



Electric Vehicle Outlook 2020

Presentation for ASEAN ENERGY DAY

FOCUS POINTS

- 1 EV Sales Outlook & Forecasts
- 2 Impact of COVID on EVs
- 3 Key Technology Trends in EV Battery
- 4 EV Charging Station Installation Base
- 5 Infrastructure as a Service – Emergence of New Business Models
- 6 Q&A session



.....but what is transforming e-mobility?

TRANSFORMATIONAL SHIFTS RESHAPING E-MOBILITY

Batteries – Lithium and Beyond



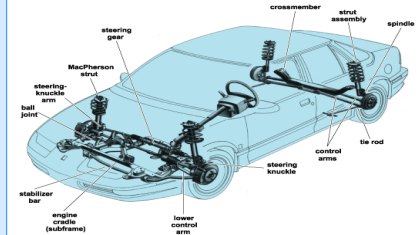
Charging: Slow → Fast → Rapid → Ultrafast



Mega Cities – Ultra low emission zones



Indigenous Platforms - Integration of Systems



New Business Models – "Infrastructure as a Service"



EV Retailing Transformation



Smart Grid – V2G, V2H, Balancing etc.



Cognitive Era and Autonomous Mobility

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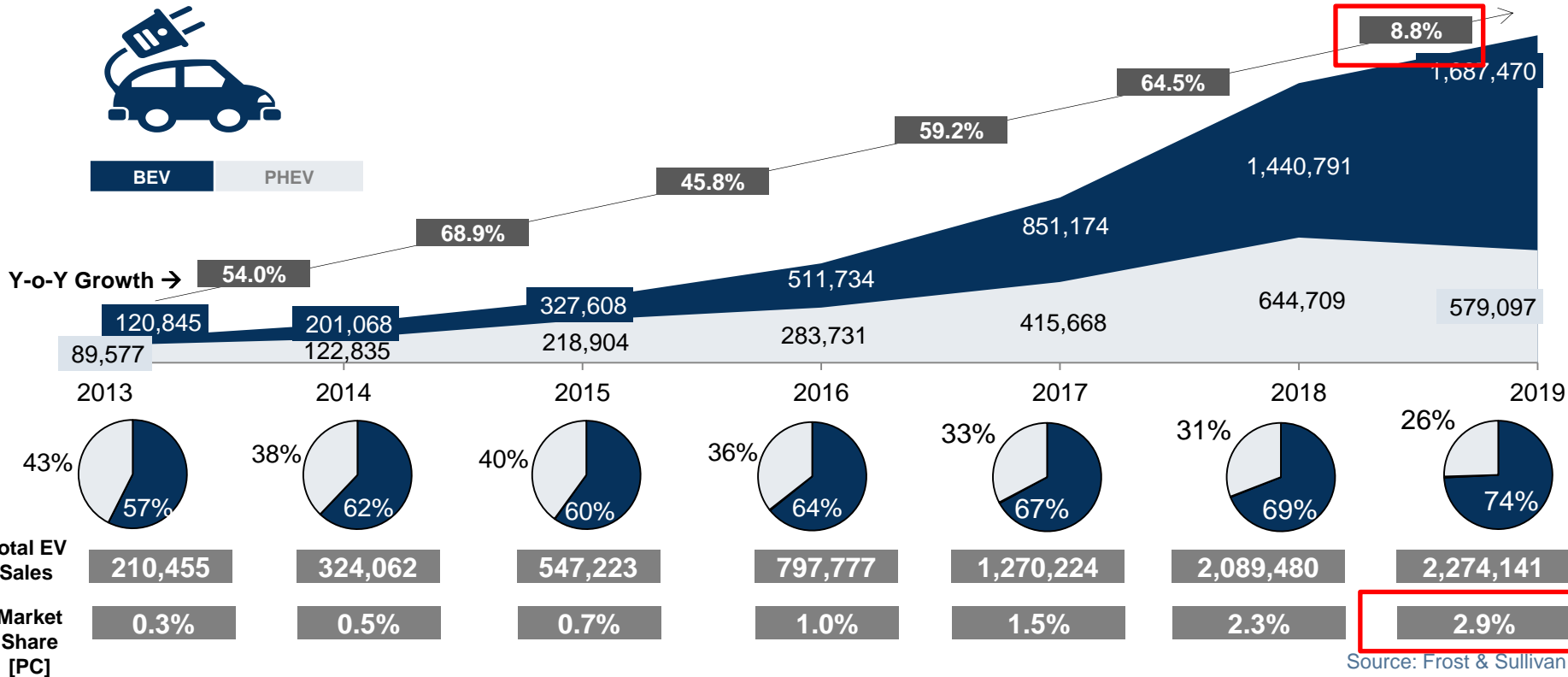


HISTORIC EV SALES : ABOUT 2.2 MILLION ELECTRIC VEHICLES WERE SOLD IN 2019 WITH A LOWEST Y-O-Y GROWTH RATE TILL DATE. CHINESE EV MARKET FELL FLAT DUE TO PHASE OUT OF INCENTIVES

Electric Vehicle Outlook: Historic EV Sales, Global, 2013-2019



BEV PHEV

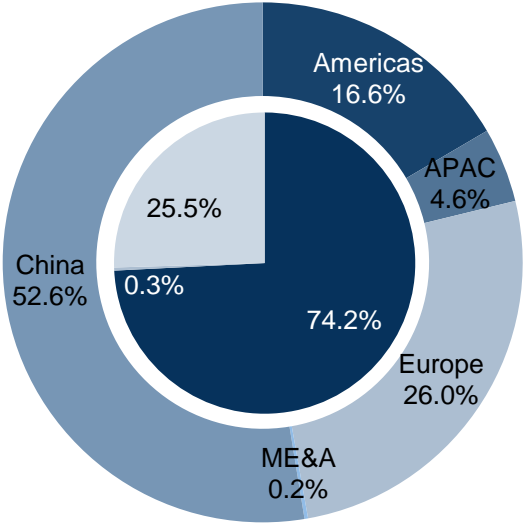


Source: Frost & Sullivan

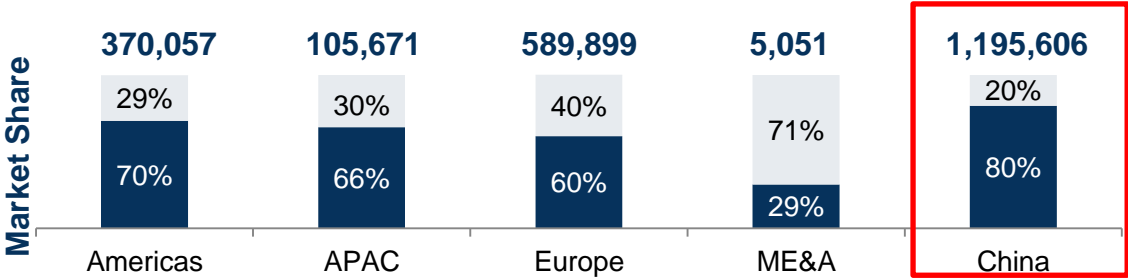
EV MARKET VEHICLE 2019 – GLOBAL: CHINA CONTINUES TO LEAD THE MARKET WITH OVER 52.6% MARKET SHARE WITH ABOUT 1.2 MILLION UNITS SOLD. MARKET GROWTH REALLY CAME FROM EU – GREW BY 65%

Electric Vehicle Outlook: Market Outlook, Global, 2019

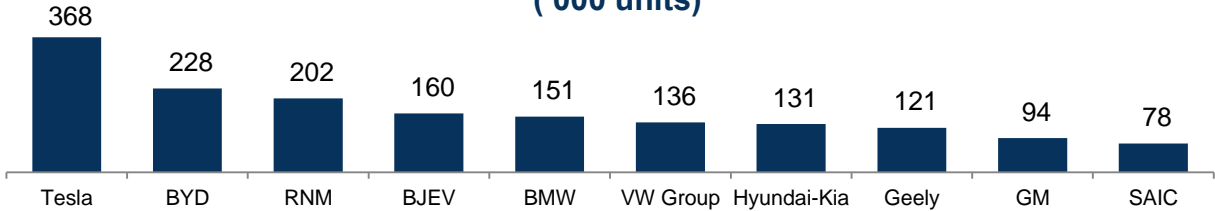
2,274,141 EVs sold in 2019	345 (221 BEV & 124 PHEV) Models for Sale	~6,554,875 Total EV Car Parc	>320,000 Charging Stations
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BEV **PHEV**



