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“German Demand for Battery Materials”

Michael Schmidt

German Mineral Resources Agency (DERA) at the
Federal Institute for Geosciences and Natural Resources (BGR)



Federal Ministry
for Economic Affairs
and Energy

The Federal Institute for Geosciences and Natural Resources is the central geoscientific authority providing advice to the German Federal Government in all geo-relevant questions. It is subordinate to the Federal Ministry for Economic Affairs and Energy (BMWi).



Source: Fotolia

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Evaluation of mineral resources:
Contributions for a sustainable and secure raw materials supply.

Mineral economics:
Raw Materials Information and Analysis.

http://www.deutsche-rohstoffagentur.de/DERA/DE/Home/dra_node.html

Germany's Raw Materials Strategy
(Update)

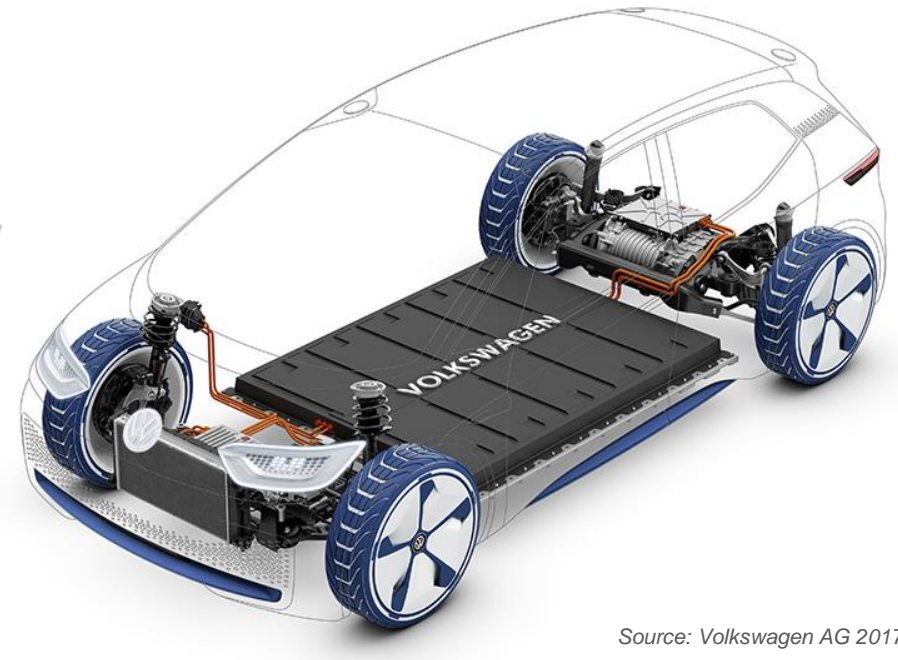
Summer 2019

Will address the need for „New Mobility“



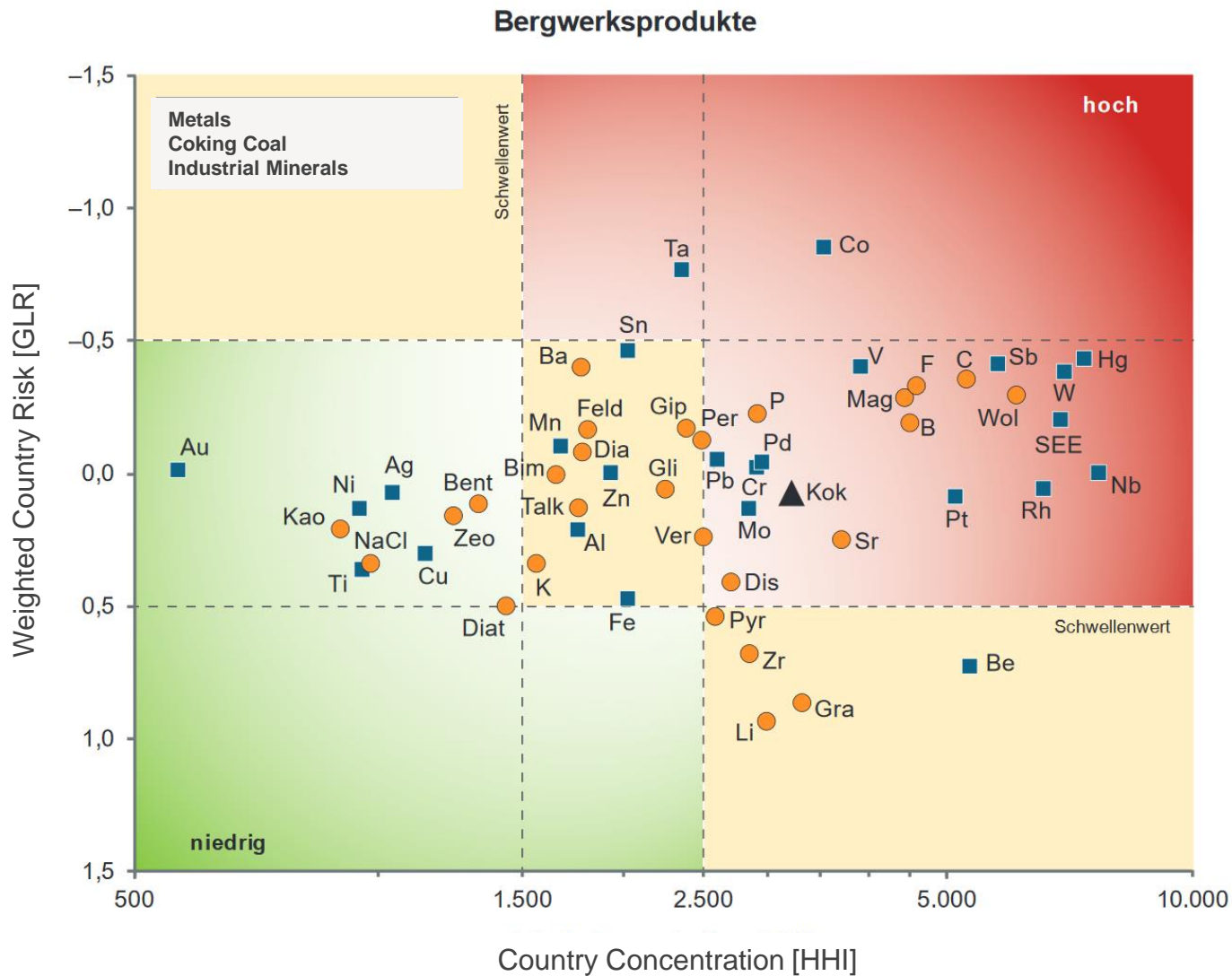
What affects the demand of raw materials for LIB now and in the future?

