

# RWE ELECTRO-MOBILITY

"We are putting renewable energy  
on the road."

Dr. Stephan Hell

Group manager product management product innovation



RWE Effizienz GmbH



# Agenda

1 Current market situation



2 Core challenges for charging infrastructure

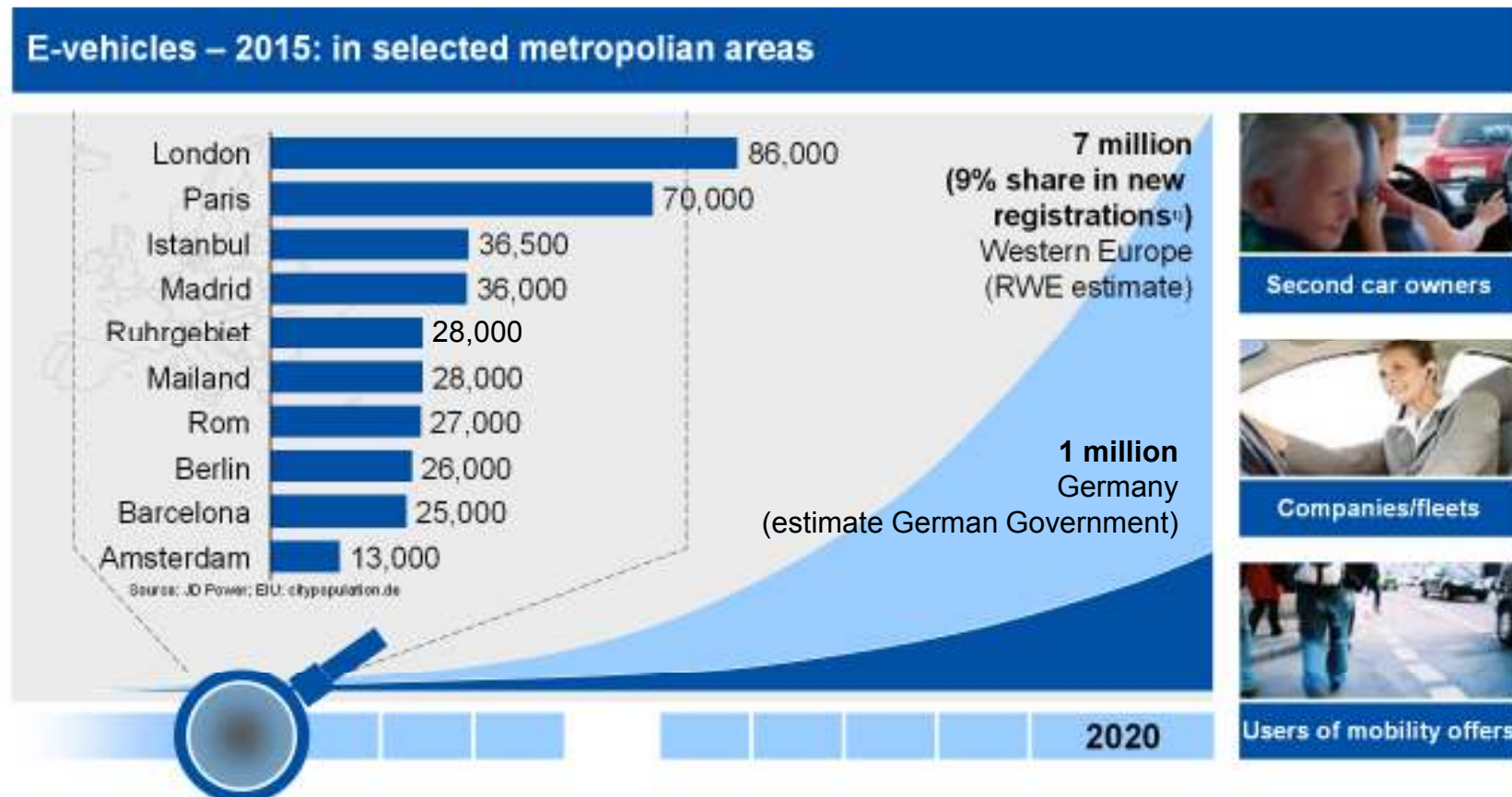
3 Status quo RWE

4 Visions

1

# Electro-mobility at first in conurbations – >300,000 EVs expected in European metropolian areas by 2015

CUMULATIVE NUMBER OF ELECTRIC VEHICLES (EV + PHEV)



