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The Green eMotion project: pan-European effort towards an interoperable electromobility system

CIVITAS DYN@MO Summer University 2014

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Contents

1. Project basics
2. Green eMotion Demo regions
3. What we do
4. ENDESA Demo region Plan

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Project basics

The creation of a unique and user-friendly framework for green electromobility in the Europe.

- Green eMotion project is part of the European Green Cars Initiative (EGCI) that was launched within the context of the European Recovery Plan.
- The project has a total budget of €42 million and is funded by the European Commission with €24 million.
- Green eMotion consortium consists of forty-three partners from industry, the energy sector, electric vehicle manufacturers, and municipalities as well as universities and research institutions.
- The project was officially launched on 31 March 2011 and it will finish on March 2015 (48 months).

Project basics

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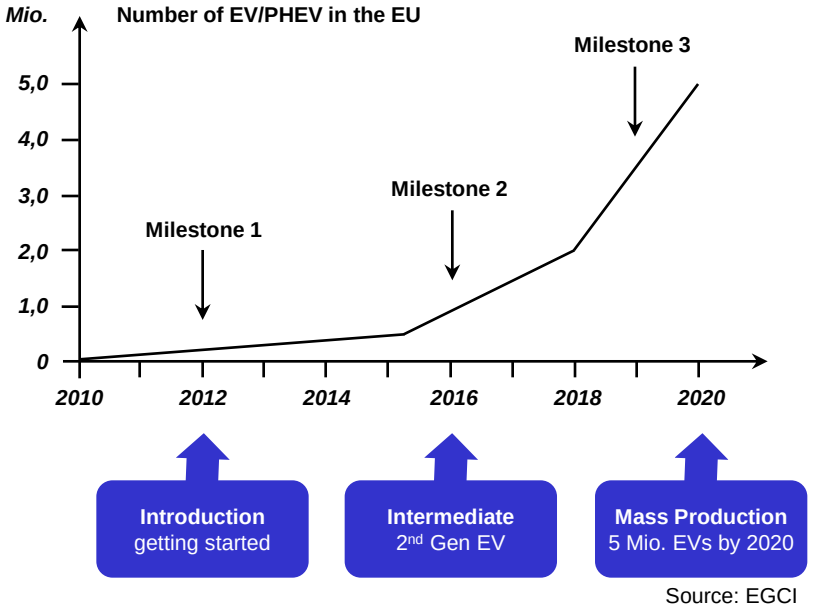
Motivation for the Green eMotion Project

The situation:

- Number of electric vehicles (EV) is increasing heavily in Europe over the next decade (see draft of EGCI Roadmap for EV in Europe)
- Quite a big number of local electromobility demonstration projects funded by regional, national or European programs are running.



Source: EGCI

Leads to three major requirements:

- Coordination of results from existing demonstration projects to define best in class solutions.
- Standardization of technologies has to be in place 2015 at the latest.
- To drive a car conveniently between the existing demo regions, an overarching coordination is necessary (roaming).

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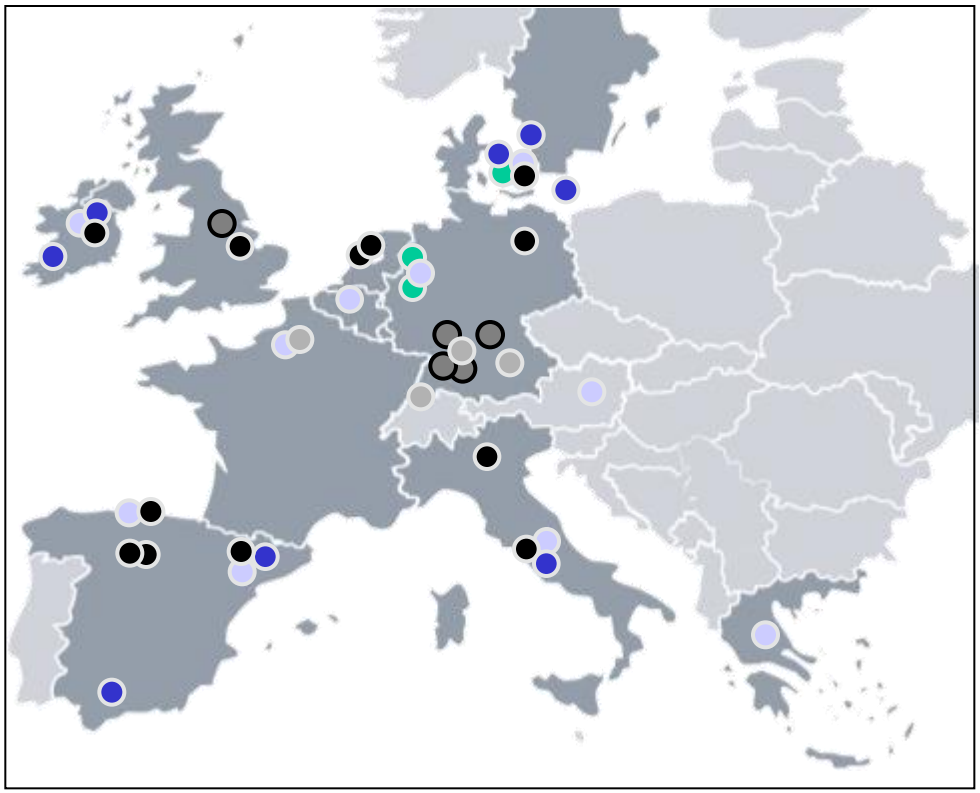
Green eMotion – a 42 Mio € project with 43 Partners



FP7 call TRANSPORT – 2010 TREN -1
Project Start: March 2011
Duration: 4 years
Funding: 24 Mio €

- **Industries:**
  Alstom(UK), Bosch(D), IBM(D), SAP(D), Siemens (D, Project Coordinator)
- **Utilities:**
  Danish Energy Association(DK), EDF(F), **Endesa** (ES), Enel(I), ESB(IR), Eurelectric(B), Iberdrola(ES), RWE(D), PPC(GR), Verbund(AU)
- **Electric Vehicle Manufacturers:**
  BMW(D), Daimler(D), Nissan(H), Renault(F)
- **Municipalities:**
  Barcelona(ES), Bornholm(DK), Copenhagen(DK), Cork(IR), Dublin(IR), Malaga(ES), Malmö(S), Rome(I)
- **Research Institutions and Universities:**
  Cartif(ES), Cidaut(ES), CTL(I), DLR(D), DTU(DK), ECN(NL), Imperial(UK), IREC(ES), RSE(I), TCD(IR), Tecnalia(ES), TNO(NL)
- **EV Technology Institutions:**
  DTI (DK), FKA(D), TÜV Nord(D)

