

VOLKSWAGEN

AKTIENGESELLSCHAFT

KONZERNFORSCHUNG

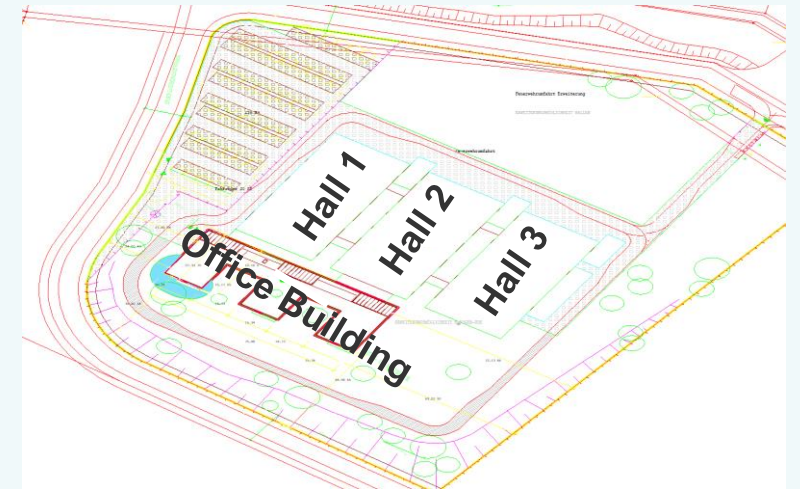


VOLKSWAGEN GROUP RESEARCH

BATTERY RESEARCH

EGVIA | BRUSSELS | 20.6.2018

WELCOME TO THE TECHNOLOGY CENTER IN ISENBÜTTEL



Complete Areal	ca.	38.000 m ²
Hall Area	ca.	6.800 m ²
Office area	ca.	2.800 m ²

HIGHLIGHTS 2016/2017

BATTERY

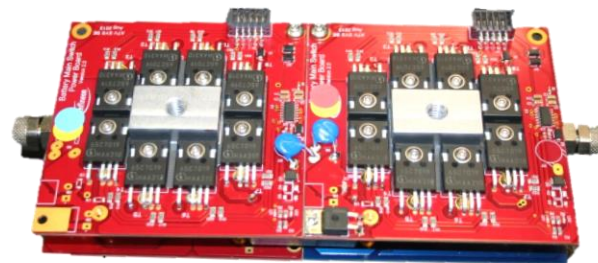
- Fundamental Understanding of Materials
- New Materials
- Modeling
- Cooling
- Production Process
- Scouting



