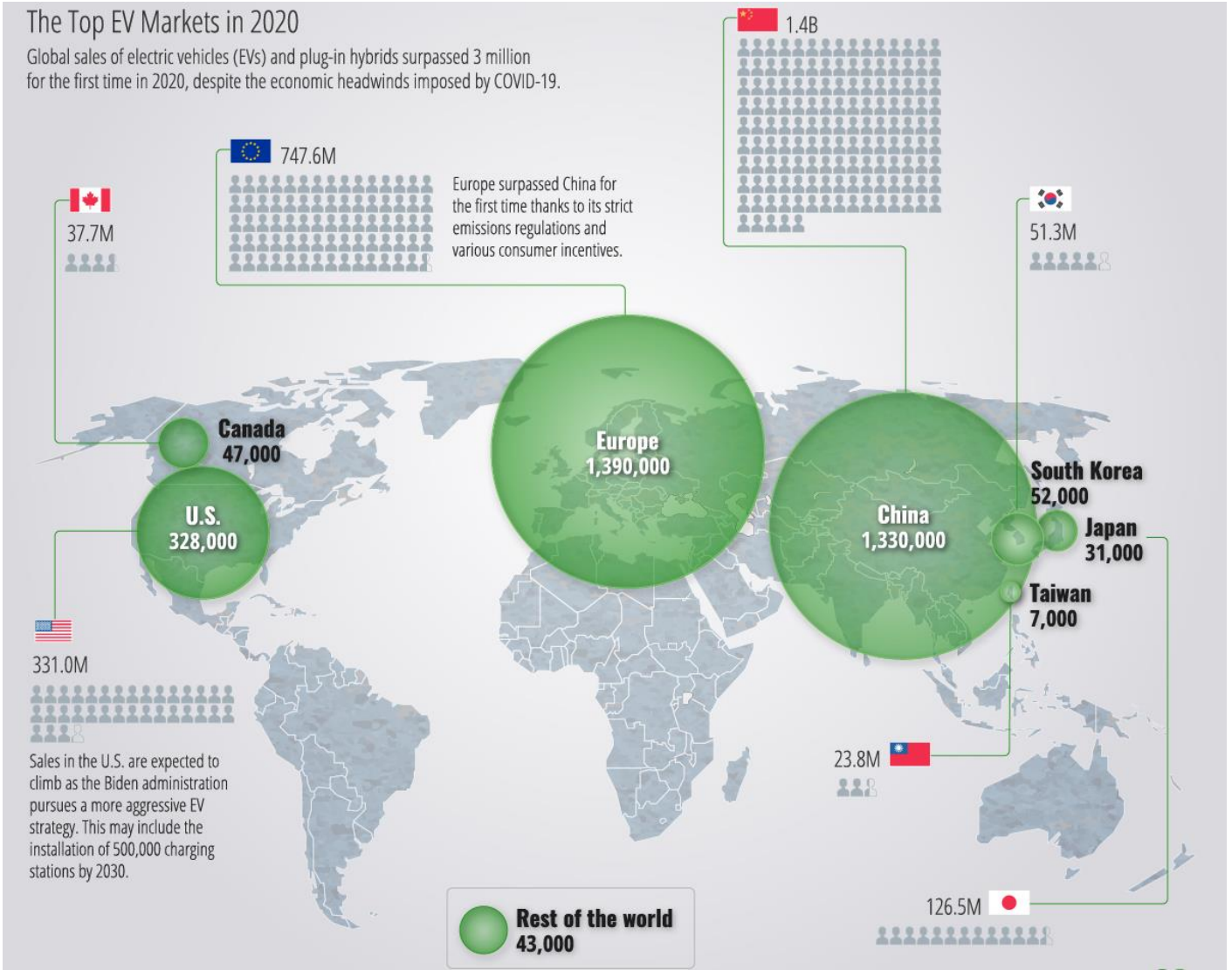
International EV policies

ECI 189G: Lecture 17

Dan Sperling
Alan Jenn
Spring 2022

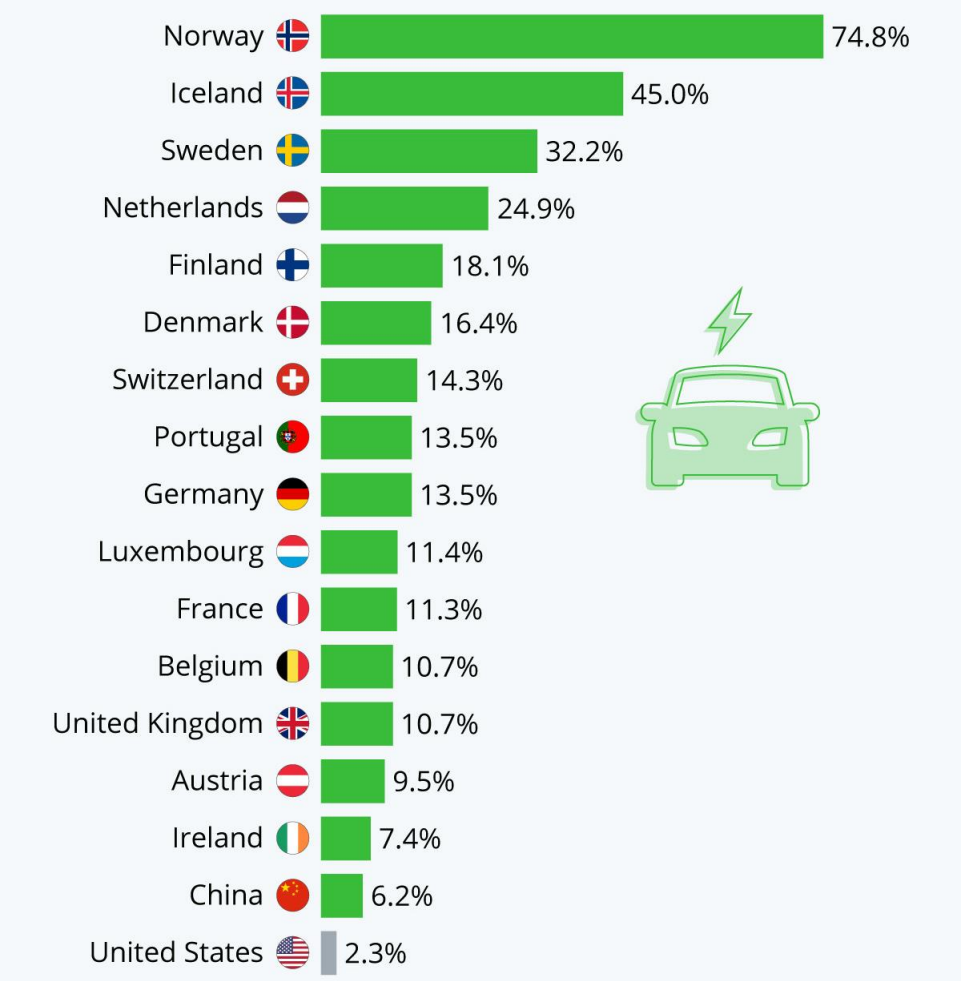
EVs in the rest of the world



Norway: Leading the Way

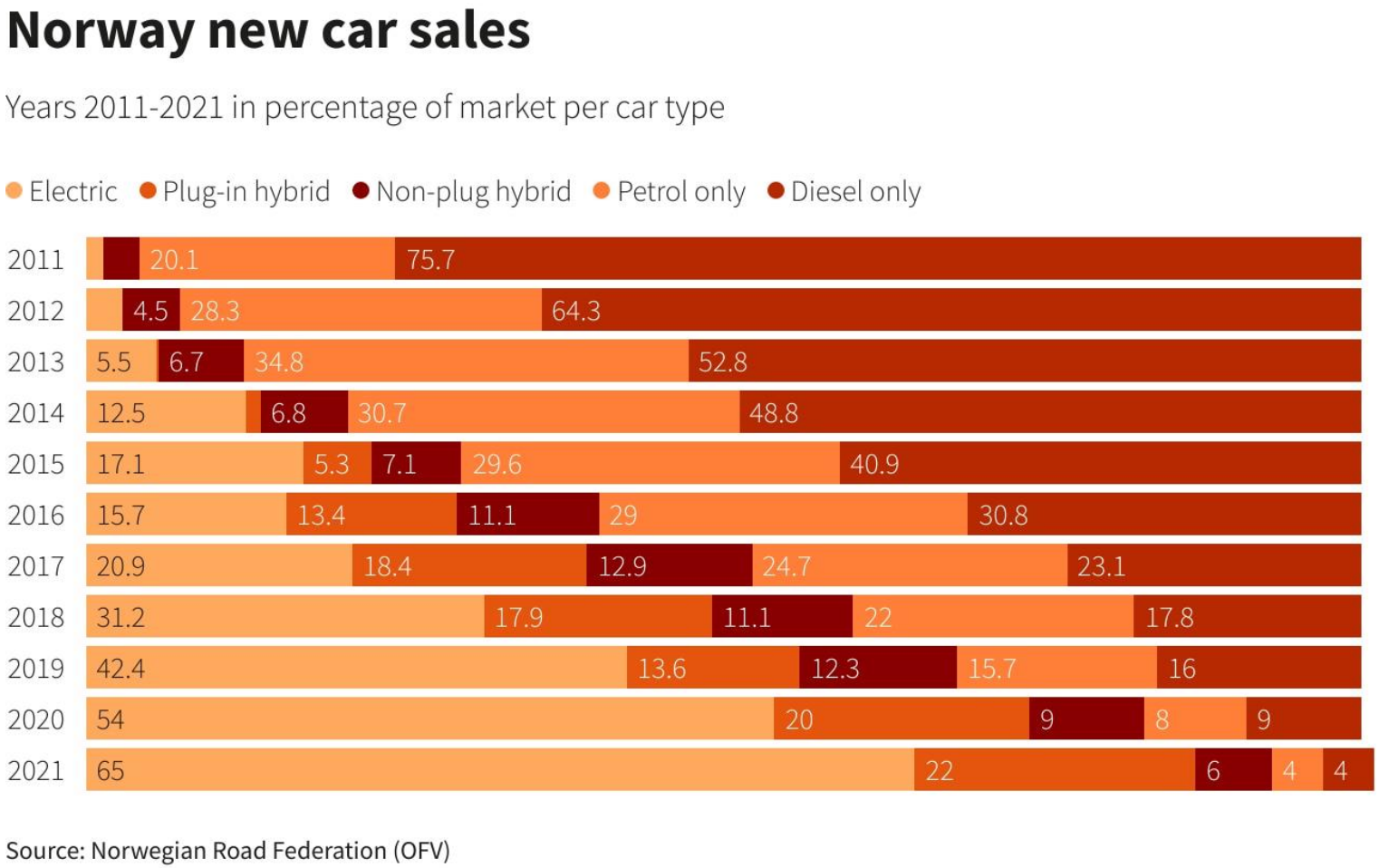
Which countries sell the most by share?

- While countries like China, US, and Germany sell the EVs, by market share the story is quite different
- Nordic countries seem to have the greatest success in EV sales
- Are there successes from smaller countries that others can learn from?



Market share dominated by EVs in Norway

- By 2018, *half* of all new cars were EVs (compare successful California at 12%)
- Last year, EVs accounted for 87% of all new cars sold in Norway
- At this rate, Norway will reach 100% EV sales within the next 2 years!



Why is Norway so successful?

- **Cheaper** and more convenient!
  - No import tax
  - No 25% VAT tax
  - No (now reduced) annual road tax
  - No (now reduced) road and ferry tolls
  - No (now reduced) EV parking fees
  - Access to drive in bus lanes
  - Reduced taxes on company cars
- All main road systems in Norway have fast charging stations (about 1 station per 1000 EVs)

Comparing EV and ICV prices

	Volkswagen Golf	Volkswagen e-golf
Import price:	22 046	33 037
CO2 tax (113 g/km)	4 348	-
NOx tax:	206	-
Weight tax:	1 715	-
Scrapping fee:	249	249
25% VAT:	5 512	-
Retail price:	34 076 €	33 286 €

- At the end of the day, it is straight up more expensive to buy a gas/diesel car than an EV in Norway

EVs in the rest of Europe

CO_2 emissions target

- Analogous to the CAFE/GHG emission standards, the EU has implemented CO_2 emissions for its member countries
- In 2009, Directive No 443/2009 set targets:
  - 130 g/km (~43 MPG) for new cars in 2015
  - 175 g/km (~32 MPG) for commercial vehicles in 2017
  - Both of targets were met several years ahead of schedule
- Keep in mind that the efficiencies use the WLTP efficiency measurements! (Also

