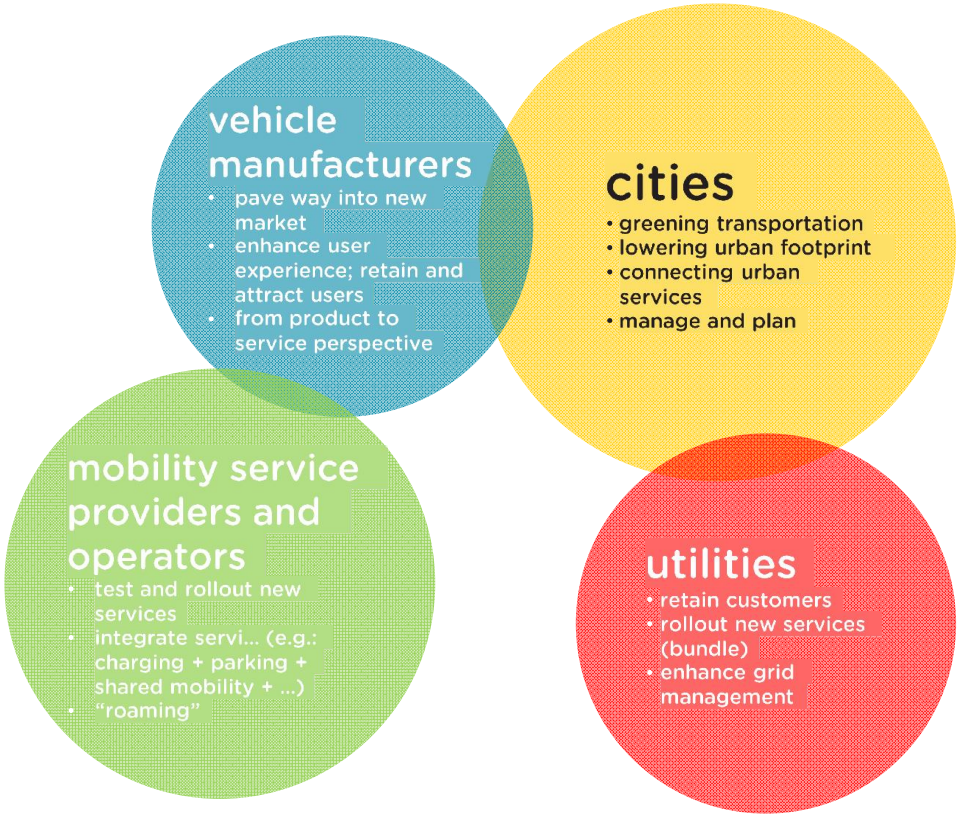
infrastructure: connecting the EV ecosystem



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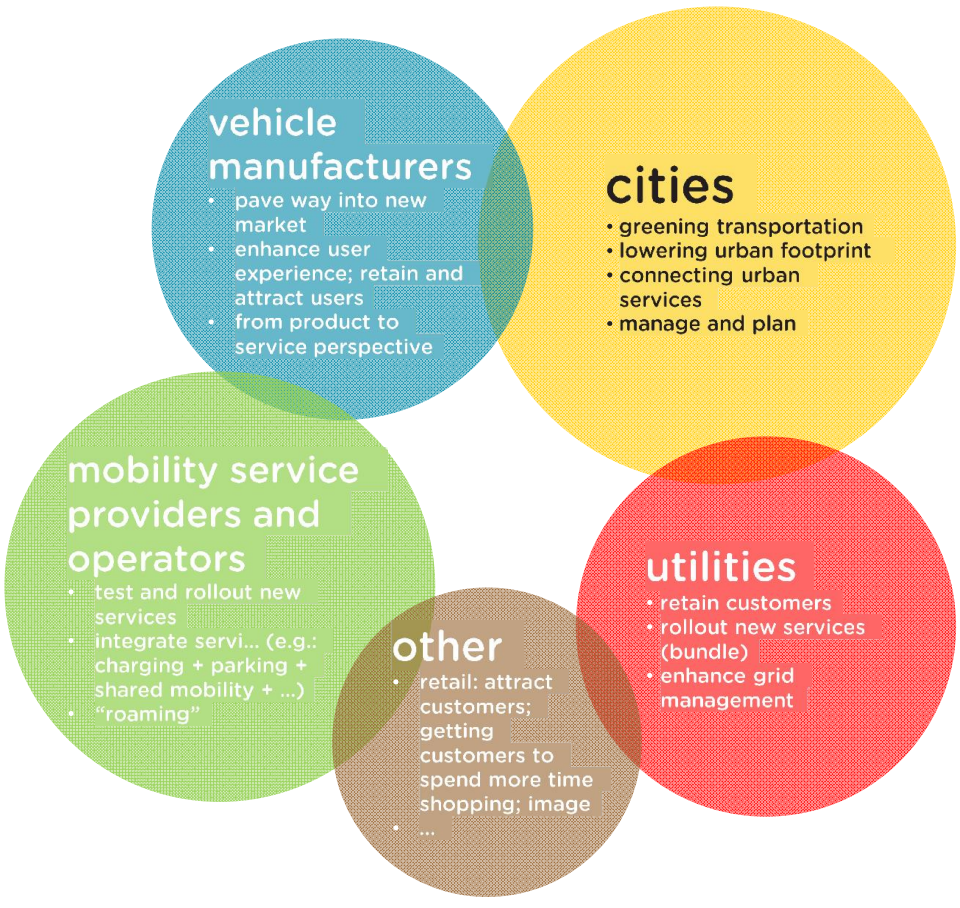
infrastructure: connecting the EV ecosystem