Electric Vehicle Outlook: EV Sales Split by Top OEMs, 2019 ('000 units)

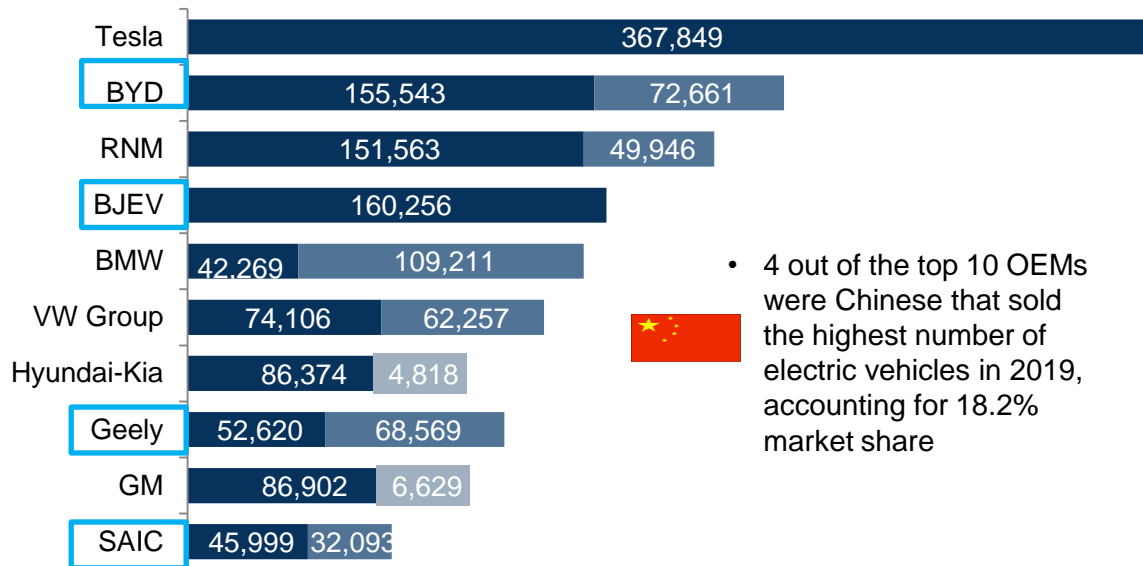


TOP 10 OEMS

Electric Vehicle Outlook: Top 10 OEMs, Global, 2019

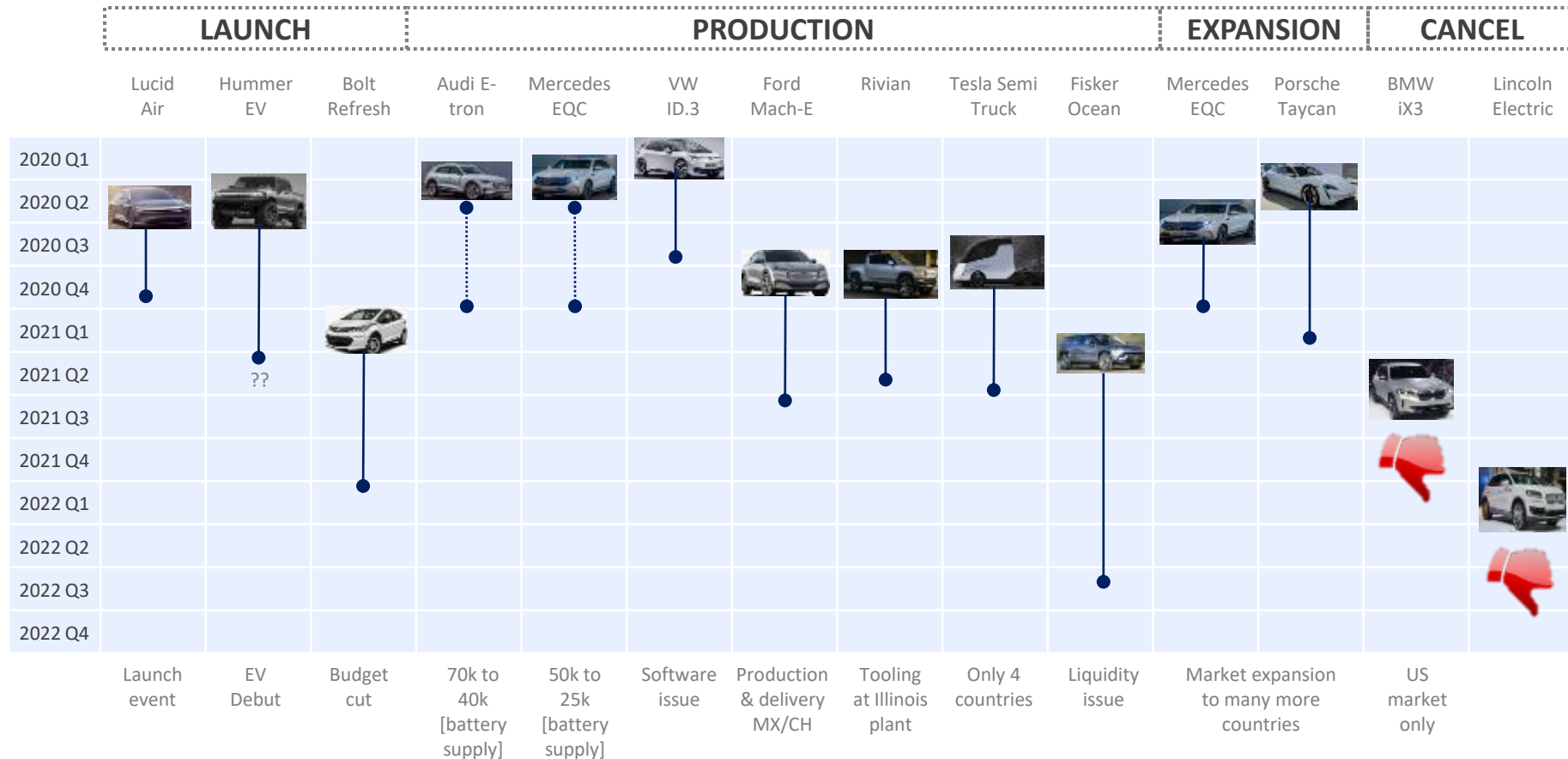
BEV

PHEV

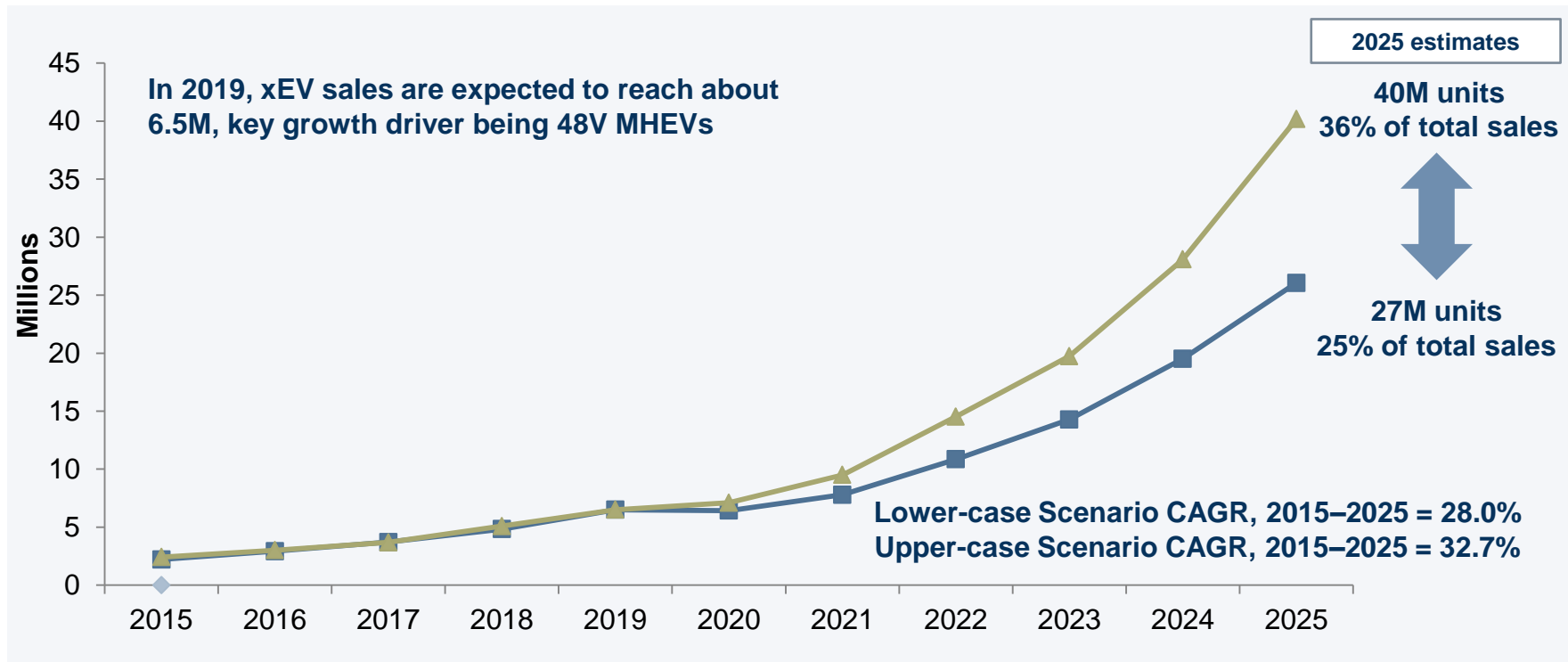


- 4 out of the top 10 OEMs were Chinese that sold the highest number of electric vehicles in 2019, accounting for 18.2% market share

EV MODELS IMPACTED DUE TO COVID19 CRISIS



TOTAL XEV MARKET SCENARIO ANALYSIS: IN AN UPPER-CASE SCENARIO FOR XEVs, ALL OEMs ARE EXPECTED TO COMPLY