1) Source: IEA, independent research institutes

EV: Electric vehicle  
PHEV: Plug-in hybrid electric vehicle incl. range extender

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# 2

## Infrastructure installation with three core challenges

### CHALLENGES

|          |  |  |
|----------|--|--|
| <b>A</b> | <b>Technology/<br/>Standardisation</b><br>  | <ul style="list-style-type: none"> <li>&gt; At least Europe-wide standardisation of the plug connection vehicle-charging post (success: VDE application rule)</li> <li>&gt; European standard for data communication (bidirectional and broadband)</li> <li>&gt; Preparation of international roaming agreements betw. utilities</li> <li>&gt; Ensuring consistent cross-boarder payment systems</li> </ul>          |
| <b>B</b> | <b>Investments/<br/>Business model</b><br> | <ul style="list-style-type: none"> <li>&gt; Shoulder the financial investments for infrastructure of EUR 3-4 billion in Germany and of EUR 20-25 billion in Europe</li> <li>&gt; Set the stage for an as fast as possible and area-wide build-up of intelligent, roaming-capable charging infrastructure</li> <li>&gt; Development of well-functioning business cases and new, innovative business models</li> </ul> |
| <b>C</b> | <b>Market model/<br/>Framework</b><br>    | <ul style="list-style-type: none"> <li>&gt; Consistent market model in Germany that permits competition - charging post is part of the unregulated business</li> <li>&gt; Ensuring compatible regulatory framework across Europe</li> <li>&gt; Simple approval procedures</li> <li>&gt; Creating a legal framework e.g. refinancing of connection costs of a charging post via NUC; parking space quotas</li> </ul>  |

IS: Infrastructure    NUC: Network Usage Charges

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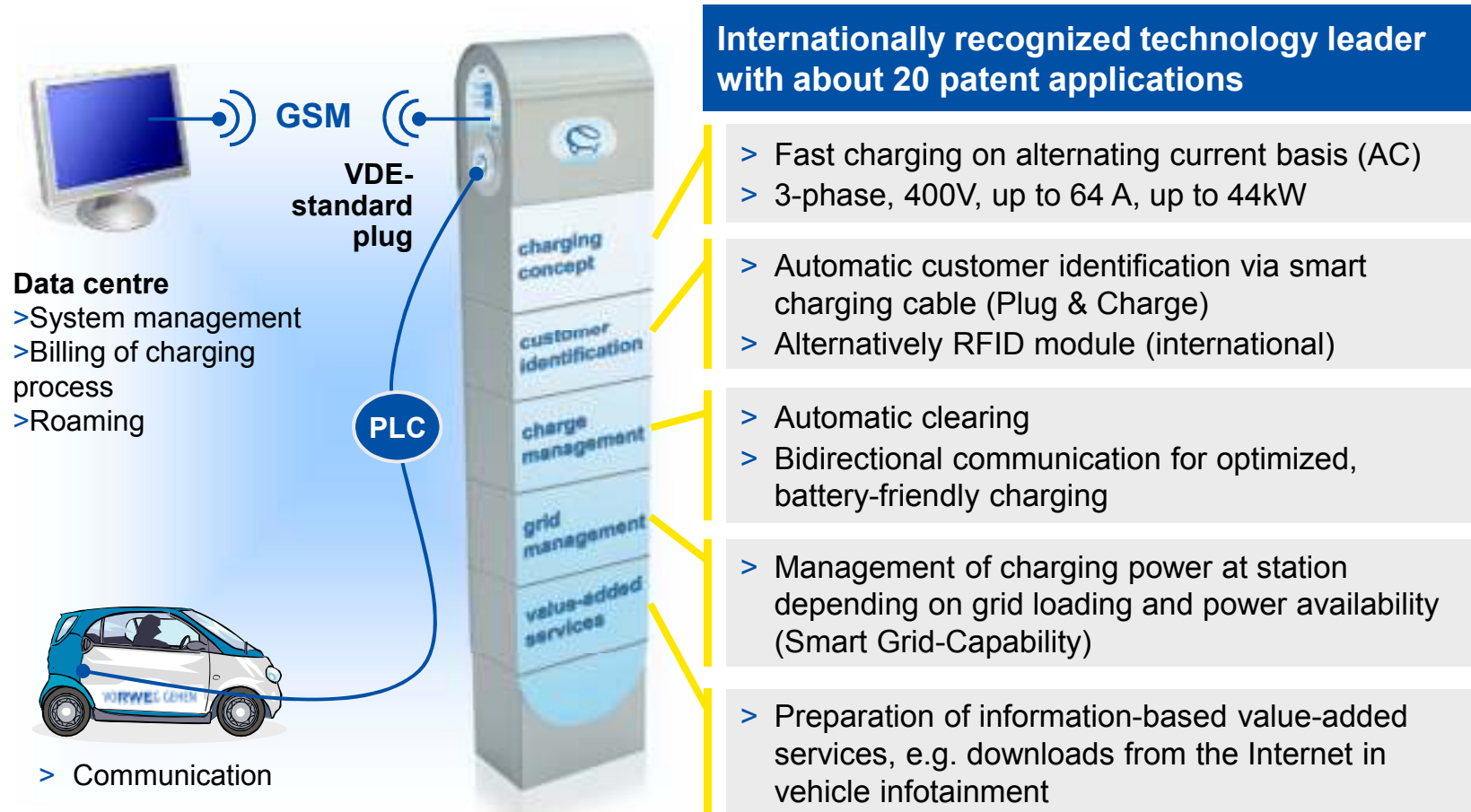