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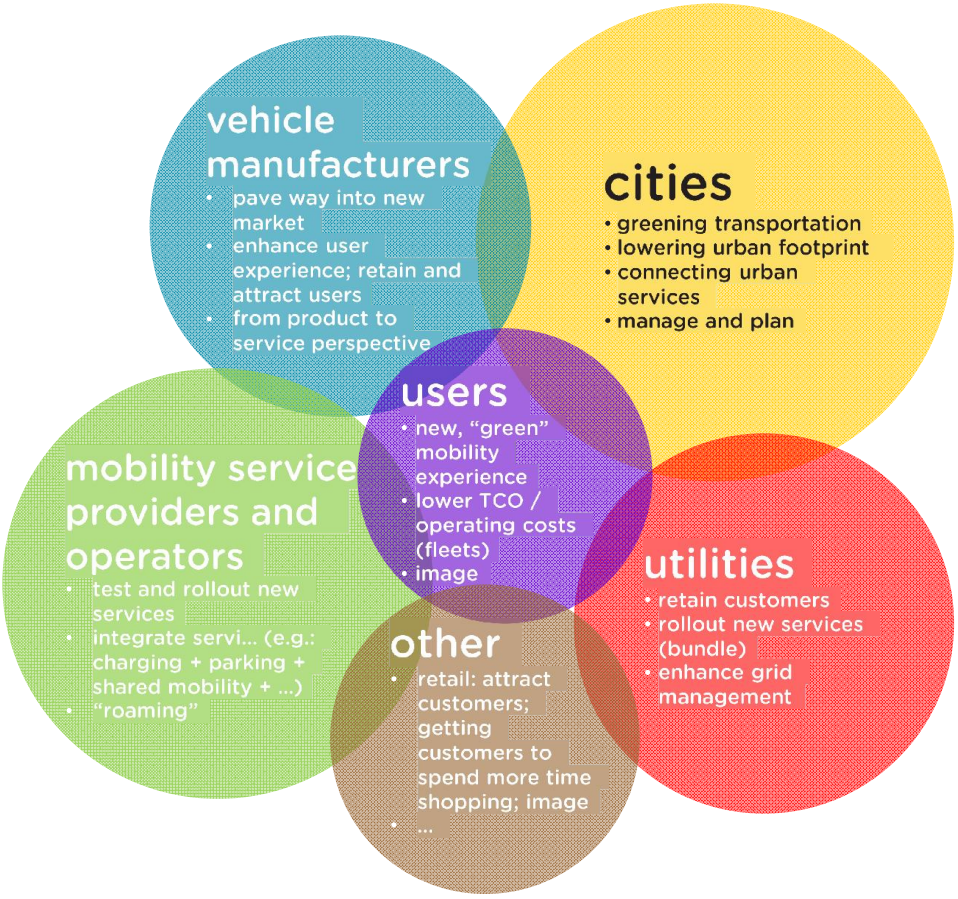
infrastructure: connecting the EV ecosystem



