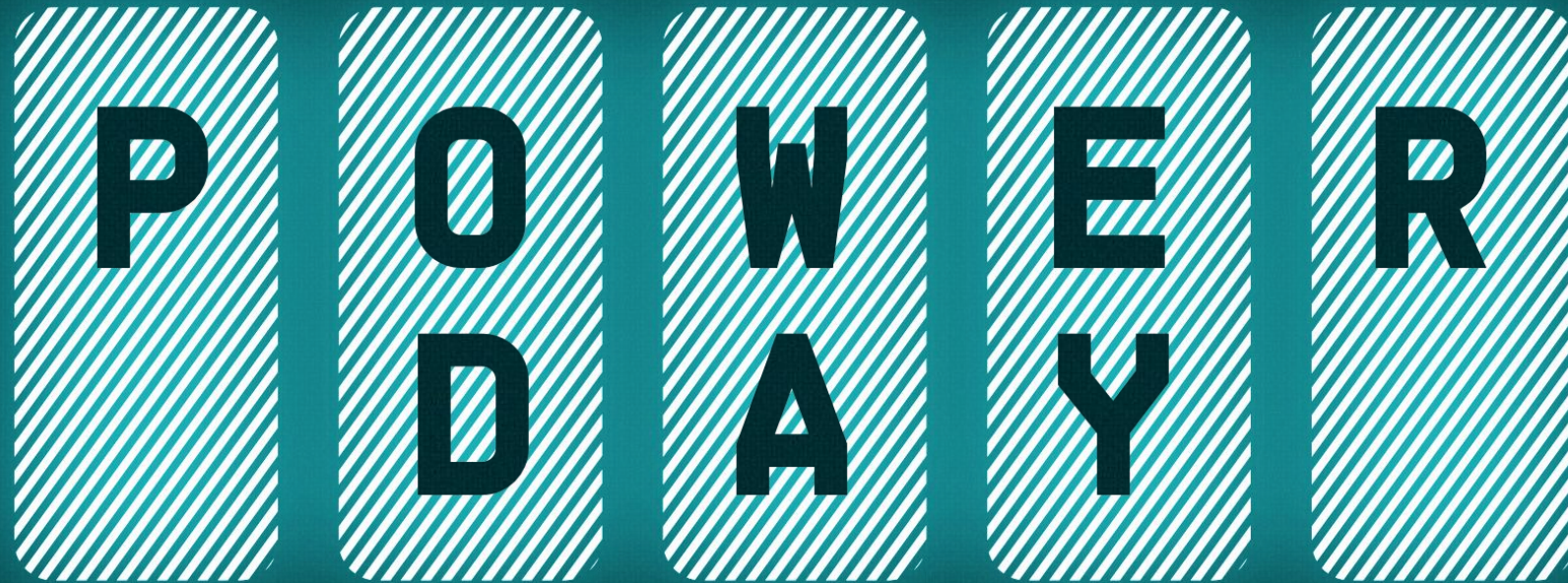


VOLKSWAGEN
AKTIENGESELLSCHAFT



Herbert Diess, CEO of Volkswagen Group

Thomas Schmall, Member of the Board of Management
of Volkswagen Group for Technology

March 15, 2021

Disclaimer

The following presentations as well as remarks/comments and explanations in this context contain forward-looking statements on the business development of the Volkswagen Group. These statements are based on assumptions relating to the development of the economic, political and legal environment in individual countries, economic regions and markets, and in particular for the automotive industry, which we have made on the basis of the information available to us and which we consider to be realistic at the time of going to press. The estimates given entail a degree of risk, and actual developments may differ from those forecast. Any changes in significant parameters relating to our key sales markets, or any significant shifts in exchange rates or commodities relevant to the Volkswagen Group or deviations in the actual effects of the Covid-19 pandemic from the scenario presented will have a corresponding effect on the development of our business. In addition, there may be departures from our expected business development if the assessments of the factors influencing value enhancement and of risks and opportunities presented develop in a way other than we are currently expecting, or if additional risks and opportunities or other factors emerge that affect the development of our business.

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VOLKSWAGEN

AKTIENGESELLSCHAFT

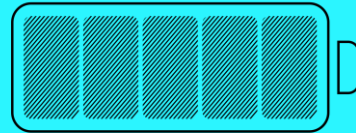


E-Mobility

VOLKSWAGEN
AKTIENGESELLSCHAFT



E-Mobility

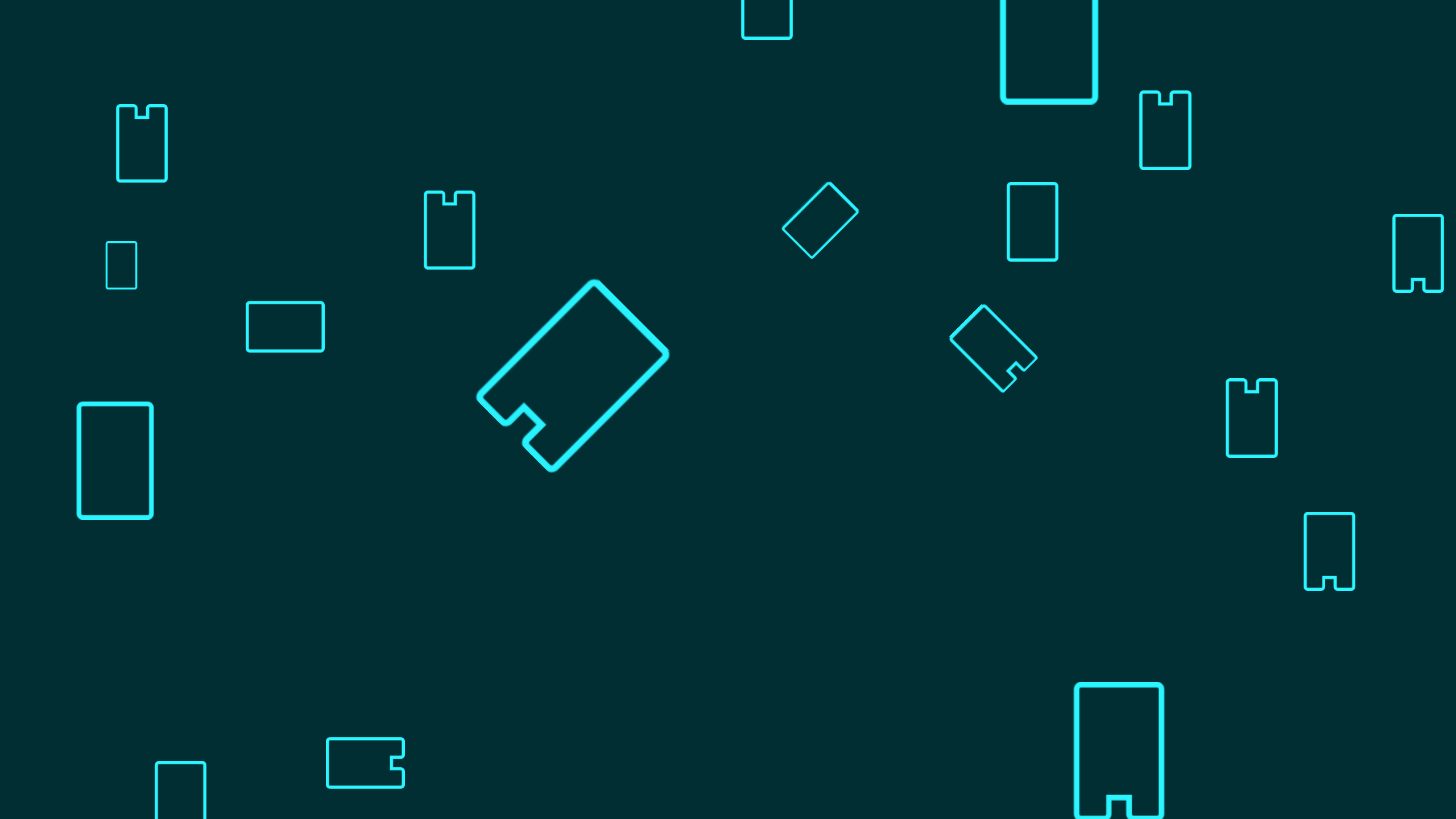


Power

Battery / Charging / Energy Management



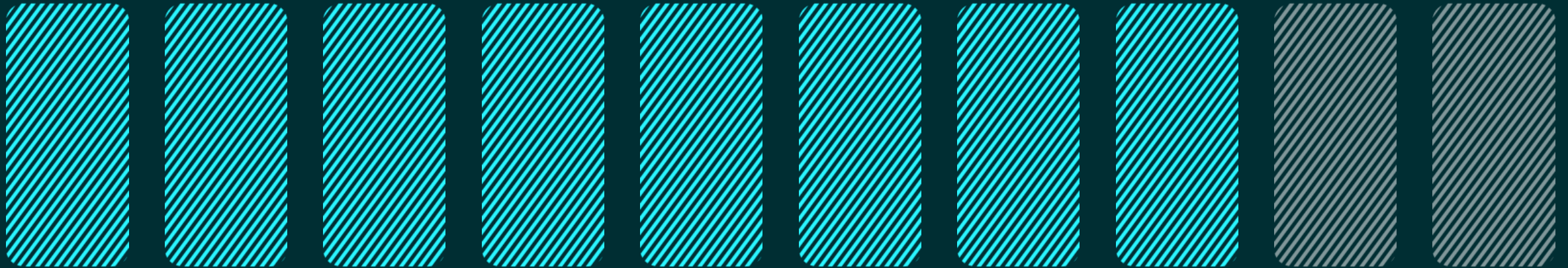
BATTERY



**Unified
Cell**

2023

2030



Unified Cell

80%

SPECIAL
CASES

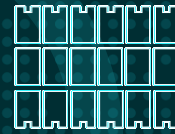


Battery costs

-50%

in entry segment

Battery cell



Battery systems

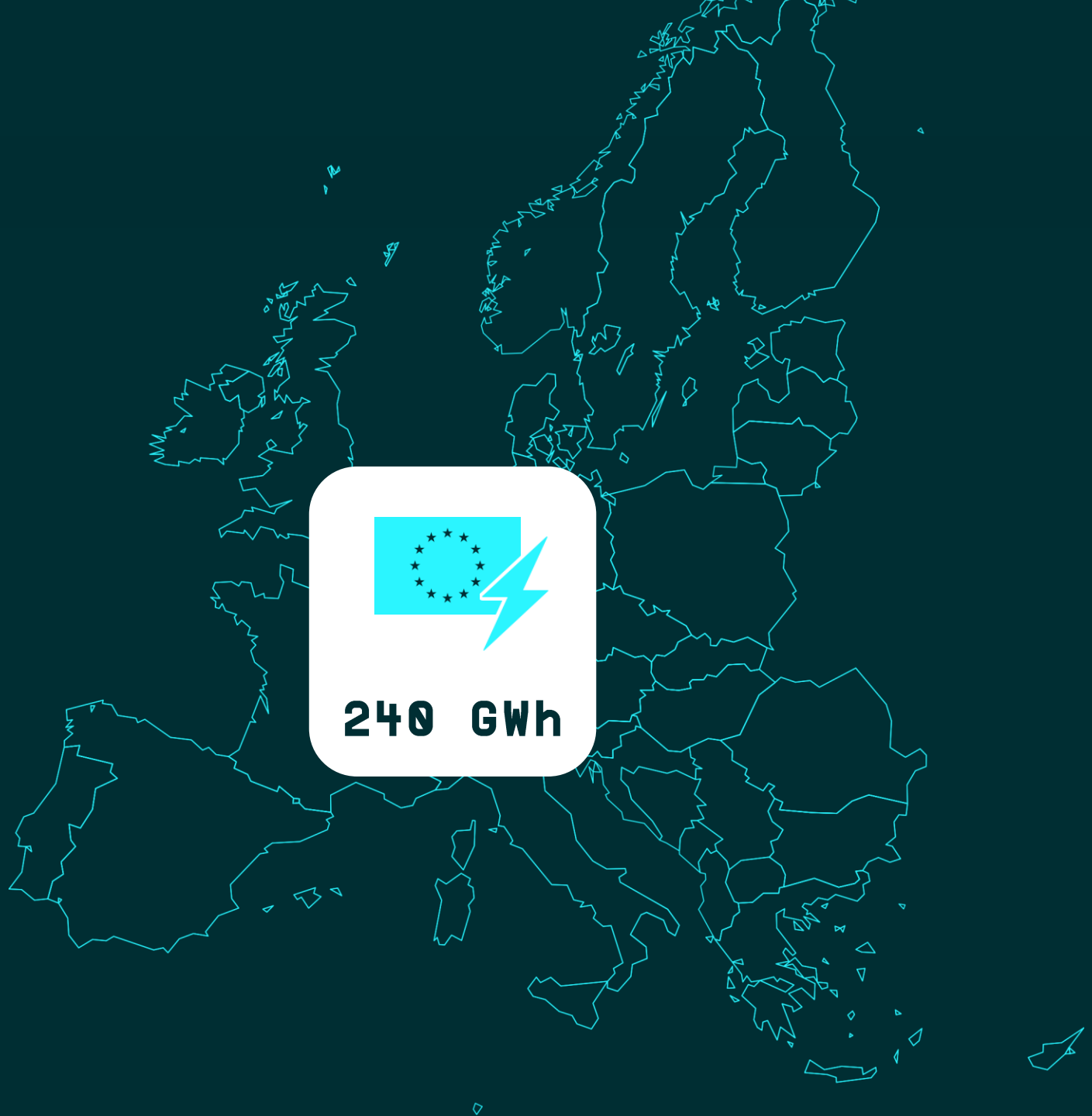
Recycling



Second Use



First Use



240 GWh

A white rounded square box containing a blue icon of the European Union flag (a circle of twelve stars) and a blue lightning bolt. Below the icon, the text "240 GWh" is written in a bold, black, sans-serif font.



40 GWh



40 GWh



40 GWh



40 GWh



40 GWh



40 GWh

CHARGING

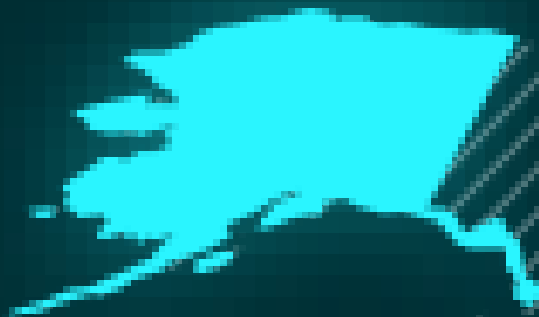




High Power Charging
GLOBAL NETWORK



EUROPE



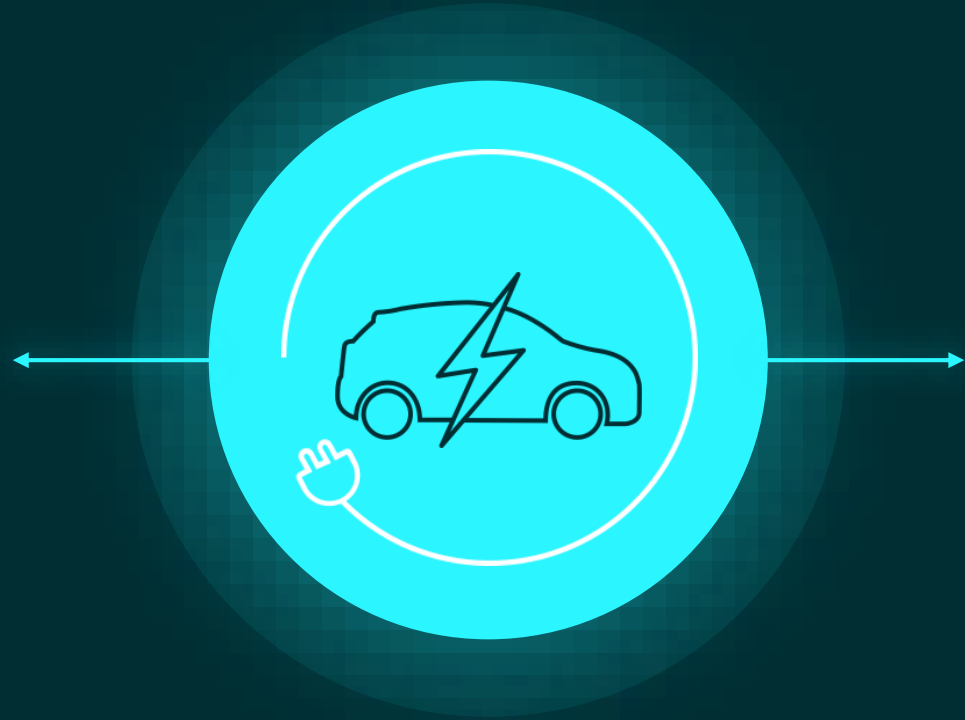
USA



CHINA

**ENERGY
MANAGEMENT**





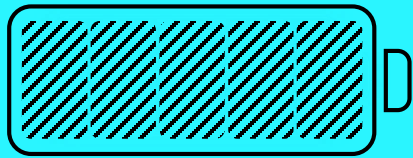
Power as Core Competence



NEW TECHNOLOGY DIVISION:

**WE ARE THE
POWERHOUSE OF
VOLKSWAGEN**

TWO MAIN PILLARS



**BATTERY CELL
& SYSTEM**



**CHARGING &
ENERGY**

FIRST CHALLENGE: SCALE VOLUME TO HUGE SPREAD OF PRODUCT PORTFOLIO



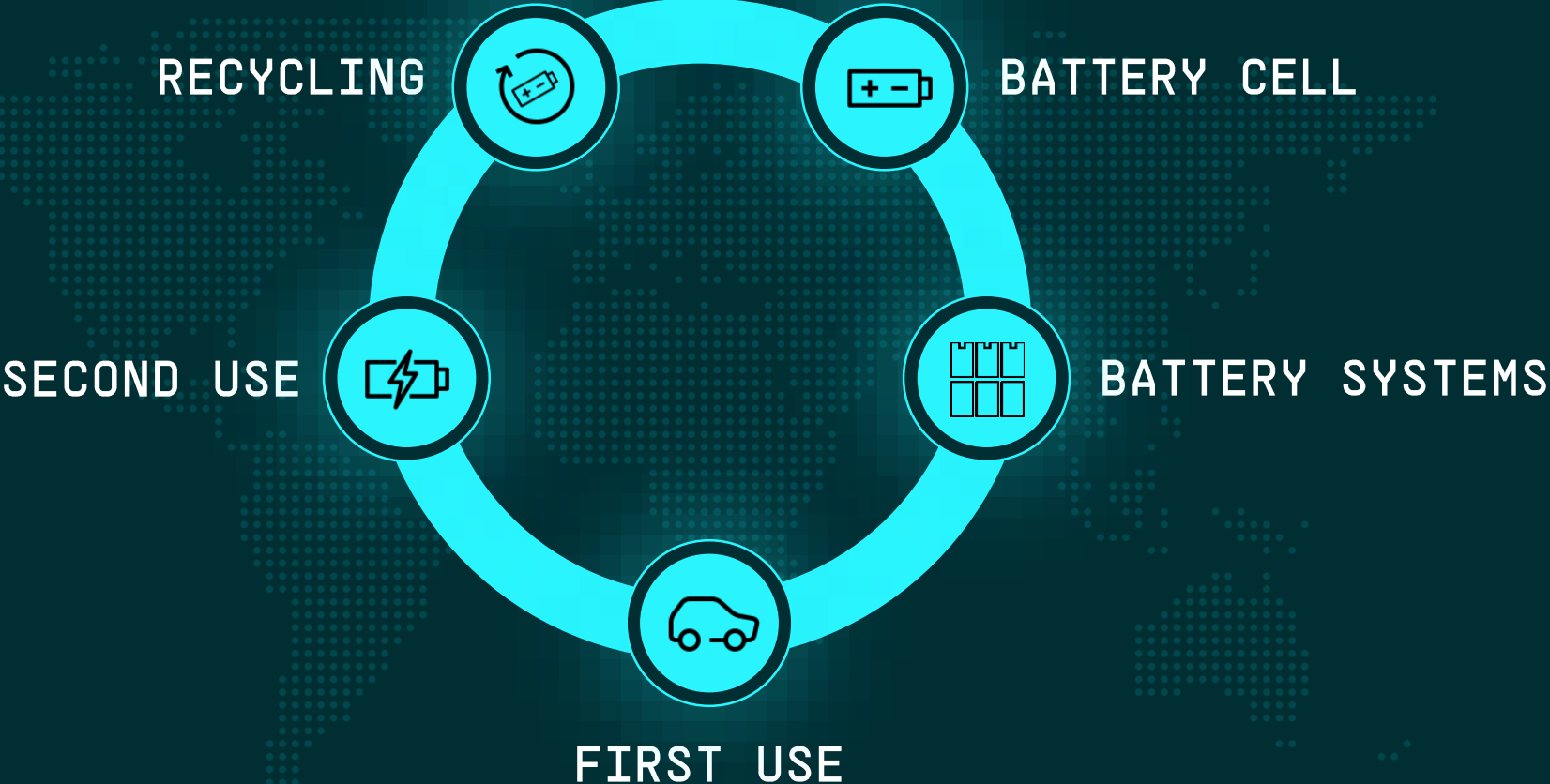
IF YOU HAVE THE VOLUME...
THE NEXT CHALLENGE WILL BE

TECHNOLOGY,
TIMING
AND **PRICE!**

**THERE IS
NEED FOR SPEED!**

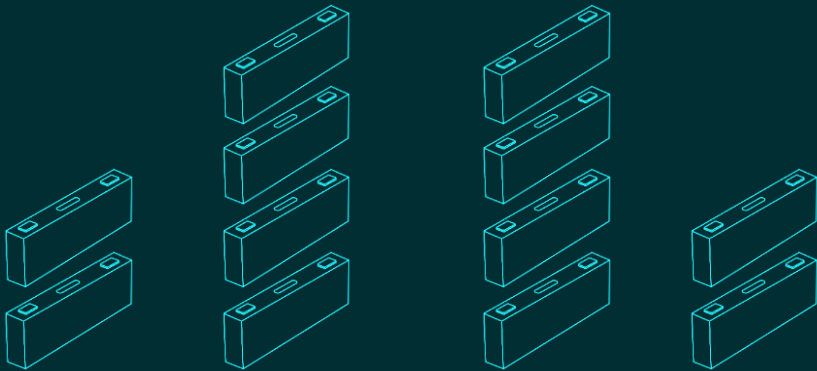
MINDSET CHANGE IN FUNCTIONAL RESPONSIBILITIES

CLOSED LOOP APPROACH

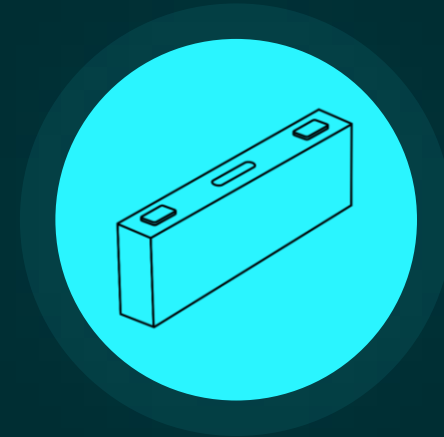


AND A FUNDAMENTAL MINDSET CHANGE IN **TECHNOLOGY SETUP**

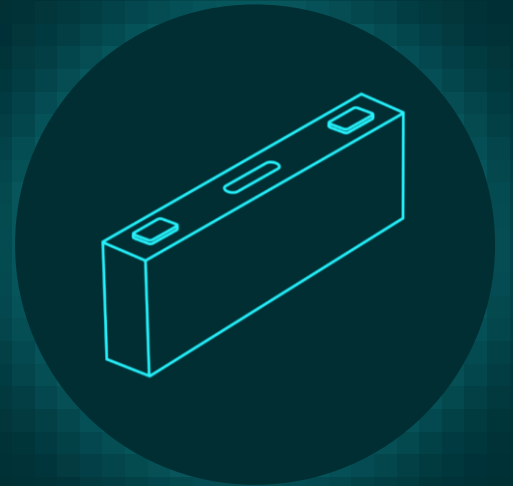
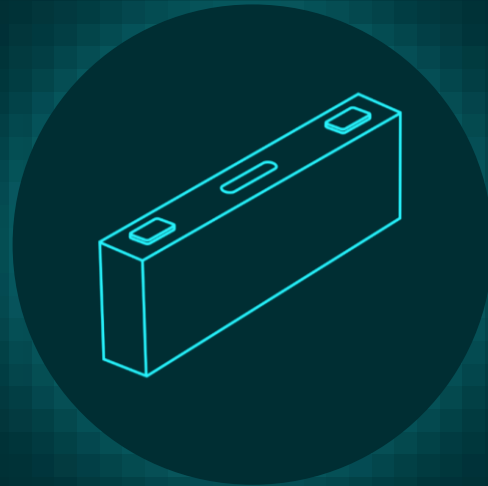
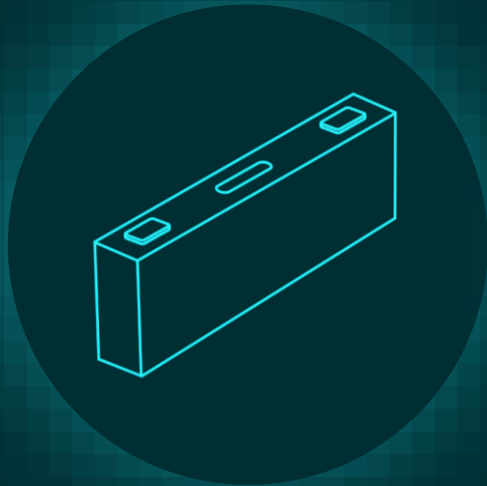
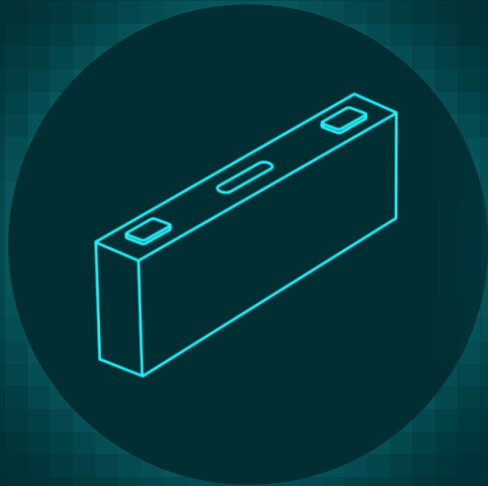
CURRENT APPROACH



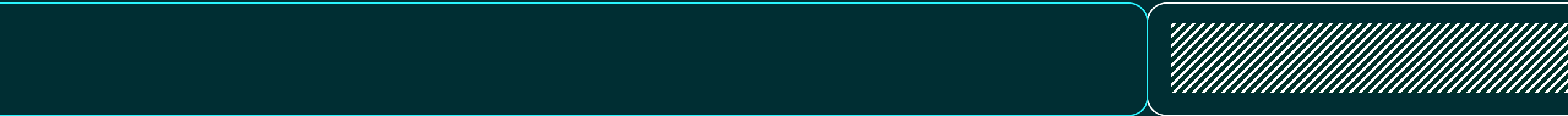
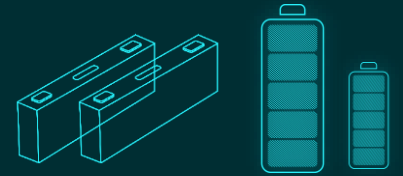
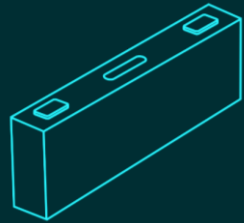
UNIFIED CELL



THE INTELLIGENCE OF THE BATTERY CELL
IS INSIDE



ACTUAL PRODUCT PORTFOLIO SHOWS POSSIBLE
UNIFIED CELL UTILIZATION OF 80%

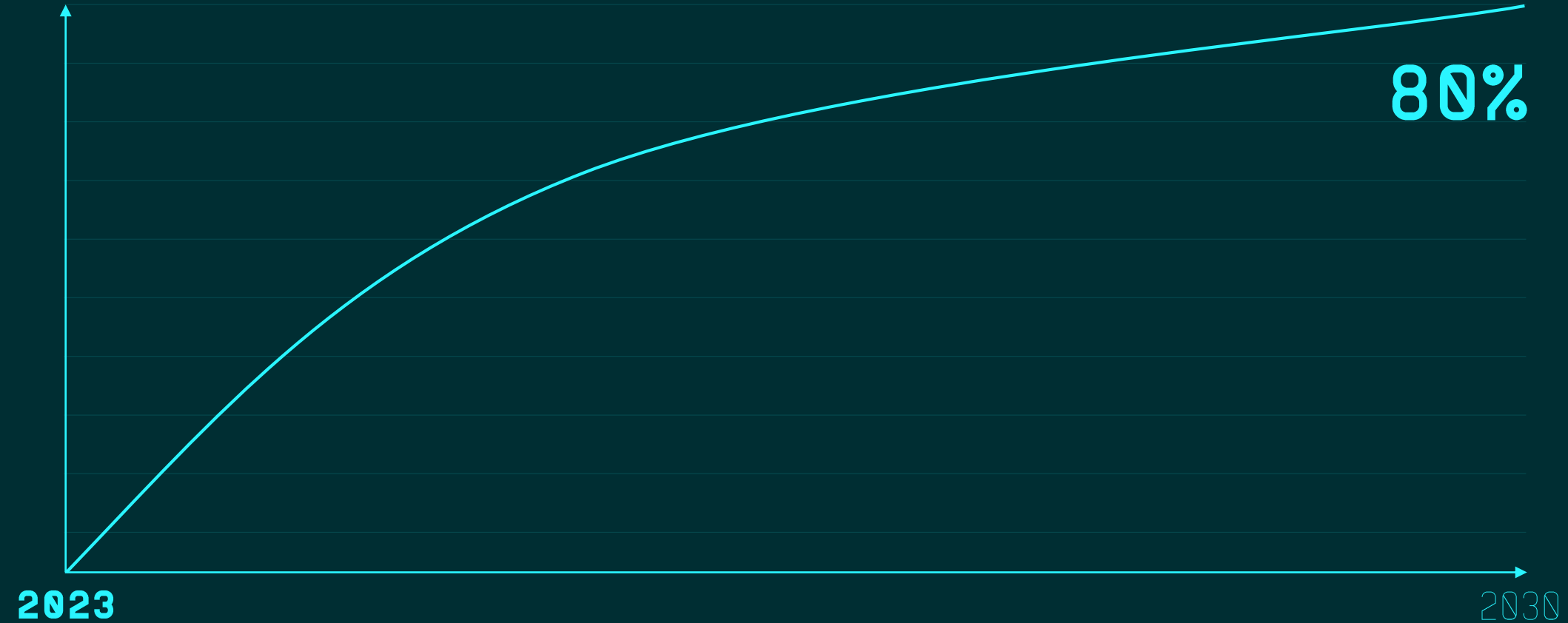


80%
Volume

20%
Specific Solutions

ROLLOUT UNIFIED CELL CONCEPT
STARTS 2023

START



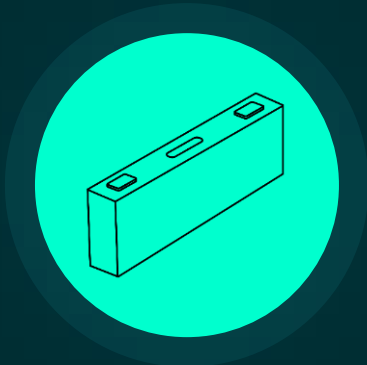
REACHING COST TARGETS

WITH UNIFIED CELL CONCEPT

ENTRY

COST: -50%

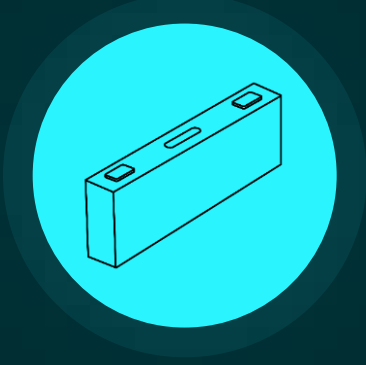
Inexpensive
Chemistry



VOLUME

COST: -30%

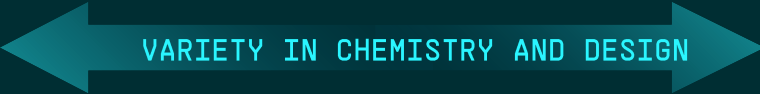
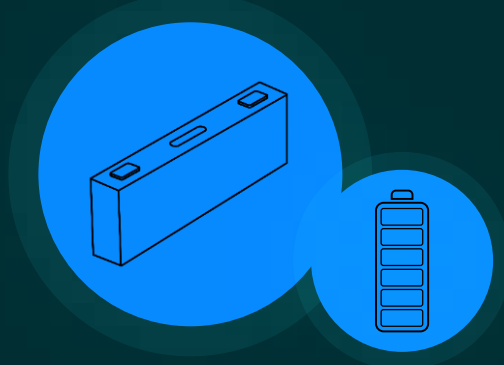
Mainstream
Chemistry