New EU CO_2 emissions targets

- A new directive was recently passed: EU 2019/631
  - 95 g/km (~58 MPG) by 2021
  - ~81 g/km (~69 MPG) by 2025
  - ~59 g/km (~94 MPG) by 2030
- Unlike US, these targets ***cannot*** be met without EVs!
- Cap on PHEVs (15% for 2025, 35% for 2030), but some flexibility for automakers

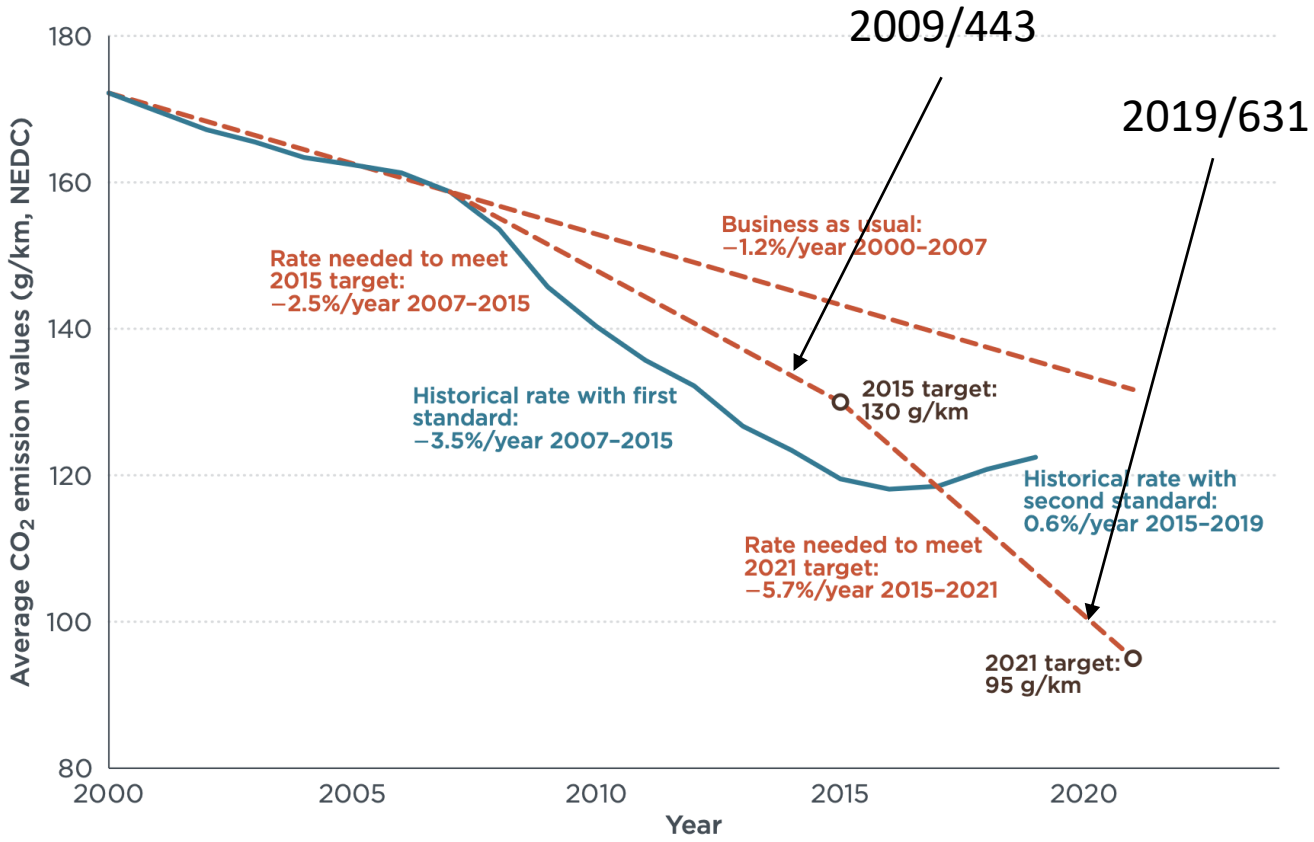
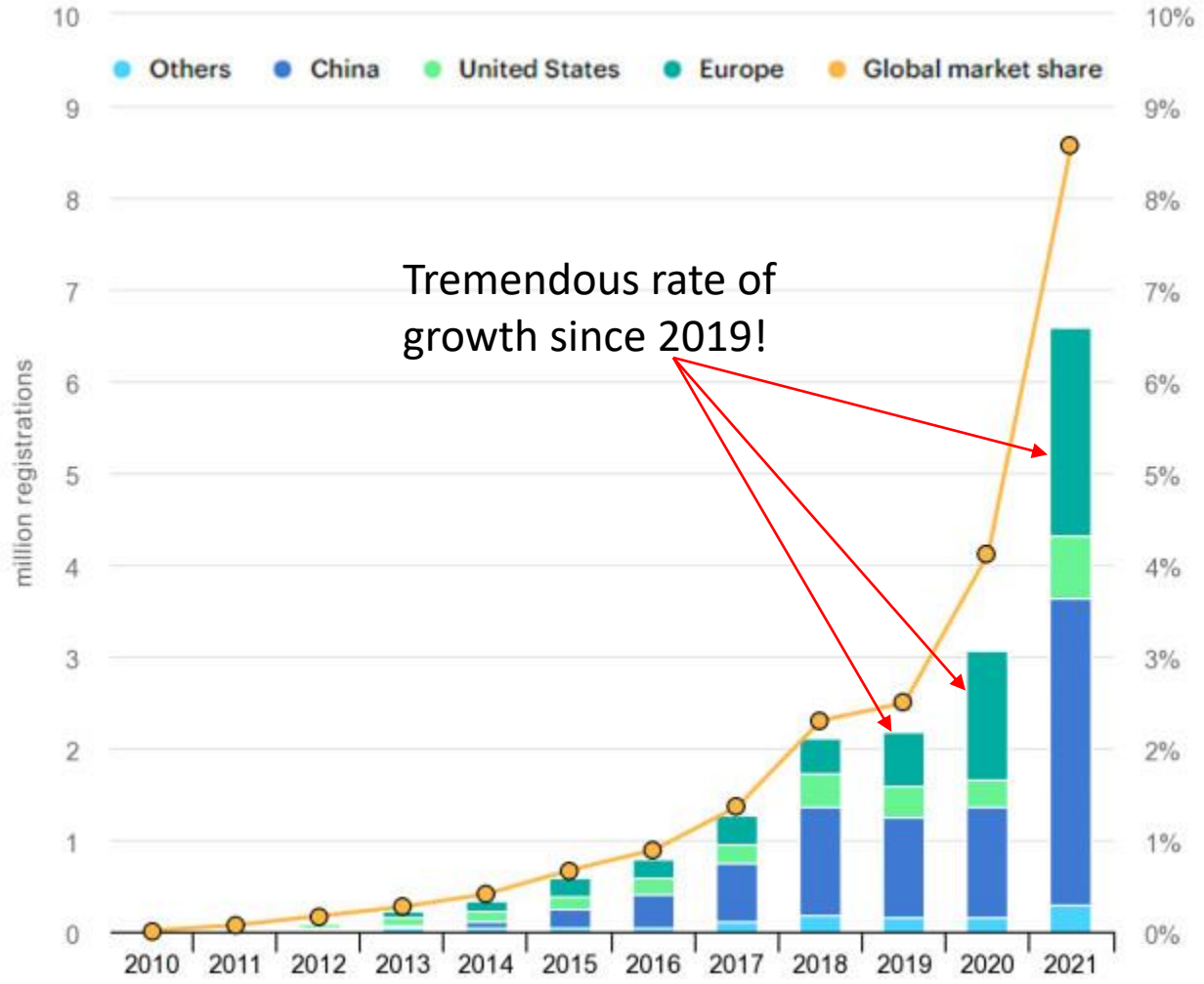


