

Driving a Green Future in China: Development of Electric Vehicles in the Past Decade and Implications for the future

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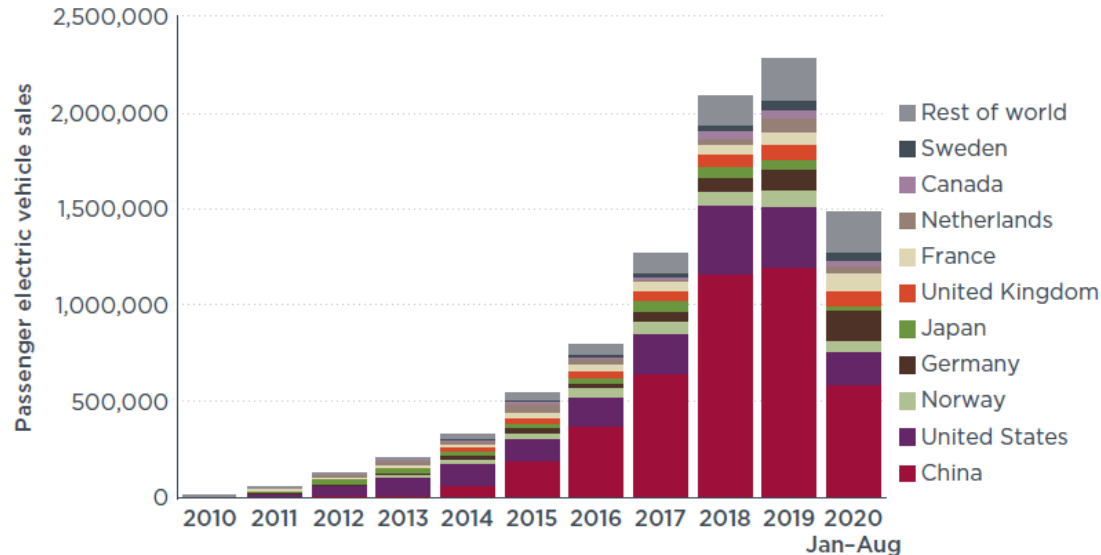
Electric Mobility and Climate Goals in China

Hui He, China Program Director

EV development in the past decade

China and Europe are leading the global electric car sales

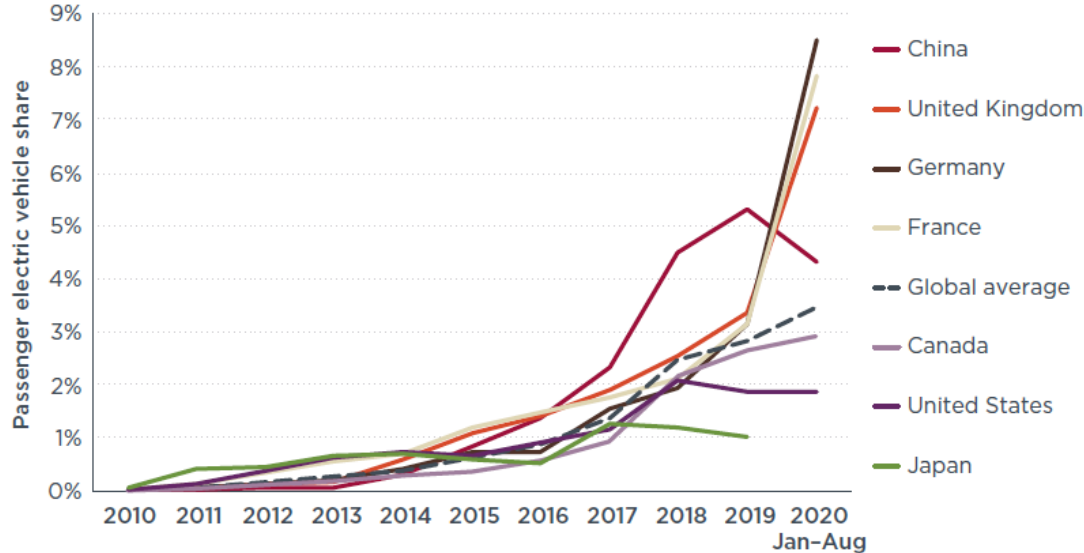
- China continues to be the largest EV market, its cumulative EV sales in the past decade representative 47% of the world's total
- Europe experienced substantial EV growth in 2020



Global light-duty electric vehicle sales till August 2020

Electric vehicle market penetration rose to 3.5% globally, largely driven by the growth in Europe