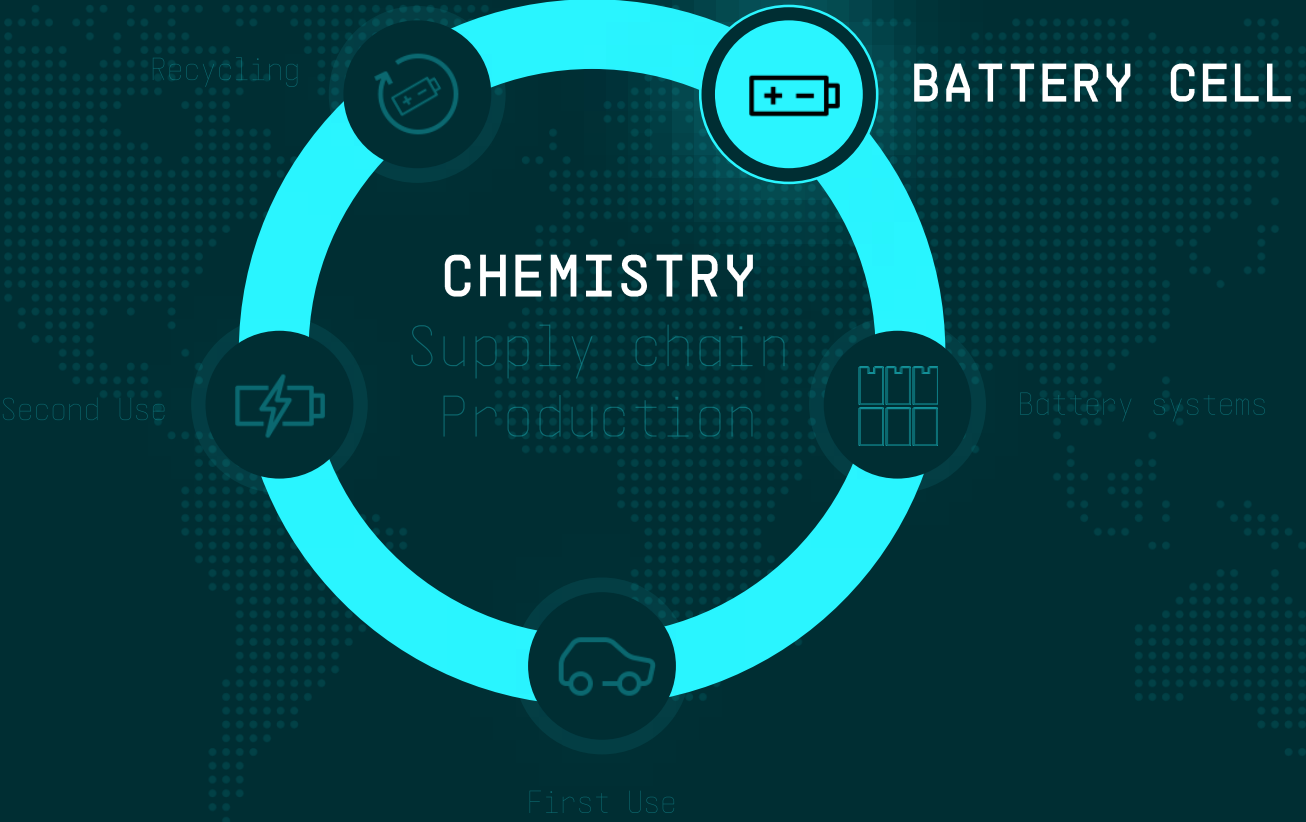
SPECIFIC SOLUTIONS

COST: +xx%

High end chemistry for
high performance



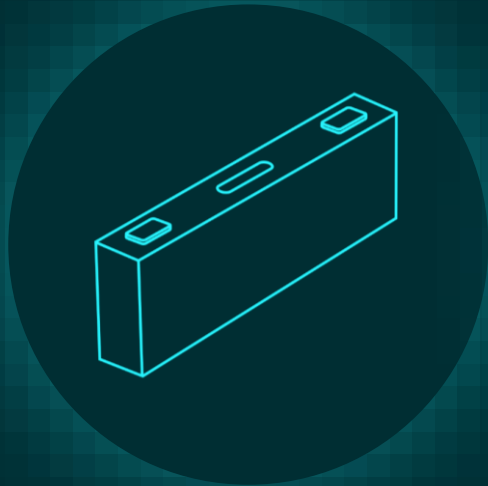
CLOSED LOOP APPROACH



THE INTELLIGENCE OF THE BATTERY CELL
IS INSIDE

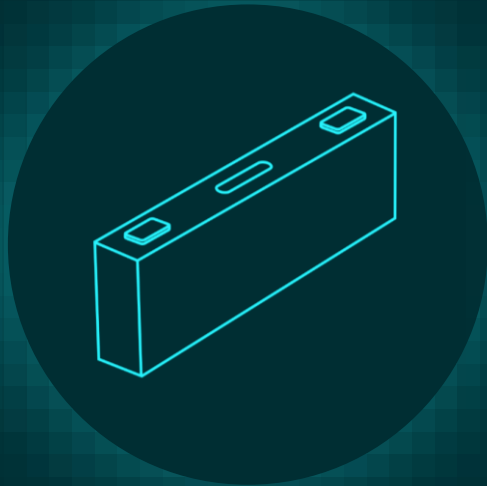
ENTRY

IRON PHOSPHATE



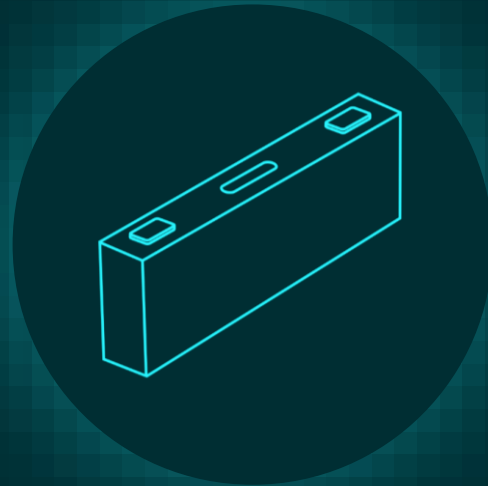
VOLUME

HIGH MANGANESE

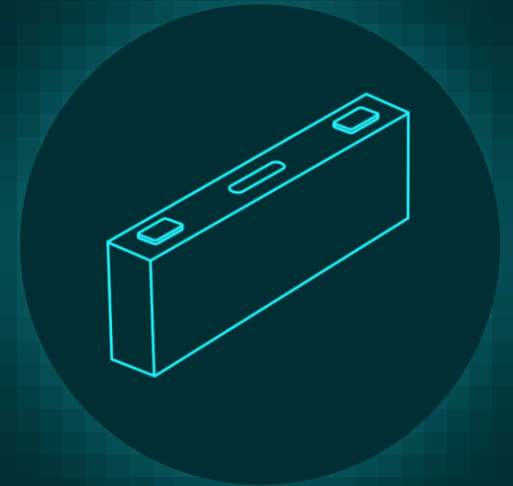


SPECIFIC SOLUTIONS

NICKEL MANGANESE COBALT

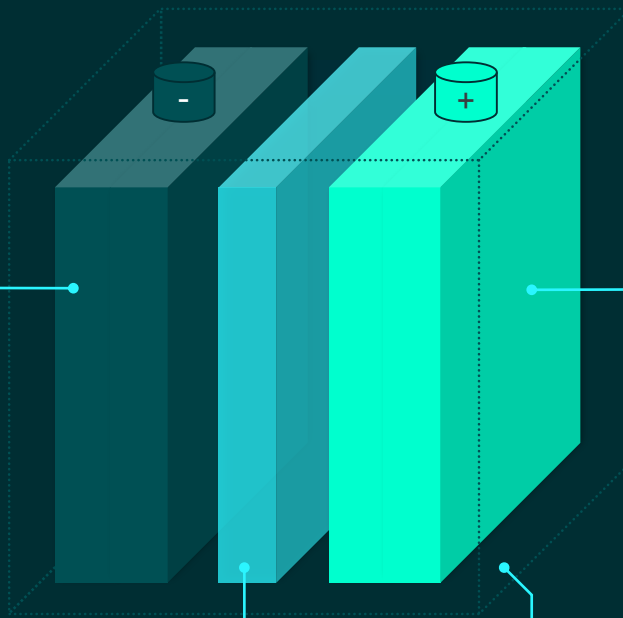


SOLID STATE



MOST IMPORTANT CONTROL LEVERS FOR BATTERY FUTURE COMPETITIVENESS

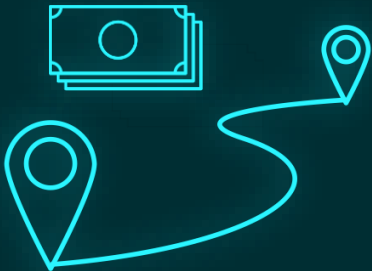
ANODE
CHARGING TIME



SEPARATOR

ELECTROLYTE

CATHODE
COSTS AND RANGE





CATHODE

CONTROL LEVER FOR
SUSTAINABLE SUPPLY CHAIN,
COSTS AND RANGE

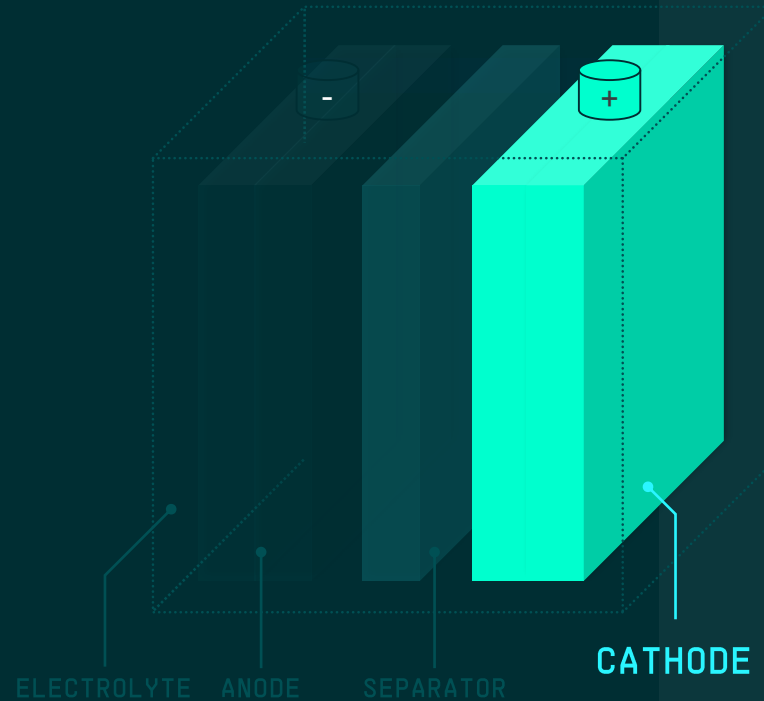
CATHODE

CONTROL LEVER FOR SUSTAINABLE
SUPPLY CHAIN, COSTS AND VEHICLE RANGE

STATE OF THE ART – NMC-CELL

CATHODE

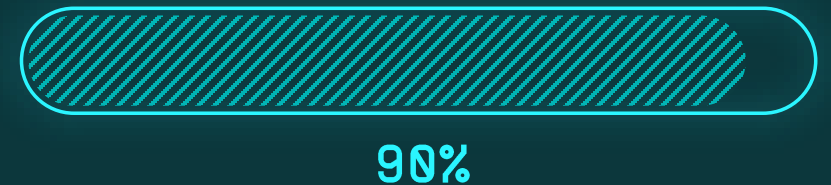
- Nickel
- Manganese
- Cobalt



CATHODE CELL COST SHARE



CATHODE RANGE IMPACT



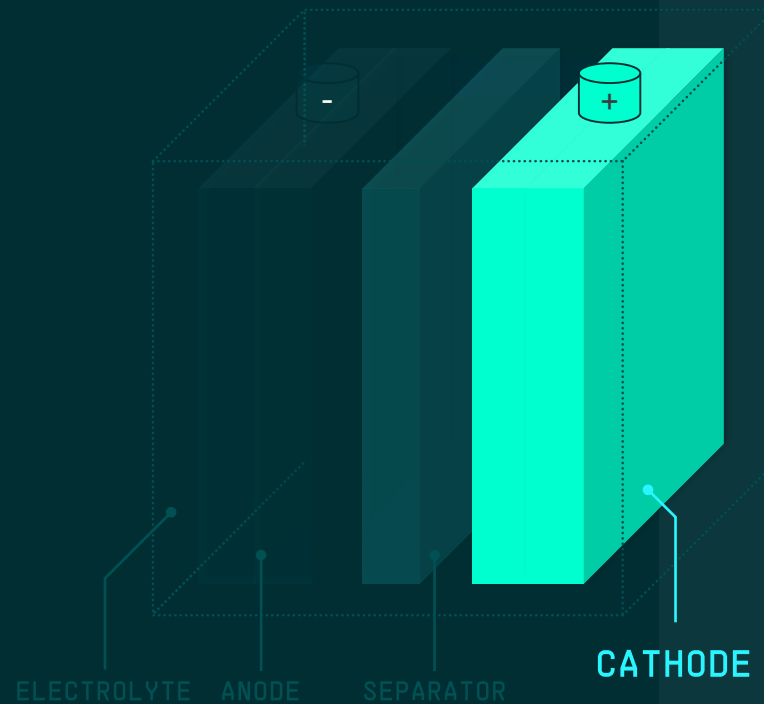
CATHODE

ROBUST AND INEXPENSIVE CHEMISTRY FOR ENTRY VEHICLES

LFP-CELL

CATHODE

- Iron-Phosphate
- Nickel
- Manganese
- Cobalt



COSTS



RANGE



CATHODE

