



Fast Charging

- a strategic view from E.ON

Matthias Mahrt, E-Mobility @ E.ON
Innovation and Projects, E.ON AG
CHAdeMO Europe Assembly Amsterdam, 23.09.2011



An overview. Of us.

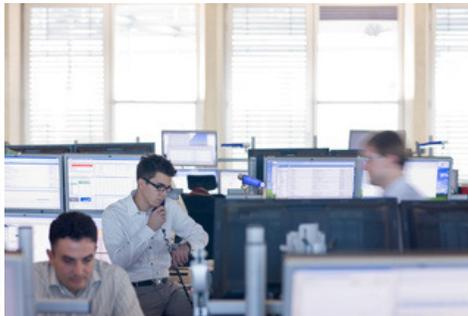


- E.ON is one of the world's largest investor-owned power and gas companies.
- At facilities across Europe, Russia, and North America, our more than 85,000 employees generated just under €93 billion in sales in 2010.
- Our objective is to make energy cleaner & better wherever we operate.
- We are implementing a new strategy to transform our company into a global provider of specialized energy solutions.

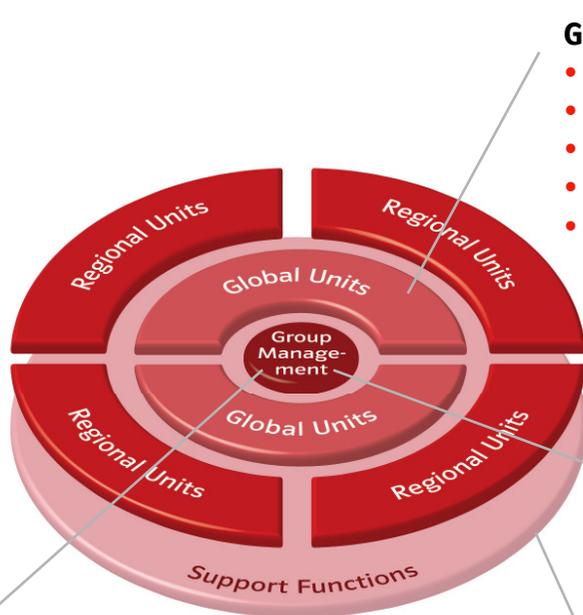
Our focus

We focus on what we do best and where we can add the most value. And that's making and marketing energy in competitive, converging international markets. Our core businesses are:

- renewables generation
- conventional generation
- energy trading
- global gas
- innovative energy solutions for customers



Our Group Structure



Global Units

- Conventional Generation
- Renewables Generation
- New Build & Technology
- Global Gas
- Trading

Support Functions

- IT
- Procurement
- Insurance
- Consulting
- Business Processes

E-Mobility@E.ON

- Direct-report to Prof. Maubach, member of the E.ON AG board of management, responsible for technology
- Regional/ local E-Mobility business to be established within the existing retail network of the Regional Units



Our e-mobility products focus on customer value-adds

customer orientated



reliable



integrated



cost efficient



environmentally friendly

E.ON: one-stop shop service provider for EV charging

E-mobility package with 4 optional components



Configured charging infrastructure hardware as basis of the offer



Delivery, installation, service and maintenance



Energy supply & management



e-fleet consulting with partner companies

- Full service from the analysis of necessities and local conditions, plus consulting services, technical installation and commissioning & maintenance.
- Optional marketing support: events, co-branding

Our concept: Customized solutions for different mobility and parking concepts

Private		Fleet		Public and semi-public parking		
 Private households	 Company parking	 Fleet services	Park&charge concepts			
 Real Estate	 Municipal fleets		 Car parks	 Hotels	 Airports / Train stations	
			 Retail / Restaurants	 Municipalities	DC fast charge	
					 Rest stations / Highways	
						

E-Mobility requires reliable access to power

Fast Charging : mobility complement to long-time parking / slow charging

Long Parking time (6-7h)



At home



At work



In parking garages of airports, train stations, recreation centers...