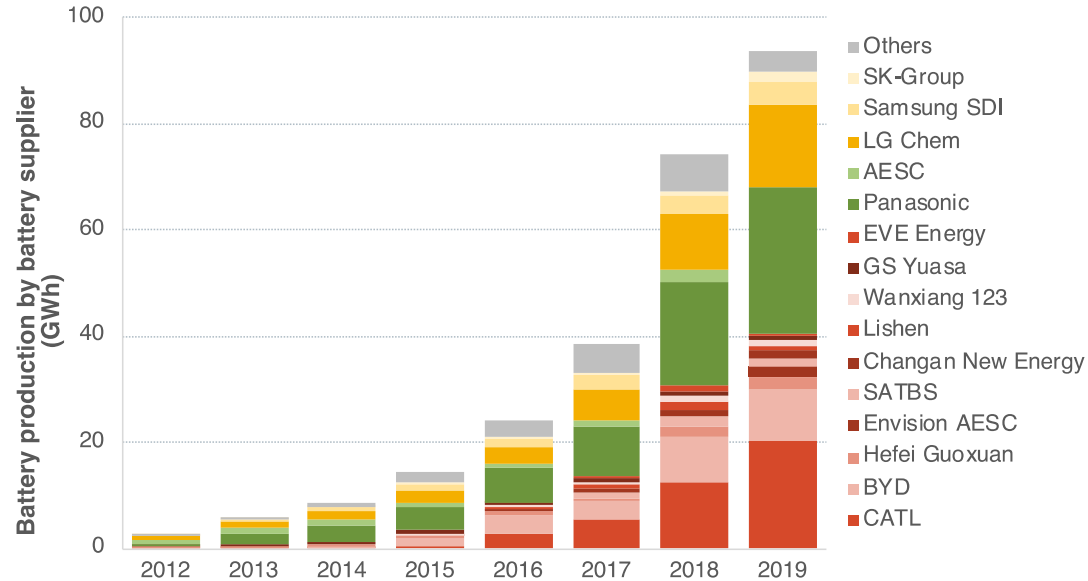
- EV penetration in major European markets more than doubled and reached above 7% in 2020
- China had the highest EV share (of 5.3%) in 2019, then fell to 4.3% in Jan-Aug 2020



EV share among new light-duty vehicles in global market

China is the world's leading electric vehicle battery producer

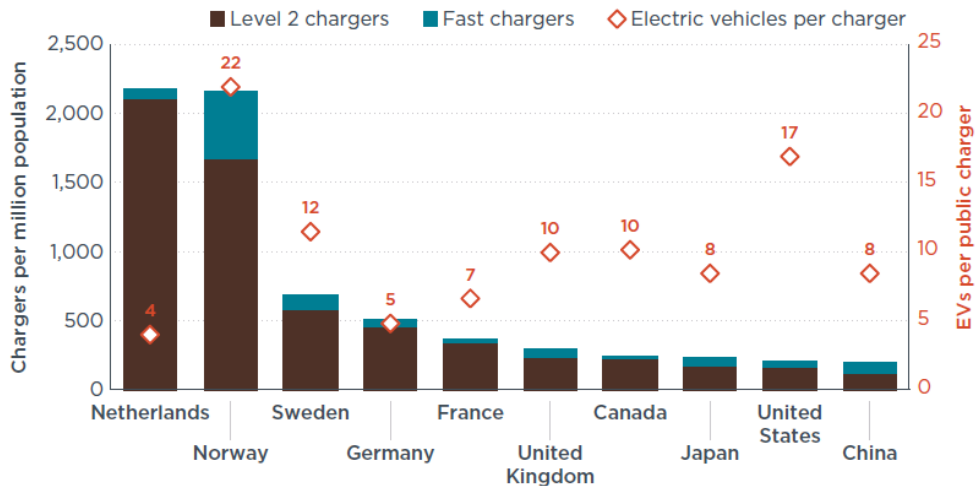
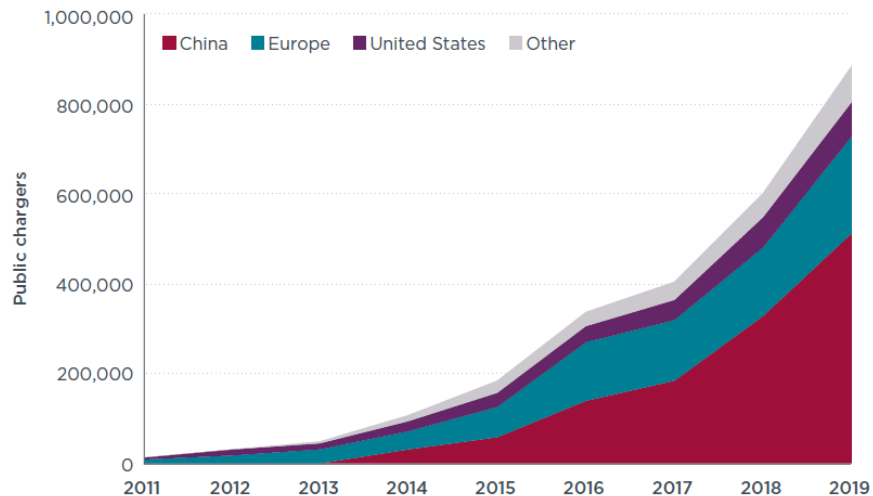
- China produces about half of the world's total battery cells in 2019
- Four major battery suppliers – Panasonic, CATL, LG and BYD -- represent nearly 80% of all battery production



