Dutch situation EV deployment

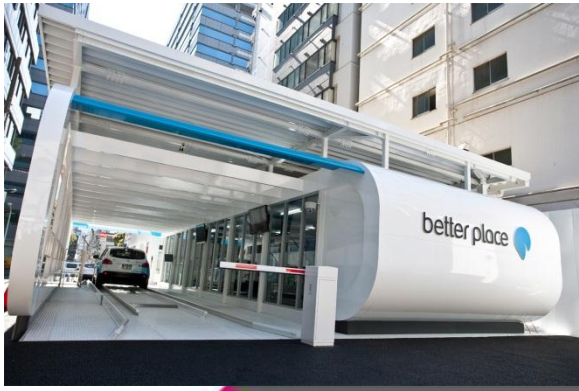
IEA TASK 17

André Postma
Oosterbeek
26 April 2012

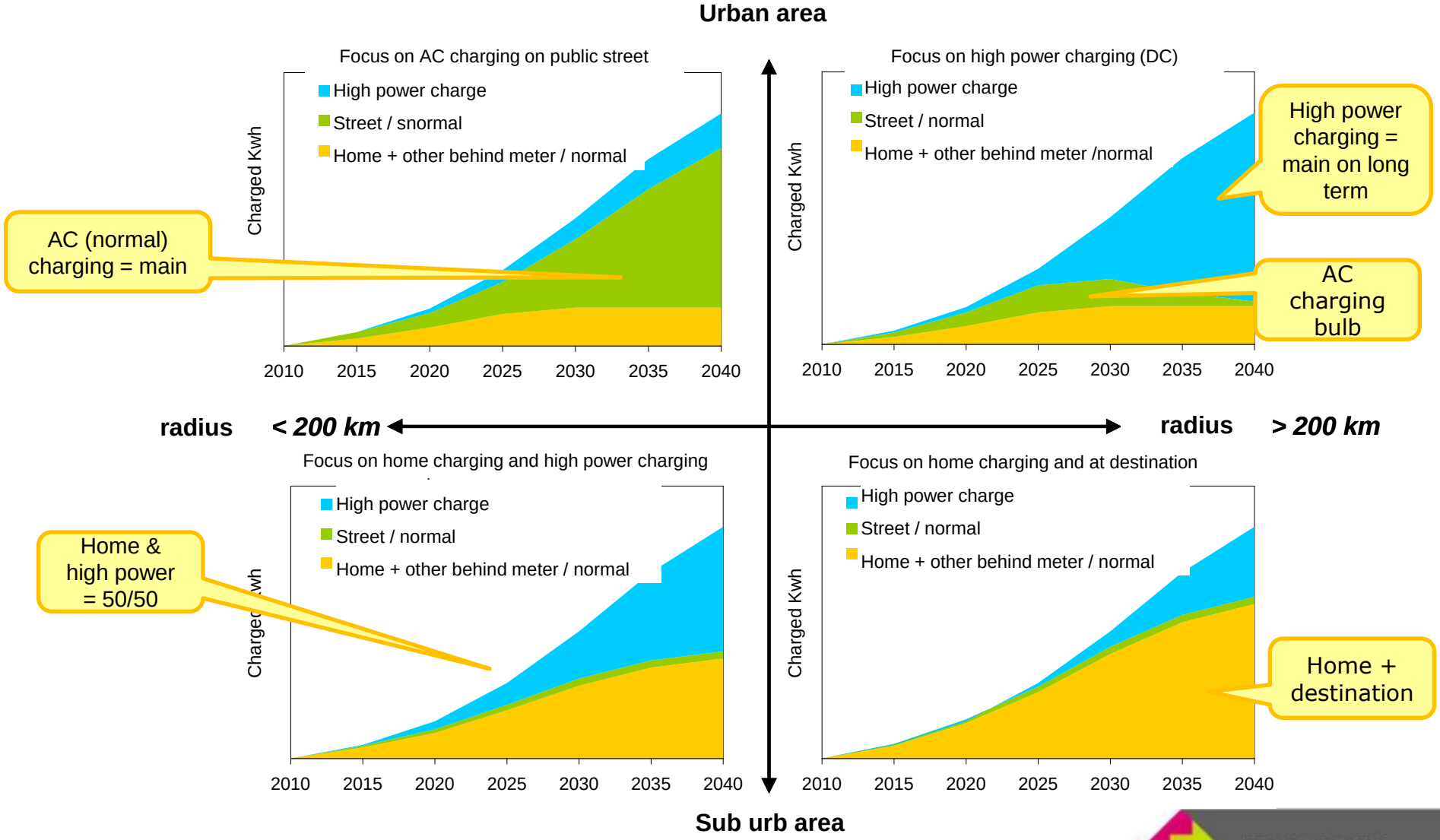
Different ways of charging

There are different ways of charging your car, based on different technologies. And these technologies can be used again in combination.

- **Home charging (AC)**
- **Public street charging (Low power AC & High power AC)**
- **High power (DC) charging**
- **Battery swap systems**
- **Inductive / conductive charging**