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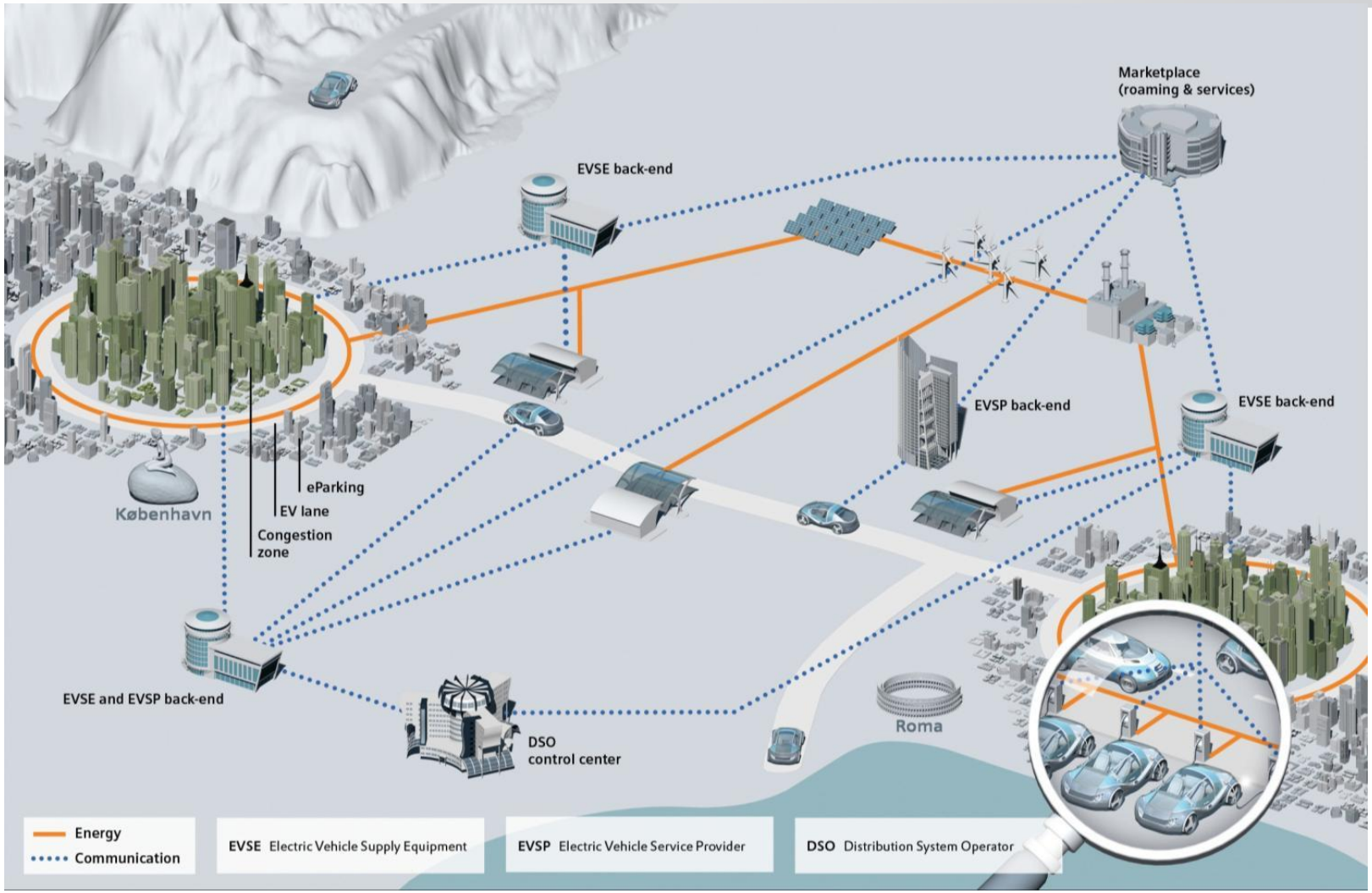
European electromobility – the big picture



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Defining the Framework for Electromobility in Europe

- Green eMotion tests and demonstrates the **interoperability** of an electromobility system in selected demo regions.
- Green eMotion analyses the operability of electric cars under **real life conditions** und develops recommendations for the implementation of the mass market (to increase user acceptance).
- Green eMotion recommends ways to an optimised grid and charging **infrastructure.**

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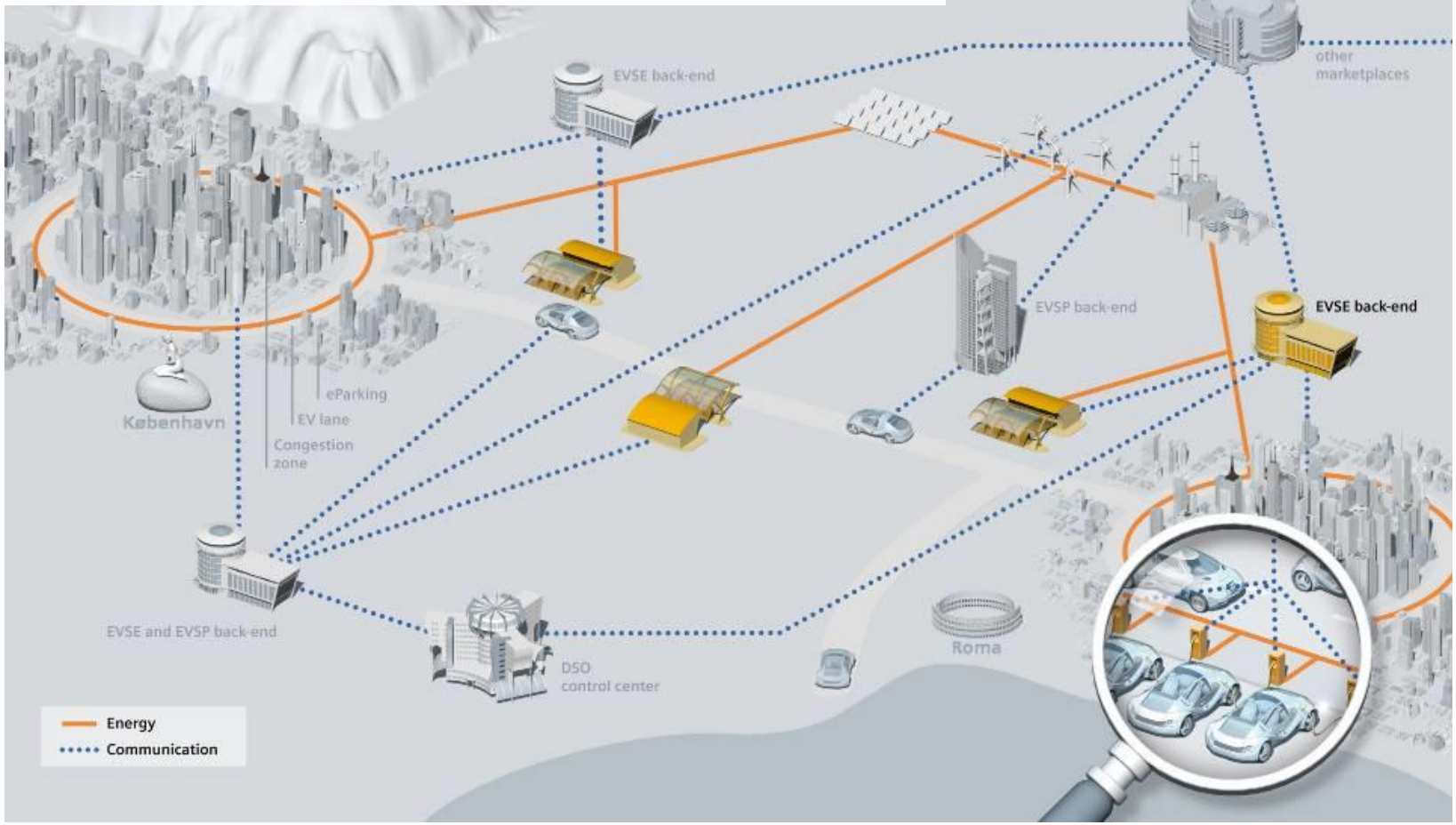
The infrastructure story

EVSE operator wants to install charging infrastructure:
Which type (AC/DC/swapping)? How many?
Where (considering the lowest grid connection costs)?



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Defining the Framework for Electromobility in Europe

- Green eMotion recommends selected **standards** for an interoperable electromobilty system (de facto standards for Europe).
- Green eMotion adjusts the proposals and results in discussion with a broad **stakeholder** base.
- Green eMotion defines the IT architecture for a European **marketplace** including interfaces which allows competition in implementation.