- Incentives & Regulation (2018 → 20xx)
- Market Penetration → Annual Growth
- Expectations: **Customer, Government, Industry**
- Technological Concept (PHEV, BEV etc.)
- Battery Size
- Chemical Composition (Current → Future)
- Emerging Or Disruptive Technologies



Source: Volkswagen AG 2017

DERA Criticality List 2019



40 DERA Rohstoffinformationen



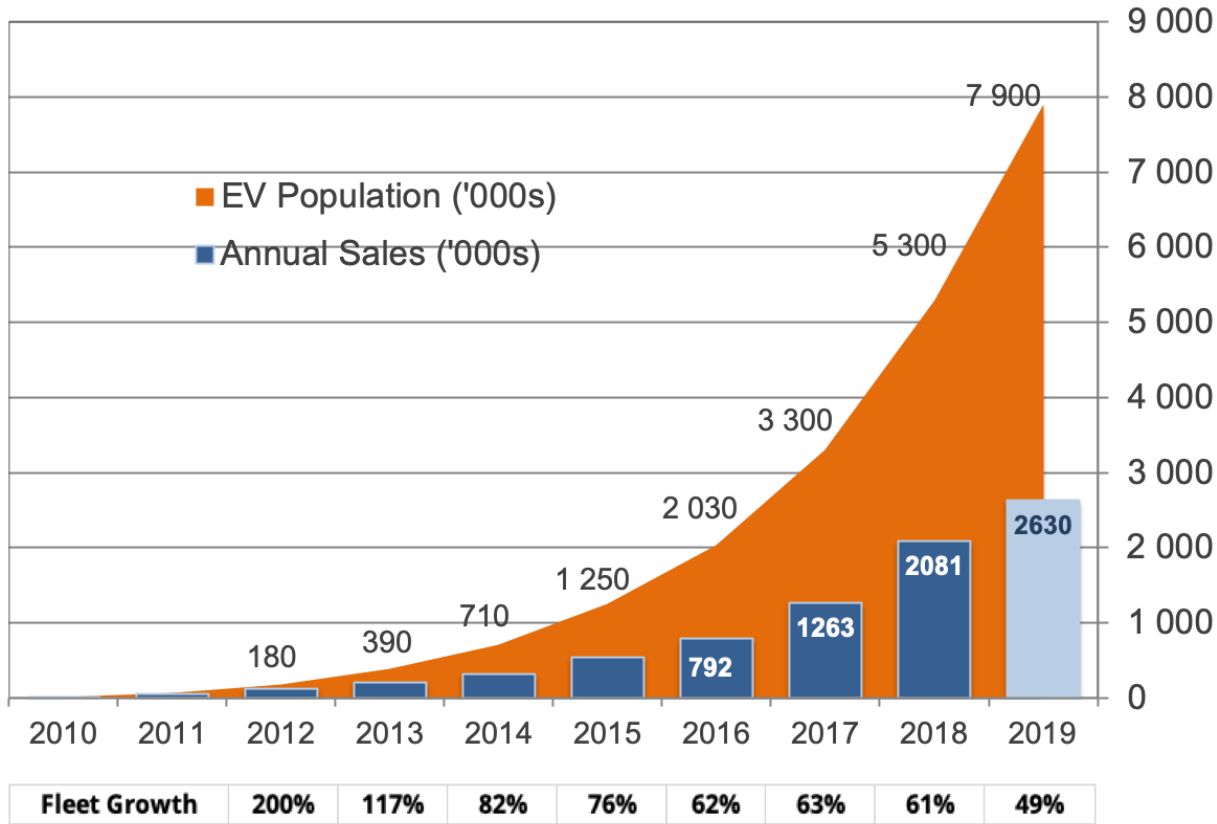
DERA-Rohstoffliste 2019

Angebotskonzentration bei mineralischen Rohstoffen und Zwischenprodukten – potenzielle Preis- und Lieferrisiken

