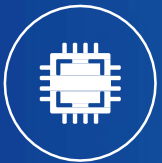


VOLKSWAGEN

AKTIENGESELLSCHAFT

Leading the Transformation.

Investor Update, Wolfsburg, 19th August 2019



Digital Car & Services

Christian Senger

Board Member Digital Car & Services
Volkswagen Passenger Cars

Agenda

1

Situation

2

Organization

3

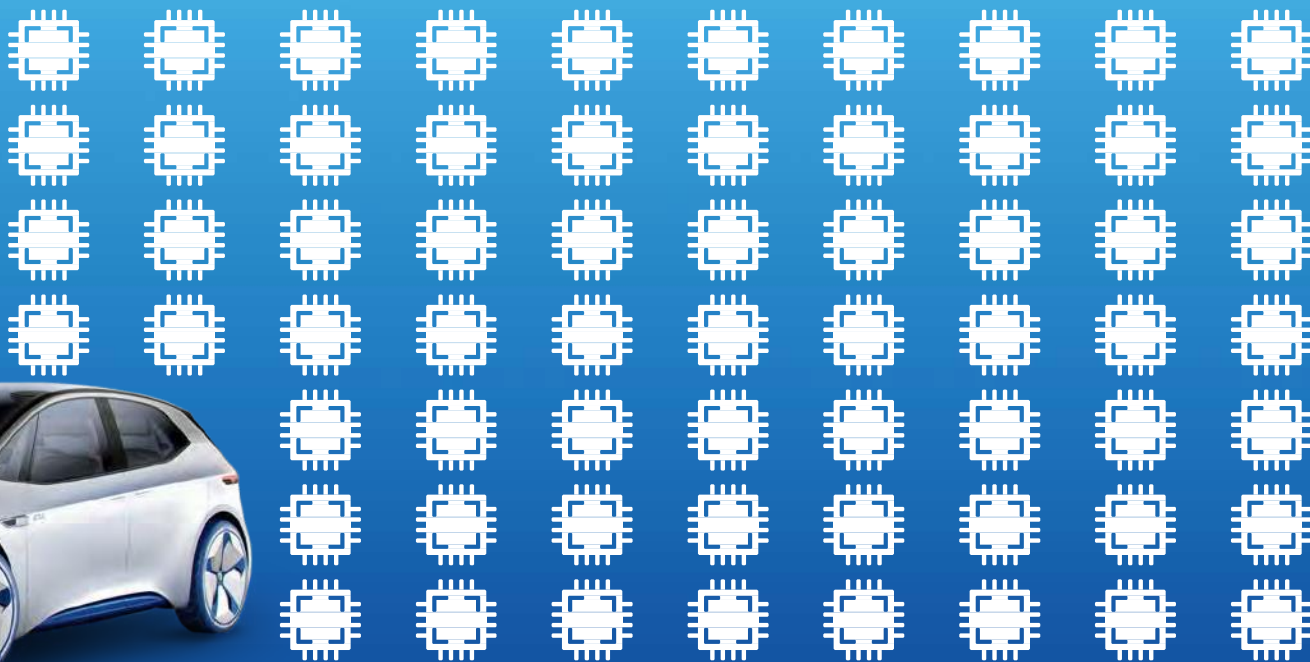
Collaboration

Platform strategy is key to technology leadership and scalability



Volkswagen is the pioneer for platform development

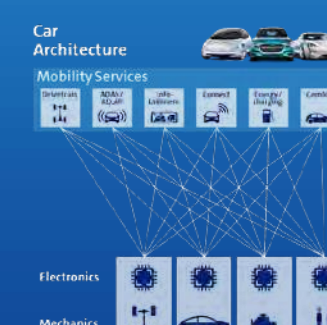
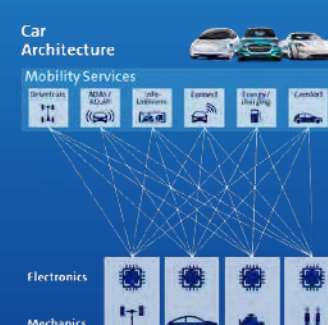
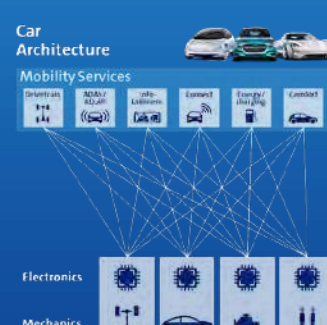
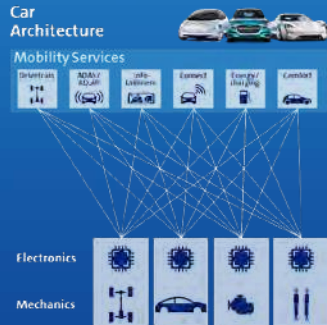
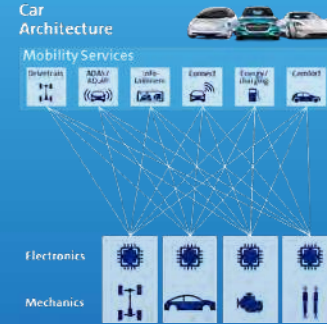
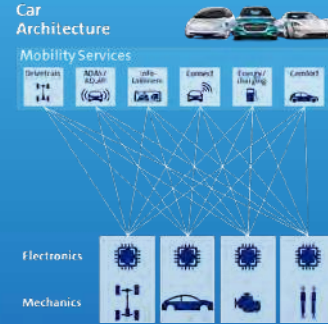
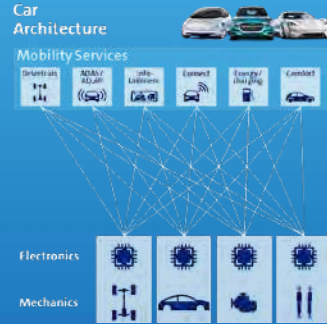
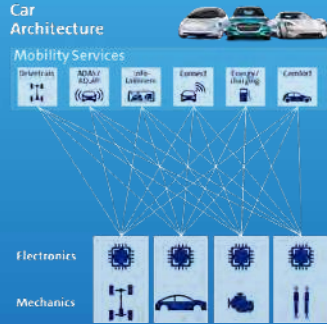
70 ECU's per car ...



... 200 SW Suppliers ...



... 8 electric architectures



... countless connections between ECU's and SW-Functions

Car Architecture

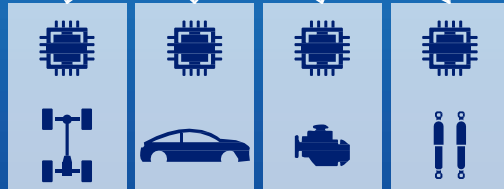


Mobility Services



Electronics

Mechanics



Resulting in:

- Paralyzing amount of complexity
- Updates are not possible
- Inability to harvest economies of scale

... We need CHANGE !

Today the in car software is developed without a unified operating system or a standard platform