- Principal charging infrastructure
- Low-cost charging @home and @work
- Value-add service in public spots (e.g. recreation centers)
- ! Low earning potentials limit economic business perspectives



Short stops (<30 min)



Short stop locations © McDonalds



Gas stations & Highways



- Increase range of EVs for longer journeys
- Reduce customer's „range anxiety“
- Provide solution for curbside-parkers

→ DC Fast charging solution complements charging needs of EV users

DC Fast Charging Concept

DC Fast Charging takes ca. 30 min. – available customer time to be filled!

Customers will come to DC Fast Charging Stations ...

30 min at most for full car charging

... looking for additional services while they are waiting

- When parking for a short period of time (less than 1h)
- Unexpected recharging need
- To extend range in longer journeys



Fastfood Restaurants



Daily procurements



New charge &... activities in future?

- "Strategic locations of DC stations will prove to be a customer value-add" (Frost & Sullivan)

Forced parking time during car charging incentivizes customers to look for services in the meantime



Our Background in Fast Charging "Flottenversuch Elektromobilität"

Matthias Mahrt, E-Mobility @ E.ON

Innovation and Projects, E.ON AG

CHAdeMO Europe Assembly Amsterdam, 23.09.2011

„Flottenversuch Elektromobilität“, Berlin, 26. Juni 2008



- Dr. Maubach
CEO E.ON Energie AG
- Prof. Winterkorn
CEO Volkswagen AG
- Mr. Gabriel
Bundesminister für Umwelt,
Naturschutz und Reaktorsicherheit



20 Cars „**VW Twindrive**“

- Project duration: 2008 - 2012
- Place: Wolfsburg, region Berlin
- Plug-In Hybrid, Range Extender
- Range electric approx. 50 km
- Test of 4 Li-Ion battery types
- Interface Car/Grid

Combination of
Smart Meter Technology and
On-Board Battery Management

DC off board charger (as one part of the infrastructure)

- Use of "standard" components
- Charging power 30 kW
- Special requirements:
 - Housing
 - Air conditioning
 - Protocols
 - Communications
 - Connector
 - Cable
 - And so on.





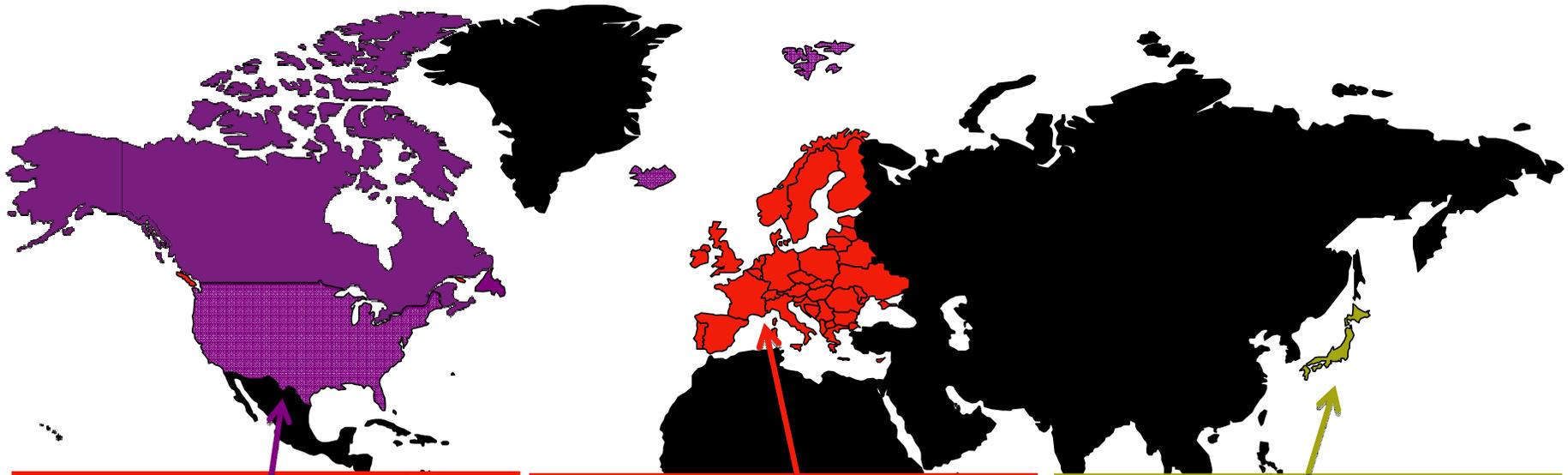
Background in Market Overview Fast Charging Study (End of 2010)