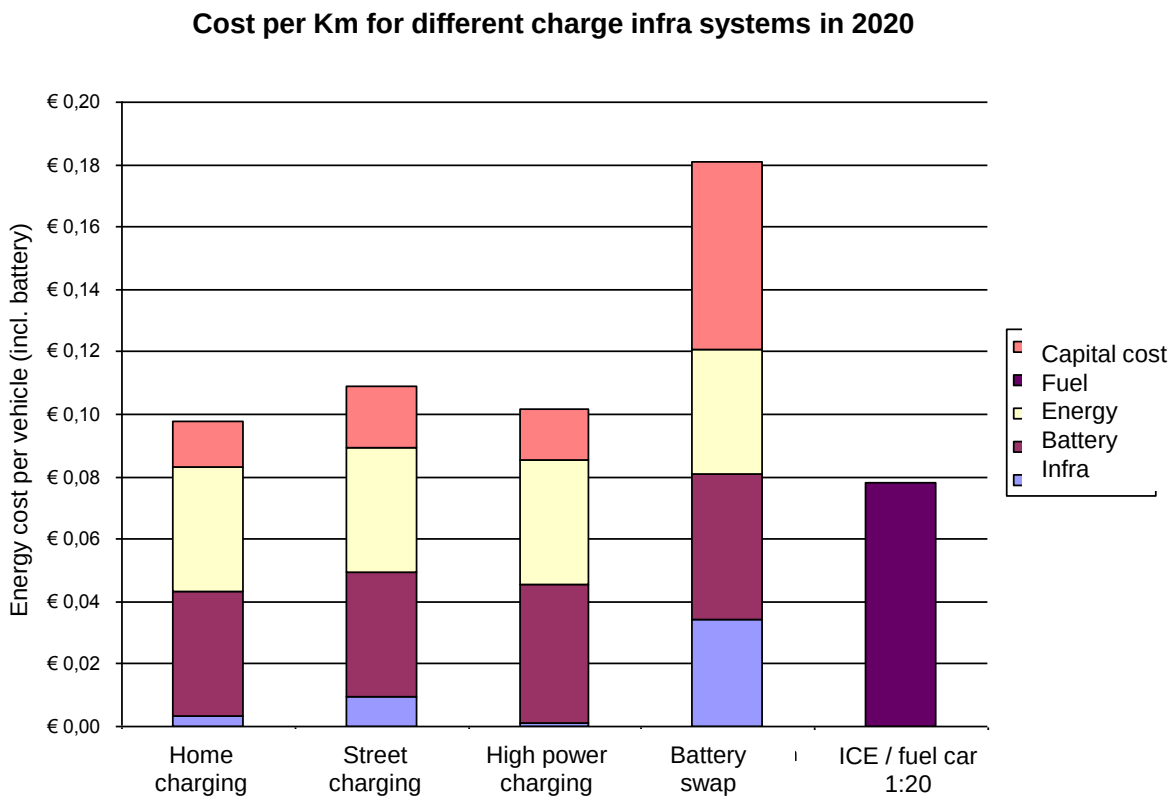


Different ways of charging



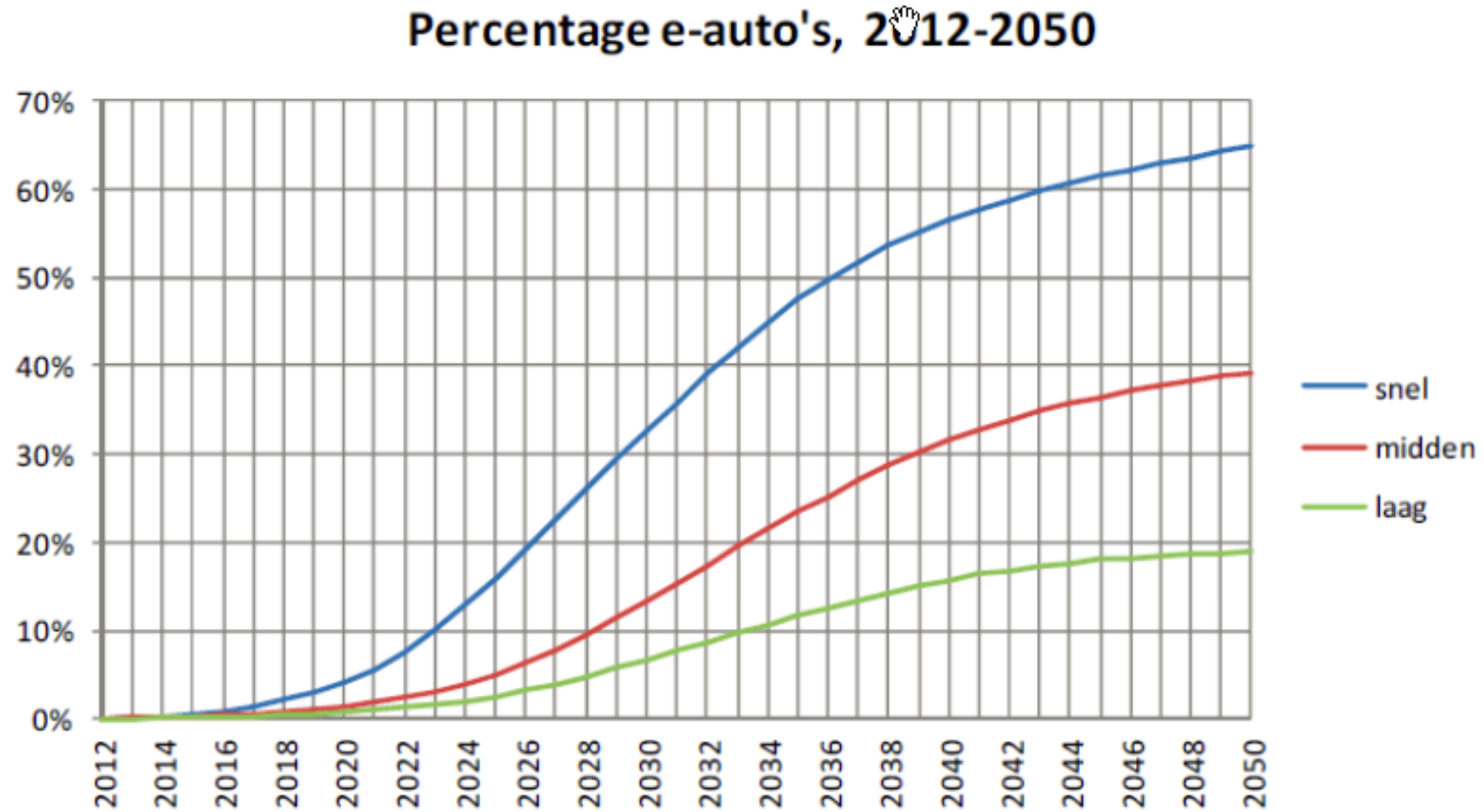
Cost of different charge infra systems

Out of scope:
Road taxes
Cost for modifying the energy-grid



- **Biggest share in cost: battery and energy**
- **From an energy cost point of view (incl. battery cost): Home charging, street charging and high power charging are almost competitive in 2020 (0,098, 0,109 resp. 0,101 €/km) with a 'normal' ICE fuel car (0,078 €/km)**
- **Battery swap system is the most expensive one, mainly because of high investment cost for infrastructure and the cost of capital (investment financing).**

Deployment of EV in the Netherlands



SOURCE Movaris

The reality

To reach all the goals in a coordinated and structured way 10 April 2010 The Formula E-team was founded. This team was chaired by his royal highness Prince Maurits van Oranje.

The Formule E-team realises break through regarding e-mobility in infrastructure, batteries and EV availability

www.formuleeteam.nl

Agreements interoperable infrastructure

General rules agreed upon:

- Interoperability of infrastructure for cars
- Exchange of user ID (no names) & issuer ID
- Exchange of charge point location & owner
- 'Opt in' for users (users need to agree)
- Open to new infrastructure providers with publicly accessible charging points

www.formuleeteam.nl

Minutes of infrastructure meeting electric driving 06-04-2010

3. TNO-KEMA study and decision on standard plug in the Netherlands

TNO and KEMA presented the outcomes of their study to the possibility of chosing a standard plug for charging of EV in the Netherlands already. In their research TNO and KEMA considered the following:

Applicable world and European standards (regarding plugs and connectors as well as charging modes);

The availability of potentially adopted plugs;

Car manufacturer's perspectives; and

The daily safety

Both the 'Mennekes plug' and the 'Scame plug' could be considered as standard plug in the Netherlands according to TNO and KEMA.

Based on the results from the study the Mennekes plug was unanimously chosen by all parties (Eneco, Nuon, Enexis, Stichting E-laad, Better Place, 365 Energy Group and UNETO-VNI). Also Essent and MisterGreen – who were absent at the meeting – have confirmed that they prefer the adoption of the Mennekes plug.

Minutes of infrastructure meeting electric driving 06-04-2010

4. Presentation on interoperability w.r.t. authorization

The progress made in the ‘interoperability workgroup’ in which the providers of public charge spots get together was presented.