WITH EMISSION TARGETS; TECHNOLOGICAL ADVANCEMENTS, ECONOMIC FACTORS AND CONSUMER ACCEPTANCE OF XEVs ARE KEY FACTORS FOR DETERMINATION



Note: This graph includes hybrids (electrified cars without a plug) as well
Regions: NA, EU, JP, CH, SK, IND

Source: Frost & Sullivan

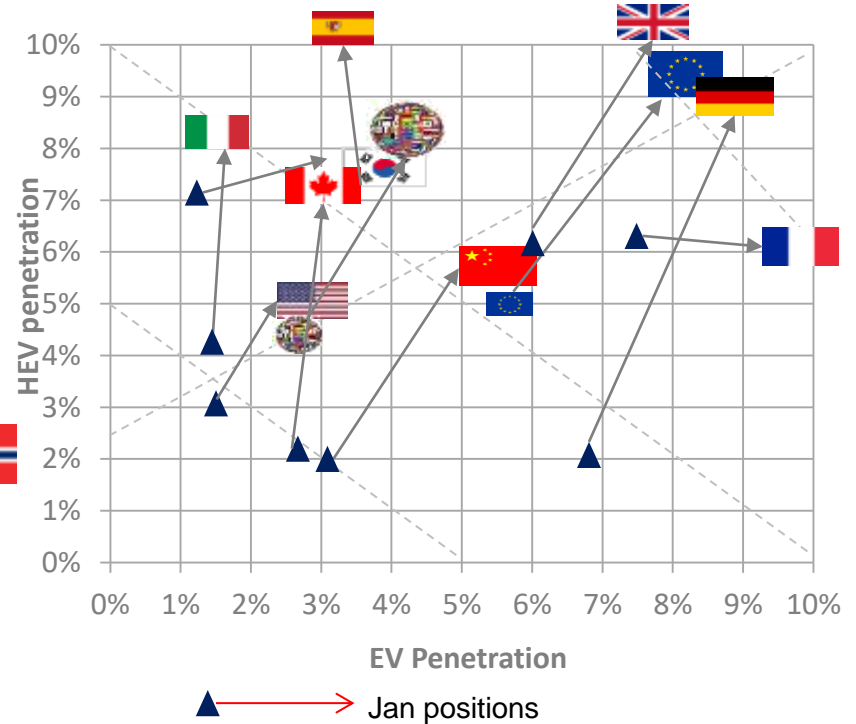
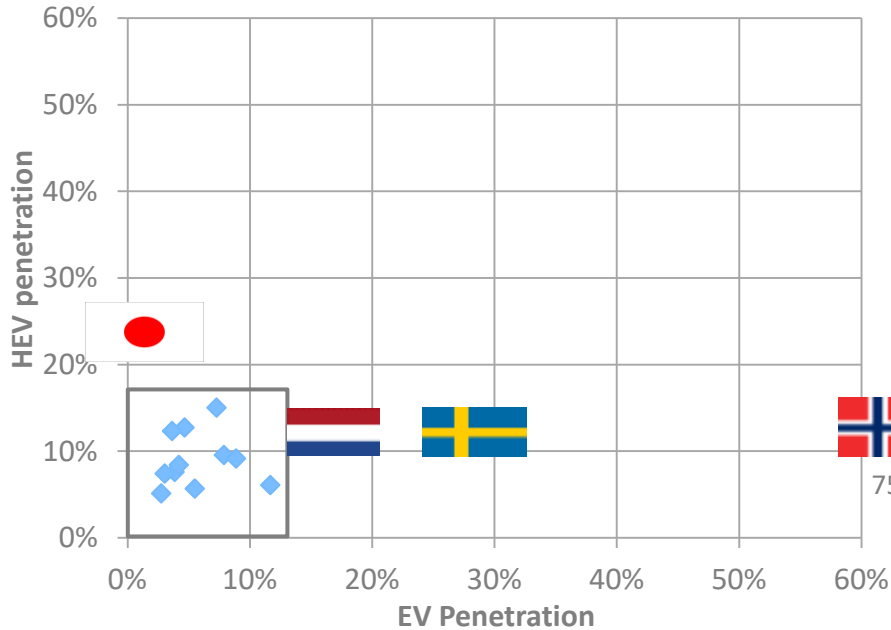
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EV & HEV PENETRATION DASHBOARD: JAN → MAR

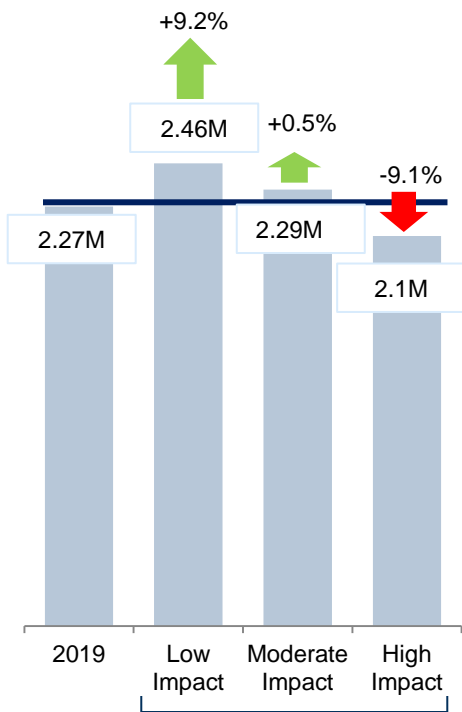
- % of Passenger Vehicle Sales, January progression to March 2020 -



