

世界の充電インフラ 最新動向

CHAdEMO seminar

黒崎 美穂

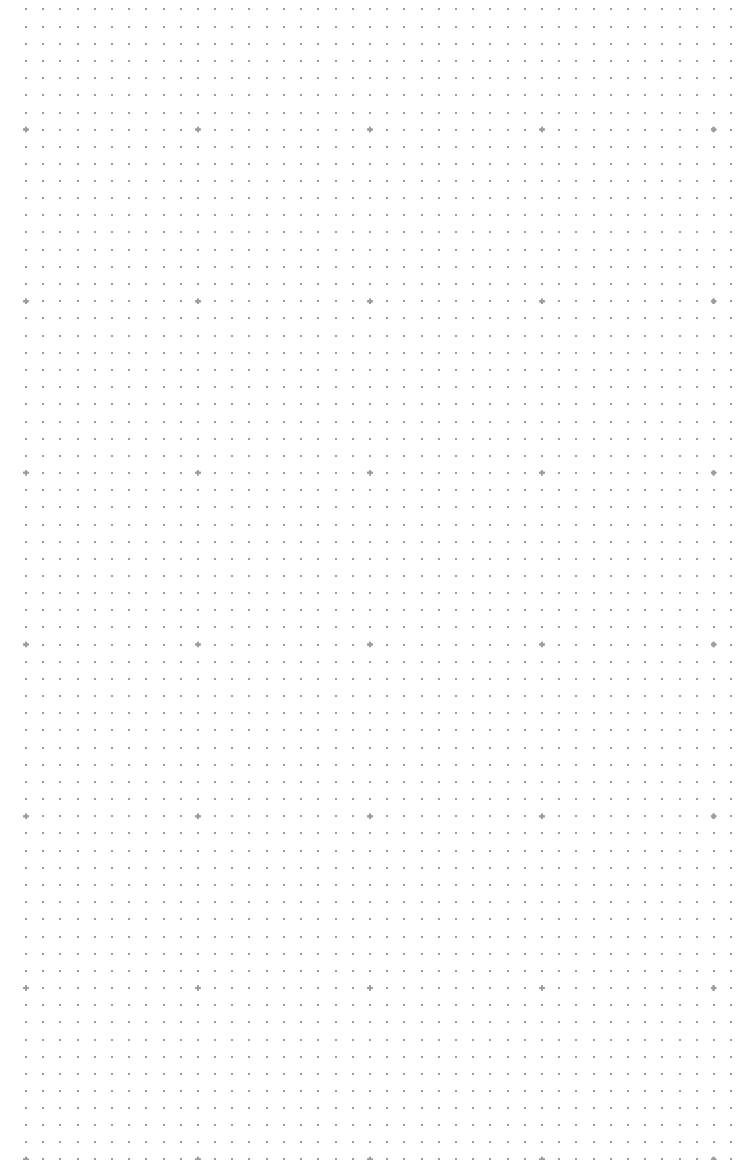
February 08, 2019

BloombergNEF

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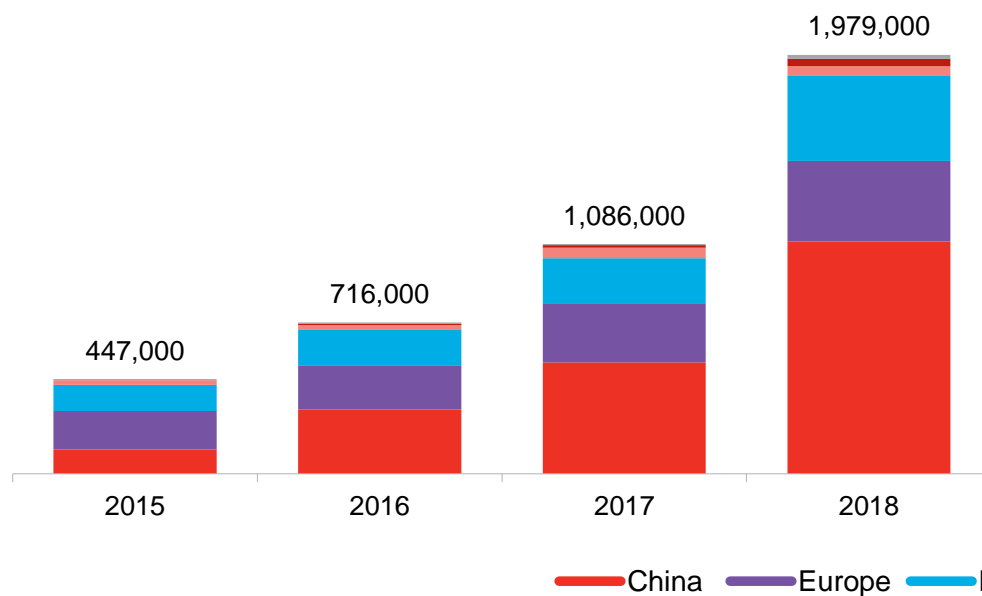
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電気自動車

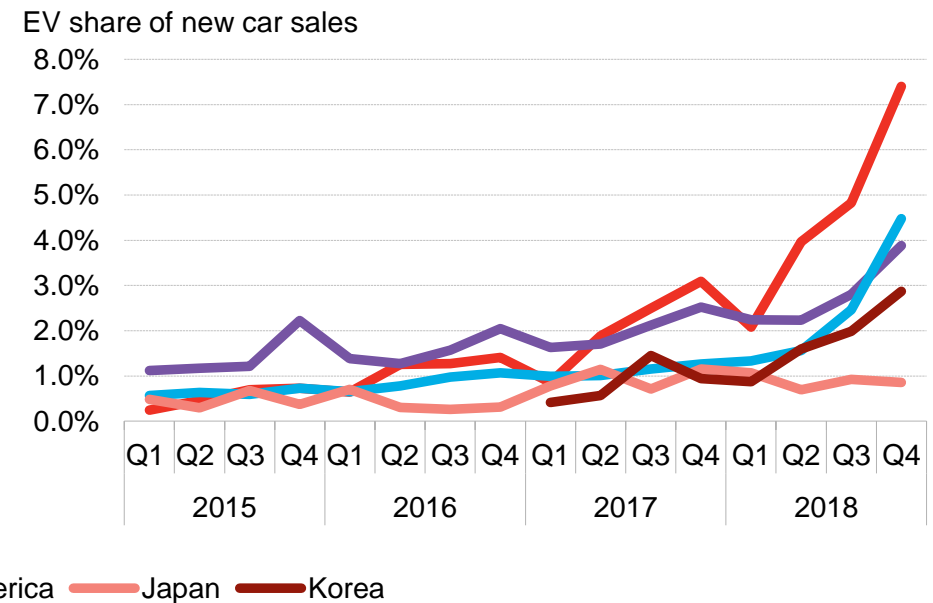


電気自動車の普及スピードは速くなっている

Global EV sales

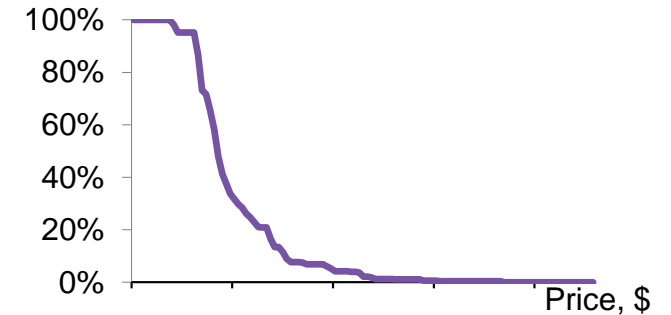
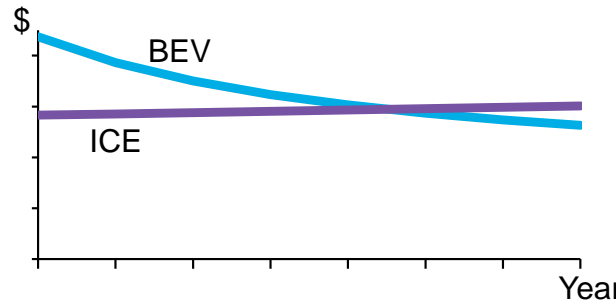
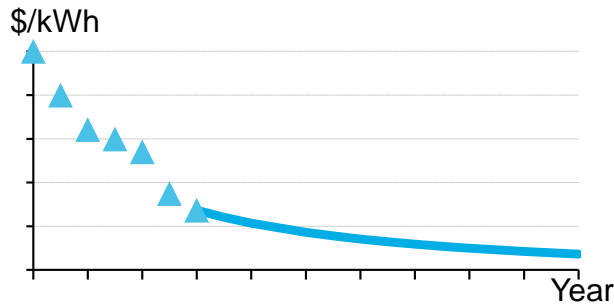


EV sales penetration by country



Source: BloombergNEF, EV includes BEVs and PHEVs. Some December 2018 data is estimated. Europe figure covers 16 main European vehicle markets

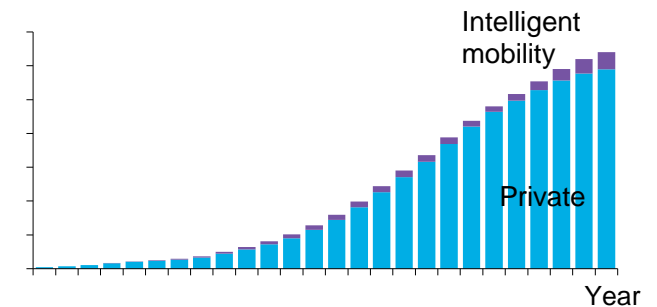
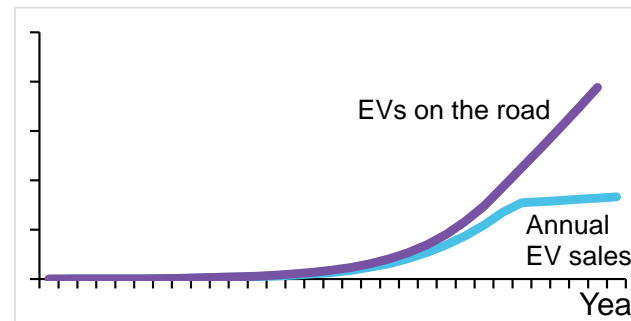
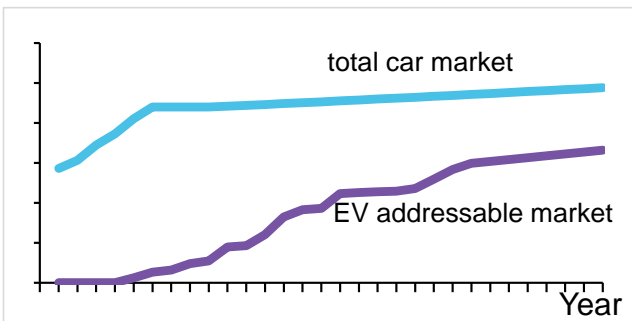
簡略化した長期電気自動車見通しの方法論



1 The **battery experience curve**

2 Allows us to estimate **retail prices of electric vehicles** and find when they become cheaper than combustion cars

3 We use the **'price-volume' map**: the way consumers spend their money in every region and market segment



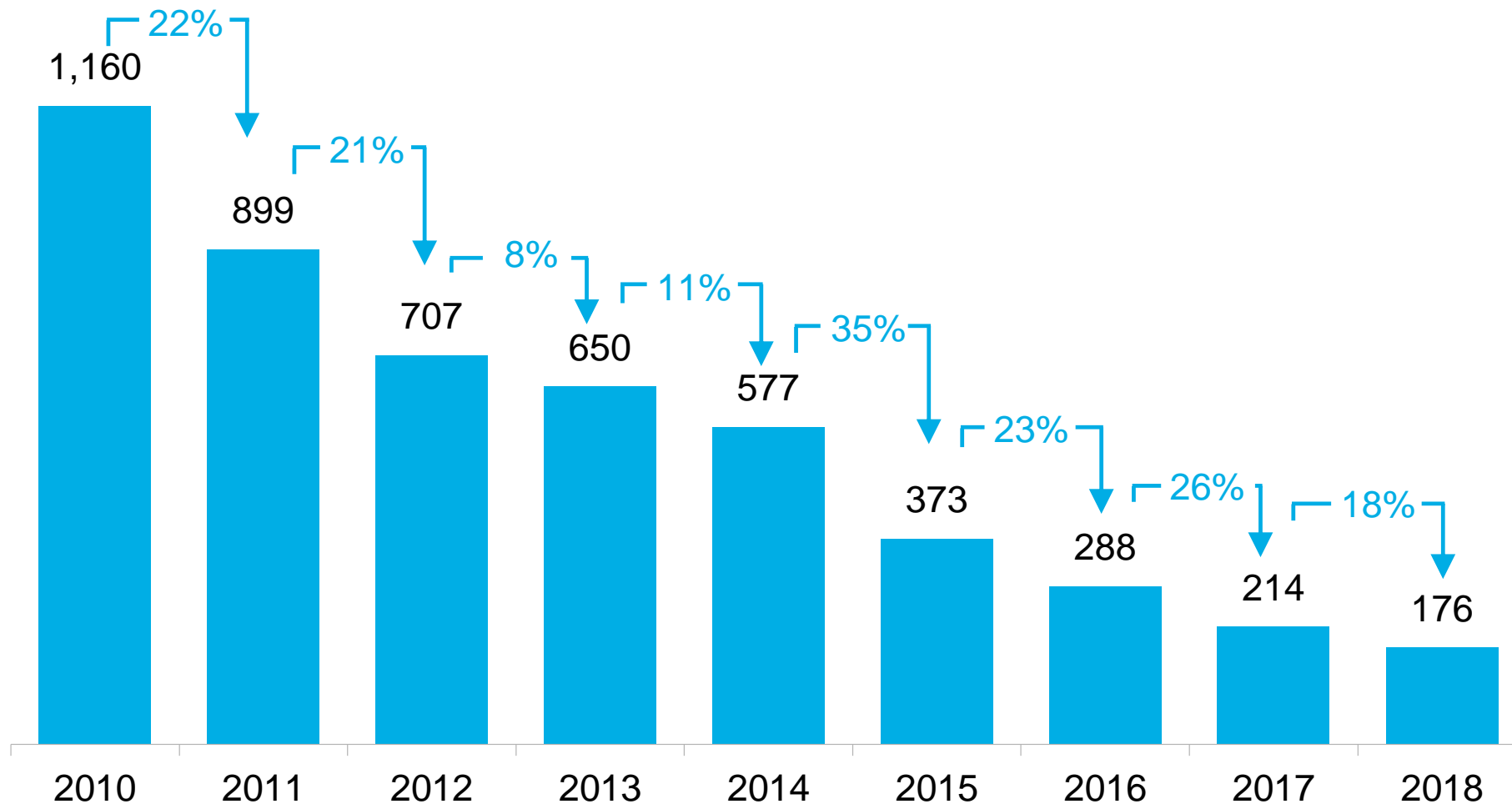
4 And we adjust the total car market to that implied by current year's electric vehicle costs: **the addressable market**

5 We use relative powertrain costs and demand elasticities to diffuse into the addressable market using the **Generalized Bass Diffusion** model