Smartphone Architecture

Apps



Universal standard interface

Platform

App Store, iOS, SDK, Framework



Hardware-specific communication

Hardware



Car Architecture

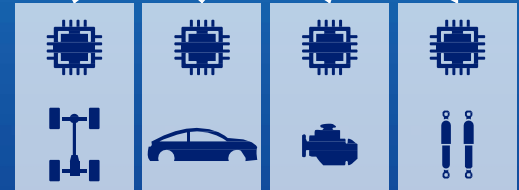


Mobility Services

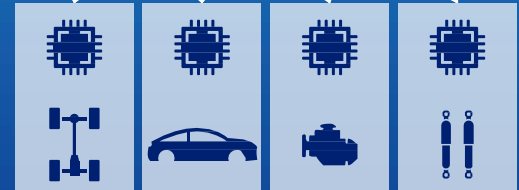


Lack of "one language" for communication between apps and hardware

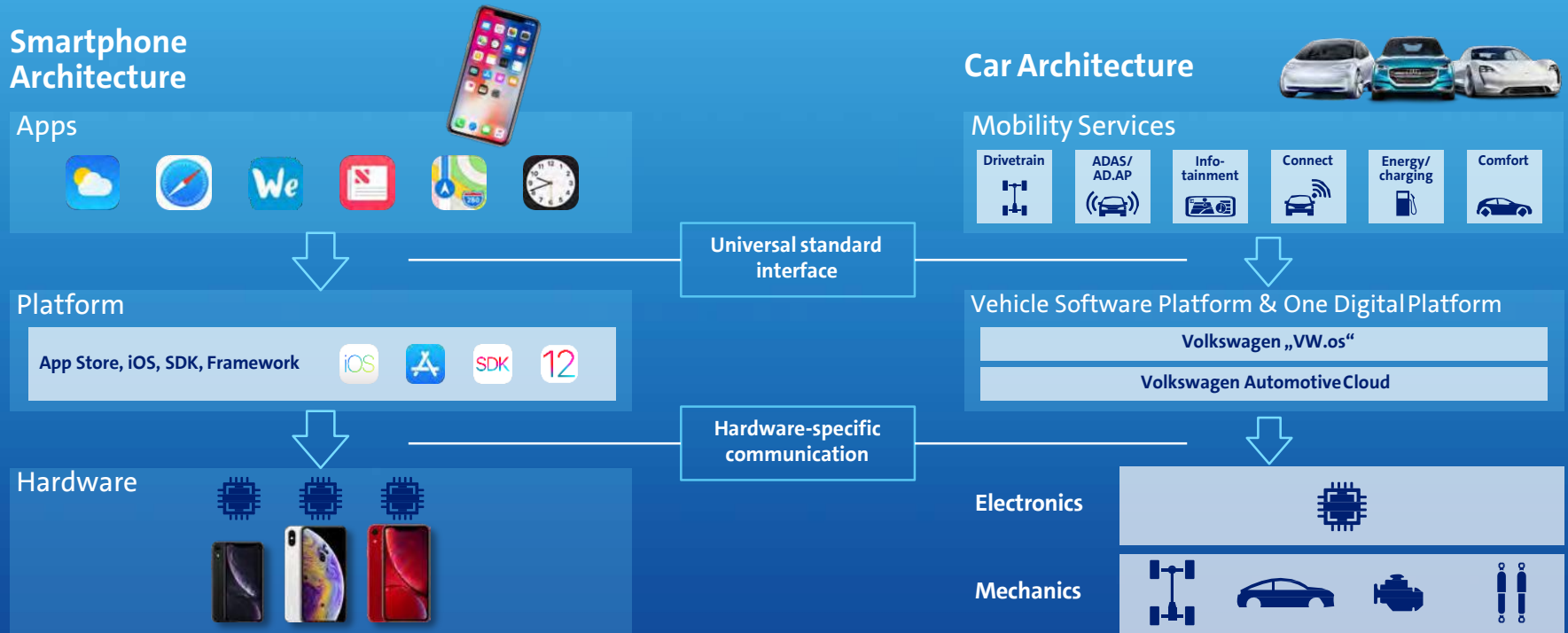
Electronics



Mechanics



We need to copy the IT-Industry and develop functions on a group wide platform



Agenda

1

Situation

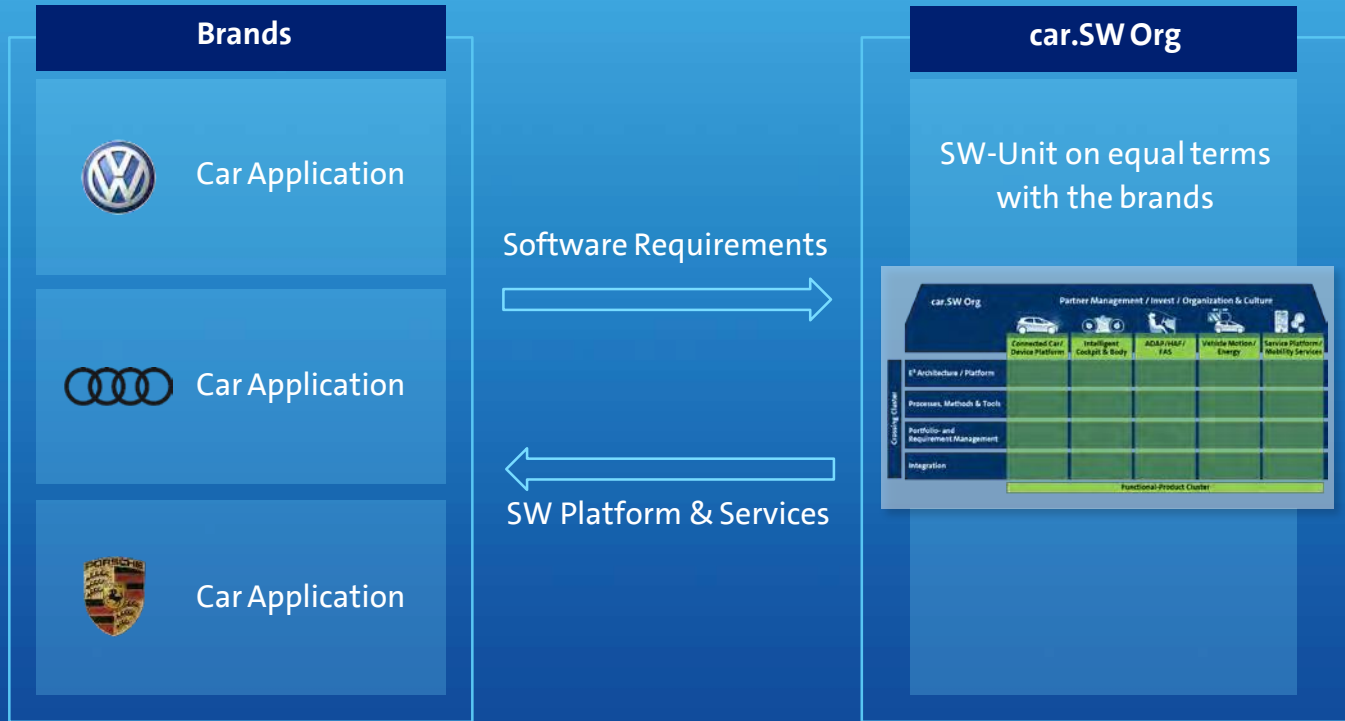
2

Organization

3

Collaboration

Embedding car.SW Org into the Group Structure in 2019



car.SW Org – Structure

car.SW Org

Partner Management / Invest / Organization & Culture



Connected Car/
Device Platform

Intelligent
Cockpit & Body

ADAP/HAF/
FAS

Vehicle Motion/
Energy

Service Platform/
Mobility Services

E³ Architecture / Platform

Processes, Methods & Tools

Portfolio- and
Requirement Management

Integration

Crossing Cluster

Functional-Product Cluster

Agenda

1

Situation

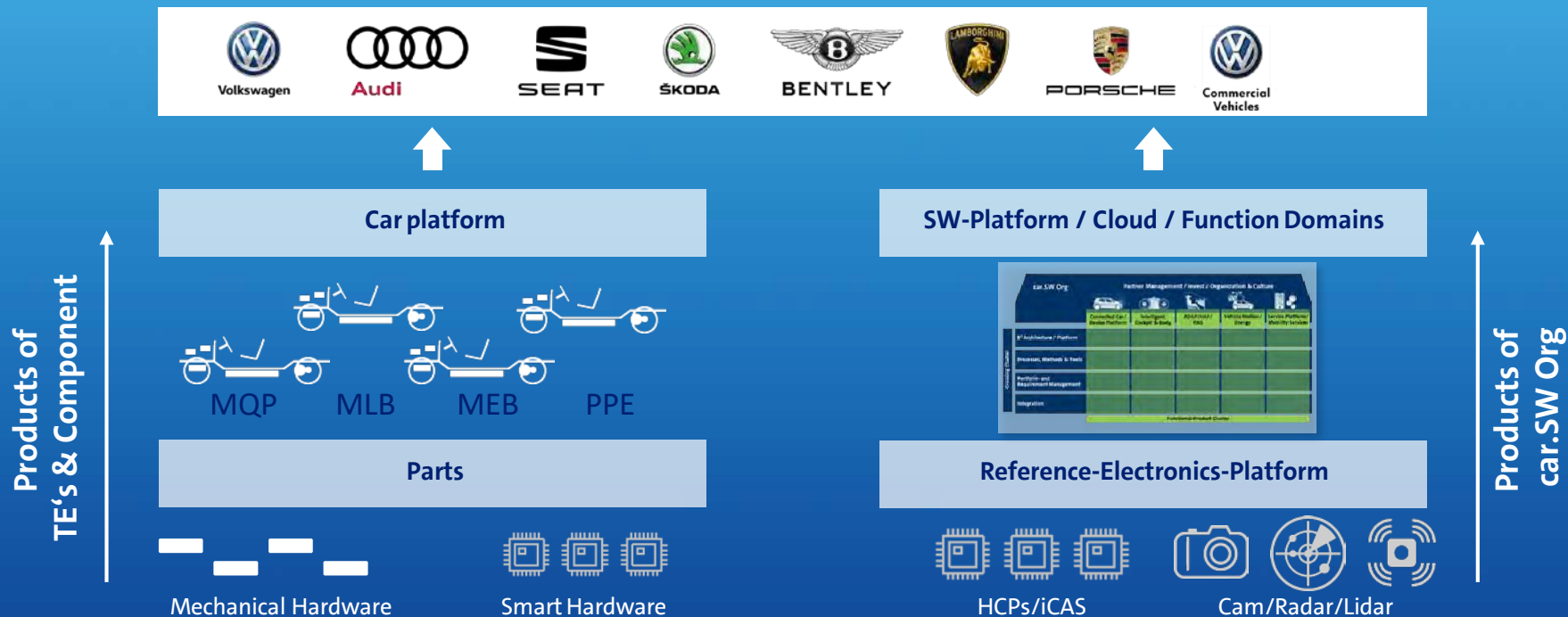
2

Organization

3

Collaboration

Software contributes to the brand success by its own roadmap and development cycles



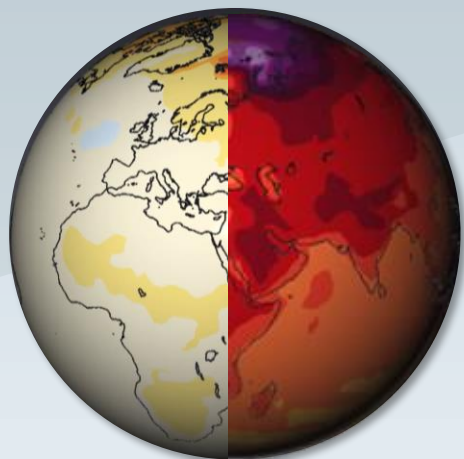
We are going through a huge transformation...