Market Penetration: Global Sales of Electric Vehicles and Plug-in Hybrids

GLOBAL PLUG-IN VEHICLE FLEET

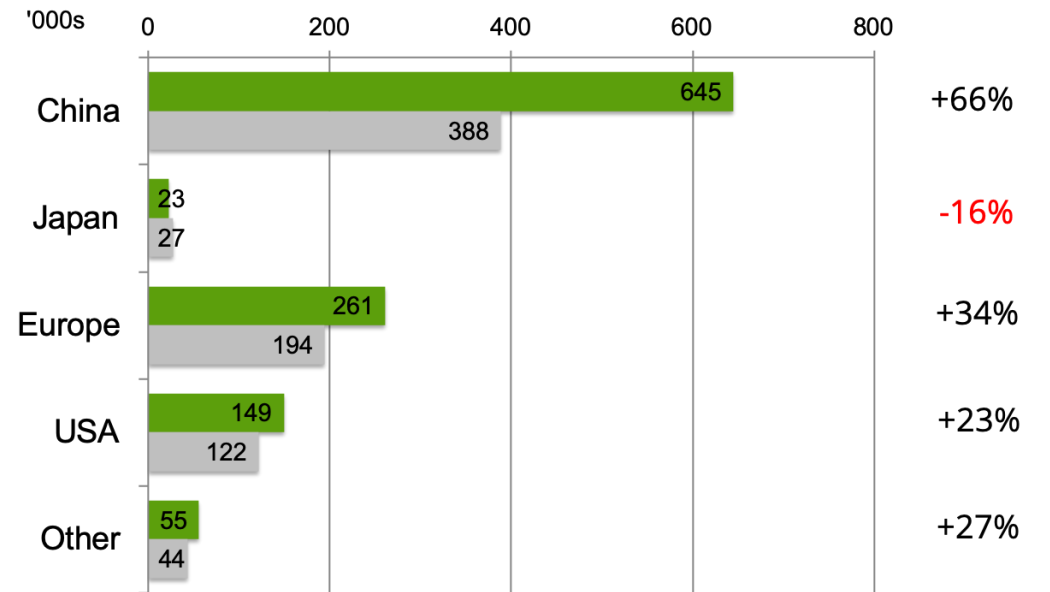
EV VOLUMES



EV SALES AND % GROWTH

■ 2019 H1
■ 2018 H1

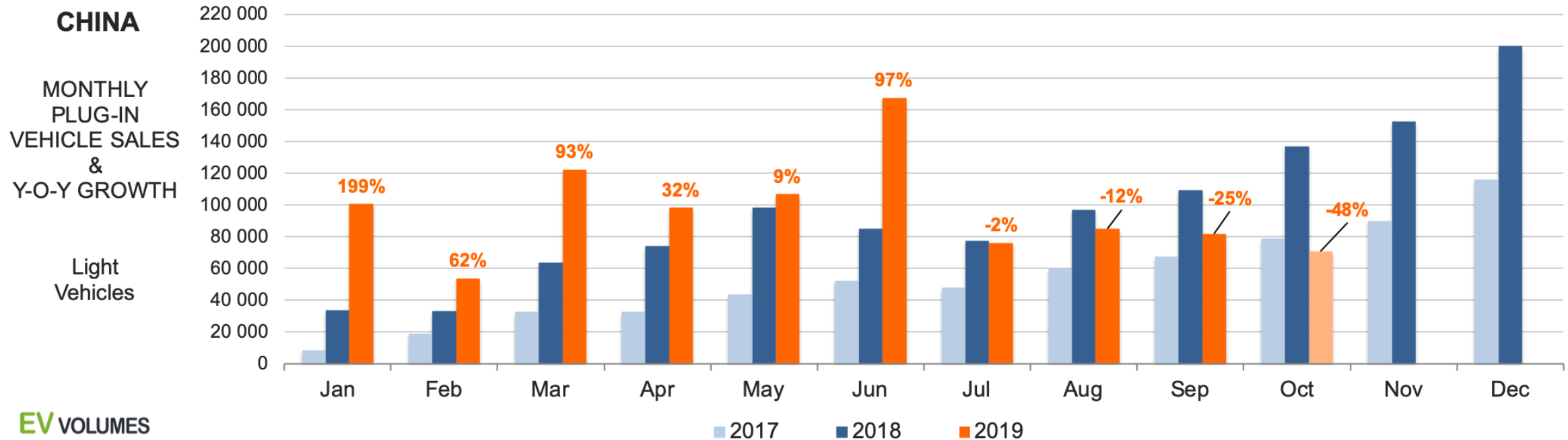
EV VOLUMES



2019

Source: EV VOLUMES 2018, 2019

Subsidy and Incentive driven.....