6 Finally, we add the effect of **Intelligent Mobility**: car-sharing, ride-hailing and autonomous cars

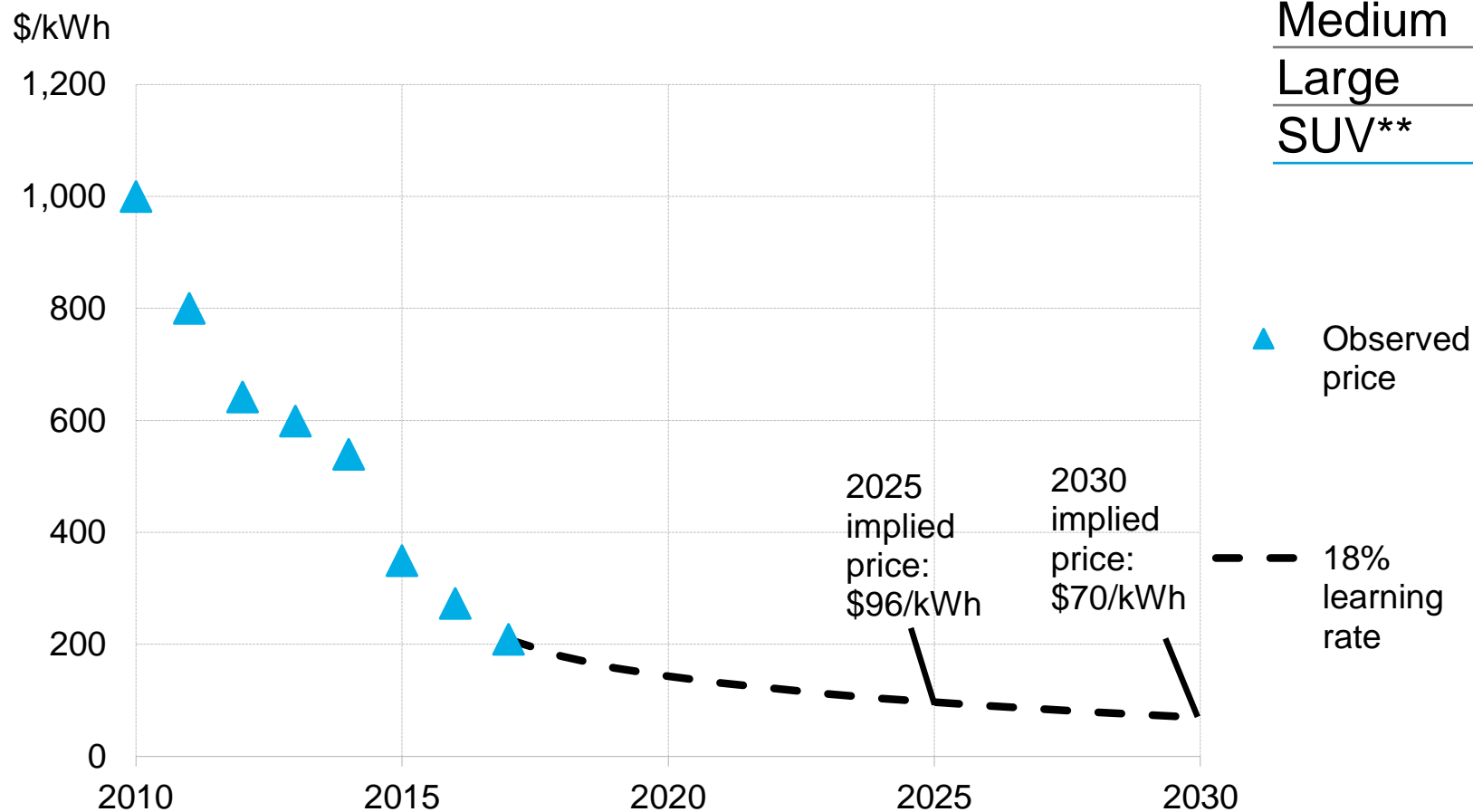
リチウムイオン電池価格調査結果： 加重平均

Battery pack price (real 2018 \$/kWh)



Source: BloombergNEF Note: The data in this chart has been adjusted to show real 2018 dollars

電気自動車の初期費用は内燃機関車と2024年に同等となる

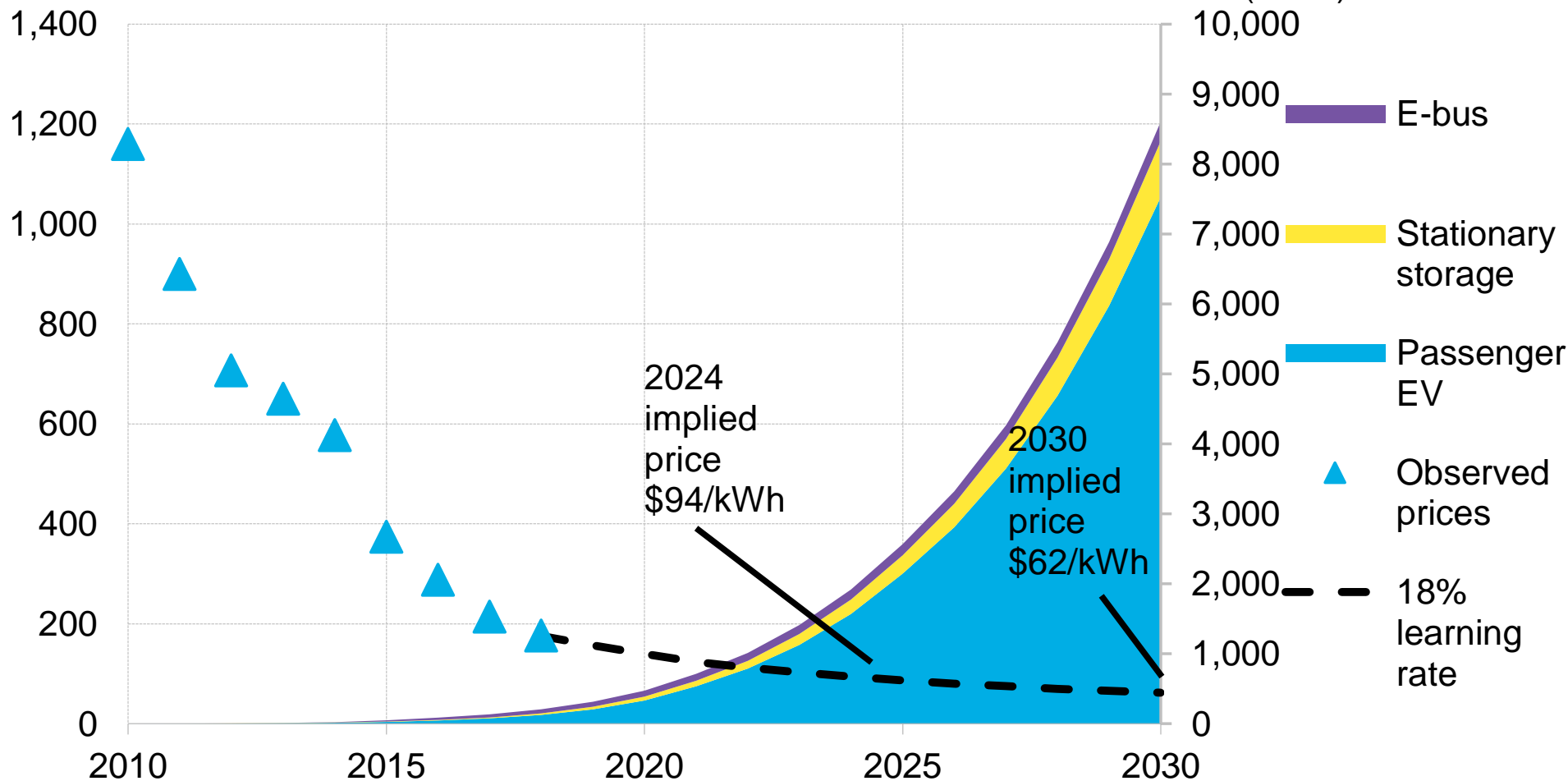


Segment	U.S.	EU
Small	2027	2028
Medium	2025	2024
Large	2026	2025
SUV**	2024	2026

Source: BloombergNEF

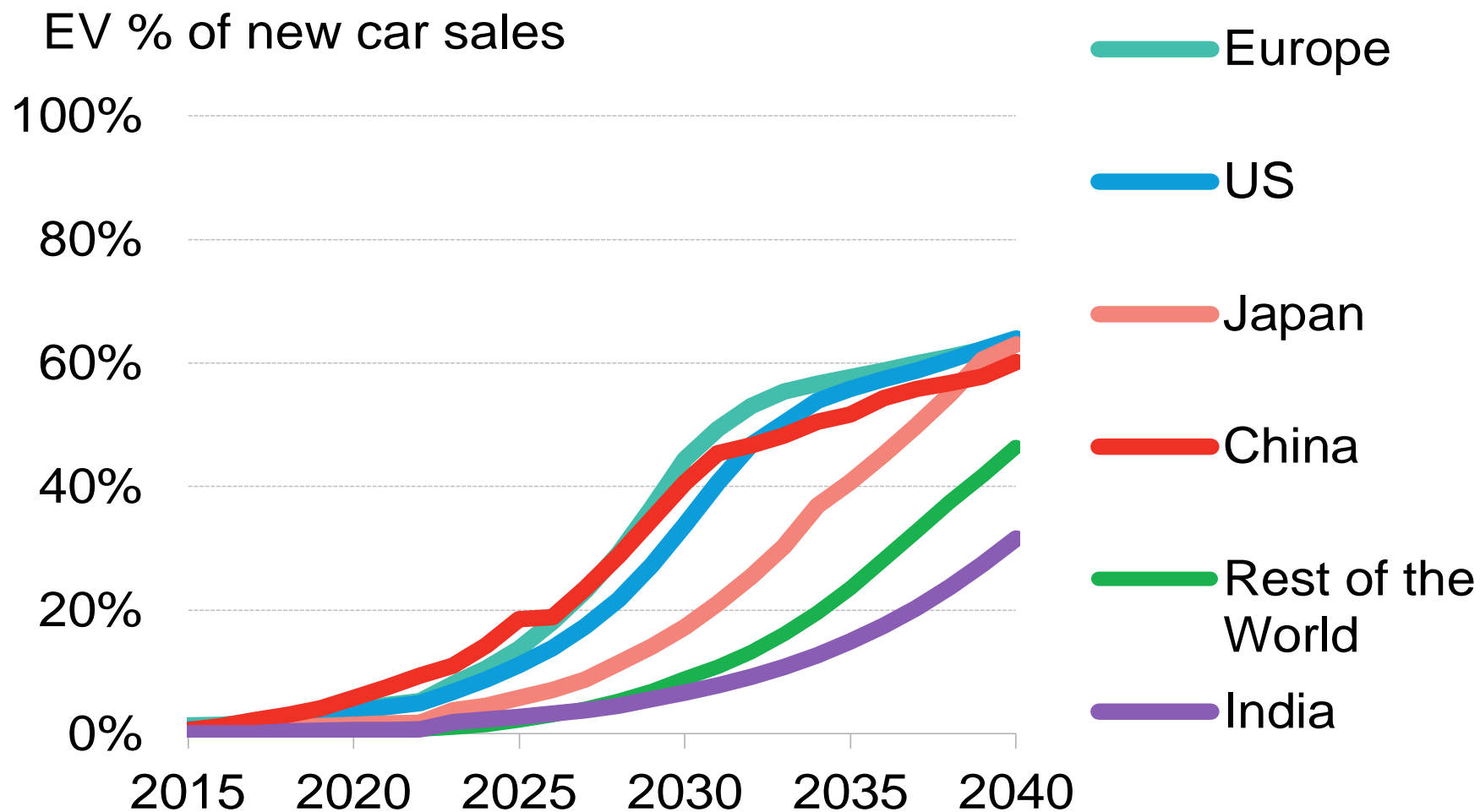
最新のリチウムイオン電池価格とアプリケーション別需要

Lithium-ion battery pack price (real 2018 \$/kWh) Cumulative demand for lithium-ion batteries (GWh)



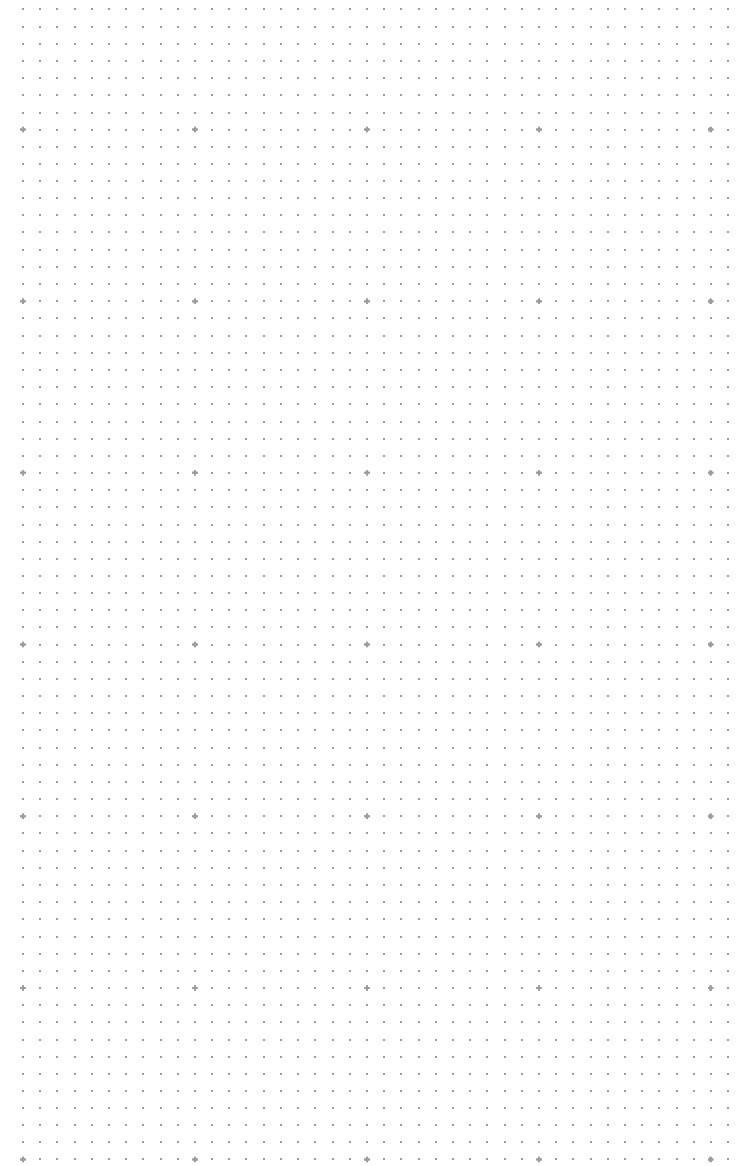
Source: BloombergNEF Note: The data in this chart has been adjusted to show real 2018 dollars