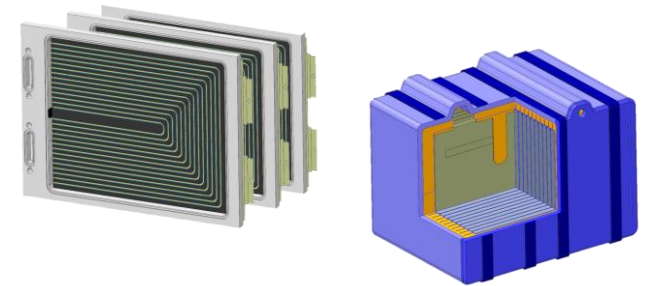
KNOW-HOW TRANSFER & CONSULTING



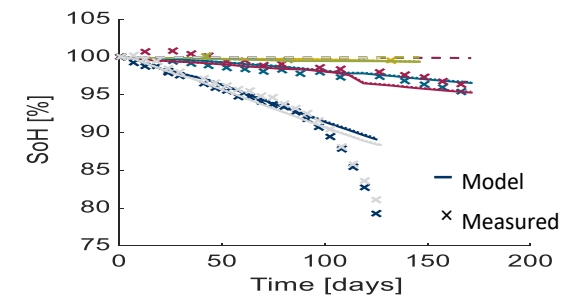
SEMICONDUCTOR SWITCH: TRANSFER TO MEB



COOLING



AGING MODEL

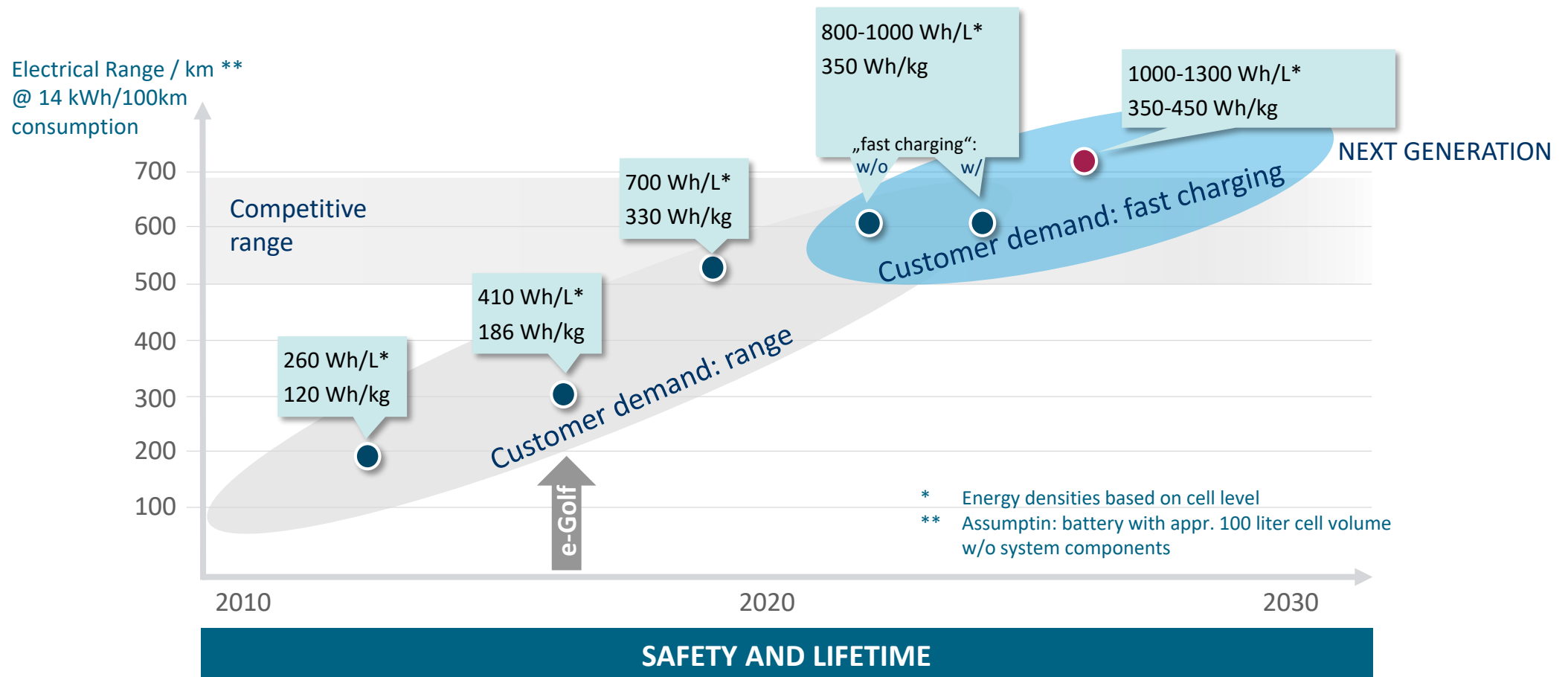


ENLARGEMENT AND EXPANSION OF BATTERY ACTIVITY

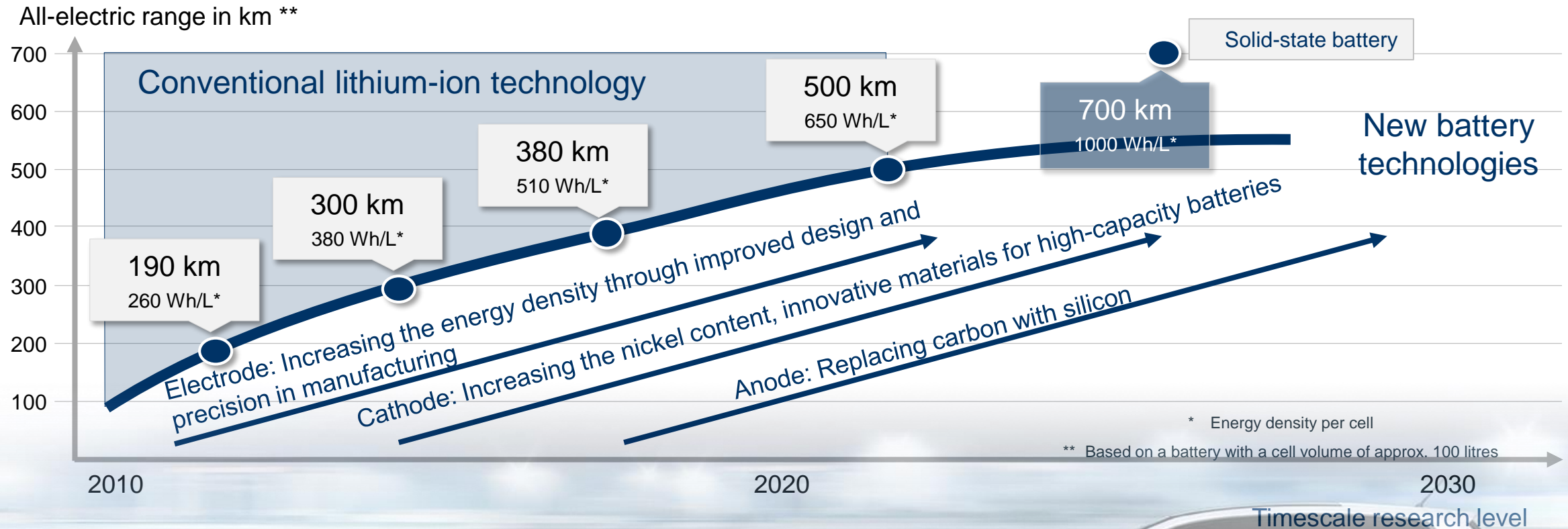


BATTERY ROADMAP – MAIN TECHNOLOGY DRIVERS

ADDITIONAL FOCUS ON FAST CHARGING



BEYOND LITHIUM-ION BATTERY: SOLID STATE BATTERY

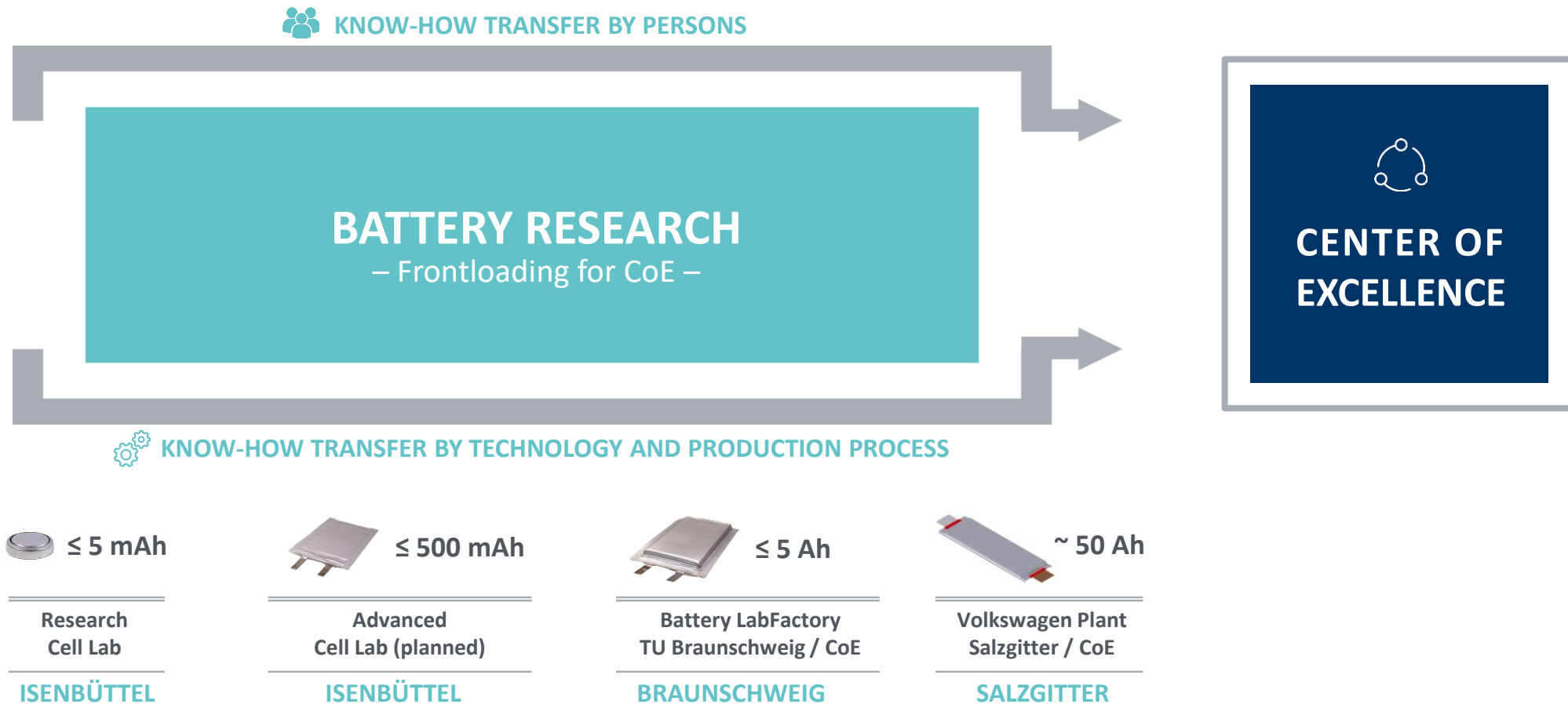


REQUIREMENTS BATTERY RESEARCH

	Target values
Fast Charging	15 min @ 10% - 80% SOC @ 10°C – 45°C
