

Energy & Mobility Transitions

REVision2019

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March 6, 2019



BloombergNEF

Sharing global and local knowledge

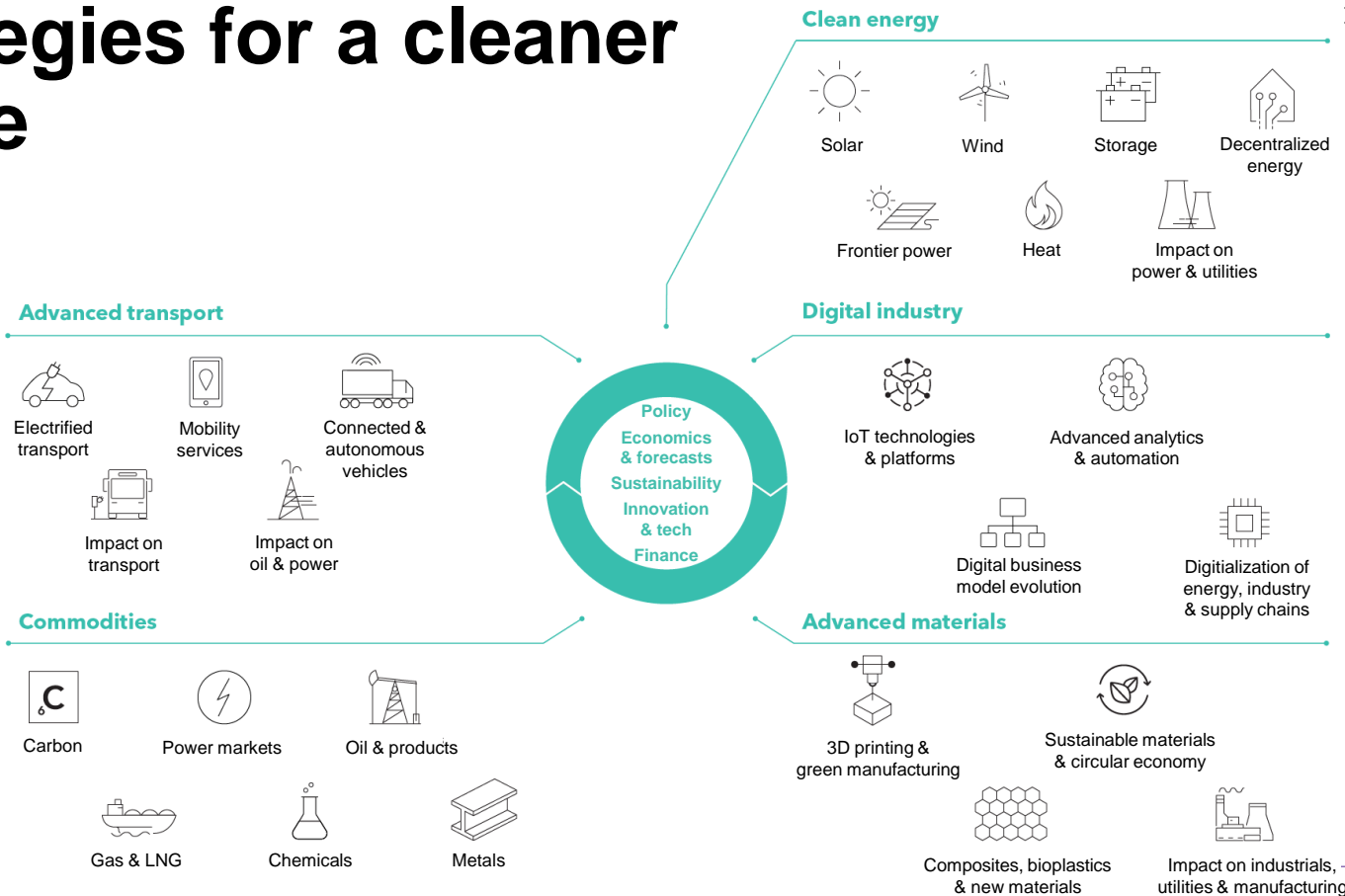


250

BNEF professionals in
17 locations*

* Part of the Bloomberg LP with
19,000 employees in 176
locations.

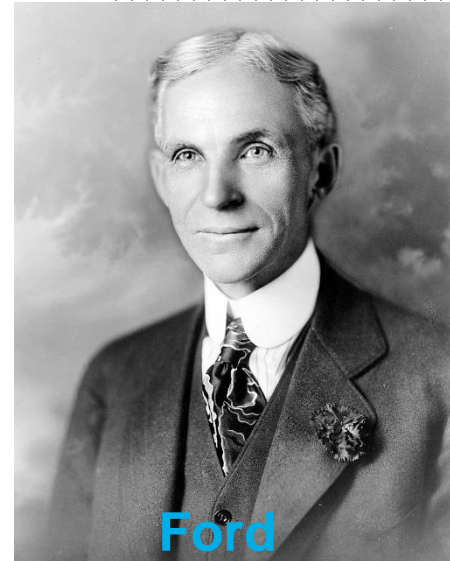
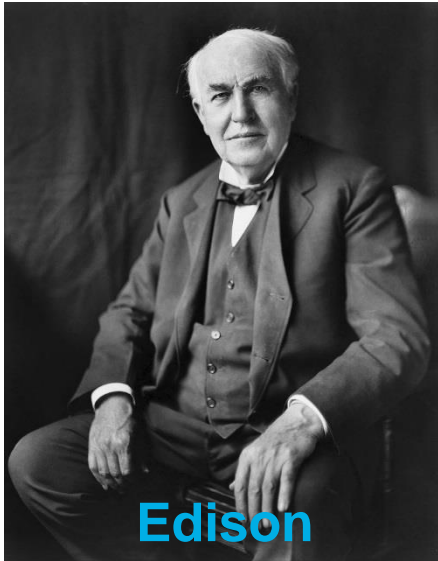
Strategies for a cleaner future