地域別の電気自動車の新車に占める 予測割合



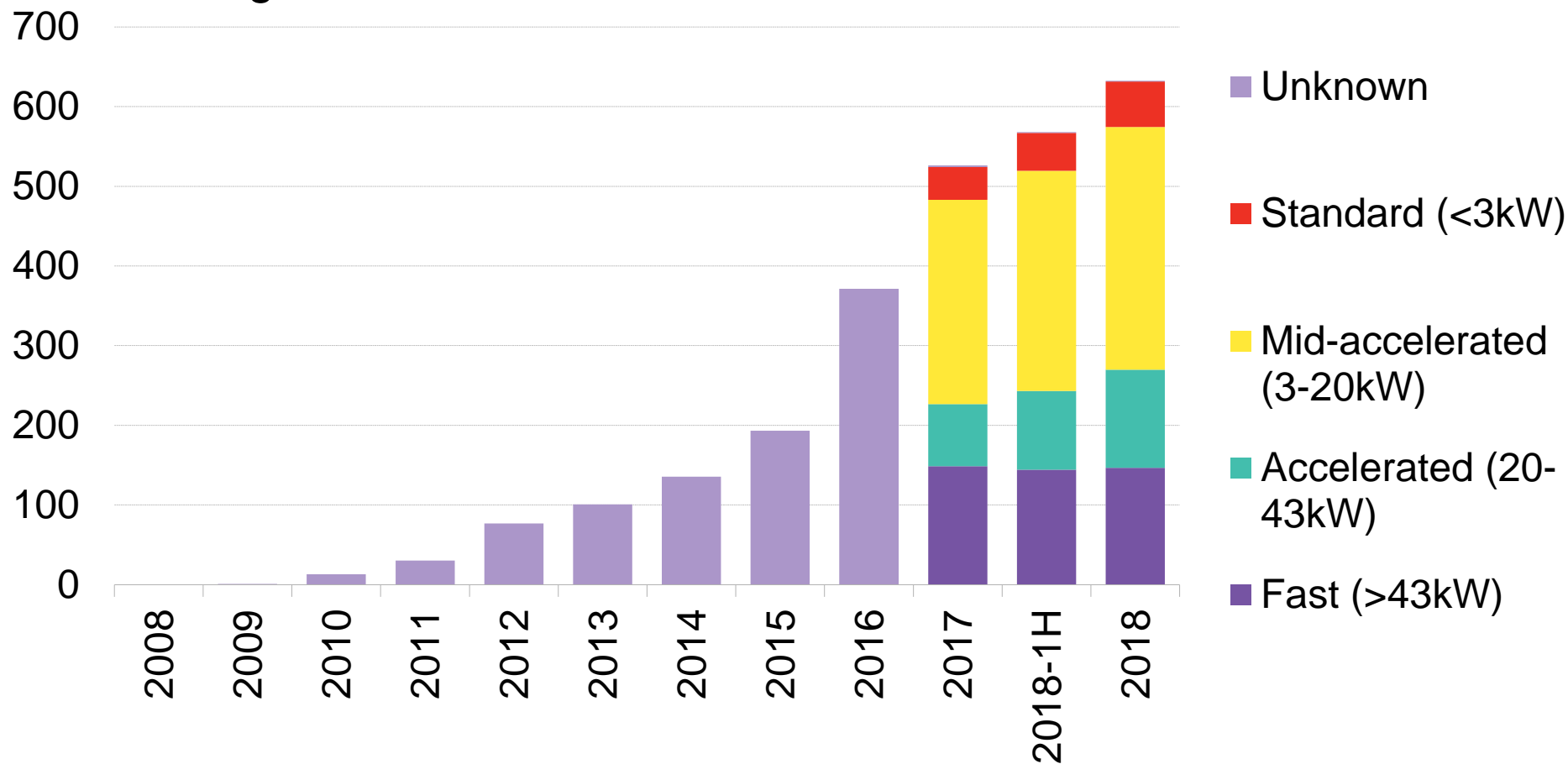
Source: BloombergNEF

充電インフラ



累積導入済充電インフラ タイプ別

Thousand chargers

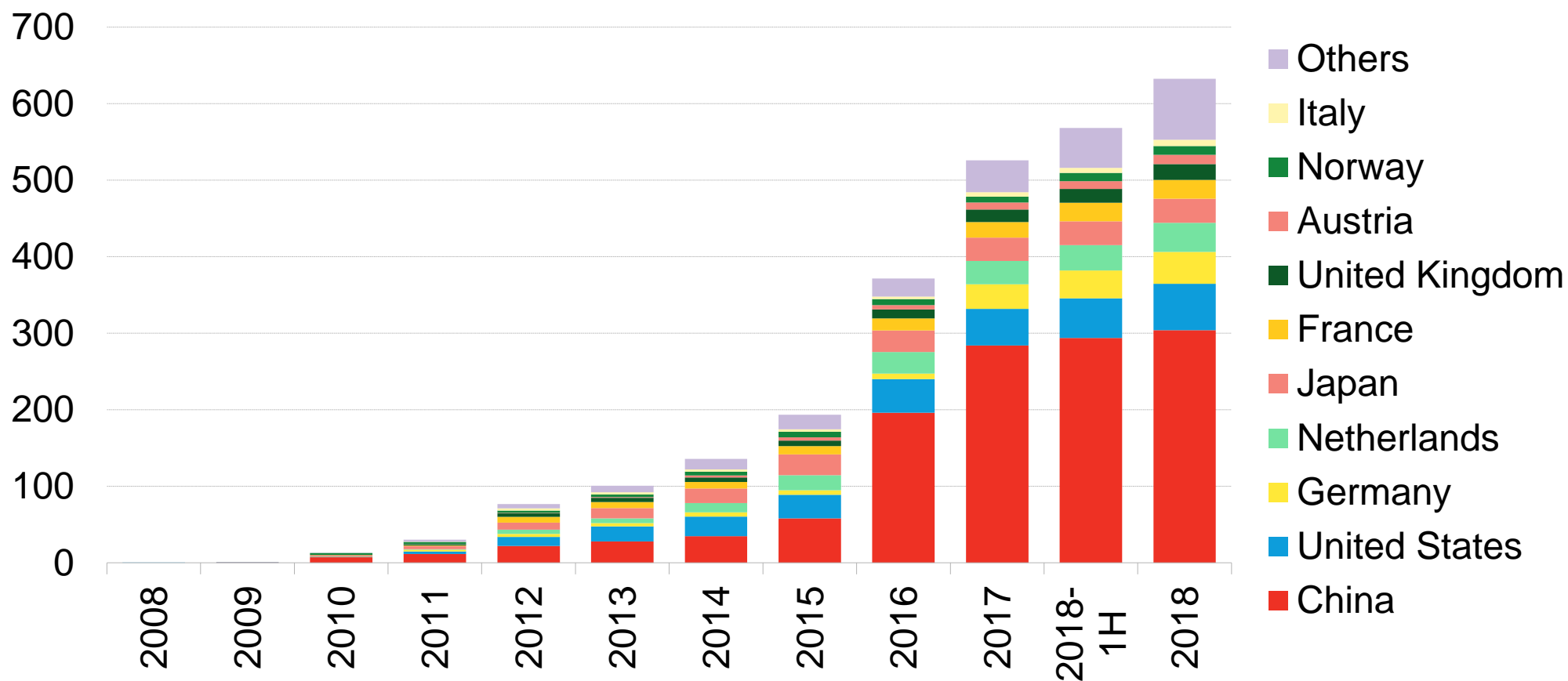


Source: BloombergNEF

累積導入済み充電インフラ 国別

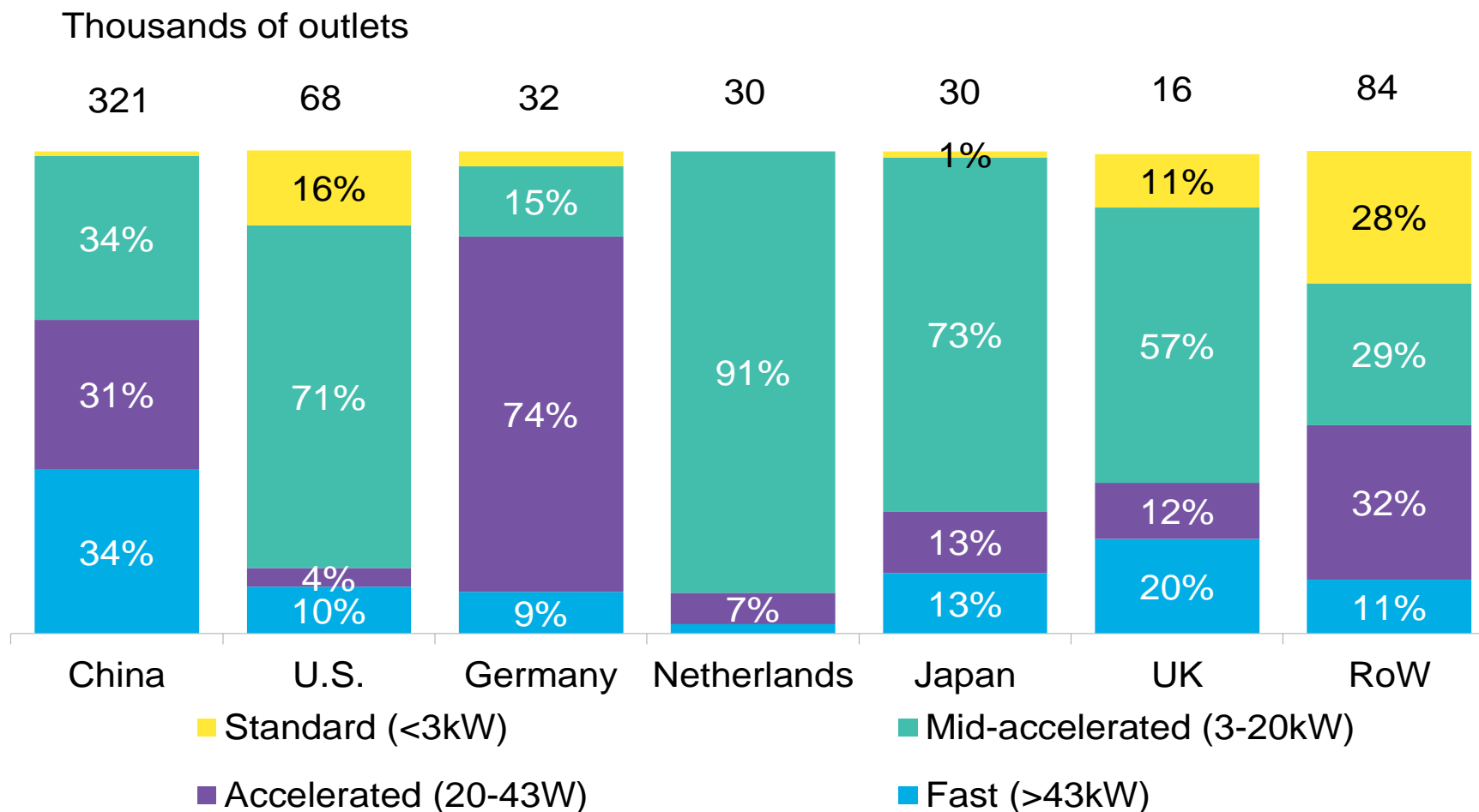


Thousand chargers



Source: BloombergNEF

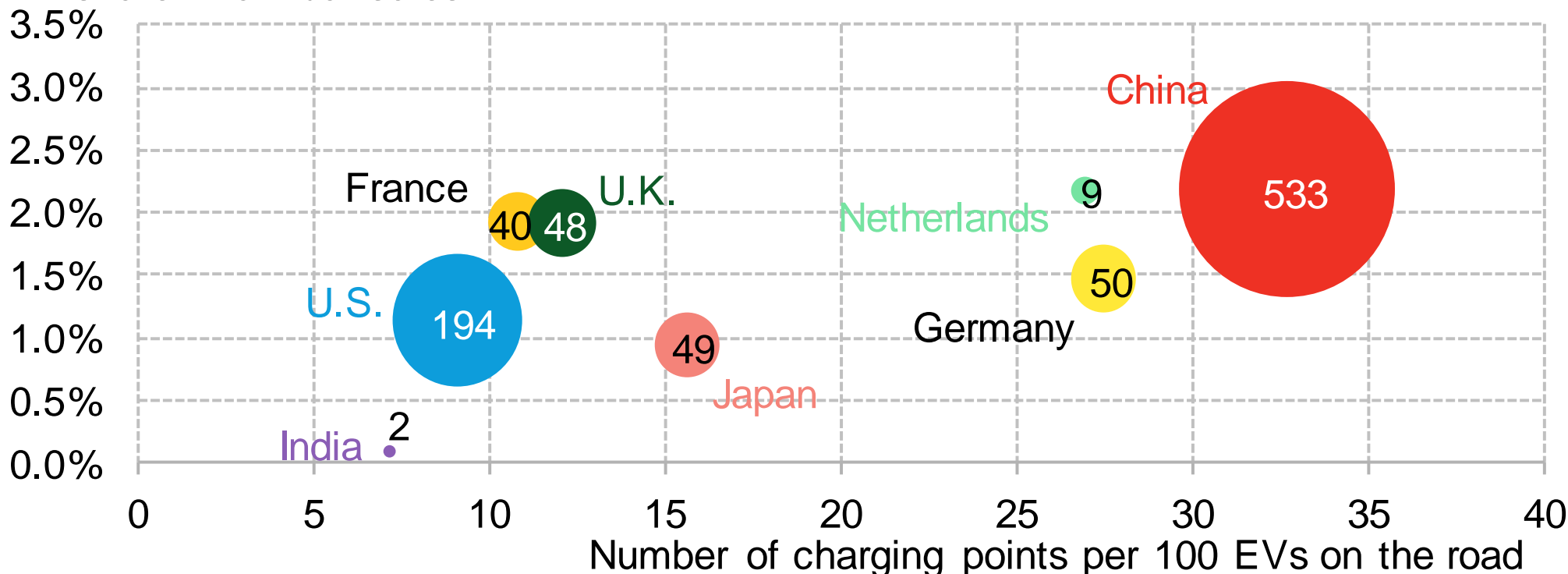
国別充電インフラ タイプ別内訳 (2017年)



Source: Bloomberg. Data current as of the end of 2017.

電気自動車と充電インフラの普及率 2017

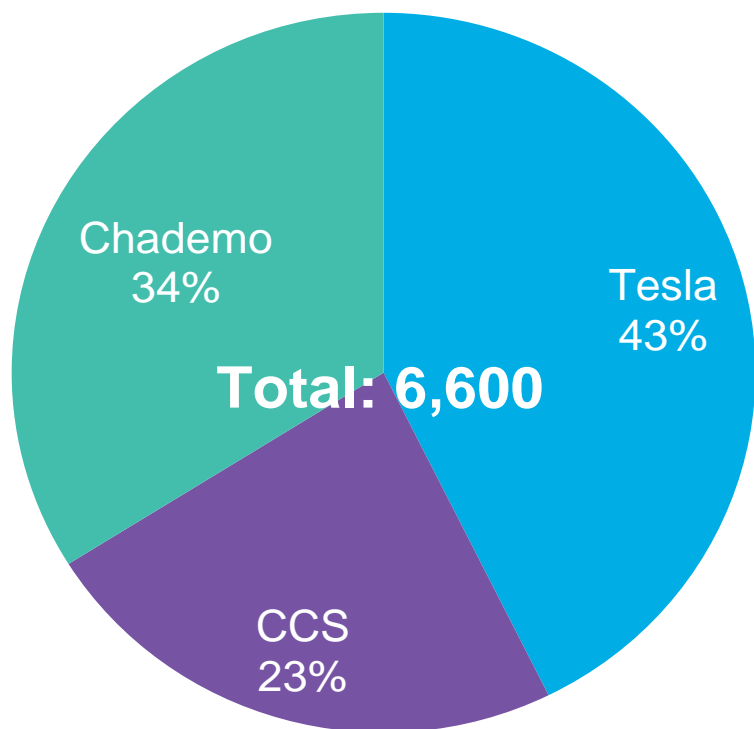
EV share in annual sales



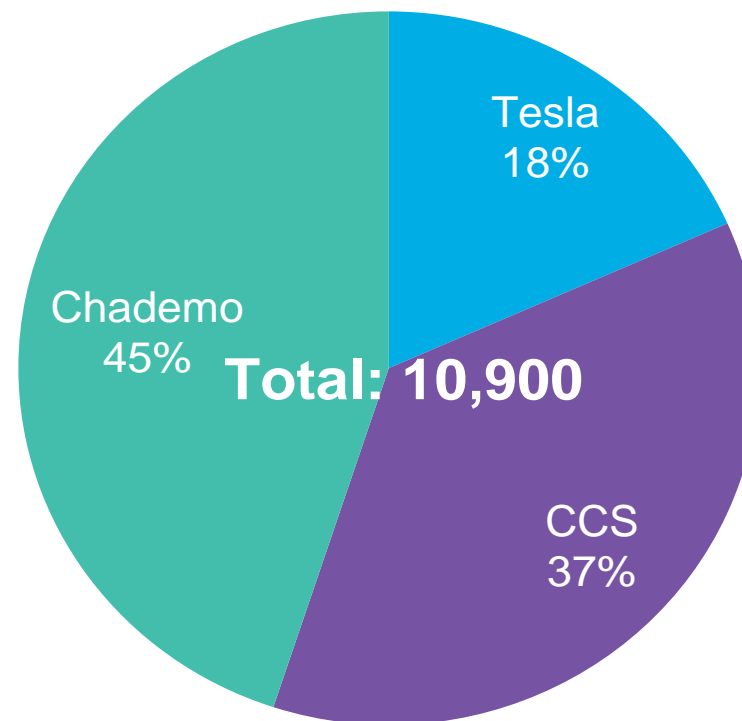
Source: Bloomberg NEF. Note: The figures in the bubble and the size of the bubble represent the total sales volumes (thousands) for passenger EVs (highway-capable electric four-wheelers) in 2017. The EV share and distribution of charging points is data as of end of 2017.