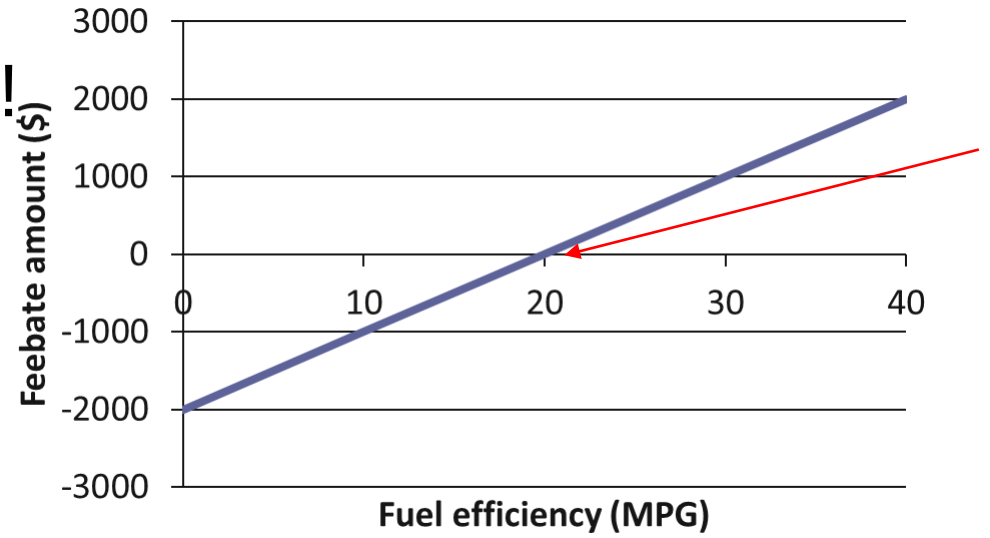
Figure 1. Historical average CO_2 emission values, targets, and annual reduction rates of new passenger cars.

Are these regulations working?



Feebates for sustainable funding

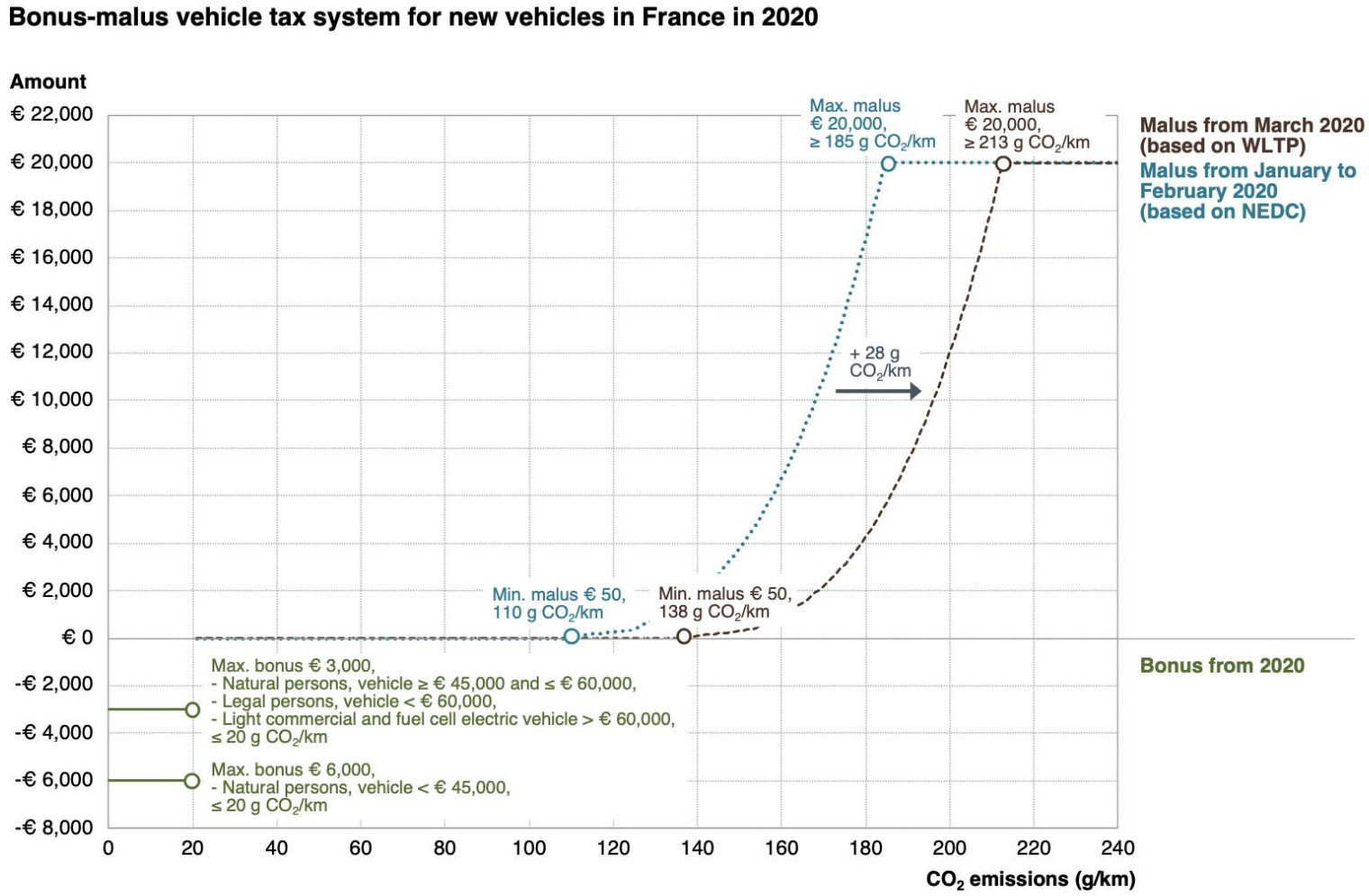
- As governments provide subsidies for buying EVs, there is a question of how funding can be allocated for these funds
- A “feebate” is the combination of a fee and a rebate. In transportation, this policy would apply a fee to gas guzzlers and provide a rebate for electric vehicles and highly efficient gasoline vehicles.
- Feebates pay for themselves!