Contents

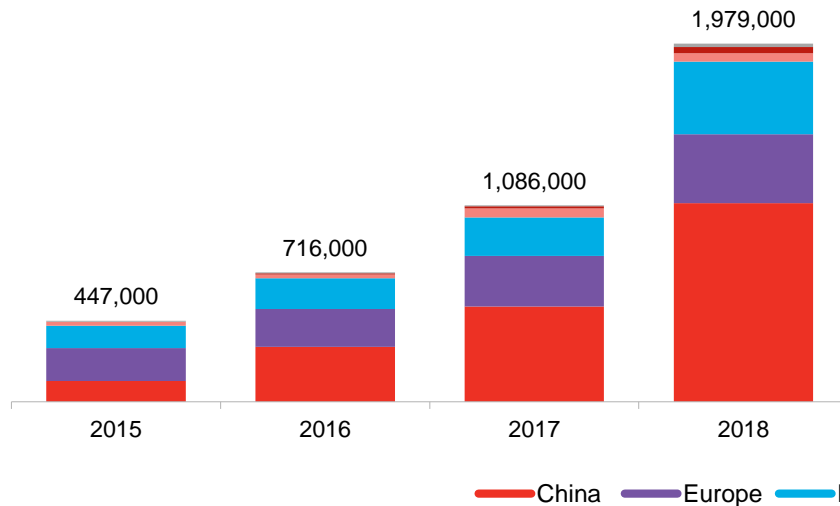
Twin transitions	4
Sector coupling	15
Distracted boyfriend	19

Twin transitions

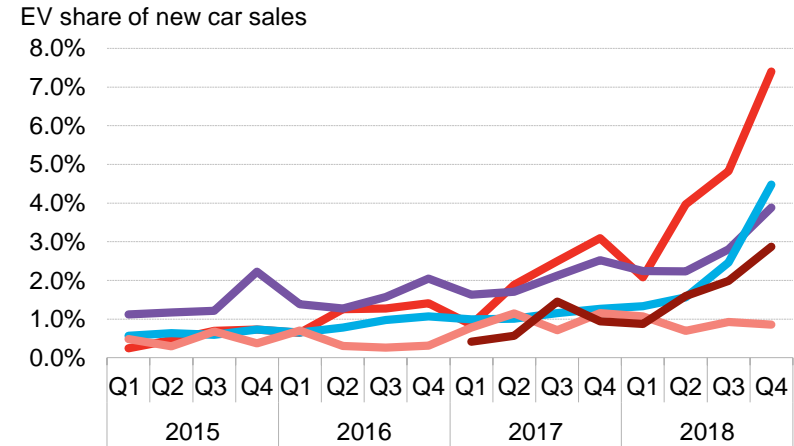


EV adoption is ramping fast

Global EV sales



EV sales penetration by country

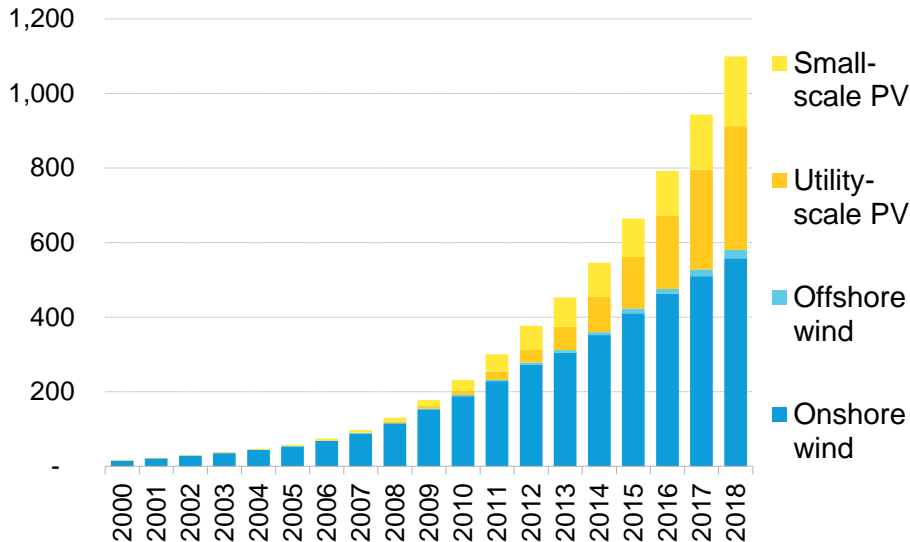


Source: BloombergNEF, EV includes BEVs and PHEVs. Some December 2018 data is estimated. Europe figure covers 16 main European vehicle markets