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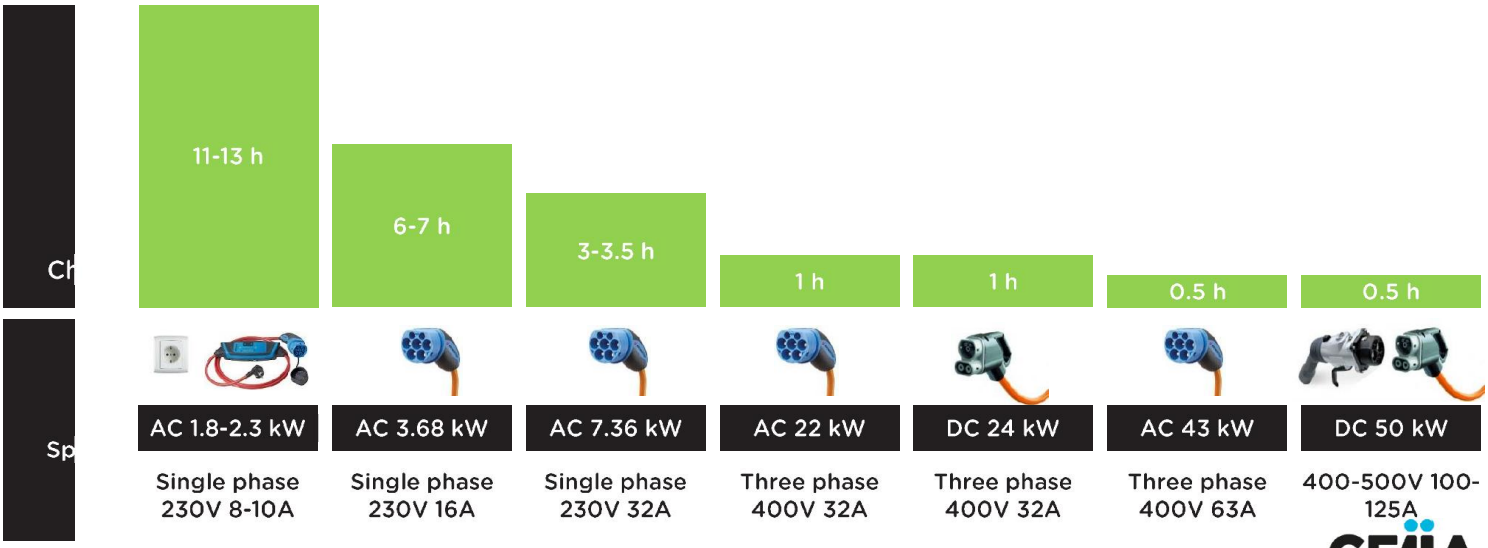
infrastruccuture: adjusting to demand



non exhaustive; considering a 24 kWh battery

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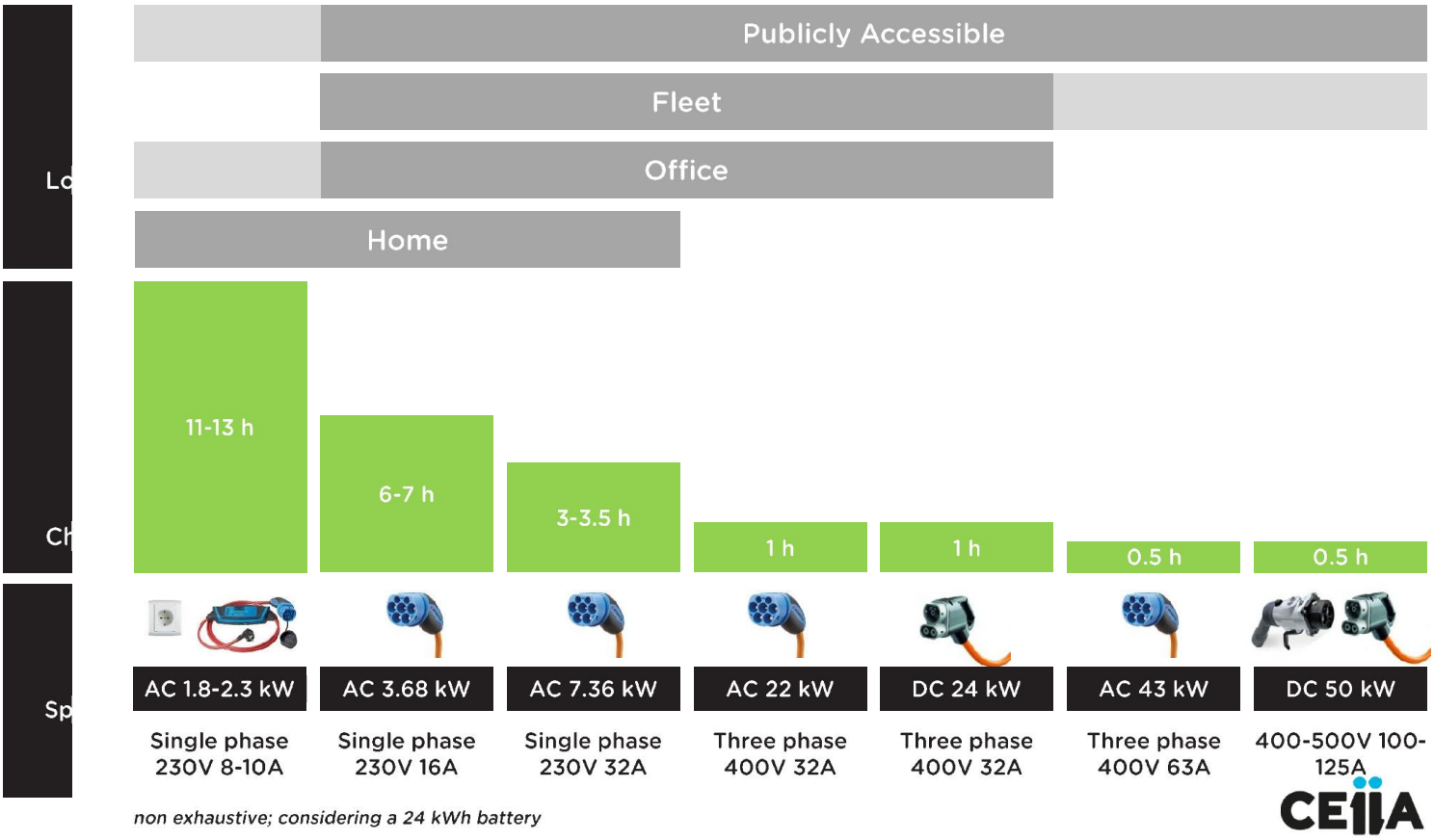
infrastrucuture: adjusting to demand