急速充電 規格別 米国と欧州

U.S.



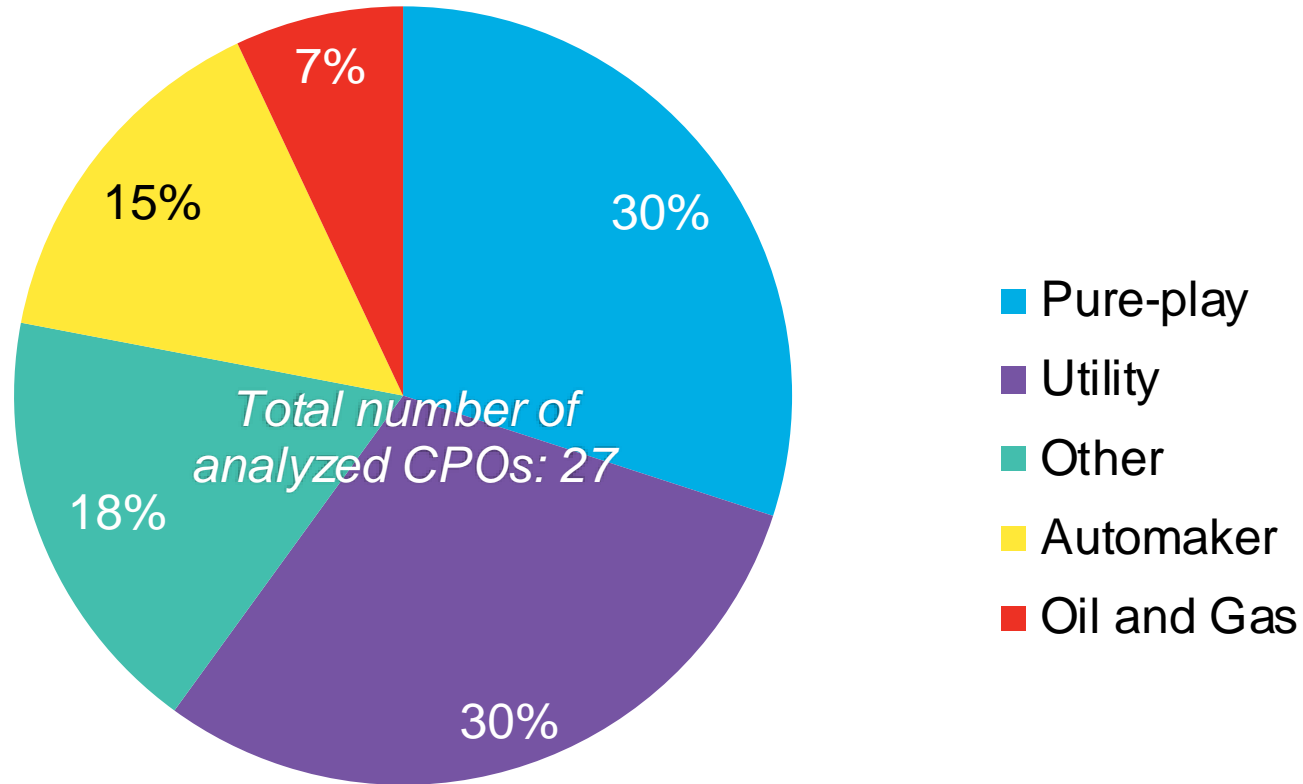
Europe



Source: BloombergNEF, Alternative Fuels Data Center

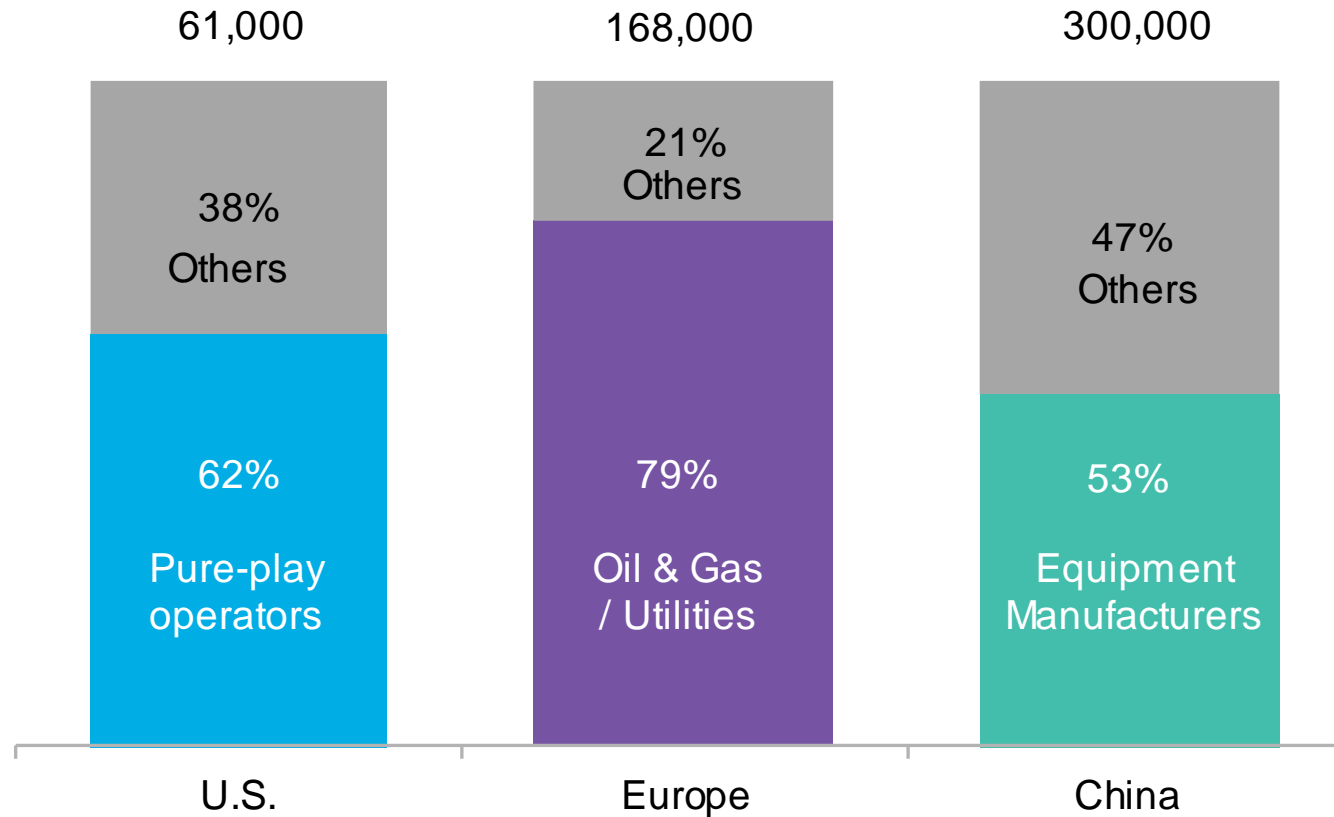
充電施設オペレーター（北米、欧州、中国）

Share of selected CPOs








Source: BloombergNEF

充電施設オペレーター，地域別 2018



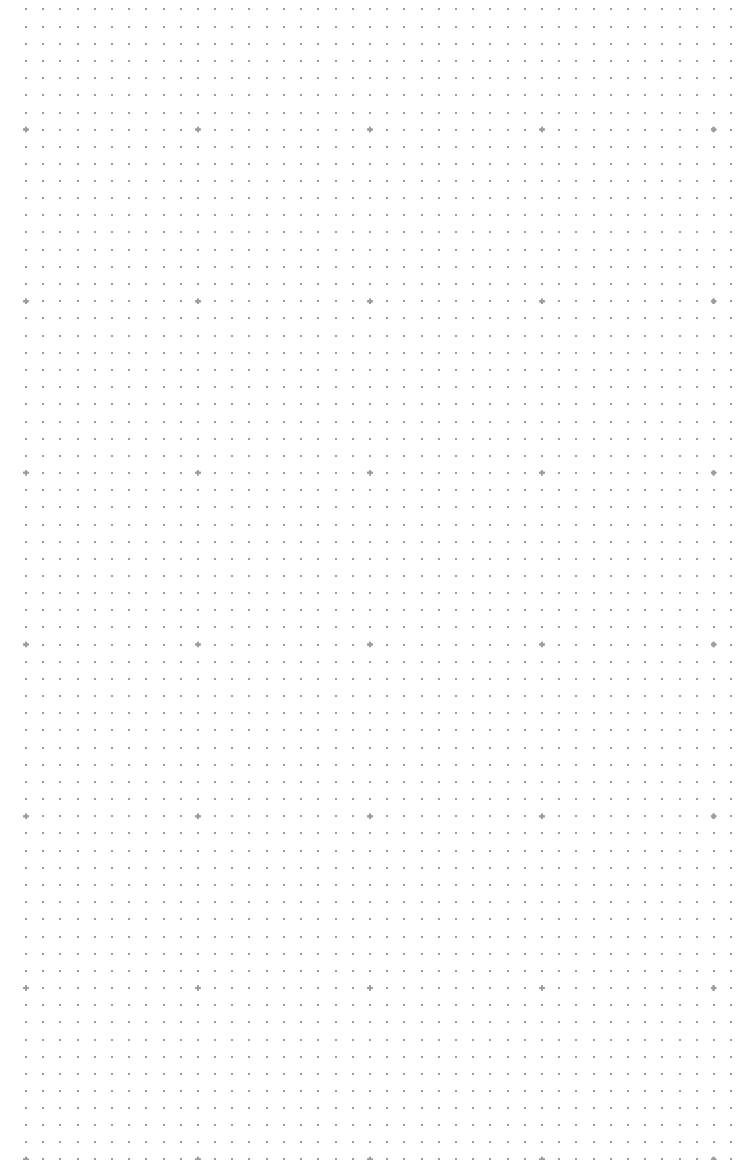
Source: BloombergNEF

石油大手企業の電力事業、充電インフラへの進出

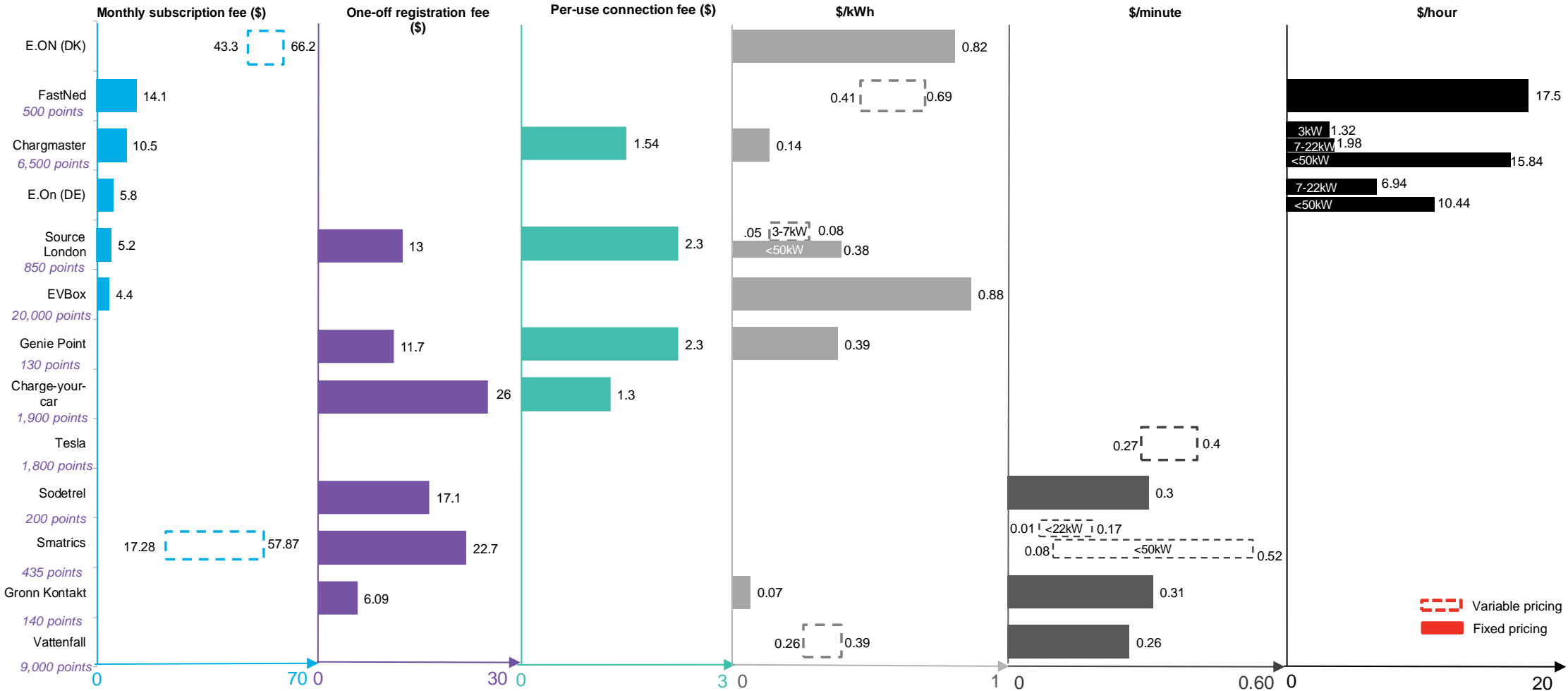
		Europe				
						
Generation and trading	Gas power plants					
	Power trading				(Danske Commodities)	
	Renewable energy	(Multiple)	(Lightsource, others)	(Silicon Ranch Corp)		(Apodi project)
	Grid-connected storage	(Saft)	Tesla partnership			(Planned)
Residential and industrial retail	Electricity sales	(Lampiris, Direct Energie)	(Planned)	(First Utility)		
	On-site generation (e.g., rooftop PV)		(Lightsource)			
	Other services (eg, demand response)	(GreenFlex, Direct Energie)	(Ubiworx)	VC, partnerships		
Electric vehicles	Public charging infrastructure	(G2mobility, PitPoint)	(Charge-master)	(NewMotion)	VC (Chargepoint)	Partnership (Ionity)
	AVs or car sharing		VC (Drover)	VC (FarePilot)		

Source: BloombergNEF, company reports and presentations.