Wind and solar are at terawatt scale, storage is accelerating

Global wind and solar installations

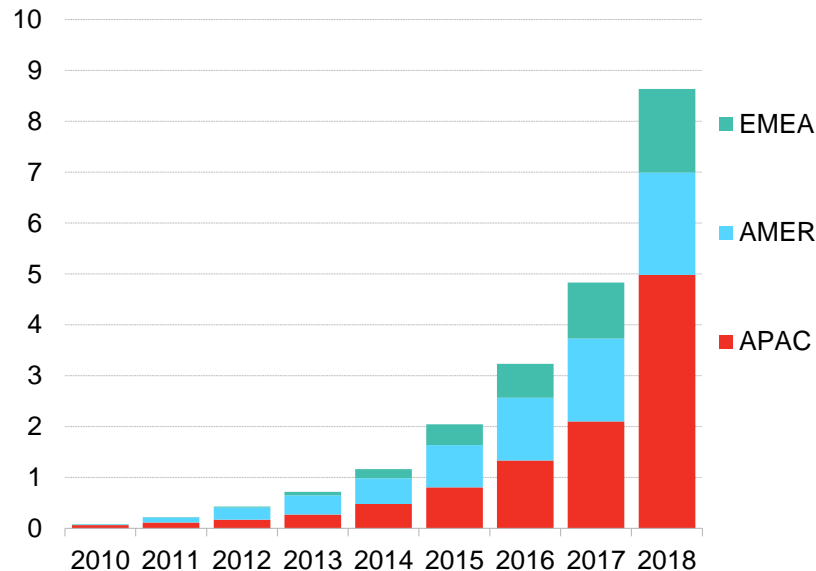
Cumulative GW



Source: Bloomberg NEF.

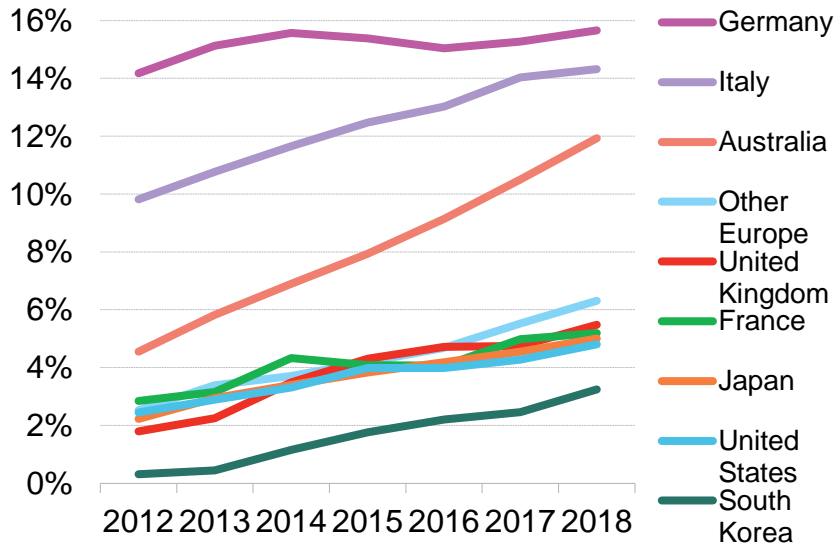
Global energy storage installations

Cumulative GW

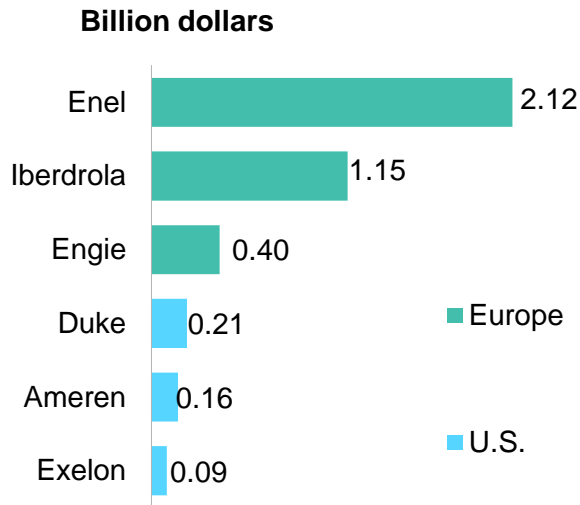


Power is decentralizing and digitalizing

Decentralization ratio



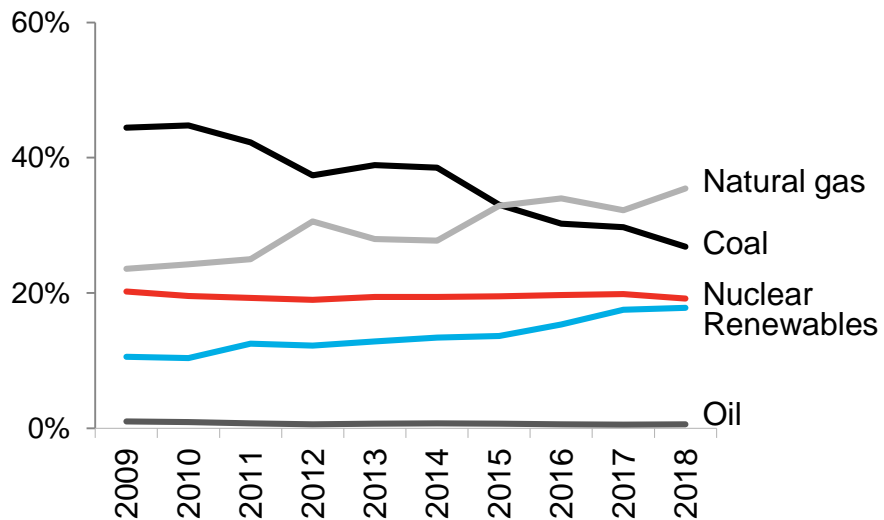
Annualized planned utility digitalization capex