IMPACT OF COVID-19 ON GLOBAL EV SALES

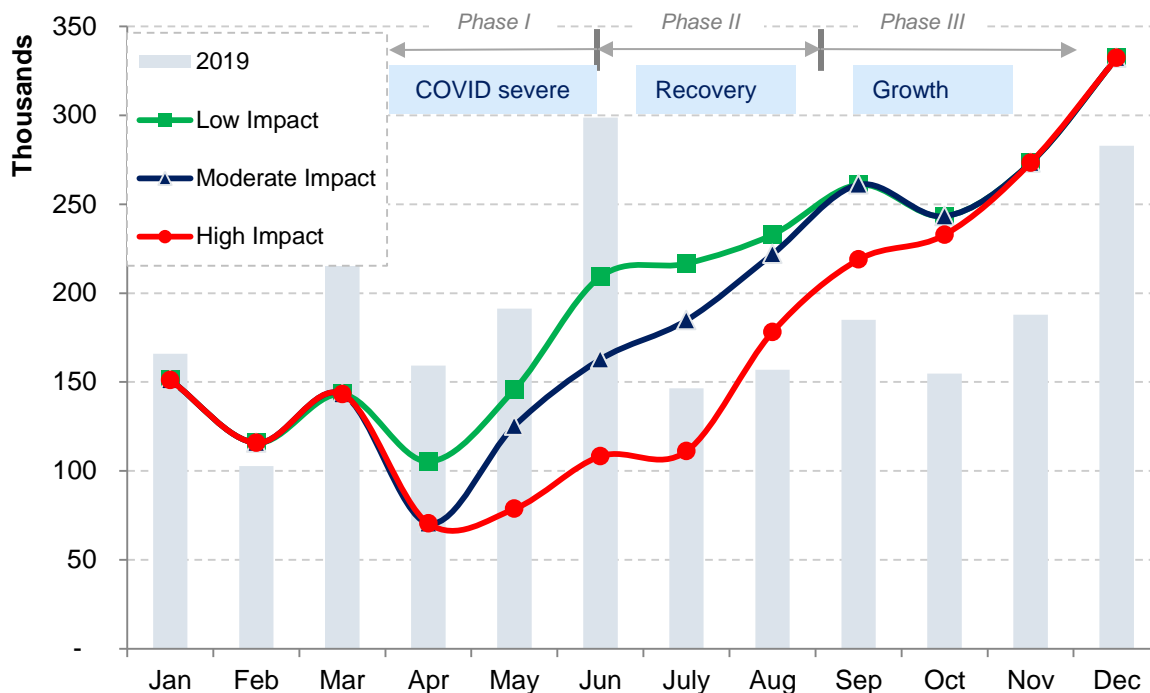
EVEN BEST CASE SCENARIO WILL NOT RECOVER TILL JUNE, BUT POST-RECOVERY IS EXPECTED TO HAVE A HEALTHY GROWTH.

Impact of COVID-19, Global, 2019-20



2020e

Impact of COVID-19 on EVs: Scenario Estimates, Global, 2019-2020

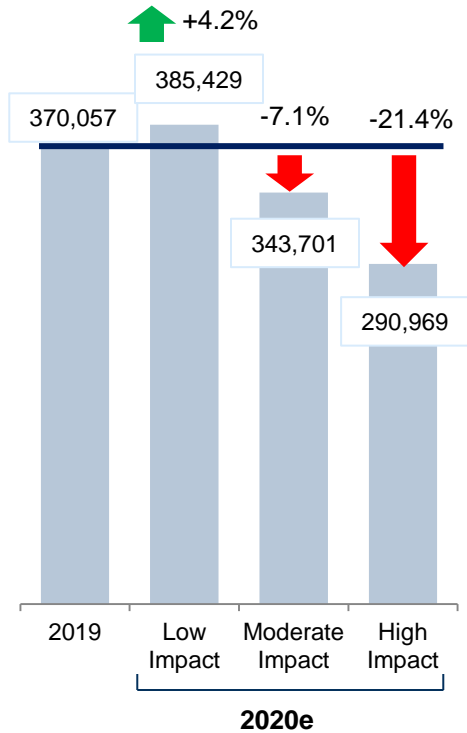


As analysed on 16th April 2025

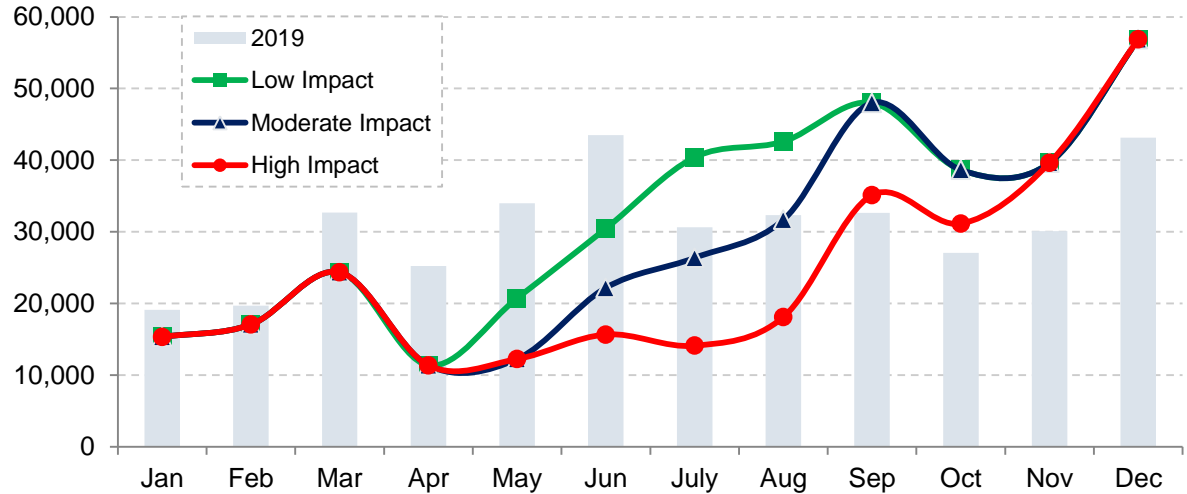
IMPACT OF COVID19 ON AMERICAS EV SALES 2020



Impact of COVID-19, Americas, 2019-20



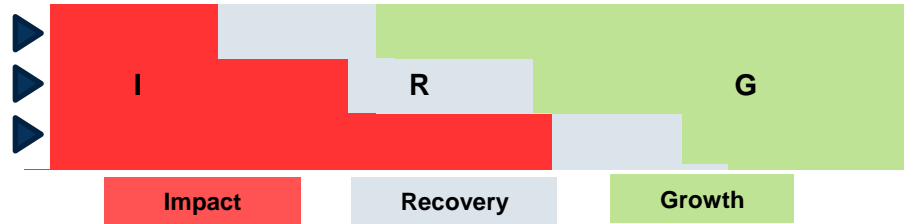
Impact of COVID-19 on EVs: Scenario Estimates, Americas, 2019-2020



Scenario: Low Impact

Scenario: Moderate Impact

Scenario: High Impact

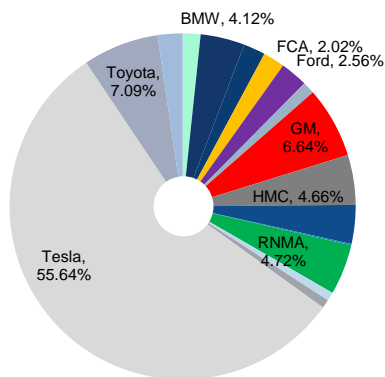


MARKET SHARE ANALYSIS OF USA EV SALES

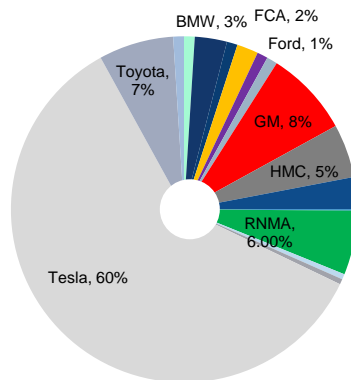
TESLA AND GM LIKELY TO GAIN MARKET SHARE DRIVEN BY COMPETITOR SUPPLY CHAIN ISSUES + FALLING MARKET VOLUMES



