ELECTRIC VEHICLE

Recharging Solutions

Foment del Treball Nacional

Forum Energia Empresa

endesa

1 Electric Mobility challenges

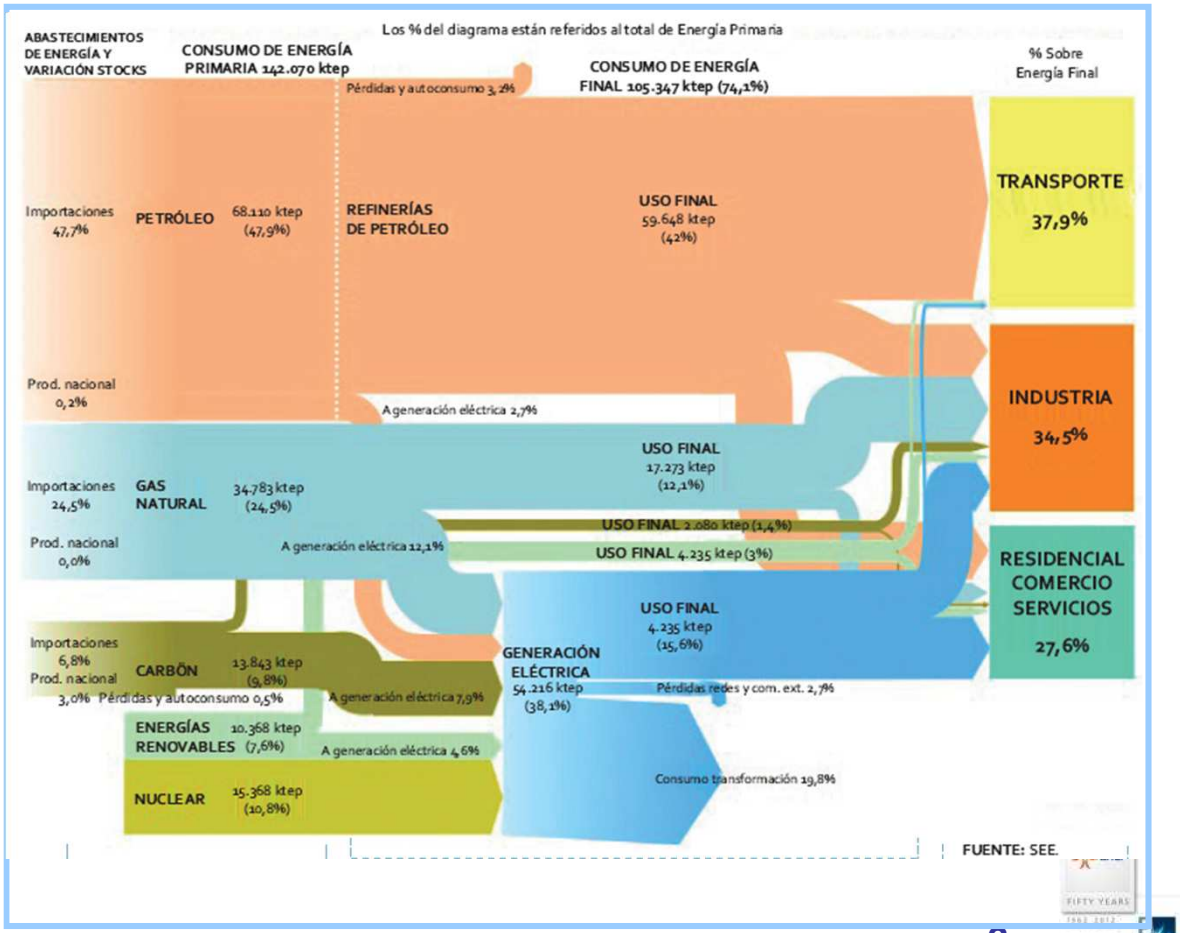
Key Notes: Sustainability, Energy Efficiency, deployment, investments