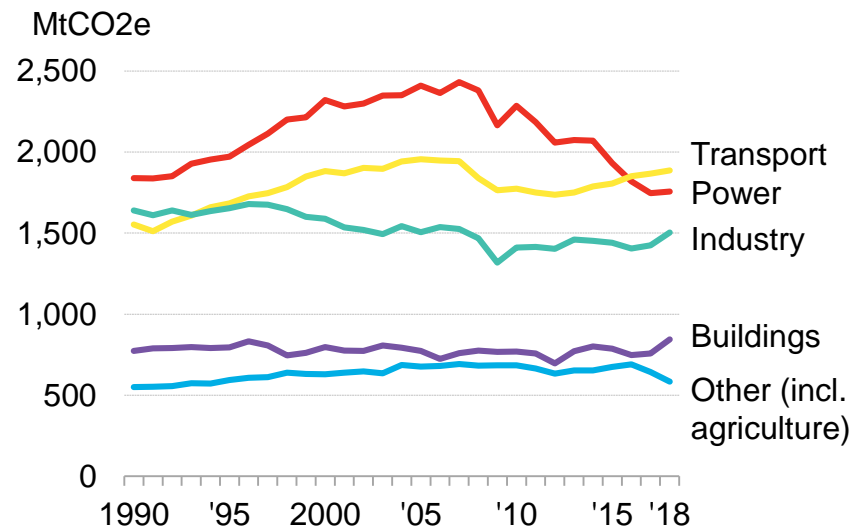
Source: BloombergNEF. Note: decentralization ratio is small-scale PV, storage, and demand response capacity divided by total system capacity

Progress on decarbonization

U.S. power generation mix



U.S. greenhouse gas emissions by sector



Source: BloombergNEF, EIA, EPA

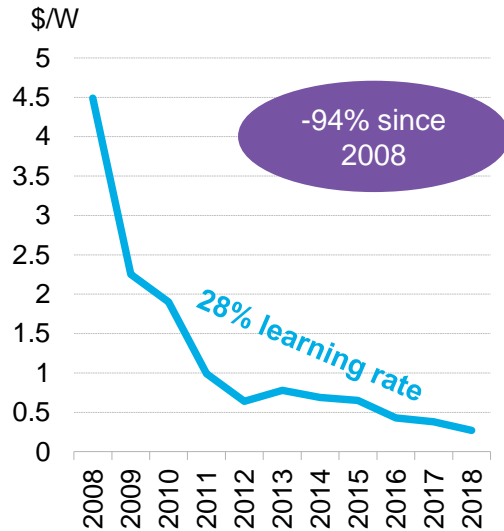
Twin transitions supported by policy and regulation

Selected government targets:	Electric vehicles	Renewable power
California	5m (~33%) on the road by 2030	60% by 2030 100% clean power by 2045
Europe	<i>30-50% of sales by 2030</i>	55% by 2030*
Sweden	Ban ICE sales by 2030	<i>100% by 2040</i>
UK	Ban ICE sales by 2040	<i>~50% by 2030</i>
Spain (proposed)	Ban ICE sales by 2040	70% by 2030, 100% by 2050
China	7m (~20%) sales by 2025	35% by 2030

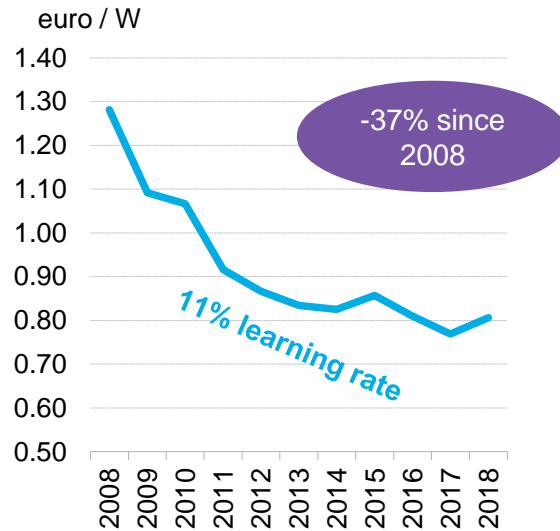
*Note: Italicized figures are our estimates and interpretations of EU regulations and UK carbon budget. *EU legislation calls for 32% renewable energy by 2030, of which power sector is expected to make a bigger contribution of around 55%.*

