Volkswagen

ID.

INSIGHTS

CHARGING DAY

PRESENTATIONS

BERLIN, JUNE 2019

“Charging for all” – the key to the market success of e-mobility

Thomas Ulbrich
Board Member E-Mobility, Volkswagen Brand

Climate change is the biggest challenge of our time

Increase in
man-made
global warming

Continuous rise
in sea level

Growing number
of natural disasters

Damages in total amounting to
160.000.000.000 $

Volkswagen has begun the transformation to a carbon-neutral company

Volkswagen

Conventional platforms

Conventional projects

SOP

SOP

EOP

>10 years

Fleet renewal

"Zero emission"
fleet in operation

Product portfolio

Transformation

CO_2-neutral vehicles

CO_2 emissions

- BEV
- FCEV
- PHEV

ZERO CO_2

COP21 · CMP11
PARIS 2015
UN CLIMATE CHANGE CONFERENCE

CO_2 NEUTRAL

2020

2050

These vehicles are not yet for sale in Europe.

The largest electric offensive in the global automotive industry is at the heart of our strategy

Volkswagen

~ 70 new fully electric models through 2028

~ 30 billion euros invested through 2023

~ 22 million vehicles through 2028

18 e-sites worldwide, incl. 8 MEB plants

~ 1 billion euros for battery cell production

~ 250 million euros for charging infrastructure

1st wave

These vehicles are not yet for sale in Europe.

But: there are still some prejudices about e-mobility

#1 **Price: “EVs are too expensive!”**

#2 **Range:** “The range is too short!”

#3 **Product:** “EVs aren’t attractive!”

#4 **Environment:** “EVs aren't clean either!”

#5 **Charging:** “There aren’t enough charging stations!”

The ID.3 removes most of these prejudices...

#1 **Price:** under €30,000

#2 **Range:** 330-550 km (WLTP)

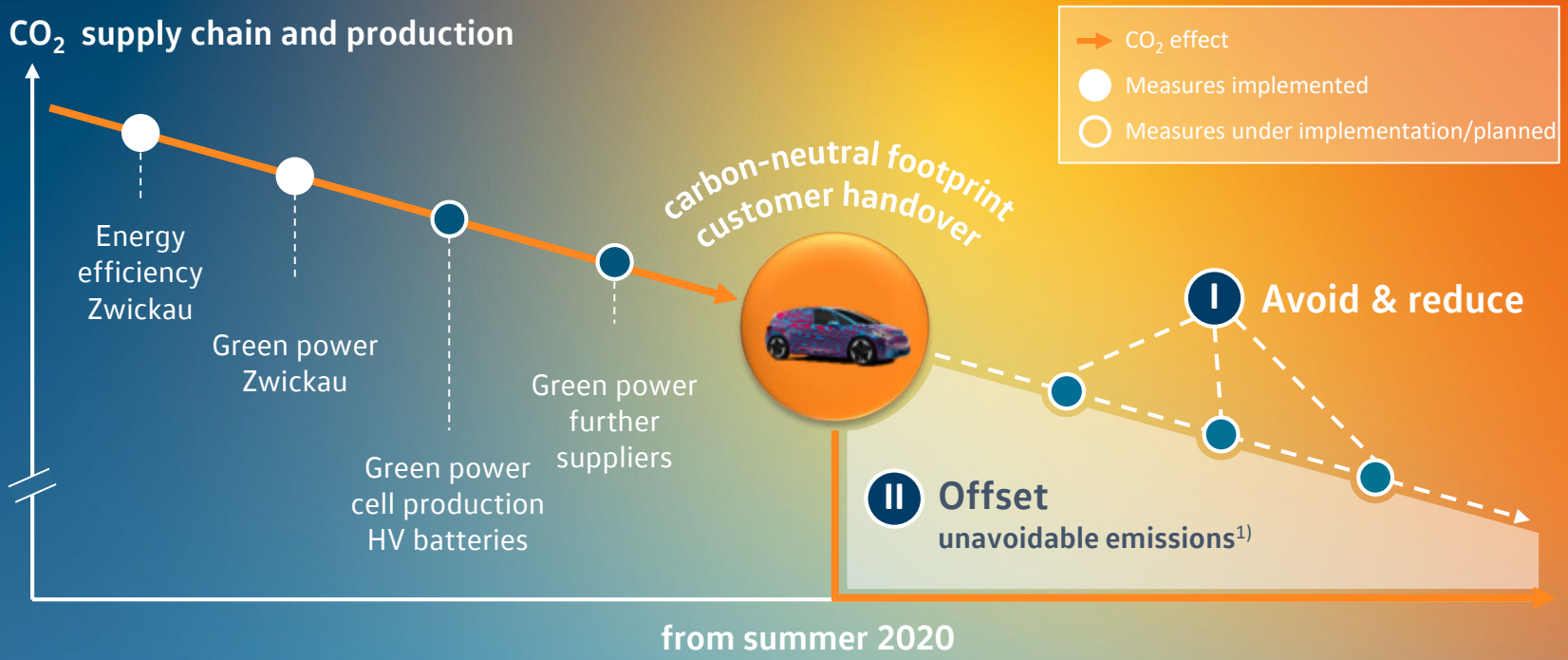
#3 **Product:** augmented reality & much more

#4 **Environment:** carbon-neutral balance

...and we are paving the way for the breakthrough of e-mobility

This vehicle is not yet for sale in Europe.

We are optimizing CO_2 reduction throughout the entire ID.3 value chain



1) Certified projects, e.g. VCS (Verified Carbon Standard) or REDD+ (Reducing Emissions from Deforestation and Forest Degradation)

This vehicle is not yet for sale in Europe.

Currently, the charging structure is the critical success factor for the breakthrough of e-mobility in Germany

Volkswagen

#1 Price ✓

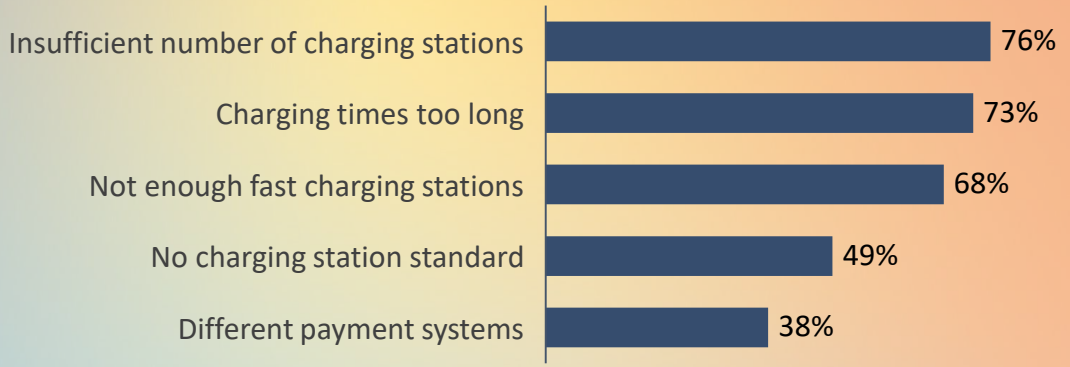
#2 Range ✓

#3 Product ✓

#4 Environment ✓

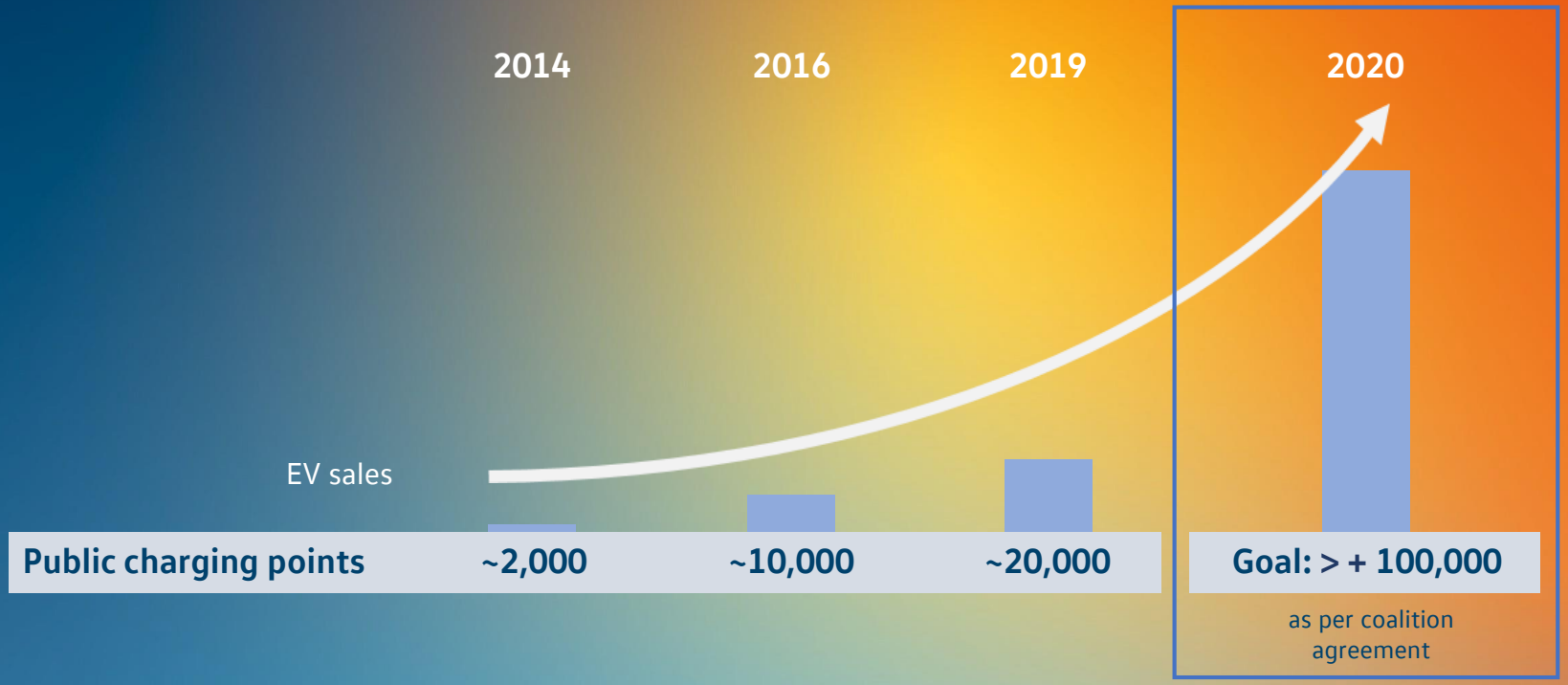
#5 Charging !