Starting point: Endesa sustainability plan for 2008-2012

Main Action lines

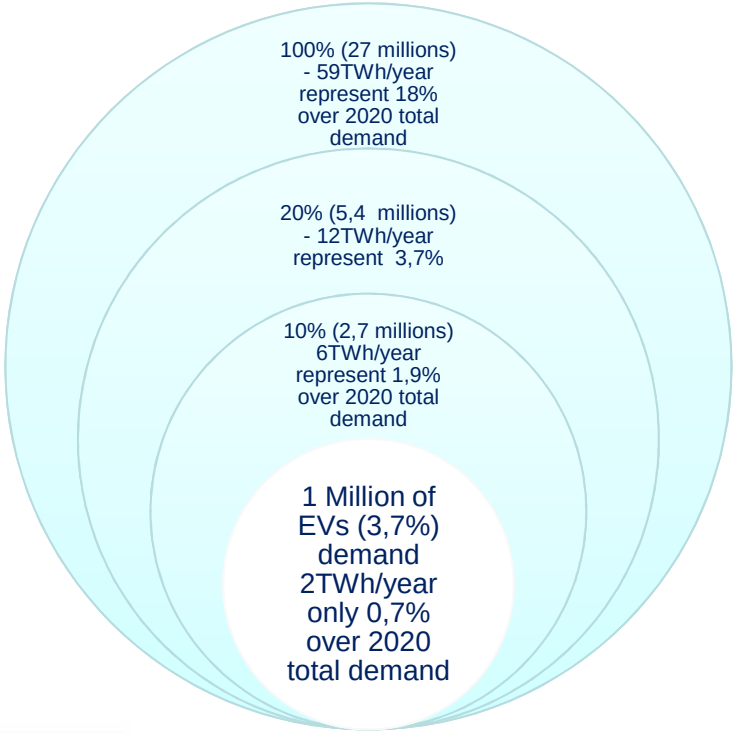
- Recharging infrastructure deployment
- Business model for clean transportation
- Set up alliances
- Clean transportation promotion inside Endesa
- Demonstrations and citizen implication

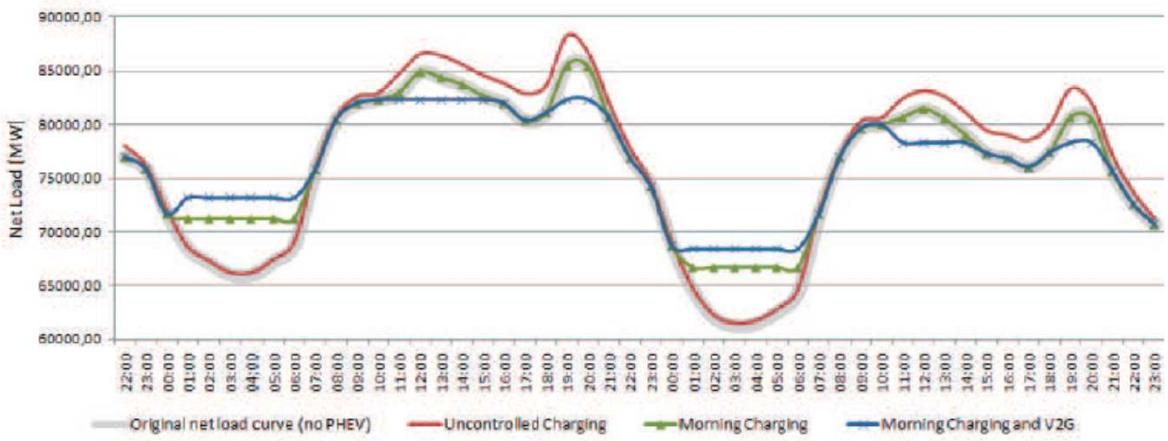
Commitment with 20-20 goals



- At 2020, if all the vehicles will be electric (27 millions fo Spain) the energy demand will increase 18% (based on EURELECTRIC scenario).

- Each million of EVs will imply 2 TWh/year, increasing 0,7% energy demand per year





- Energy is not a problem, but power management will be the key

Source: RWTH AACHEN UNIVERSITY

ENDESA Development lines

	NATIONAL	INTERNATIONAL
STANDARDIZATION	GOBIERNO DE ESPAÑA · MINISTERIO DE INDUSTRIA, TURISMO Y COMERCIO · AENOR	G4V Grid for Vehicles · eurelectric ELECTRICITY FOR EUROPE · CHAdeMO · IEC · ISO International Organization for Standardization
DEMONSTRATIONS PROMOTION	movele Movilidad Eléctrica · smartcity · Quick · Live Endolla't a Barcelona · FORÉVE	Green eMotion · SEVENTH FRAMEWORK PROGRAMME · e-DASH
INFRASTRUCTURE	VERDE · CROVE · FAST FAST TOGHETHER · ENEL GROUP	    CHAdeMO · Enel L'ENERGIA CHE TI ASCOLTA. · UNPLUGGED
MARKET	 CEPSA · elf · endesa · optima · SEAT · NISSAN · Wir leben Autos. · BERGÉ Automotive Logistics · PEUGEOT	ELVIRE · ZEM2ALL