Cycle Life	No additional aging budget for 200 fast charging cycles ≥ 80% capacity retention @ 800 cycles, 80% DOD (C/3 Charge&Discharge) @ 100% DoD @ 45°C ≤ 50% DC- resistance rise @ 800 cycles, 100% DoD @ 45°C
Energy Density	≥350 Wh/kg ≥800 Wh/l
Power Density	1000 W/kg 2000 W/l
Safety	Hazard Level ≤ 4 BoL and EoL
Temperature	-30°C to +60°C
	-40°C to +70°C

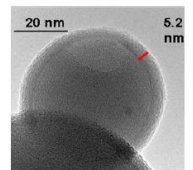
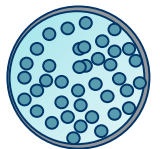


TECHNOLOGY AND PROCESS TRANSFER



TECHNOLOGY APPROACH: PREFERRED PARTNER

	COMPANY	Energy	Fast charging	Safety	Lifetime	CORE TECHNOLOGY
Cell	A	+	+	+		<ul style="list-style-type: none"> All solid state
	B	+	+	+		<ul style="list-style-type: none"> New separator New electrolyte Nickel-rich material
	C			+		<ul style="list-style-type: none"> Ceramic separator
	D	+	+			<ul style="list-style-type: none"> Process know-how
Anode	E	+			+	<ul style="list-style-type: none"> Nanostructured core shell silicon material
	F	+	+			<ul style="list-style-type: none"> Nanostructured 3D electrode architectures
Cathode	G			+	+	<ul style="list-style-type: none"> Coated active material
Electrolyte	H	+			+	<ul style="list-style-type: none"> Electrolyte



Particle coatings

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THANK YOU!