Charging anxieties of customers



Source: AUTO BILD

The goal of more than 100,000 charging stations is still a long way off



Infrastructure expansion must cover all main charging situations

50% of charging operations

20% of charging operations

25% of charging operations

5% of charging operations

slow

fast

Charging when parked

Charging during stop-over

This vehicle is not yet for sale in Europe.

Volkswagen is investing some €250 million in expanding the charging infrastructure

Affordable
wallboxes
incl. Volkswagen Naturstrom®

Through 2025 Group-wide:
36,000 charging points
at sites and at dealers in Europe
(many public)

Access to over
100,000 charging points
in Europe

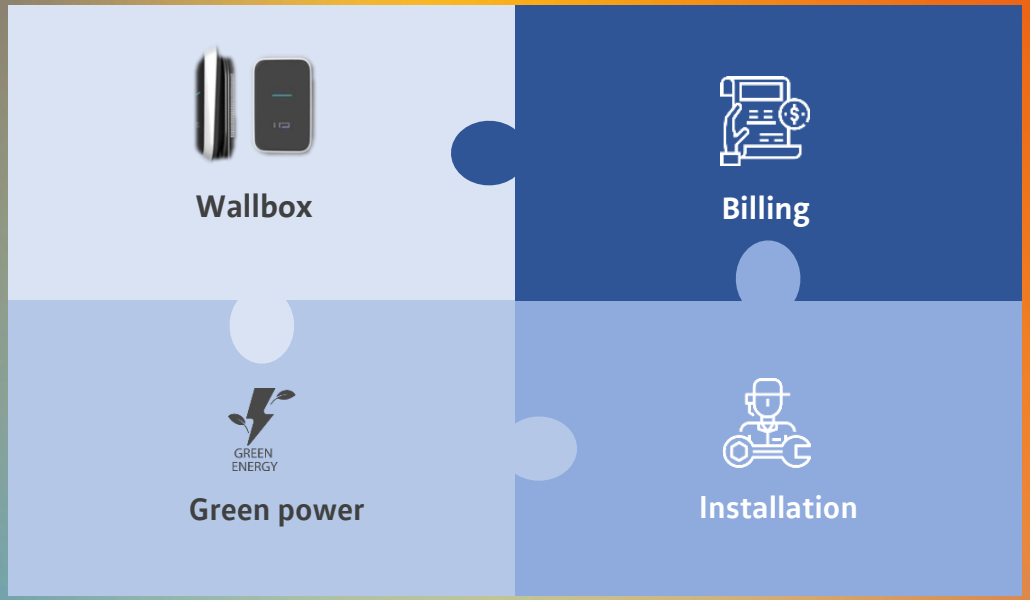
Across Europe:
400 charging stations
on major highways

This vehicle is not yet for sale in Europe.

Charging at home: Volkswagen occupies the strategic business area of charging with Elli

Volkswagen

Elli
Electric Life



Charging at work: Volkswagen is installing some 4,000 charging points at German plants

Number of charging points in 2025 (target):

AC	~3,950
DC	~50
AFC	~40

Public charging: Volkswagen is cooperating with retail chains

Volkswagen is installing public charge bays:

- Charging points at all 3,000 Volkswagen dealers in Europe
- Cooperation with retailers (e.g. Tesco/UK)
- Flexible fast charging bays
- We Charge app with access to 100,000 charging points in Europe

Cooperation with Tesco/UK
600 stores
2,400 charging points

e-Golf: Power consumption, kWh/100 km: combined 14.1 with 17-inch wheels – 13.2 16-inch; CO_2 emissions, combined, g/km: 0; efficiency class: A+

Charging on highways: Volkswagen is committed to high power charging through participation in IONITY

- Europe-wide fast charging network
- 400 charging stations with up to 2,400 charging points
- Charging every 200 kilometers
- Flat-rate fee: currently 8 euros per charge

This vehicle is not yet for sale in Europe.

Politics has recognized the importance of the charging infrastructure

“I want charging to be available to everyone everywhere. It’s time now to tackle charging.”

Andreas Scheuer, Federal Minister of Transport, April 2019

Targeted measures can significantly speed up charging infrastructure expansion

Volkswagen

HOME

WORK

PUBLIC

HIGHWAY

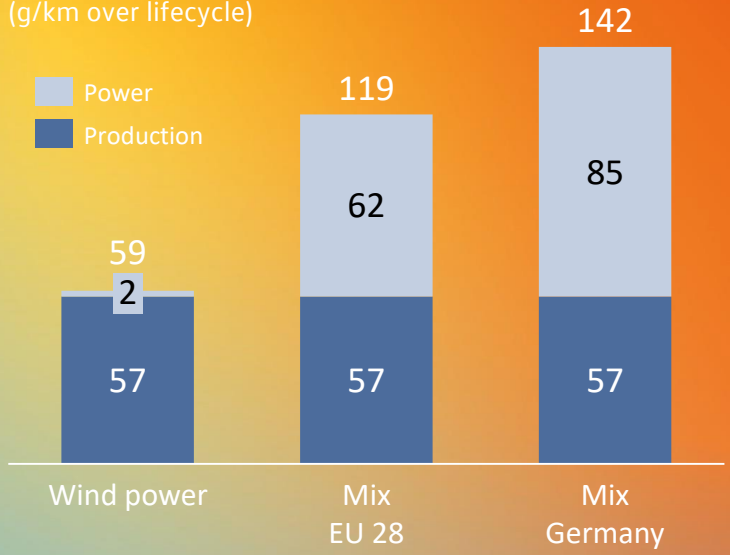
	HOME	WORK	PUBLIC	HIGHWAY
SHORT-TERM 2019-2020	• Support introduction • WEG • Regulation on building efficiency • Right to charging infrastructure	• Start supporting introduction	• Support for parking spaces, parking lots, etc. • 12/6 instead of 24/7 • Sanctioning of illegal parking	• Swifter approval • Specifications for service stations
MEDIUM-TERM 2020	• (Phased) Support for intelligent charging points	• (Phased) Support for intelligent charging points	• Regulation on building efficiency • Calibration law • Exemption from construction permits for projects	• Include service areas with no amenities

This vehicle is not yet for sale in Europe.

The energy transition also needs a powerful boost

It's all about the mix: EV eco-balance

(g/km over lifecycle)



Basic assumption: e-Golf with mileage of 200,000 kilometers

SUMMARY: We need concerted action now in Germany to achieve the breakthrough of e-mobility!

Volkswagen

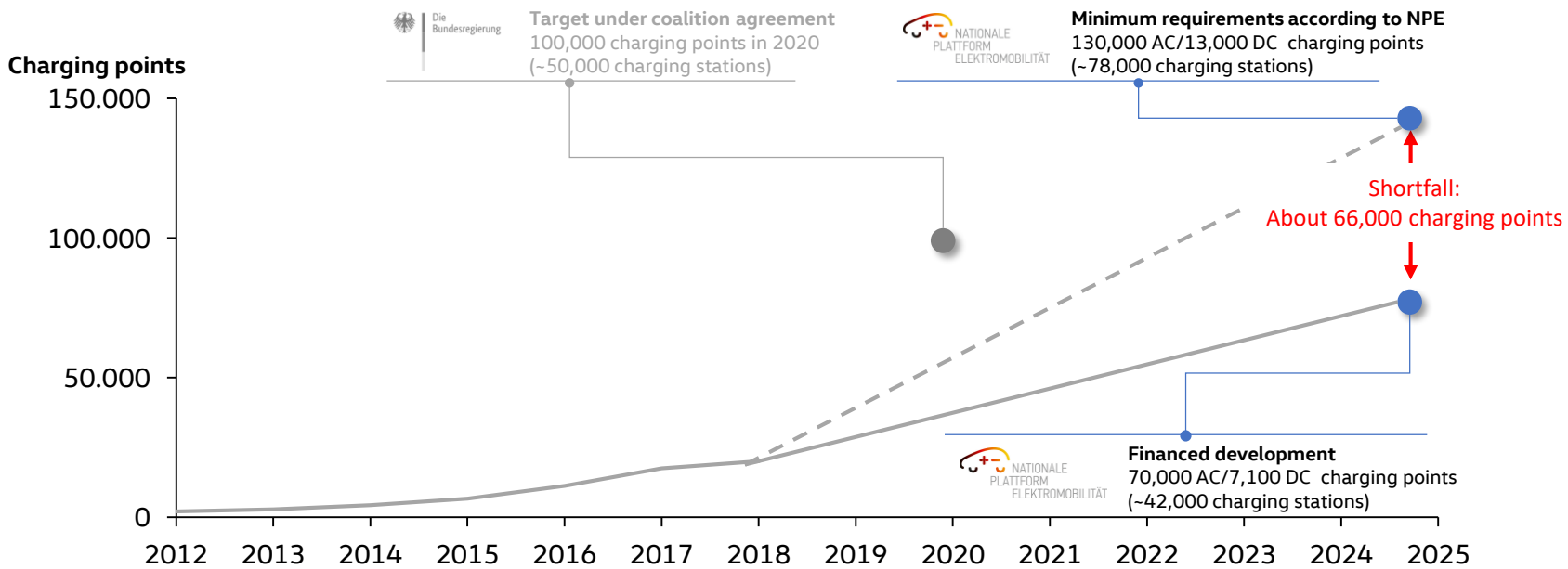
Masterplan E-mobility

Focus on charging infrastructure

Is the charging structure adequate – and what needs to be done?