FUTURE BEST COST TO VALUE FOR MAINSTREAM CHEMISTRY

HI-MN-CELL

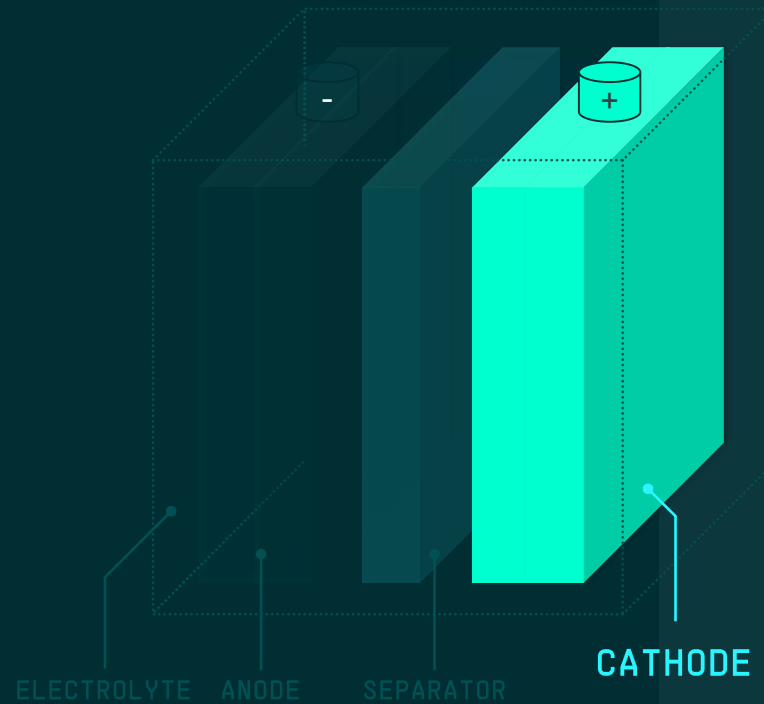
CATHODE

- Nickel



- Manganese

- Cobalt



COSTS



RANGE





ANODE

CONTROL LEVER FOR
CHARGING PERFORMANCE

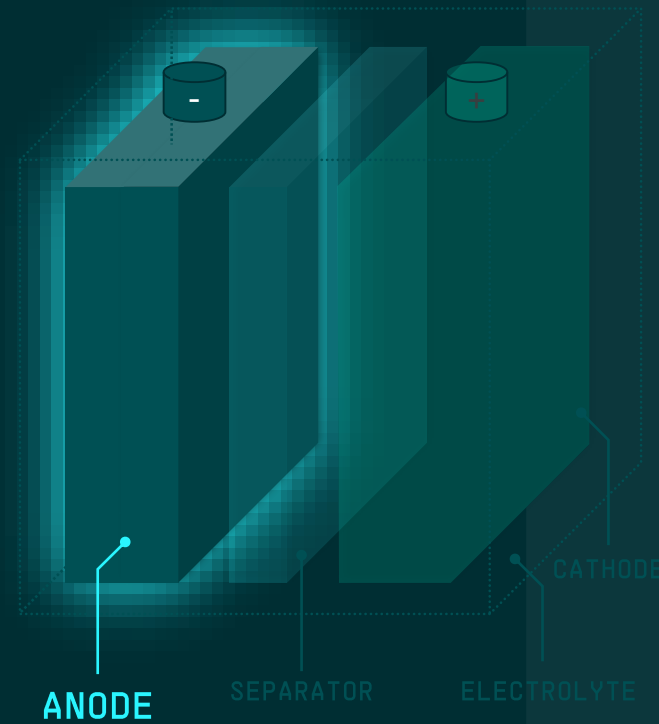
ANODE

CONTROL LEVER FOR CHARGING PERFORMANCE

STATE OF THE ART – GRAPHITE

ANODE

- Synthetic graphite

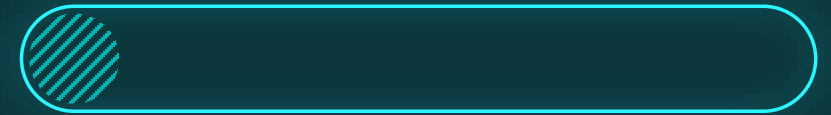


ANODE CHARGE TIME IMPACT



100%

ANODE RANGE IMPACT



10%

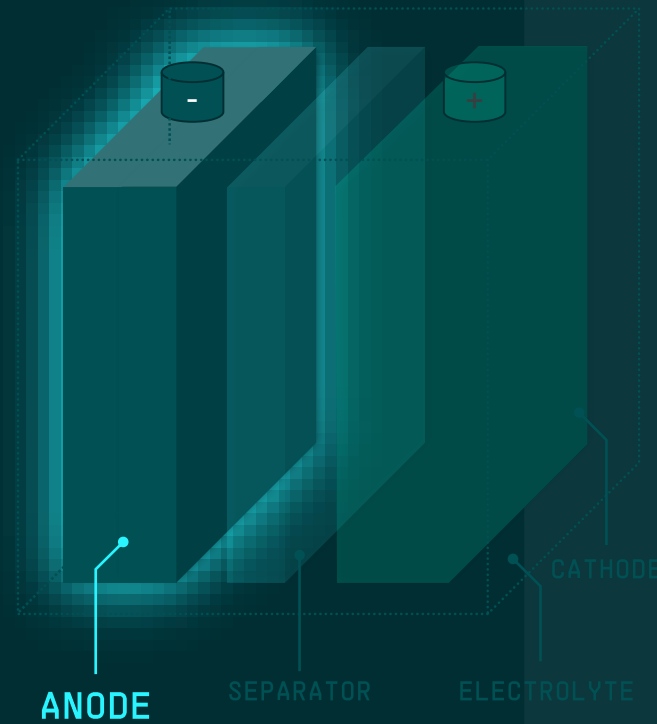
ANODE

SILICON ANODE SIGNIFICANTLY REDUCES CHARGING TIME AND IMPROVES RANGE

HI-SI-CELL

ANODE

- Synthetic graphite
- Silicon



CHARGING TIME



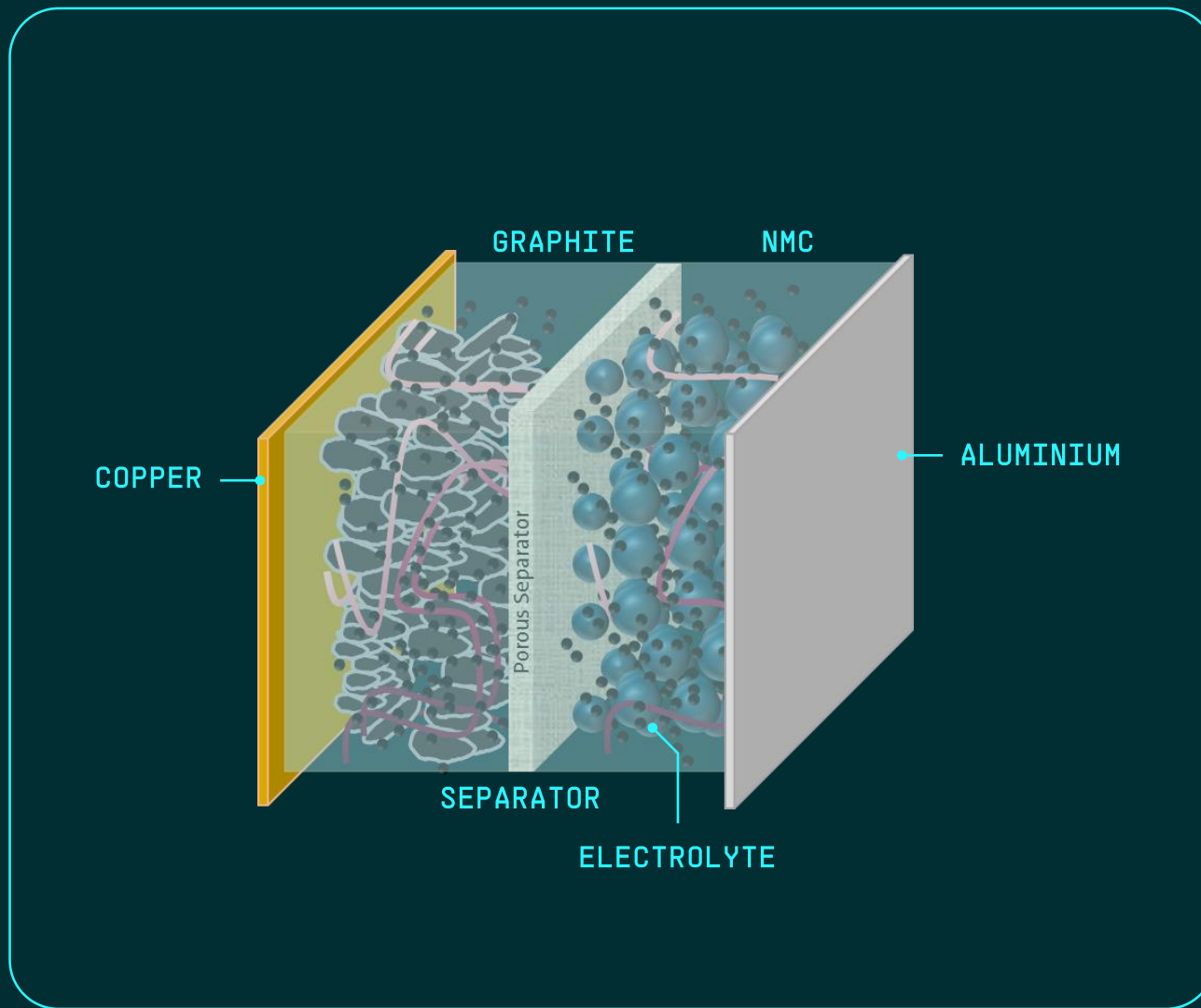
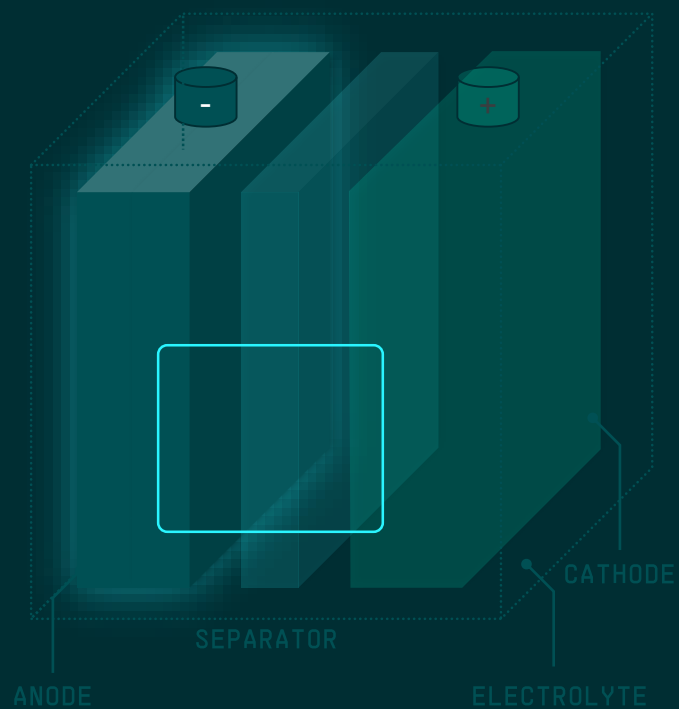
RANGE



● SOLID STATE

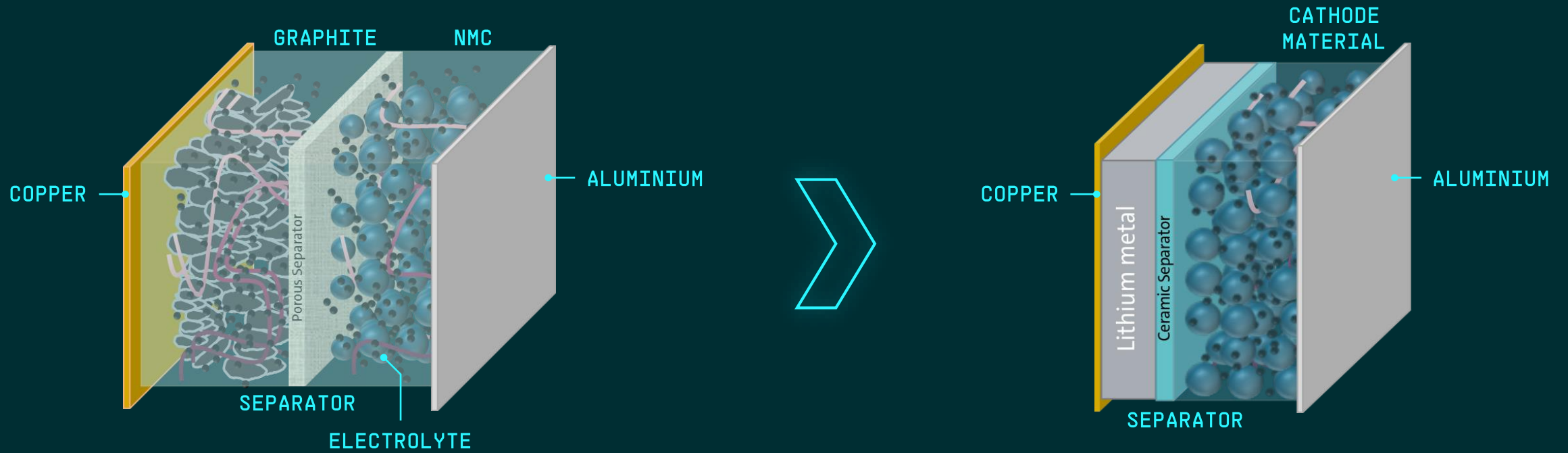
SIMPLER DESIGN LEADS TO HIGHER
PERFORMANCE AND LOWER COSTS

STATE OF THE ART BATTERY CELL IN DETAIL



SOLID STATE BATTERY CELL

SIMPLER DESIGN LEADS TO HIGHER PERFORMANCE



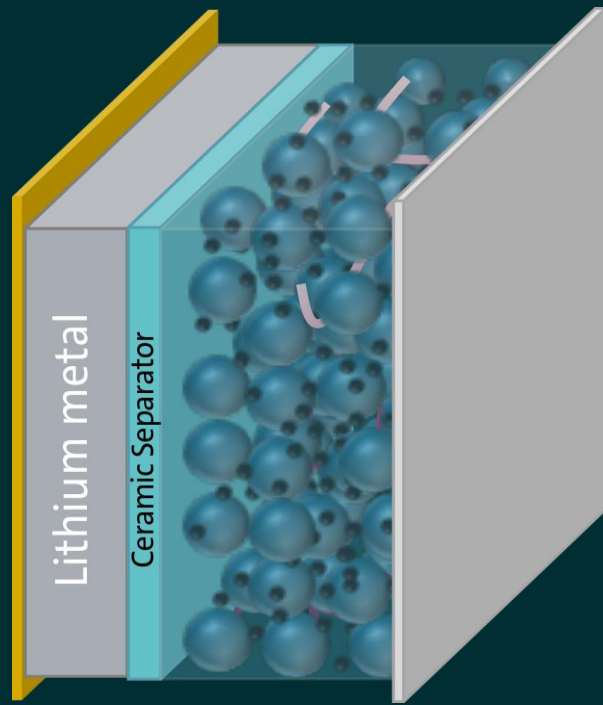
STATE OF THE ART

SOLID STATE

SOLID STATE BATTERY CELL

BEST IN CLASS CHARGING TIME AND INCREASED RANGE

SOLID STATE BATTERY



CHARGING TIME



RANGE



ULTRA FAST CHARGING WILL IMPROVE

EV LONG DISTANCE CAPABILITY

VOLKSWAGEN ID.4 PRO

[77 kWh]