non exhaustive; considering a 24 kWh battery

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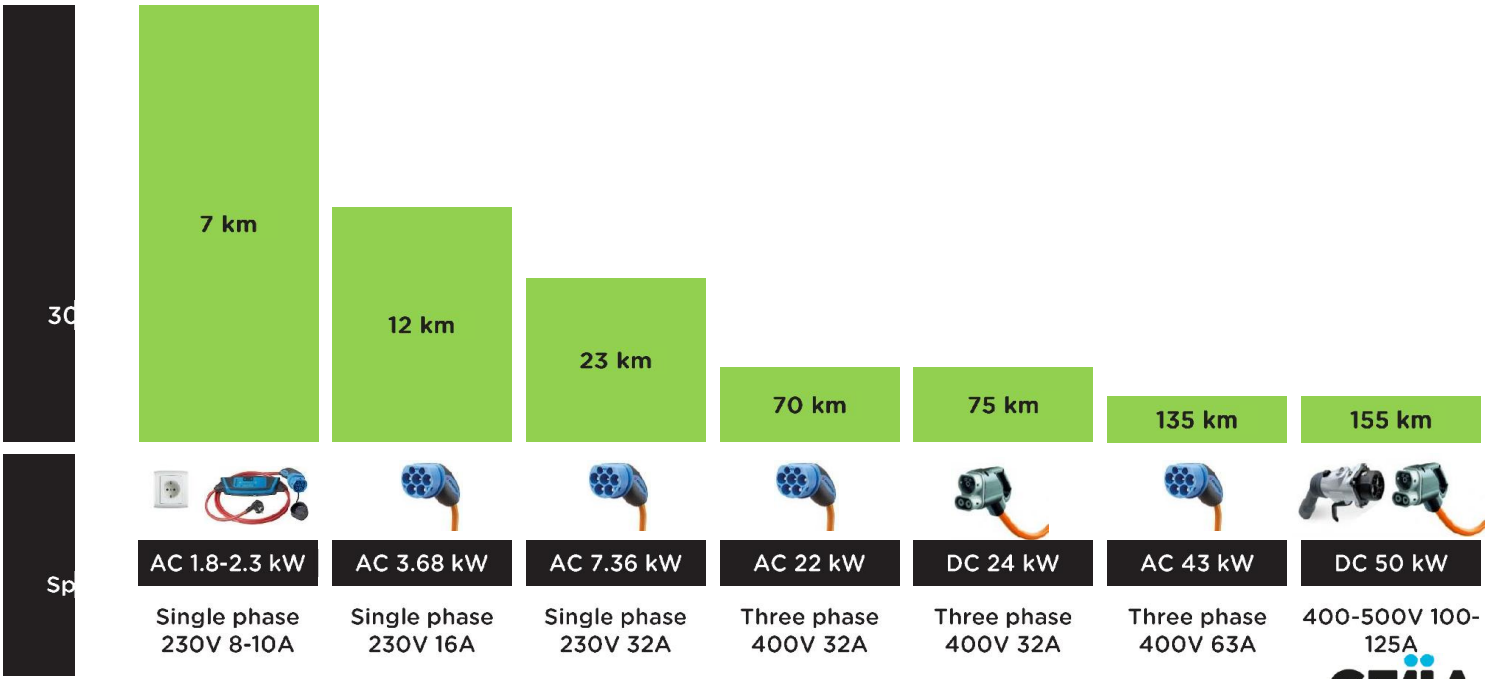
infrastrucuture: adjusting to demand

what are 30 min worth?