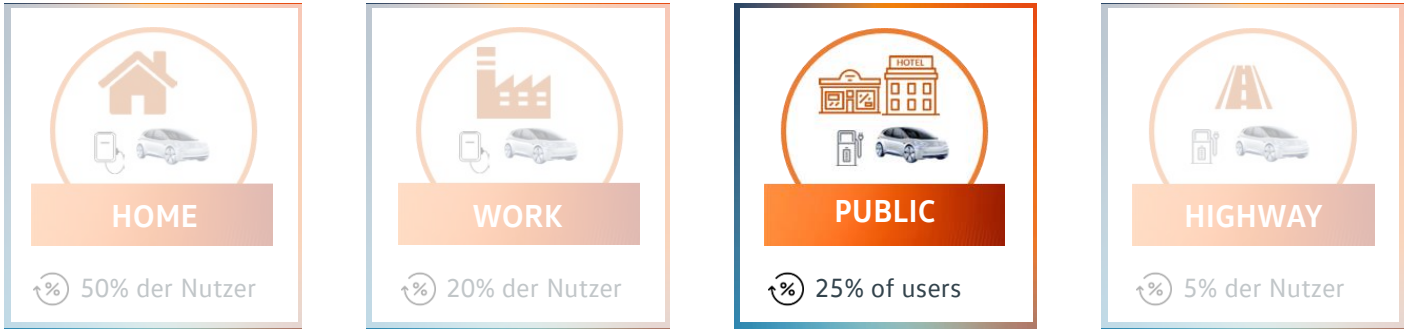
Stefan Schmerbeck
Technology & Future Mobility External Relations

More visible charging infrastructure creates customer confidence– this infrastructure will be needed later for the market run-up



Sources: NPE progress report 2018, Coalition Agreement 2018, Institut der deutschen Wirtschaft Köln e.V., 2018

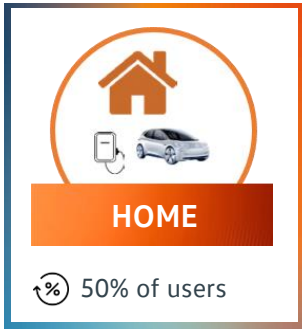
First step (with immediate effect): develop public charging infrastructure

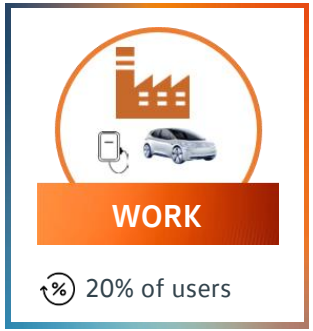


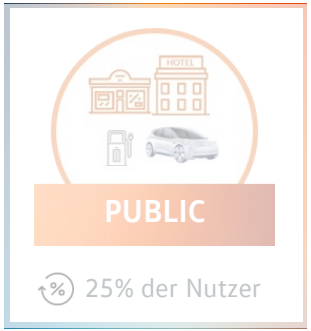
- More publicly accessible, visible charging points are the top priority for 2019 and 2020
- 100,000 charging points will be needed by 2020 – mainly in urban areas
- The charging stations we will need tomorrow must be built today – to combat charging anxiety
- Clear responsibilities, positioning, coordination and cost distribution requirements are needed for states and local authorities – to be steered and (co-)financed by federal government

This vehicle is not yet for sale in Europe.

Second step (from 2020): develop private charging infrastructure



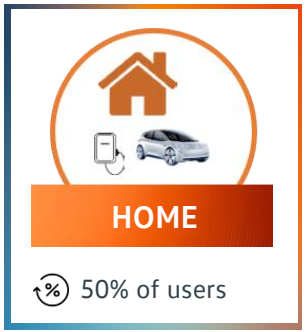


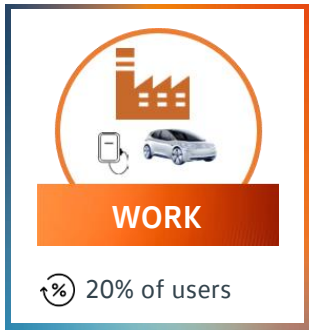


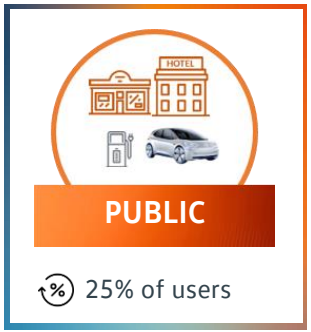
- Law concerning tenancy agreements and home ownership: implement rights to install private charging points
- Dismantle administrative obstacles to development of charging infrastructure
- Weights and measures law: no dismantling of existing charging infrastructure, facilitation of practicable billing systems
- Building Efficiency Ordinance: obligation to develop charging infrastructure (new and existing buildings)
- Extension of Subsidy Ordinance: inclusion of retail trade, subsidies for private charging infrastructure

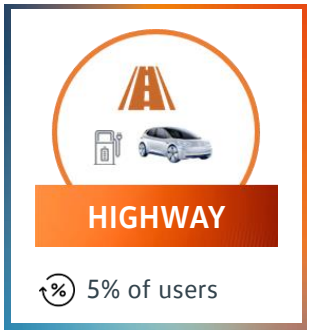
This vehicle is not yet for sale in Europe.

For rapid infrastructure development, even stronger commitment is called for









SHORT-TERM 2019-2020	▪ Support introduction ▪ WEG ▪ Regulation on building efficiency ▪ Right to charging infrastructure	▪ Start support for introduction	▪ Support for parking spaces, parking lots, etc. ▪ 12/6 instead of 24/7 ▪ Sanctioning of illegal parking	▪ Swifter approval ▪ Specifications for service stations
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This vehicle is not yet for sale in Europe.

Summary

Politicians must lay the foundations by the summer

100,000 additional charging points needed **by 2020**

More Norway and **less bureaucracy** in Germany

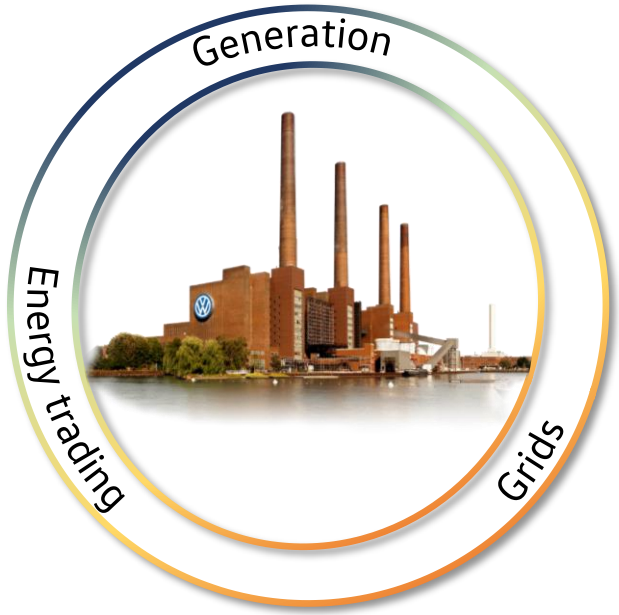
We need to send out a **signal against charging anxiety/reservations**

This vehicle is not yet for sale in Europe.

Is there enough power – and when is it green?

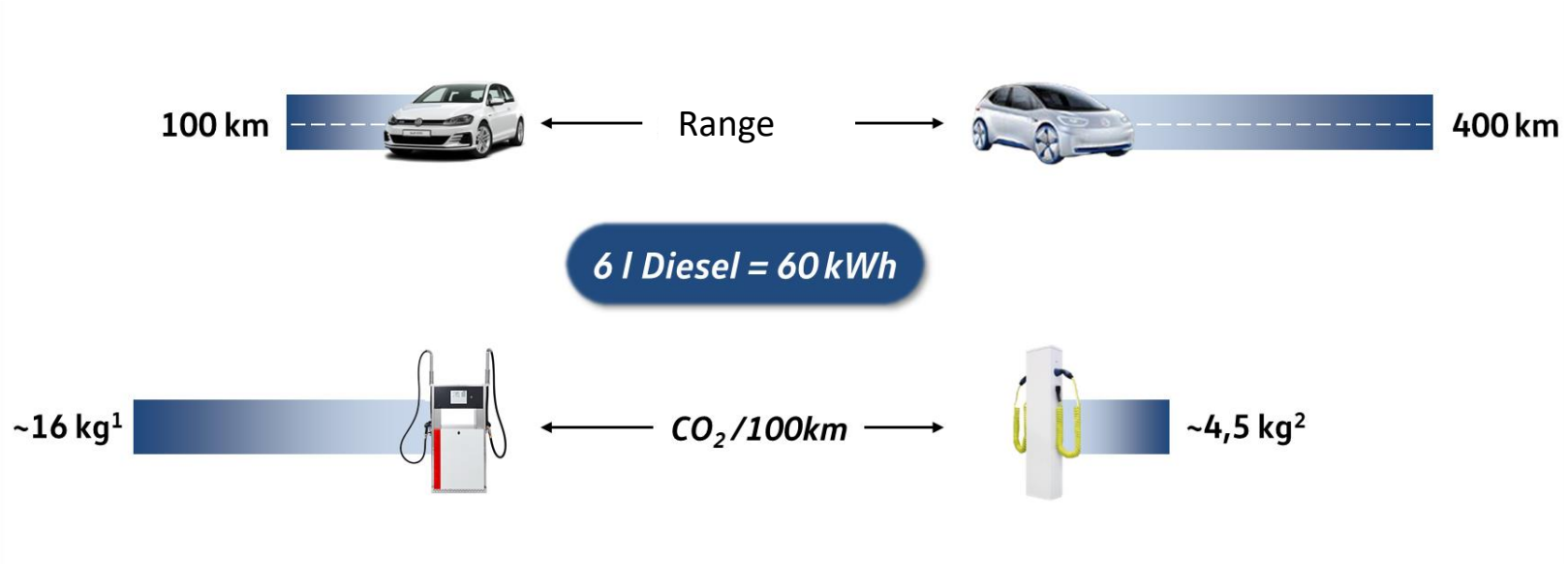
Karsten Miede
Head of E-Mobility Services,
VW Kraftwerk GmbH