Simple example of a linear feebate with a pivot point at 20 MPG

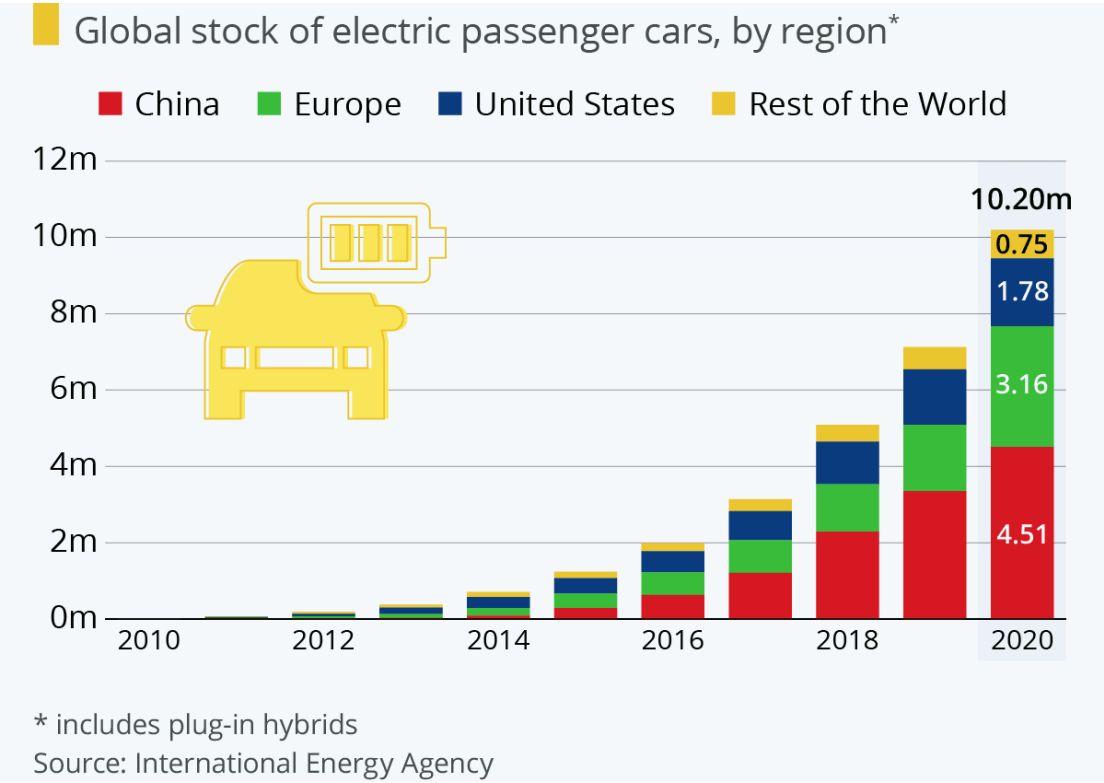
“Bonus-malus” in France

- Not a theoretical concept!
- In France, feebates (known as “bonus-malus”, literally “good-bad”) have existed since 2008
- Bonus can be as high as €6000, but Malus can be as high as €20000!