4 Visions

3

# Mass market-capable, smart and internationally marketable charging infrastructure system developed

OVERVIEW OF THE RWE E-MOBILITY TECHNOLOGY CONCEPT



GSM: Global System for Mobile Communications

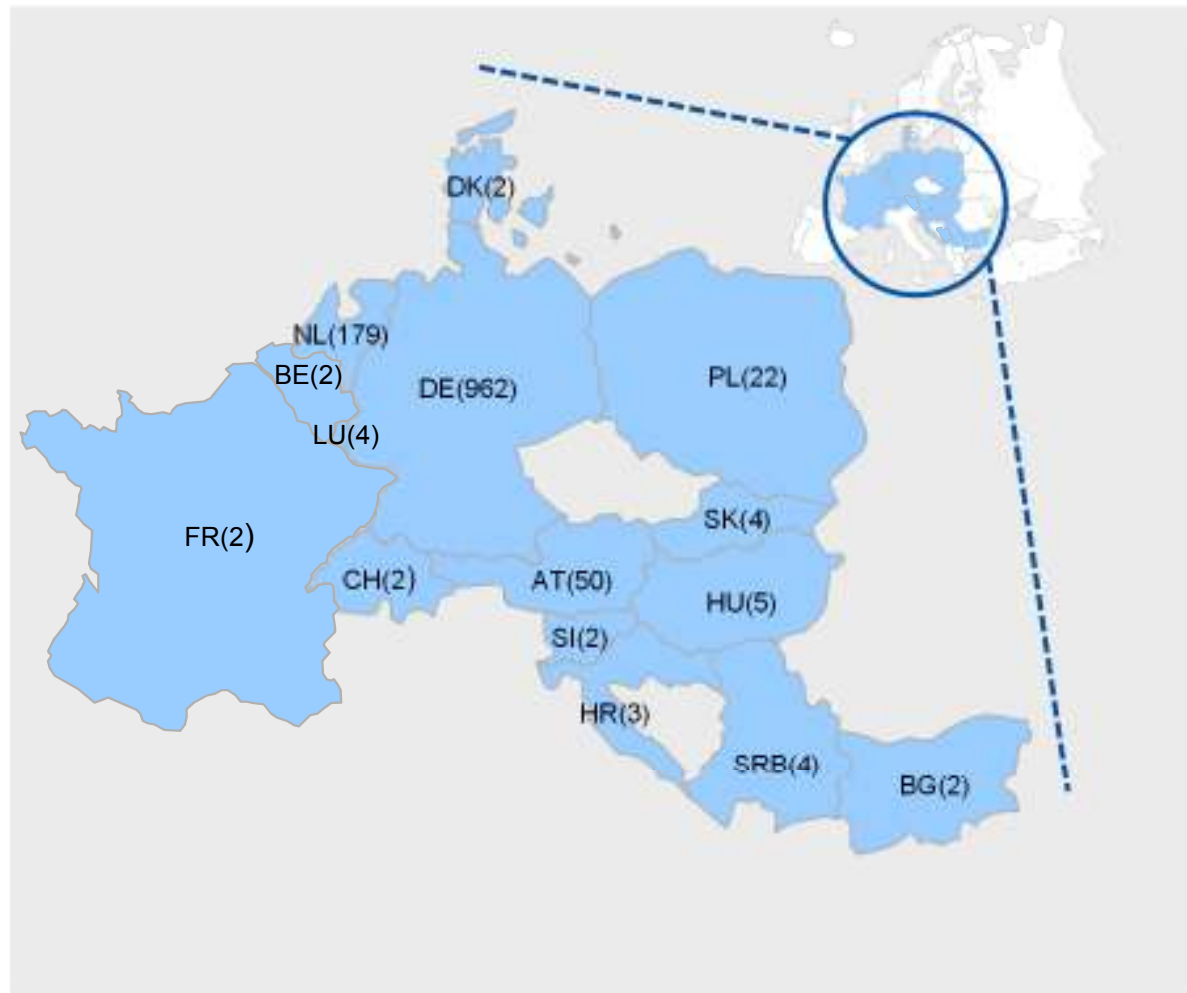
PLC: Powerline Communication

VDE standard plug: German standard plug

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## The European perspective: System operations of RWE charging technology in 15 countries in Europe

|                 |   |     |
|-----------------|---|-----|
| Germany         |    | 962 |
| The Netherlands |    | 179 |
| Austria         |    | 50  |
| Poland          |    | 22  |
| Hungary         |    | 5   |
| Serbia          |    | 4   |
| Croatia         |    | 3   |
| Denmark         |    | 2   |
| Slovakia        |    | 4   |
| Bulgaria        |   | 2   |
| Switzerland     |  | 2   |
| Luxembourg      |  | 4   |
| Slovenia        |  | 2   |
| France          |  | 2   |
| Belgium         |  | 2   |





3

## RWE charging solutions range from easy starters' packages to smart charging infrastructure

DIFFERENT CLIENT EXIGENCIES



3

# Access systems for EV charging with RWE system solution



## 3

## Fact sheet Combi Station

## Combi-Station



|                             | AC   | DC  |
|-----------------------------|--|---|