Transitions driven by technology

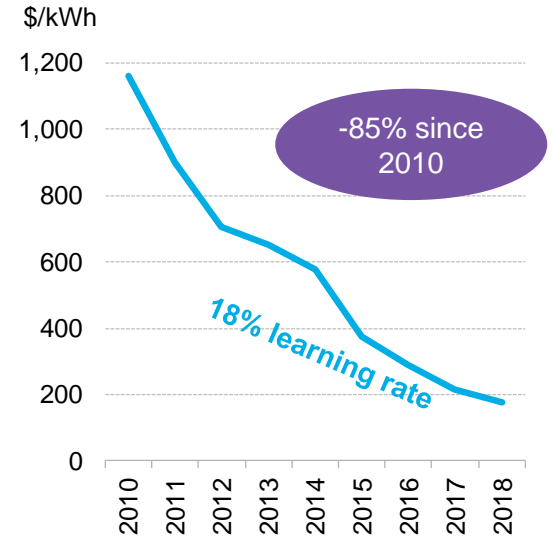
Solar PV module prices



Onshore wind turbine prices



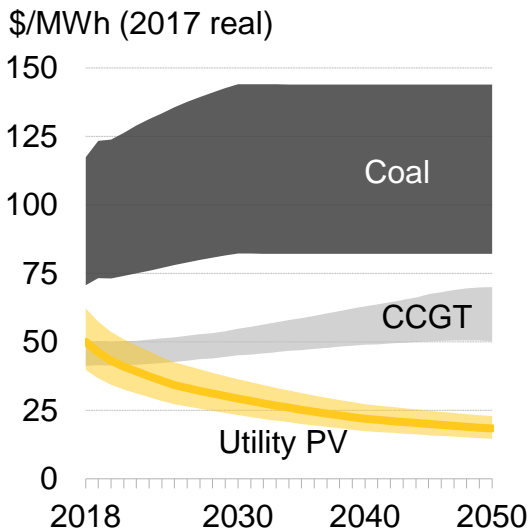
Lithium-ion battery prices



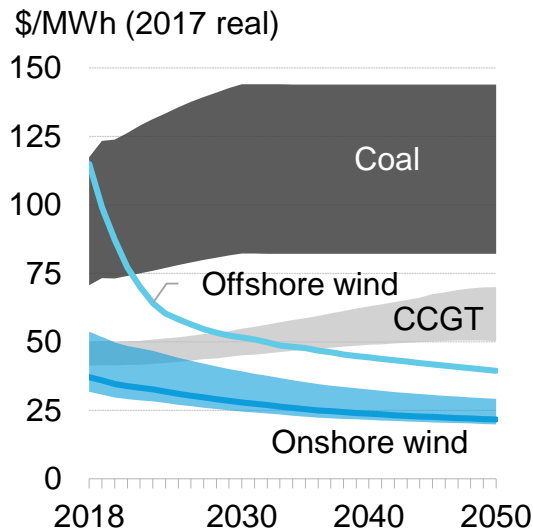
Source: BloombergNEF.

Transitions characterized by tipping points

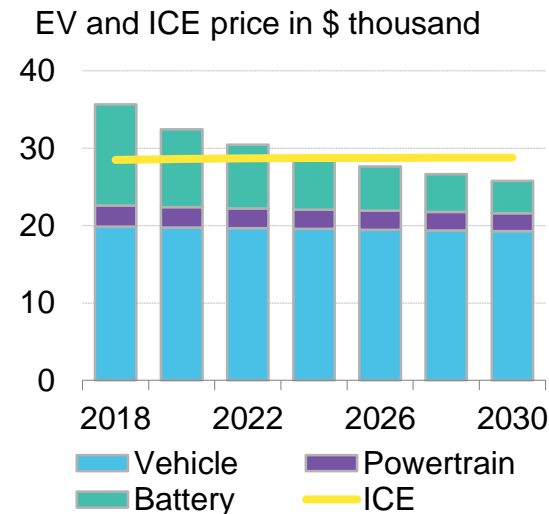
Solar costs vs. coal & gas



Wind costs vs. coal & gas



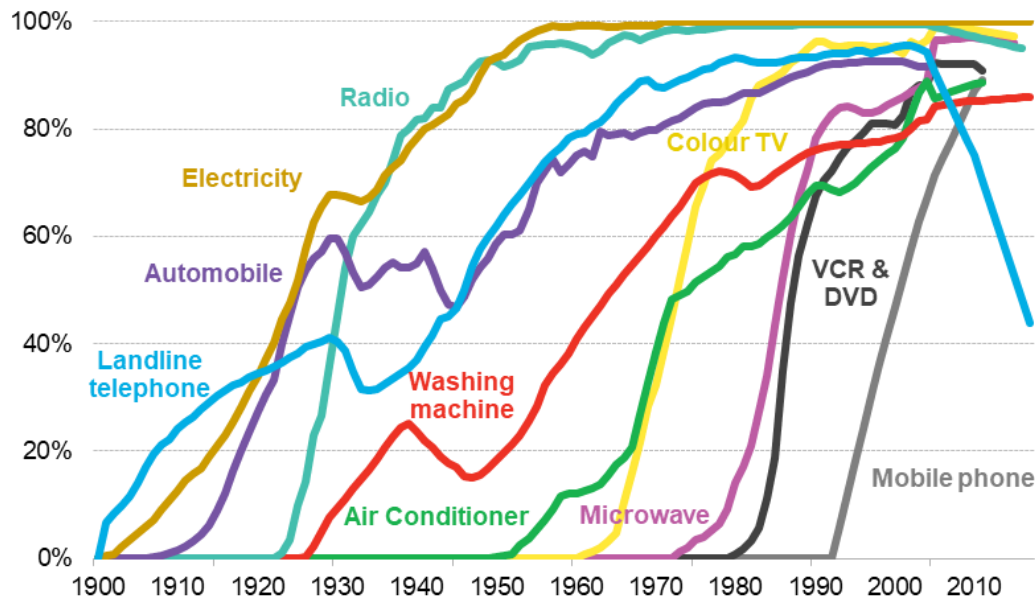
EV purchase price vs. ICE



Note: Levelized cost of electricity (solar, wind, gas, coal) calculations are for utility-scale assets in the U.S. and exclude incentives such as the ITC and the PTC. Utility PV assumes tracking. EV price is for a medium segment vehicle in the U.S.