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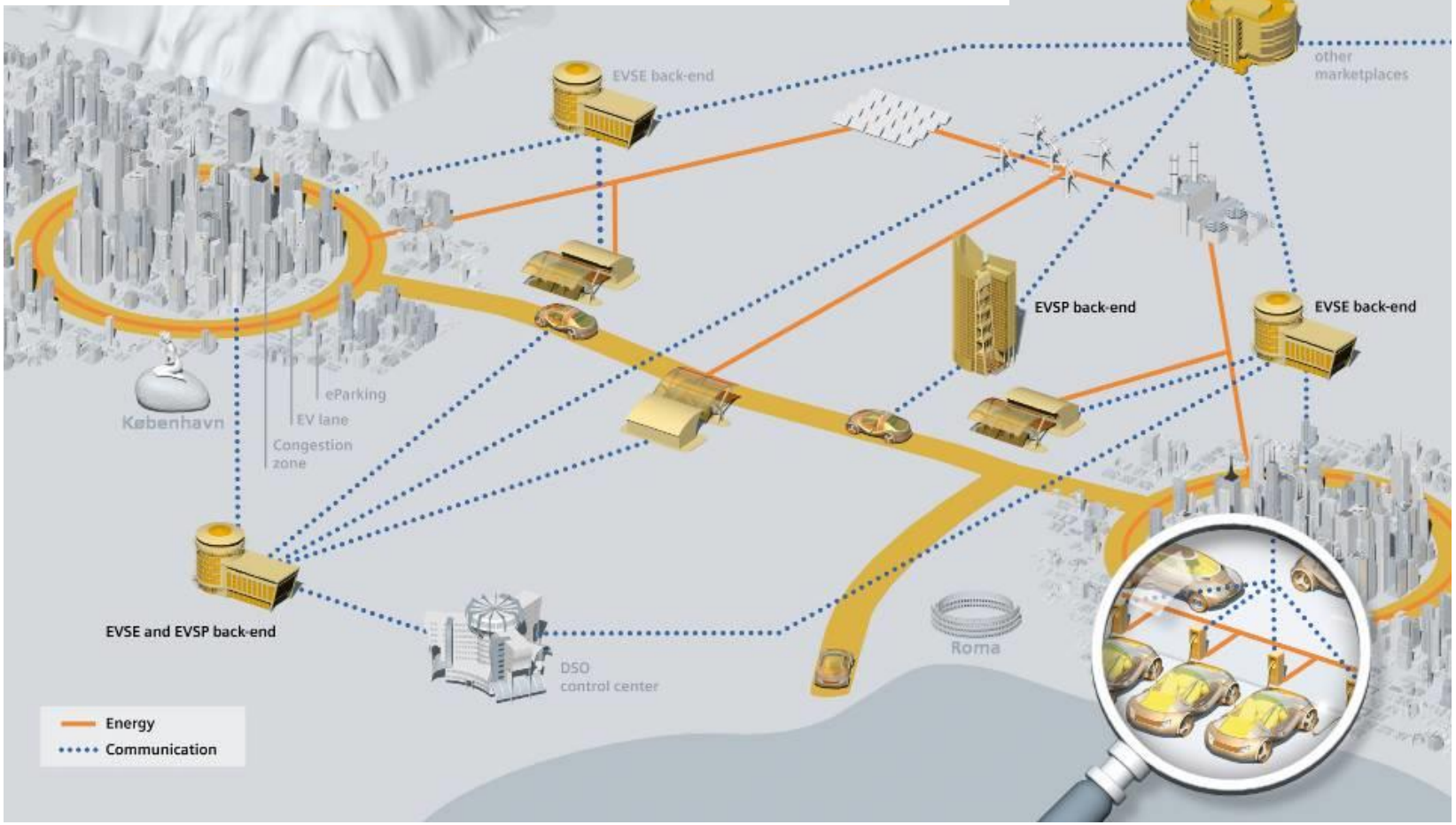
The interoperability story - standards and ICT solutions

Driver wants to use an e-car everywhere in a convenient way:
Compatible plug/interfaces, identification, authorisation, billing;
Find and reserve charging posts, eco-routing, cost-value ratio



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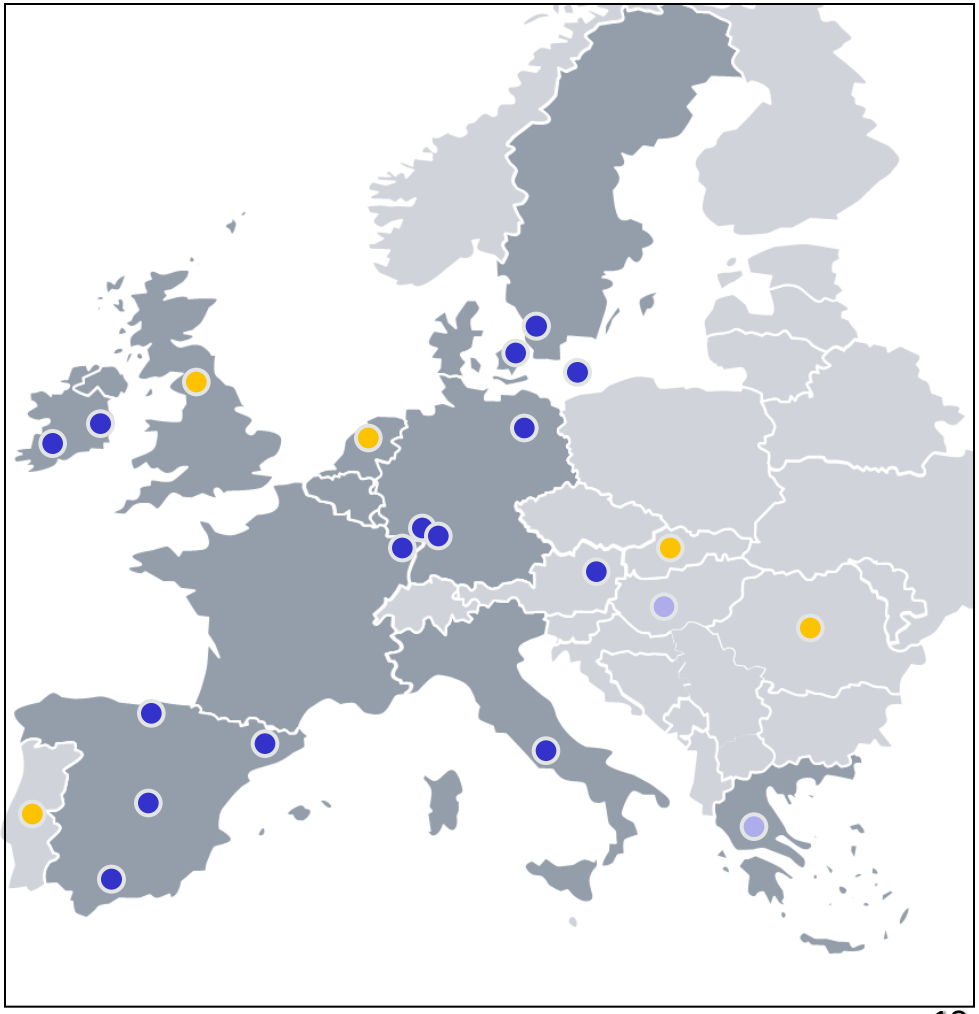
Demonstration Regions

- 10 Demonstration regions fully operative, involving 7 countries and more than 15 municipalities.
- 2 Replication regions and 1 demonstration region to be included in 2013.
- 5 External demonstration projects already sharing data.

- Existing demonstration region
- Replication region
- External demonstration sites