| <b>Charging power</b>       | 22 kW AC   | 50kW DC   |
| <b>Outlet</b>               | e-Mobility Typ 2   | CHAdEMO   |
| <b>Size</b>                 | 120 *85 *210   |   |
| <b>System-functionality</b> | <ul style="list-style-type: none"> <li>&gt; public. AC-charging</li> <li>&gt; Stand-alone</li> </ul> | <ul style="list-style-type: none"> <li>&gt; Public DC charging</li> <li>&gt; Stand-alone</li> </ul> |
| <b>Access</b>               | <ul style="list-style-type: none"> <li>&gt; Plug &amp; Charge</li> </ul>                             | <ul style="list-style-type: none"> <li>&gt; Direct payment</li> <li>&gt; Mobile Payment</li> </ul>  |
| <b>Billing</b>              | <ul style="list-style-type: none"> <li>&gt; Single bill kWh</li> </ul>                               | <ul style="list-style-type: none"> <li>&gt; Single payment time</li> </ul>                          |
| <b>Payment</b>              | <ul style="list-style-type: none"> <li>&gt; Quarterly billing</li> </ul>                             | <ul style="list-style-type: none"> <li>&gt; Direct payment</li> </ul>                               |
| <b>EV</b>                   | <ul style="list-style-type: none"> <li>&gt; AC Typ 2</li> </ul>                                      | <ul style="list-style-type: none"> <li>&gt; CHAdEMO EV</li> <li>z.B. i-miev, c-cero ...</li> </ul>  |