Since the infrastructure meeting in January agreements have been made concerning the interoperability with respect to authorization.

Recently a roadmap has been defined on how to realise interoperability with respect to authorization on September 1st 2010. A similar roadmap will be made regarding the adoption of the Mennekes plug in the interoperability workgroup.

Dutch EV charging market investigation

ZERAUTO
nieuwsblog

BEGIN NIEUWSBRIEF
CONTACT

'Formule E-team kiest voor Mennekes-stekker' 12 April 2010

+1 0

van **David Pedro**

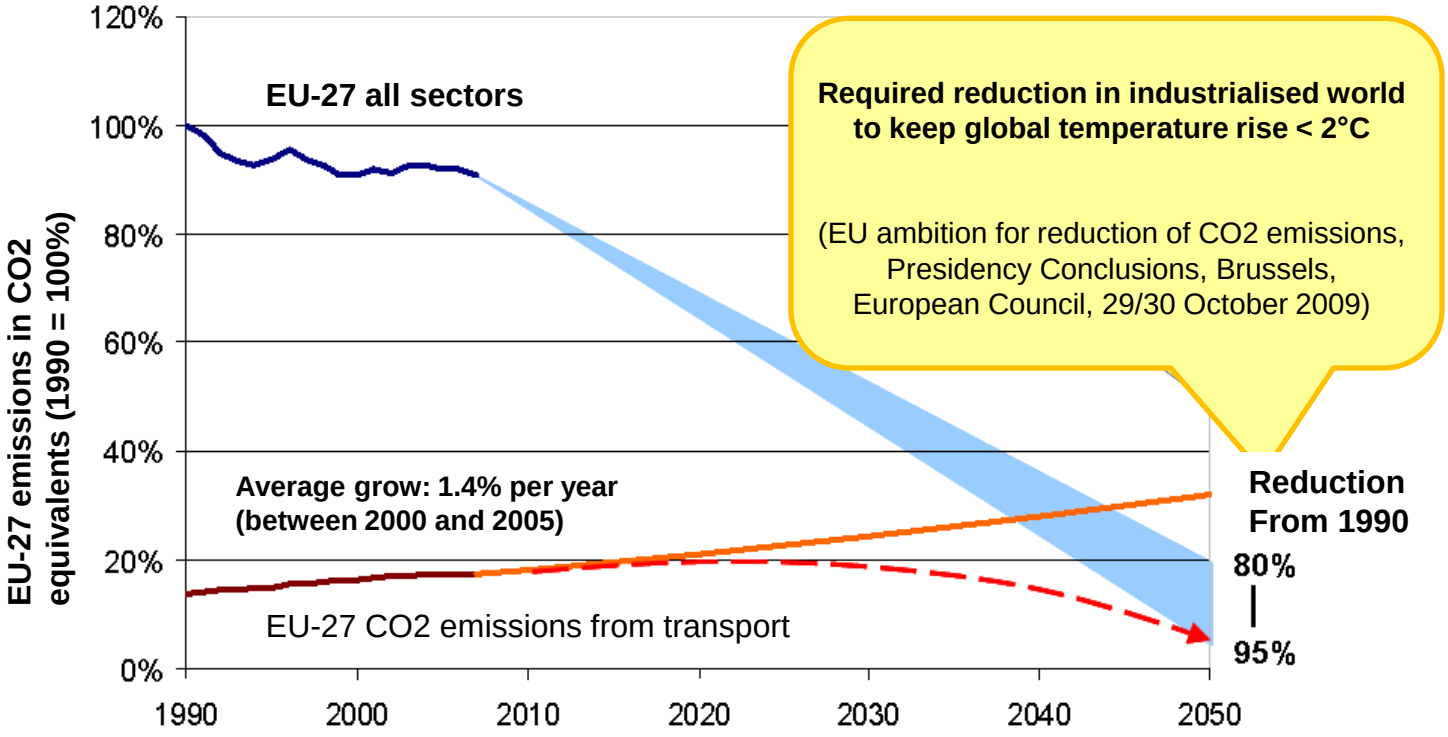
In Nederland kunnen elektrische auto's in de toekomst met de Duitse Mennekes-stekker opladen. De standaardisering van de oplaadstekker voor elektrische auto's is onder leiding van het Formule E-team met Prins Maurits aan het roer tot stand gekomen.

Opvolgen:

Drivers electric transport

Sustainability
- reduction of CO_2-emissions

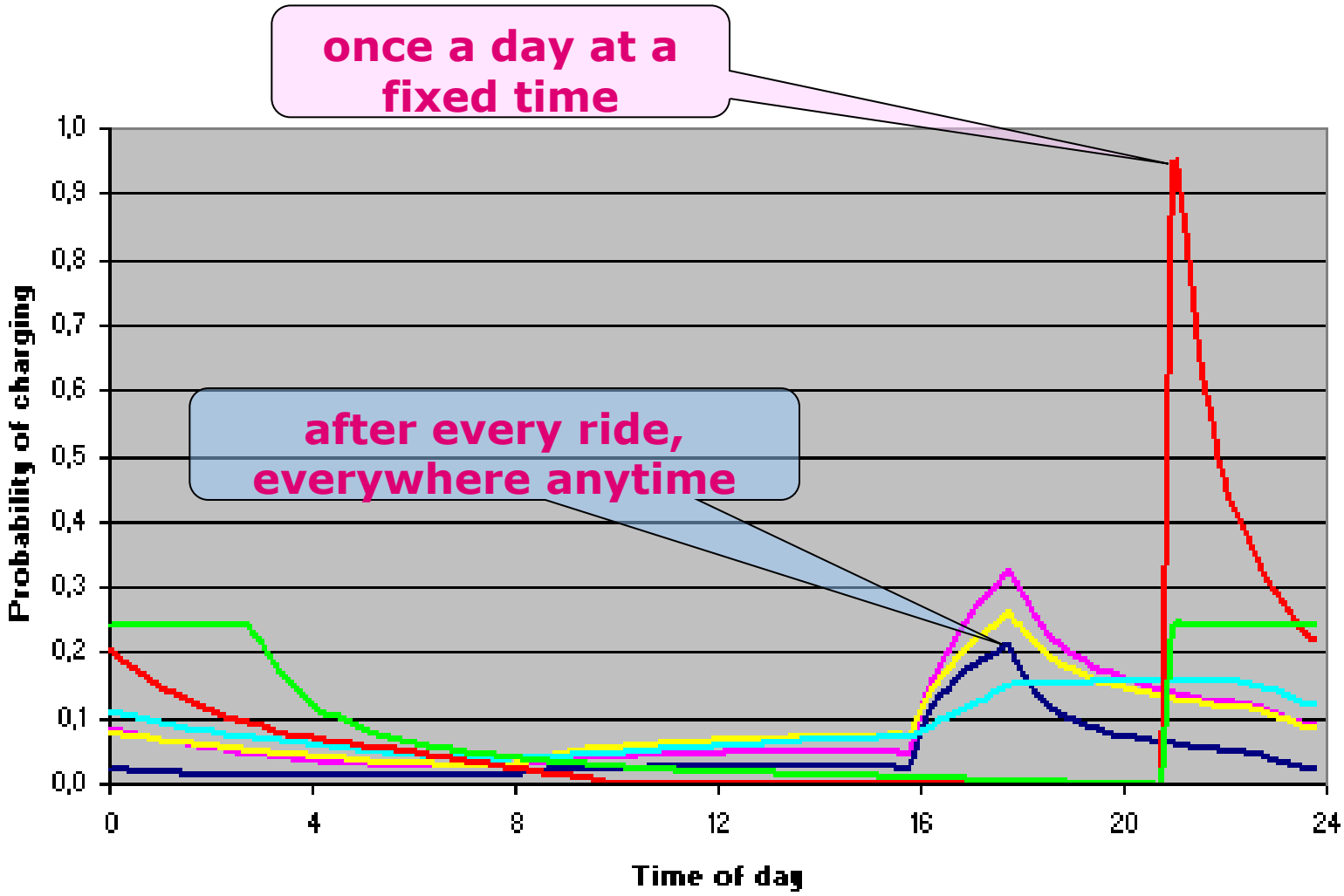
Cost
- Electric cars are interesting as product because of: cost, technology and other aspects of the car, and other benefits like cheap parking places.