Light-duty electric vehicle sales by battery cell supplier

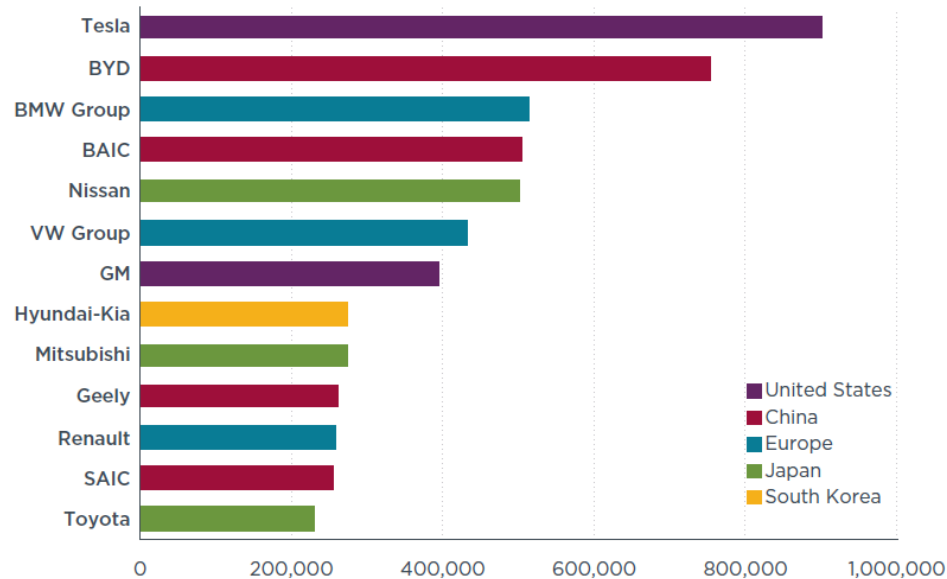
Charging infrastructure grew together with EV sales as an ecosystem

- Public charging infrastructure has averaged 70% growth annually over the 2011-2019 span, with China leading the way
- Countries are developing—and adapting—their charging strategies by shifting from simply putting more chargers on the ground to better catering local consumer needs



Major auto manufacturers are seeing economy of scale in EV sales

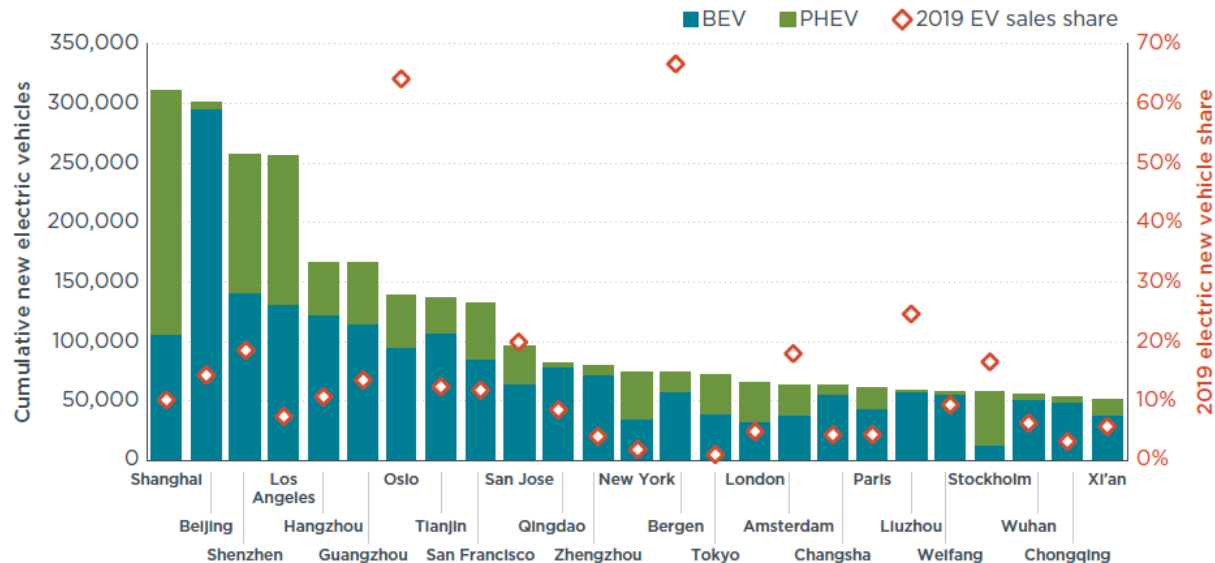
- 13 auto manufacturers have reached large economy of scale, with more than 200,000 cumulative sales globally, including four Chinese groups