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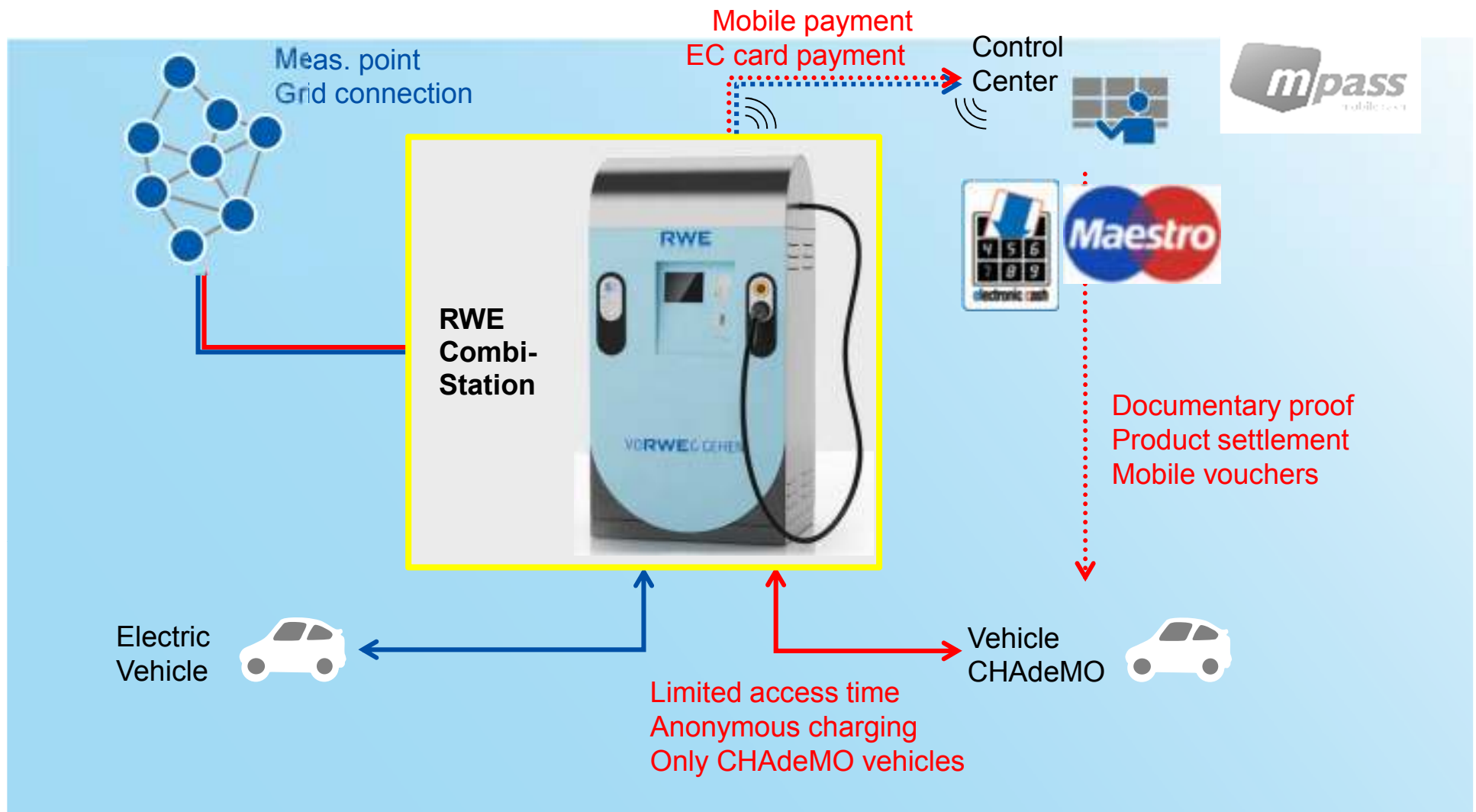
## Functionality Combi Station



3

# Ultra quick charging activities : Combi Station

RWE Effizienz E-Mobility Combi station project



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## CHAdEMO Combi Station Installation per 09 / 2011



11 station in Germany  
10 along highway A1

first Combi Station in  
Berlin in March 2011



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# Impression Combi Station Installation



Installation with different cooperation partner

3

## Easy installation procedure



Gewicht des Sockel 2,07 t, Auslaß der Kabeleinführung rechts Rohr DN 120 mm



3

# Additional internal DC quick charging activities

**1** Test Installation and measurement Quick Charger Types 50 kW

SGTE  
epyon

Takaoka 200V 50 kW at Eurotest / Dortmund  
Epyon Terra 100.4 2\*50 kW at RWE / Essen  
RWE Combi station 22 kW AC + 50 kW DC  
Perspective : QC experience, grid reaction ....



**2** Conversion of a Mercedes Viano into a AC and DC quick chargeable vehicle

Conversion into an AC 11kW or DC 50kW chargeable car as test platform for QC above CHAdeMO standard and demonstration vehicle for automotive supplier on QC projects