Matthias Mahrt, E-Mobility @ E.ON

Innovation and Projects, E.ON AG

CHAdEMO Europe Assembly Amsterdam, 23.09.2011

Global Market Overview



North America:

- ▶ Several key manufacturers
- ▶ Handful of installations to date
- ▶ 2 major projects underway - potential for hundreds of DC fast chargers to be installed by end 2011



Europe:

- ▶ Handful of manufacturers
- ▶ Very few DC fast chargers installed
- ▶ Projects more reliant on government funding



Japan:

- ▶ More than 10 manufacturers
- ▶ Driving standardisation
- ▶ Hundreds of DC fast chargers installed, hundreds more in 2011



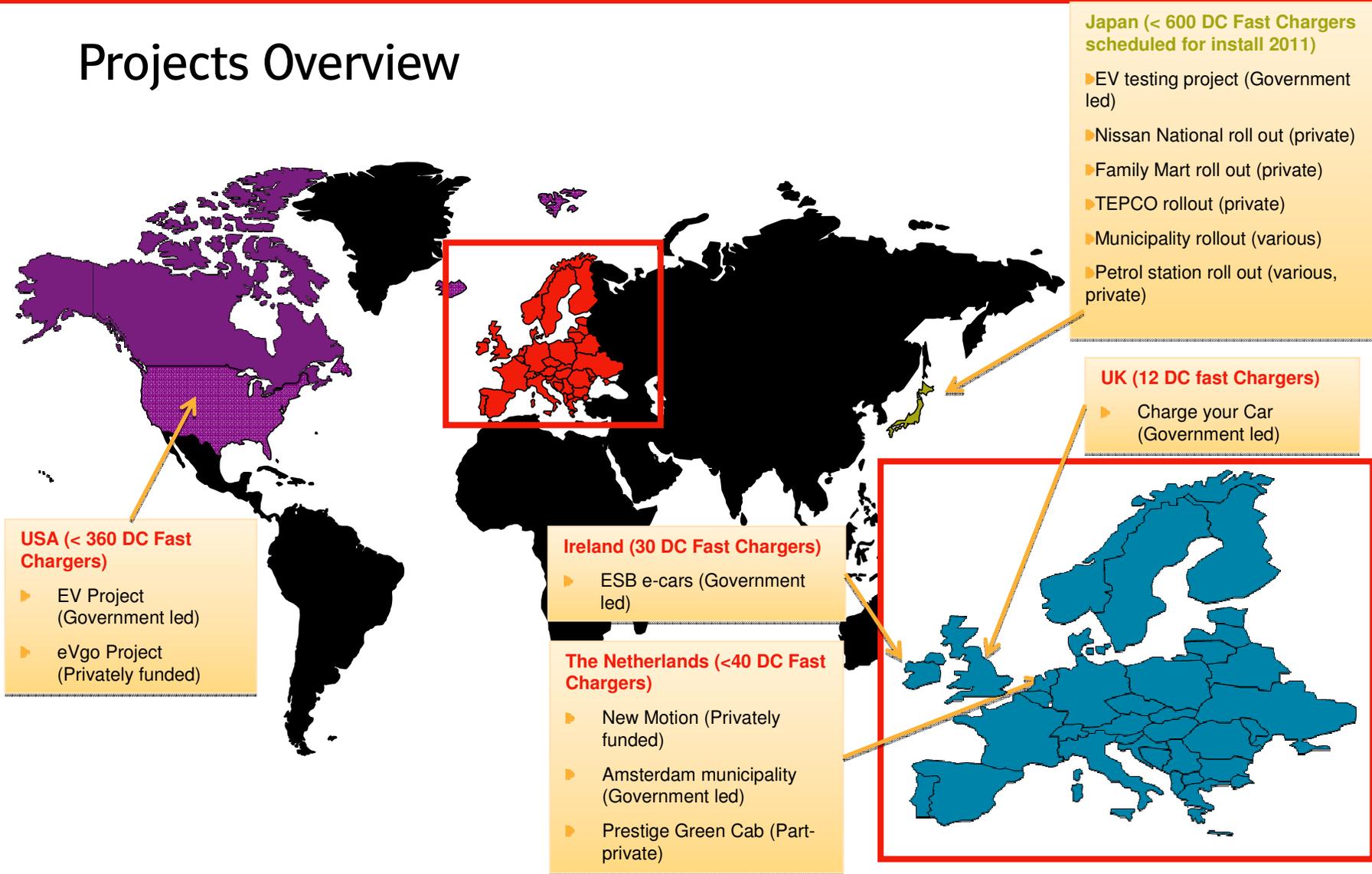
Outcomes

- **Fast chargers procured in the next year should be CHAdeMO compliant**
All manufacturers with product available for the European market are expected to meet this requirement.
- **Chargers need to be capable of upgrading**
This is necessary to support potential future standards developments – particularly in Europe where an alternative DC fast solution is likely
- OEMs are supporting different fast charging solutions:

CHAdeMO	US "Solution"	European "Solution"
▶ Nissan LEAF	▶ (GM - Opel)	▶ (Daimler)
▶ Mitsubishi i MiEV		▶ (Porsche)
▶ Peugeot iON		▶ (BMW)
▶ Subaru Plug-in Stella		▶ (Renault (also pushing for 22 kW AC charging))
▶ Protoscar LAMPO2		
▶ (Toyota)		



Projects Overview



Analysis of Maintenance approaches

	Maintenance arrangement	Example projects
TYPE A	Project Manager assumes responsibility for maintenance of the posts installed in the project	
TYPE B	Project Manager funds the maintenance but outsources all or part of the service to the charging post manufacturer.	
TYPE C	Project Manager arranges a maintenance contract but charges the host for this service	
TYPE D	Project Manager has no involvement in maintenance; this is the responsibility of the host.	

Best practice is: TYPE B

TYPE B maintenance can have two forms:

- ▶ Outsource maintenance to DC fast charger manufacturer
- ▶ Provide level 1 support in house, or via local partner. Outsource specialised level 2 support only.

Analysis: Challenges of site selection - Hosts