Goals for shares of electric vehicle sales in selected electric vehicle capitals

Cities are the frontier of EV deployment

- 40% of world's electric car sales are in 25 leading cities, 14 were from China



China adopted strategies, plans, regulations and policies to drive EV growth



National strategies and plans

In early 2000s, China's 10th Five-Year-Plan established "863" electric vehicle project signaling the birth of China's early EV strategy. Since then, developing EVs becomes a national strategy to revitalize the nation's auto industry

Industrial plans and goals

Industrial plans follow the national FYPs and strategies. There were 4 important industrial plans for EV development: the 2009 Auto Industry Adjustment and Revitalization Plan requiring production of 500 thousand EVs and hybrid vehicles by 2012, the 2012-2020 Energy-Saving and NEV Development Plan setting a goal of 5 million EVs on the road by 2020, Made in China 2025, and NEV industrial Plan 2021-2035, aiming 20% EV market by 2025.

Central policies

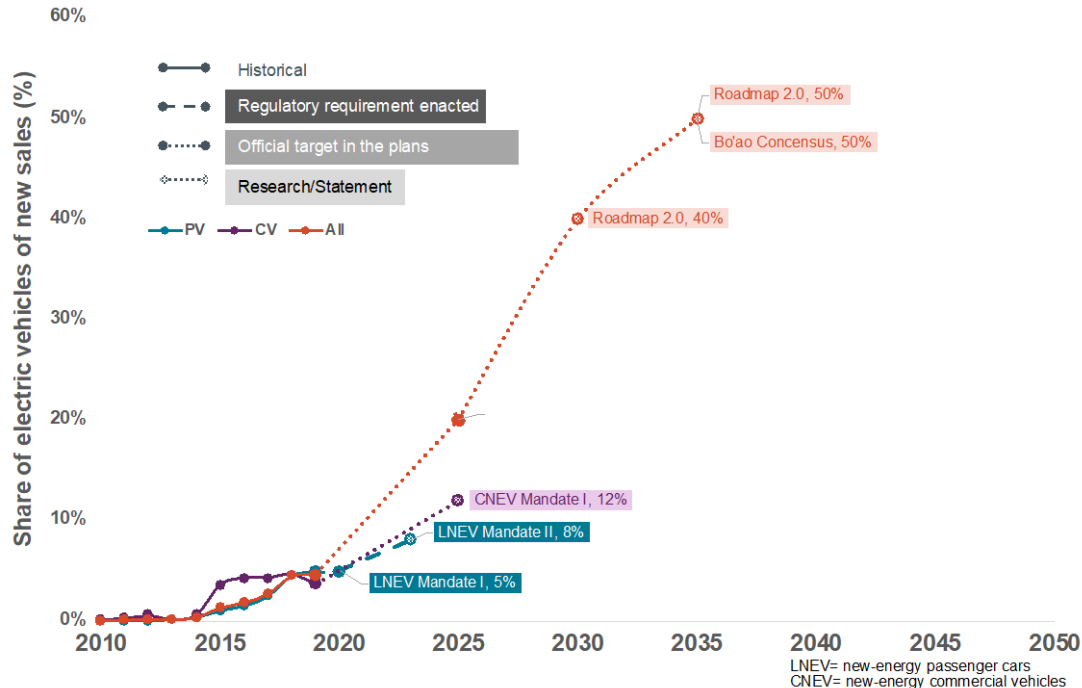
Since its landmark "Ten-City-Thousand EV" pilot program launched in 2009, China has adopted EV purchase subsidies, tax breaks, and sales mandate for new-energy cars, government procurement requirement, and infrastructure subsidies at the national level

Local policies

Provinces and cities have developed a wide range of policies tailored to their local conditions, such as the license plate incentives in mega cities like Beijing and Shanghai, road access privileges, parking incentives etc

Strategies, plans and regulatory requirements

- The official industrial plan sets 20% EV target by 2025
- Industrial associations projects a goal of 50% NEV by 2050



Subsidy program: was designed to promote longer-range, higher energy density, and more efficient EVs