The giant of China

China's EV successes



Sales of major electric vehicle brands in China in 2020

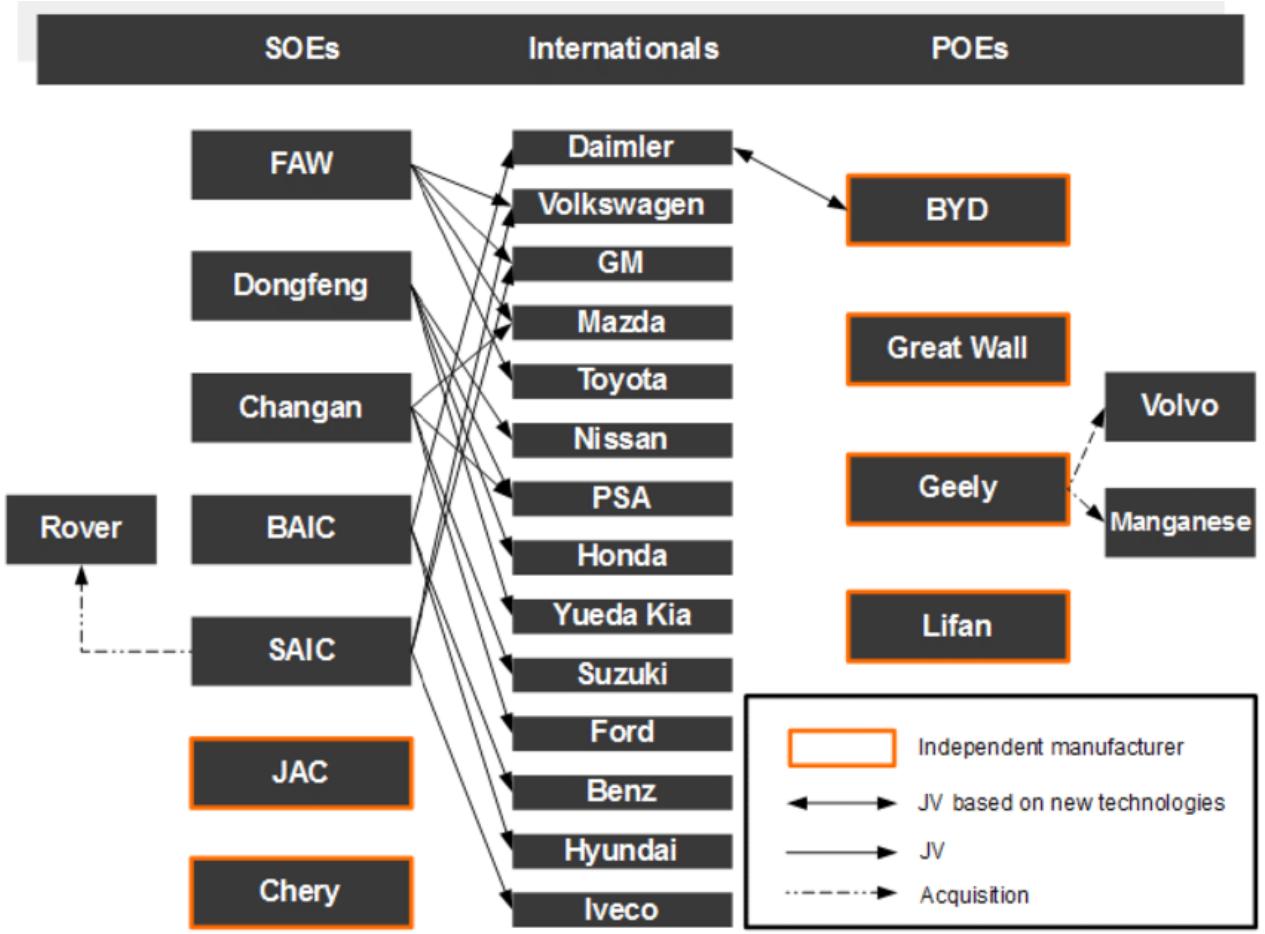
Brand	Number of vehicles	Change from 2019
SAIC-GM-Wuling	174,000	190.0%
Tesla (China)	138,500	Not available*
BYD	103,400	–20.9%
Nio	43,700	113.0%
Li Auto	32,600	Not available*
Xpeng	27,000	112.0%

Brands did not sell EVs in 2019
Source: Company websites; China Passenger Car Association

- By absolute numbers, China dominates in EV sales – but it might not be by companies you have heard of!

Automaker joint ventures

- In order for a foreign automaker to operate in China:
  - Must partner with a China-based company in a joint venture
  - Could not hold more than 50% stake
  - Could establish a maximum of two companies
- Rapidly allowed China to level the technology playing field
- As of Jan 2022, this requirement ended



Beijing license plate policy

- Due to Beijing's issues with traffic congestion and vehicle pollution, they implemented a license plate lottery policy
- To buy an ICV you had to enter a lottery (some studies found these to be worth as high as $20k!), but EV purchases were exempt from the lottery

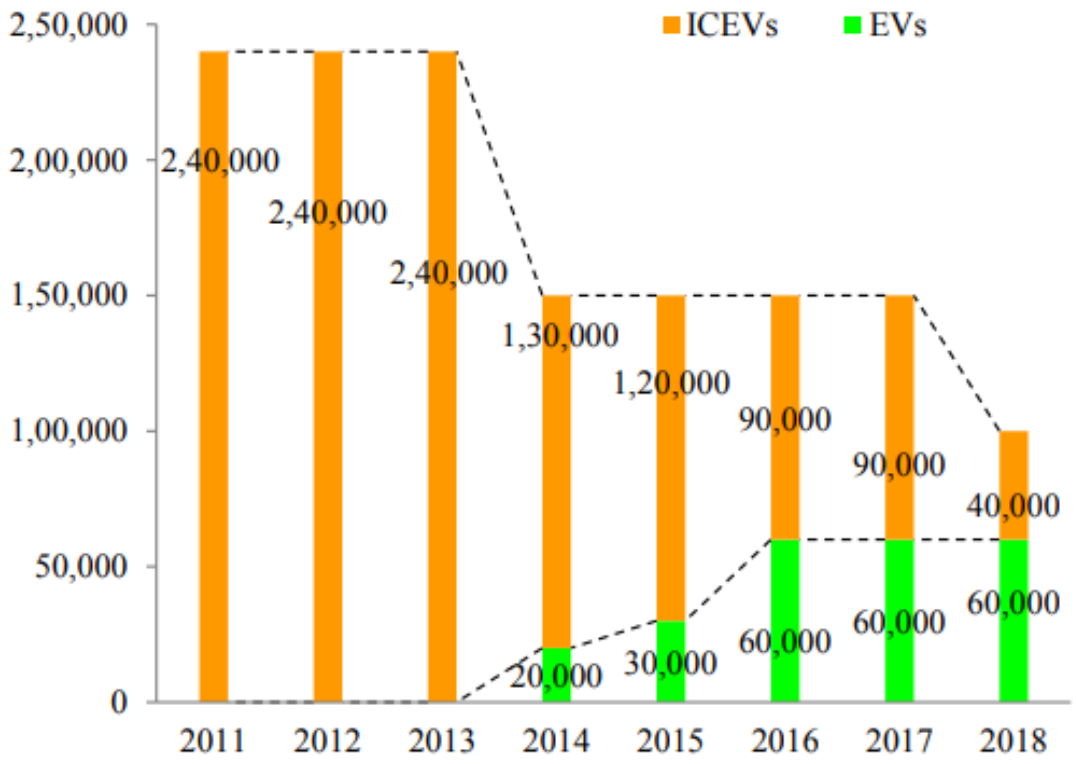


Fig. 3. License plates allocation from 2011 ~ 2018 in Beijing.