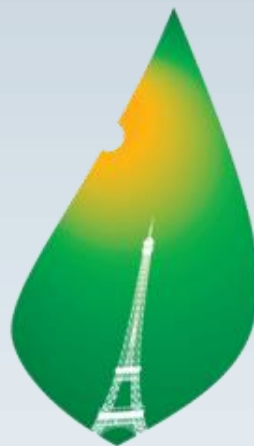
© powered by
car.SW OS

... TOGETHER !





COP21 • CMP11
PARIS 2015
UN CLIMATE CHANGE CONFERENCE



Investor Meeting | DWS Invest

Thomas Ulbrich

Head of E-Mobility

Board Member Volkswagen Brand

Climate Change is the biggest challenge of our time



**Increasing man-made
temperature rise**

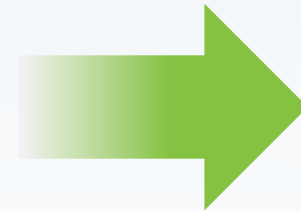
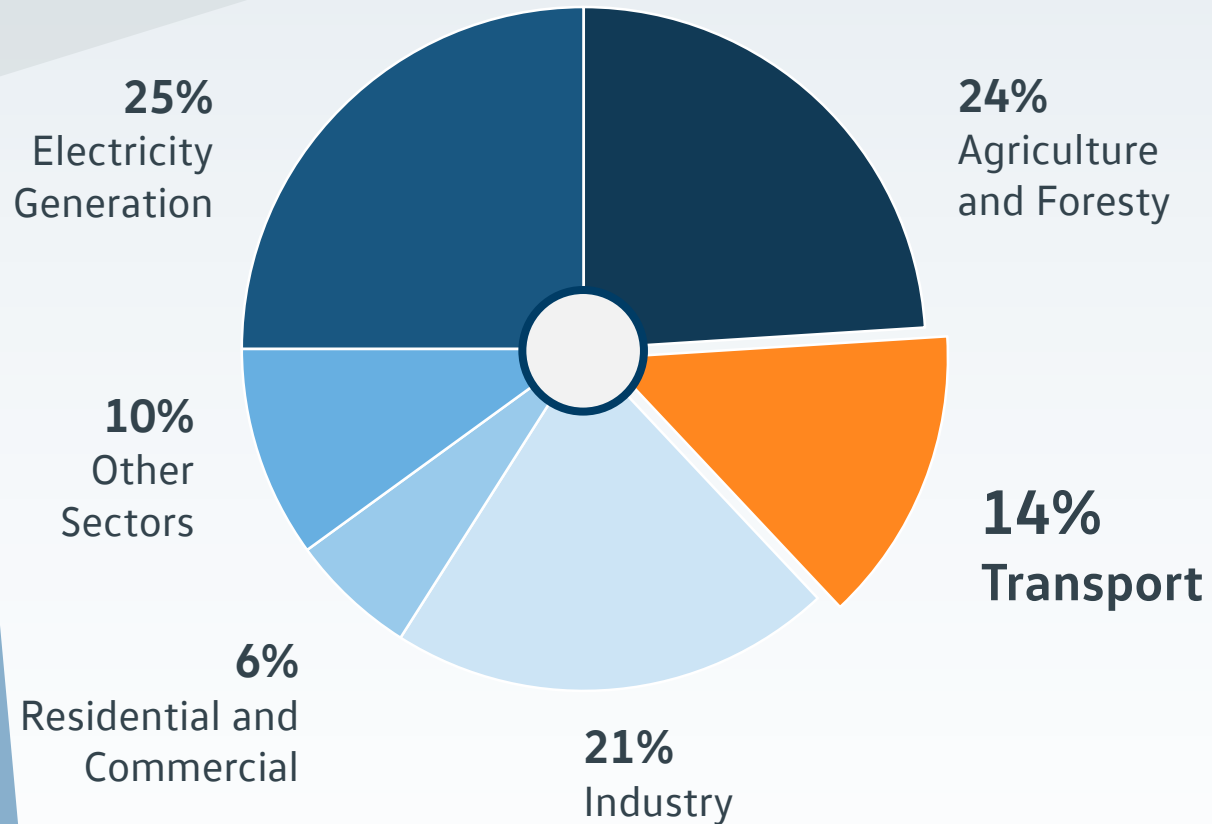


**Constantly rising
sea levels**

**Growing number of
natural disasters**

Besides other economic sectors, the transport sector will contribute to reducing global greenhouse gas emissions

Global emissions by economic sector:



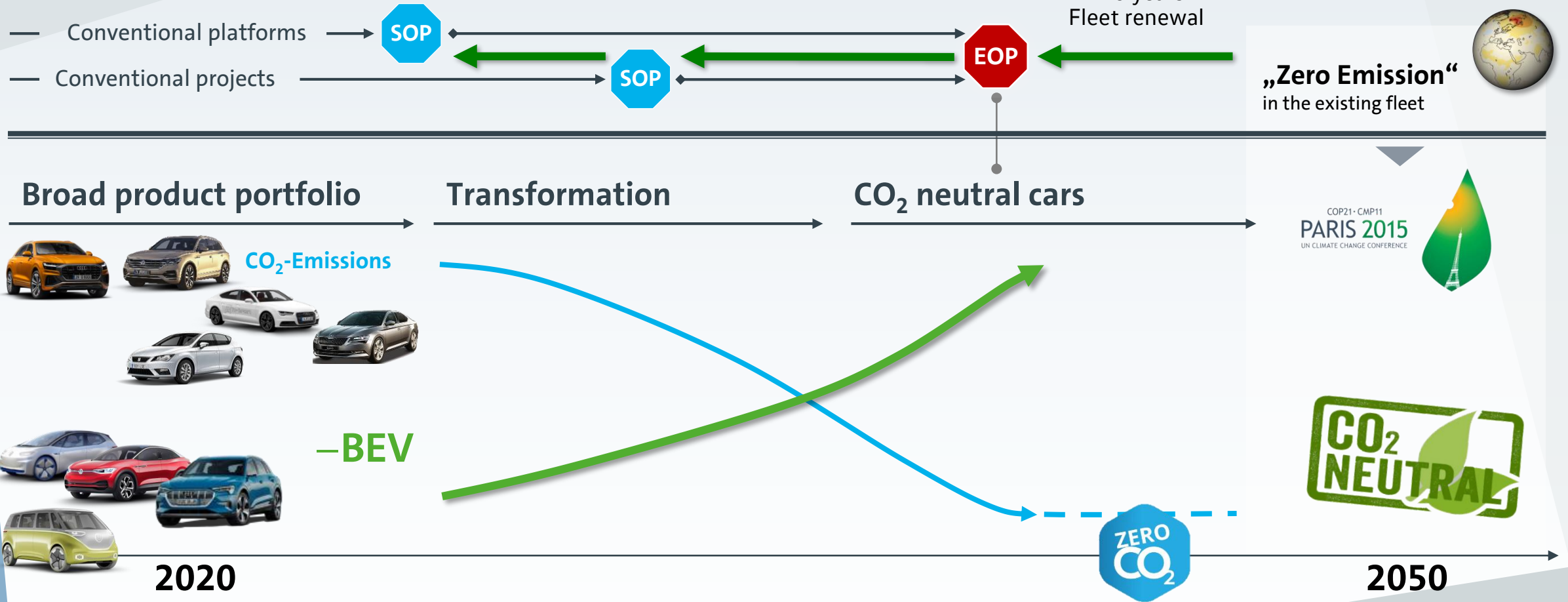
0 CO₂

Goal: Reduce CO₂ emissions from transport to zero by 2050 at the latest.