Past transitions

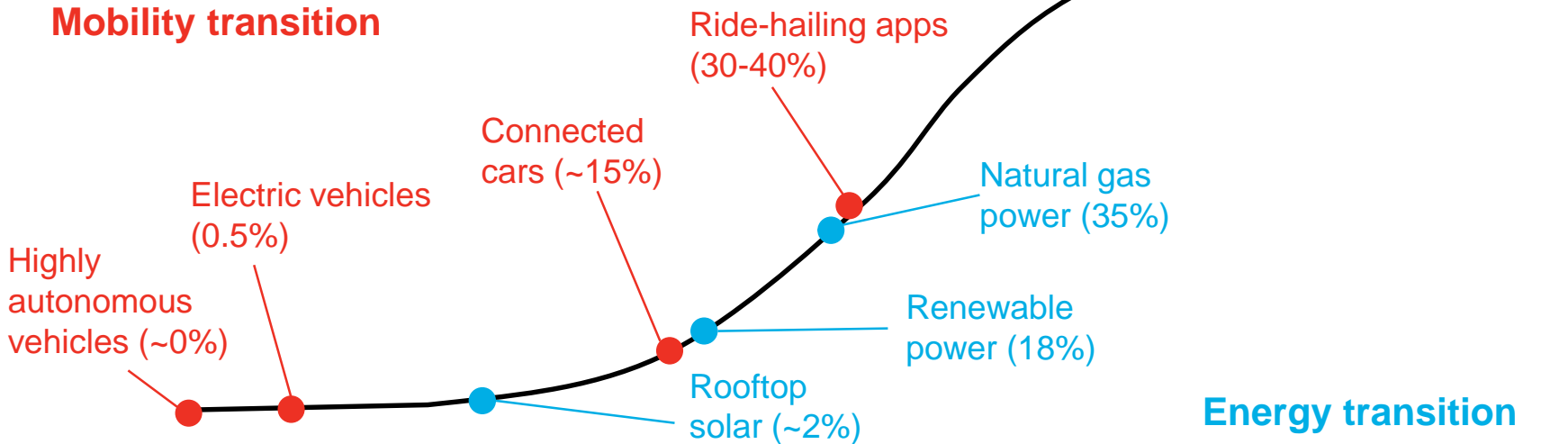
Selected technologies' penetration of U.S. households



Source: Michael Felton, NY Times, <https://www.census.gov/history/pdf/sipp-data-appliances.pdf>

But twins can develop at different paces...

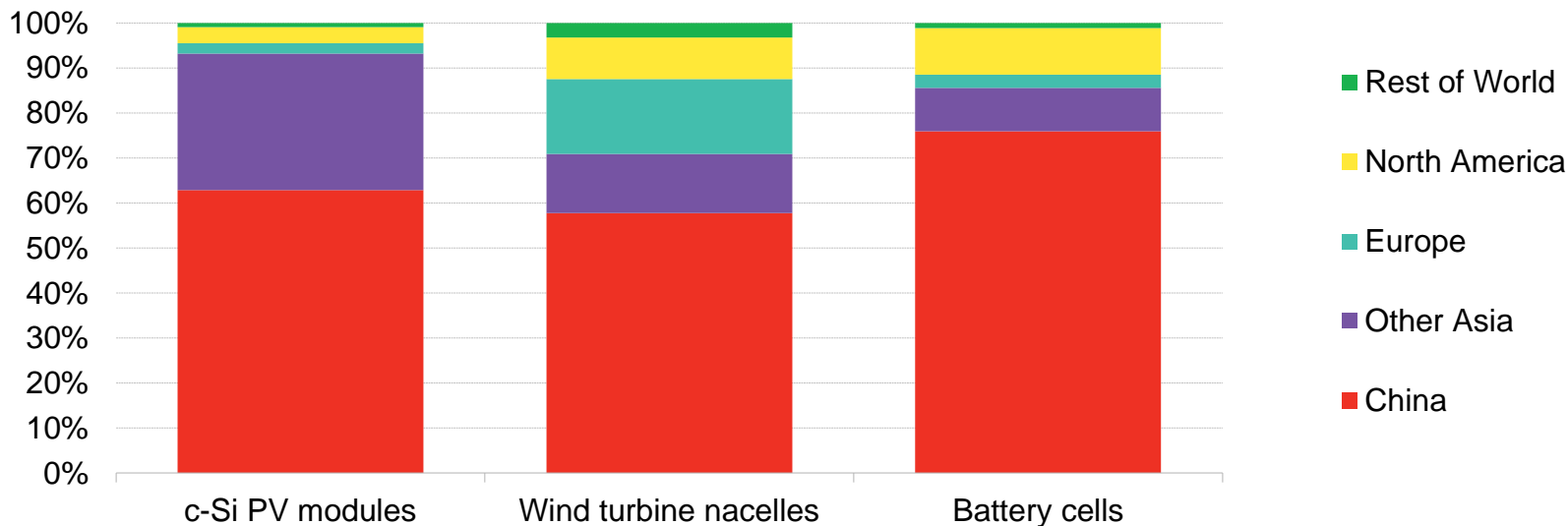
Current penetration of selected technologies, U.S.