2

EV Charging portfolio

Key Notes: Recharge infrastructure, Charging service: everywhere, everycar

Recharging infrastructures portfolio

Private environment

Public environment

EV recharging speed

Fast Charging

NORMAL CHARGING

Specific Fleets recharging management

AC & DC Public recharge stations

Normal charging at home and at the office

Parking areas:

Master /slave solutions

AC Charging solutions
From 3,7 kW up to 43kW

General characteristics

Complete station for the management of AC conductive charging of electric vehicles, charging with battery chargers, housed on board the vehicle, suitable for installations in:

Open public areas
along the road
or public access areas

Reserved public areas
shopping centres, car parks,
exchange points, blocks of flats

Service stations

Electrical charging and payment will occur **automatically** for the customer, who will only have to connect the vehicle to the charging station using a special connector.

General characteristics

Complete station for the management of AC conductive charging of electric vehicles, charging with battery chargers, housed on board the vehicle, suitable for installations in:

Private / Public garages

In private garages electrical charging and payment will occur automatically for the customer, who will only have to connect the vehicle to the charging station using a special connector.

EMMS
System for Managing Normal Charging Infrastructure for Electric Vehicles

EMMS : Electric Mobility Management System

A multitenant system

EVSE Operators

DSO

OTHERS

Hosting (ASP)
or
Full Service:

- Installation
- Commissioning
- Maintenance
- Operation
- Management

EMMS

B2B relationships

Hosting (ASP)
Or
Full Service:

- Contract
- Card
- Customer

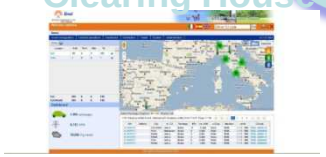
Electric Vehicle
Service Providers

ENERGY VENDORS

OTHERS

CUSTOMERS

Clearing House



B2C relationships

FAST DC Charging Solutions
Multistandard, up to 60 kW

Charger technology Evolution

CRAVE
2010 – 2012 Experience

EQC 50
Transition phase 2013

FASTO

CRAVE Chargers	EMMS Integration CRAVE Management tools	Transition phase	FASTO Chargers
CRAVE 20 + INLET 22kW OPTION AVAILABLE **CRAVE 20 Decoupling System + Storage System** *AVAILABLE IN 2012*	**CRAVE Local and Remote CMS** **CRAVE Commissioning tools** **CRAVE Smart Box Subsystem (ESS)** **EMMS Suite**	**Upgraded and Flexible Solution** **Integrated into EMMS via CRAVE System**	**FASTO** **Product family** **Modularity**

FASTO Chargers: Product family

Basic + Secondary Outlet + Decoupling System

FASTO Chargers

FASTO All in One

Basic

+ Secondary Outlets

+ Decoupling system

+ Add Value Services

FASTO 50 basic

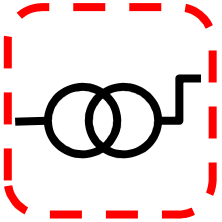
FASTO 50 Options

Secondary Outlets

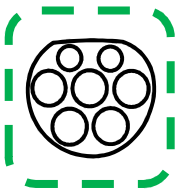
Decoupling System

ESS – EMMS
Integration

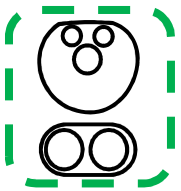
CHAdeMO
DC Mode 4
50 kW



DSO connection
55 kW



AC Outlet
43 kW



Combo2
DC Mode4
50 kW

Storage System

Second Life Batteries

PROJECT ACTIVITIES : 1 Power Controlling Strategy

The **Crave SS** (Smartbox Subsystem) allows the **smart** fast charge **management** providing a **charger standardize user interface** and **external communications**