What happens if there is no load managing system for controlling massive charging EV

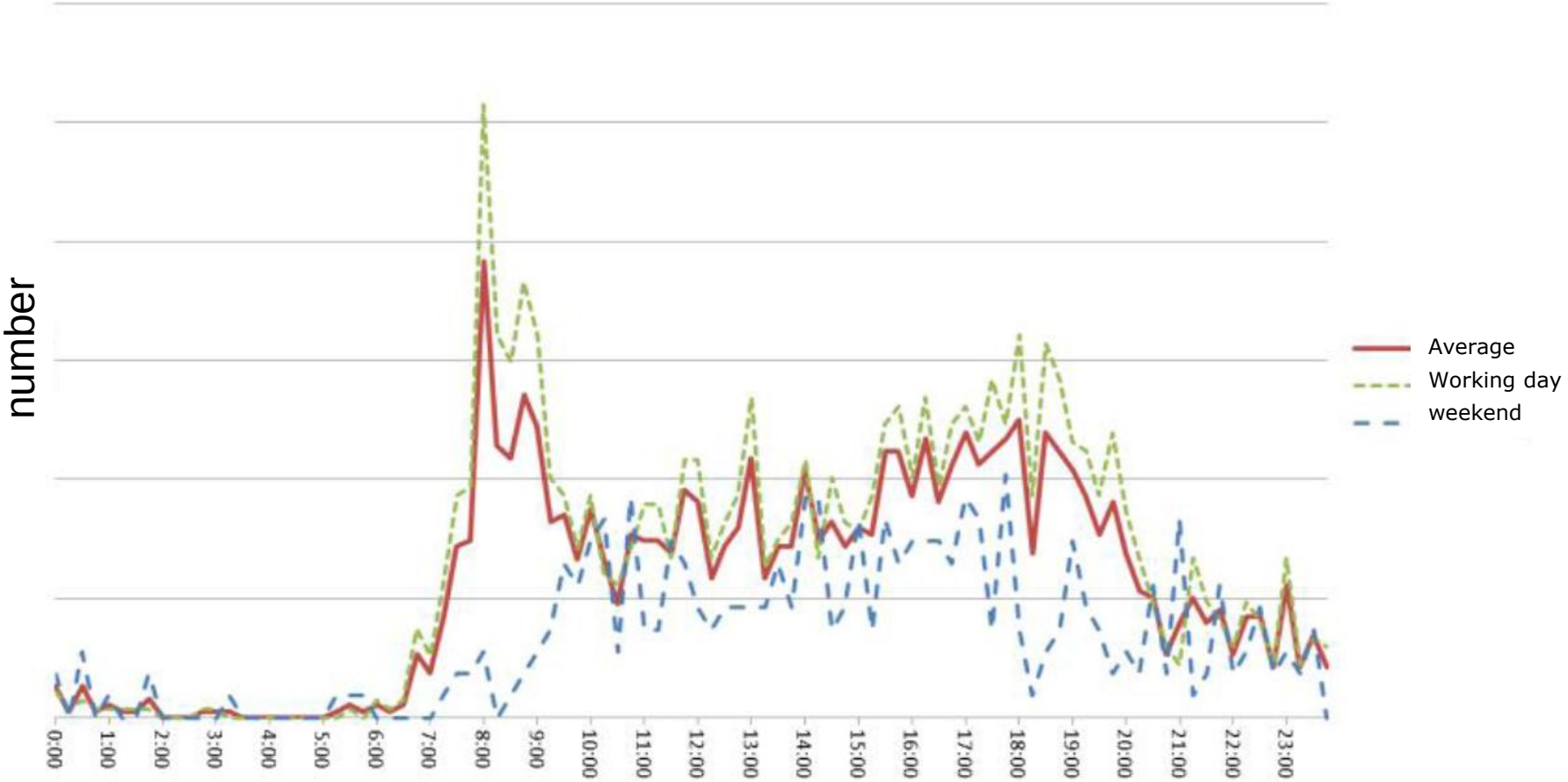
Probability of charging

at residential level.