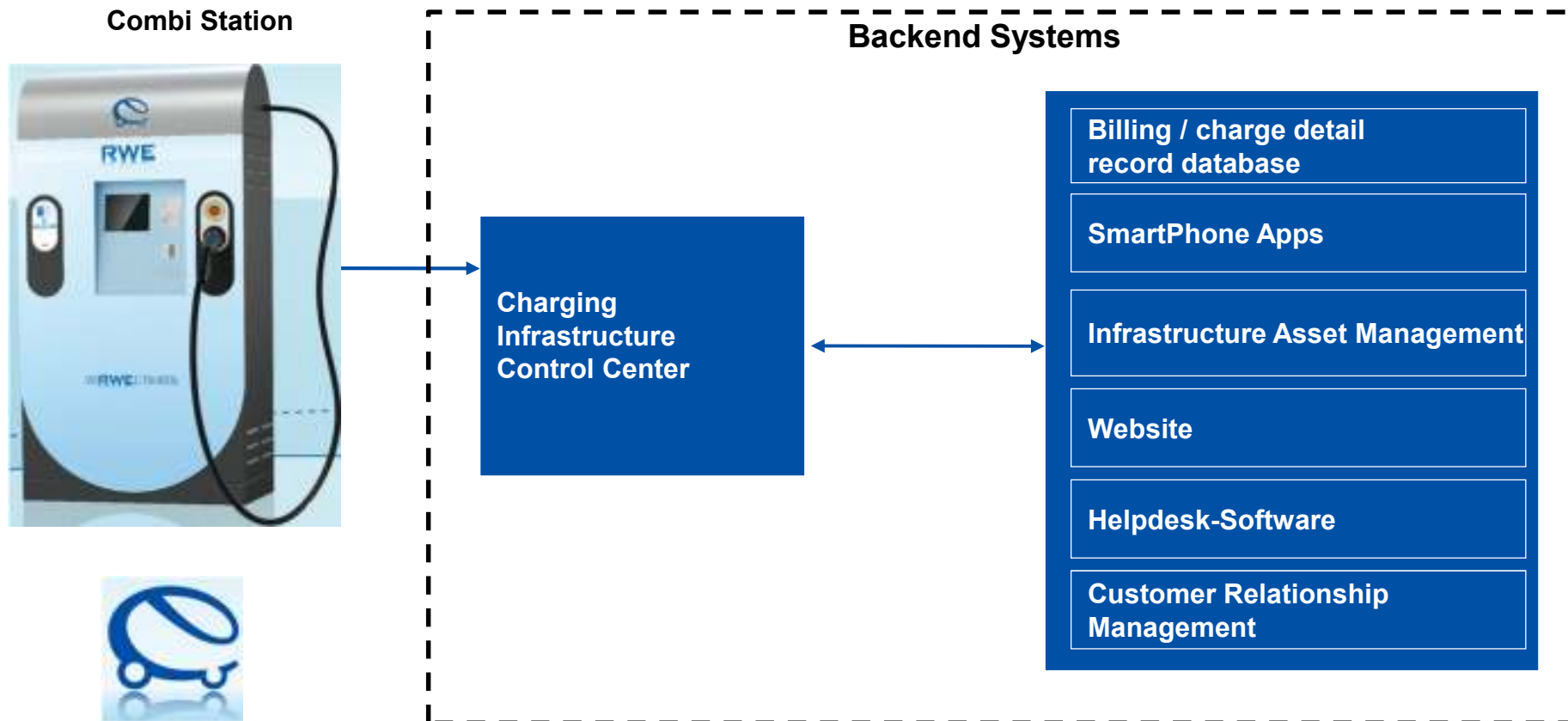
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## Additional internal DC quick charging activities



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# RWE charging infrastructure solutions System design with main components