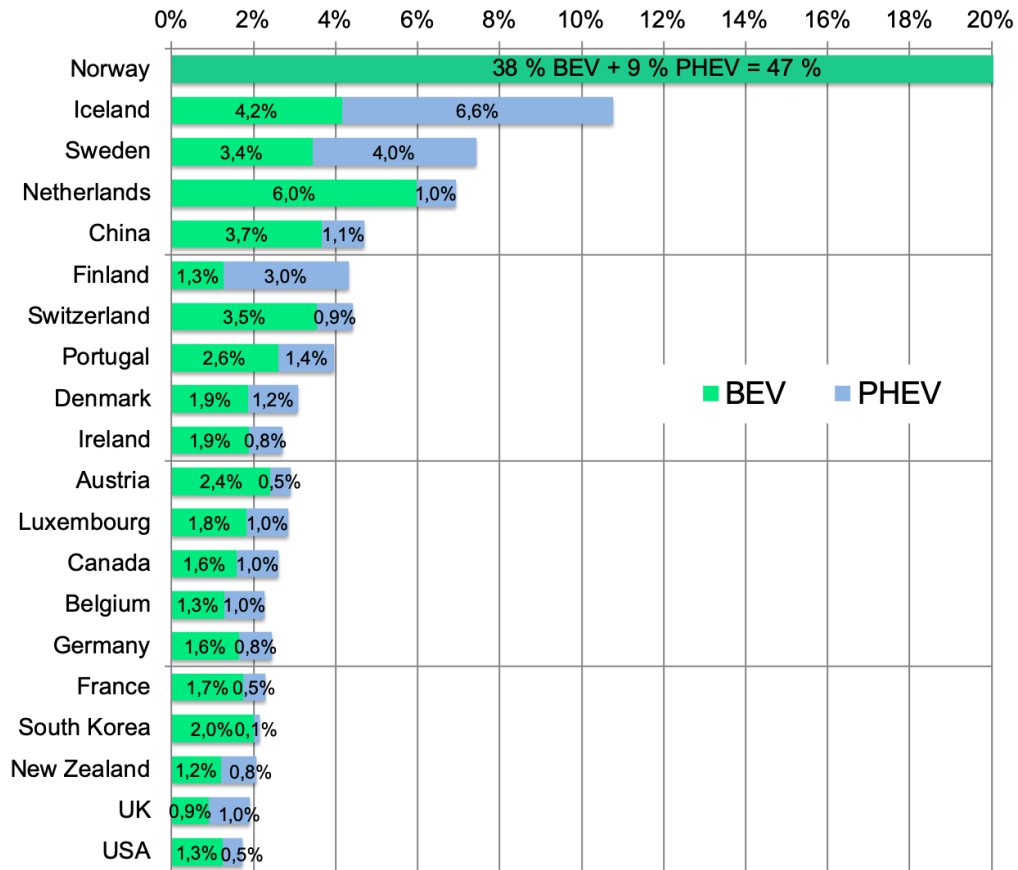


Source: EV VOLUMES 2019

Europe

EV SHARES AND COMPOSITION 2019 H1 LIGHT VEHICLES

EV VOLUMES



Volume Change vs 2018 H1

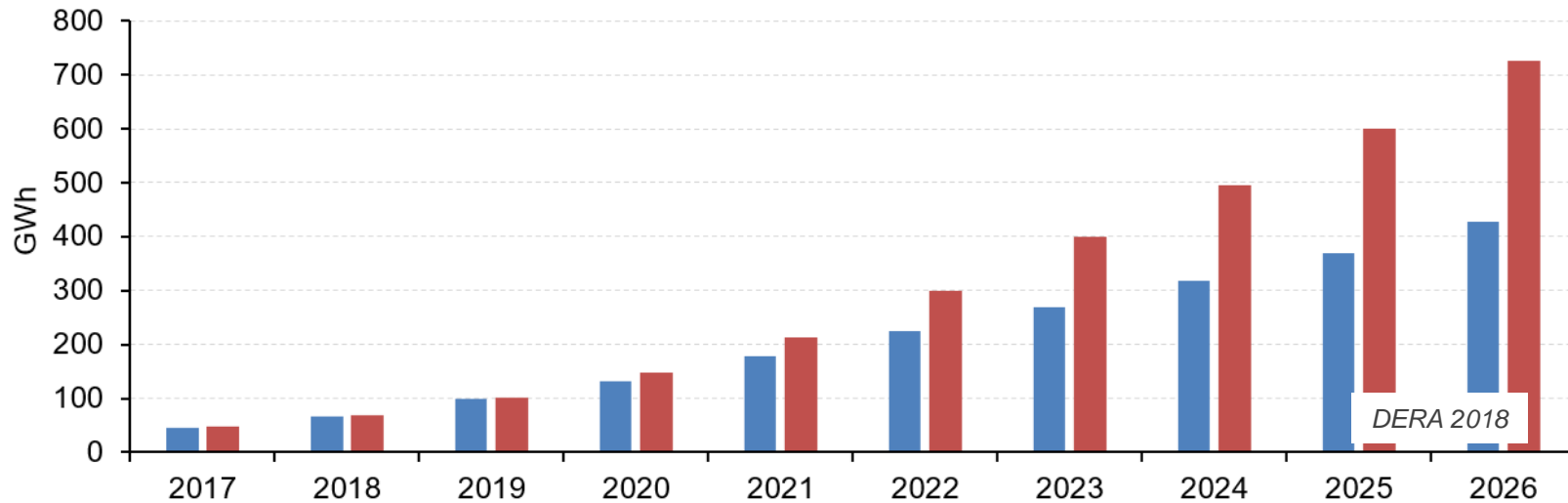
BEVs	PHEVs
+73%	-45%
+52%	-41%
+252%	-2%
+115%	+156%
+75%	+42%
+166%	-17%
+138%	-21%
+94%	+16%
+379%	-4%
+237%	+105%
+60%	-17%
+200%	+14%
+62%	-9%
+145%	-38%
+64%	+0%
+37%	+21%
+42%	+46%
+63%	+37%
+54%	-29%
+66%	-28%

More than **50%** of growth in the EU from Tesla Model 3...



Source: EV VOLUMES 2019

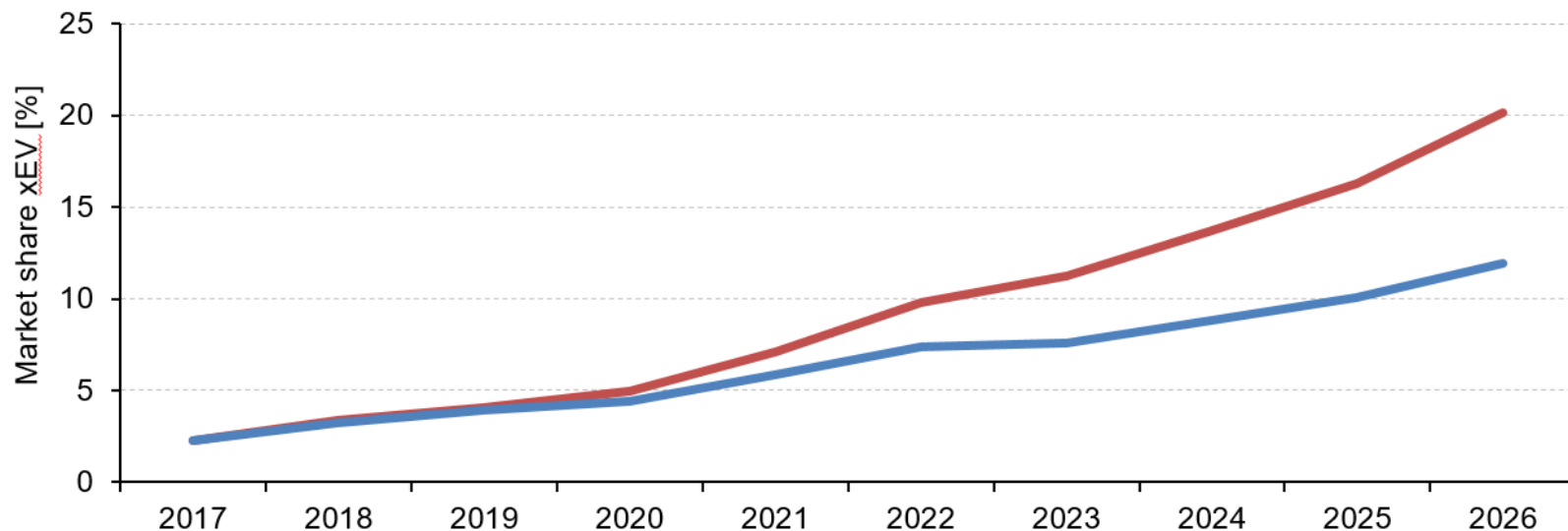
DERA EV Demand Scenarios:



GWh in 2026:

- **DERA DRIVE**
→ 726 GWh
- **DERA BASE**
→ 428 GWh

Base Case (9-11 Mio. Evs)

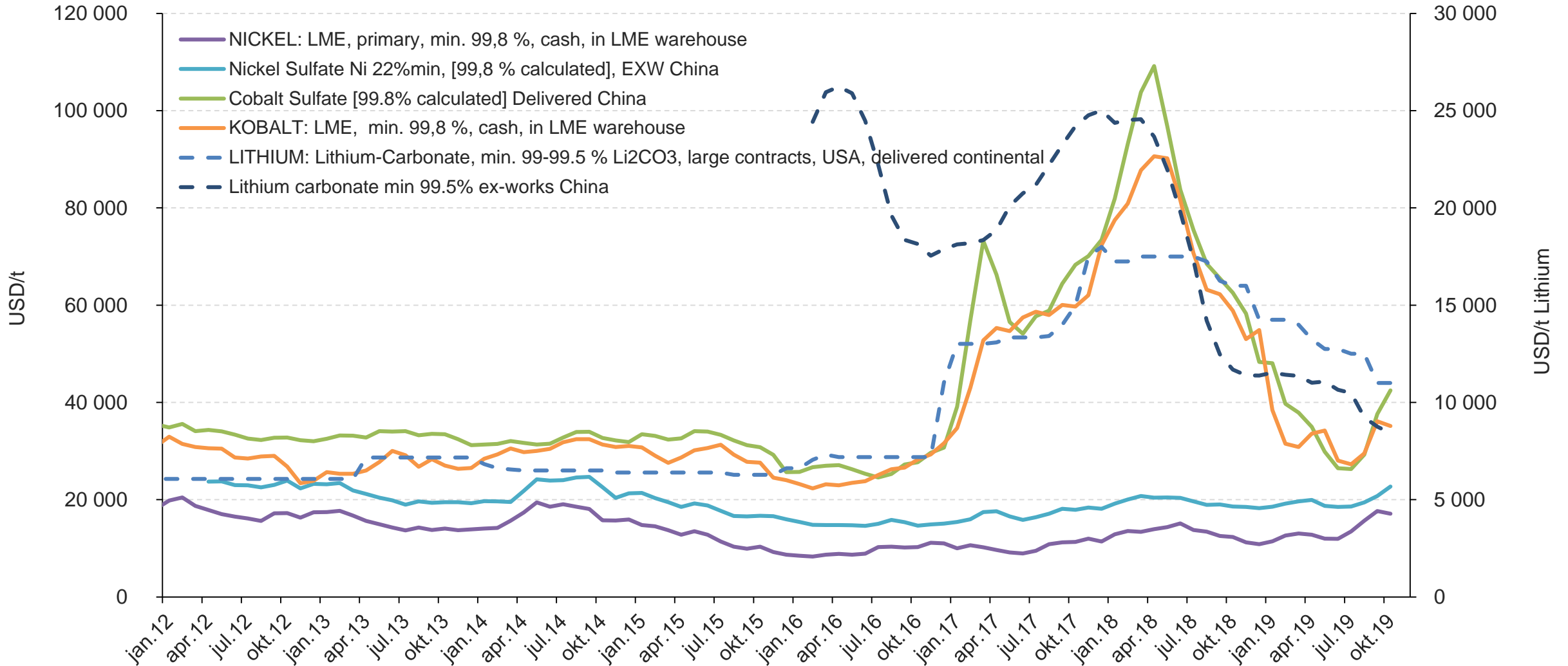


BEV in 2026:

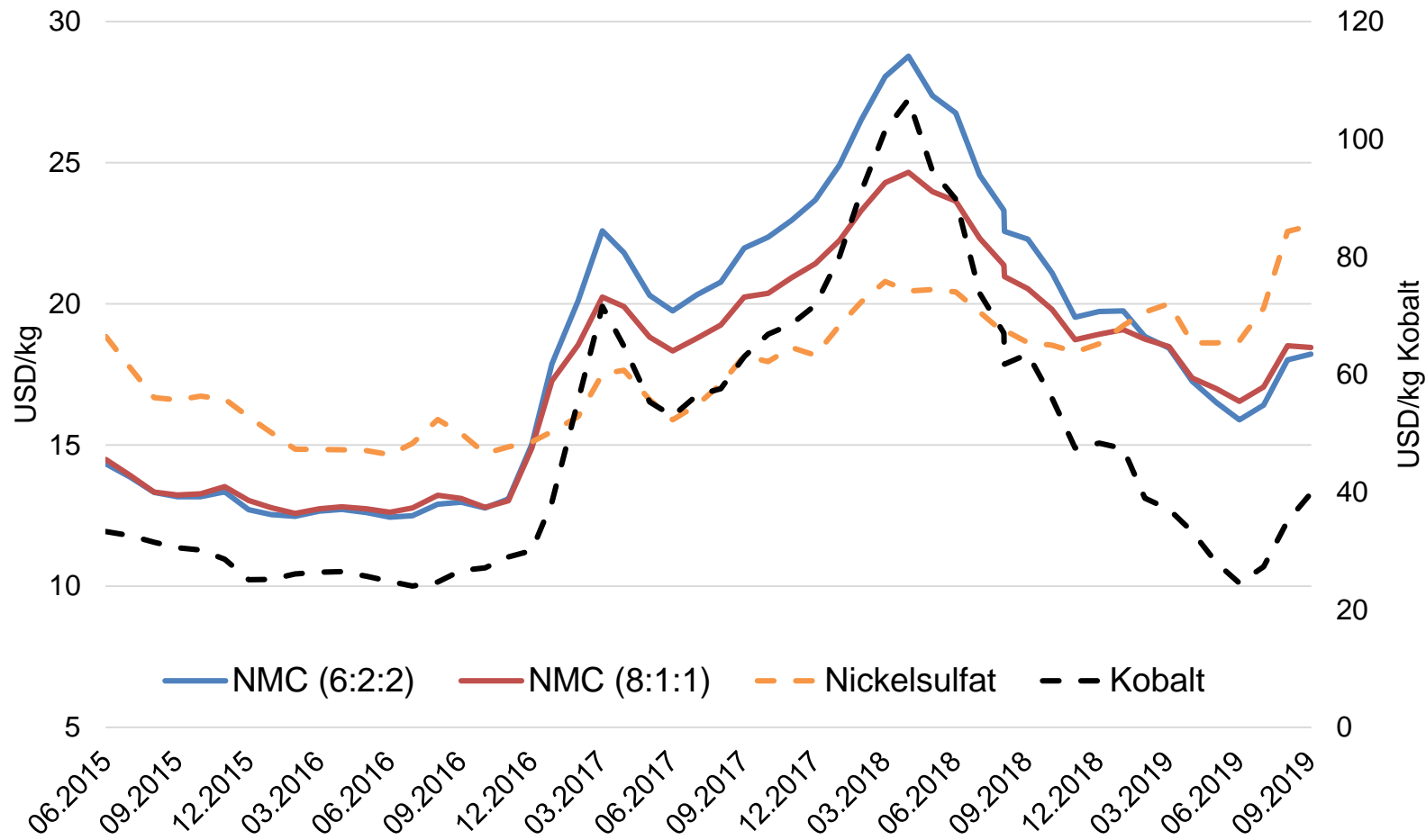
- **DERA DRIVE**
→ ~20 % EV
- **DERA BASE**
→ ~12 % EV