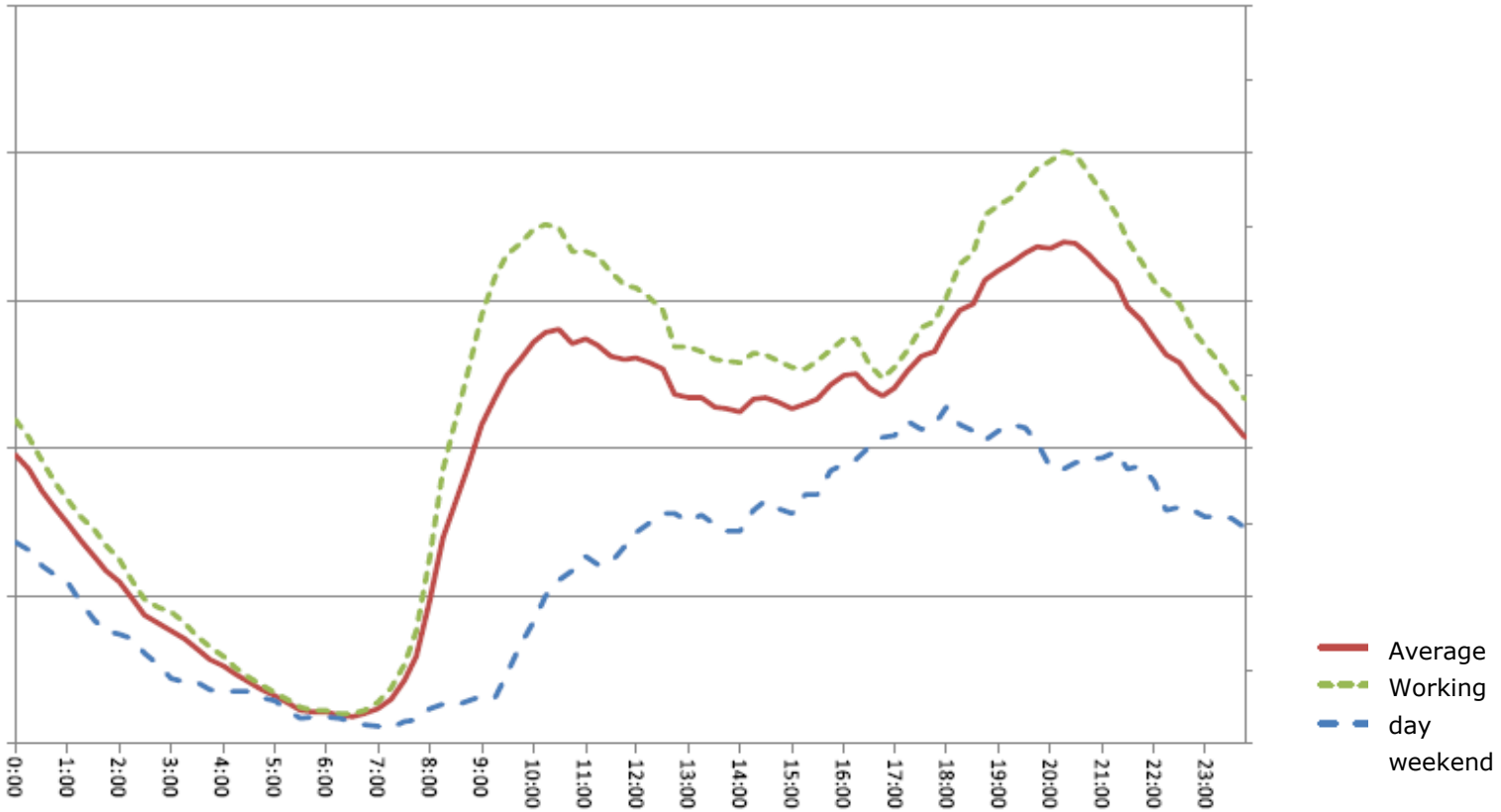
Charge sessions during the day (2011)

Distribution starting times charge transactions E-laad, oct – dec 2011



Power demand during the day (2011)

Total power charge transactions E-laad, oct – dec 2011



Impact electric transport on the energy grid

Simulation-results

Average number of EV's per household	Peekimpact as % trafo capacity Without intelligence	With Intelligence
0,01	57%	56%
0,02	59%	56%
0,03	62%	57%
0,05	66%	58%
0,10	77%	60%
0,25	109%	67%
0,40	142%	74%
0,50	164%	79%
0,75	218%	90%
1,00	273%	102%

Without intelligence peek traffic with 10 EV's in a district of 100 homes goes above 70% of the max capacity of the trafo system.

With intelligence (in this scenario, charging is spread during the evening and night), 25 to 30% can be charged without any problem.

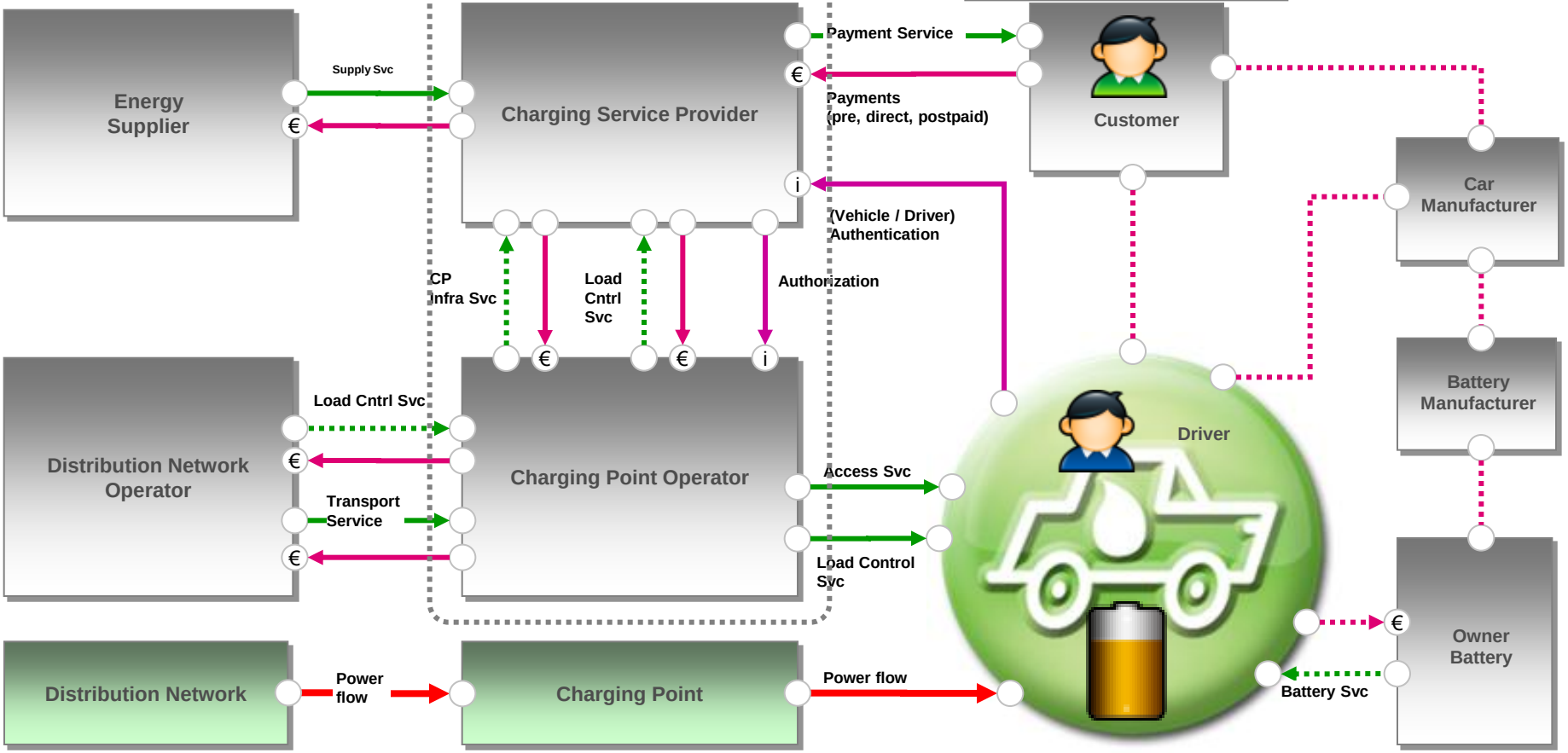
To be taken measurements:

- **Expanding grid capacity**
- **Charge strategies: steering of the charge process**
- **Influencing behaviour of users**