DISTANCE



450 km / 280 mi

CHARGING TIME



today ~ 25 min

until 2025 ~ 17 min

after 2025 ~ 12 min

LOS ANGELES



435 km
270 mi

LAS VEGAS

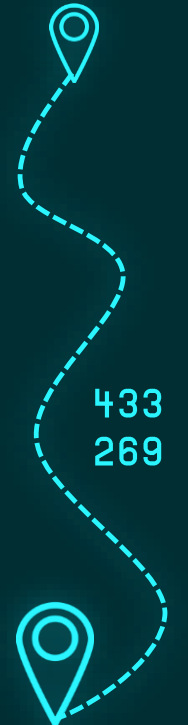
LEIPZIG



430 km
267 mi

MUNICH

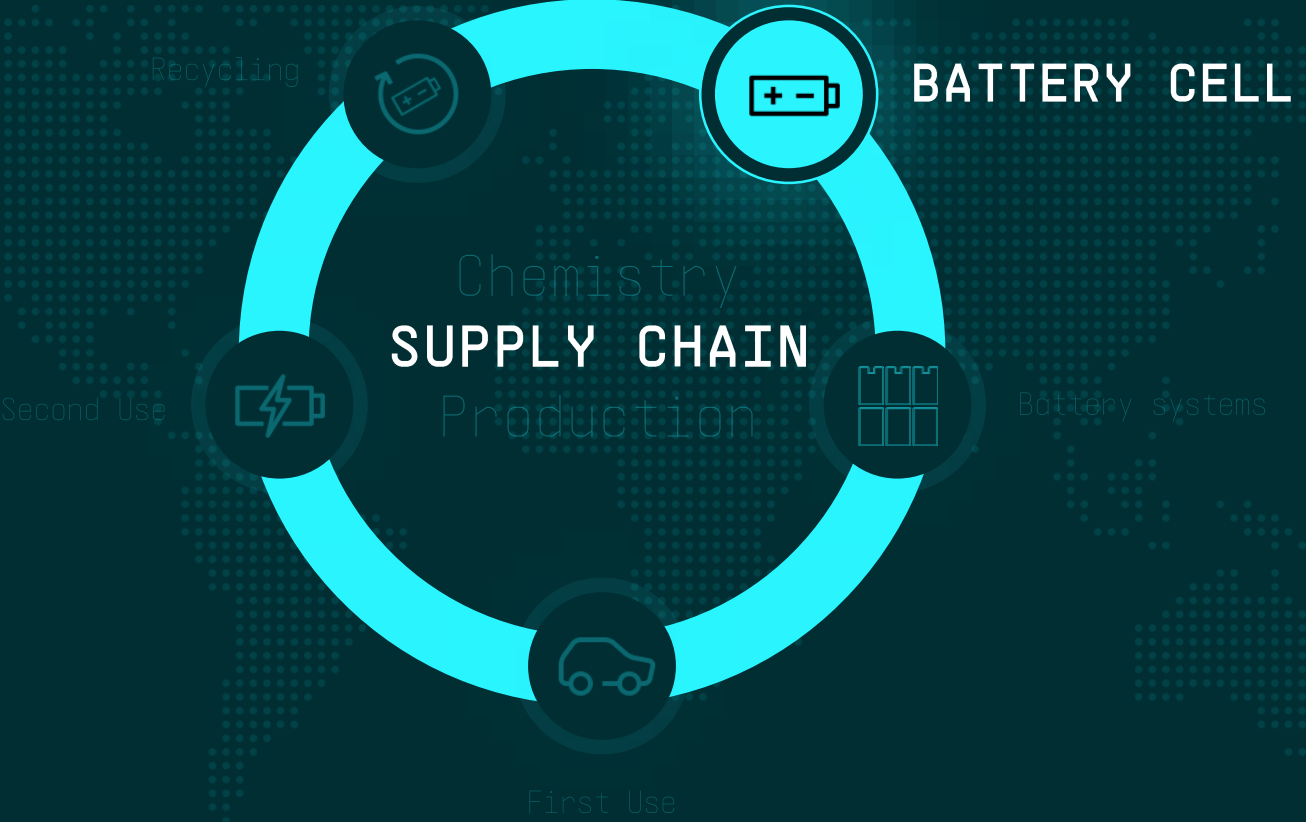
BEIJING



433 km
269 mi

DONGYING

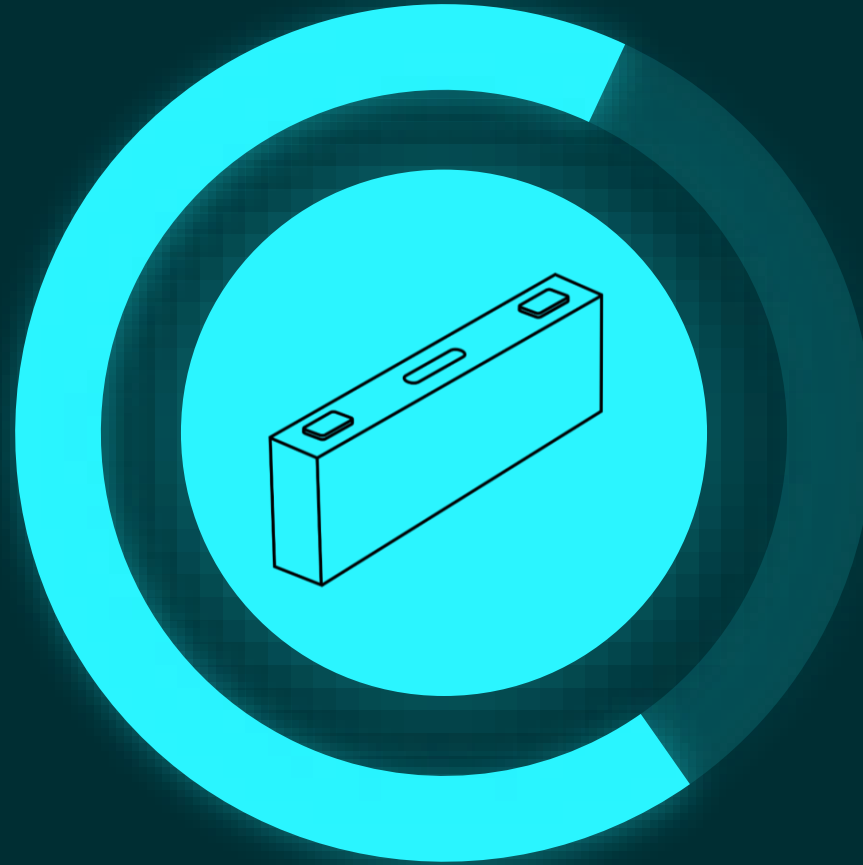
CLOSED LOOP APPROACH



COST-SPREAD BATTERY SYSTEM

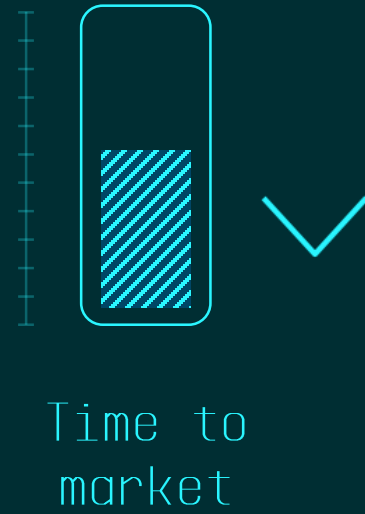
2 / 3

CHEMISTRY

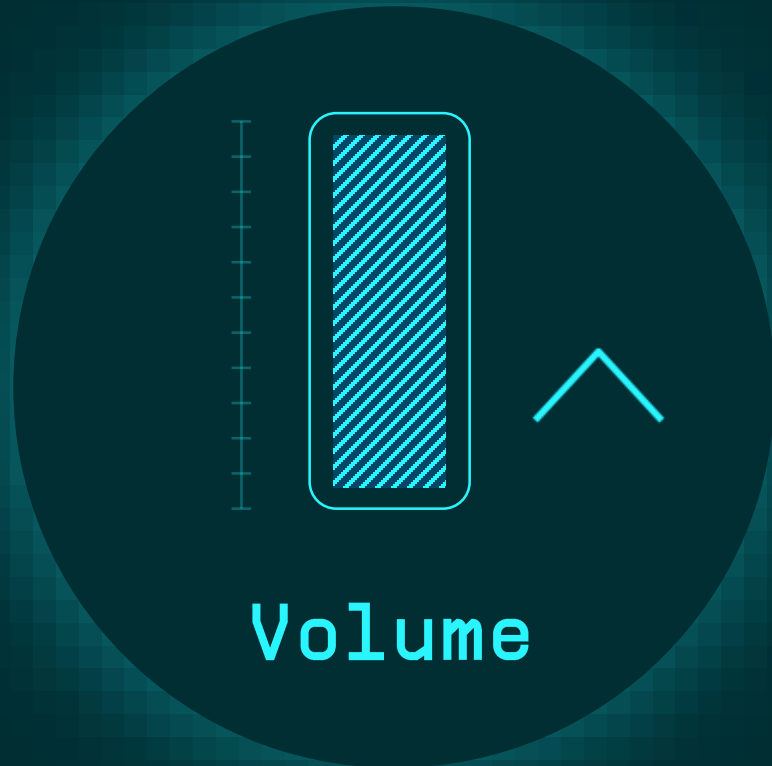


1 / 3

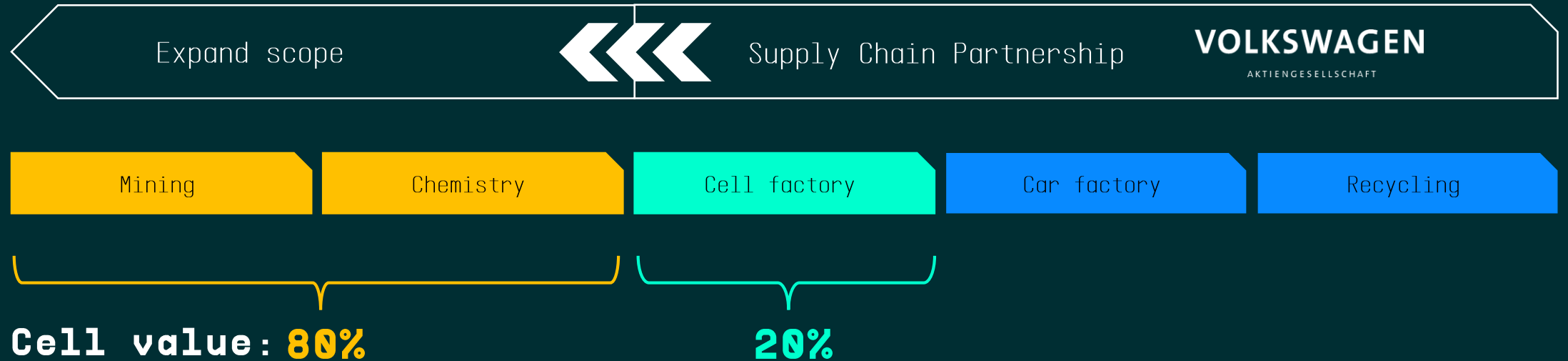
MAIN OBJECTIVE FOR BEV RAMP UP



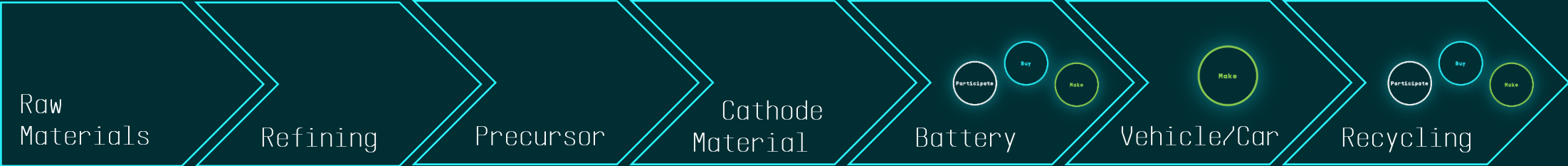
MAIN OBJECTIVE FOR BEV RAMP UP



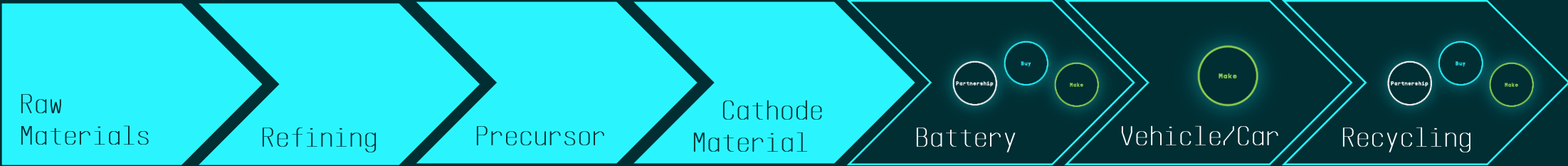
VOLKSWAGEN EXPANDS SCOPE ALONG VALUE CHAIN



THE RIGHT BALANCE



THE RIGHT BALANCE

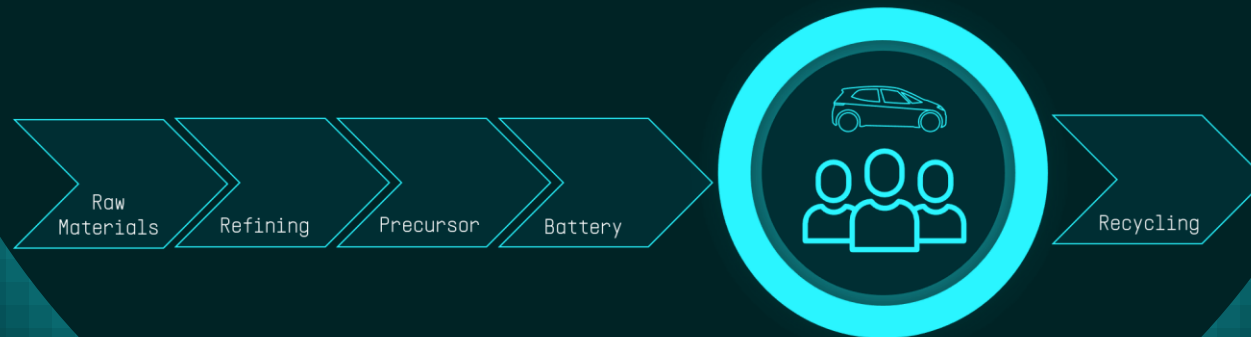


Vertical Integration

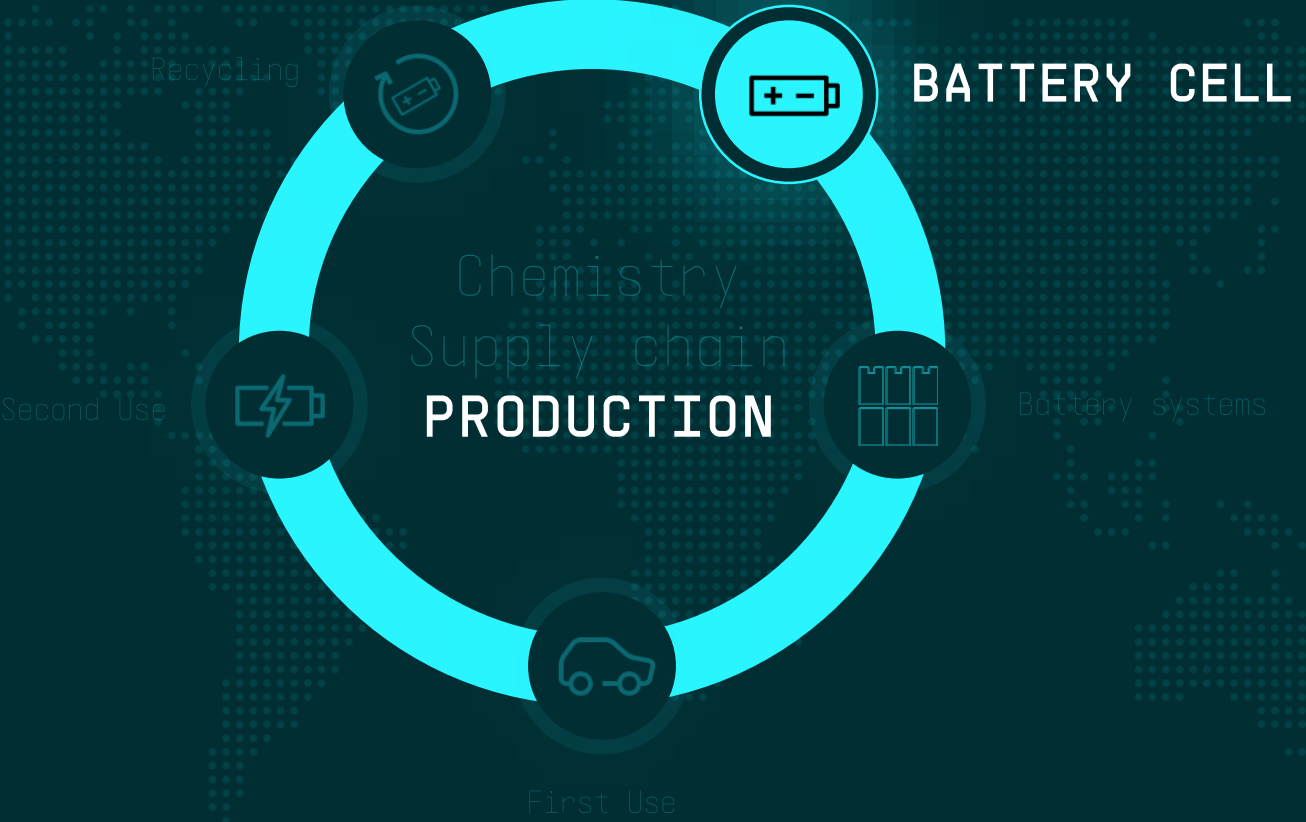
CUSTOMER DEMANDS



NEW STRONG PARTNERSHIPS –
KEY TO FUTURE SUCCESS!

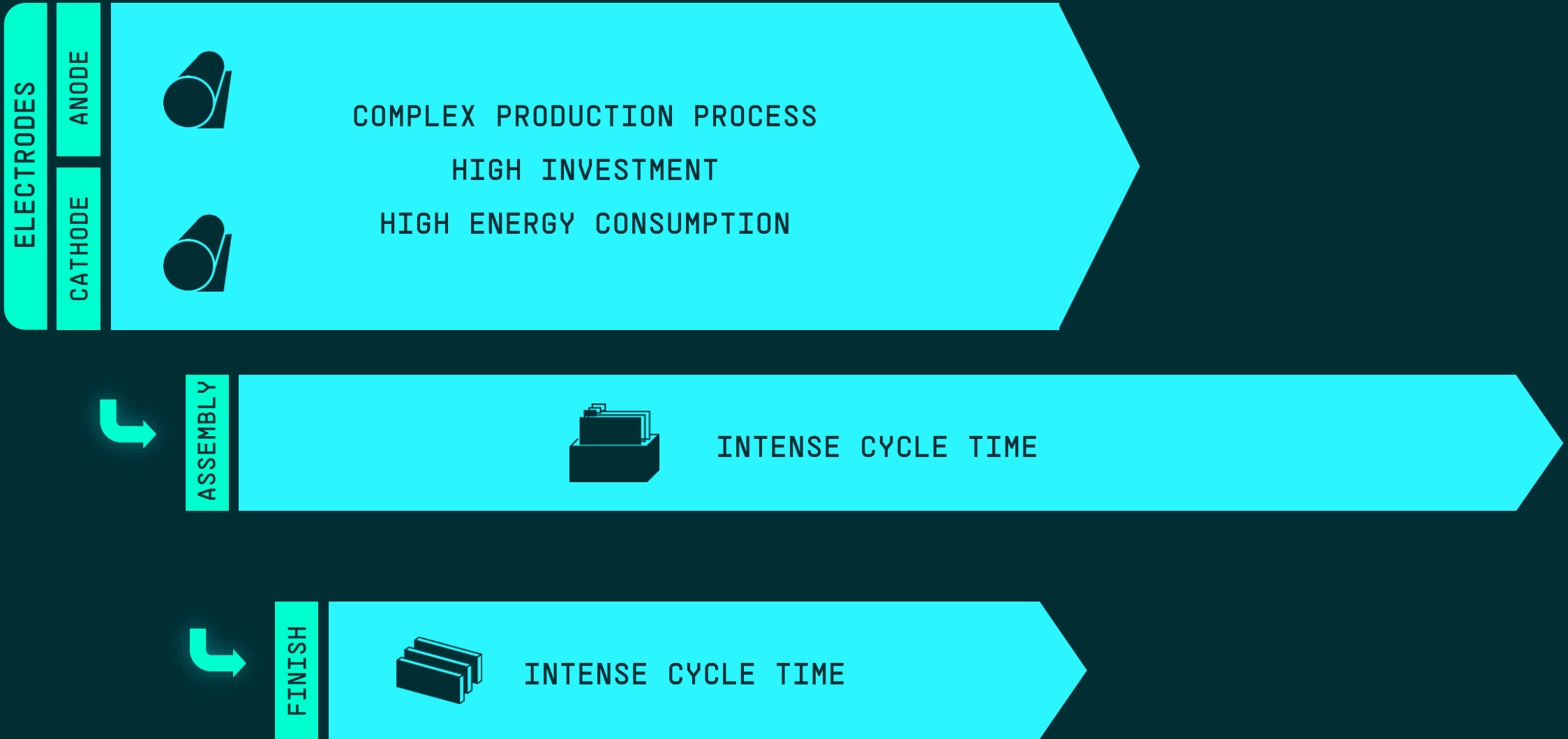


CLOSED LOOP APPROACH

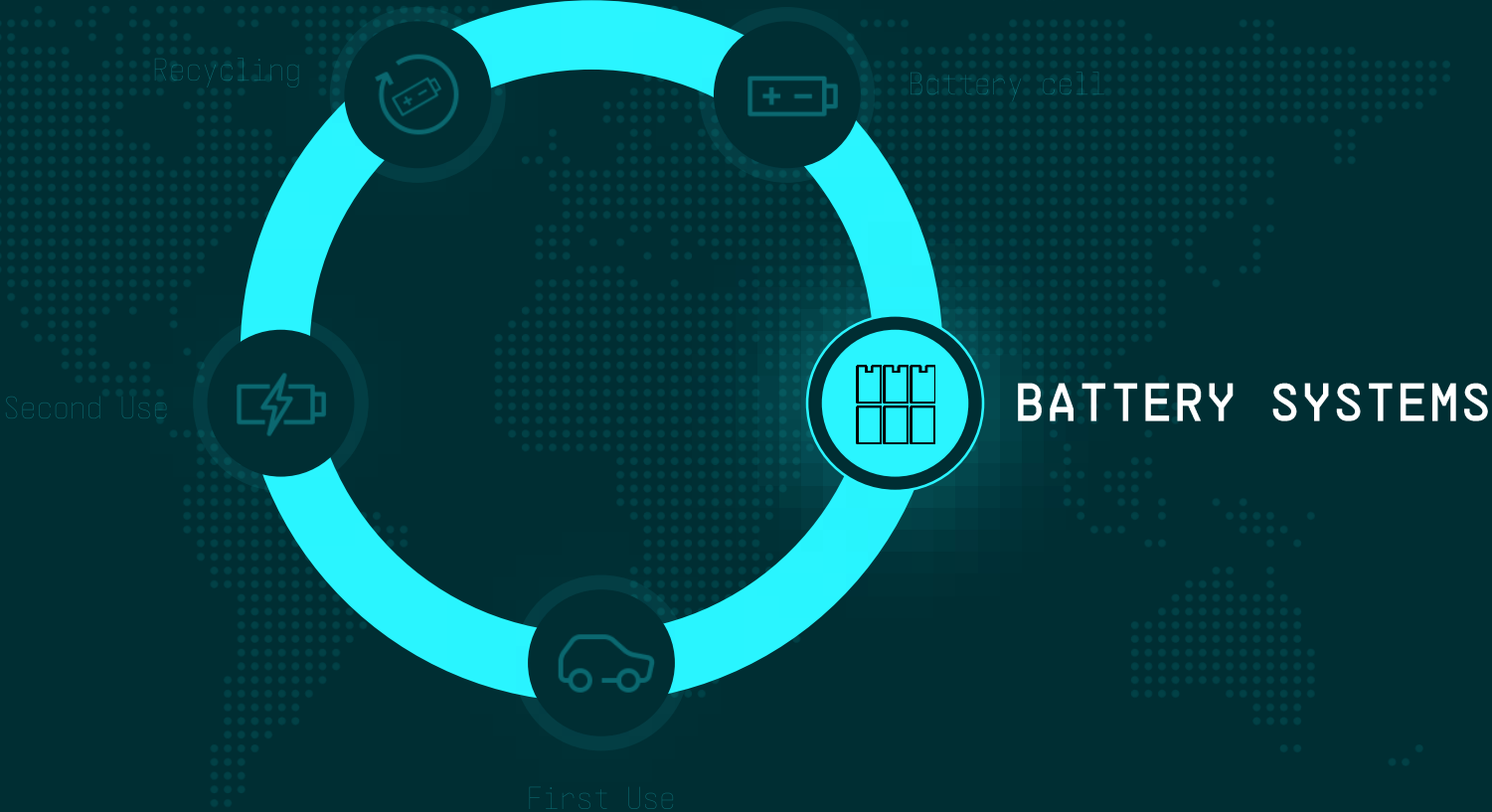


STATE OF THE ART BATTERY CELL PRODUCTION

INVESTMENT AND ENERGY INTENSE PROCESSES



CLOSED LOOP APPROACH

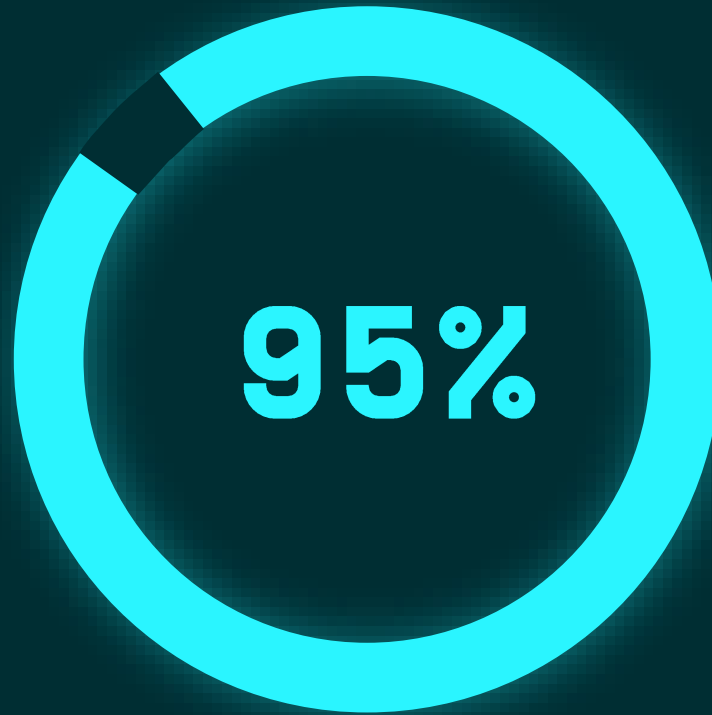


CLOSED LOOP APPROACH

RECYCLING



REUSING 95% OF THE RAW MATERIALS THROUGH
HYDROMETALLURGY PROCESS



THE **FIRST PLANT**
FOR **RECYCLING**
USED ELECTRIC CAR
BATTERIES!