We have been active in the energy market for many years – VW Kraftwerk GmbH has decades of experience within the Group



- Departure from coal: two power plants in Wolfsburg to be changed over to natural gas for €400 million
- Change will save 1.5 million tonnes of CO_2 per year – corresponding to about 870,000 cars
- CO_2 avoidance costs per tonne only €14

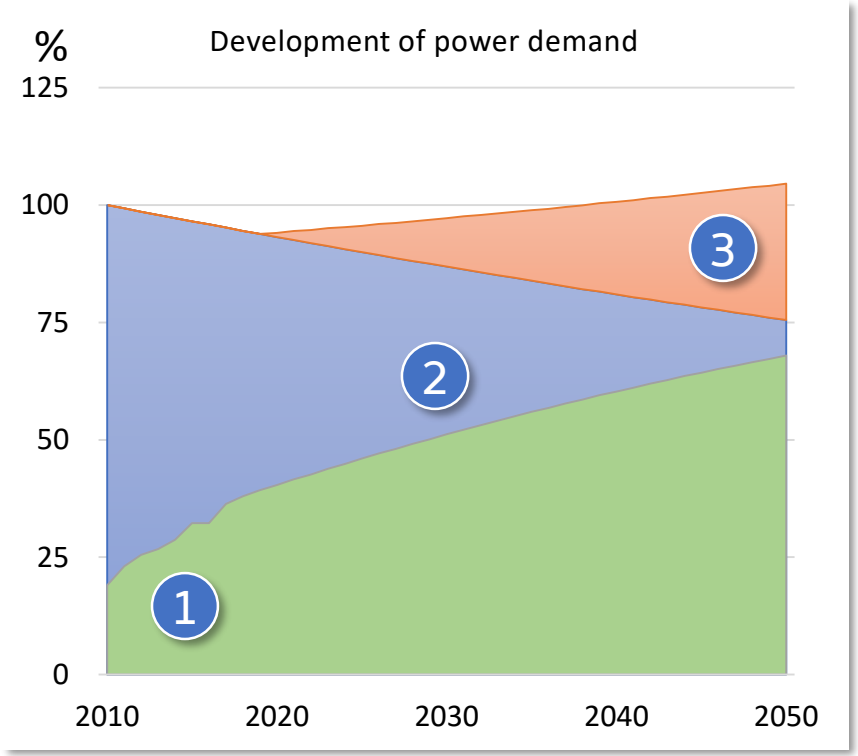
Electric car has four times the range with comparable energy input



[1] According to DEKRA 1 liter of diesel produces 2.65 kg of CO_2 emssions | [2] According to European Energy Agency (EEA) 0.296 kg per kWh in EU mix

ID.3 - This vehicle is not yet for sale in Europe.

There is enough power – but the energy transition must be accelerated for climate protection reasons

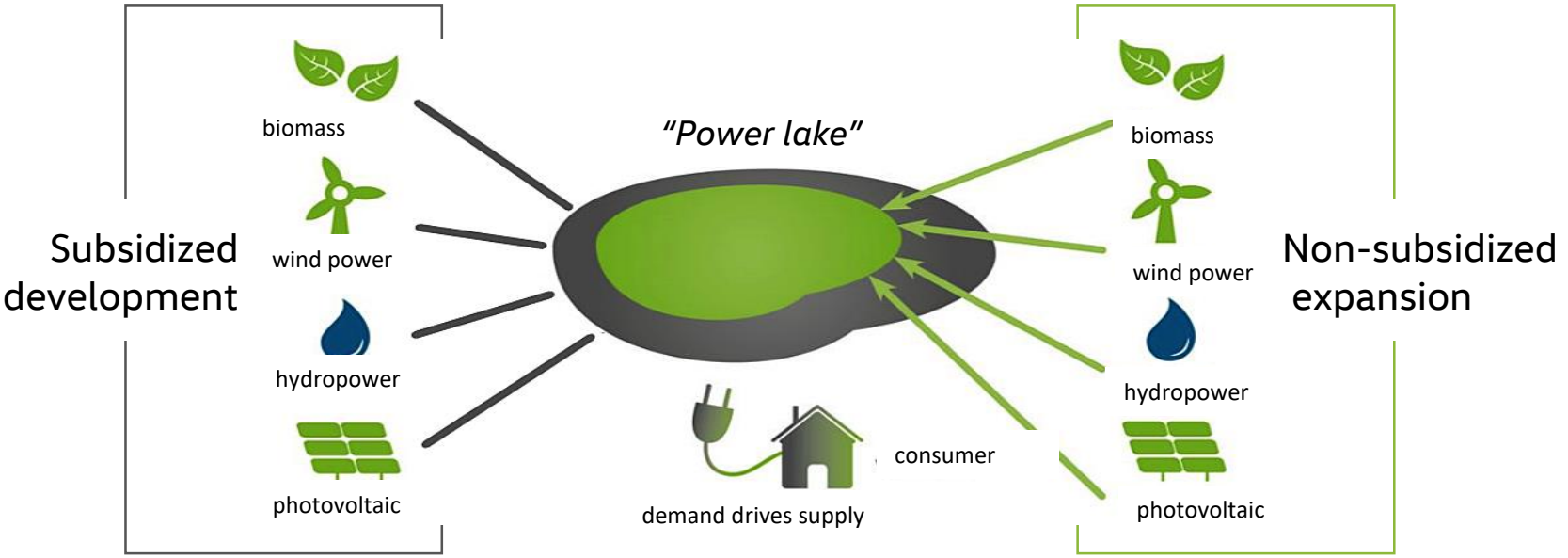


1. By **2050**, the share of **energy** from **renewable** sources is to reach about **90%**

2. Power users are becoming increasingly efficient: **savings** of **25%** by **2020**

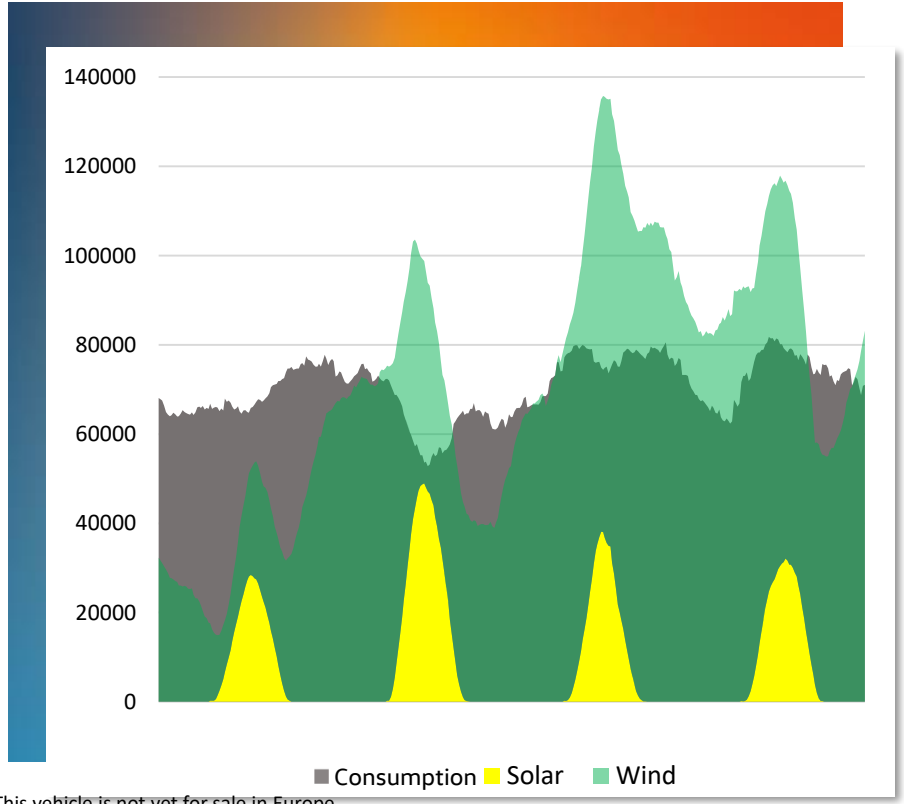
3. **1 million more BEVs** per year will only boost **power consumption in Germany** by **0.5%** per year

When is green power really green? Expansion of renewable energies: with subsidies and as a result of genuine demand



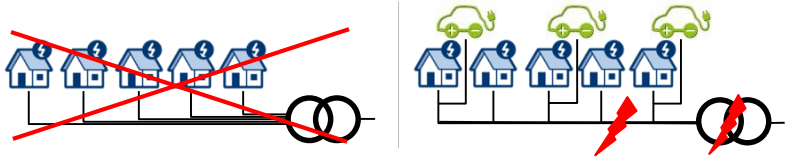
- The more consumers purchase green power, the greener will the power lake become
- Plants subsidized under Renewable Energy Act lose the possibility of generating green power
- Only the (non-subsidized) expansion of renewables with the objective of supporting the traffic transition can guarantee CO_2-free individual mobility in the long term

E-mobility offers flexibility for the power sector – but power grids must continue to be expanded



Bidirectional charging creates the short-term buffer needed for harmonizing generation from renewable sources with demand

The myth of affluent electric suburbia. Existing grid can cover additional demand but intelligent grid expansion will be necessary



Networking of photovoltaics, battery storage in the home and electric vehicles becomes relevant

This vehicle is not yet for sale in Europe.