Raw Material Prices for LIB

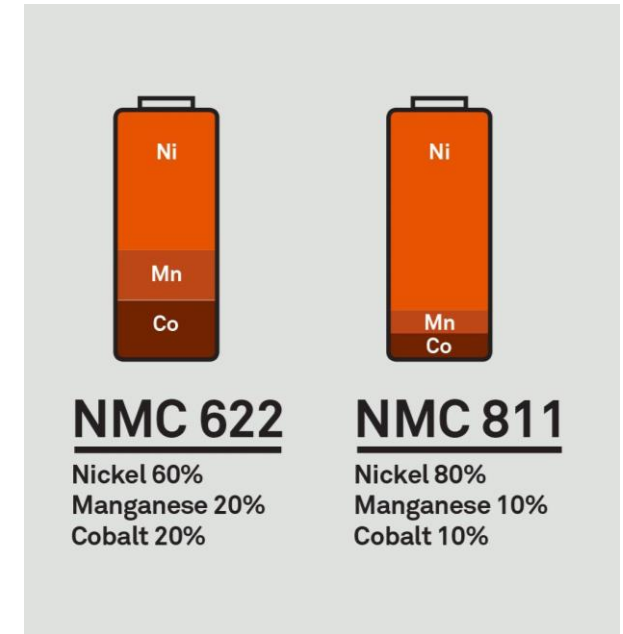
RAW MATERIALS > 50% of cost!