GRID CONNECTION

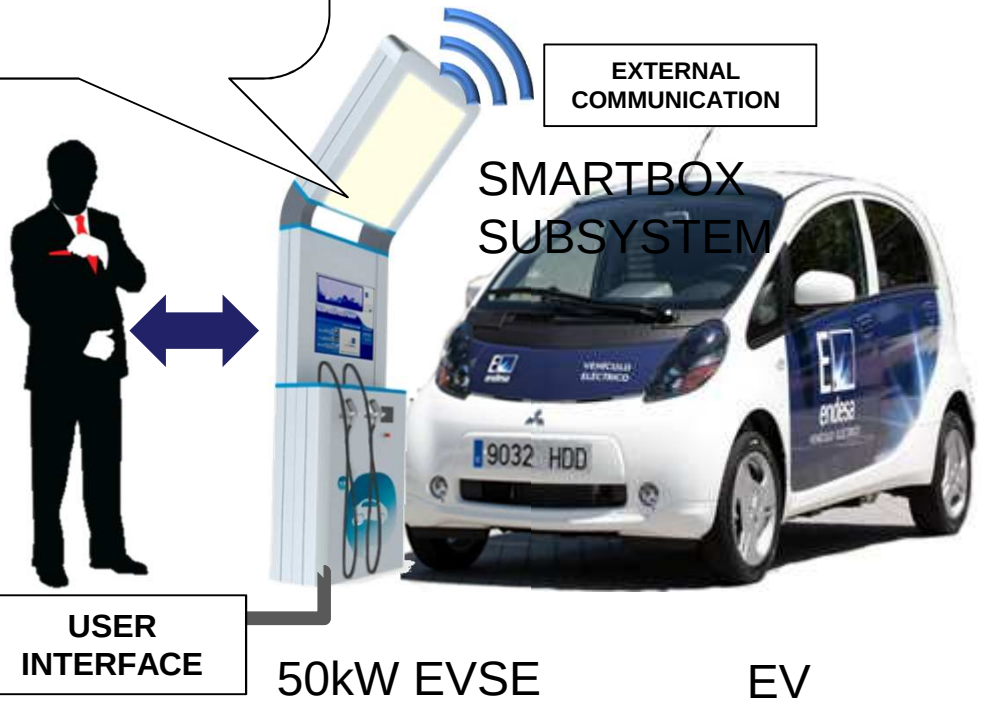
USER INTERFACE

50kW EVSE

EV

PROJECT ACTIVITIES : 1 Power Controlling Strategy

The **Crave SS** (Smartbox Subsystem) allows the **smart** fast charge **management** providing a **charger standardize user interface** and **external communications**



PROJECT ACTIVITIES : 1 Power Controlling Strategy

The **Crave SS** (Smartbox Subsystem) allows the **smart** fast charge **management** providing a **charger standardize user interface** and **external communications**

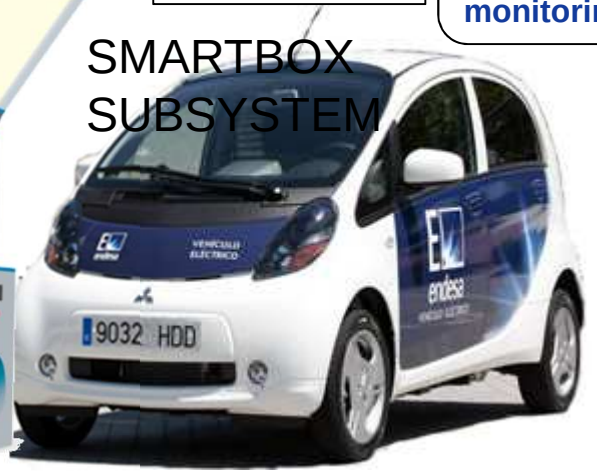
POWER REDUCTION

CRAVE CM

Fast charge EVSE **remote controlling and monitoring**

EXTERNAL COMMUNICATION

SMARTBOX SUBSYSTEM



USER INTERFACE

50kW EVSE

EV

GRID CONNECTION

PROJECT ACTIVITIES : 1 Power Controlling Strategy

The **Crave SS** (Smartbox Subsystem) allows the **smart** fast charge **management** providing a **charger standardize user interface** and **external communications**

POWER REDUCTION

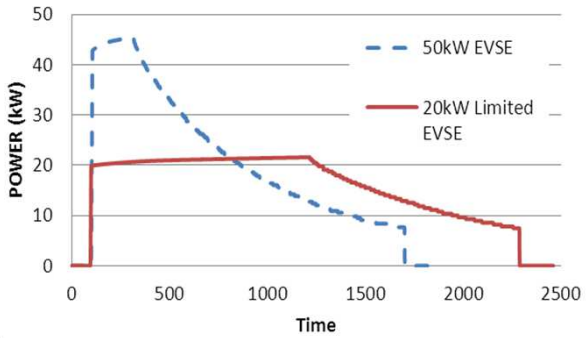
CRAVE CM

Fast charge EVSE **remote controlling and monitoring**

EXTERNAL COMMUNICATION

SMARTBOX SUBSYSTEM

The consumption peak is controlled



USER INTERFACE

50kW EVSE

EV

GRID CONNECTION

PROJECT ACTIVITIES: 2 Demand Balancing Strategy

The Decoupling System acts as energy buffer between the EV and the distribution grid. The energy is stored in latest generation Lithium batteries