VEHICLE TYPE	TECHNOLOGY	YEAR	DESIGN PARAMETERS										
			EC	ER	LH	BC	BD	BM	CS	SP	FS	RP	VM
	BEV	2016		⊗								X	
	BEV	2017	X	⊗				⊗		X			
	BEV	2018	⊗	⊗		⊗	⊗			Y			
	BEV	2019	⊗	⊗		⊗	⊗			X			
Passenger Cars	PHEV	2016		X								X	
	PHEV	2017	X	X								X	
	PHEV	2018	X	X		⊗					⊗		
	PHEV	2019	X	X		⊗					⊗		
	FCV	2016		X									
	FCV	2017		X								⊗	
	FCV	2018										⊗	
Bus/Coach	BEV	2016	⊗	⊗									
	BEV	2017	X	X			⊗	X	⊗				
	BEV	2018	⊗	X			⊗	X	⊗				
	BEV	2019	⊗	X			⊗	X	⊗				
	PHEV	2016		⊗	X							X	
	PHEV	2017	X	X				X				⊗	
	PHEV	2018	X	X				X				⊗	
	PHEV	2019	X	X				X				⊗	
	FCV	2016		X									
	FCV	2017		X									X
	FCV	2018											
Truck/Vocational	BEV	2016		X									
	BEV	2017	X				X						
	BEV	2018	⊗				X						
	BEV	2019	X	X			X						
	PHEV	2016		X								X	
	PHEV	2017		X			X						
	PHEV	2018		X								X	
	PHEV	2019		X								X	
	FCV	2016		X									
	FCV	2017		X									X
	FCV	2018											



$$Subsidy = \min\{Subsidy_{ER}, Subsidy_{BC}\} \times F_{BD} \times F_{EC} \times F_{OS}$$

Where,

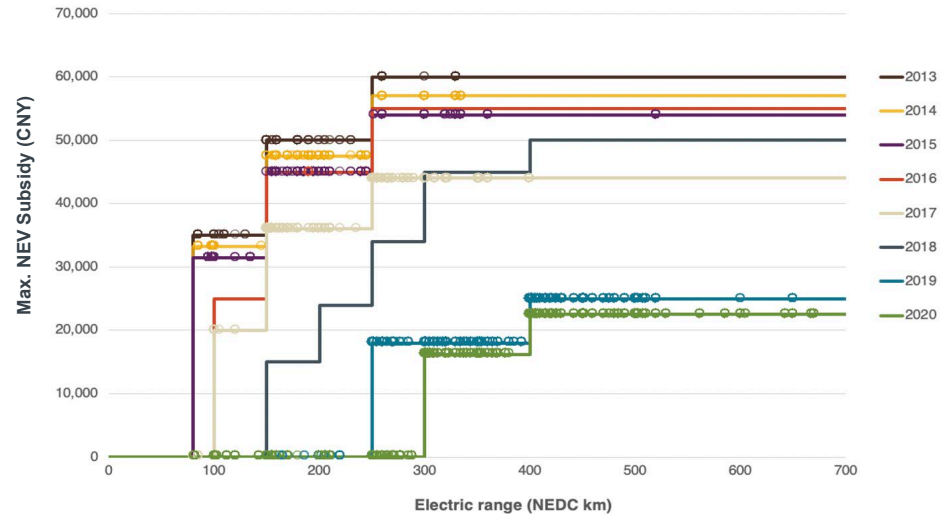
$Subsidy_{ER}$ = base subsidy determined by electric range