Monitoring
1800 charging points
600 electric vehicles
1000 users



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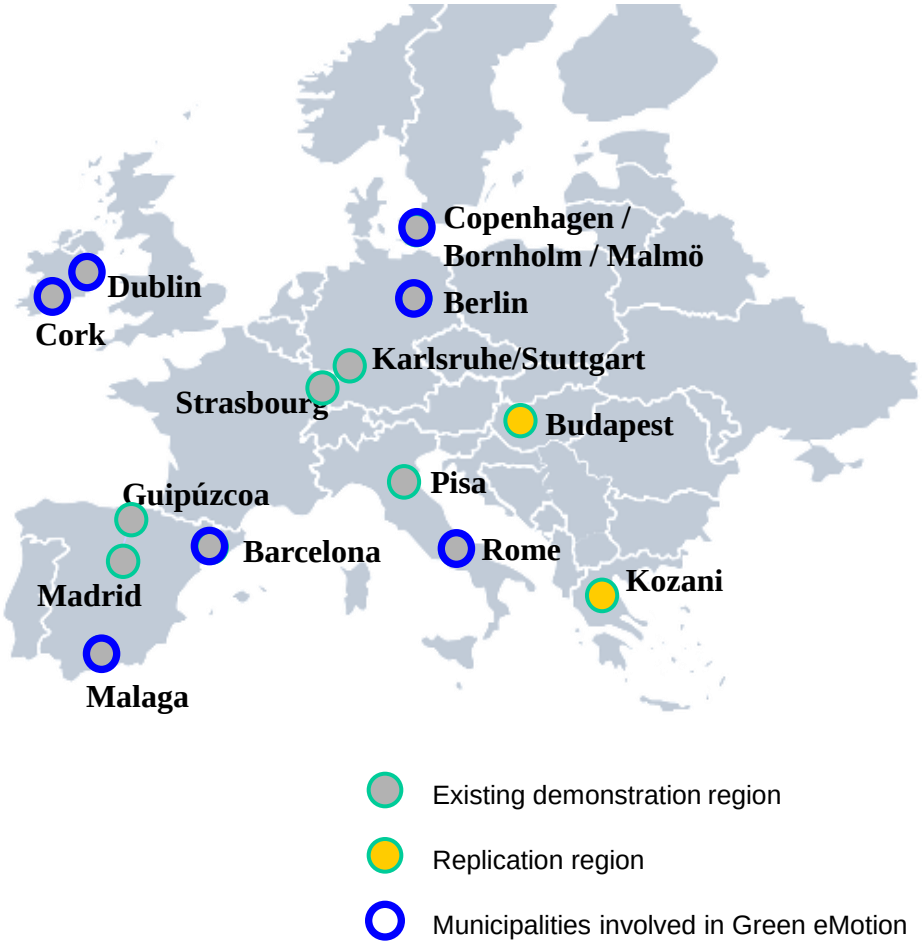
Demonstration Regions

- In the Green eMotion demo regions roughly 2.000 EVs are driving right now and for their electricity supply more than 2.500 charging points are installed.
- This will increase to around 70.000 EVs and more than 80.000 charging posts in 2015.
- In total more than 380 Mio € are spend in funded projects within these demo regions (+ private investments by GeM partners).



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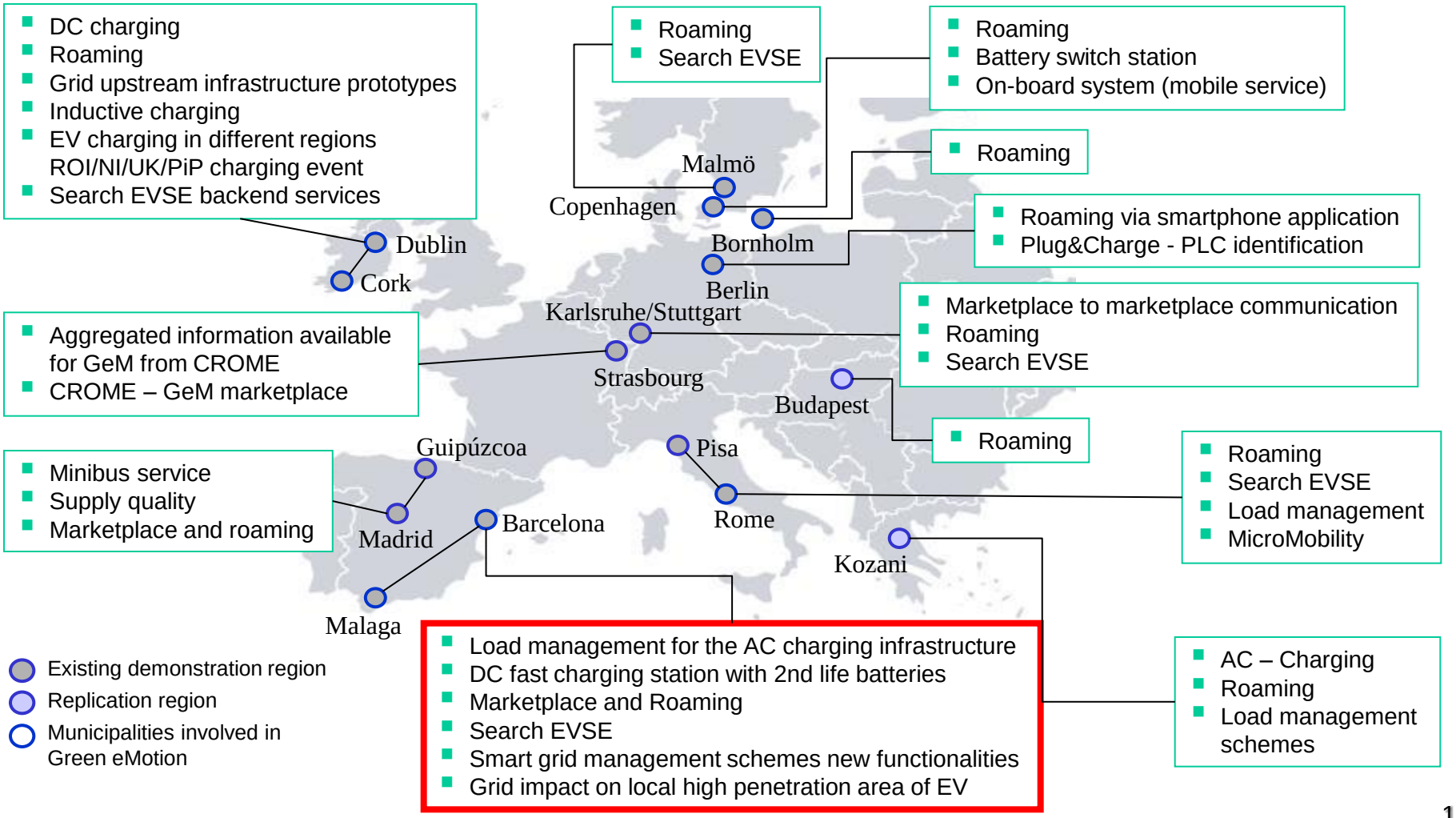
Demonstration Regions



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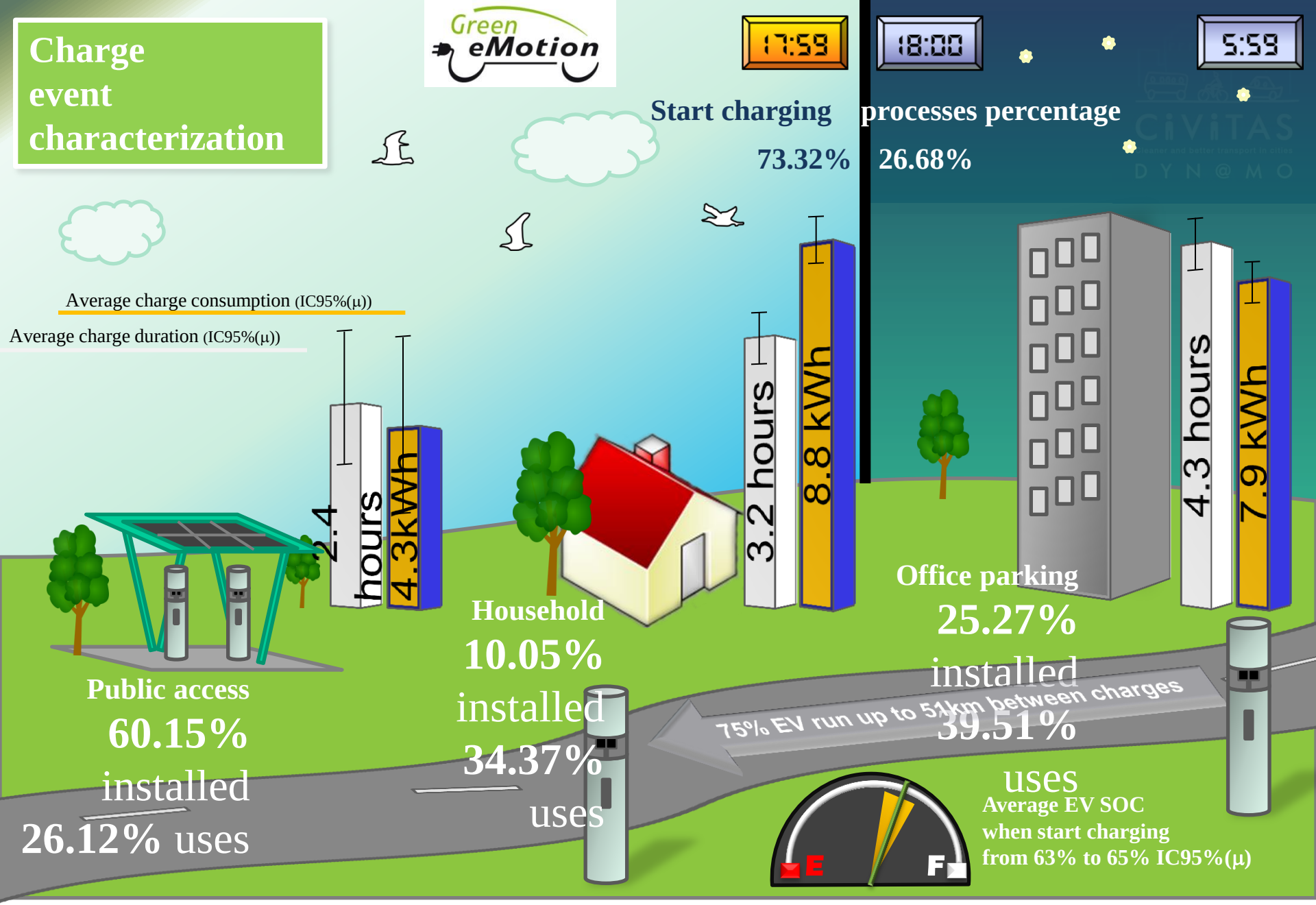
Charge event characterization