Market model Electric transport

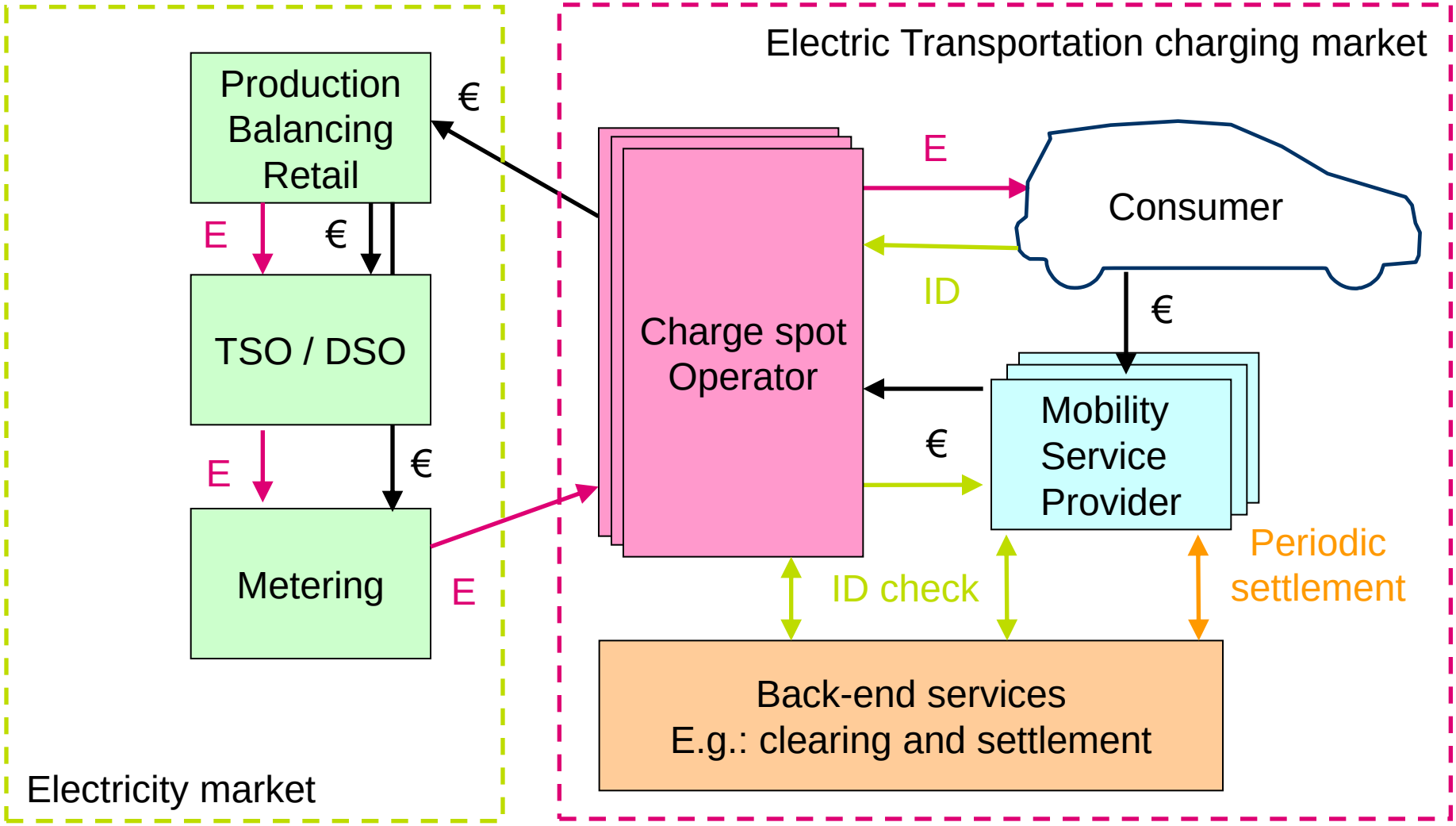
* on request of Formule E-team

For home charging the inhabitant is both CSP as well as CPO. For private environments this can be the same entity. For public charging this are two different entities.