$Subsidy_{BC}$ = base subsidy determined by battery capacity

F_{BD} = battery energy density multiplier

F_{EC} = electric energy consumption multiplier

F_{OS} = ownership type multiplier



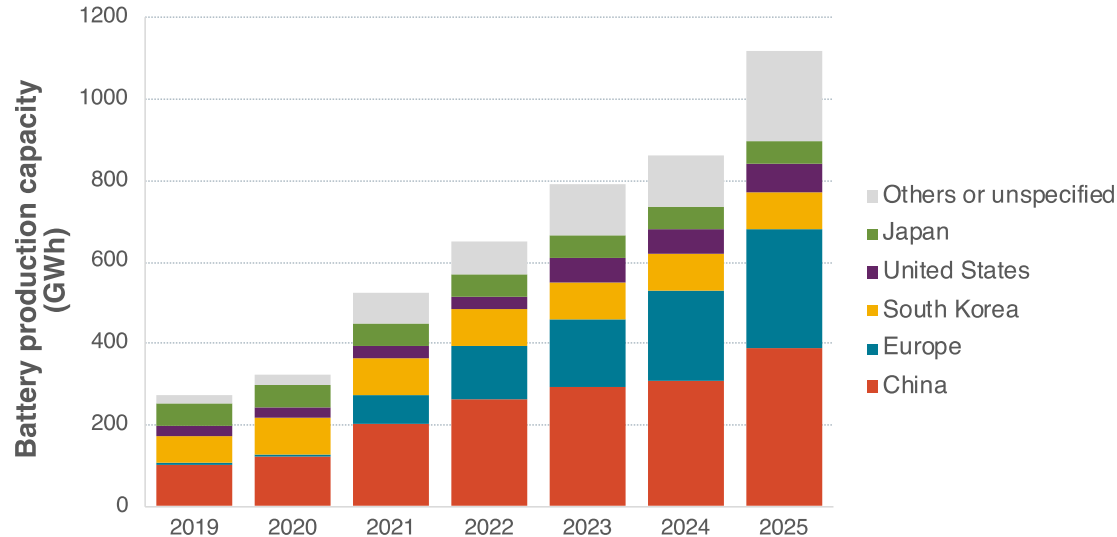
City-level policies

NEV promotion policies at the city level		Pilot cities																	Number of cities with this incentive												
		Shanghai	Shenzhen	Hangzhou	Guangzhou	Wuhu	Lanzhou	Xiangtan	Qingdao	Changsha	Beijing	Tianjin	Linyi	Haikou	Zhuzhou	Huzhou	Yichun	Wuhan		Ningbo	Kunming	Xi'an	Nanchang	Chongqing	Xiamen	Taiyuan	Zhengzhou	Nanjing	Chengdu	Shijiazhuang	Hefei
Direct Incentives	Local BEV purchase subsidy	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	29	
	Local PHEV purchase subsidy	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x			x	x	x	x	27	
	Exemption from vessel & vehicle tax	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	30	
	Parking fee reduction		x													x					x	x			x				x	6	
	Licence production cost reduction																				x							x	x	3	
	Charging fee reduction	x	x			x					x	x						x				x								7	
	One-time usage subsidy		x																			x								2	
	Trade-in subsidy					x																x			x				x	4	
	Car insurance fee reduction																					x								1	
	Home charger subsidy													x																1	
Toll fee reduction																												x	1		
Indirect incentives	Public charger availability		x	x	x	x	x						x	x		x	x	x			x	x	x	x	x	x	x	x	x	18	
	Reserved parking space															x					x									2	
	Exemption from purchase restrictions	x	x	x	x						x	x																		6	
	Exemption from driving restrictions						x				x	x						x				x						x		6	
Other incentives	Fleet purchase subsidy	x				x											x			x								x	5		
	Taxi purchase & usage fee reduction	x	x							x						x						x								5	
	Research and development subsidy	x								x	x					x						x	x							6	
	Battery recycle subsidy	x	x																										x	3	
	Car rental subsidy						x																							1	
Total incentives in this city		9	10	5	5	8	5	3	3	3	7	6	6	4	3	4	8	5	5	3	10	9	5	4	5	1	4	4	6	9	4

Implications for the future

China will continue to serve as the powerhouse of the global EV industry

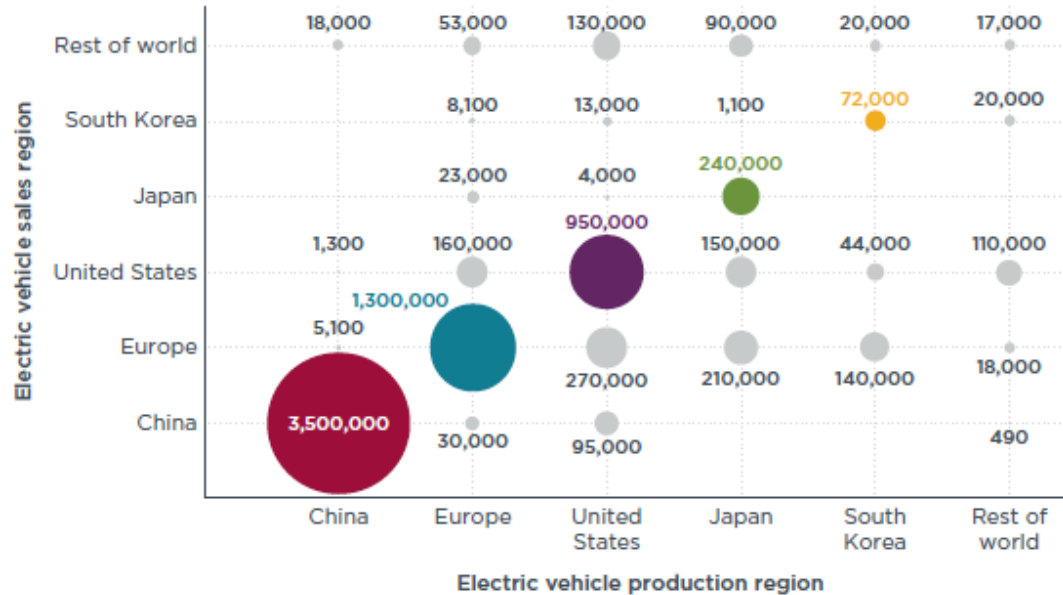
- Based on industry announcements, future battery production capacity globally will grow by a factor of 4 compared with 2019
- China is leading in battery production, and is likely to maintain this leading position in five years from now