Summary

There is **enough power,** but the **energy transition needs to be accelerated**

Grids will provide the power, if they are **adequately expanded**

EV can be **integrated in smart networks**

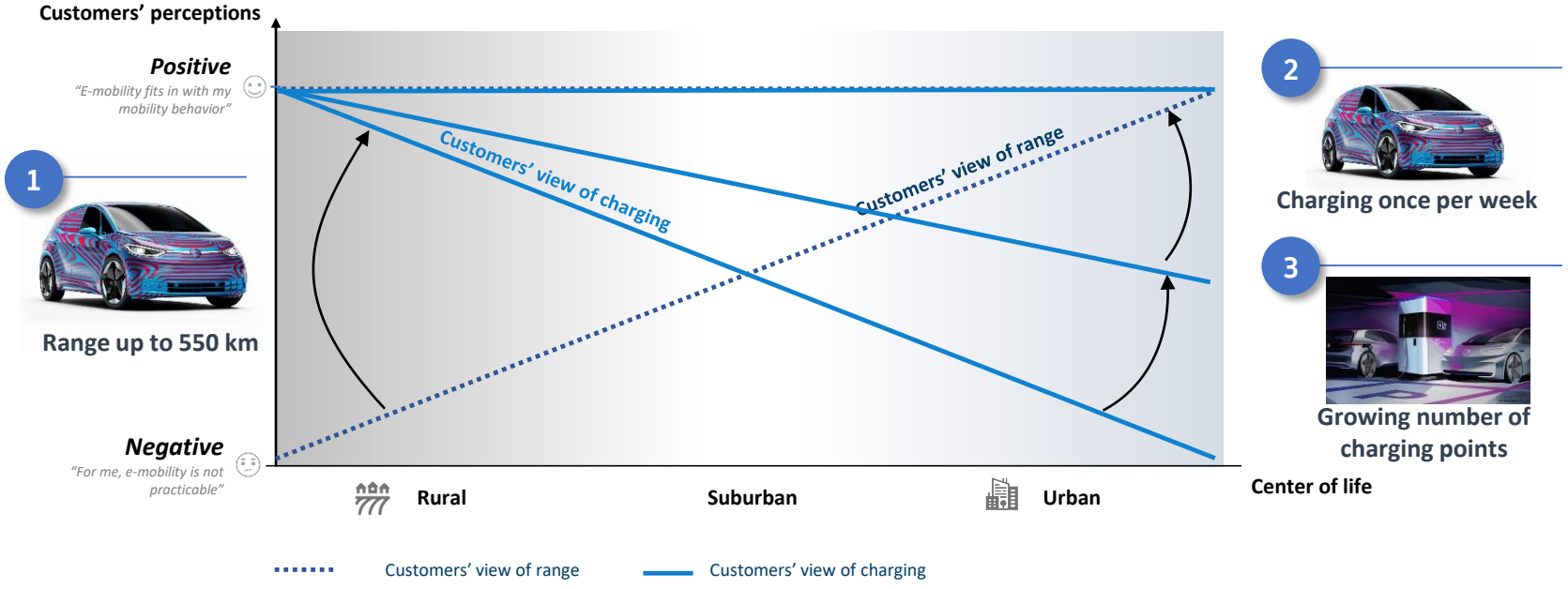
Customers benefit from “behavior in line with system requirements”

This vehicle is not yet for sale in Europe.

When will charging become simple, convenient and affordable?

Martin Roemheld
Head of E-Mobility Services, Volkswagen

Customers perceive e-mobility differently



This vehicle is not yet for sale in Europe.

The ID.3 will finally make e-mobility fit for everyday and leisure use

Volkswagen

	Everyday use	Weekends	Vacations
	~ 30 km per day	~500 km at weekend	1,000 km distance from destination
	Urban	*Regional/national*	*International*
			
	420 km — Charging once per 14 days	225 km | 225 km — Charging at destination	350 km | 360 km | 320 km | 240 km — Charging in breaks
	One night sleep	*Football match*	*Coffee* *Lunch* *Break*
2,3 kW |	At home	At destination	At destination
11 kW |	At home	At destination	At destination
50 kW |	During shopping	At destination	At destination
100 kW |	On highway	During break	During break

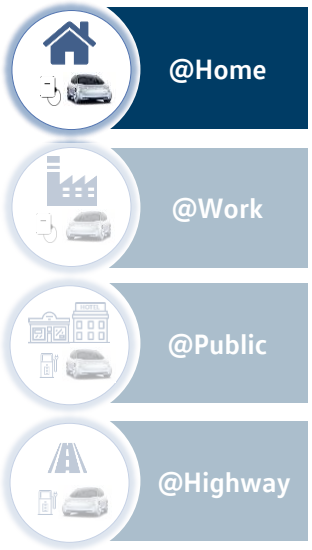
idealized presentation– real values may be different

Volkswagen offers suitable charging solutions for all situations

	Everyday use ~ 30 km	Weekend Up to 500 km	Vacation > 1,000 km
@Home	Wallbox charging with 11kW when required	(nighttime) charging before trip: start with ~100% range	
@Work	Charging in line with supply and demand		
@Public	We Charge, IONITY: Public charging points (Roadside, supermarkets, ...)	We Charge: (Semi-)public charging points at destination – throughout the EU (hotels, attractions,...)	
@Highway		We Charge, IONITY: Fast charging along route – throughout the EU	

This vehicle is not yet for sale in Europe.

The Volkswagen full-service offering for home charging



Wallbox + installation from a single source:
ordering, testing of power connection, installation, service

Fast, convenient and safe charging with up to 11 kW, optionally with green power from Elli

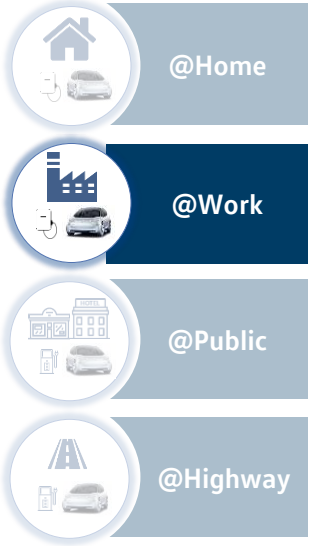
+

In some cases, **subsidy** for charging infrastructure **in private homes** (regional)

One charging operation per week adequate for commuting distances – **Wallbox can be used by several vehicles**

This vehicle is not yet for sale in Europe.

Charging at work – another possibility



Wallbox designed for invoicing incl. **monitoring and control functions**

By 2025, **Volkswagen** is to install **over 4,000 charging points for employees** at **German Volkswagen locations**

\+

Stationary time is **used for charging** – no restrictions on use

Low capacity adequate with daily use,
low investment by employer

Power can be provided by the employer **tax-free**

This vehicle is not yet for sale in Europe.

Volkswagen contributes to the development of public charging infrastructure

Employee car parks

Now: about 600 charging points
2025: about 4,000 charging points

Charging at Volkswagen dealerships

All 3,000 dealers and service points in the EU are to be equipped by 2020

Advice for fleet customers

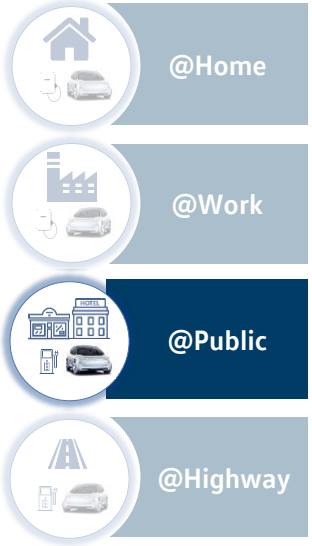
Requirements, costs, regulations, management

Public charging

Action is needed!

ID. Family: These vehicles are not yet for sale in Europe.
e-Golf: Power consumption, kWh/100 km: combined 14.1 with 17-inch wheels – 13.2 16-inch; CO_2 emissions, combined, g/km: 0; efficiency class: A+

Charging @Destination becoming increasingly important



In future access to **150,000 public charging points** in Europe **via We Charge**

Charging possibilities at all **Volkswagen dealerships** in Germany

+

Simply electrifying everywhere: 400 electric charging stations at Lidl branches by March 2020

Press release: Aldi Süd develops nationwide network of charging points

Kaufland opens 100th fast charging station for electric cars

Visit: daily/weekly

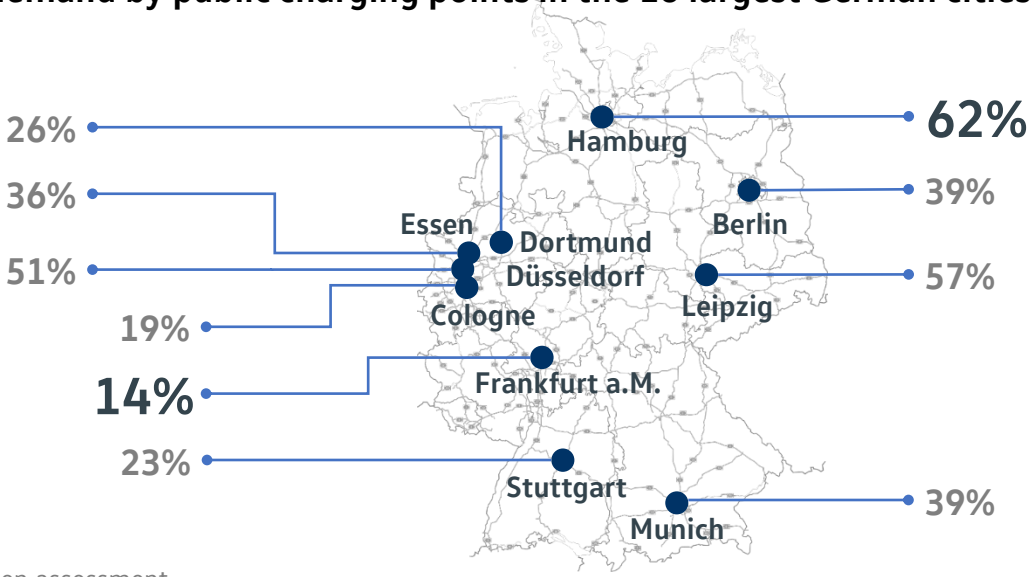
Charging eco-power free-of-charge at IKEA – all outlets to have electric charging stations by mid-March

Visit: sporadic

This vehicle is not yet for sale in Europe.