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ES1 – Barcelona and Malaga

Endesa Leads the Demo region ES1, that involves the regions of Barcelona and Málaga.

In this cities the following democases are being demonstrated:

- Load Management charging system into AC infrastructure.
- DC fast Charge station integrating 2nd Life Batteries embedded into SmartGrid Concept.
- Market Place Services.
- e-mobility Smart Grid New Functionalities - Charging Management Schemes.
- Grid Impact on High Penetration Local Area of EV.

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1. Load Management charging system

- Endesa, Siemens and Malaga Municipality have deployed 10 AC chargers in the city of Malaga with the objective of modulating the charging power to achieve specific grid features, avoiding problems related with EV impact integration and test interfaces between service providers and infrastructure operators.

endesa

Ayuntamiento de Málaga
Agencia Municipal de la Energía

SIEMENS

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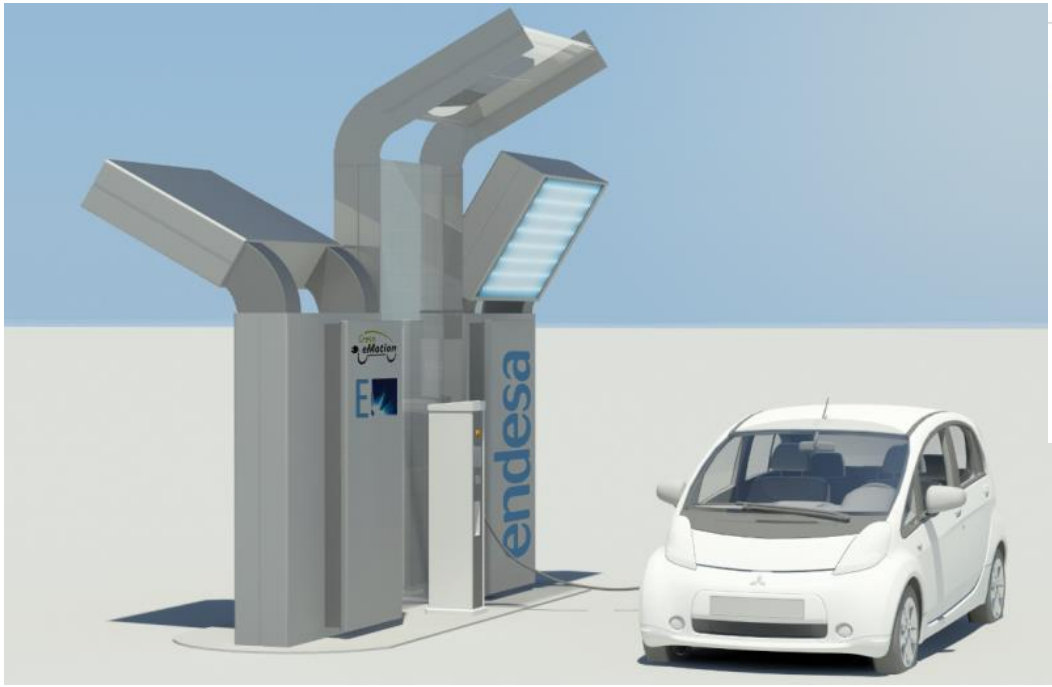
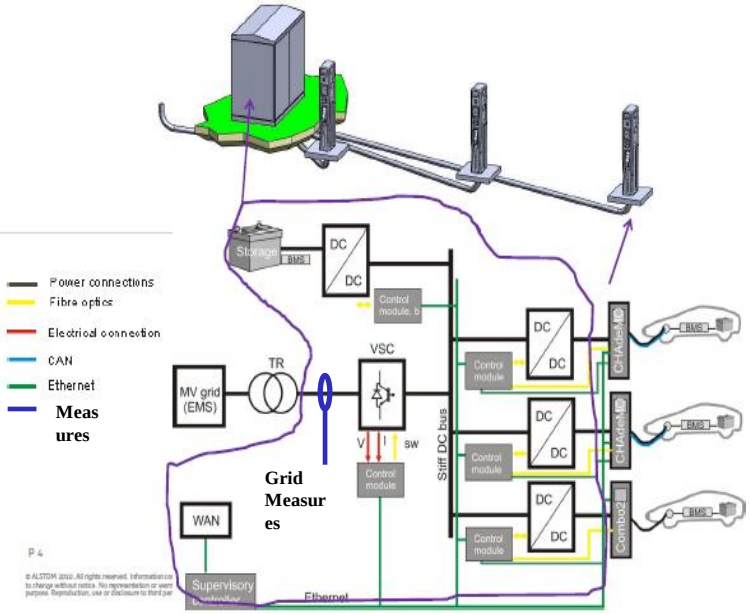
2. DC Fast Charge Station in Malaga

ENDESA is working on the construction of a DC Fast Charging station 50 kW + 2nd life battery in collaboration with Renault and Malaga Municipality





endesa RENAULT Ayuntamiento de Málaga Agencia Municipal de la Energía

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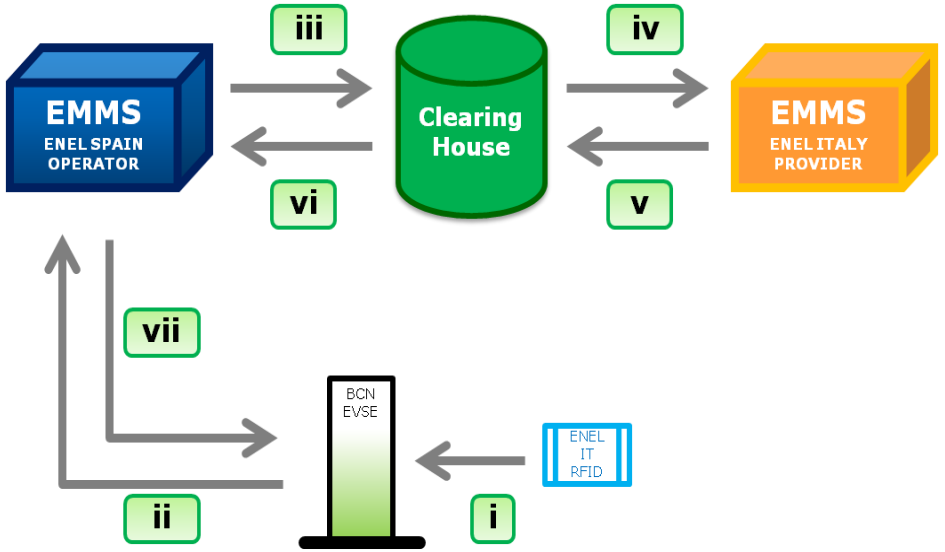
3. Market Place Services

- Market Place features are going to be demonstrated by ENDESA in coordination with IBM, Siemens and Enel.
- EVSE search and roaming services
- The identification systems of ENDESA EVSEs and the EVSE backend in the city of Barcelona have been demonstrated with the objective to identify an EV driver from any DemoRegion from GeM and allow her to charge.