CRAVE CMS

STORAGE SYSTEM

DECOUPLING SYSTEM

SMARTBOX SUBSYSTEM

50kW EVSE

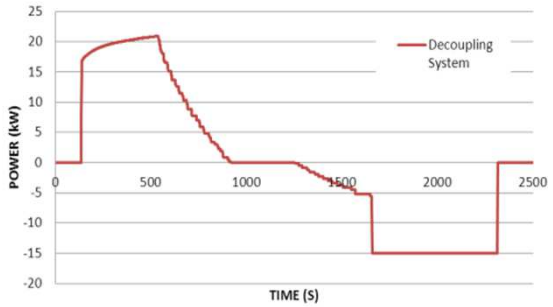
EV

GRID CONNECTION

PROJECT ACTIVITIES: 2 Demand Balancing Strategy

CRAVE CMS

Decoupling System power exchange



STORAGE SYSTEM

DECOUPLING SYSTEM

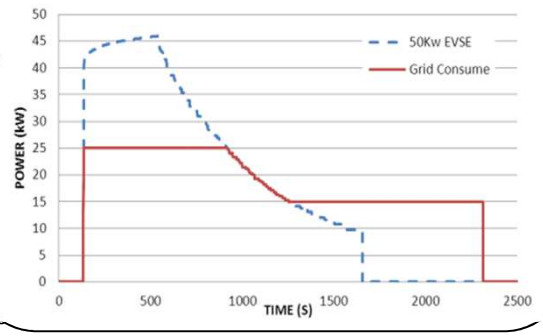
SMARTBOX SUBSYSTEM

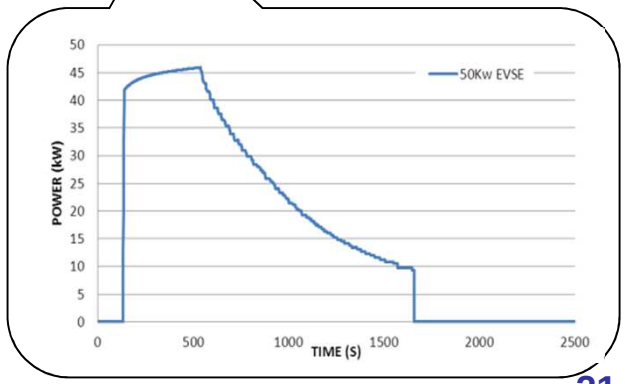
50kW EVSE

EV

GRID CONNECTIO

The peak consume is smoothed





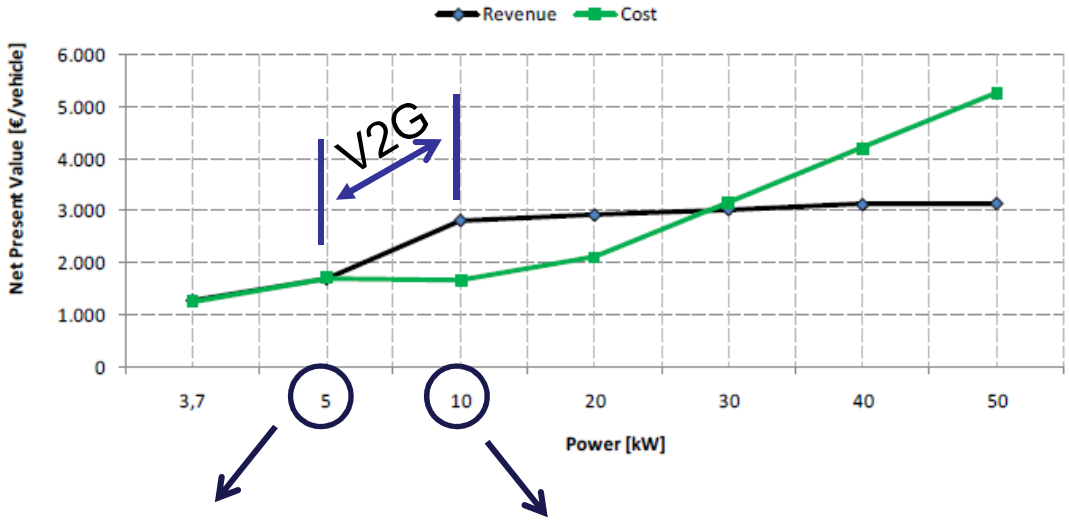
3 V2G

Key Notes: bidirectional, control, aggregation

At which power we should discharge?