Source: Intergovernmental Panel on Climate Change IPCC

Retrograde target derivation based on the Paris Climate Agreement requires effective transformation planning

Paris implications and transformation path



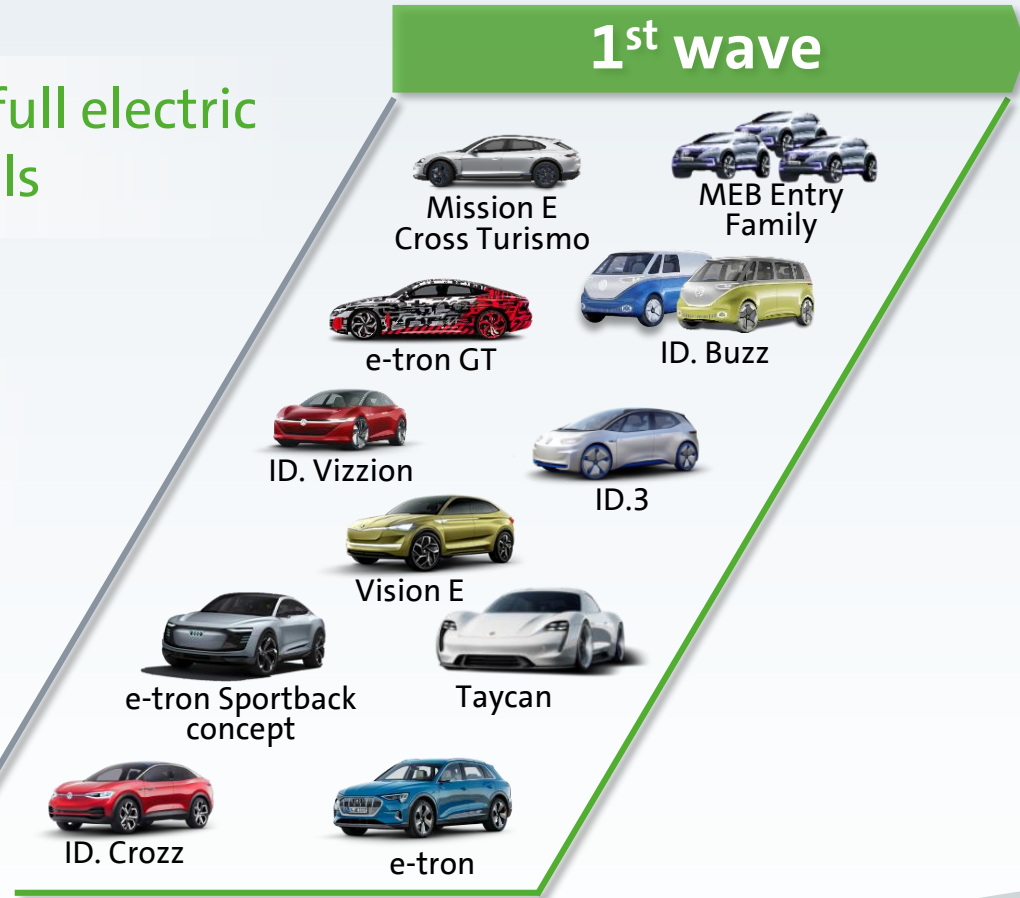
Volkswagen Group has launched the largest electric offensive in the global automotive industry

Global Market offer

~70 New full electric models

~30 bn. invest

~22 m. cars

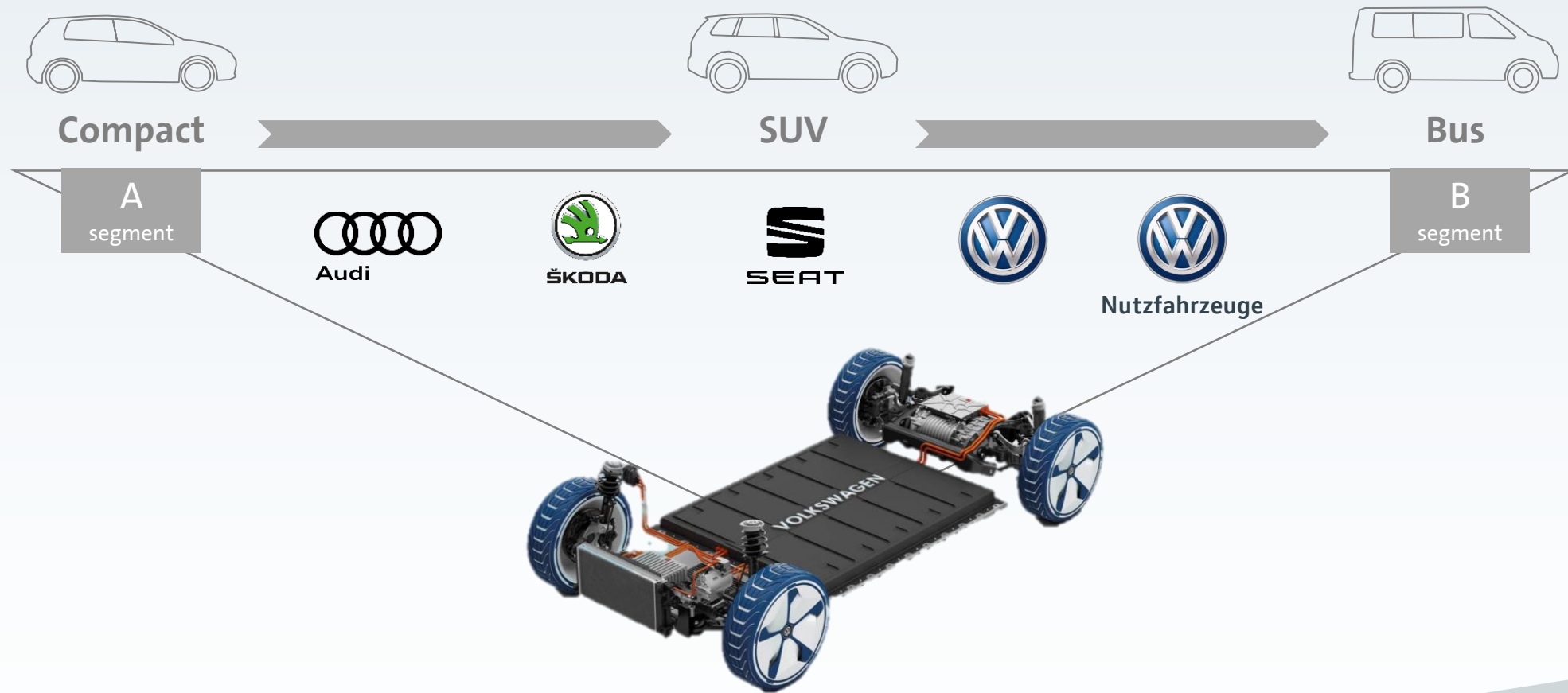


Electric for all: The SOP of the Volkswagen ID.3 at the end of 2019 marks the start of a new era.



The MEB electric platform is the technological and economic backbone of the e-offensive

By 2022, we will be offering pure electric models in all relevant vehicle segments