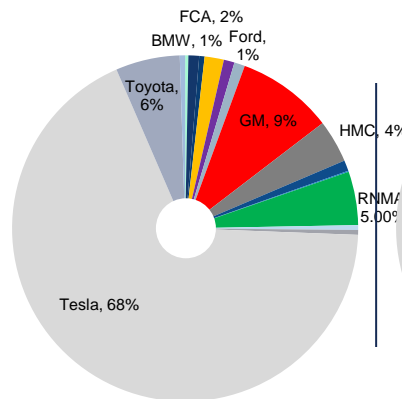
2019 Market Share [MS], USA



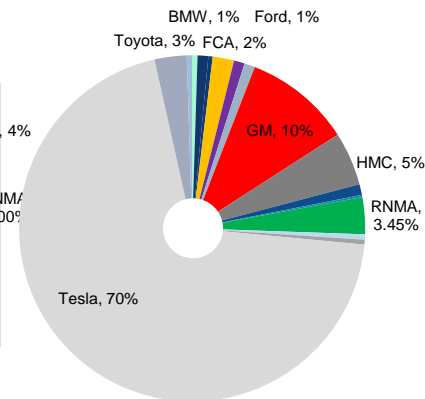
2020 MS, Low Impact (USA)



2020 MS, Moderate (USA)



2020 MS, High Impact (USA)



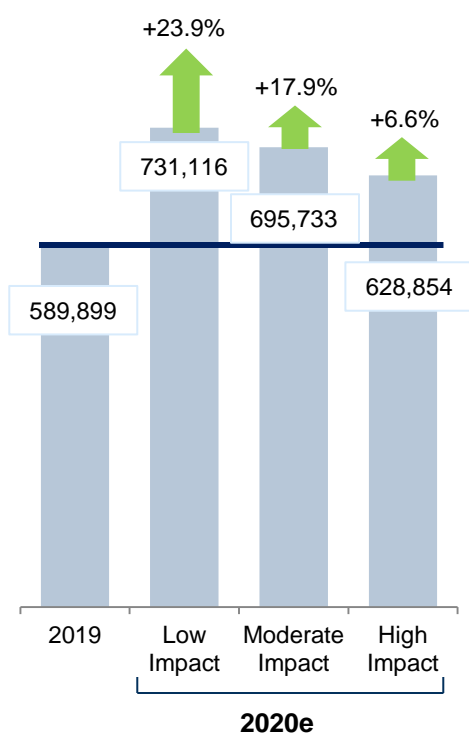
OEM	Market Share - 2019	Market Share - 2020		Market Share - 2020		Market Share - 2020	
Tesla	55.5%	60%	🟢	68%	🟢	70%	🟢
GM	6.6%	8%	🟢	9%	🟢	10%	🟢
Ford	2.5%	1%	🔴	1%		1%	
FCA	2%	2%	🔴	1.8%	🔴	2%	🟢
BMW	4.1%	3%	🔴	1%	🔴	1%	
VW (Porsche)	2%	1%	🔴	1%		1%	

Source: MarkLines, Frost & Sullivan Forecast

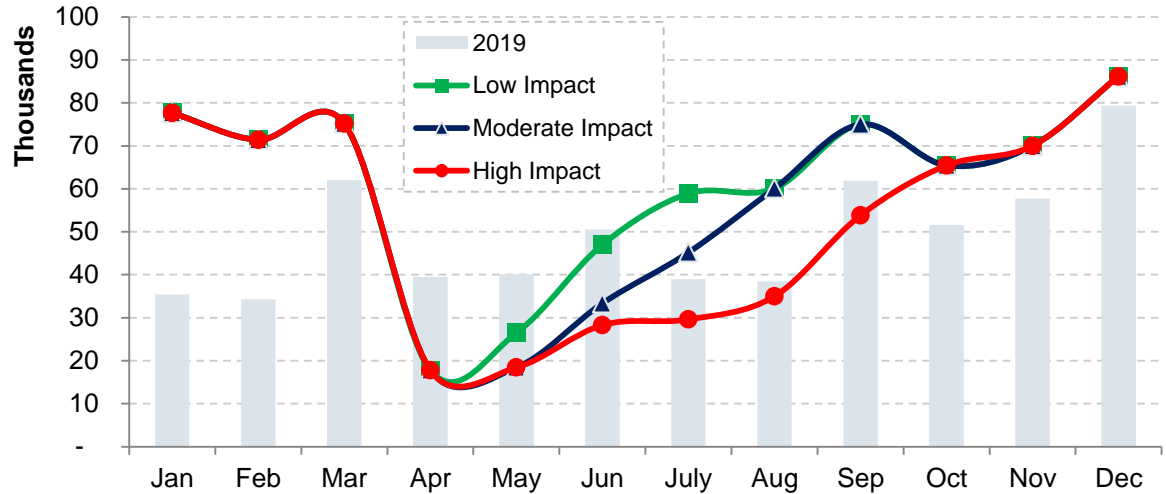
IMPACT OF COVID-19 ON EUROPE EV SALES

EUROPE HAD BEST Q1 AND LIKELY TO RECOVER FROM LOCKDOWN FROM JUNE. DESPITE COVID OUTBREAK EVS IN EUROPE IS EXPECTED TO GROW VS 2019 DUE COMPLIANCE PRESSURE AND CUSTOMER SEGMENTATION

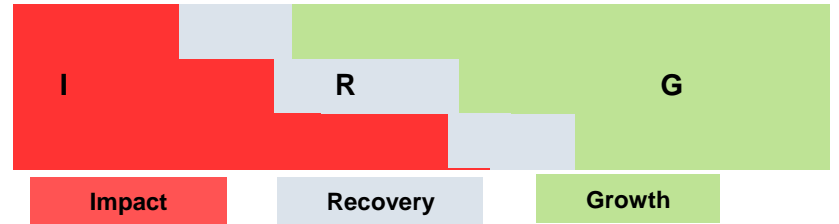
Impact of COVID-19, Europe, 2019-20



Impact of COVID-19 on EVs: Scenario Estimates, Europe, 2019-2020



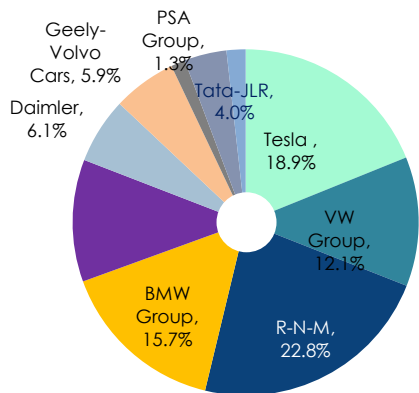
- Scenario: Low Impact
- Scenario: Moderate Impact
- Scenario: High Impact



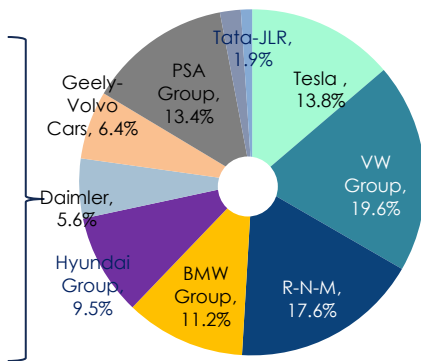
MARKET SHARE ANALYSIS OF EU EV SALES

DIFFICULT TO PREDICT A CLEAR LEADER FOR EU AT THIS STAGE. PSA IS THE OEM MAKING THE DIFFERENCE IN EU MARKET SHARES.