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3. Market Place Services

Green eMotion **MarketPlace**

Roaming Authorization Request

Roaming Authorization Response

Roaming Authorization Response

Roaming Authorization Request

Enel EVSE Operation Back-end

Enel Services Back-end

Endesa Services Back-end

Endesa EVSE Operation Back-end

4. Grid Impact on Local High Penetration Area of EV

ALMACENAMIENTO

Sistema de almacenamiento integrado al sistema de gestión de demanda para absorber/suministrar excesos de energía en función de la oferta/demanda.

MICROGENERACION

Microgeneración eolica y fotovoltaica para minimizar la potencia contratada.

CARGA NORMAL

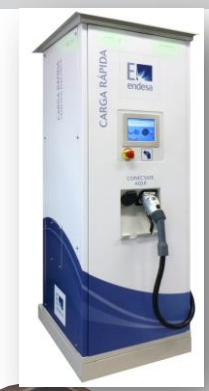
Estaciones de recarga normal dispuestas en un parking para las flotas de vehículos de Endesa y en el exterior para uso público.

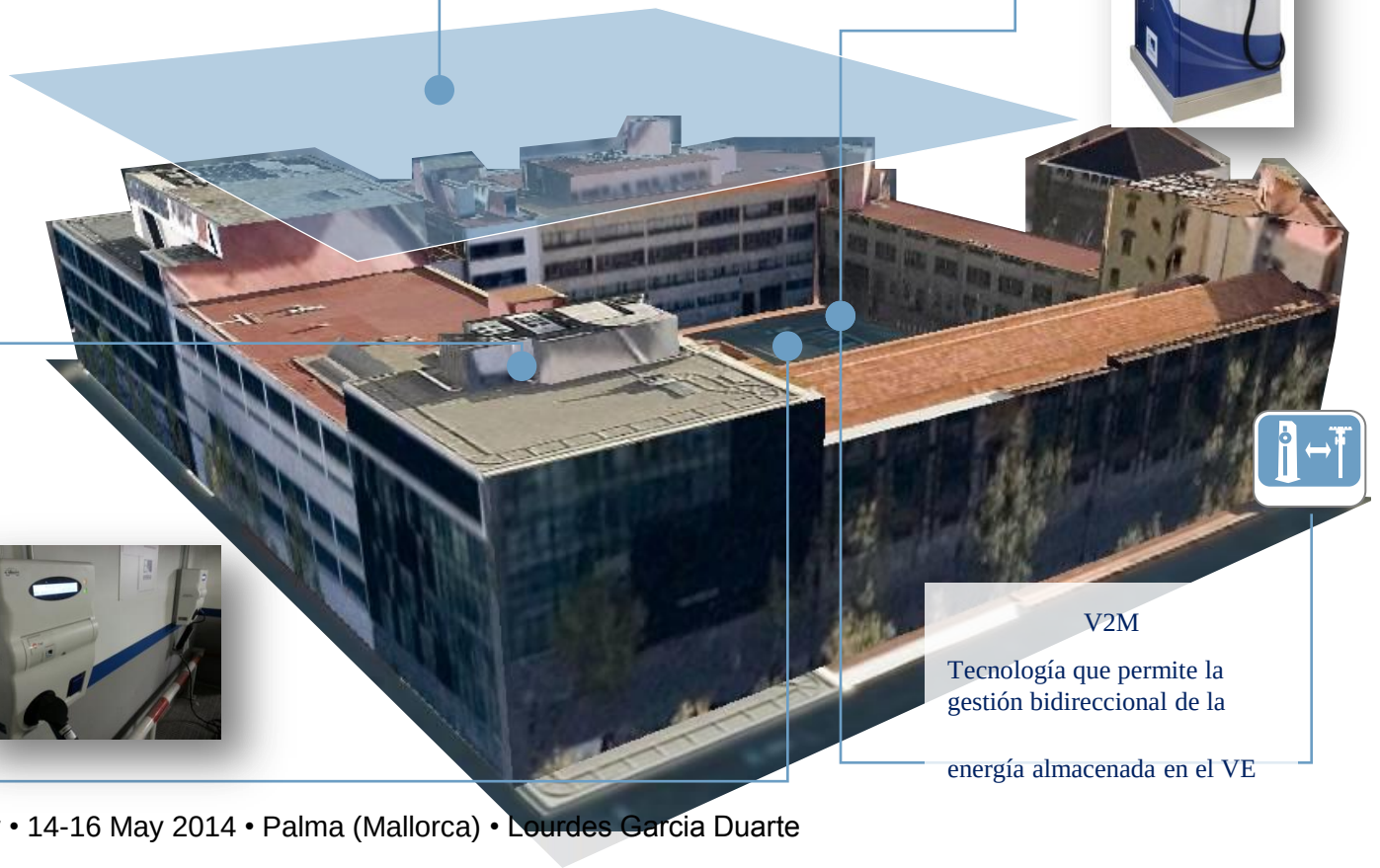
DEMAND MANAGEMENT SYSTEM

Elemento integrador de la demanda de las infraestructura de recarga, que gestiona la energía para optimizar el consumo de la microgeneración, minimizar la potencia contratada u otra consigna de interés.

CARGA RAPIDA

Infraestructura de recarga rápida en la "isla de Energía" para uso público y también de flota Endesa