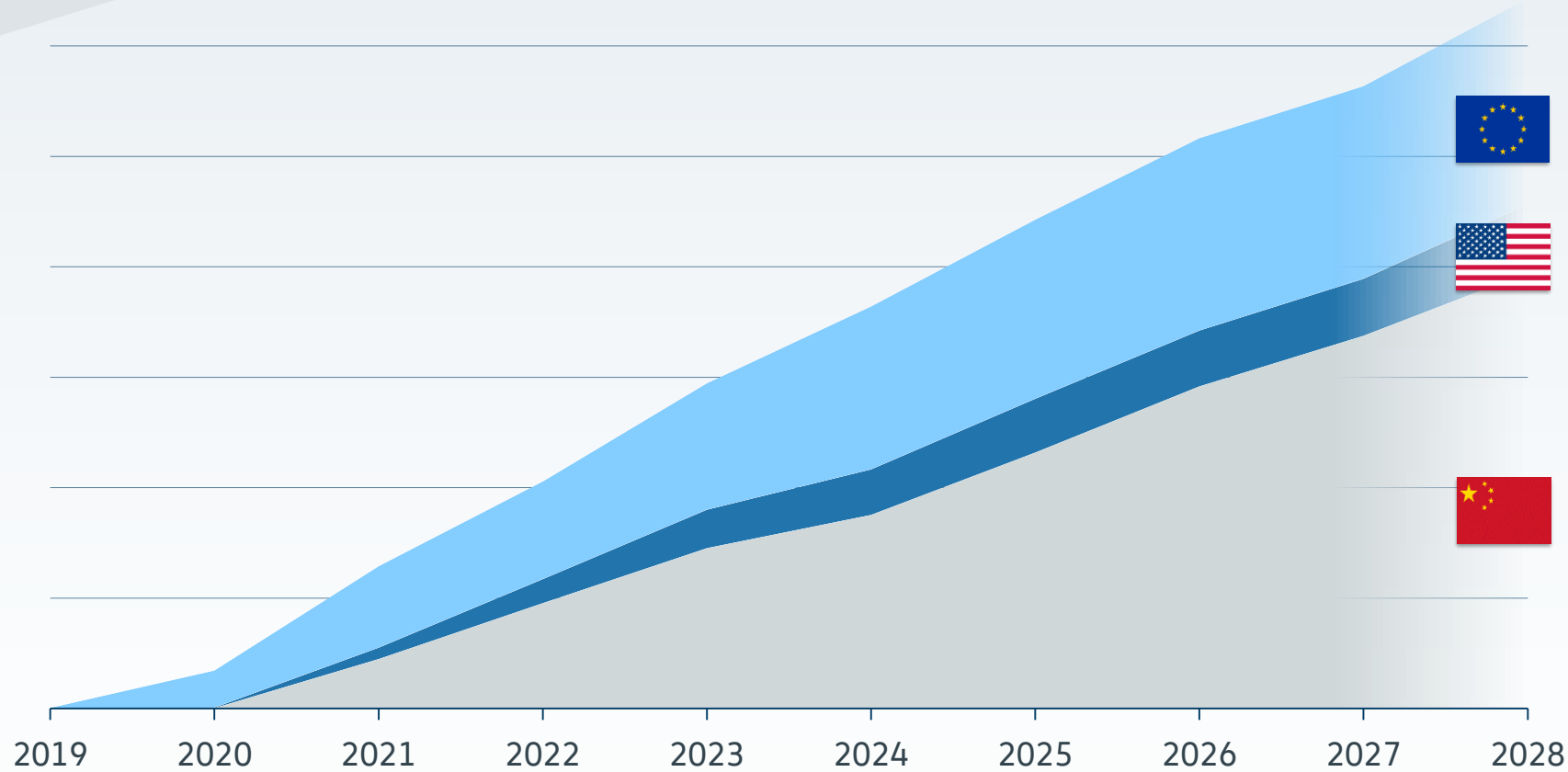


We are planning up to 15 Million MEB-based vehicles in the first wave...

Sales Volume

VW Group

VOLKSWAGEN
GROUP



Brand VW



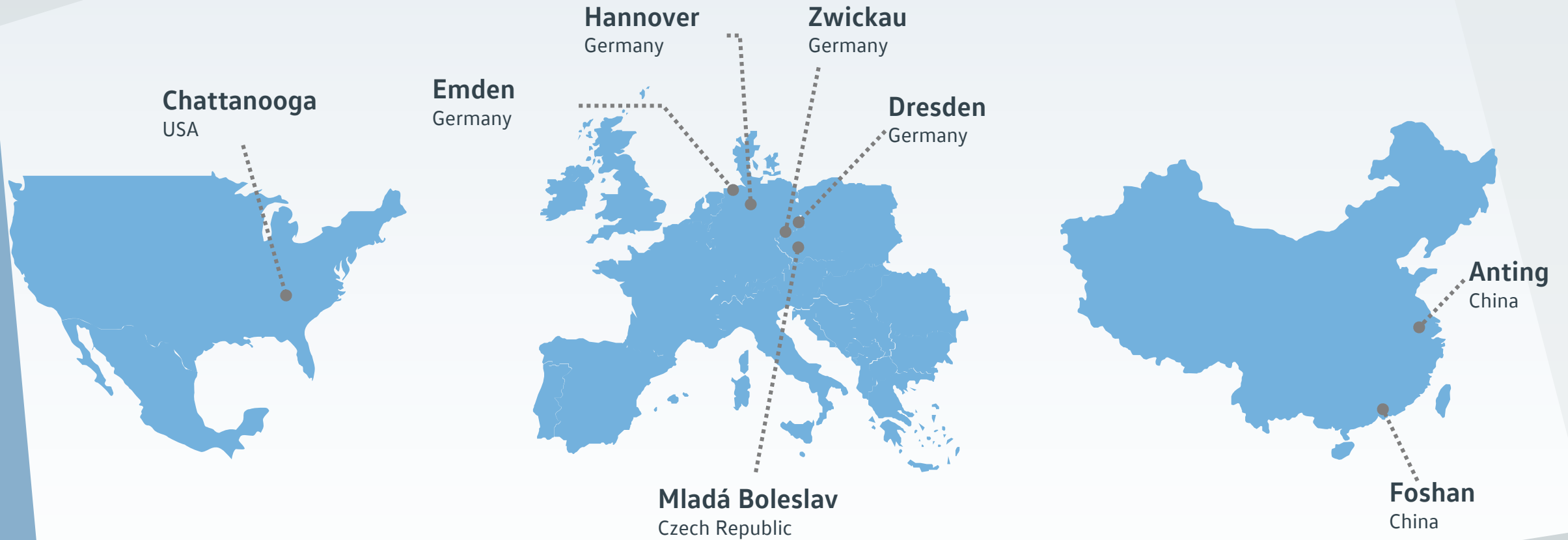
Focus 2025

> 1.0 Mio. ✓



Volkswagen consistently implements its MEB strategy in the production sites

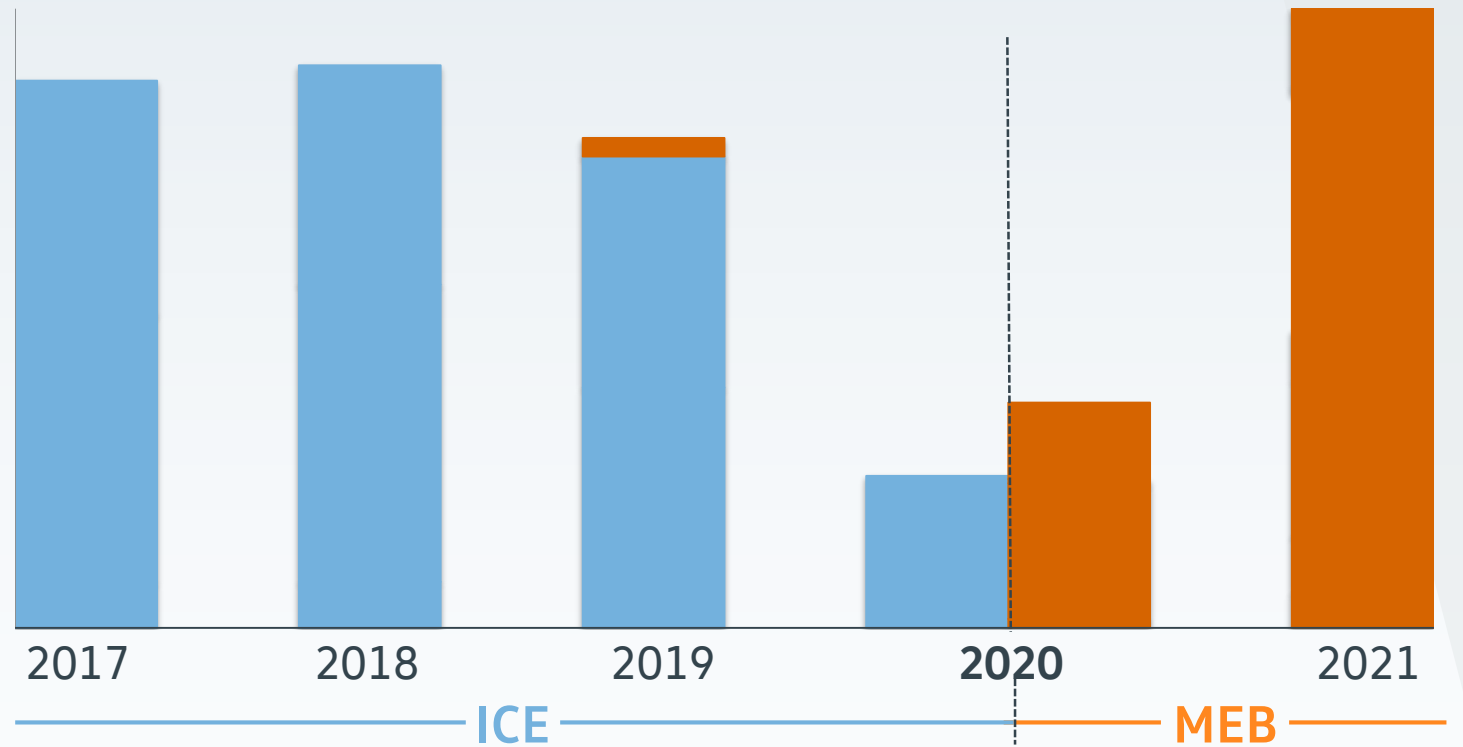
Ramp up of 8 MEB locations until 2022:



The Volkswagen plant Zwickau will step-by-step be transformed into an MEB-only site



Production Volume



Volkswagen invests more than 1,2 Billion Euros at the Zwickau site.