充電料金

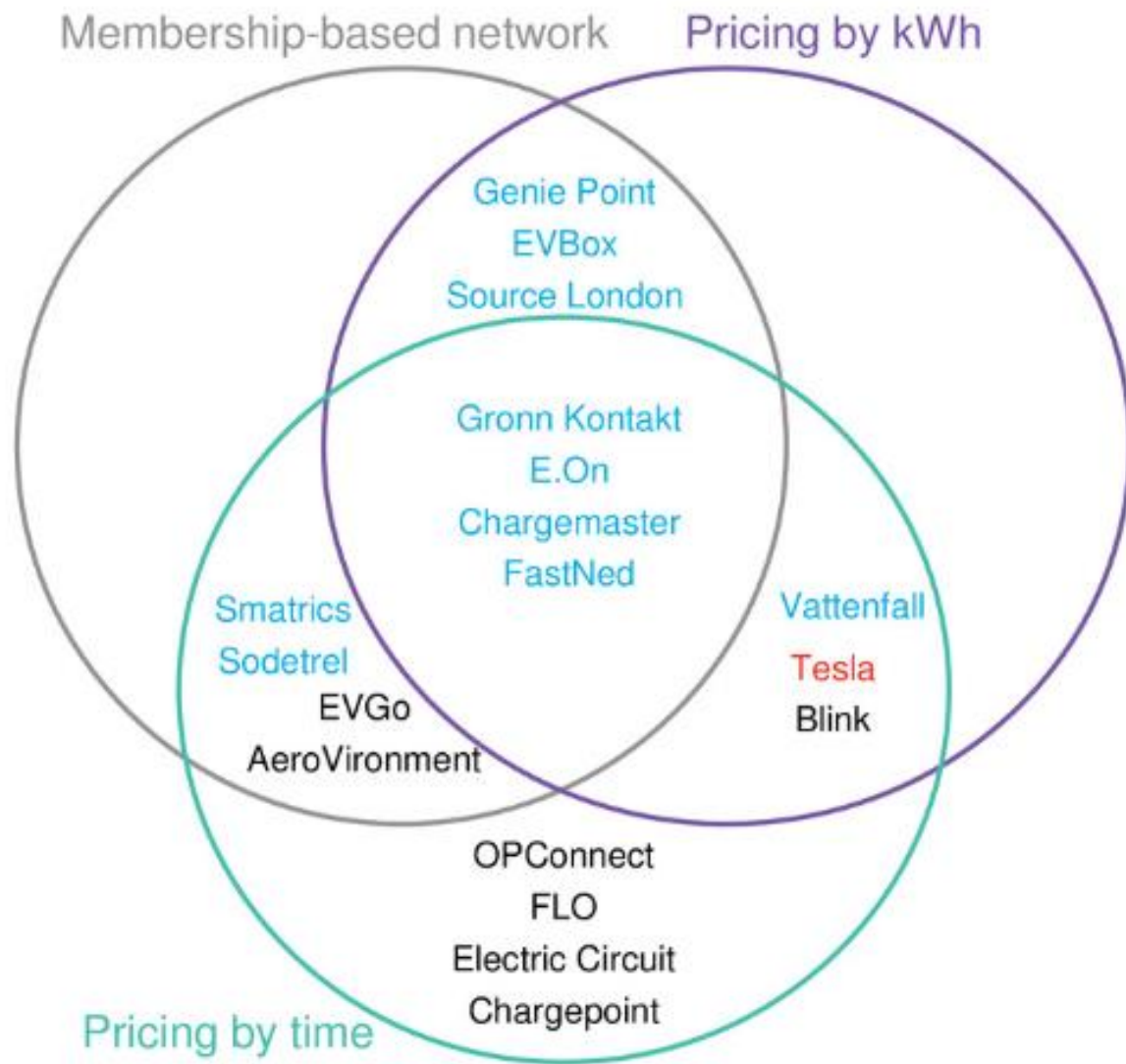


料金構造の比較 欧州



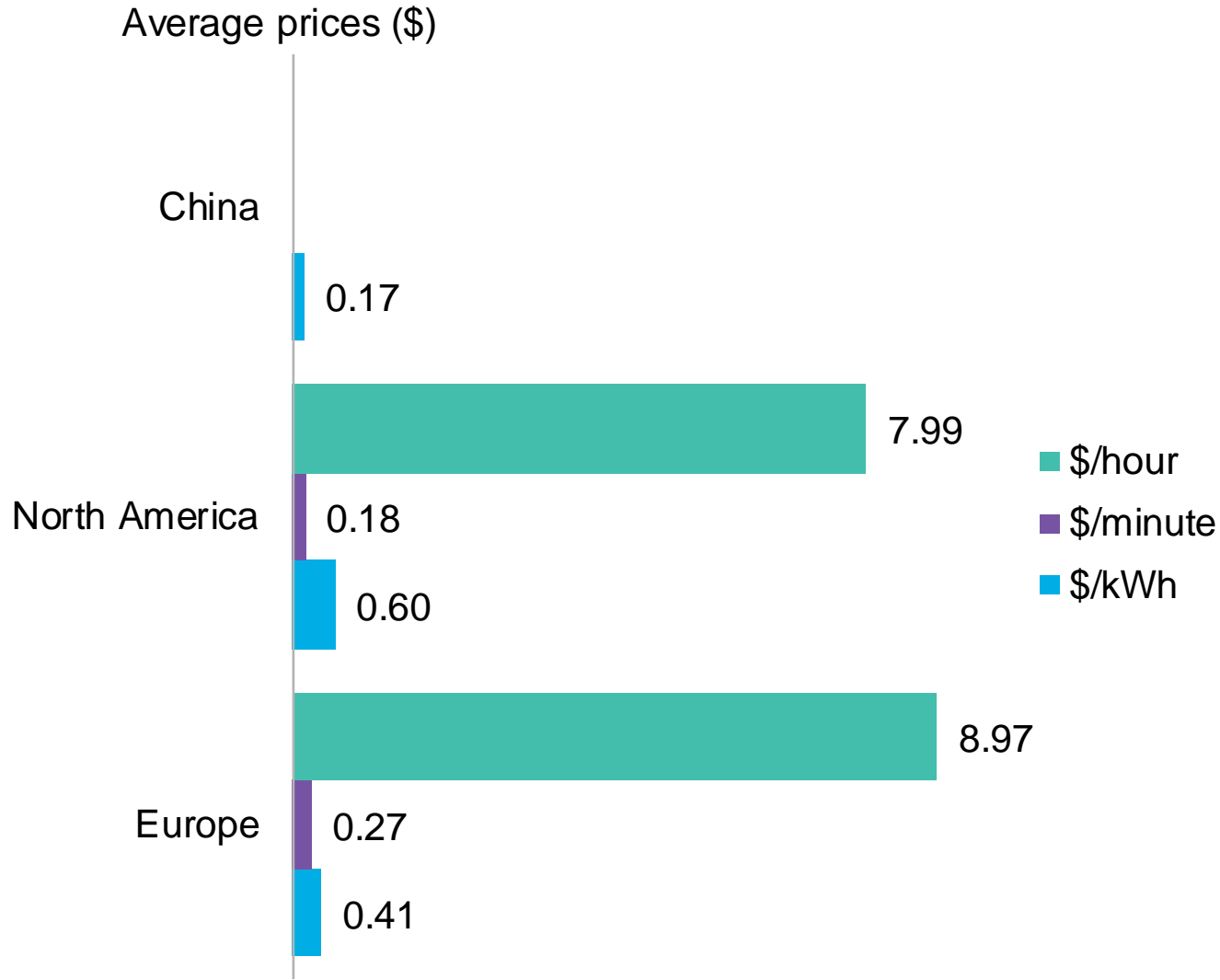
Source: BloombergNEF

料金構造の特性比較 オペレーター別



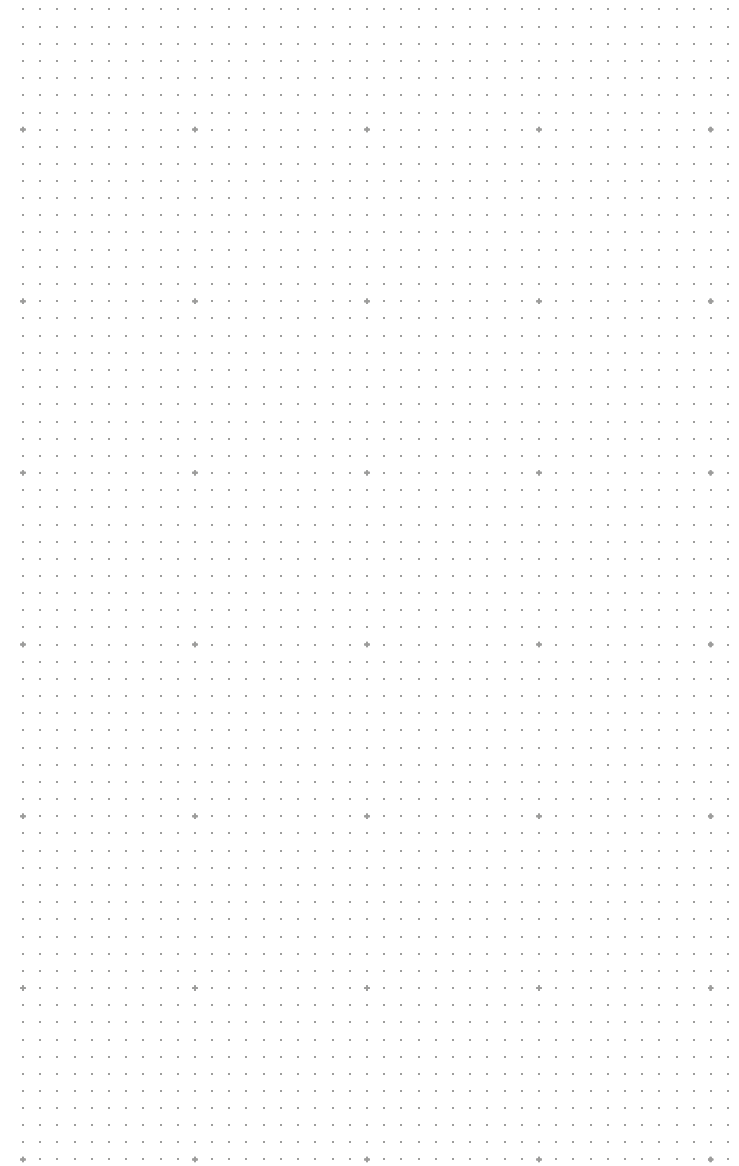
Blue = Europe, Black = North America. Operators in both are shown in red. Tesla does not charge membership fees but users must own a Tesla vehicle.

充電平均料金：中国、北米、欧州



Source: BloombergNEF

中国



中国電気自動車を後押しする政策

- Industrial policy
- Clean air in cities
- Reduced oil imports
- Reduced CO2 emissions

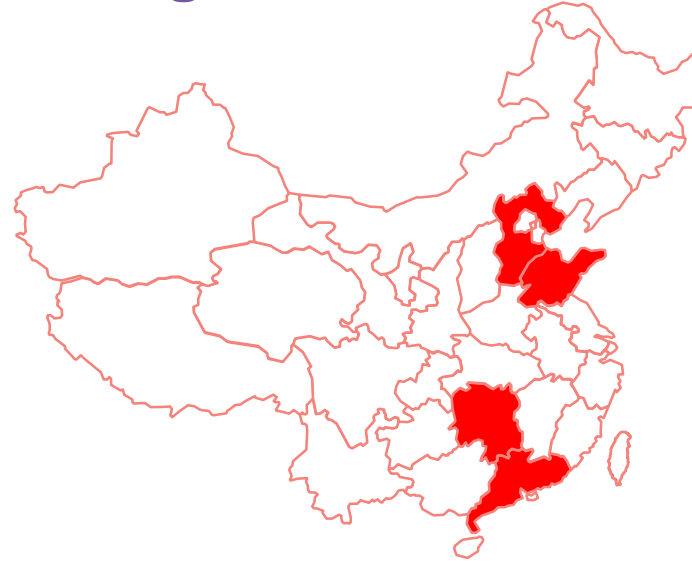
中国

3層構造のEV政策サポート

National Policies



Regional Policies



City Regulations

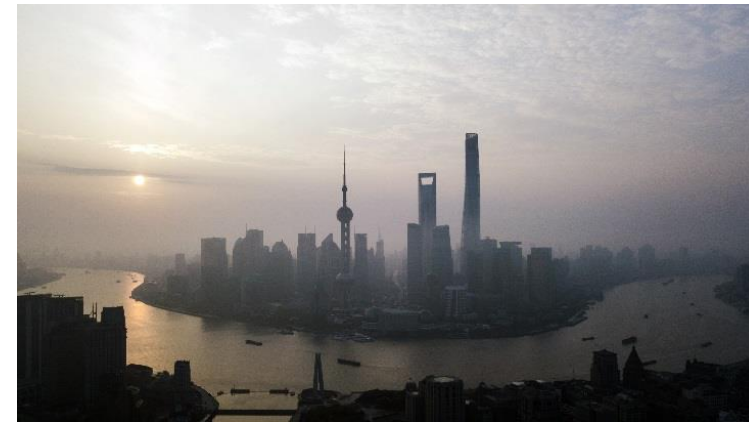
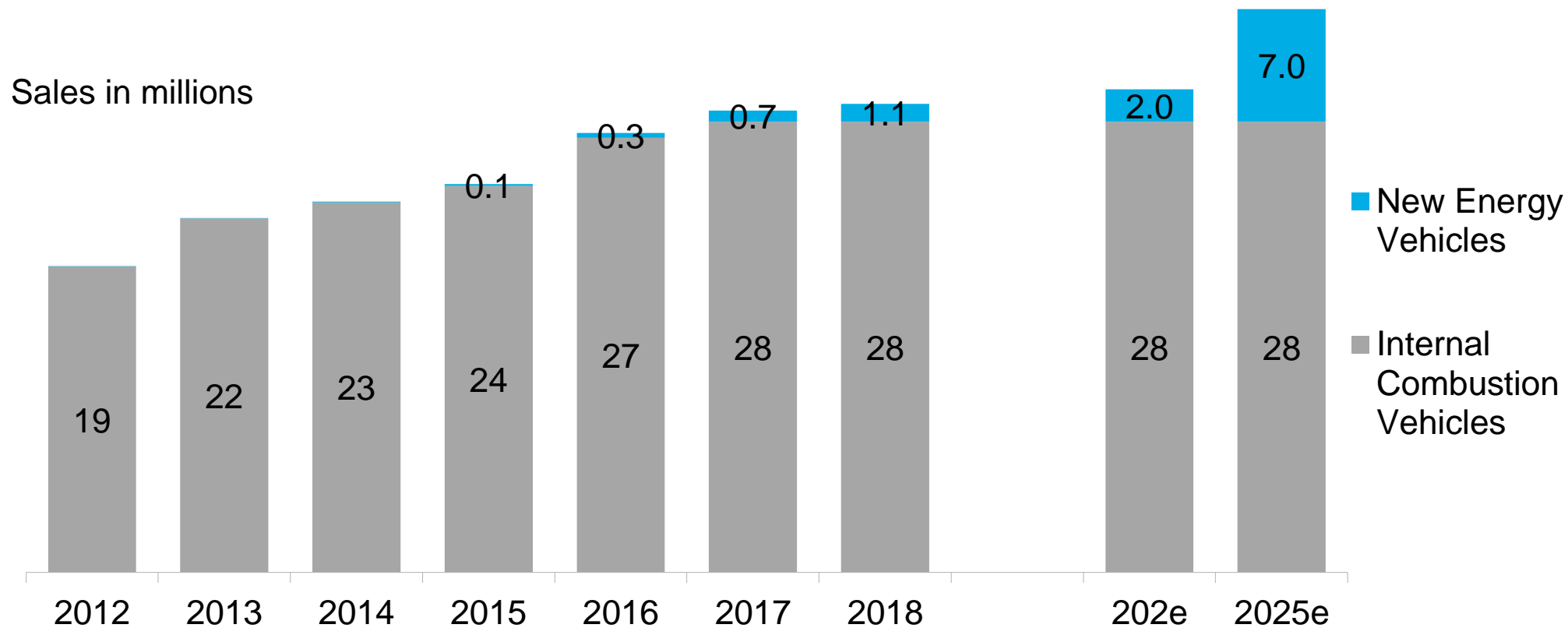