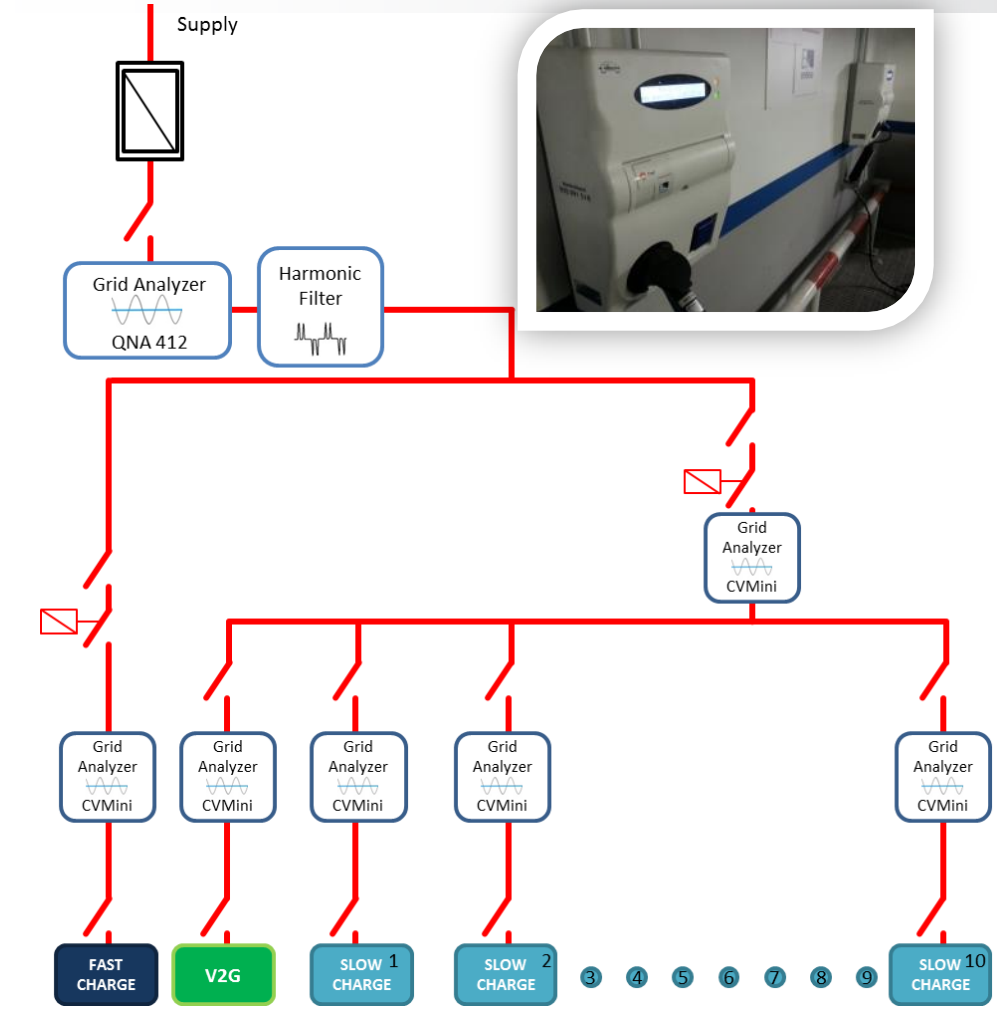


V2M

Tecnología que permite la gestión bidireccional de la

energía almacenada en el VE

4. Grid Impact on Local High Penetration Area of EV



No	Model	Nominal power
10	*AC Enel Charger*	3.7 kW / 22 KW
1	*Endesa DC EQC50*	50 kW
1	*Endesa V2G*	10 kW bidirectional

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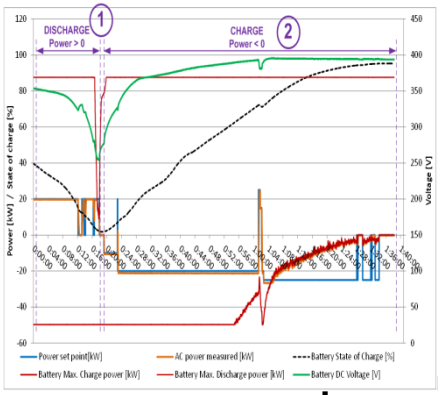
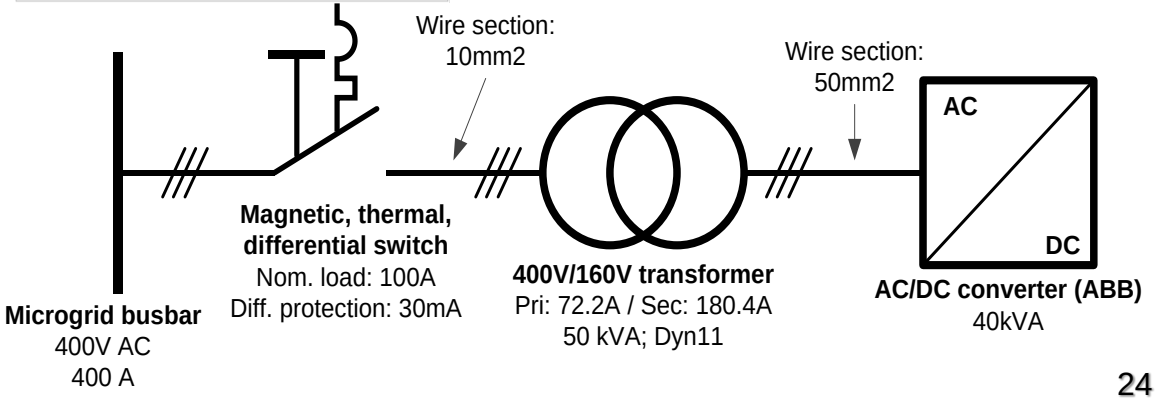
5. Smart Grid Management Schemes New Functionalities

2nd life batt + 40kW converter + 50kW Charger + gateway





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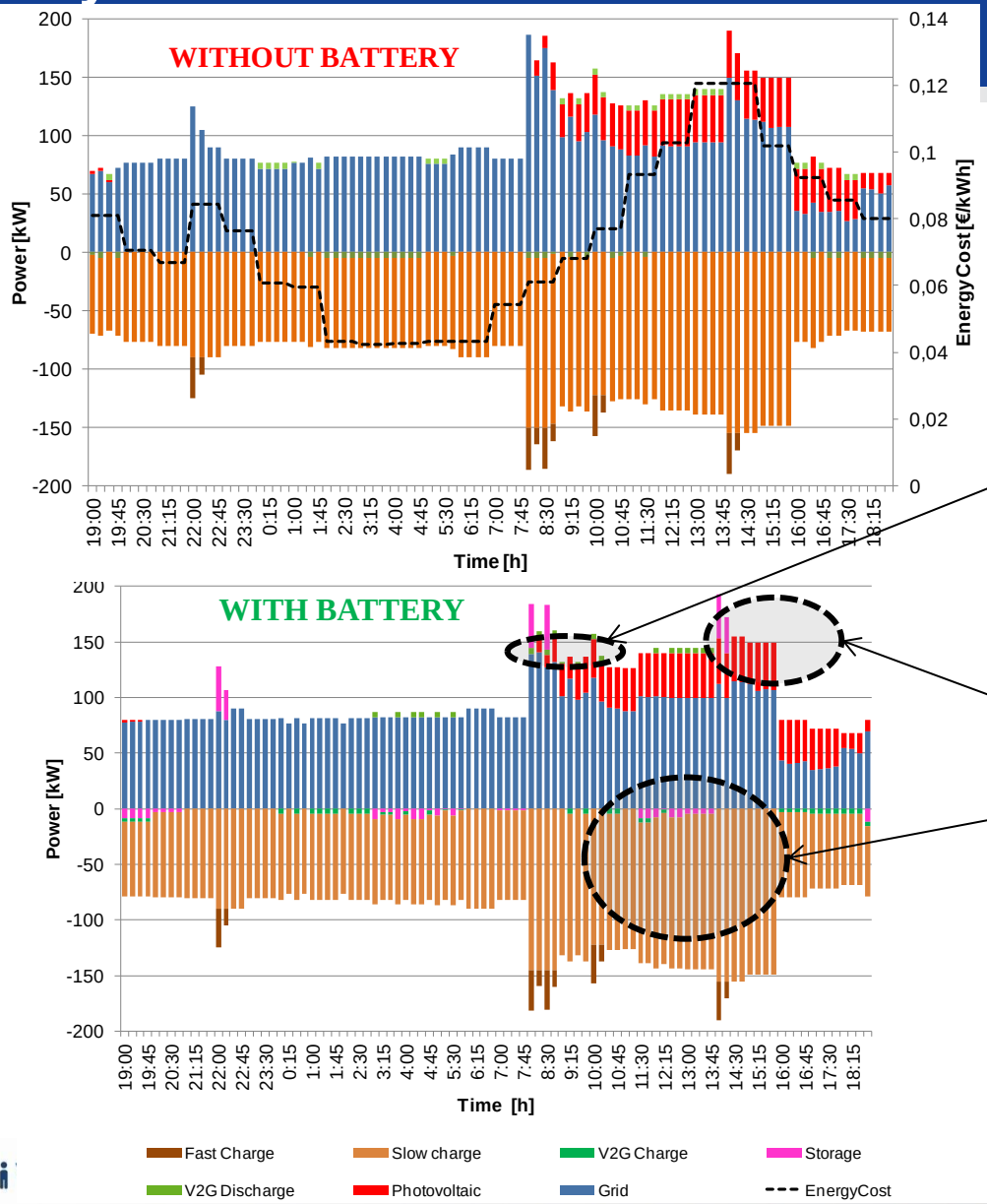
EXAMPLE 2: PEAK SHAVING
E-Parking lot Barcelona WITH storage systems