### 3

## Wide range of system and operation services in place, offer to be further expanded

### OVERVIEW ON CURRENT AND TARGET SERVICE OFFER

|                            |   | Cities/<br>local<br>utilities | Large<br>scale IS<br>operators | Bus./<br>fleet<br>operators | Auto<br>makers/<br>leas. co. | Indirect<br>sales/<br>w'sale | Private<br>custo-<br>mers |
|----------------------------|---|-------------------------------|--------------------------------|-----------------------------|------------------------------|------------------------------|---------------------------|
| <b>Consulting</b>          | Business & system design                    | ✓                             | ✓                              | ✓                           | –                            | –                            | –                         |
|                            | Technical training (Inst., O&M)             | ✓                             | ✓                              | ✓                           | –                            | –                            | –                         |
| <b>Local<br/>services</b>  | Choice of location/grid access              | (✓)                           | ✓                              | ✓                           | ✓                            | (✓)                          | ✓                         |
|                            | Installation/Commissioning                  | (✓)                           | ✓                              | ✓                           | ✓                            | (✓)                          | ✓                         |
|                            | Operation & Maintenance                     | (✓)                           | ✓                              | ✓                           | ✓                            | (✓)                          | ✓                         |
| <b>IT services</b>         | Control center/helpdesk                     | ✓                             | ✓                              | ✓                           | –                            | –                            | –                         |
|                            | Authentication                              | ✓                             | ✓                              | ✓                           | (✓)                          | (✓)                          | (✓)                       |
|                            | Contract clearing/data mgmt.                | ✓                             | ✓                              | ✓                           | (✓)                          | –                            | –                         |
|                            | Custom. authent. applications <sup>1)</sup> | ✓                             | ✓                              | ✓                           | (✓)                          | –                            | –                         |
|                            | Customized helpdesk SW <sup>2)</sup>        | (✓)                           | (✓)                            | (✓)                         | –                            | –                            | –                         |
|                            | Customized operation SW <sup>2)</sup>       | (✓)                           | (✓)                            | (✓)                         | –                            | –                            | –                         |
|                            | E-Roaming betw. IS operators                | ✓                             | ✓                              | ✓                           | (✓)                          | –                            | –                         |
|                            | Billing                                     | (✓)                           | (✓)                            | (✓)                         | (✓)                          | –                            | –                         |
| <b>Energy<br/>services</b> | Invoicing                                   | (✓)                           | (✓)                            | (✓)                         | (✓)                          | –                            | –                         |
|                            | Load mgmt.                                  | (✓)                           | (✓)                            | (✓)                         | (✓)                          | (✓)                          | (✓)                       |
|                            | Metering point operation/serv.              | (✓)                           | (✓)                            | (✓)                         | (✓)                          | (✓)                          | (✓)                       |
|                            | Integration w/ smart grid <sup>3)</sup>     | (✓)                           | (✓)                            | (✓)                         | (✓)                          | (✓)                          | (✓)                       |

Customer offer: ✓ In general (✓) Partially available  
– In general not

1) WWW-based, smart phone, etc. 2) If customer operates IS on his own

3) Incl. integration with local fleet mgmt. system & distributed generation

### 3

## Activities in international standard groups for EV / EVSE

- IEC 15118 V2G communication
- IEC 61851 infrastructure installation for EV
- IEC 62196 connector for EV
- IEC 61850 communication for electric installation

## Requirements for QC installation from RWE

Components of a QC system have to fulfill IEC 61851-1 : 2010 and IEC 61851-22/23 with all their dependencies , i.e. IEC 61000-6-2 and IEC 61000-6-3