Expansion in the cities has not yet been completed

Coverage of demand by public charging points in the 10 largest German cities



Basis: Volkswagen assessment

- **Massive boost to expansion over the past six months**
- **Demand for public charging infrastructure in the cities currently not met!**

Charging to become customer loyalty tool

Retail outlets

15 min at 11 kW enough for journey home

Shopping mall/outlet center

11 kW for top-up charging, 100 kW for weekly charging or break in journey

Hotel

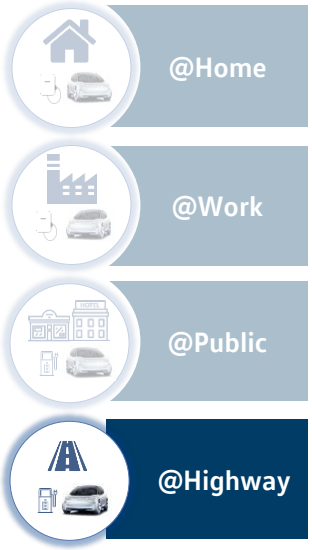
11 kW for full charging overnight

Restaurant

Top-up charging in city

Full charging in 30 to 45 minutes with 100 kW along major routes

High network density and charging performance make electric cars suitable for long trips



IONITY **HPC stations** with up to **350 kW** on **major routes**

100% green power at **IONITY**

\+

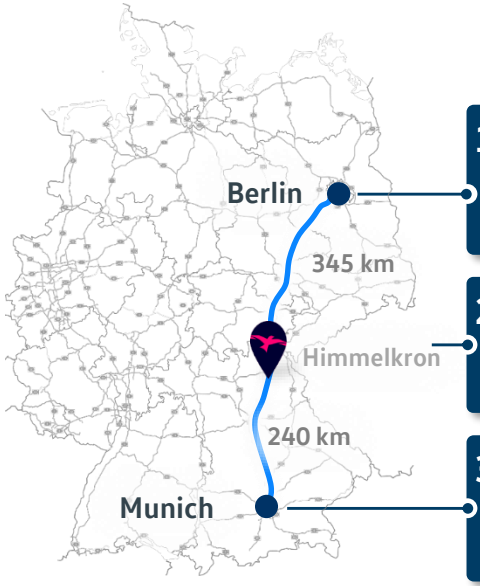
TANK & RAST **More than 200 additional locations in Germany** in the **Tank & Rast** network, with ratings of at least50 kW

Further fast charging networks with up to **350 kW under development** – competition has been created!

This vehicle is not yet for sale in Europe.

1) Germany: 100% eco-power, throughout EU, eco-power where technically feasible and available

Berlin – Munich? No problem with the ID.3!



1 @Home

ID.3 fully charged and set to right temperature for departure

2 @Highway

30-minute charging break at IONITY charging station coffee break

3 @Public

Recharging at destination with We Charge
AC charging overnight

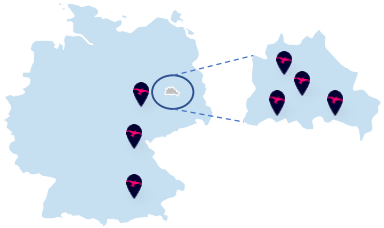
345 km | 240 km = 585 km

30 min

This vehicle is not yet for sale in Europe.

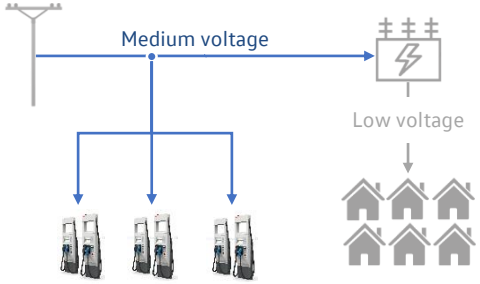
HPC as an alternative in the city

HPC for cities



- **Fast charging >100 kW:** from the highway to **the cities**
- Alternative **charging option** for **street parkers**

Good for networks



- **Fast charging units use** the **medium-voltage grid**
- This **relieves the burden** on the **low-voltage grid** (service connections)**!**

Pilot project starting now

- Volkswagen is **building the first fast charging units in Wolfsburg**!
- **5 locations, 28 stations, part of** €10 million investment
- Opening on June 25

Upon the market launch of the ID.3, charging is simple, convenient and affordable

At home

Green power and Wallbox

On the road/public

Access/billing and route planning

Elli

Volkswagen

LIDL IKEA Kaufland

We Charge

IONITY

§ Legal framework

Public expansion

Occasional charging

Semi-public

Long-distance charging

Highway

This vehicle is not yet for sale in Europe.

Upon the market launch of the ID.3, charging is simple, convenient and affordable

The **number of charging opportunities is growing**

We Charge allows **charging throughout Europe with** only **one contract**

Long-distance travel will become a **normal part of e-mobility**

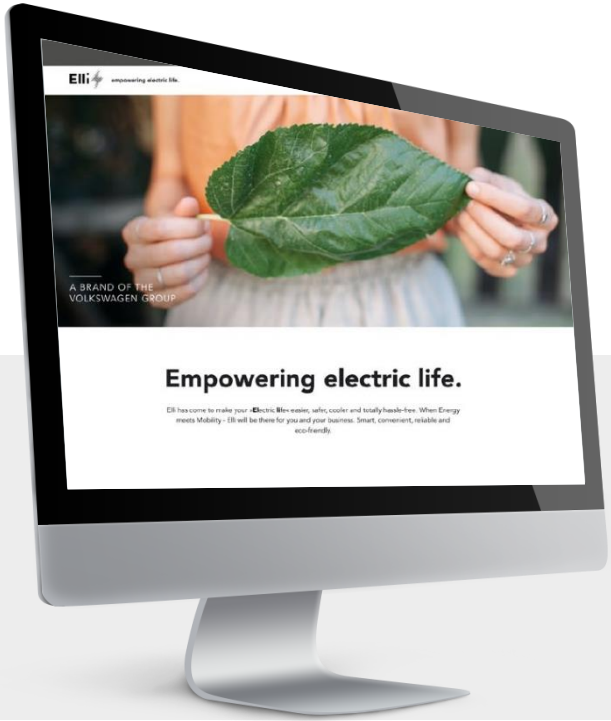
Still **regional need for action** for the **expansion of charging infrastructure**

This vehicle is not yet for sale in Europe.

New business models for innovative energy solutions

Thorsten Nicklass
CEO Elli

Volkswagen Group has bundled charging and energy solutions in Elli



Elli stands for *El*ectric *Li*fe

When energy meets mobility – Elli will be there

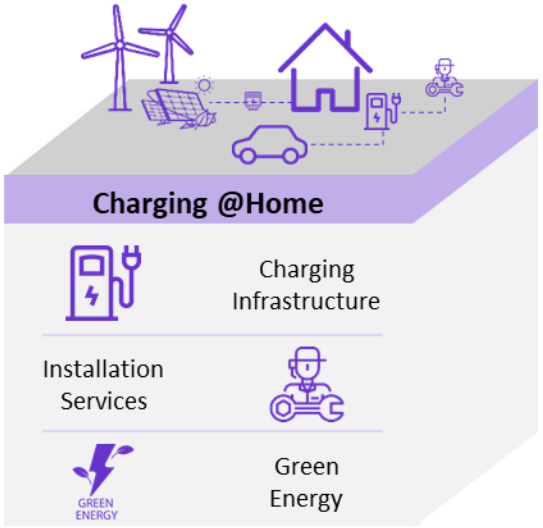
Mission is to firmly place e-mobility in the mainstream

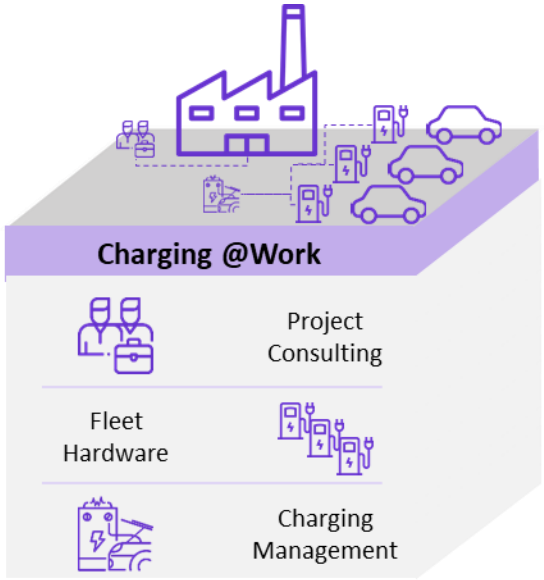
2018
Company established, first product portfolio developed