MEB Transformation in Zwickau ongoing

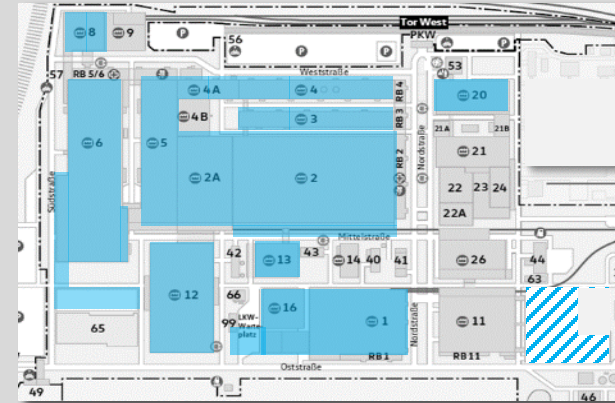
Organizational basis set



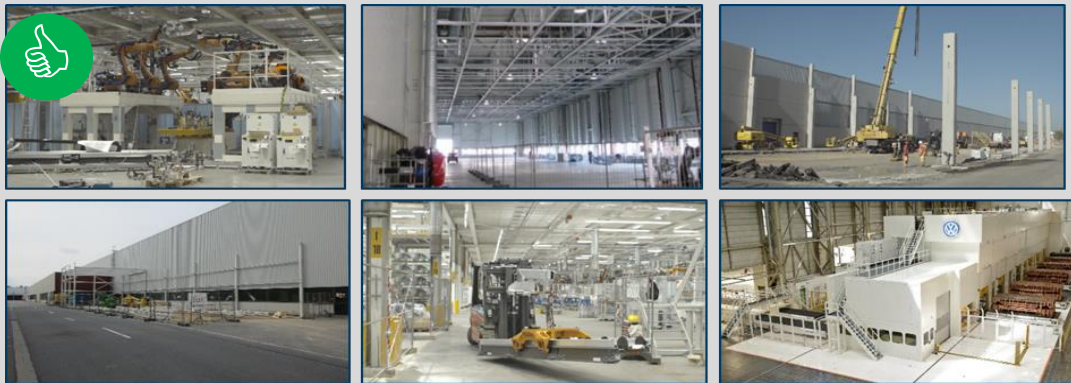
**Volkswagen
Sachsen**

**Direct organisational connection to Head of
Brand Board division „E-Mobility“**

More than 67% already contracted and spent



Construction work in full swing



328 Pre-series cars already built



Nevertheless: In society, politics and industry there are concerns regarding the E-Mobility transformation ...

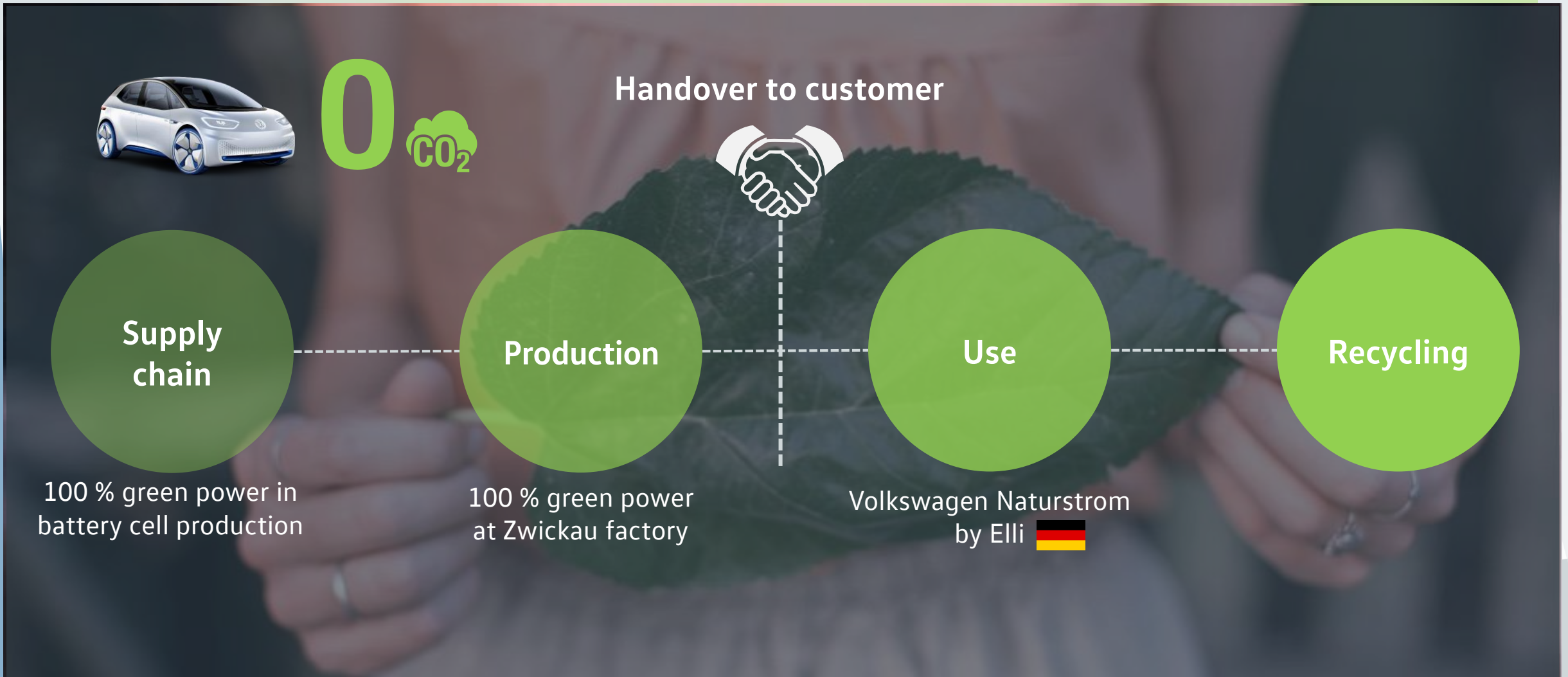


- 1 A lot of CO₂ arises from the battery and car **production**
- 2 We don't have **enough power**
- 3 **Without green energy** there is **no difference**
- 4 E-Mobility **is too expensive**
- 5 Range is **too small**, it **shrinks in Winter**
- 6 Number of loading facilities is **not sufficient**
- 7 Charging takes **too long**
- 8 **Durability** of the battery is short and is then **special waste**

1 A lot of CO₂ arises from the battery and car production



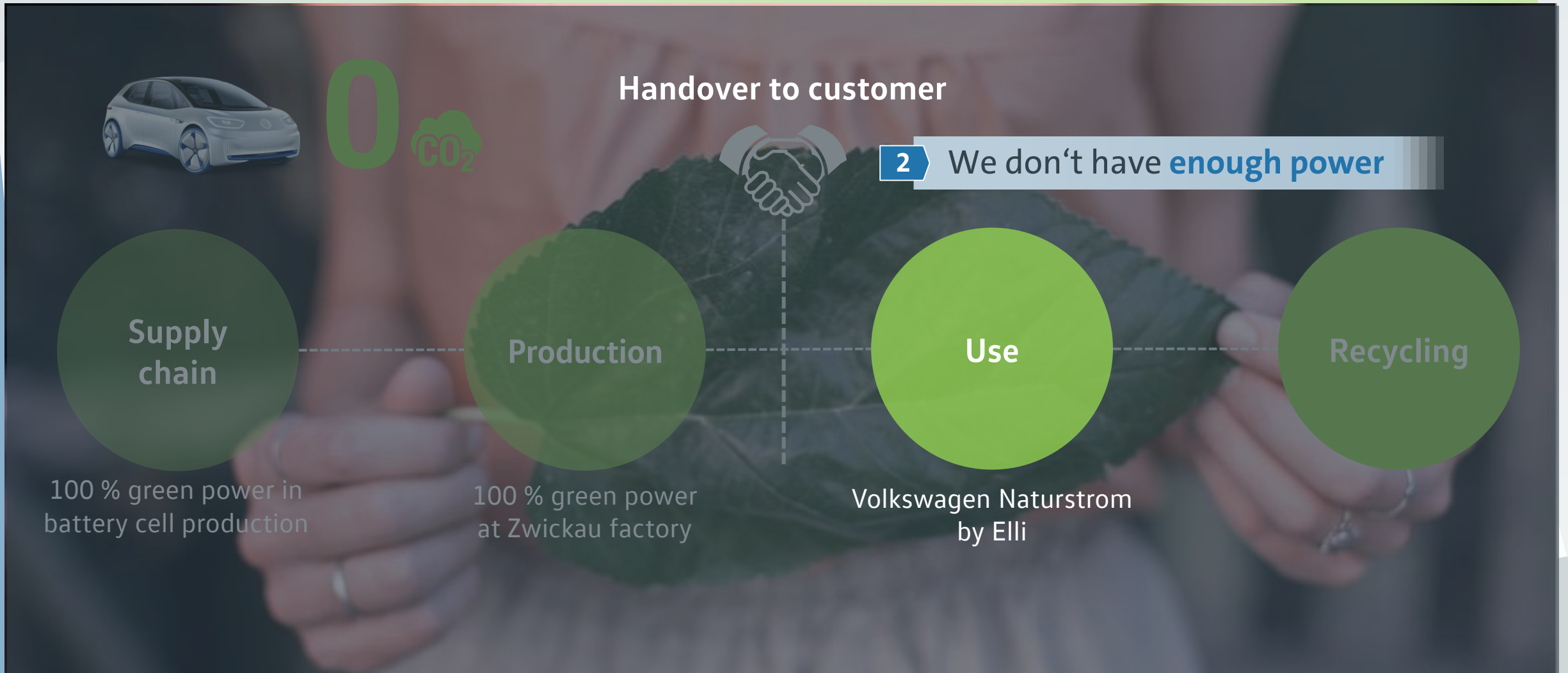
The first steps towards a CO₂-neutral society have been taken, the ID. will be handed over CO₂-neutral to customers in EU