Shanghai license plate policy

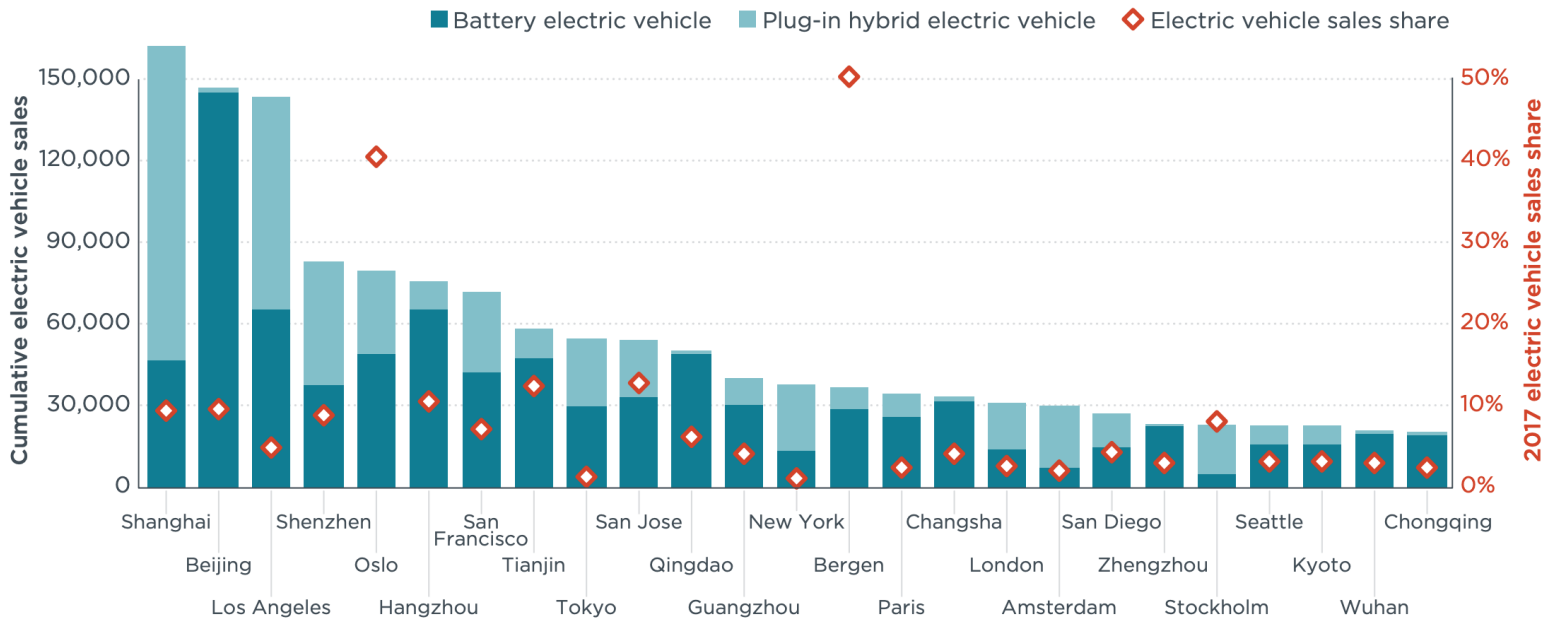


Figure 2. Cumulative electric vehicle sales and 2017 sales shares in electric vehicle capital cities.

- Similar to Beijing, Shanghai implemented an auction-based license plate policy – fees can be as high as $14,000 per plate!
- EVs exempt from these fees
- PHEVs are treated equal to BEVs and local popularity was due to the fact that PHEV automakers were located in Shanghai (though PHEV exemption is ending next year)

Pushing for national regulation in China

- Yunshi Wang of the UC Davis China Center for Energy and Transportation was instrumental in getting Chinese regulators and California regulators in the same room
- “Passing on” knowledge and expertise of CA’s ZEV regulation to China, eventually leading to…