Announced light-duty electric vehicle battery production capacity by region

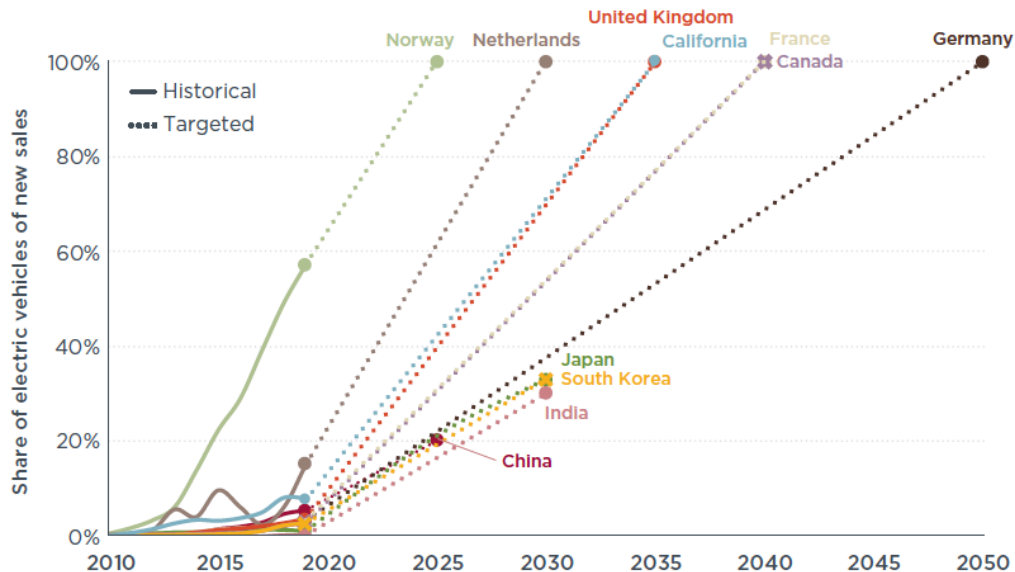
China can play a greater role in a globalized EV industry

- China's EV developments: Leading market and producer, but still relatively isolated
- China has an immense opportunity to expand EV shipments abroad



Long-term visions and goals are critical for realizing carbon neutrality targets in major markets

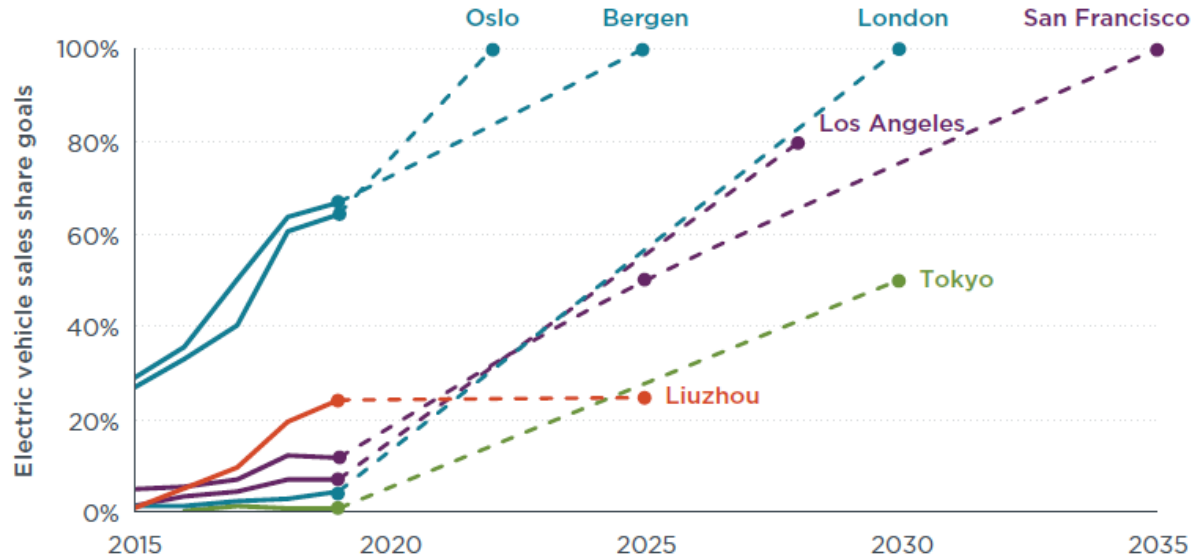
- More than a dozen regions, mostly European countries, have proposed timelines to transition to zero-emission vehicles with the next three decades
- Among major auto markets, China has yet set long-term targets for electrification