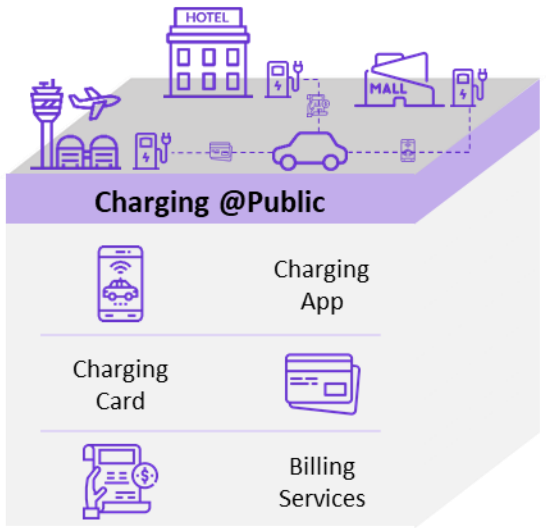
January 8, 2019
Communication kickoff

January 29, 2019
First product - Volkswagen Naturstrom® - becomes available

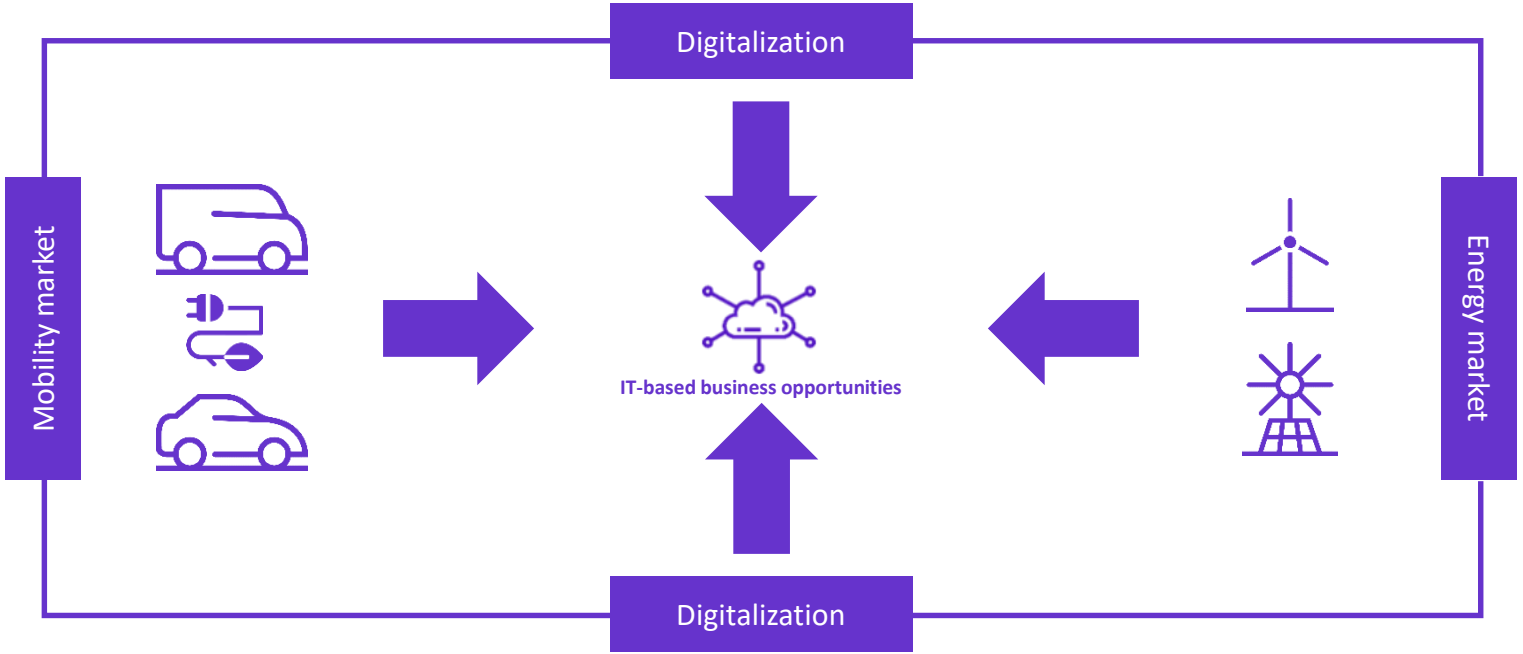
Elli offers charging solutions for main applications



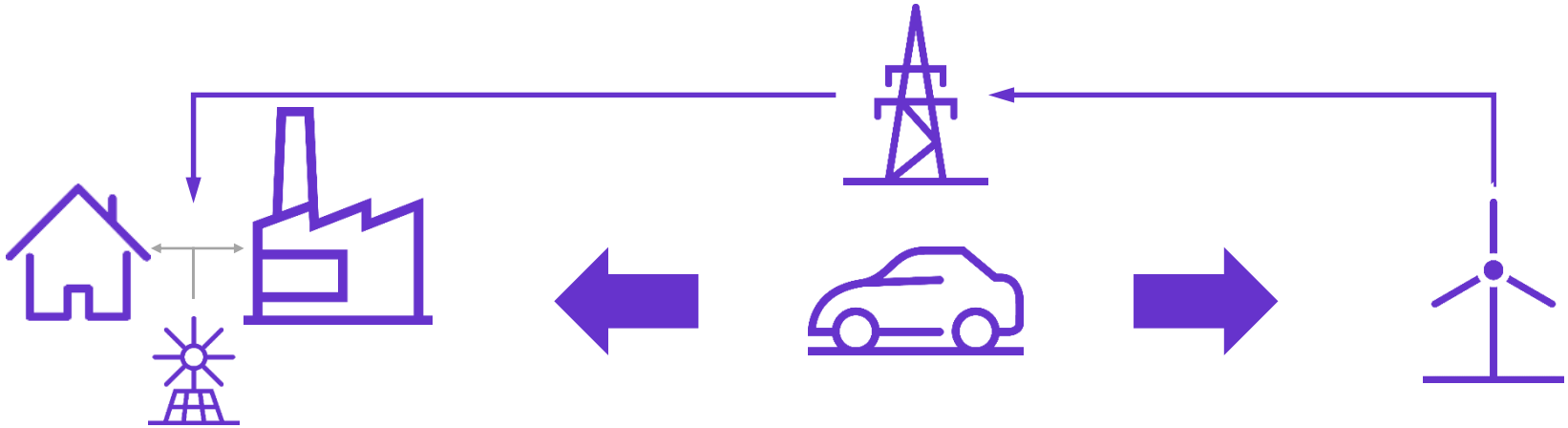




Blending the digital world, mobility and energy – the foundation for new, data-driven business models



Electric vehicles become intelligent, flexible energy storage units



Many customers generate their own energy

Going forward, EVs can help balance energy supply and demand

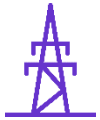
Energy increasingly provided by unpredictable sources

Smart electric vehicles can distribute energy – that has several advantages

Elli business models based on vehicle and energy data

B2C business model

Grid stimuli



Intraday market incentives

EV responds, stores or releases power

Power system is optimized, financial benefit for customer

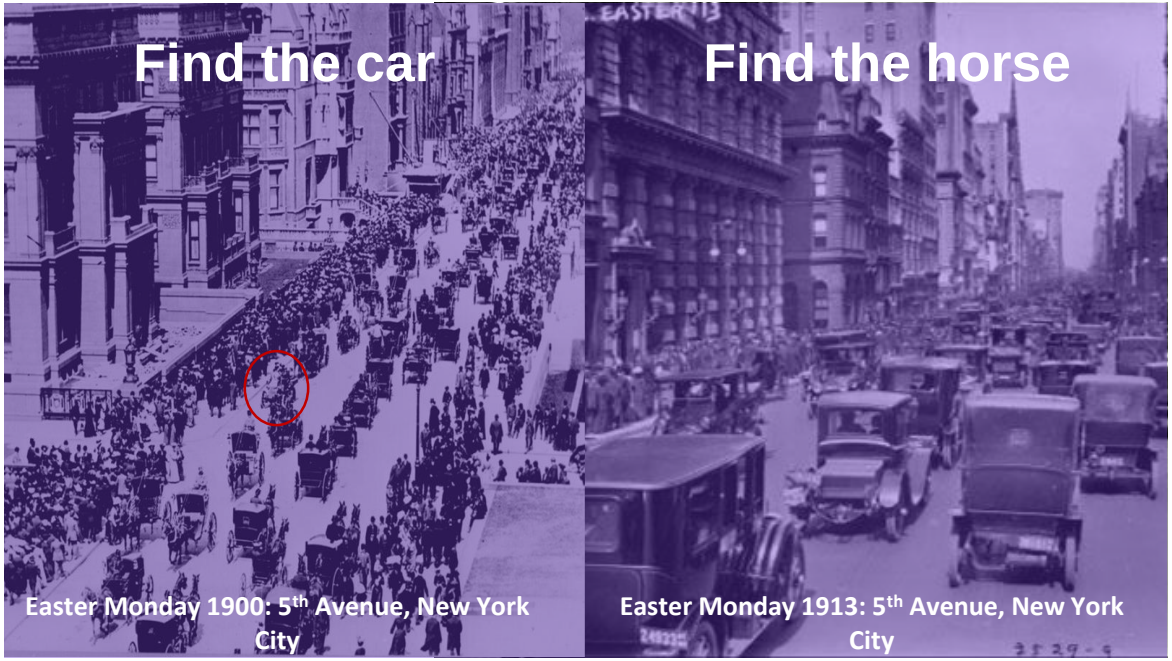
B2B business model

Employer releases power to employee EVs

EVs function as mobile energy storage units

Employees can take power they generate to work

Summary



- The digital world, mobility and energy are coming together
- Elli offers smart charging solutions and energy from renewable sources
- Portfolio spans green power, wallboxes, services and consulting
- With Elli, Volkswagen has a presence in a strategically relevant, very exciting business field
- Volkswagen is therefore harnessing opportunities to retain existing customer groups and develop new ones

Innovative charging solutions for tomorrow

Gunnar Bärwaldt
Portfolio Management e-Mobility Services
Volkswagen Brand

The future with Plug & Charge: EVs become credit cards on wheels

Charging by card today

1

Take card out

2

Plug in

3

Tap card on device

4

Put card away

Charging with Plug & Charge tomorrow

Fully automatic

- Car pays automatically via digital interface and block chain technology
- No need for charging card or app
- Charging becomes so much easier

This vehicle is not yet for sale in Europe.