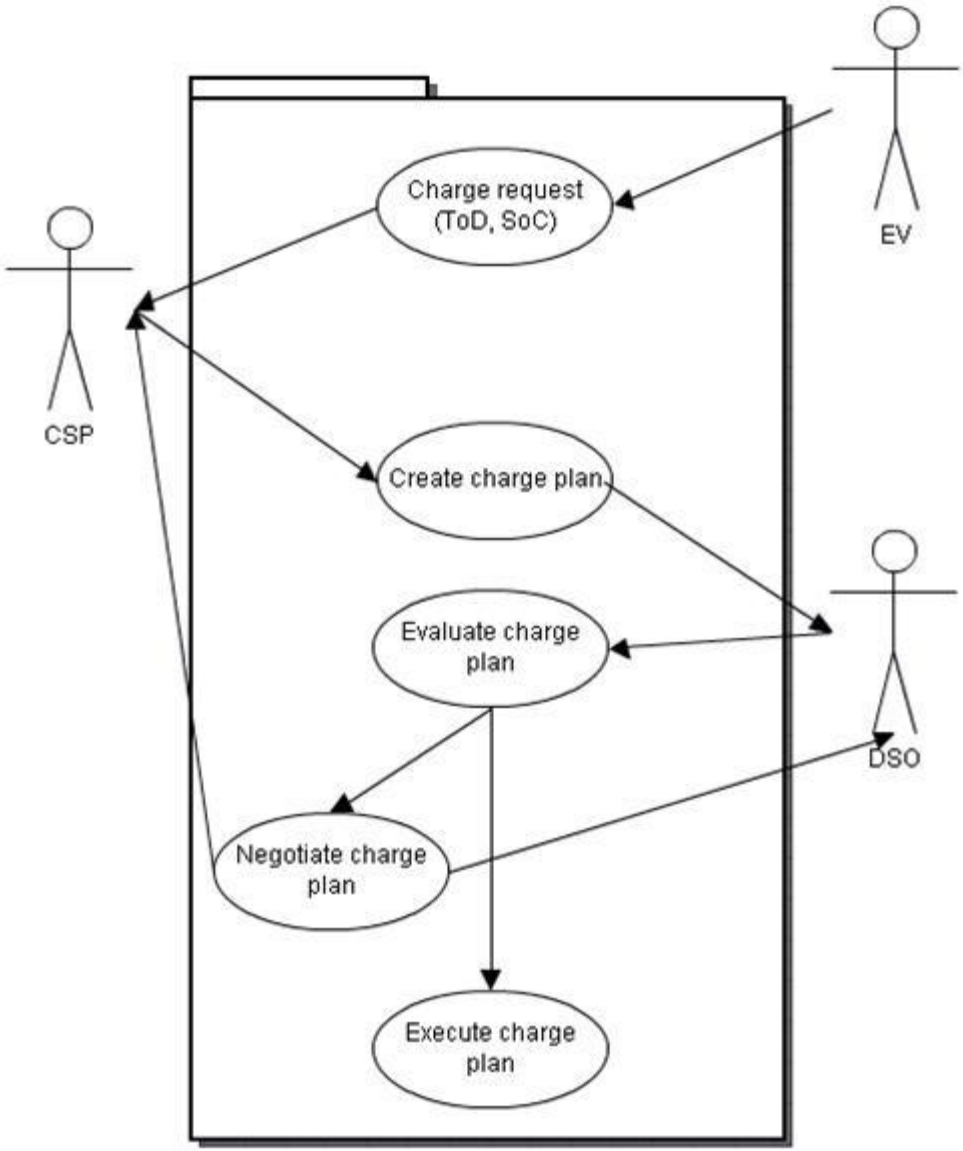


Possible market model for smart charging

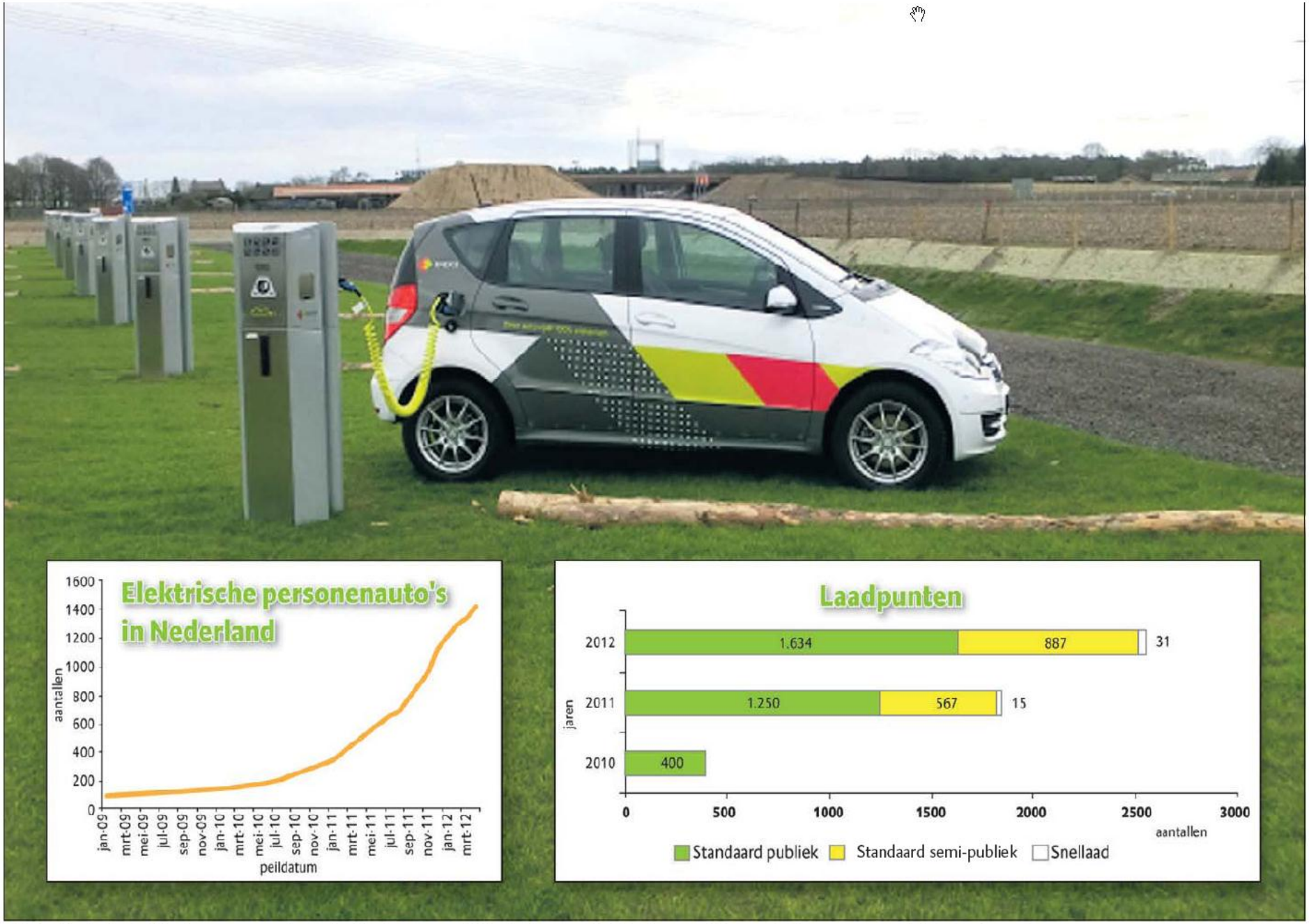
2015-20



The principal of Smart charging



FLORIADE ● Florielectric promoot elektrisch rijden ● Verkoop van e-cars neemt sterk toe



Bij de Floriade in Venlo staan zestig oplaadpalen voor elektrische auto's. Na de wereldexpo krijgen ze een plekje in de regio. foto **Florielectric**

S ing Process

Drivers' wishes

EV

Electricity

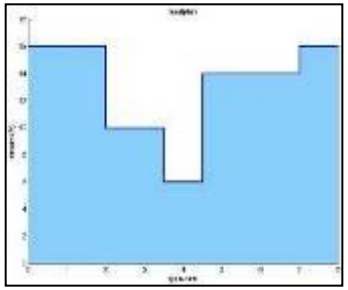
current

Charge Spot

ToD
SoC
Contract-id
Battery capacity
{charge me now, ...}

Contract-id,
CS-id,
CSP-id

Charge rate



Charge plan(15min)

TX-id, Contract-id, phase, max CS-capacity

Charge Service Provider

CSP

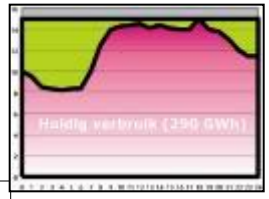
{yes, List({TX-id, session-id})} **OR:**
{no, List({TX-id, exception, exception-data})}

Energy demand(t)

List({kWh-need, ToD, priority, phase, max. charge, TX-id, session-ID})

Charge Spot Operator

CSO



{yes, List({CS-id, session-id})} **OR:**
{no, cap. forecast, List({CS-id, exception, exception-data})}

Go/No-Go

List({ ChargePlan, CS-id, phase, session-ID})

List({kWh-need per 15 min, CS-id})

Power demand(15min)

DSO: Transformer

Local Controller

DSO: ICT system

ESCHER

Wind / sun forecast

Total load

Weeronline

Transformer

LEGENDA:

= message (flow)

= energyflow

ESCHER = **E**nexis **S**mart **C**

EV-id, CS-id = Message conter

Dutch EV charging point deployment

e-laad.nl

Charge point interactive Management System

Gegenereerd op 2012-04-15 20:59:37.

1 407	313	63
Aantal laadpunten	Geplande laadpunten	Ladende auto's

89 786	107 852
Ton CO_2 reductie *	kWh verbruikt

* Brandstofmix: 50% benzine, 50% diesel
Verbruik: met 20 kWh wordt 100 km gereden
Gemiddelde CO_2 uitstoot van diesel: 160 g/km
Gemiddelde CO_2 uitstoot van benzine: 173 g/km
Meting gestart op 01-01-2011

http://ev-services.net/e-Laad/Statistics

Dutch EV charging point deployment

Landelijk netwerk van 459 snellaadpalen langs de snelweg

Gepubliceerd op 01-02-2012 om 09:52

VIDEO – Er komt een landelijk dekkend netwerk van minimaal 459 snellaadpalen voor elektrische auto's op 335 plaatsen langs de snelweg. Onder marktpartijen is grote belangstelling voor het plaatsen van deze oplaadpunten. Dat maakte Rijkwaterstaat bekend. Dit betekent dat bestuurders van elektrische taxi's straks op meer plekken gemakkelijk langs de snelweg de accu van hun auto kunnen opladen.