Cathode Cost

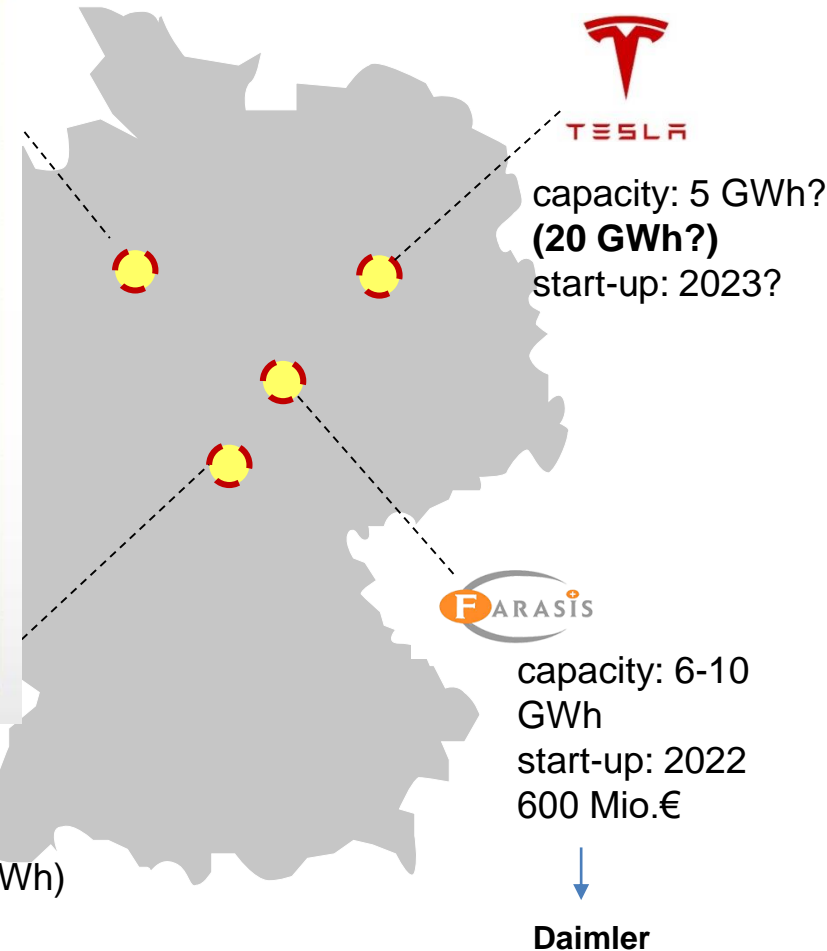
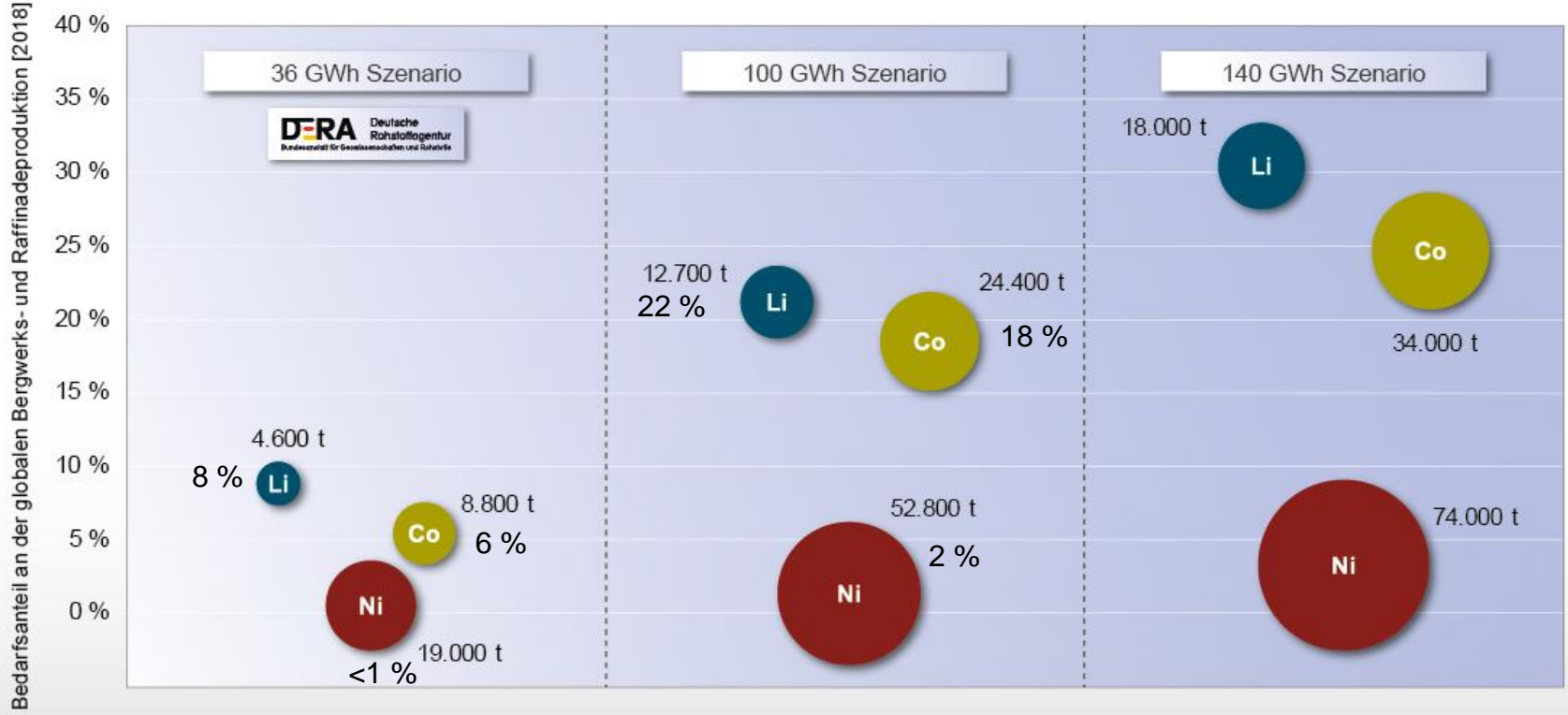


Quelle: BGR 2019



- 8:1:1 currently more expensive than 6:2:2 and 5:3:2 due to Ni and Co cost development.
- No incentive to reduce Co in the cathode apart from moral/ethical reasons...

Planned Cell Production Germany



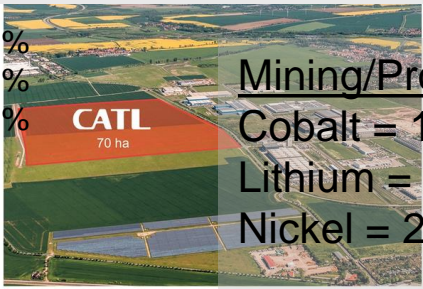
CATL

capacity: 14 GWh (60/100 GWh)
start-up: 2022*
up to 1,8 Bill. €

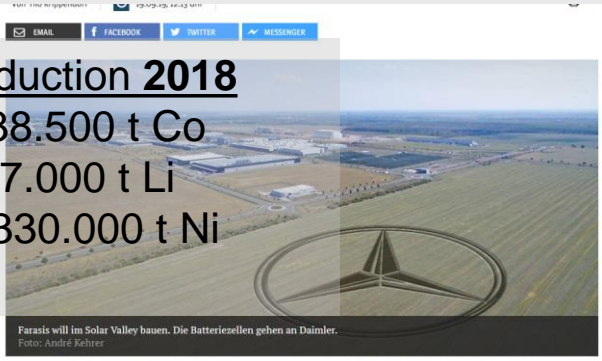
BMW

*Production of battery cell, production of modules from 2020 onwards

GANZ AUSBAU
KAPAZITÄT
NMC 111: 30 %
NMC 622: 50 %
NMC 811: 20 %




Mining/Production 2018
Cobalt = 138.500 t Co
Lithium = 57.000 t Li
Nickel = 2.330.000 t Ni




Multitude Of New Lithium-ion Factories Planned In Europe

Today <10GWh Capacity  Tomorrow >300GWh announced

 Started 2010, 2.5GWh

 16GWh to start and ramp up to 30GWh

 To build Gigafactory starting in 2021

 Start 2022, up to 10GWh

 Start 2022, up to 100GWh

 Start 2023, up to 24GWh

 Start 2020, up to 1GWh

2028:

China: ~ 1,426 GWh (73 plants)

EU: ~ 331 GWh (12/13 plants)

USA: ~ 155 GWh (5 plants)

Global >2.000 GWh cell production capacity...