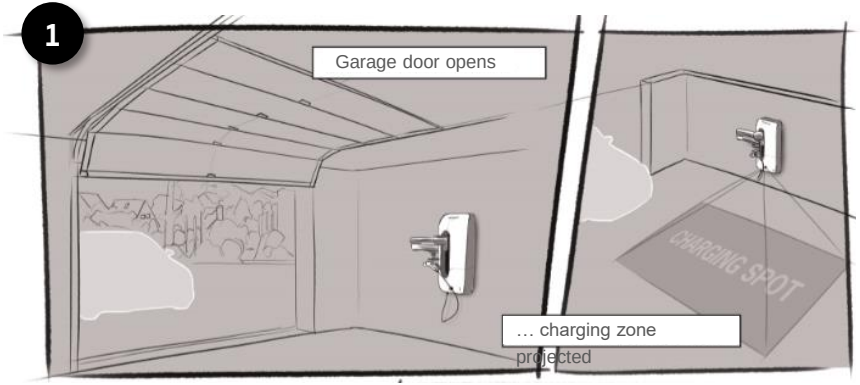
We Charge finds and books Plug & Charge-compatible charging points

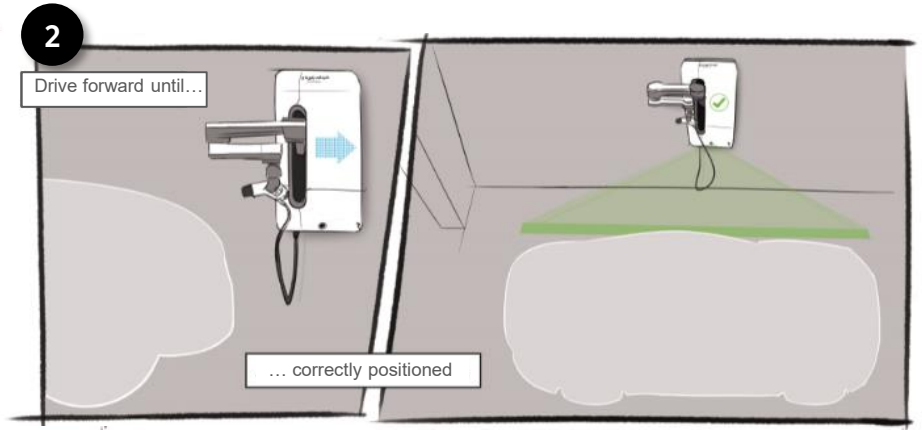
- Charging point identified – can be booked if not in use

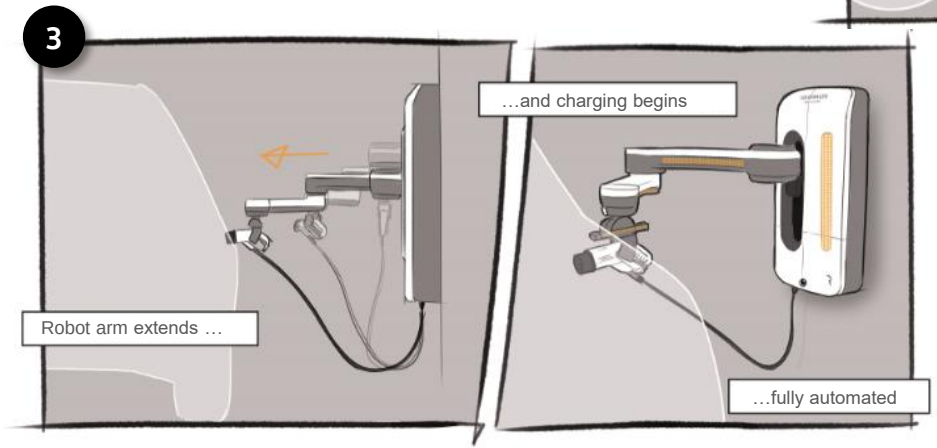
- Charging point presented in head-up display and announced by voice assistant

- Vouchers and special offers displayed during charging

The future with charging robots: alternative to inductive charging

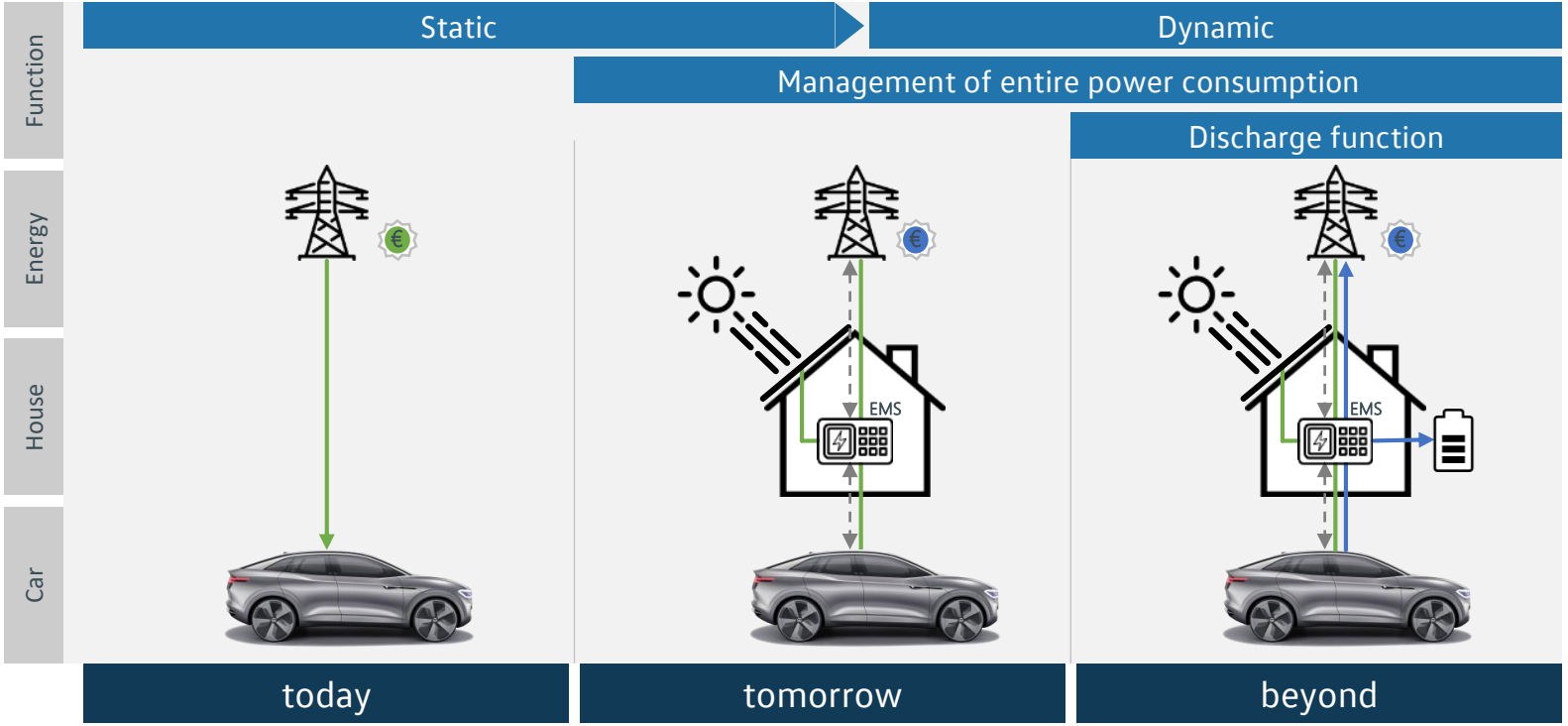






- Supports automated parking
- Attractive price-performance ratio
- Couldn’t get any easier than this!

In future bi-directional charging will integrate EVs in power grid

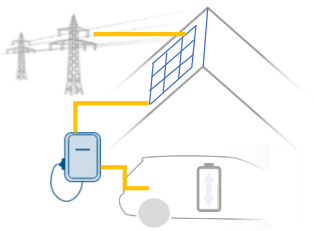


This vehicle is not yet for sale in Europe.

EVs are relevant at all levels of the energy system

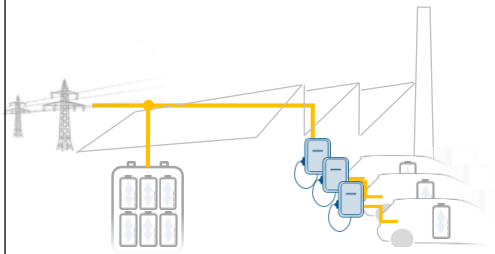
Volkswagen

local B2C



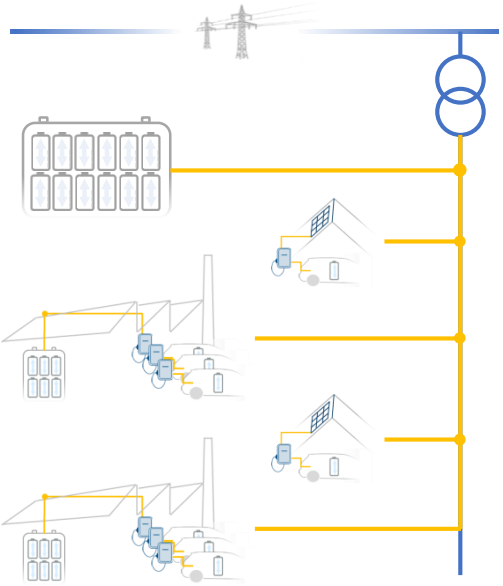
e.g. private consumption optimization

local B2B



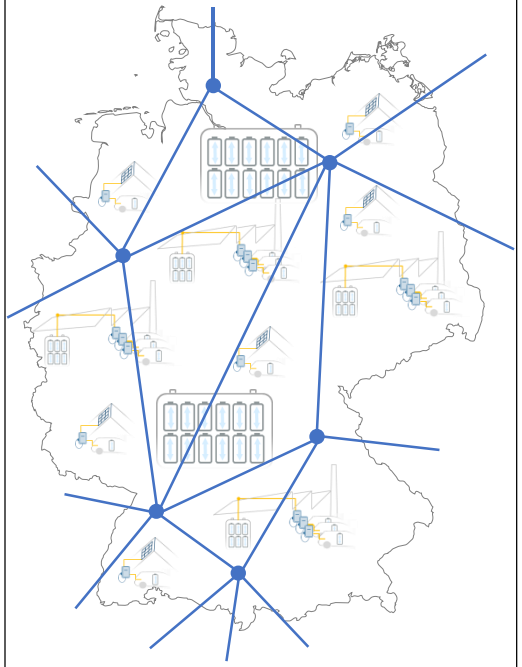
e.g. peak shaving management

regional



e.g. maintaining voltage and regional storage of renewables

national



e.g. improving capacity utilization of power lines

Summary

Charging with the ID. is simple and convenient – and **will be even easier looking further ahead**

Plug & Charge turns the EV into **a credit card on wheels**

Robots **take the hassle out of fiddling with plugs**

Functional integration of EVs makes the **energy system more flexible**

Bi-directional charging **increases value** of e-mobility in the longer term

This vehicle is not yet for sale in Europe.