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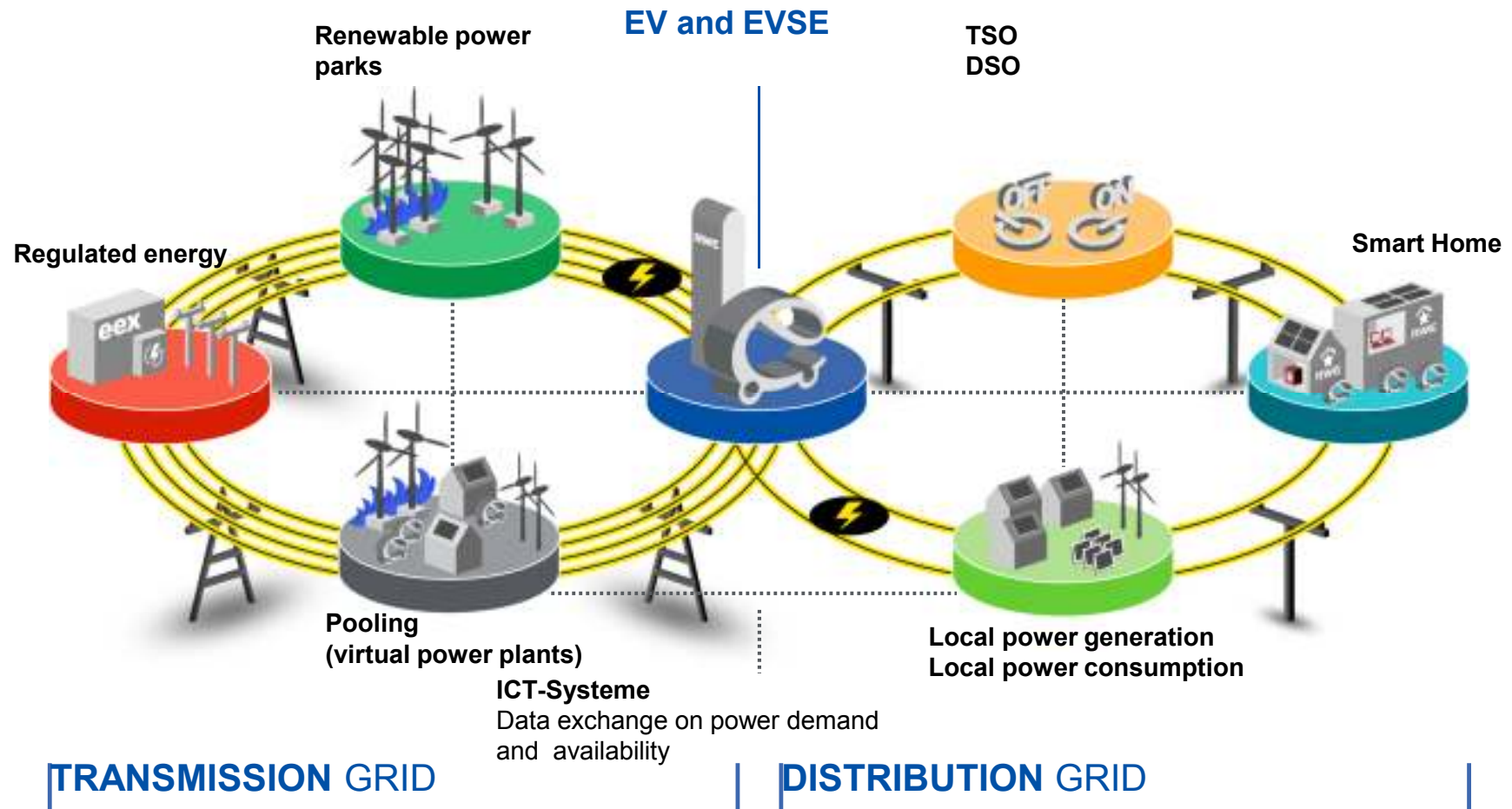
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Vision : Electro mobility will play a major role in the future Smart Grid activities.



## 4

# Vision: RWE is preparing the future today – E-Mobility, Renewable Energies and Add-on Services

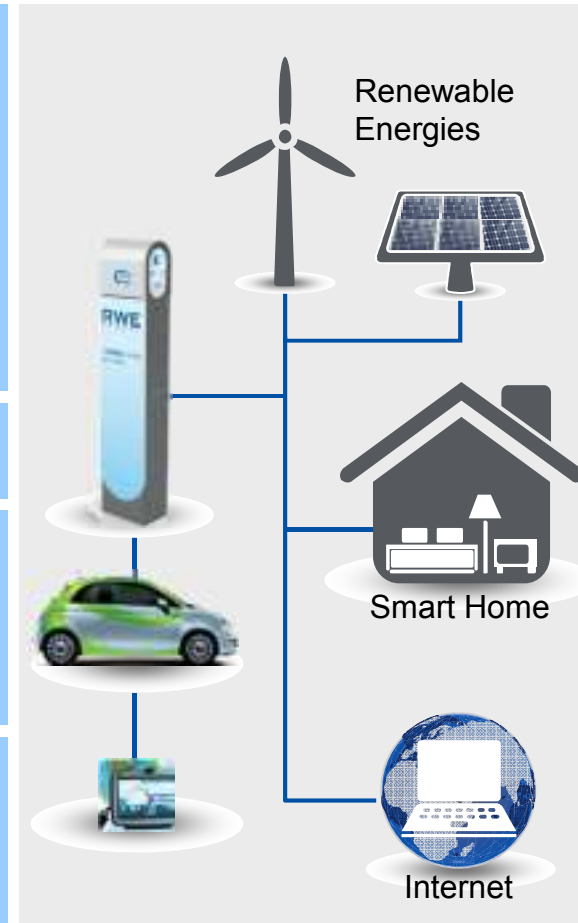
## INTELLIGENT INFRASTRUCTURE FOR FUTURE SERVICES

- > Intelligent control as prerequisite for optimum use of renewable energies (Vehicle-to-grid)
  - Charging batteries on over-supply of renewable energies
  - If needed, feeding of surplus energy back into the grid

- > Possibility of integration in smart grid structures

- > Option to integrate in Smart Home products
  - Demand side management
  - Optimised distributed generating

- > Possibility to couple the vehicle infotainment system with
  - Private network (e.g. music, travel data)
  - Remote diagnosis system of auto manufacturer





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