Note: BloombergNEF

...and industrial strategy may not play out the same

Geographical distribution of manufacturing capacity



Source: BNEF. Note: figures are for capacity, not production. Latest data 2019 for batteries, 2017 for wind.

Sector coupling

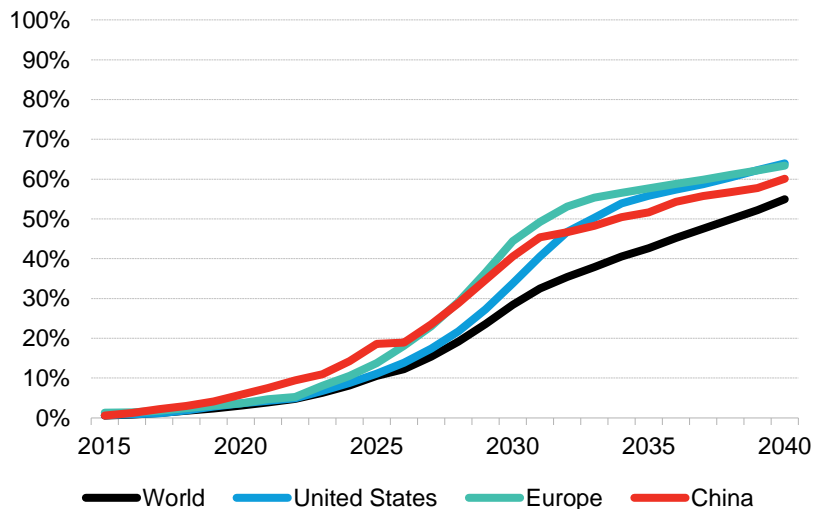


Image from theloop.ca

BNEF's outlook: half and half by 2040

Electric vehicle outlook

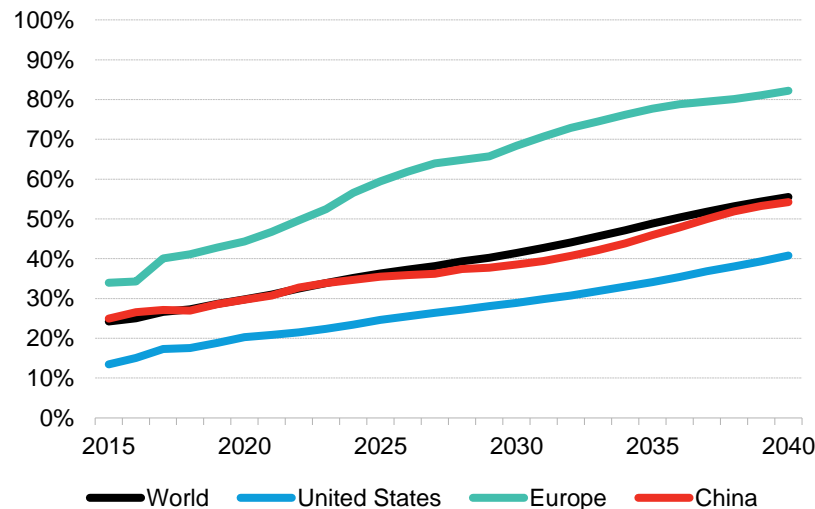
EV share of passenger vehicle sales



Source: BloombergNEF 2018 EV Outlook

New energy outlook

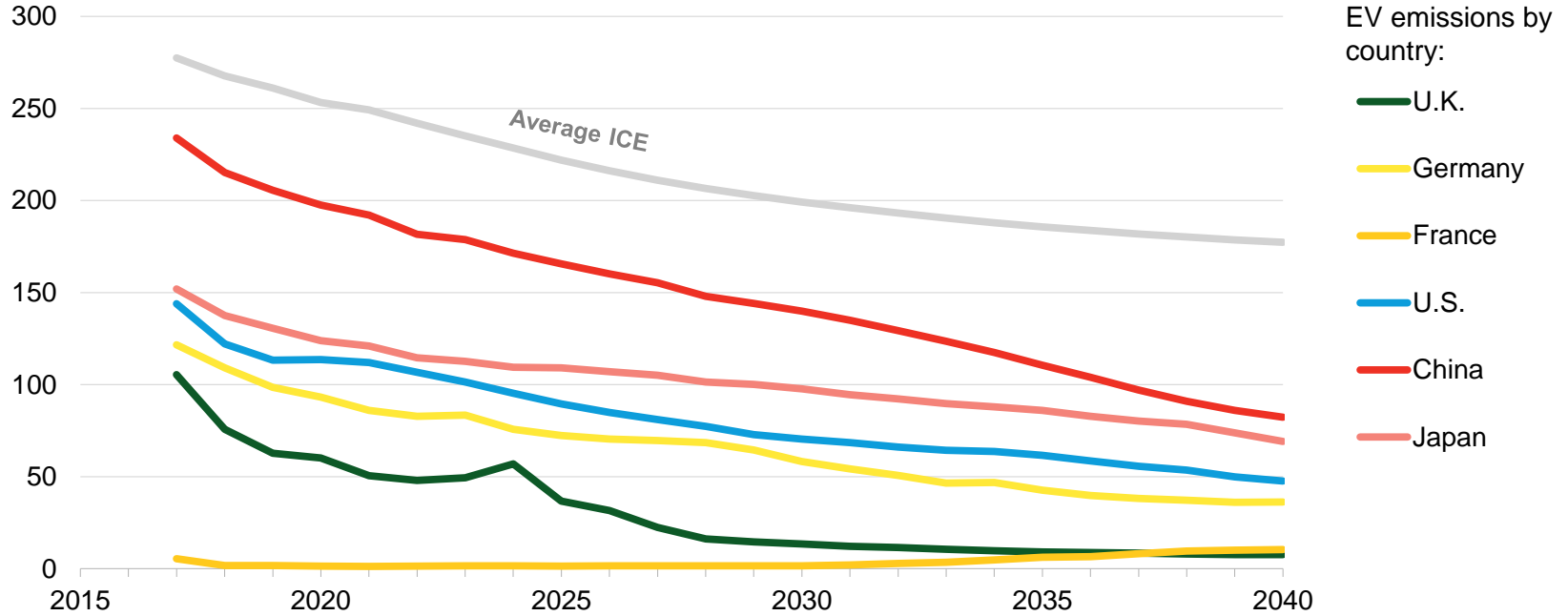
Renewable share of total generation



Source: BloombergNEF 2018 New Energy Outlook

EV operating emissions

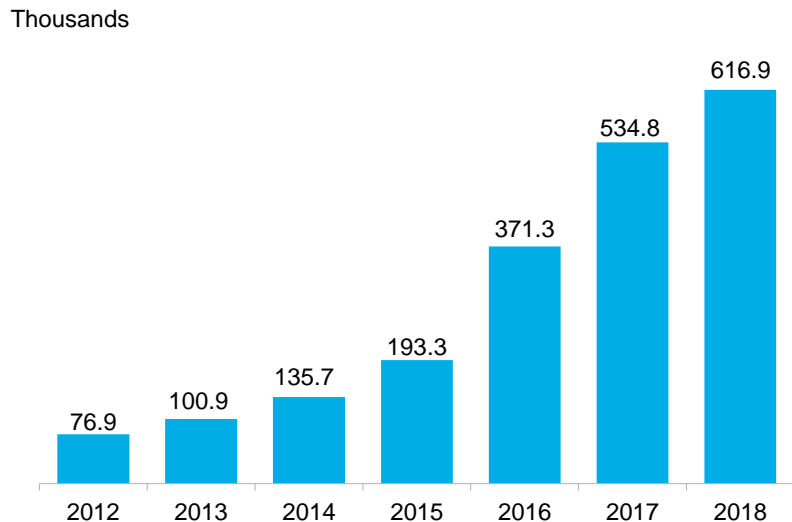
gCO₂/mile



Source: BloombergNEF

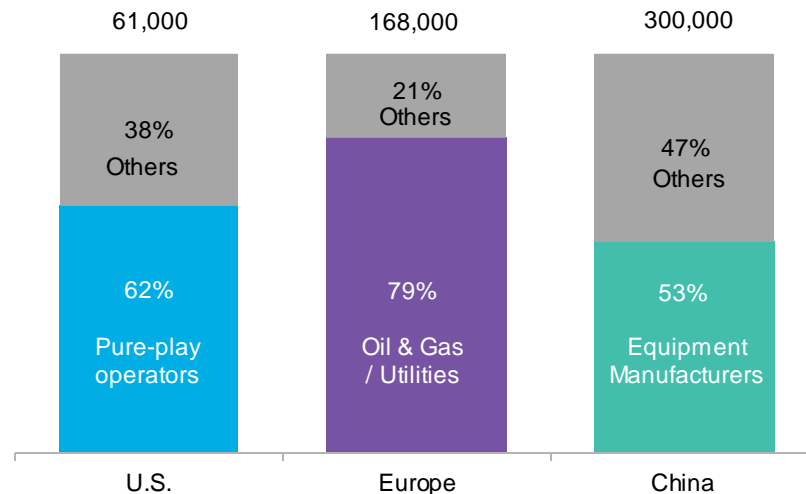
Public charging infrastructure

Chargepoints deployed, 2012-18



Source: BloombergNEF

Largest type of chargepoint operators by region, 2018










Source: BloombergNEF

Distracted boyfriend



Electricity activities of selected oil majors

		Europe					U.S.	
								
Generation and trading	Gas power plants							
	Power trading				(Danske Commodities)			
	Renewable energy	(Multiple)	(Lightsource, others)	(Silicon Ranch Corp)		(Apodi project)		Reducing emphasis
	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)		VC (Chargepoint)
	AVs or car sharing		VC (Drover)	VC (FarePilot)				

Source: BloombergNEF, company reports and presentations.

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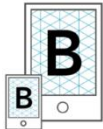
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