Dutch EV charging point deployment

Country	AC connector	# installed		# Commissioned in 2012	
		Private	Public	Private	Public
AT[9]	Type 2	50	100	/	/
CZ[10]	Type 2	3	20	/	61
DK[11]	Type 2	0[12]	280		
DE[13]	Type 2	385	1 750	/	97
ES	Type 2	0	30	0	60
FR[14]	Type 3	3 500	4 000	10 500	10 000
IE[15]	Type 2	358	202	750	1 000
IT[16]	Type 2	233	120	8 000	2 000
NL[17]	Type 2	>1 000	>2 000	>1 000	>1 500
PT[18]	Type 2	0	525	/	675
UK[19]	Type 2	0	250	/	4 000

Table 1: indicative number of installations per country for the AC connector

Eurelectric, march 2012

Dutch EV charging point deployment

Country	DC connector	#installed	# commissioned in 2012
AT	CHAdeMO	5	
BE	CHAdeMO	12	/
CZ	CHAdeMO	1	5
DE[21]	CHAdeMO	10	11
DK	CHAdeMO	5	
ES	CHAdeMO	10	40
FR	CHAdeMO	30	100
IE	CHAdeMO	28	60
IT	*No DC charging, preference goes to AC 3-phase 43kW*		
NL	CHAdeMO	25	25
NO	CHAdeMO	27	/
PT	CHAdeMO	6	44
SE	CHAdeMO	5-10	/
UK	CHAdeMO	25	/

Table 2: Overview of DC infrastructure across Europe

Eurelectric, march 2012

Dutch EV charging point deployment

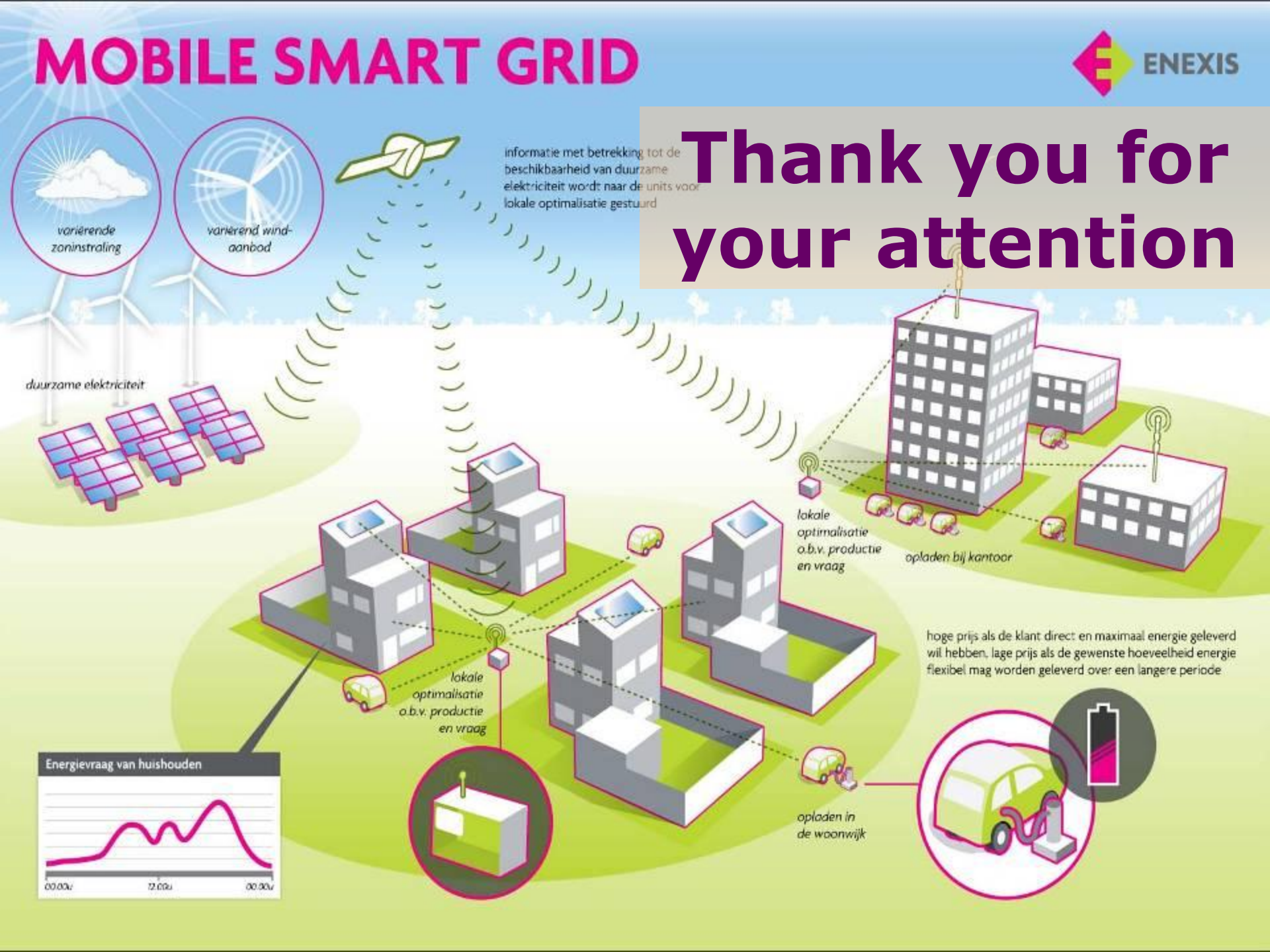
Available websites

http://www.oplaadpunten.nl

http://www.oplaadpalen.nl

Remaining questions and challenges

- Creating an adequate, self-learning capacity forecast
- Automatic communication between EV, CSP and DSO
- Multiple CSP's: how to divide available capacity?
- What if SLA of CSP cannot be met?
- What if SLA of CSP could have been met but the CSP's algorithm is not smart enough?
- What to do with multiple DSO's?
- Clearing house?
- Within which margins are charge plans executed?
- Legislation
- Standardization
- Who is in charge?
- …


MOBILE SMART GRID
ENEXIS
Thank you for your attention
variërende zoninstraling
variërend wind-aanbod
informatie met betrekking tot de beschikbaarheid van duurzame elektriciteit wordt naar de units voor lokale optimalisatie gestuurd
duurzame elektriciteit
lokale optimalisatie o.b.v. productie en vraag
opladen bij kantoor
lokale optimalisatie o.b.v. productie en vraag
hoge prijs als de klant direct en maximaal energie geleverd wil hebben, lage prijs als de gewenste hoeveelheid energie flexibel mag worden geleverd over een langere periode
opladen in de woonwijk
Energievraag van huishouden
00.00u
12.00u
00.00u

http://www.e-laad.nl/submenunieuws/323-video-signing-the-treaty-of-vaals