Electrification commitment for new passenger cars vs historical EV penetration in various markets

Cities can spread all-electric mobility

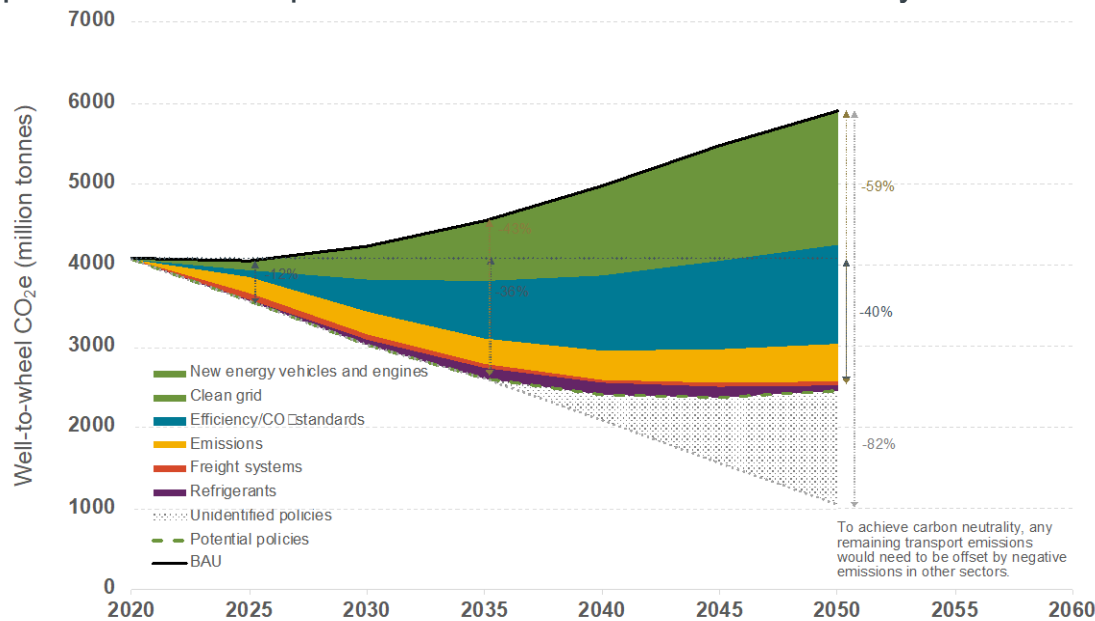
- Many cities have set goals concerning the share of electric vehicle sales, or ban of combustion vehicles



Goals for shares of electric vehicle sales in selected electric vehicle capitals

Electrification and efficiency improvement are the most important pathway to decarbonize China's transportation sector

- Our preliminary analysis shows that strong policies in electrification, vehicle efficiency and emissions in the next decade are crucial to bend down the curve of China's transportation GHG emissions, and longer-term policies have the potential to reduce GHG emissions by over 80% by 2050



WTW GHG (CO₂e) emissions (GWP20) under strong policies, 2020-2050 (Preliminary)



Reflections

- China has cultivated the world's largest EV market and battery producer, representing about half of global light-duty EV sales and battery cell production
 - ...as a result of its clearly articulated vision and strategy, well-designed planning and decade-long, strong policy push including pilot programs, direct subsidies, local non-fiscal incentives, and most recently EV sales mandates.
- Looking into the future, China can play a greater role in the global EV market
 - An updated vision for full electrification and a long-term plan to help achieve industrial, air quality, and climate change mitigation goals.
 - It's time to consider 100% EV target, tightened EV sales requirement for cars and trucks, and stringent vehicle efficiency and CO₂ standards to collectively drive continued EV growth
- Focus on heavy-duty trucks
 - Electrifying these vehicles would bring tremendous co-benefits to China's local air quality climate change mitigation
 - There is tremendous opportunity for China to introduce an EV mandate for the truck sector, similar to California's Advanced Clean Truck regulation

More info

ICCT electric vehicle page: <http://theicct.org/electric-vehicles>

ICCT China program page: <https://theicct.org/countryregion/asia/china>

ZEV Alliance: <http://www.zevalliance.org>

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The logo for the International Council on Clean Transportation (ICCT). It features the lowercase letters 'icct' in a bold, white, sans-serif font. The letter 'i' has a small white circle above it, resembling a dot or a stylized 'i'. The background is a dark teal color with a large, lighter teal circular graphic behind the text.

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