2 We don't have enough power



The first steps towards a CO₂-neutral society have been taken, the ID. will be handed over CO₂-neutral to customers in EU



- 2 We don't have enough power 3 Without green energy there is no difference

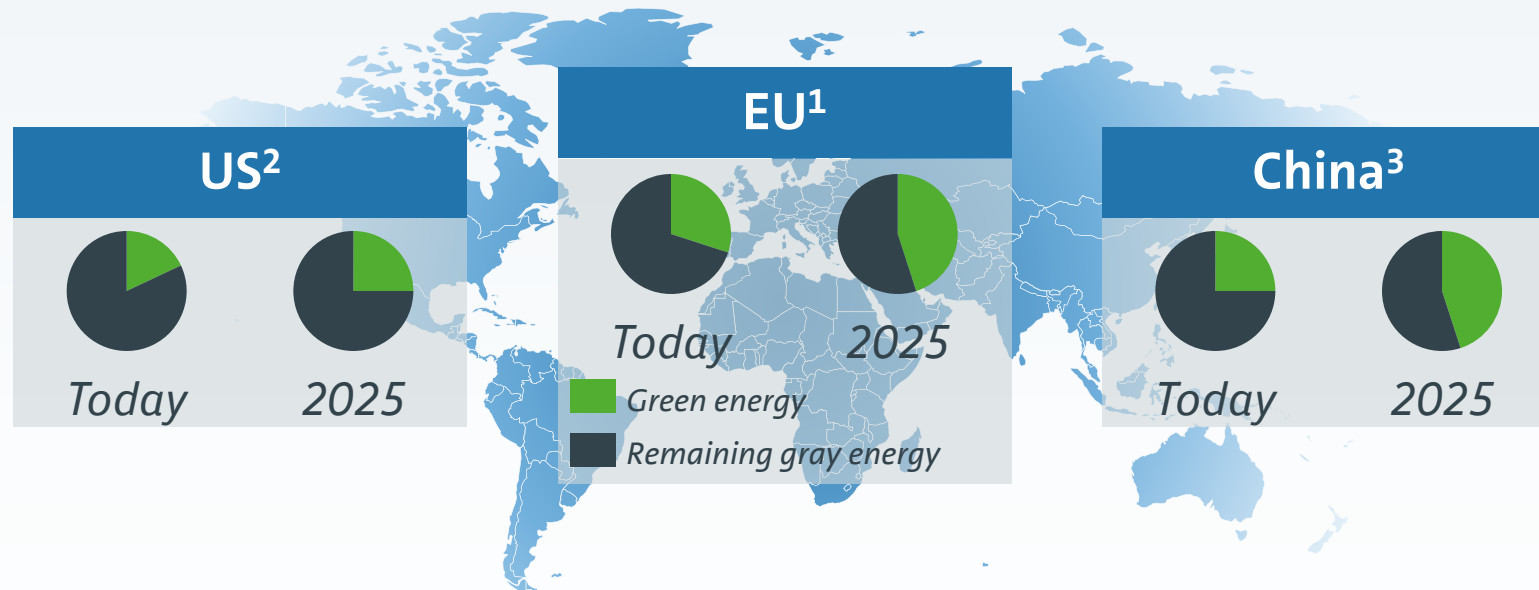


Talking about green energy – its share is increasing worldwide!

The lights will not go out – There is enough power!

The German Federal Government announced **1 million electric vehicles in Germany by the end of 2022**. These will increase the power consumption by only **0.5%**⁴

Even **today**, the global power mix makes **e-mobility greener than any combustion engine**. According to BloombergNEF the overall share of sustainable energy supply will be **63%** by 2040





The ID. will be available on same TCO level as a comparable Golf



Entry price under 30.000 €

Focus on customer loyalty on the **total lifecycle** (new: Leasing for 2nd lifecycle)

First BEV in the **volume relevant** A-segment price range

Higher sales price versus conventional cars will be compensated by **lower running costs** of the BEV

Target Positioning

ID. affordable*

As a VW Golf Diesel



Cost increase ICE cars due to EU7



* Leasingraten & Restwerte ähnlich Golf

5 Range is **too small**, it **shrinks in Winter**



The MEB offers scalable range suitable for everyday use, even in bad weather conditions



330 km WLTP up to 550 km WLTP



scalable



WLTP = Ø 48 km/h



High battery range



* Heating / air condition; ventilation; light; radio; navigation; seat heating (Winter)

** additional: All season tires

6 Number of loading facilities is **not sufficient**

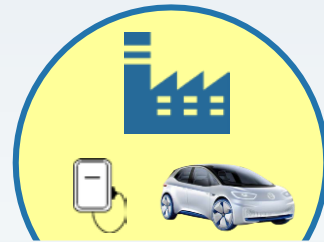


Volkswagen has defined a use-case derived charging strategy



@Home

50% of use cases



@Work

20% of use cases



@Public

25% of use cases



@Highway

5% of use cases

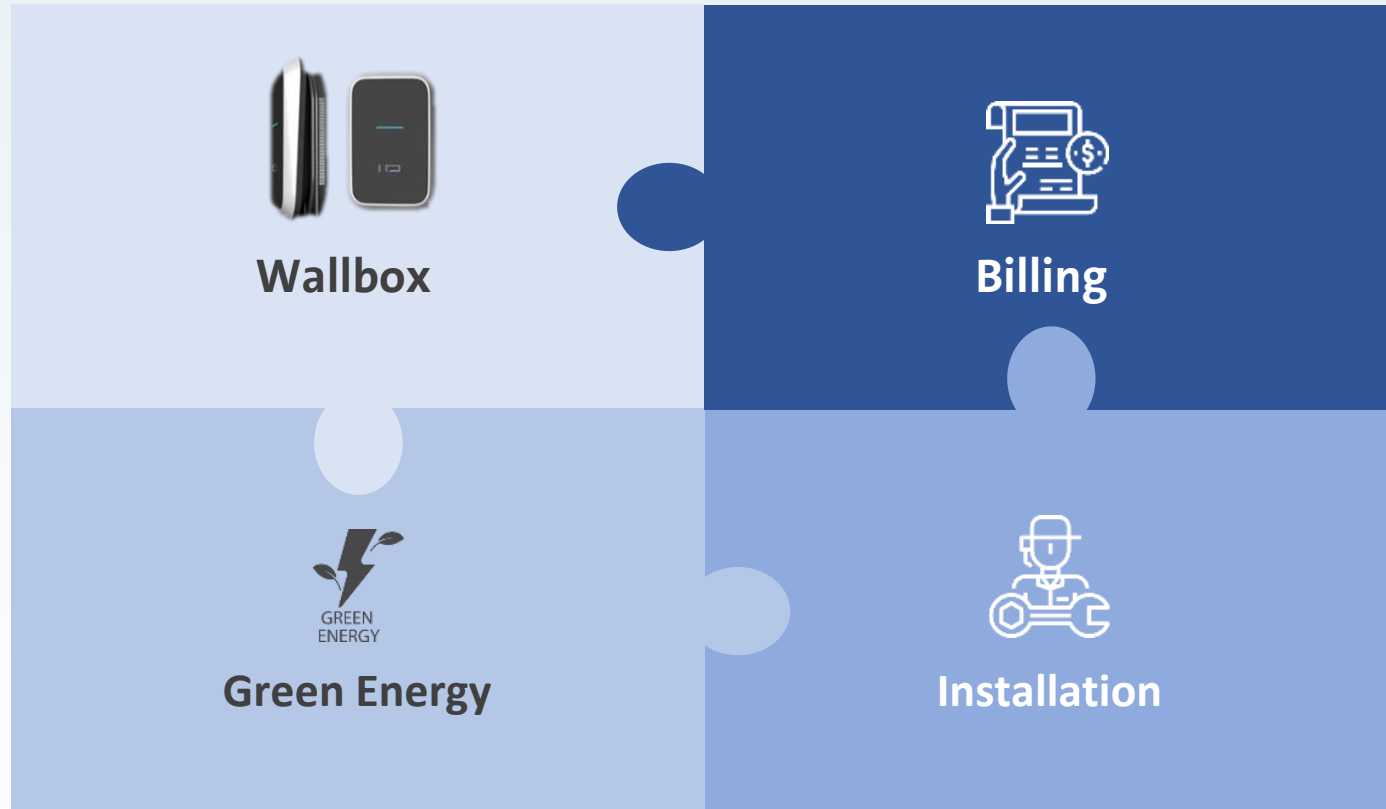
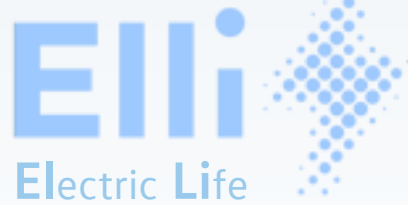
6 Number of loading facilities is **not sufficient**