V2G can maximize benefits with EV participation in daily market plus secondary regulation.

An study report elaborated on the Endesa V2M project conclude that V2G may get benefits depending on the configuration of the discharger power, showing that between 5 and 10kW are the most promising discharging rates. That is because the limiting factor right now is the battery capacity, not the power.



V2G 5 kW

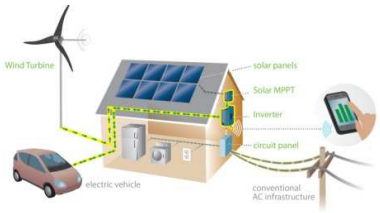
6 V2G installed in Malaga

V2G 10 kW

Produced on V2M project

V2G opportunities for...

- Customer



- Cost minimization
- CO_2 minimization
- Demand profile flatting

Time shifting

- Grid

- Power balancing
- Power quality support

V2G: Málaga ZEM2ALL

6 equipos V2G

Cada equipo de carga y descarga de hasta 5kW de potencia en corriente continua

Main Features

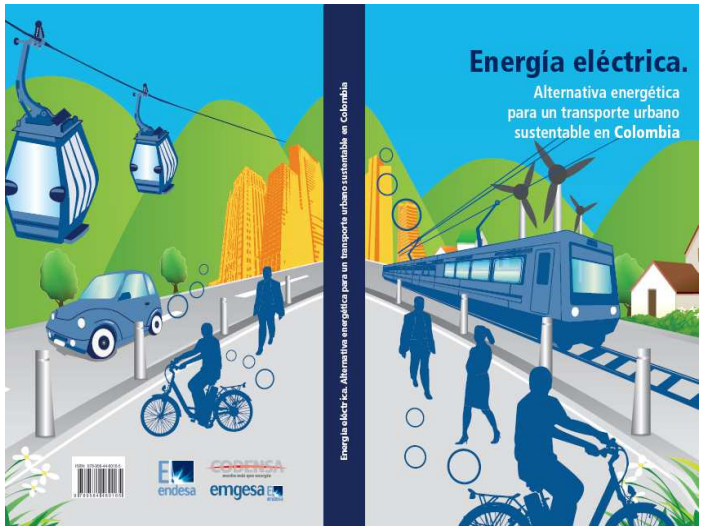
- Comunicaciones con el sistema de gestión remoto
- Integración con sistema eléctrico
- Basado en la interfaz de CHAdeMO
- Actualizable remotamente
- Certificaciones Europeas CE