Image: Bloomberg Media, Wikipedia

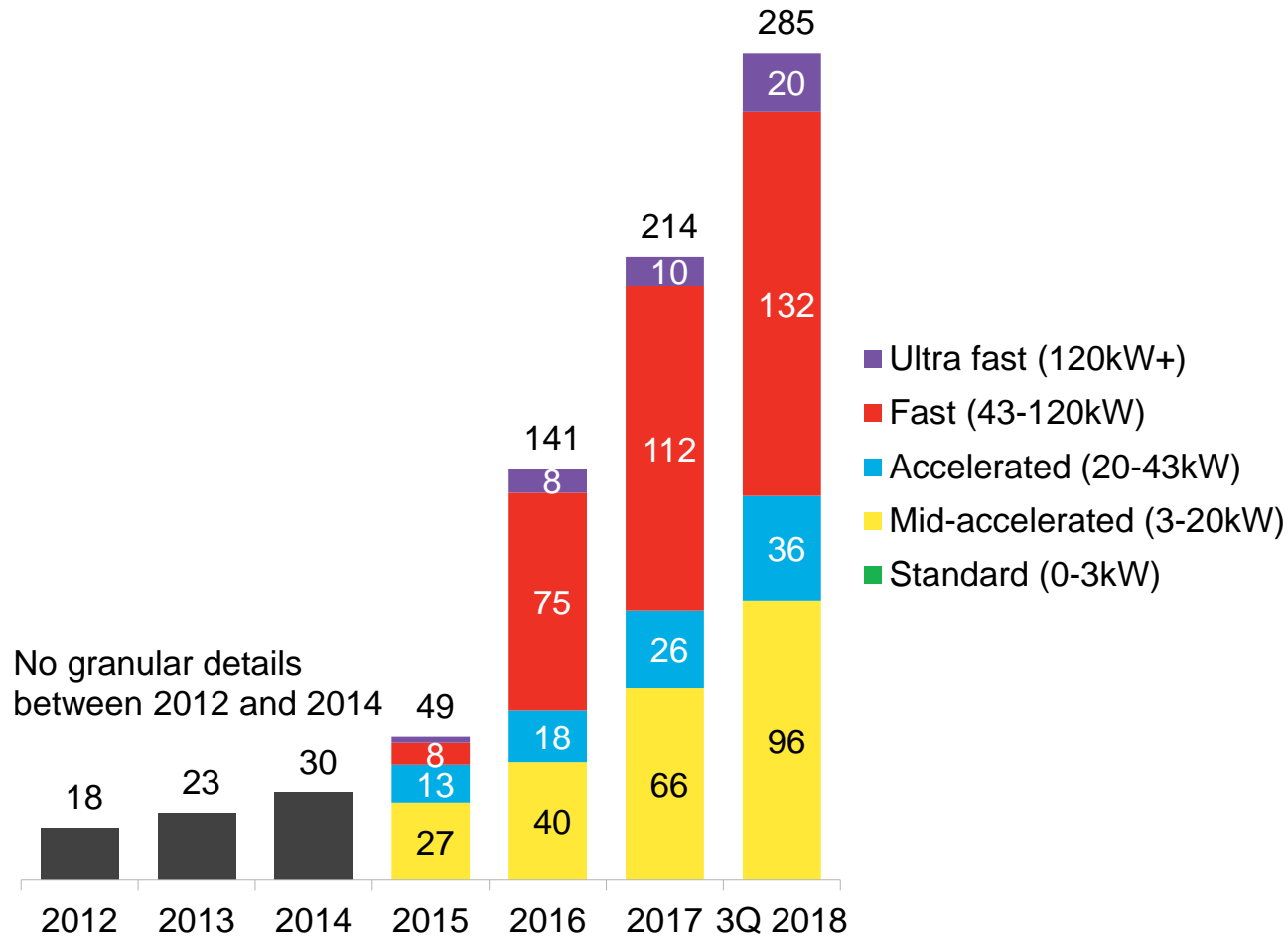
2025年の目標値



Source: MIIT, NDRC, BloombergNEF, NEV target includes both passenger and commercial vehicles

中国 累積充電インフラ タイプ別

1,000 chargers



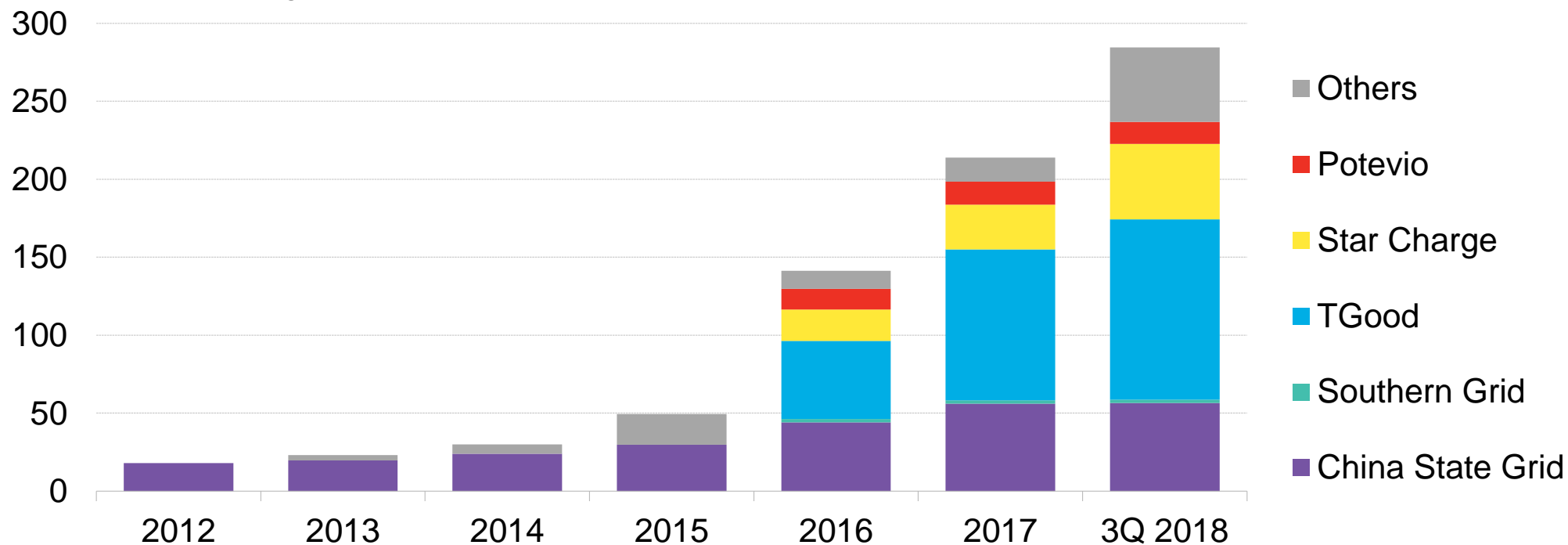
No granular details between 2012 and 2014

Source: China Electric Vehicle Charging Infrastructure Promotion Alliance, State Grid, BloombergNEF
 Note: we assume 21,000 AC chargers, 7,000 DC chargers and 2,000 AC/DC chargers in 2014, in line with 2015 ratio

オペレーター別充電インフラ



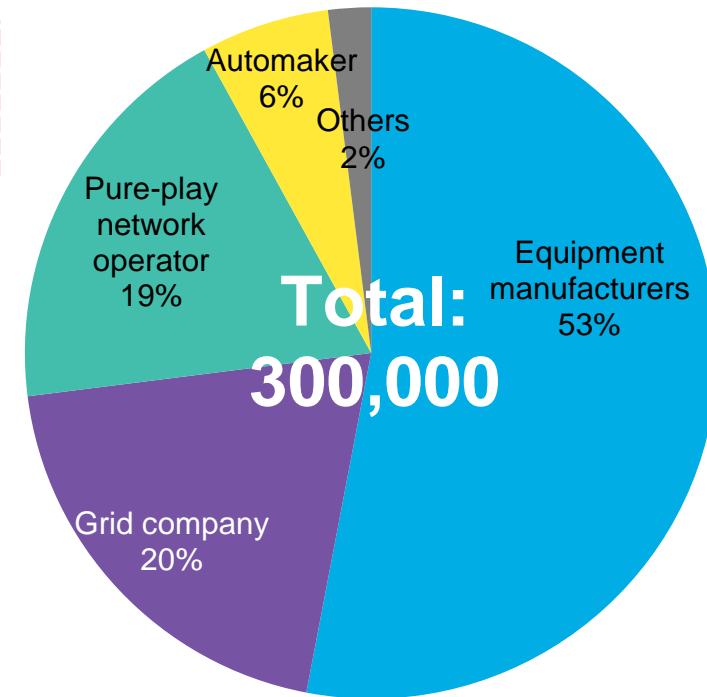
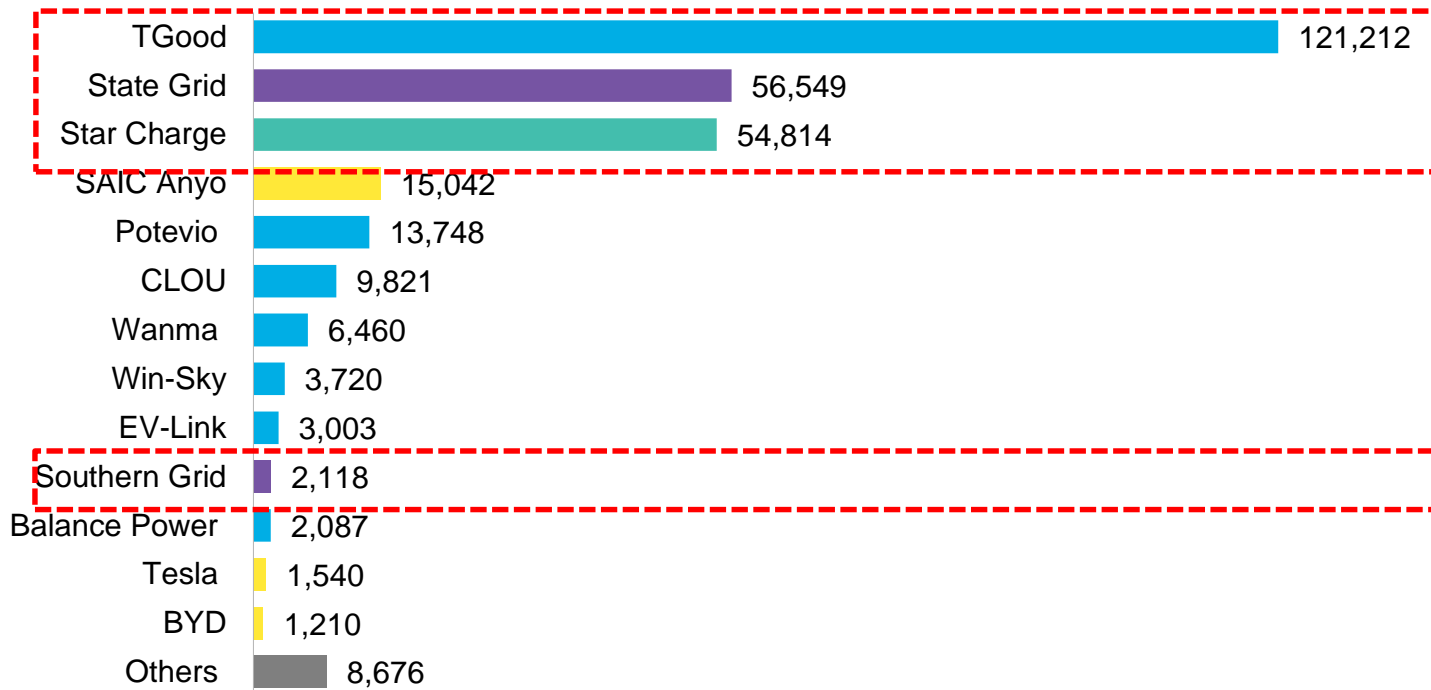
Thousands of public chargers



Source: BloombergNEF

中国政府がインフラをすべて所有

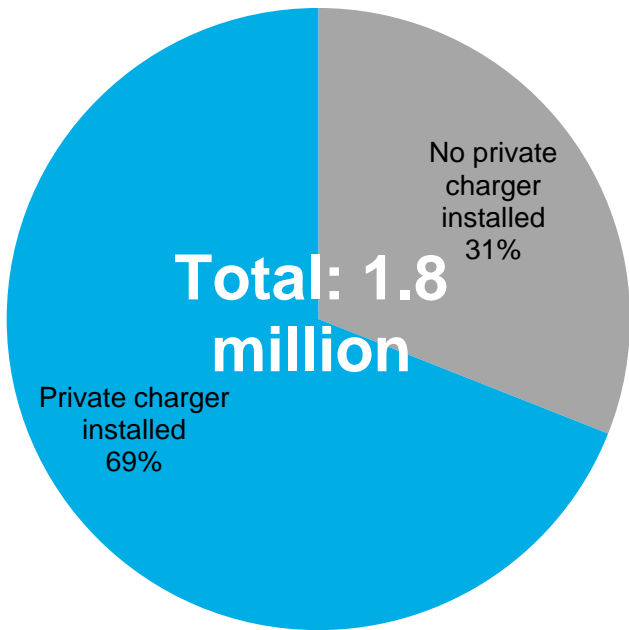
Leading public charger operators in China, 2018



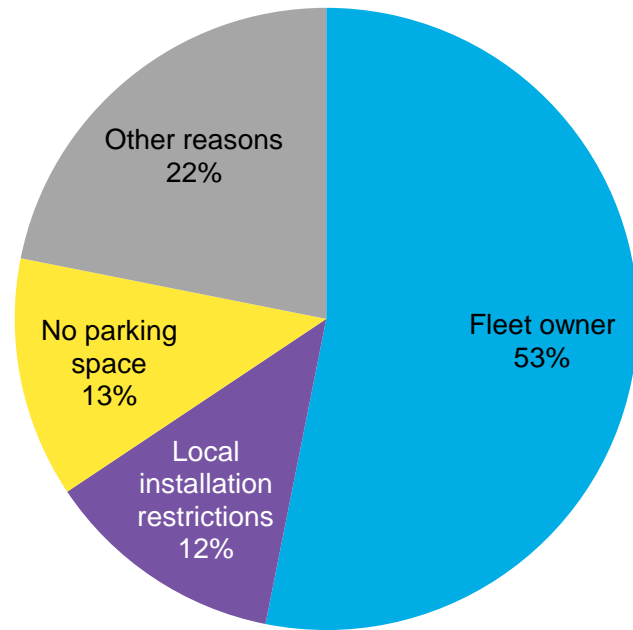
Source: BloombergNEF, respective companies. Data current as of the end of 2018