Volkswagen offers green charging solutions in a digital environment



@Home



6 Number of loading facilities is **not sufficient**



VW Facility Charging | Target State 2025



@Work

Target number of charging points 2025



AC: Alternating Current; DC: Direct Current; AFC: Autonomous flexible Charging column

6 Number of loading facilities is **not sufficient**



150 thousand available charging points in the ID. Core markets (Feb '19)



@Public



1.5

BEVs / charging point



37,000

12,000

6,000

3,000

20,650

4.0

BEVs / charging point

Charging points

Focus Germany

• Current state 2019:

20.650

• Target „Koalitionsvertrag“ 2020:

+ 100.000

• Necessary according to NPE* estimation 2025:

140.000-210.000

19,000

1,900

25,000

5,000

5,00

5,000

4,000

Master plan E-Mobility instead of "finger-pointing"



Source: eafo.eu; * Neue Plattform Elektromobilität: Premise: stock of 2-3 million electric cars; number of charging point outside Germany: rounded



Politics has recognized the importance of charging infrastructure



„I want charging to be possible for whoever and wherever. We have to address this issue.“

Federal Minister of Transport Andreas Scheuer, April 2019



„The state has to accompany the expensive investments of the automotive industry with the expansion of charging infrastructure and fiscal benefits.“

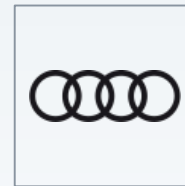
Federal Minister of Finance Olaf Scholz, March 2019

6 Number of loading facilities is **not sufficient**

7 Charging takes **too long**



IONITY is a Joint Venture for the development of a European fast-charging network



350 kW charging capacity

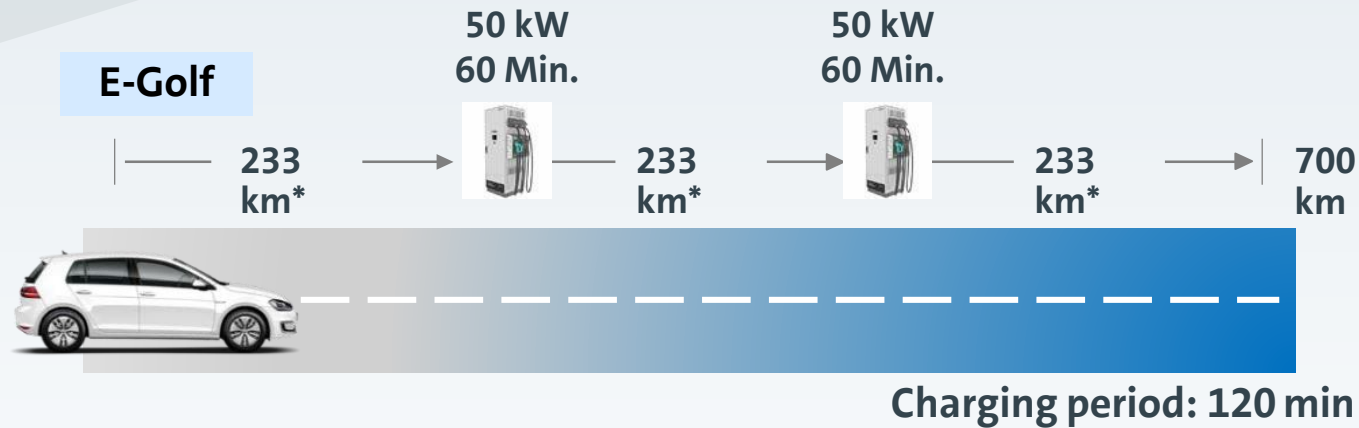
2,400 charging points by 2020 along major traffic arteries in Europe

● In operation ● Planned in 2019 ● Planned in 2020

7 Charging takes **too long**



High Power Charging (HPC) enables long ranges with short charging periods. MEB with up to 125kW charging capacity on premium level

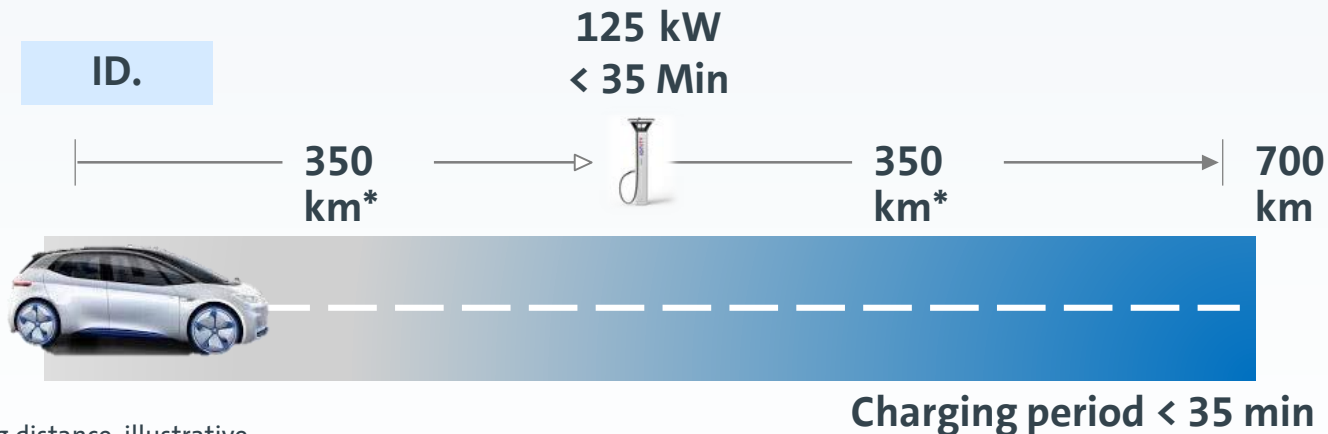


- CCS Standard
- Charging capacity up to 50kW

Charging period at 125 kW charging capacity:



30 Min.



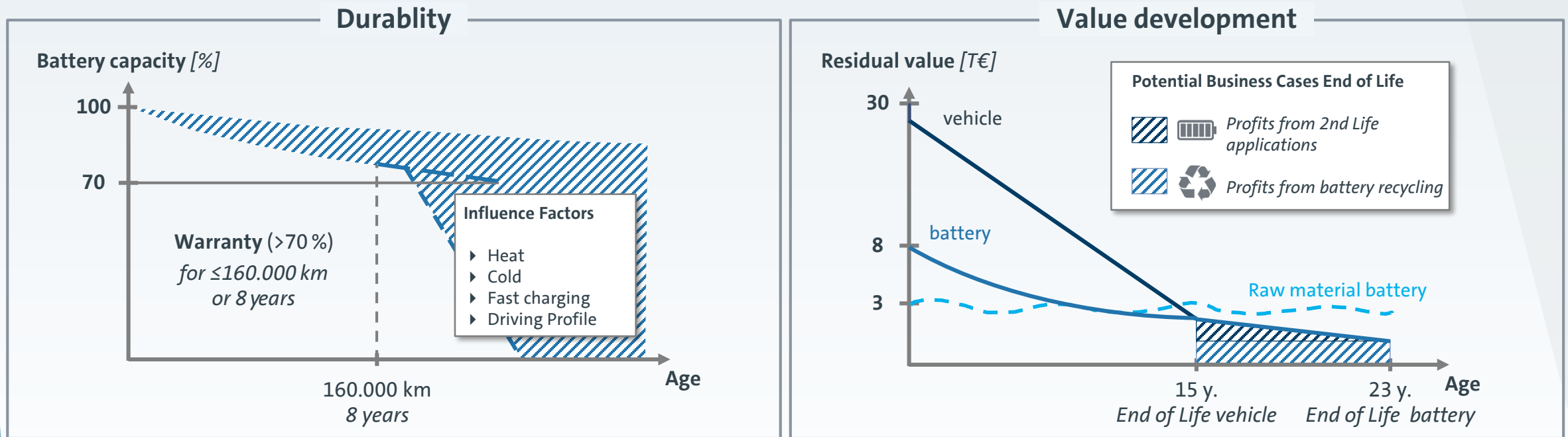
- High Power DC (z. B. Ionity)
- CCS Standard
- MEB charging capacity up to 125kW

* Driving distance illustrative

8 Durability of the battery is short and is then special waste



Volkswagen guarantees a long performance of the battery, the battery offers additional profit pools through 2nd life applications and recycling



- 1) Drive batteries' durability is longer than 1st life lifecycle
- 2) We're aiming to return the batteries at End-of-Use for 2nd use and/or recycling

8 Durability of the battery is short and is then **special waste**



The battery will be used in 2nd life applications outside the car, relevant parts of the value creation process and recycling are in-house