4 Public electric transportation

Key Notes: eBus, induction, high power equipments

Electric mobility transportation

eBUS for city transportation

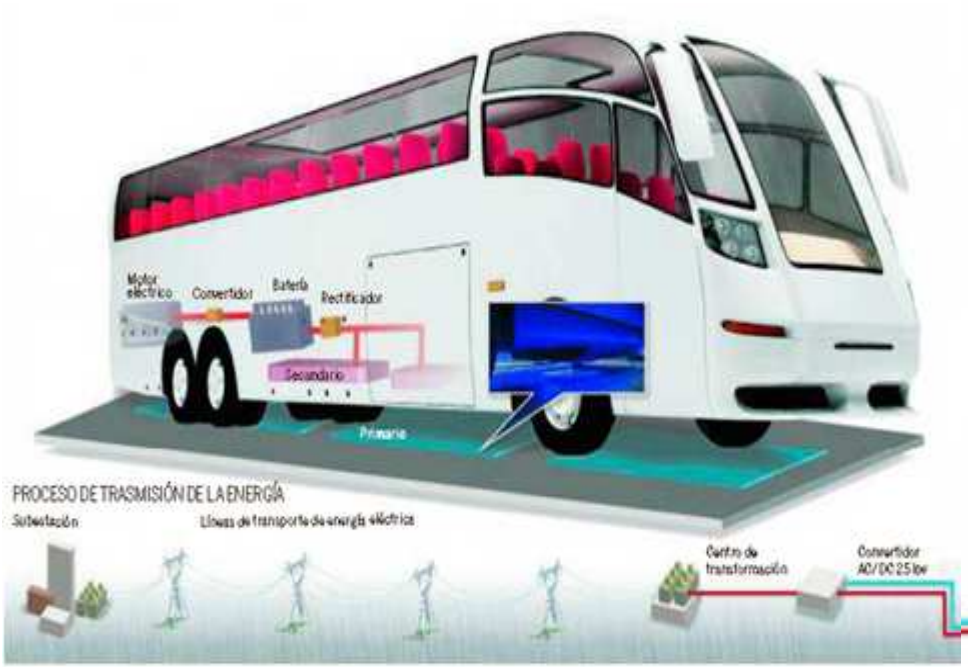


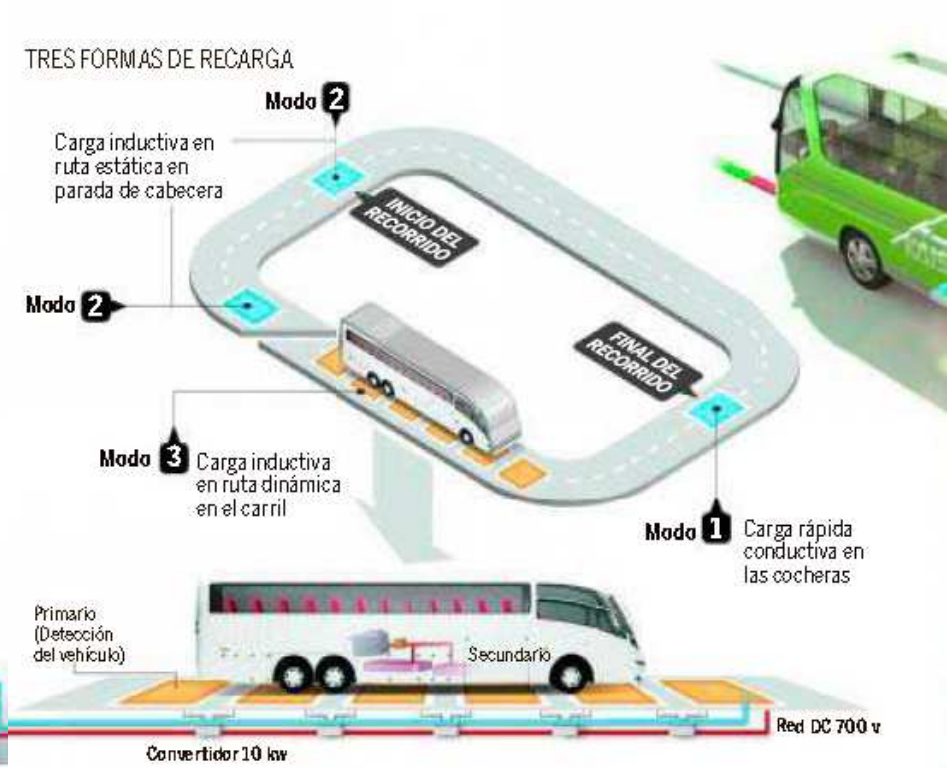
- Colaboración con administraciones públicas en España Chile y Colombia

- Demostraciones de eBUS 100%
- Infraestructura de carga en cocheras
- Elemento básico para la introducción del transporte limpio en la ciudad
- Proyectos de inducción

Inducción dinámica para transporte público urbano

❖ **Objectivo**: Optimizar las infraestructuras de cargas para hacer posible la movilidad electrica colectiva urbana, mediante tres modos de carga: Conductiva, carga estática en ruta y dinámica en ruta.

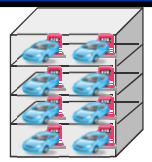




5 Main Deployments

Key Notes: Real environment, demonstrators, international

Projects: focus on the right solution

Testing Concepts							
E-Parking	Final Customer				Recharging Stations		Public Streets
	Condominium	Houses	Fleets	Parking public/private	Business as usual	Convenience store	
							

Green eMotion

movele Movilidad Eléctrica

Smart City

ZEM2ALL

ZEM2ALL: Conventional chargers

More than 300 indoor/outdoor instalation projects and 160 already on service

ZEM2ALL: fast charging stations

23 fast charging points in 9 different locations in Malaga, Marbella and Fuengirola cities

Hacia un Modelo conceptual de eParking

3

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.

2

DISTRIBUIDORA

Contratación o ampliación de potencia.

Gestor de Recarga o auto operador.

1

CARGA NORMAL

Estaciones de recarga normal dispuestas en un parking para las flotas de vehículos

4

7

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.