プライベート充電設備

Total passenger EV fleet, 3Q 2018



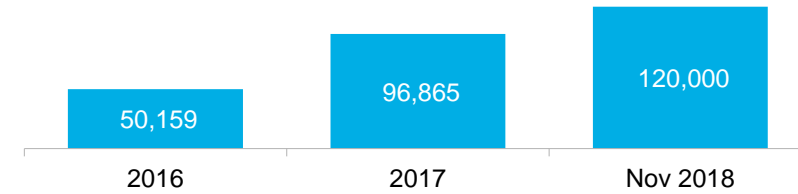
Reasons for not installing private chargers



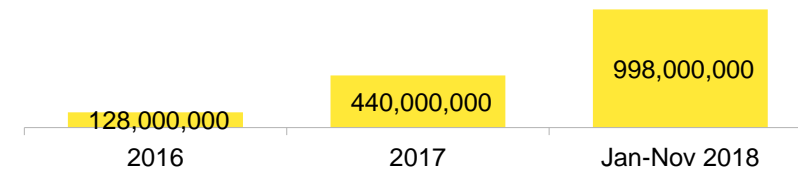
Source: BloombergNEF, respective companies. Data current as of 3Q 2018

TGood charger operational data

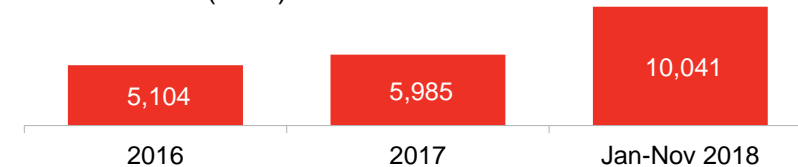
Cumulative number of chargers installed (units)



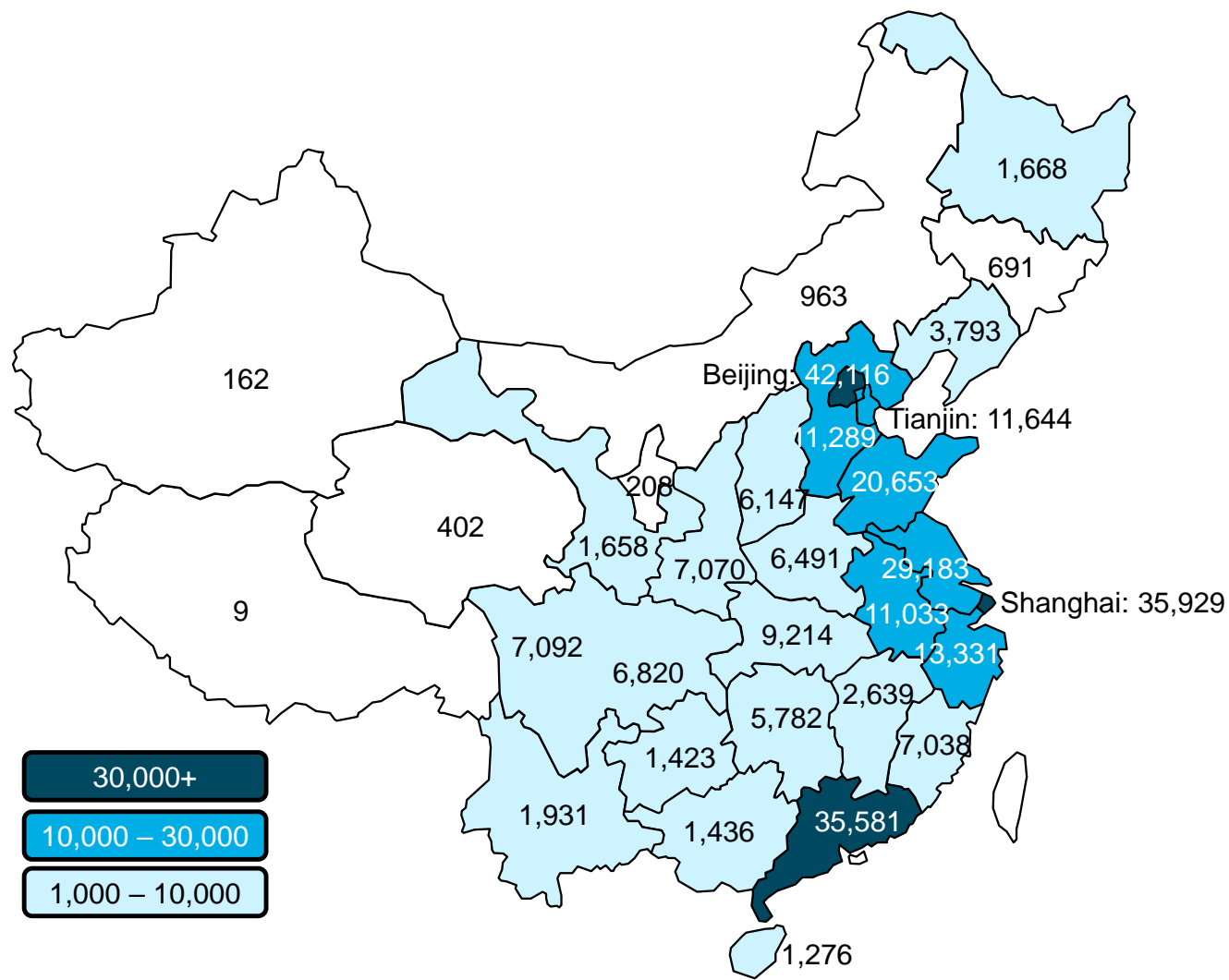
Annual energy dispensed (kWh)



Annual energy dispensed per charger (kWh)



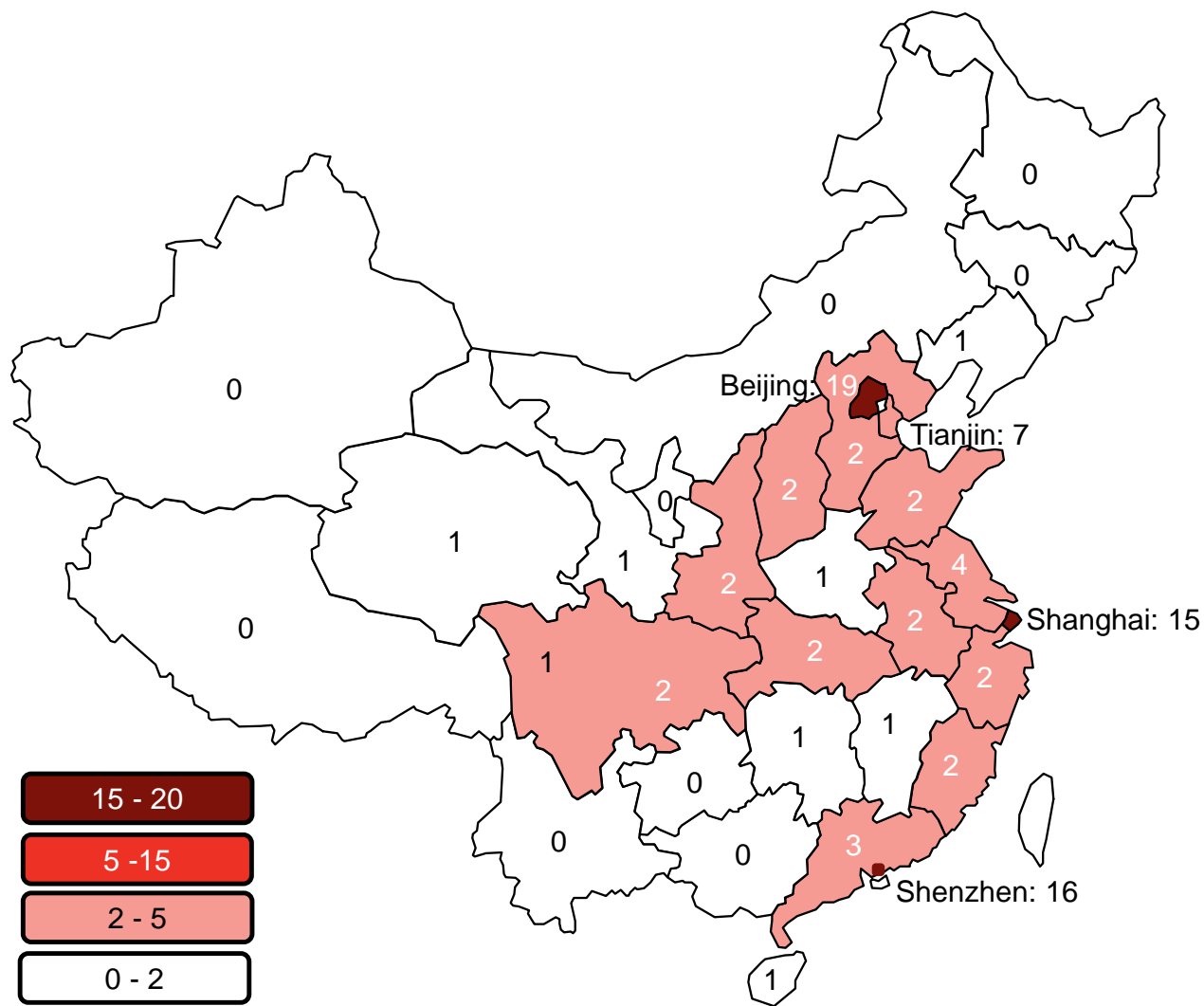
地域別累積充電インフラ導入数, 3Q 2018



Source: China Electric Vehicle Charging Infrastructure Promotion Alliance, BloombergNEF

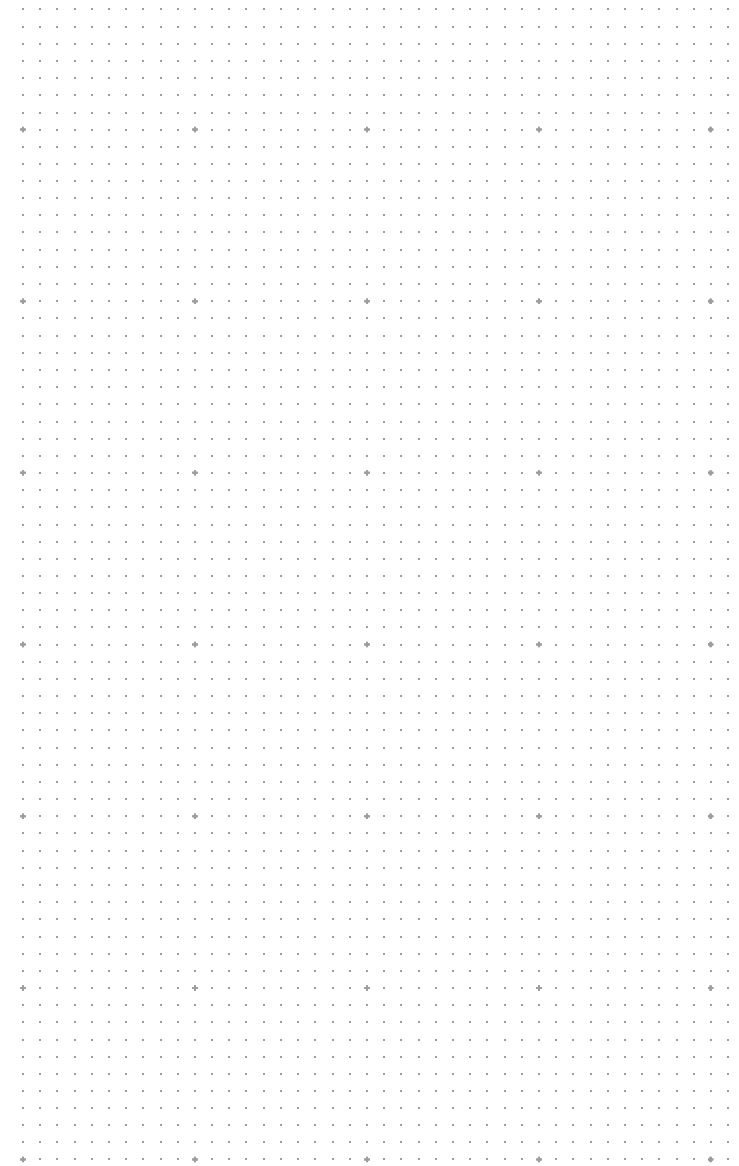
中国

一万人当たりの充電インフラ普及率, 3Q 2018



Source: China Electric Vehicle Charging Infrastructure Promotion Alliance, National Bureau of Statistics, BloombergNEF

インド



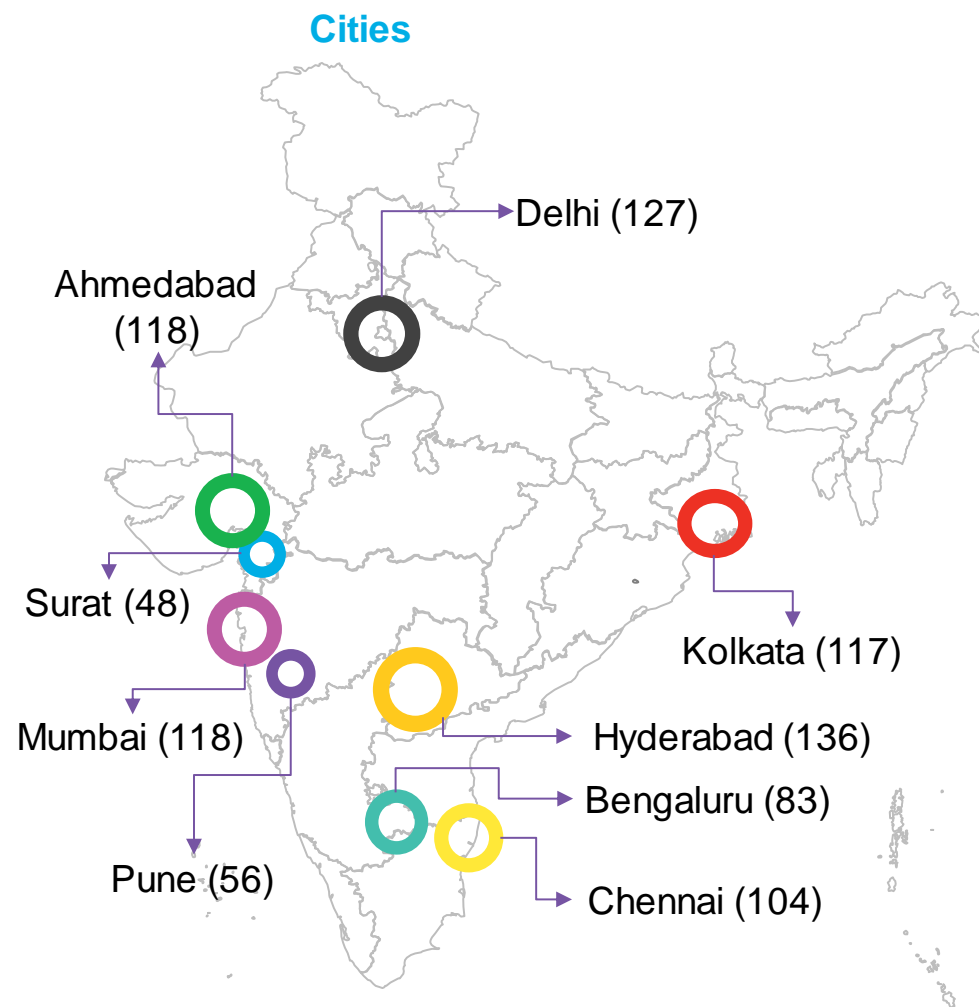
インド

インドの充電インフラ市場に進出している主要企業

Utilities		Oil companies	
 पावरग्रिड Power grid Corporation of India	 एनटीपीसी NTPC	 TATA POWER	 ಬೆವಿಕಂ BESCOM
 MAHAVITARAN Maharashtra State Electricity Distribution Co. Ltd.	 RELIANCE Energy	 fortum	 इंडियनऑयल IndianOil
 हिन्दुस्तान पेट्रोलियम HP	Automakers		Renewable energy companies
 MARUTI SUZUKI Way of Life!	 ATHER	 ACME	 magentapower Solar. Wind. Bioenergy
		Others	
		 SUN MOBILITY	 LITHION

Source: Bloomberg NEF. Note: This is not an exhaustive list.