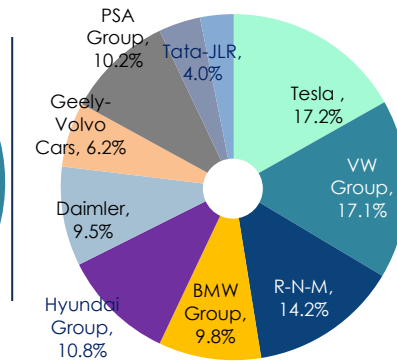
2019 Market Share [MS], EU



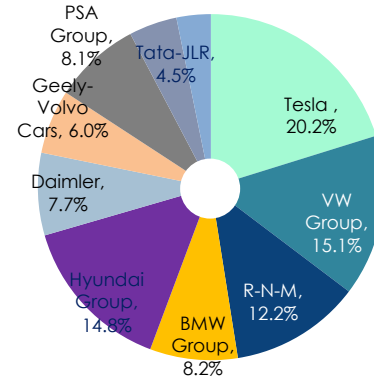
2020 MS, Low Impact (EU)



2020 MS, Moderate (EU)



2020 MS, High Impact (EU)



OEM	Market Share - 2019	Market Share - S1	Market Share - S2	Market Share - S3
Tesla Inc.	18.9%	13.8%	17.2%	20.2%
VW Group	12.1%	19.6%	17.1%	15.1%
R-N-M	22.8%	17.6%	14.2%	12.2%
BMW Group	15.7%	11.2%	9.8%	8.2%
Hyundai	11.4%	9.5%	10.8%	14.8%
PSA Group	1.3%	13.4%	10.2%	8.1%

FOCUS POINTS

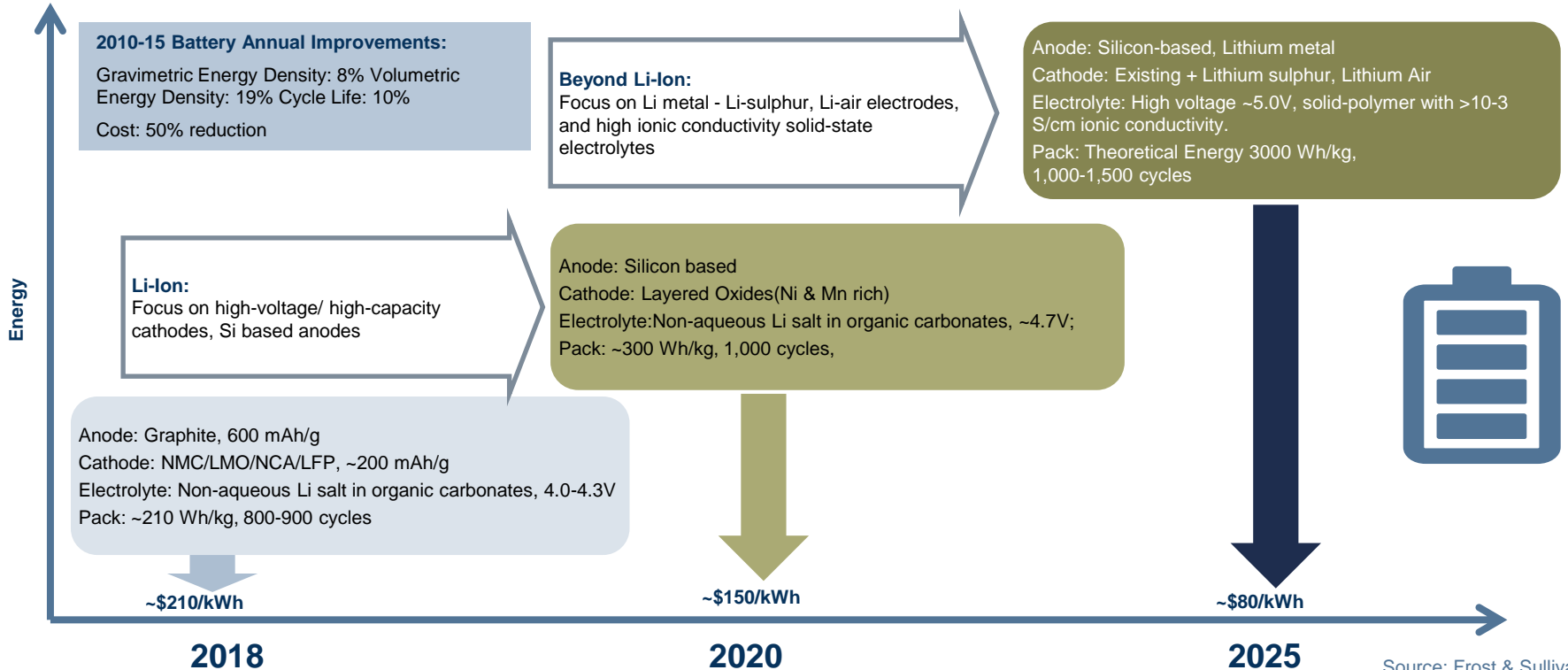
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LITHIUM-ION BATTERIES CONTINUE TO MAKE PROMISING GAINS

THE WORLD OF BATTERIES IS CHANGING VERY RAPIDLY, MAKING IT VERY HARD TO PREDICT THE MOST PROMISING BATTERY CHEMISTRY

Battery Technology Improvements, Global, 2018–2025



BEYOND 2025—SOLID-STATE BATTERIES

POST 2025, SOLID-STATE BATTERIES WILL BE IMPLEMENTED IN EVS DUE TO THEIR SAFETY FEATURES AND LONGER RANGE SUPPORT

Partnerships



SAMSUNG



2X energy density,
800 mile range

Research and Development



500 mile range



Solid State Batteries



TOYOTA

Launch of solid- state batteries
in cars by 2023–2025



Calculating a timeline of
2025/26 for the technology

Announcements

Investments of more than \$1 billion for
electric vehicle with solid-state battery