non exhaustive; considering 16 kWh/100 km

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Portugal: an overview

First electric mobility fully interoperable marketplace, launched in 2010

Pioneering comprehensive legal and regulatory framework for electric mobility

846 users
+1200 publicly accessible EVSE (460 stations)
Pilot phase: 230 normal + 49 quick to be installed
4 operators
45 cities

ap. 260 MWh consumed
ap. 170 tons CO_2eq avoided

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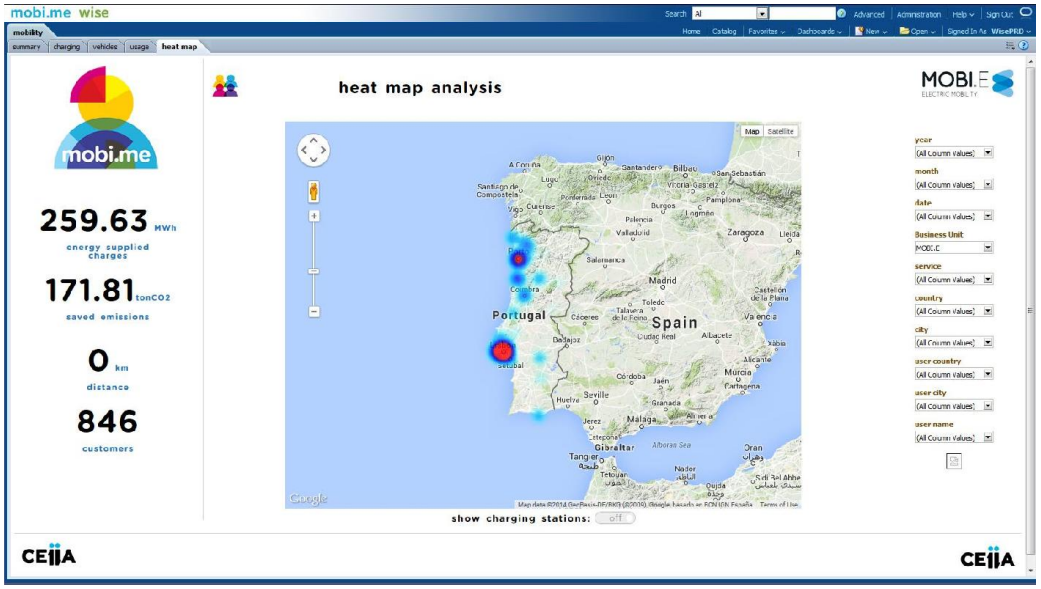
Portugal: an overview

charging profile



Charging concentrated in main urban areas (consumed energy, kWh):

- Lisboa, Loures, Almada: 56%
- Porto,Gaia: 10%
- Coimbra: 3%

90% consumption:

- 105 users
- 80 locations

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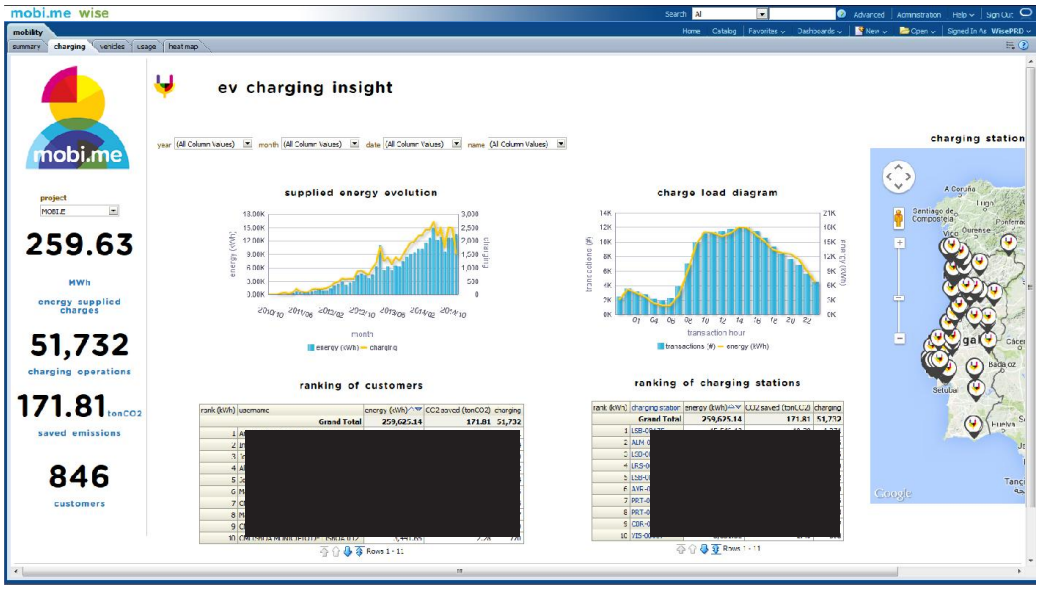
Portugal: an overview