8

VEHICULOS HIBRIDOS Y ELECTRICOS

5

CARGA RAPIDA

Infraestructura de recarga rápida

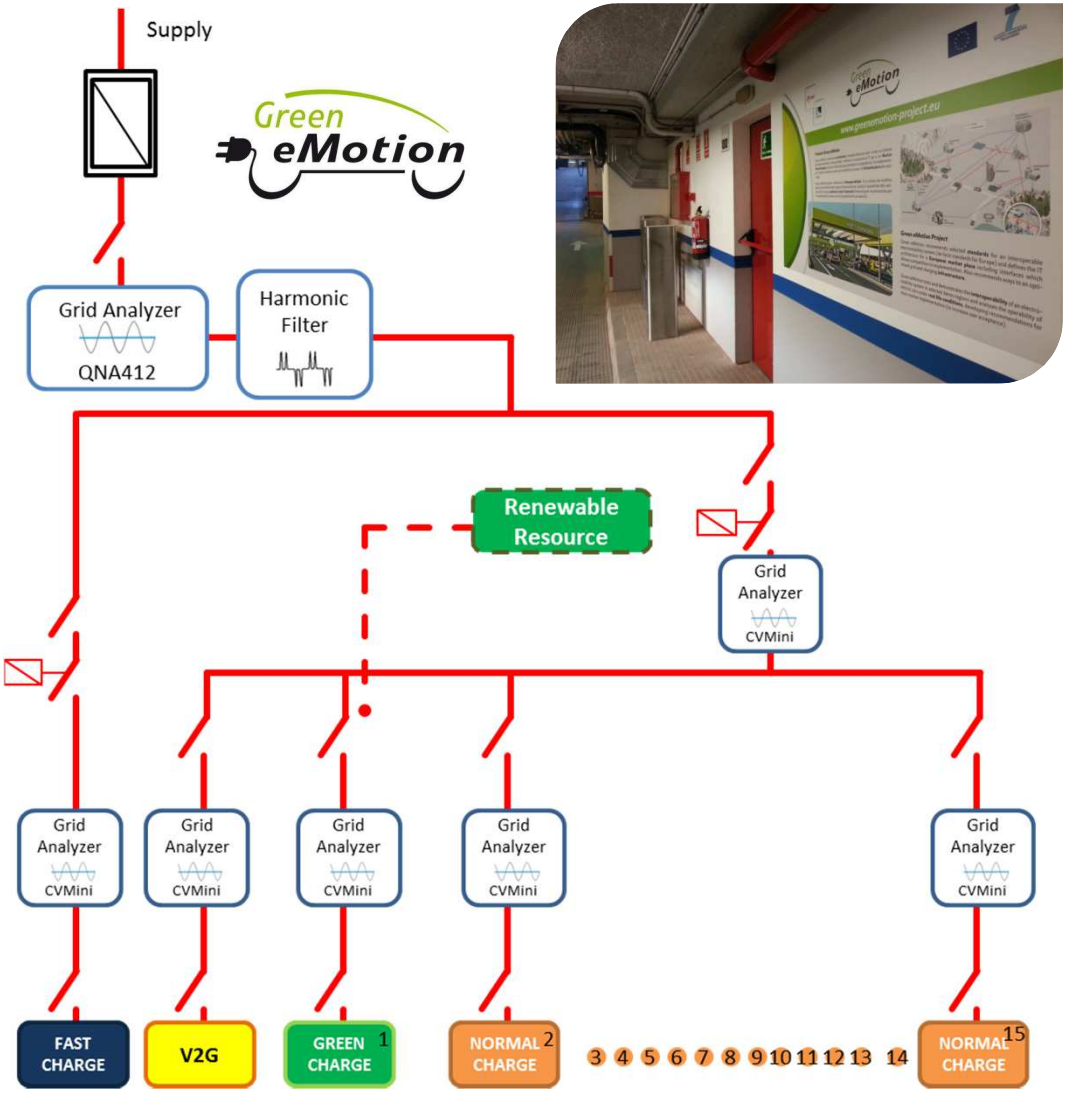
6

V2M (Vehicle to Microgrid)

Tecnología que permite la gestión bidireccional de la energía almacenada en el VE.

Endesa e-Parking Lot Living Lab

Description: EVSE



Private Fleet eParking		
N	**Model**	**Nominal power**
15	*AC Enel Charger*	3.7 kW / 22 kW
1	*EQC50*	50 kW
1	*V2G*	10 kW bidirectional

luz · gas · personas