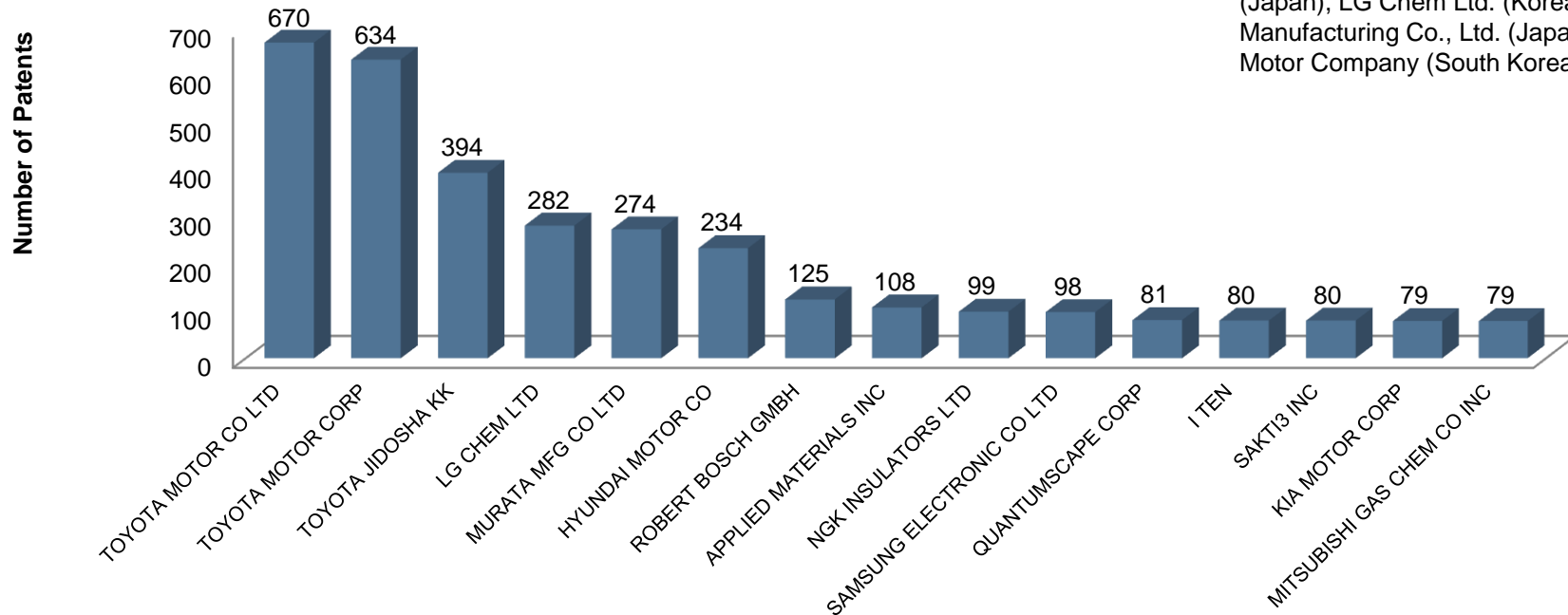
Mercedes-Benz



Investment and Acquisition

IP ANALYSIS: TOP ASSIGNEE FOR SOLID STATE BATTERY

Solid State Battery: Top Patent Assignee, 2010-2020*



The patent analysis of solid state battery reveals that maximum patent have been filed by Toyota Motor Corporation (Japan), LG Chem Ltd. (Korea), Murata Manufacturing Co., Ltd. (Japan), Hyundai Motor Company (South Korea).

Top Solid State Battery Patent Assignee

FOCUS POINTS

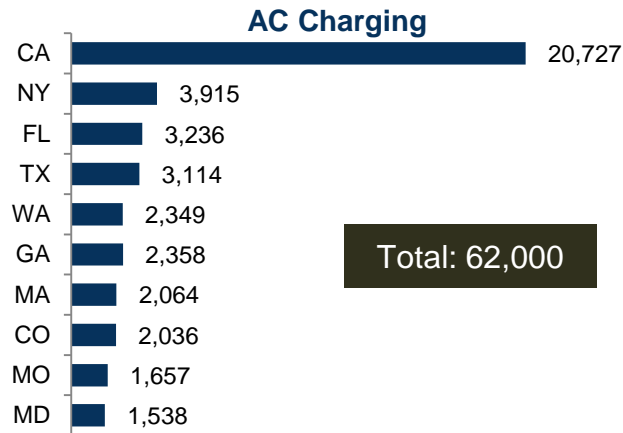
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CHARGING POINTS INSTALLATION BASE – AMERICAS

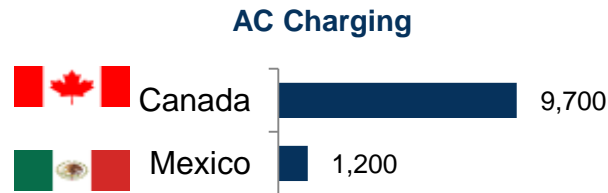
USA HAS A INSTALLED BASE OF 62,000 AC CHARGING POINTS AND 13,200 DC CHARGING POINTS

Electric Vehicle Outlook: EV Charging Points (Top 10 states), US, 2019



CCS	CHM	Tesla	Total	Leading EV Charging Operators
1100	800	2000	24,627	Aerovironment, Avcon, Beharged, Blink Network, Chargepoint, Clipper Creek, Eaton, Electrify America, EV Connect, EV Box, EV Gateway, EVGO Network, GE Wattstation, Greenlots, Magne Charge, Nissan, NRG EVGO, Opconnect, RCS, Revolta, Semacharge, Shorepower, Sun Country, Tesla, Volta, Webasto
80	60	400	4,555	
140	100	420	3,896	
150	90	400	3,754	
160	130	215	2,854	
108	85	150	2,701	
65	50	180	2,359	
90	52	125	2,303	
50	25	100	1,832	
118	90	152	1,890	

EV Charging Points, Canada and Mexico, 2019



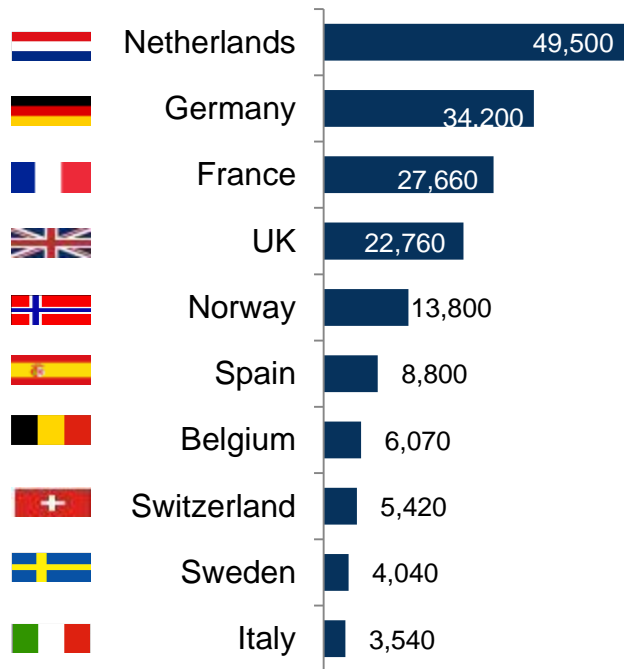
DC Charging Installations and Key Players, Americas, 2019

CCS	CHM	Tesla	Total	Leading EV Charging Operators
400	450	900	11,550	Aerovironment, Azra, Becharged, Chargepoint, Circuit Electrique, Clipper Creek, Eaton, FLO, Greenlots, NBP Echarge, Petro Canada, Semacharge, Sun Country
15	20	12	1,337	Chargenow, Tesla and other providers

CHARGING POINTS INSTALLATION BASE – EUROPE

NETHERLANDS HAS THE HIGHEST NUMBER OF AC CHARGING STATIONS FOLLOWED BY GERMANY. UK AND GERMANY LEADS IN INSTALLATIONS OF DC CHARGING STATIONS

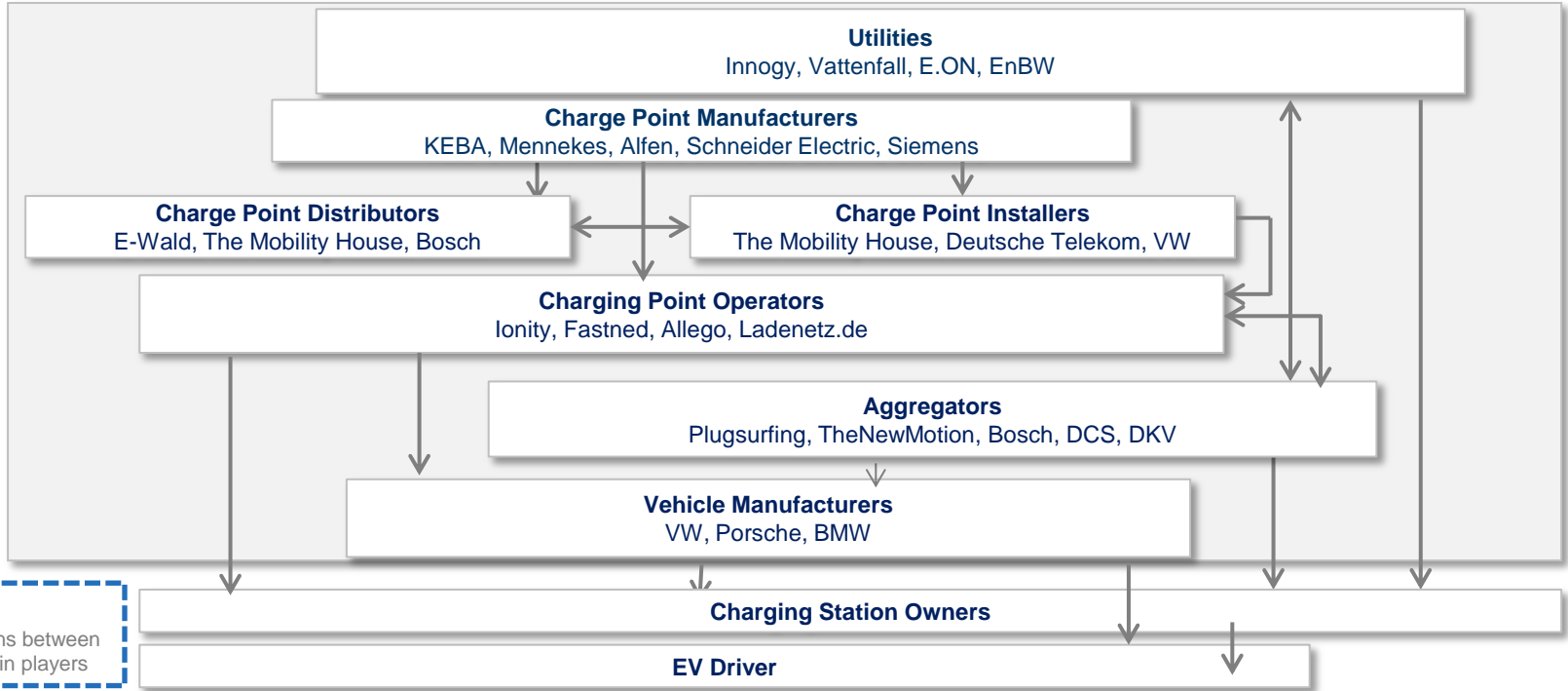
AC Charging Installation Base (Top 10 countries)