charging profile



23% charging occurs overnight

Publicly accessible network (including private locations) acting as "home charging" solution

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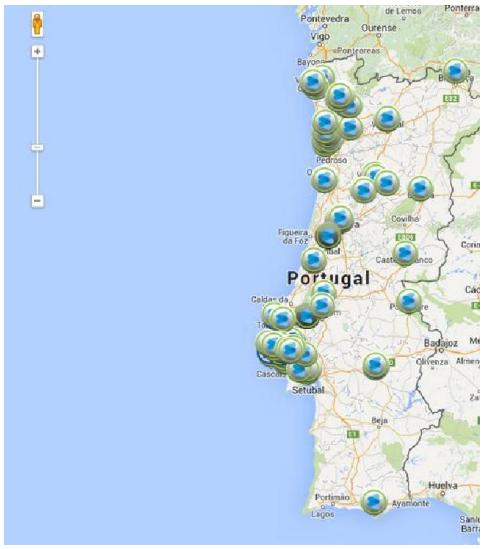
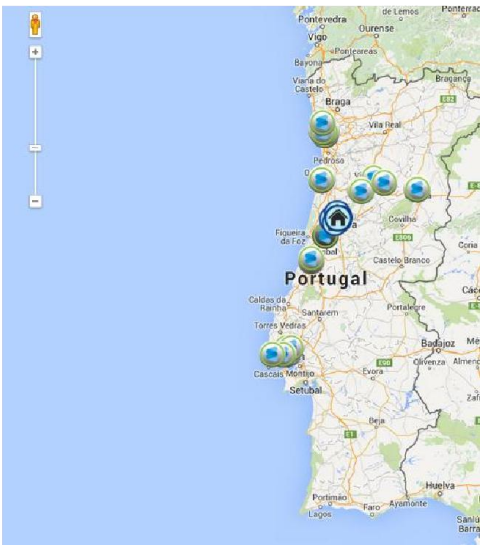
Portugal: an overview

how far do EV users go?

Lisboa	Porto	Coimbra





publicly accessible grid acts as a range extender

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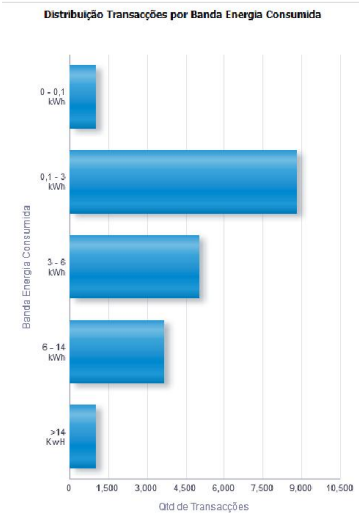
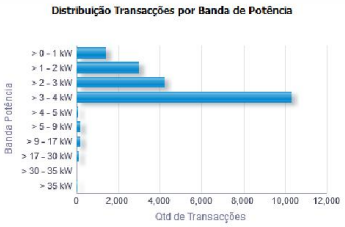
Portugal: an overview