Strategies for attracting 'hosts'

Projects have tried to attract hosts by offering:

- ▶ Free installation
- ▶ Free maintenance for the duration of the project
- ▶ The option of ownership at the end of the project

However even with these options the barriers can be too great to overcome and the project may have a limited choice of sites

Barriers to finding suitable 'hosts'

It can be difficult to find suitable sites because:

- ▶ **Not many locations have suitable infrastructure already in place.**
- ▶ **It is hard for hosts to see the commercial value of having a DC fast charger on their sites**

CASE STUDY: The EV Project, USA



Offer to hosts:

- Free installation and Free DC fast charger
- Free maintenance for duration of project
- Ownership of post after project (or option to have it removed)

Status:

Installation of 310 DC fast chargers has been delayed to April 2011 but will be complete by September 2011

Success factors:

- Free equipment, add-on business and the potential green credentials has attracted some high profile retailers.
- The option of free removal has also helped ('nothing to lose' attitude)

Impact on project:

Short delay to project

CASE STUDY: Charge your Car, One North East, UK



Offer to hosts:

- 100% funding
- 5 year extended warranty
- Ownership of post after project

Status:

5 out of 12 sites have been confirmed

Main barriers:

- Site suitability
- Commercial benefits unclear – only those who want to appear 'green' are coming forward, too much perceived risk

Impact on project:

Installation was to be complete by March 2011, with 7 more sites to confirm the lack of suitable 'hosts' will delay the project.

Summary, about the Study

- DC Charging fits into our concept of electro mobility products and services
- There is a chance for selling the service of "Fast Charge" instead of selling kWh
- The field of service and maintenance needs companies for level 1 support.
- There's a need for attractive cooperation models with the land owners
- We need a deeper analyze of the products which are currently at the market

e-on