PEAK SHAVING application has been tested in this simulation

Peak demand:
140 kW **(-25%)**

Battery is operated for reducing the peak consumption of the whole facility

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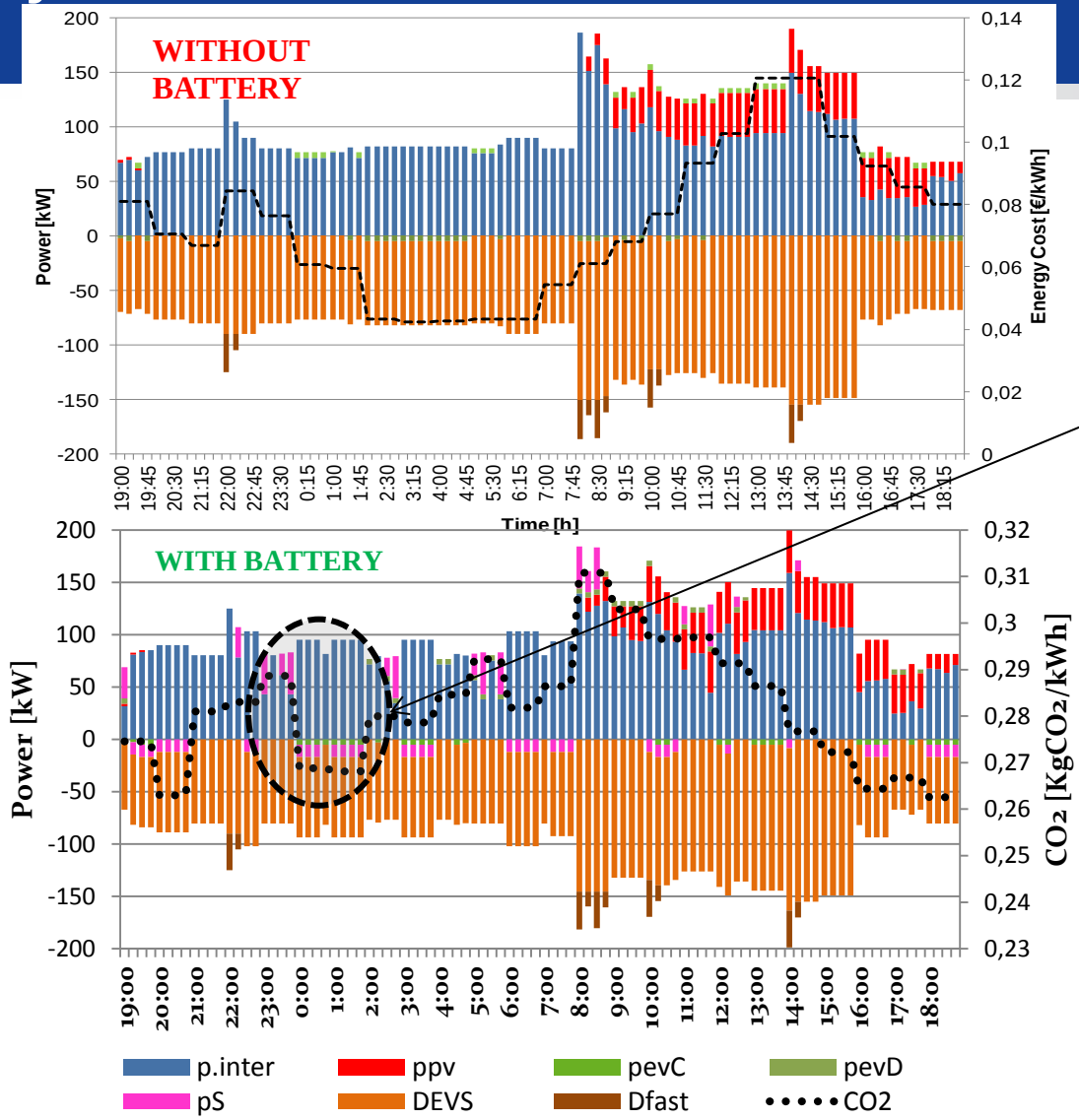
EXAMPLE 2: CO2 MINIMIZATION
E-Parking lot Barcelona WITH storage systems



CO2 MINIMIZATION application has been tested in this simulation

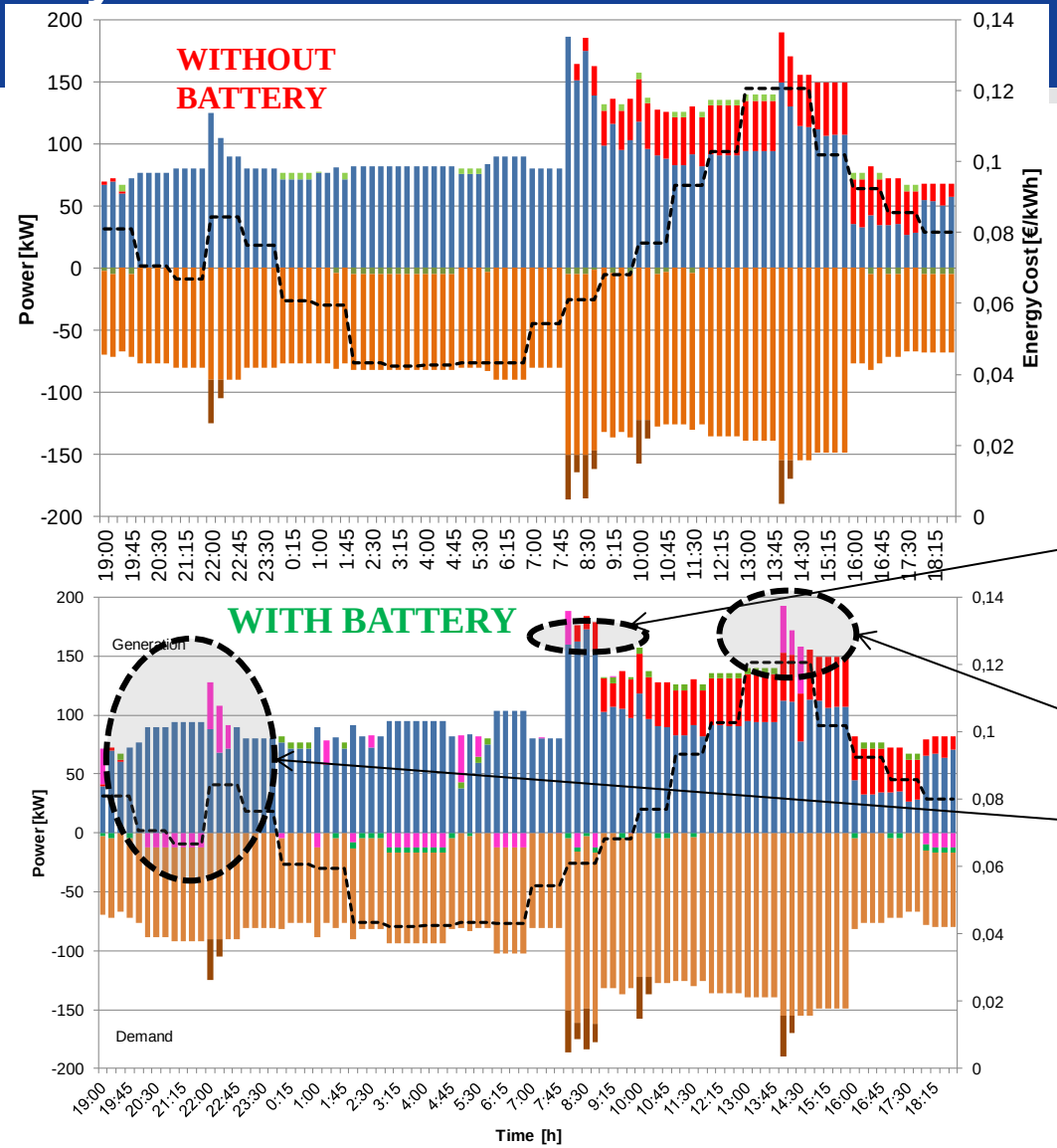
Battery operation follows CO_2 emission curve.

CO2 saving:
33.2 $KgCO_2$ **(-0.57%)**

Daily energy cost is higher **(+1.7%)**

Peak demand:
173 kW **(-7%)**

EXAMPLE 3: COST MINIMIZATION
E-Parking lot Barcelona WITH storage systems



COST MINIMIZATION application has been tested in this simulation

Peak demand:
173 kW **(-7%)**

Battery is operated for using the price differences among peak and off-peak periods

http://www.greenemotion-project.eu/

Thank you!

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