PRODUCTION IN
SALZGITTER
STARTED IN
JANUARY 2021

1

PRODUCE CATHODES FROM RECYCLED MATERIAL:
SAVING MORE THAN ONE TON OF CO2 PER VEHICLE

2

ECOLOGICALLY AND ECONOMICALLY
SUSTAINABLE EFFECT

3

THE COSTS FALL
THE CUSTOMER BENEFITS INCREASE

LOCALIZATION AND VOLUME STRATEGY



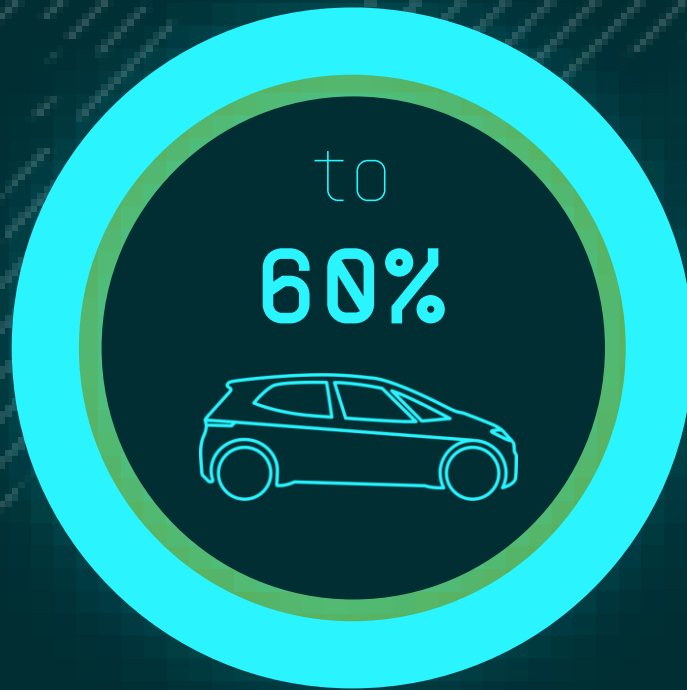
THROUGH GREEN DEAL SHARE OF BEVs INSIDE
VOLKSWAGEN GROUP WILL INCREASE...



BEV SHARE GROUP
2030



THROUGH GREEN DEAL SHARE OF BEVs INSIDE
VOLKSWAGEN GROUP WILL INCREASE...



BEV SHARE GROUP 2030
inkl. Green Deal

THIS WILL CREATE A
**DEMAND OF 240 GWH FOR
VOLKSWAGEN IN EUROPE**

THAT MEANS: **6x40 GWH!**

FIRST PLANT: **NORTHVOLT**

**Start of
production
2023**
up to 40 GWh

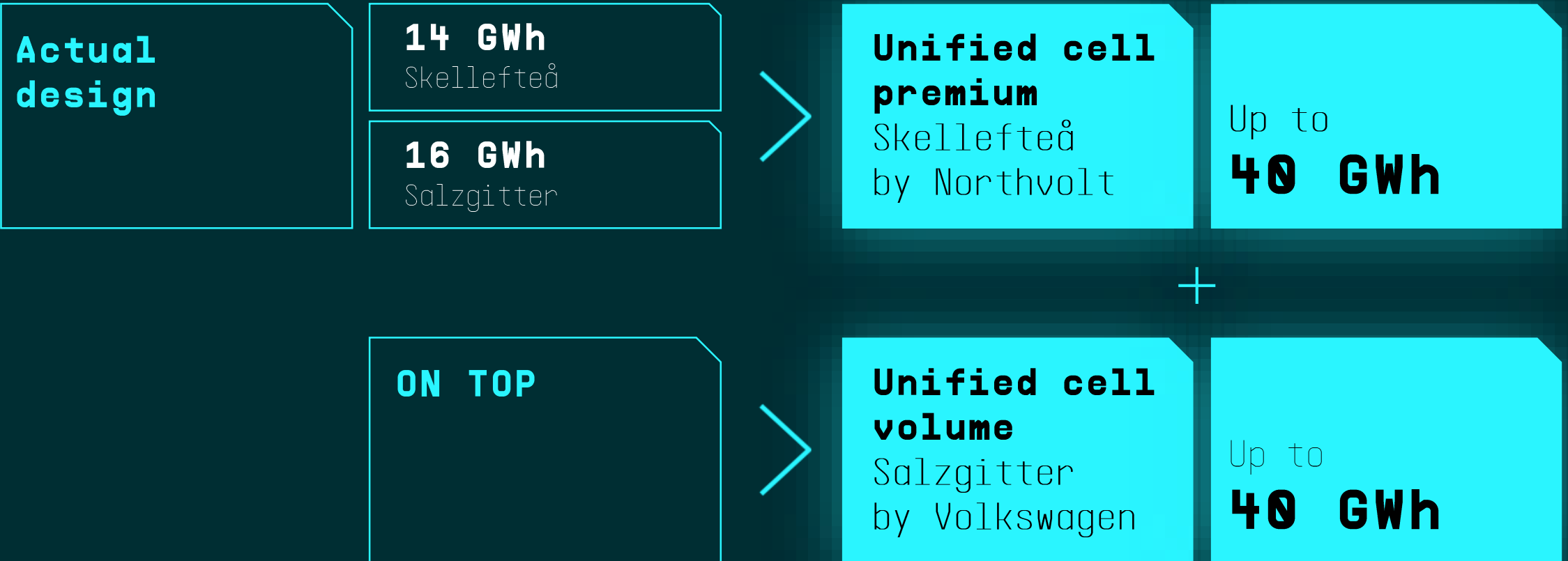


Skellefteå

1st

Actual setup

New setup



_CLEANER PROJECT SETUP

_BUNDLING RESSOURCES

_LESS COMPLEXITY

_FASTER RAMP UP

_HIGHER VOLUME OUTPUT

SECOND PLANT: **SALZGITTER**

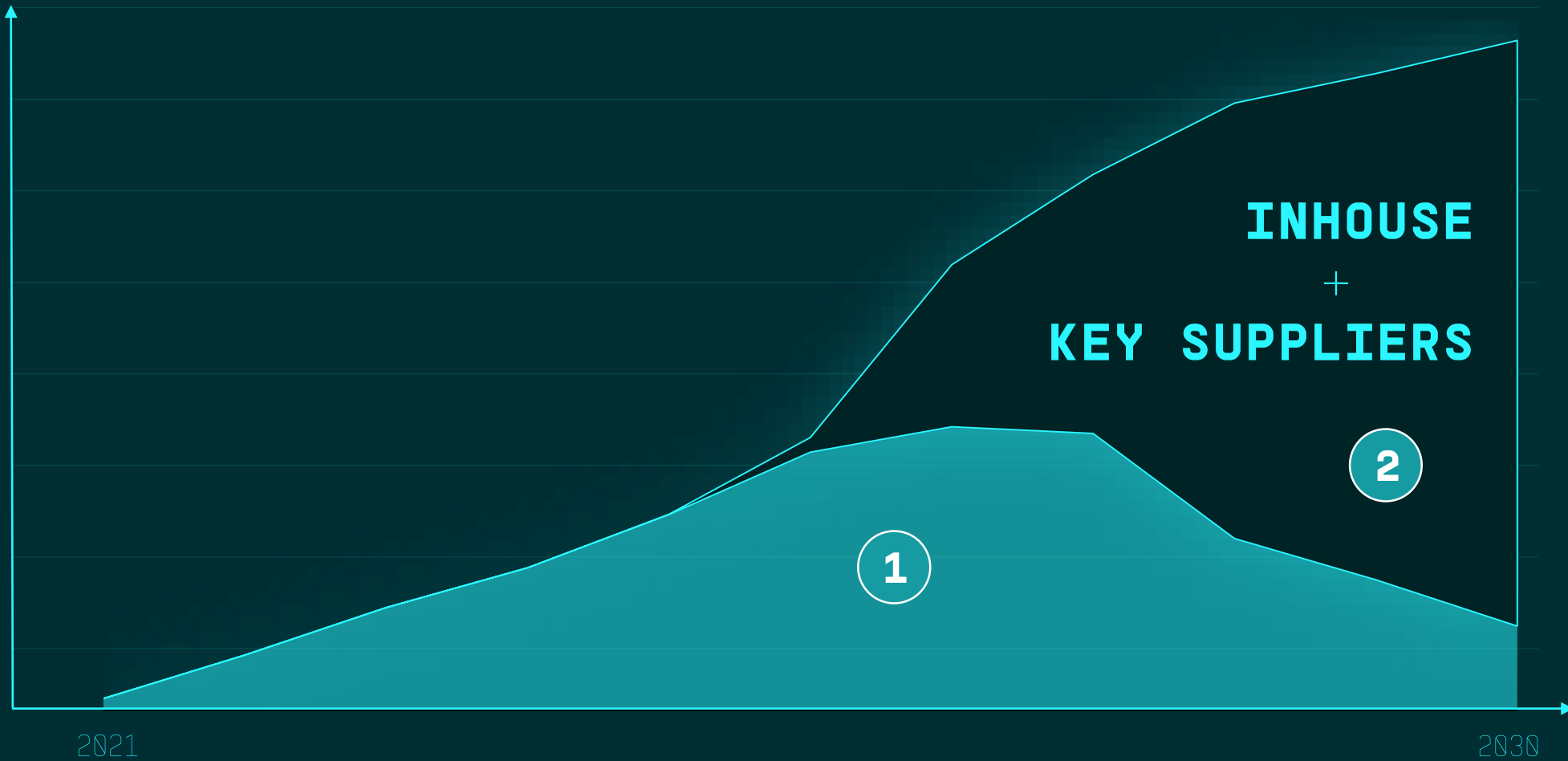
**Start of
production
2025**
up to 40 GWh



2nd

SECOND WAVE OF BATTERY TECHNOLOGY

GWH WORLDWIDE

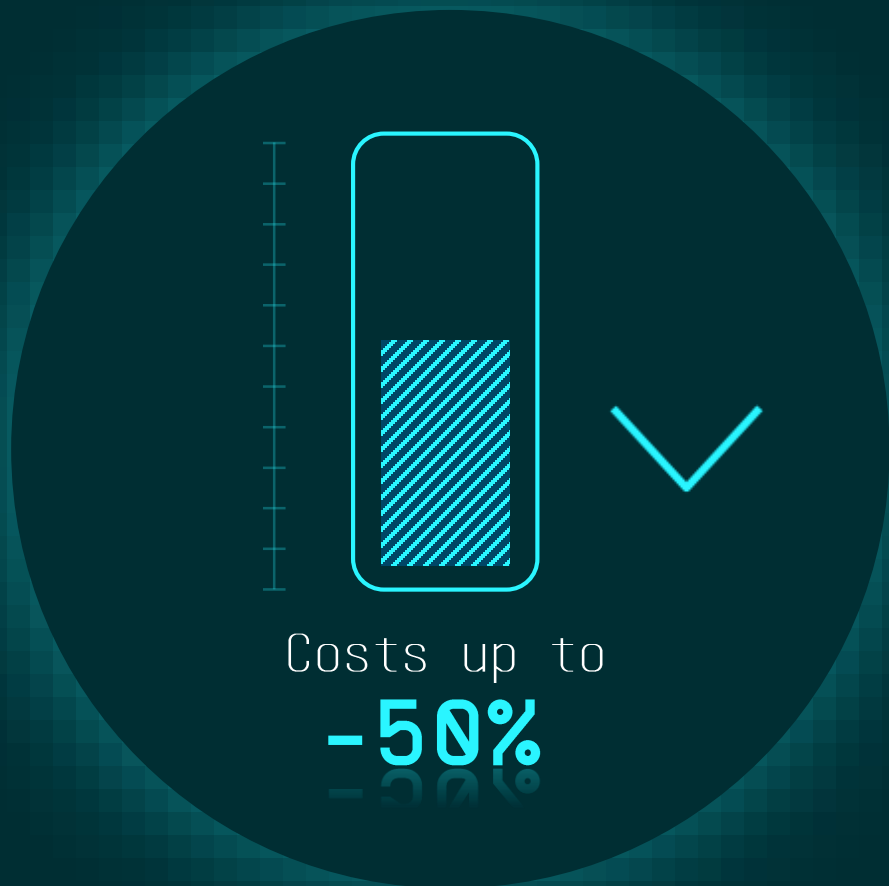


A FUTURE SUCCESS

DEPENDS ON A STRONG COLLABORATION



HOW TO REACH **COST TARGETS**



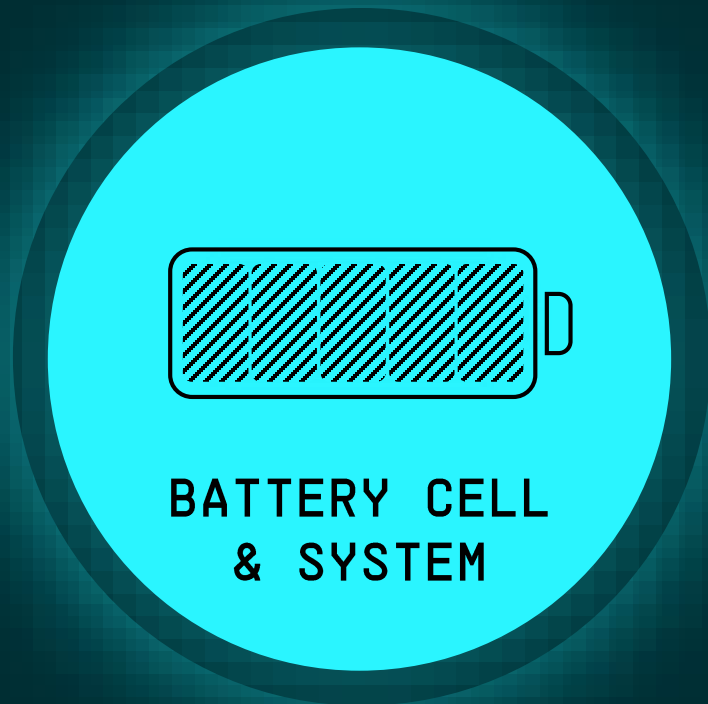
Cell design **-15%**

Production process **-10%**

Cathode / anode material **-20%**

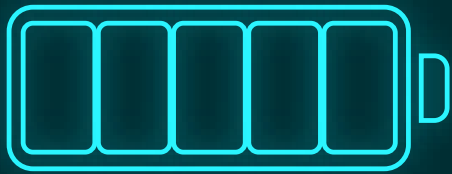
Battery system concept **-5%**

KEY TAKE-AWAYS

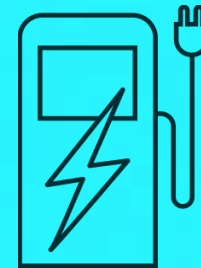


- _ **Technology roadmap** with possible unified cell utilization of 80%
- _ Action fields to **achieve cost targets** defined
- _ **Closed Loop** process installed
- _ **SOLID LOCALIZATION STRATEGY** to secure volume and timing

TWO MAIN PILLARS



BATTERY CELL &
SYSTEM



CHARGING &
ENERGY

Among **TOP 3** reasons
to **NOT** buy
an electric car:

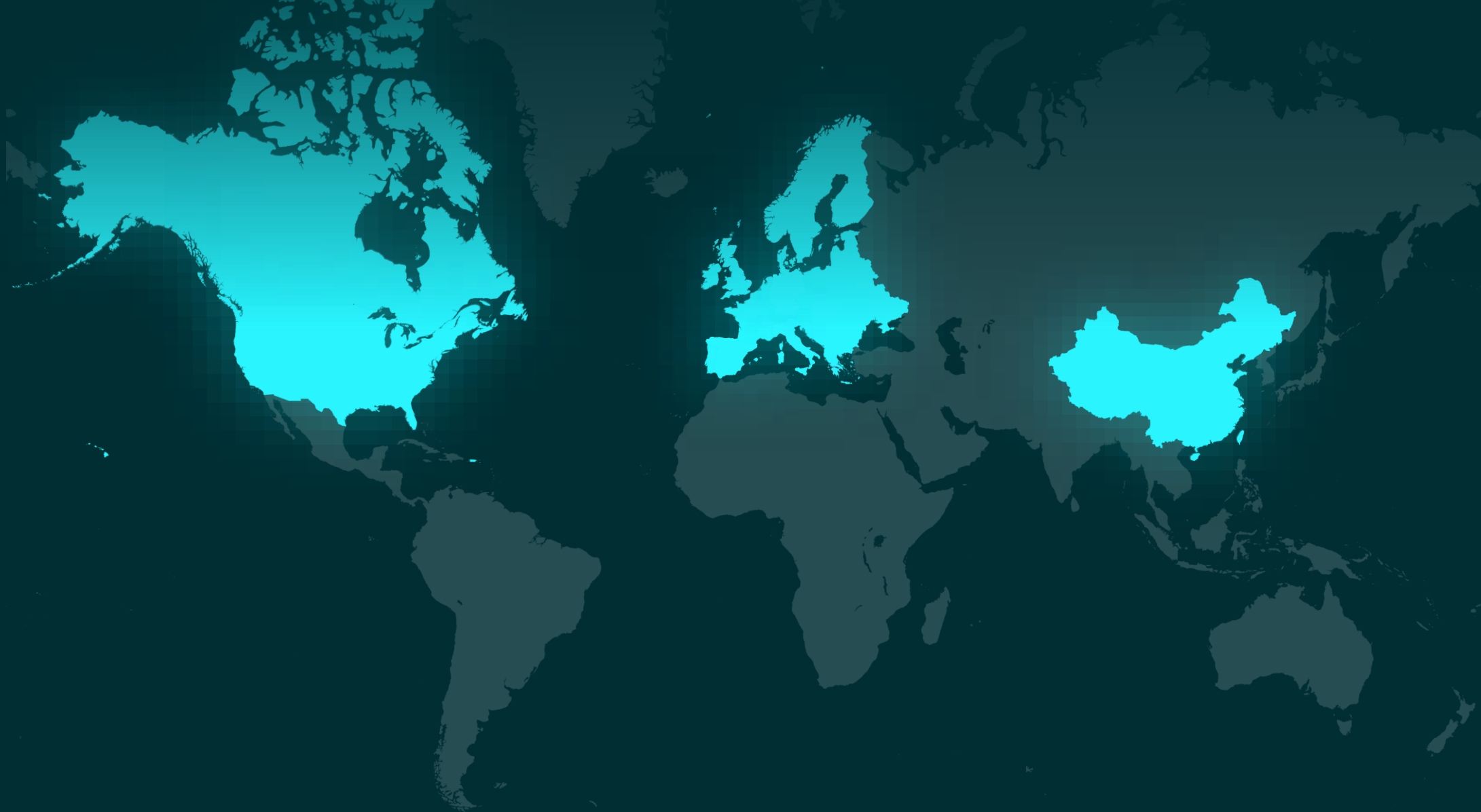
**CHARGING
INFRASTRUCTURE**





DIFFERENT CITIES,
DIFFERENT CHALLENGES

Volkswagen covering
most important e-mobility markets





EUROPE

Our HPC-Boost-Program
for Europe

IONITY



Italy

ROME

Our HPC-Boost-Program
for Europe

enel

Our HPC-Boost-Program
for Europe



IBERDROLA



MADRID

Spain

Starting 2021

United Kingdom

LONDON

BERLIN

Starting 2021

Germany

Our HPC-Boost-Program
for Europe

bp



8,000
HPC Points
by 2025

Our
HPC-Boost-Program
for Europe

IONITY

enel

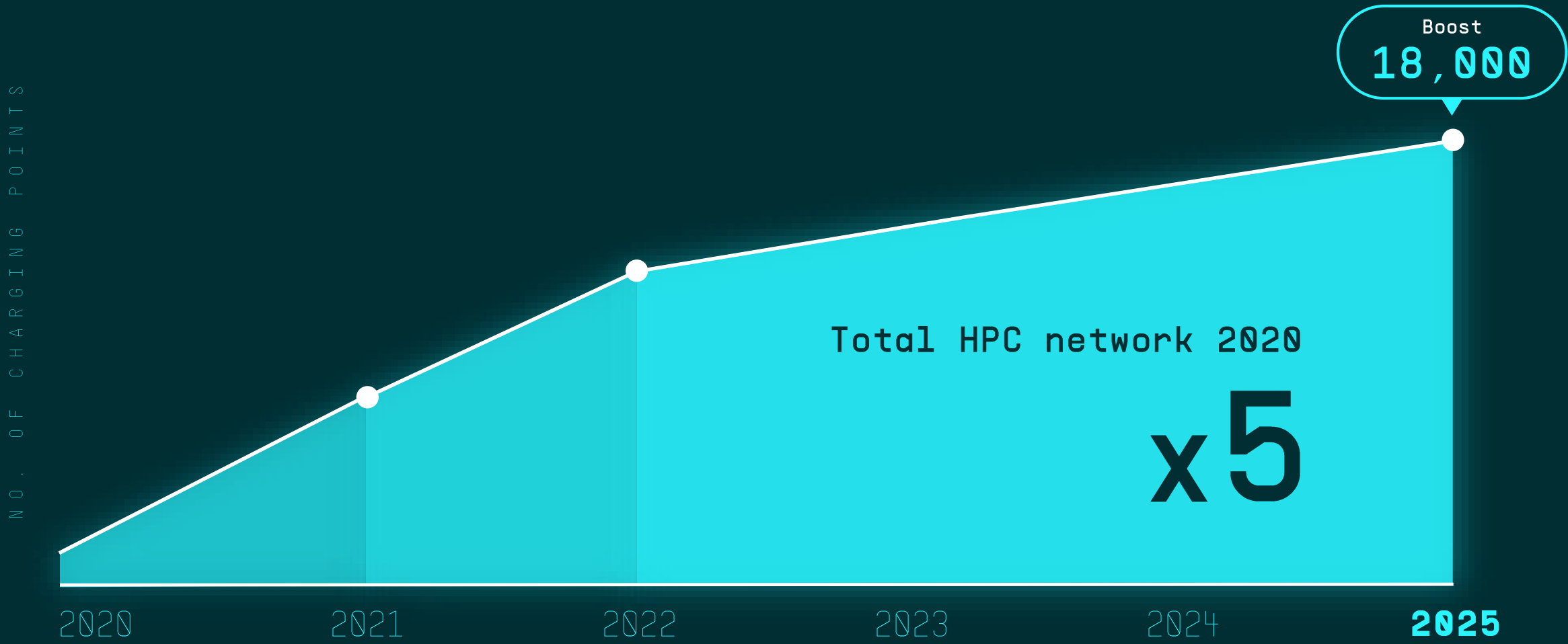


IBERDROLA

bp



Our contribution: We will expand today's HPC network in Europe by factor 5 until 2025





Our
HPC-Boost-Program
for Europe

about **18,000**
HPC points by 2025

1/3
of essential HPC
Infrastructure in Europe



FLEXPo1e

2x DC UP TO 150 kW

BATTERY BUFFER

2nd LIFE OPPORTUNITY

GRID INDEPENDENT

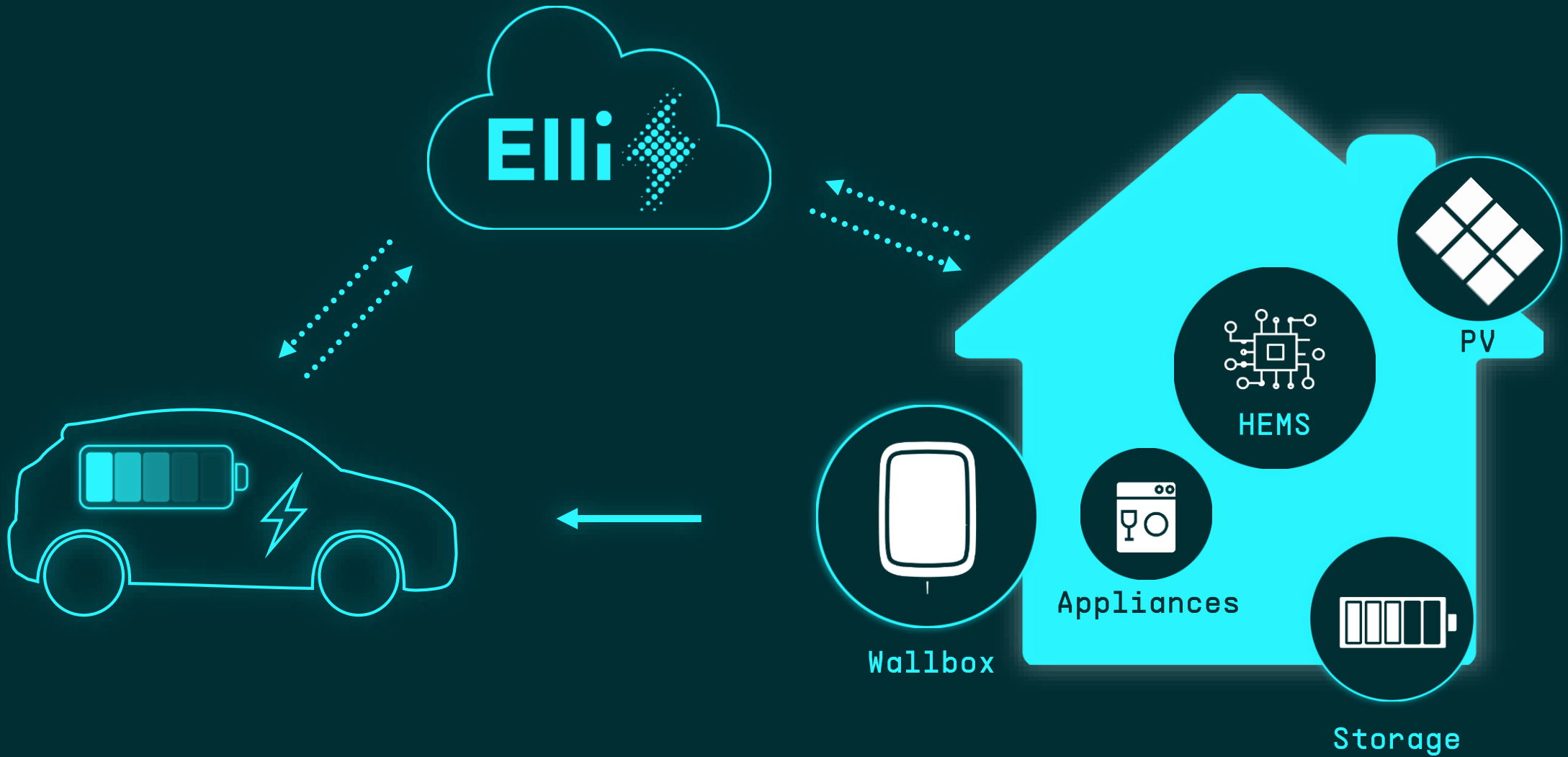
2 PRODUCTION SITES

SUZHOU [China], HANOVER [Germany]

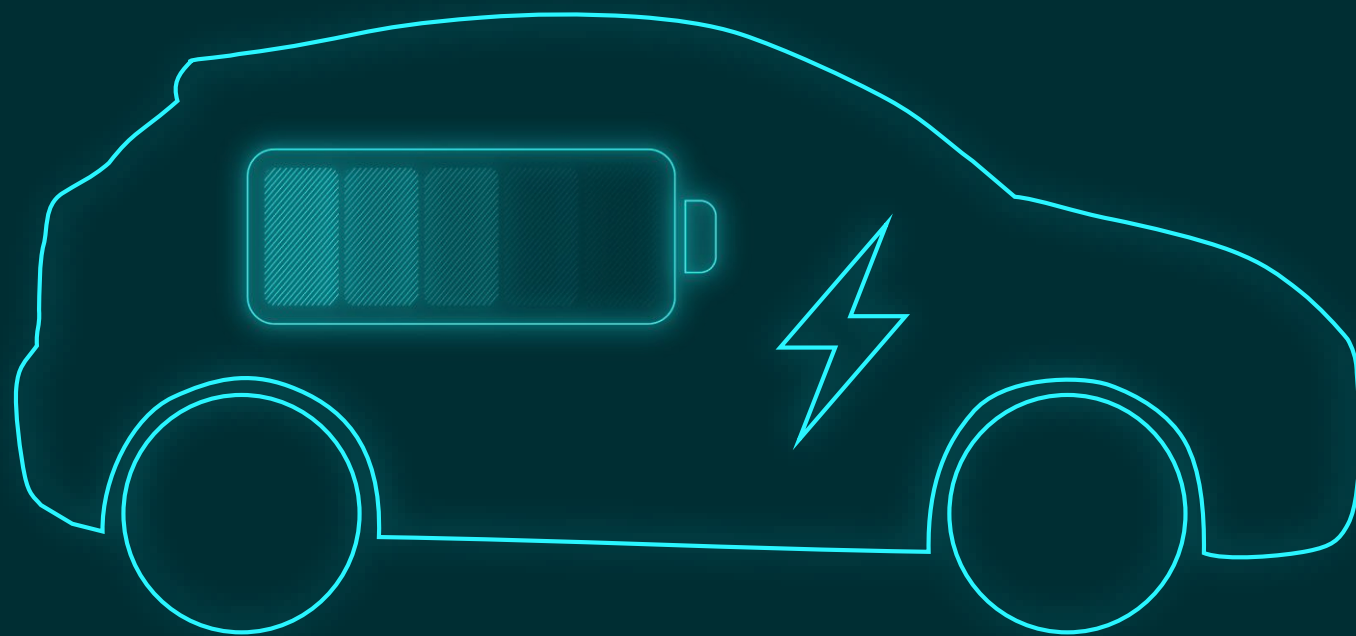
INNOVATIONS MADE BY VOLKSWAGEN GROUP COMPONENTS



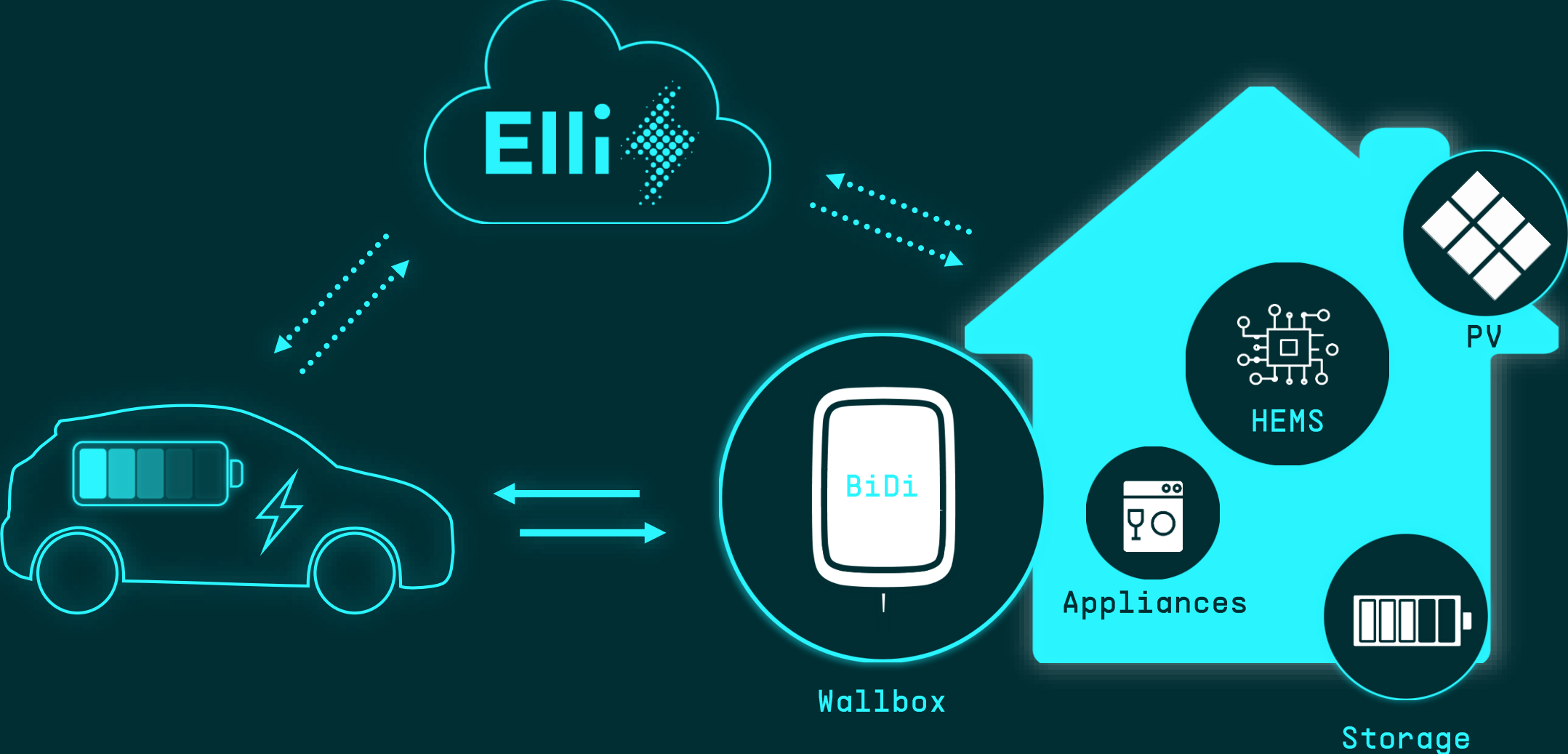
BEVs to become smart charging devices for solar and grid integration