charging profile





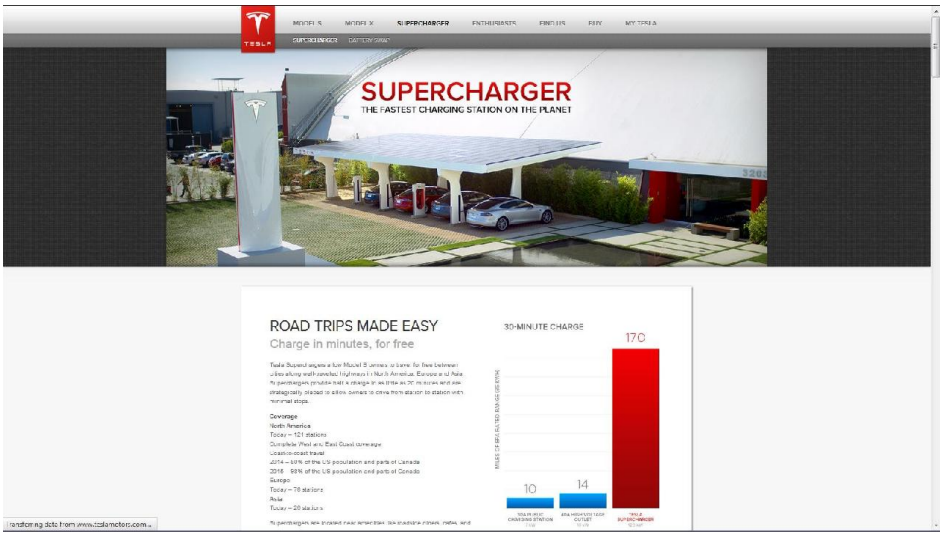
Common charging event up to 6 kWh (ap. 20 km)

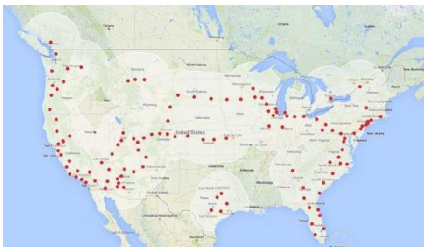
Quick charge data biased by absense of CCS-2

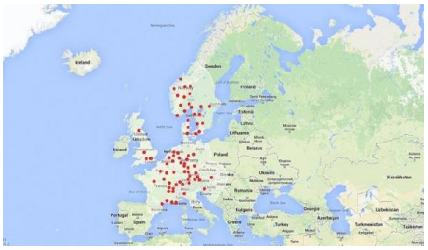
where to next?

technology

faster charging







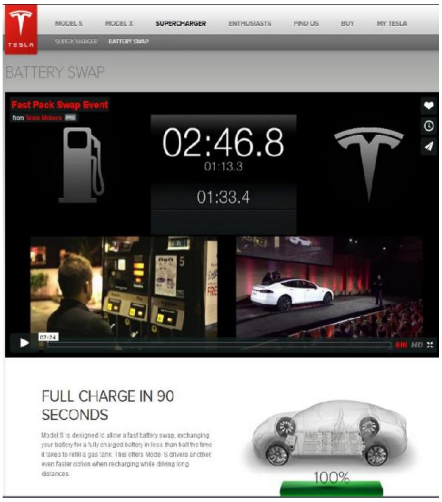
120 kW and beyond

where to next?

technology

wireless charging

battery swapping



flexible and user friendly

sustainable models?