BENCHMARK MINERALS 2019

Infinity Lithium Corporation

 Start 2021, up to 40GWh

 Start 2023, up to 32GWh

 Started 2018 6GWh later up to 70GWh

 9GWh by 2020, to invest >\$800M in a 2nd plant

 Started 2018 3GWh, later 15GWh

 Potential plant in Hungary

 Potential plant in Europe

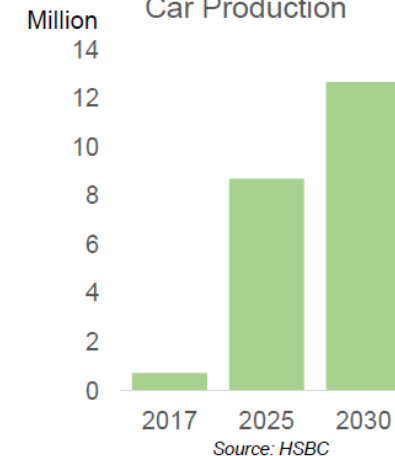
 Potential plant in Germany ??

 Potential plant in France

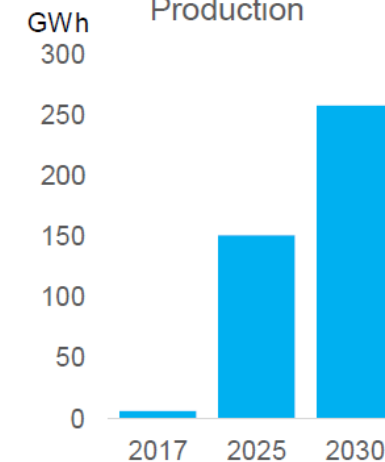
 To invest \$230M in Germany

Source: Infinity Lithium 11/2019

European Electric Car Production



Equivalent Battery Production



300 GWh: Kobalt 50 %, Lithium 60 %, Nickel 6 %

A Number Of Cathode Plants Planned In Europe In The Early 2020s

Northvolt is also planning to build its cathodes in-house after they start their battery factory in Sweden

BASF and Norilsk Nickel to cooperate on raw material supply for battery materials production in Europe. BASF intends to invest up to €400M in a first step to build production plants for cathode materials in Europe

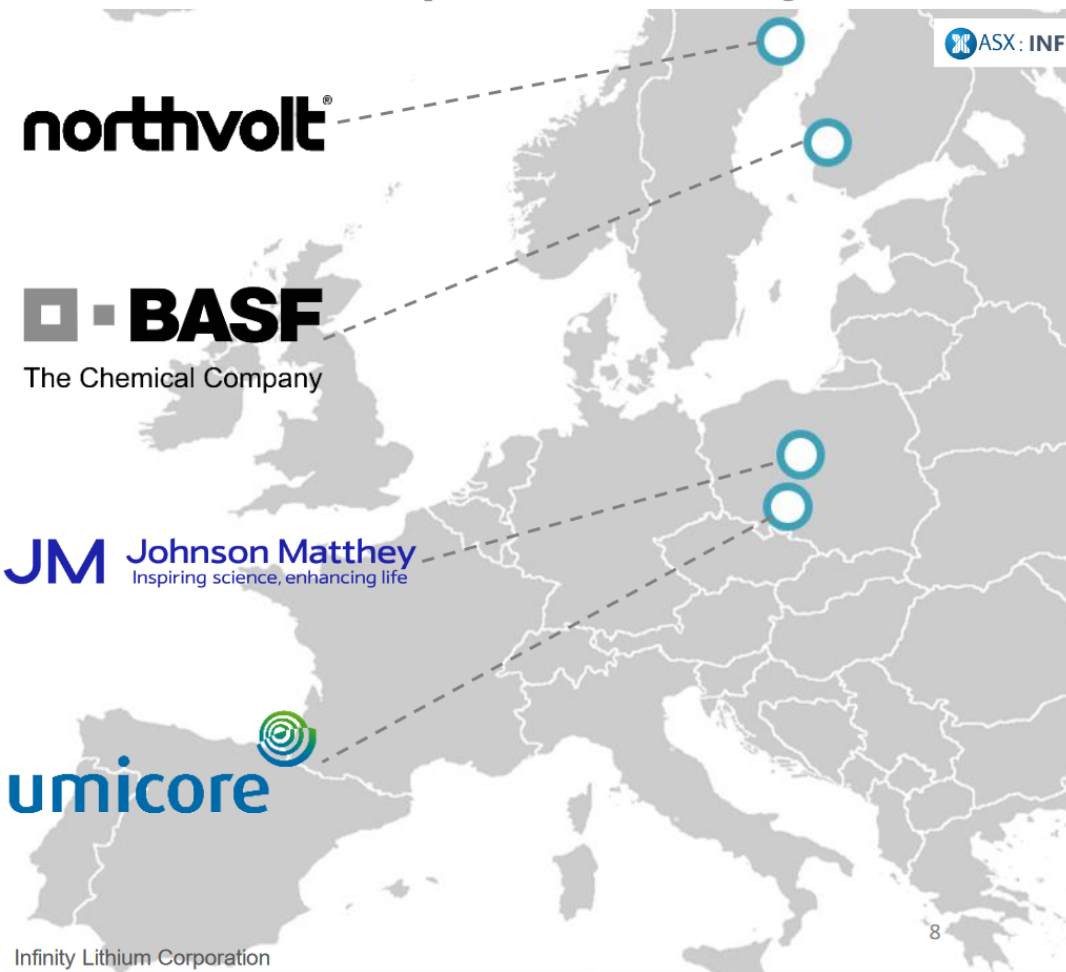
Johnson Matthey expects to start production in 2021-22 in Poland of a battery material it has developed with improved performance and reduced cobalt content to contain costs

Umicore is planning to build a cathode plant in Poland. The first phase of this investment is included in the €660M programme. Umicore is due to start deliveries in late 2020

Production at Harjavalta → End of 2020 (Cathodes for approx. 300.000 Evs)

Production of eLNO cathode at Konin → 2021/2022 (10.000 t - 100.000 t)

Lithium from Nemaska (Canada)



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EVolution of Mobility or Revolution???

Thank You

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