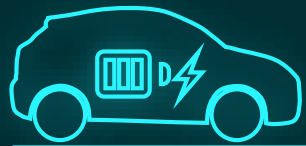
The car as a mobile power bank



BiDirectional charging enables car-owners to become their own utility



Mobility and renewable energy are complementary

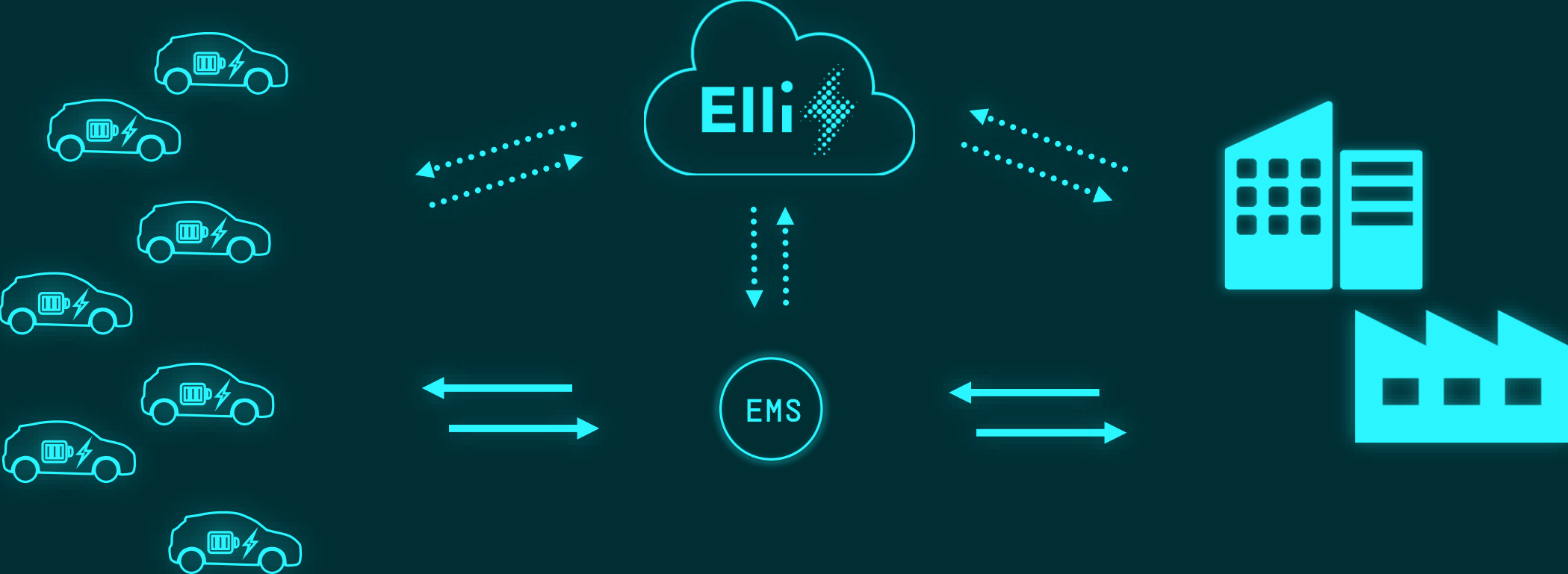


200 km / 125 miles
driving

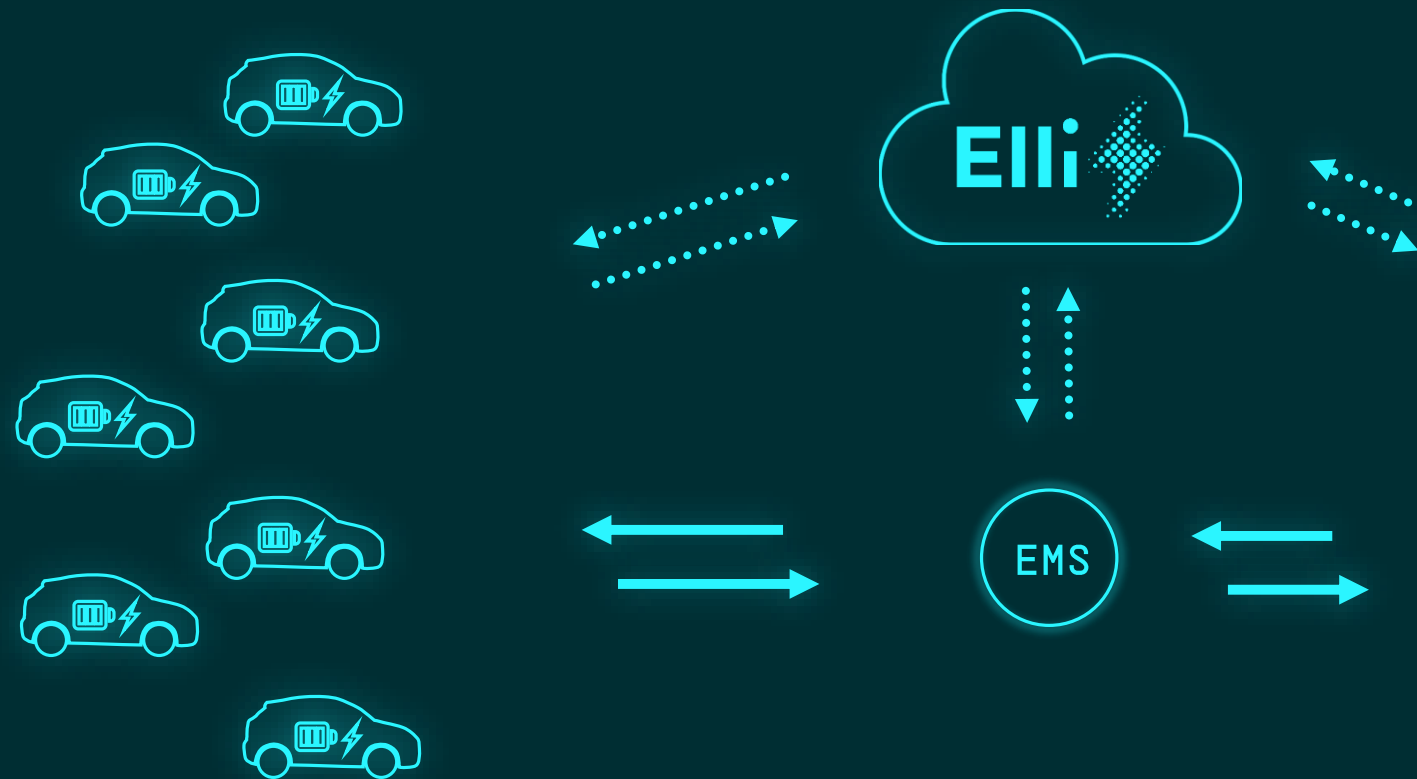


House to be powered
by the car

Business model scalable to fleet level



Business model scalable to fleet level - first running project



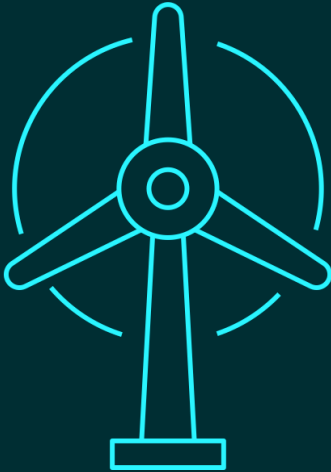
- 1,250 apartments
- 2 MWh storage capacity
- 270 wallboxes
- 720 kWp photovoltaics



Pilot @ Wolfsburg, Germany

Activating unused renewable energy with the new storage capabilities

6,500 GWh/year



2.7 million BEVs



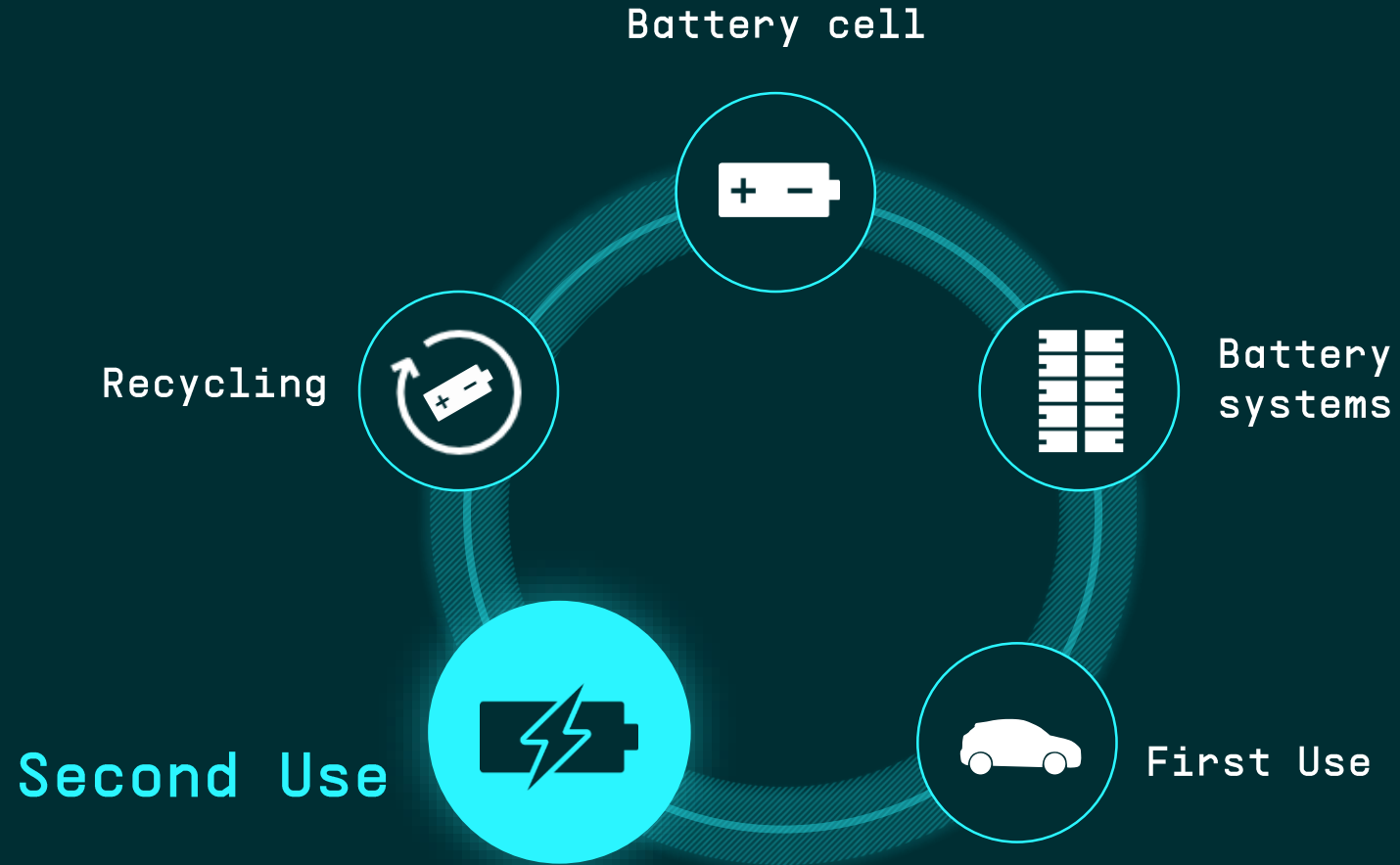
in Germany are **not used** due to lack of storage capacity

could be driving **one year** with the energy

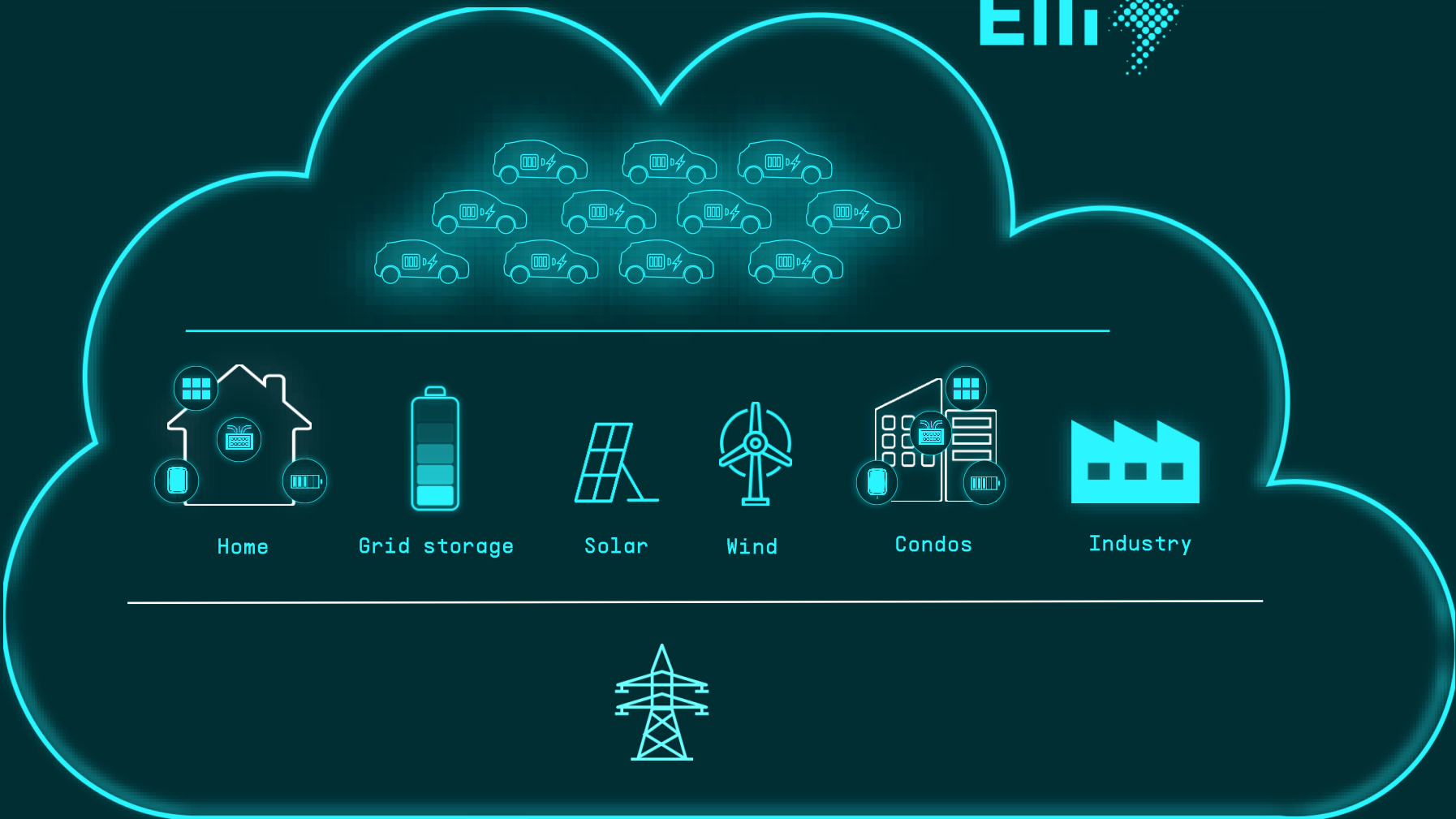
Volkswagen will use battery production capacities for large scale storage including 2nd life options



Large scale storage as part of
THE CLOSED LOOP.



Energy integration: Fully digital and data driven



Home



Grid storage



Solar



Wind



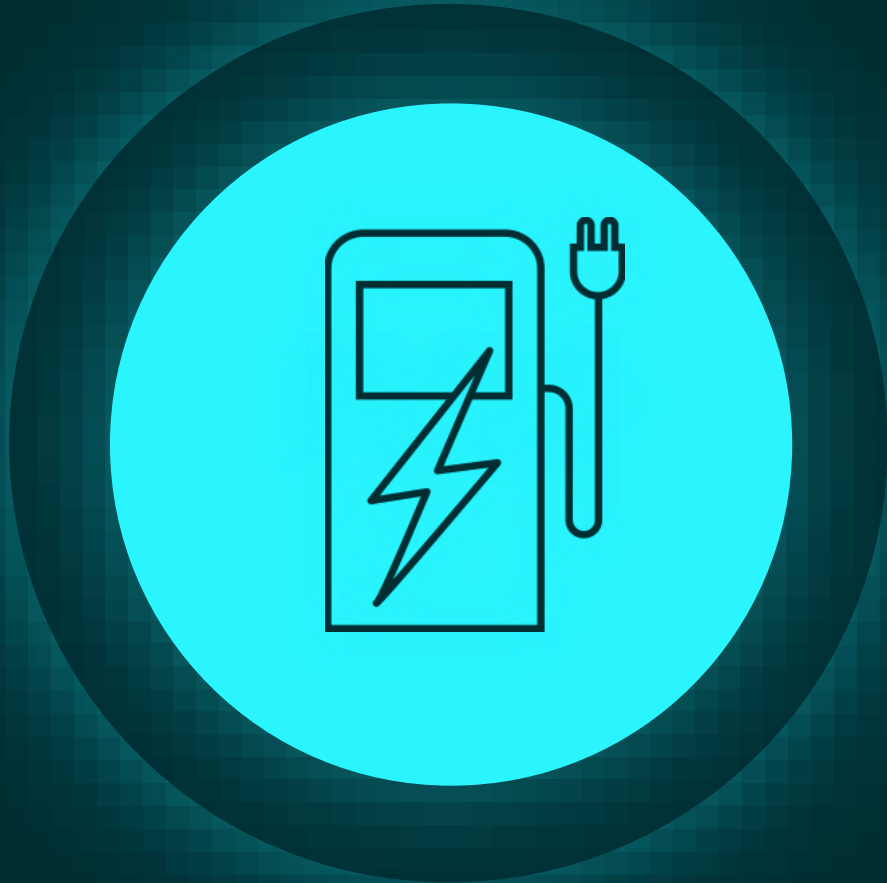
Condos



Industry



Key Take-aways



- _ **Global Boost-Plan** for charging infrastructure
- _ Expand **fast charging** in strong partnership with **local partners**
- _ The car will be a part of the **energy system**
- _ **Storage systems** to facilitate fluctuating **renewable energy supply**
- _ **Cloud based energy management**

OUR VISION & MISSION

With the right energy management and
intelligent storage systems

ONE DAY, CHARGING WILL BE FOR FREE