DC Charging Installation base and Key Players, Europe, 2020

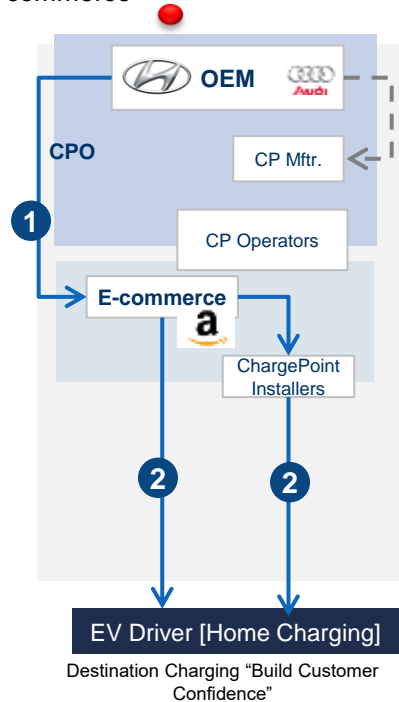
CCS	CHM	Tesla	Total [AC+DC]	Leading EV Charging Operators
450	360	260	50,570	Alfen, Allego, Chargepoint, Ecotap, E-iaad, Essent, EV Box, Fastned, Greenflux, Ionity, Nuon, Podpoint, RWE, The New Motion, Vattenfall
3,160	2,270	637	40,267	Alfen, Allego, Chargenow, Clever, Eon, EnBW, Essent, EV Box, Fastned, Ionity, Park & Charge, RWE, The New Motion, Ubitricity, Vattenfall
720	730	600	29,710	Alize, Autolib, Chargemaster, Drive Eco, Essent, E-totem, Freshmile, Ionity, Renault, Sdey, The Plugin Co
2,160	2,400	401	27,721	Alfen Allego, Chargenow, Eon, EDF, Ecotricity, Instavolt, Ionity, Nissan, Podpoint, RWE, Source London
1,340	1,460	622	17,222	AMB, Endesa, ENEL, Iberdola, Podpoint, Polar, Renault, tesla, Wenne
470	570	210	8,820	AMB, Endesa, ENEL, Iberdola, Podpoint, Polar, Renault, tesla, Wennea
113	96	150	6,429	Allego, BeCharged, Bluecorner, Ecotap, EDF, Enovos, EV Point, Greenflux, Mobib, TNM, ZeMO, Zencar
410	330	230	6,390	Beenergised, Chargenow, Easyforyou, Edrop, Essent, EWB, GoFast, Ionity, Swiss Charge
380	390	260	5,070	Charge & Drive, Clever, Ionity, Seom, Vattenfall
329	322	268	4,459	Alfen, BeCharge, Bluetorino, Drive, Eon, ENEL, EV Box, Ionity, Plugsurfing, TNM, Zapgrid

ELECTRIC VEHICLE CHARGING VALUE CHAIN → OPPORTUNITY FOR INFRASTRUCTURE AS A SERVICE

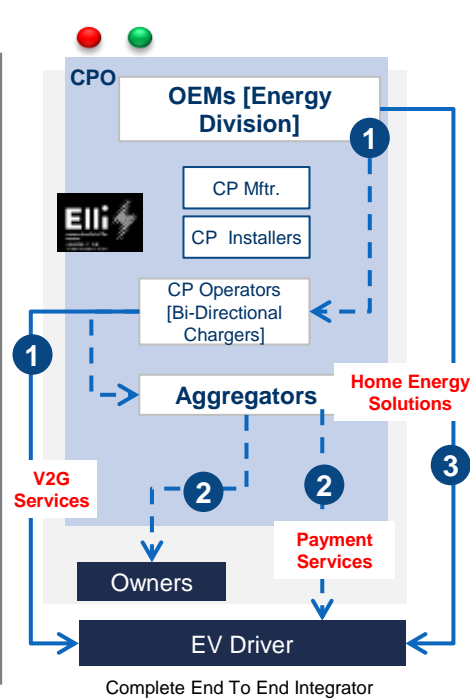


INFRASTRUCTURE AS A SERVICE - OEM BUSINESS MODEL TYPES

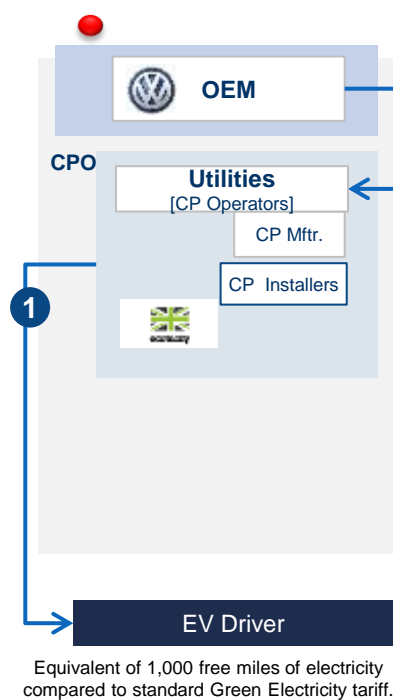
Type 1: OEMs as CPO's via E-commerce



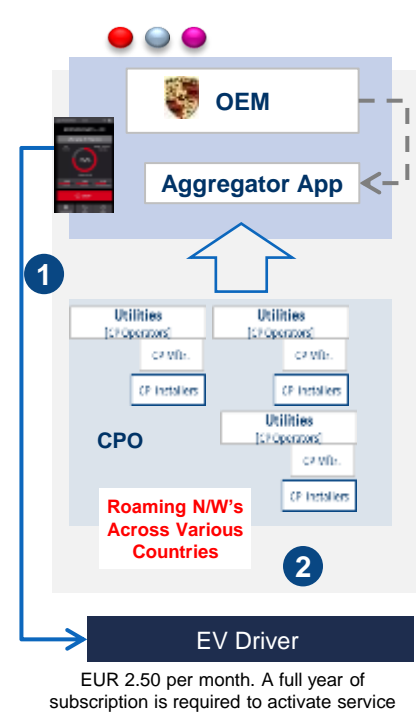
Type 2: OEMs "New Energy Division"



Type 3: OEMs Via "Utility" New Subscription Package



Type 4: Aggregator APP



Model best suited for ● Residence Charging ● Workplace/Destination ● Public Charging ● Fleets ● Highway

Research Portal= Knowledge Platform (登録・閲覧無料)

*弊社サービスご契約企業様とビジターで閲覧可能範囲が異なります。

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