第1期の充電インフラ導入優先都市と高速道路



Highway corridors

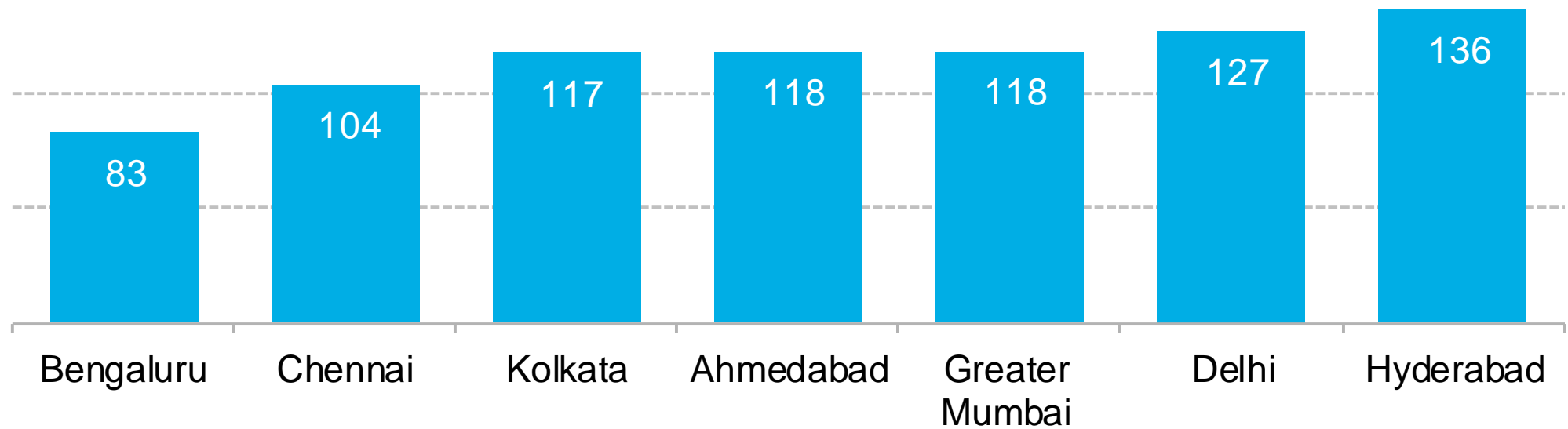
Name	Length (km)	No. of charging sites*
Mumbai-Pune expressway	94	8
Ahmedabad-Vadodara expressway	93	7
Delhi-Agra Yamuna expressway	165	13
Delhi-Jaipur highway	195	16
Bengaluru-Mysore highway	135	11
Bengaluru-Chennai highway	262	21
Surat-Mumbai expressway	281	22
Agra-Lucknow expressway	302	24
Eastern peripheral expressway	135	11
Delhi-Agra NH2 expressway	210	17
Hyderabad ORR expressway	160	13

Source: BloombergNEF, Ministry of Power. Note: The number in brackets with cities is the estimated number of charging sites based on census 2011 data for urban area and assuming availability of one charging site for every nine square kilometers. *estimated by assuming one charging site on either side of the highway every 25 kilometers.

都市別充電インフラ導入予定数

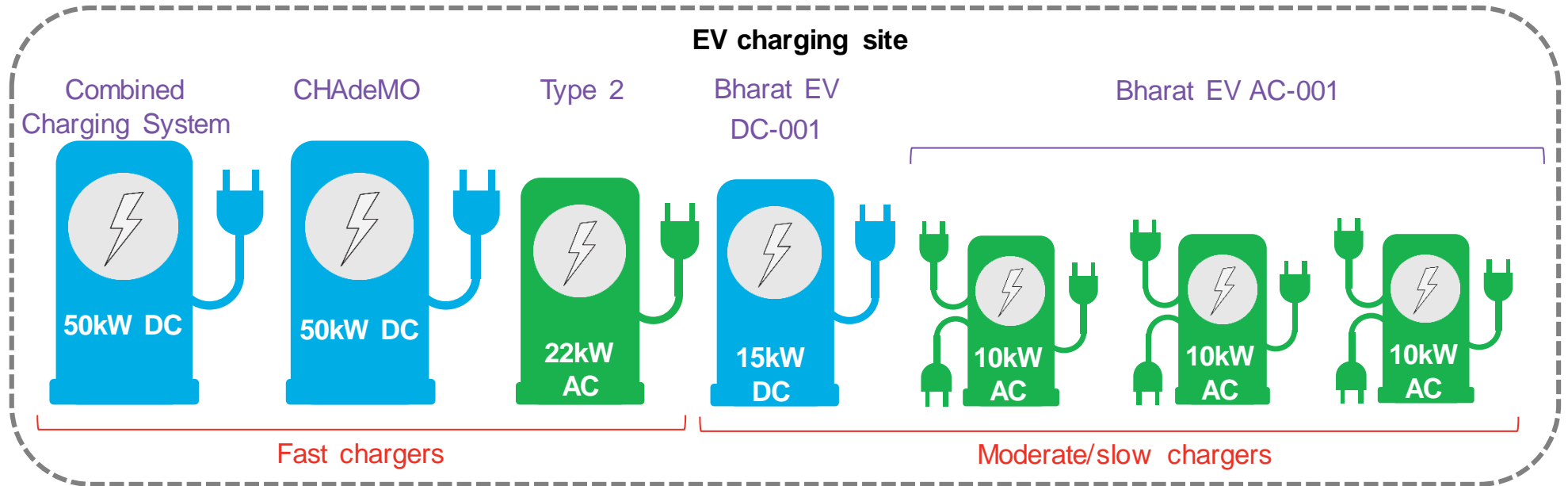


Number of charging sites



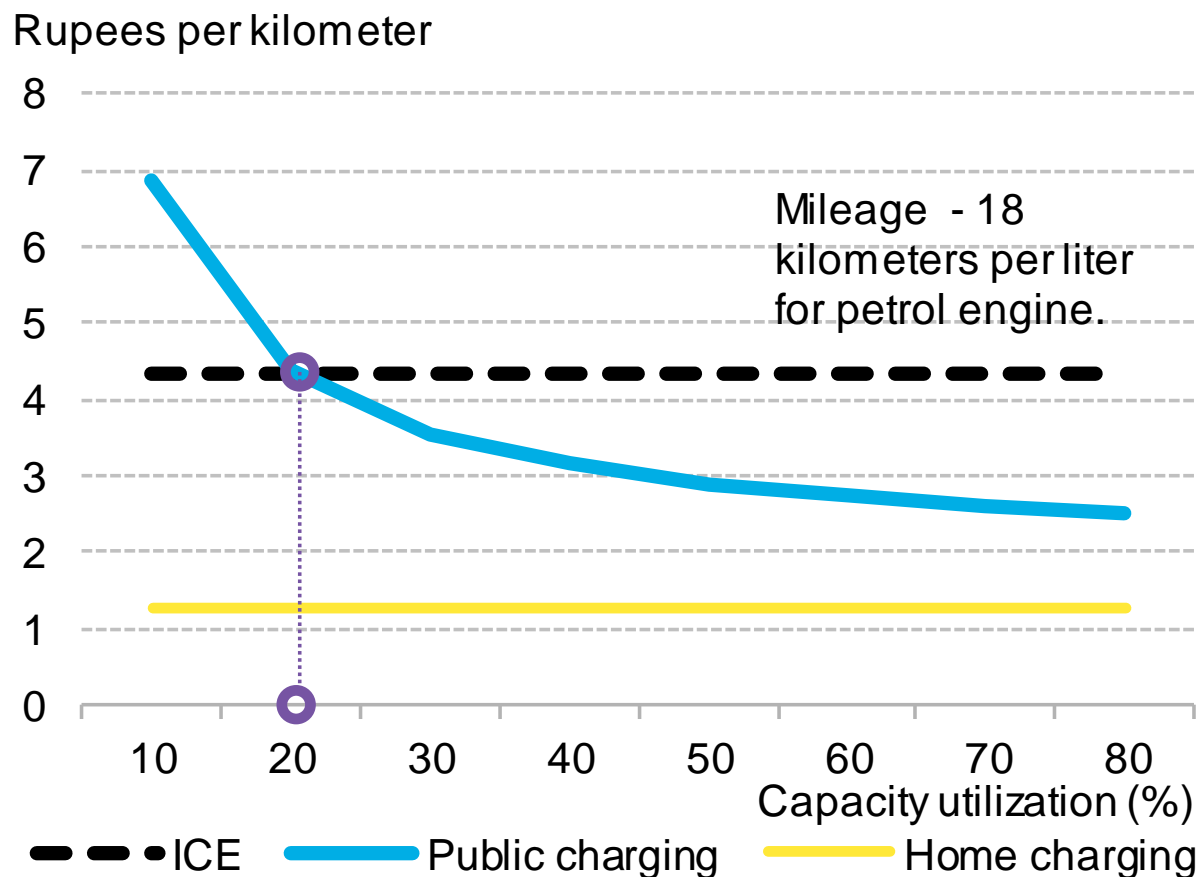
Source: Bloomberg NEF. Note: Estimated based on census 2011 data for urban area and assumes availability of one charging site for every nine square kilometers.

ガイドライン：最低限の充電規格



Source: BloombergNEF, Ministry of Power

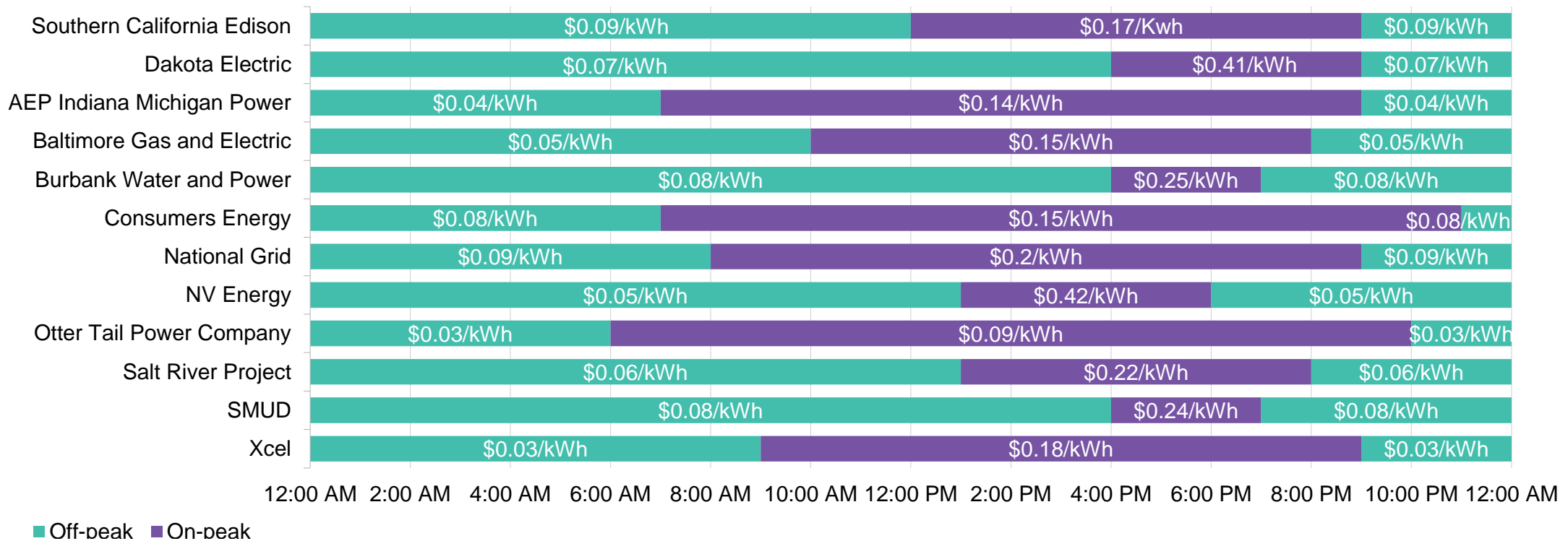
燃料費と充電設備利用率



Source: Bloomberg NEF. Note: Electricity tariffs assumed at 8.3 rupees/kWh for commercial category and home charging at 6.0 rupees/kWh. Assumes that vehicles are charged from a state of charge of 20% to 80%. The theoretical maximum number of cars that can be charged at 100% capacity utilization assumes that the charging sites operate 24 hours a day and that there is zero switchover time between charging sessions. Gasoline price – 78 rupees per liter.

電気自動車向け時間別電気料金 米国

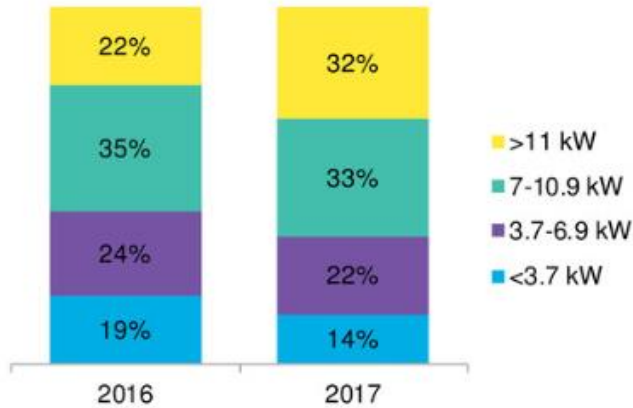
U.S. utility EV charging tariff hours and rates (\$/kWh)



Source: Bloomberg New Energy Finance, rate filings and webpages of respective companies. Note: Data shown is for summer peak. Some rates include a monthly fee which is not included here. See subsequent slide for further notes.

家庭向け充電インフラ最新動向

2016-2017 model availability by power range



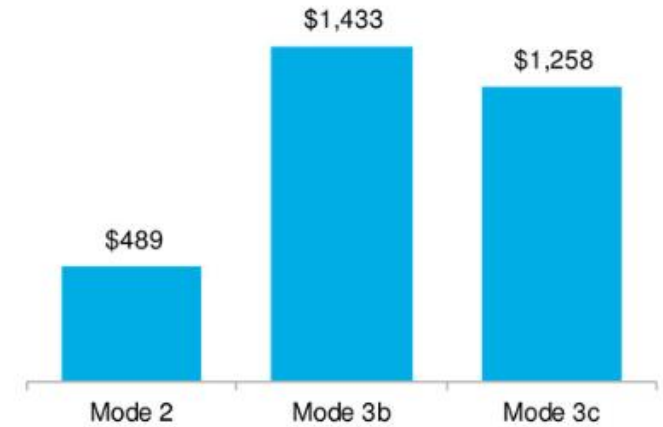
The average charger is getting more powerful

2016-2017 charger prices by power range (U.S. only)



The low end is cheaper, the high end has added features that drive the price up

Average charger price across modes



Portable chargers are the cheaper option. For fixed chargers, users can save around \$200 with their own cable

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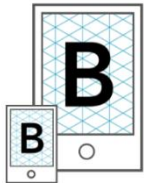
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