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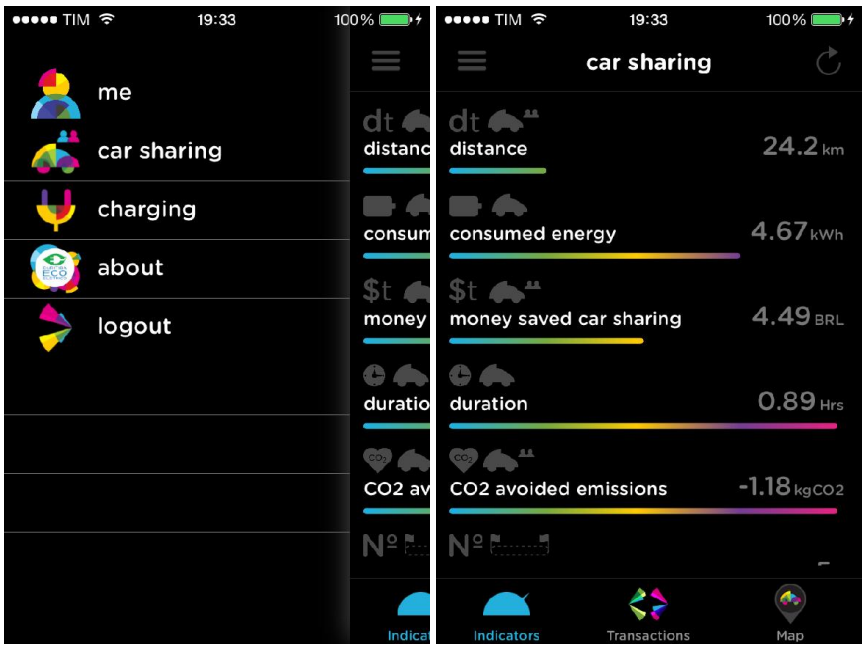
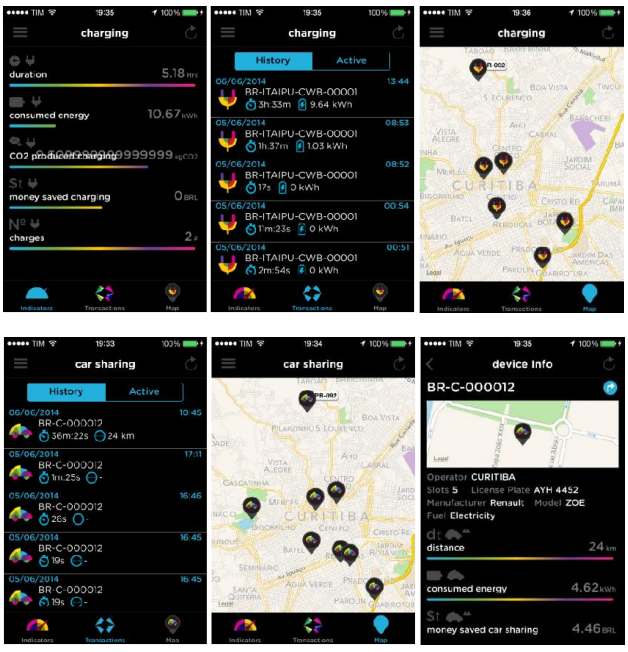
where to next?

integrating e-mobility with urban dynamics





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where to next?

interoperability

eMI3
eMobility ICT Interoperability Innovation Group

RENAULT · austrian mobile power · e.on · HUBJECT · Schneider Electric
chargepoint · BELECTRIC DRIVE · e-laad.nl · IBIL · SIEMENS
BMW · MINI · Enel Distribuzione · smartlab
CEiiA · bridging IT · EValu · MENNEKES · sodetrel
IBM · CIRCONTROL · FULLCHARGER · NISSAN · DTU Technical University of Denmark
EDF · CISC · Gireve · Panasonic · TNO innovation for life
BOSCH · Compagnie Nationale du Rhône · greenlots · PHOENIX CONTACT · alliander
here · RECARGO · TOMTOM · vito

ICT interfaces, application level protocols and standardized software services

Initial focus on unique identifiers, data models, attribute lists and data structures

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where to next?

intelligent, connected, home / fleet management

The EV is challenging the historic paradigm of the electric sector:

- Doubling average consuption, yet an itinerant user
- EV pushing for decentralized energy management: charge, store, manage, sell
- “Utility centric” vs. “user centric” models

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where to next?

policy drivers

PT: DL 90/2014

- Interoperable market place (ability to select energy provider and access any EVSE)
- Clearing ensured by electric mobility clearing house
  - B2B / B2C business clearing
  - Integration with grid mgmt
- Home / fleet charging
  - Pre-installation ready
  - Possibility to choose electricity provider in private locations independent from POD
- Transition phase until 11th.Dec.2014

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EU: directive on alt. fuels

- "appropriate number of recharging points accessible to the public should be installed, in particular at **public transport stations, such as port passenger terminals, airports or railway stations**"
- "contribute to the stability of the electricity system by **recharging batteries from the grid at times of low general electricity demand**"[...] "enable electric vehicles **to feed power from the batteries back into the grid** at times of high general electricity demand"
- "competitive market with **open access to all parties interested** in rolling-out or operating recharging infrastructures"
- "recharging points accessible to the public shall also provide for the possibility for electric vehicle users to **recharge on an ad hoc basis without entering into a contract with the electricity supplier or operator concerned**"
- "ensure that the legal framework permits the electricity supply for a recharging point to be the subject of a **contract with a supplier other than the entity supplying electricity** to the household or premises where such a recharging point is located"

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electric mobility infrastructure

(some) key challenges

Link energy mgmt with greening transportation
fostering use of renewable energy

No "one-fits-all" models
different value to different stakeholders

User-centric business environments
electric mobility + parking + public transportation + shared mobility + ...

Gradual adjustment of supply to demand
and phasing-out of public investment driven models

Interoperability
utility model vs. P2P vs. marketplace approach; consolidation of clearing houses

Sustainability: innovation and creativity
new business / service models
phase-out of public incentives

Flexible, intelligent solutions
public, home, fleet, sub-metering

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