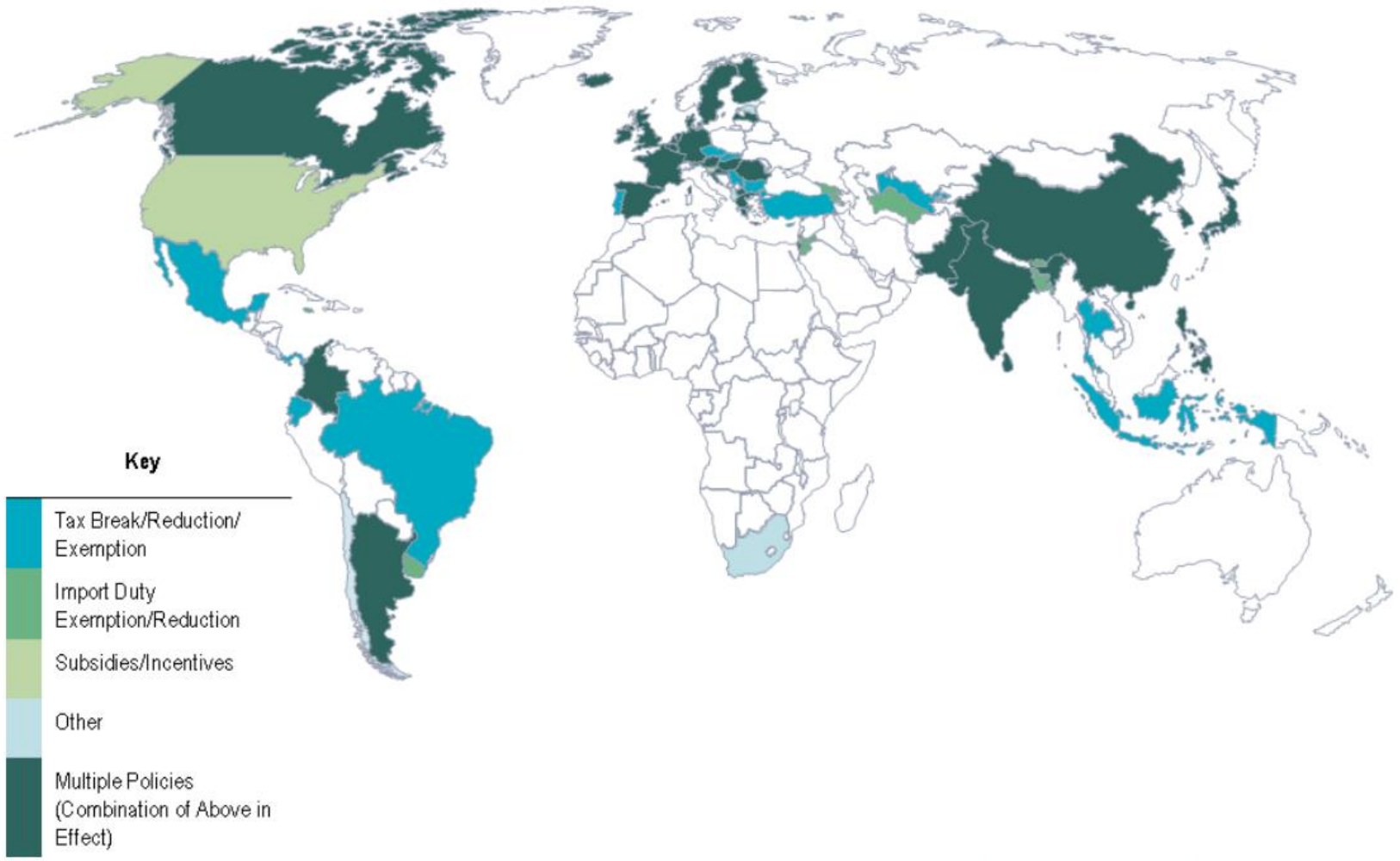
New Energy Vehicle regulation

Item	2017 policy	2020 policy
Annual percentage NEV credit target	***2019: 10%*** ***2020: 12%***	***2021: 14%*** ***2022: 16%*** ***2023: 18%***
Per-vehicle credit*	**BEV**: • Base credit (BC) = (0.012 x electric range + 0.8) • Final credit = BC x EC • Capped at ***6***	**BEV**: • Base credit (BC) = (0.0056 × electric range + 0.4) • Final credit = BC x ER x BD x EC • Capped at ***5.1***
	PHEV: • Base credit (BC) = 2 • Final credit = BC x EC • Capped at ***2***	**PHEV**: • Base credit (BC) = 1.6 • Final credit = BC x EC • Capped at ***1.6***
	FCV: • Base credit (BC) = 0.16 x rated power • Final credit = BC x RP • Capped at ***5***	**FCV**: • Base credit (BC) = 0.08 x rated power • Final credit = BC x RP • Capped at ***6***

- Similar in many respects to California but its targets were considered quite aggressive in comparison at the time (maybe not so much anymore!)
- Joint regulation with CAFC, China's version of the CAFE standards

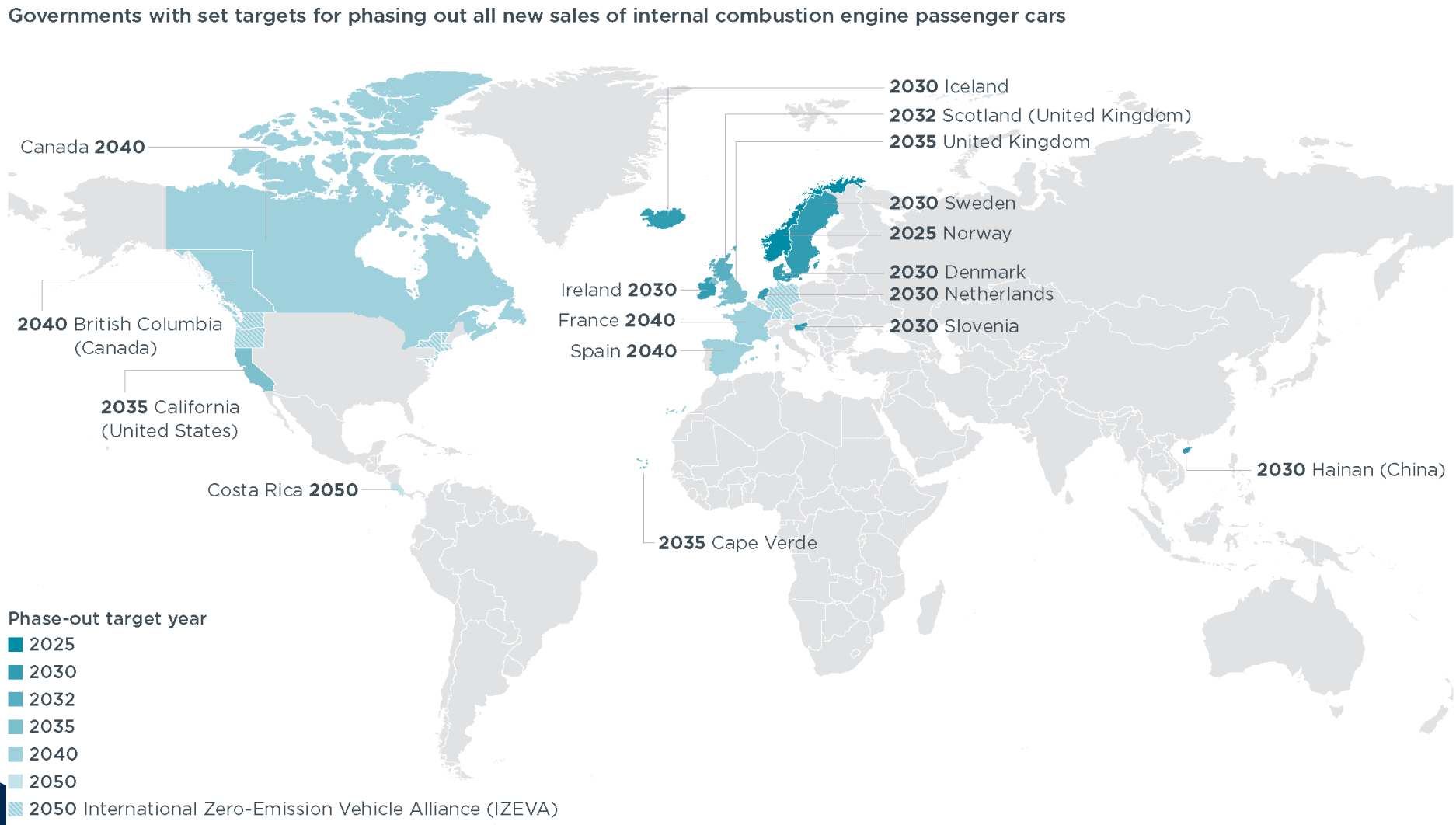
Many countries are incentivizing EVs

Figure 2: Countries with Fiscal Policies Encouraging EV Uptake



Source: Compiled by Future Fuel Strategies citing data from the United Nations Electric Mobility Database, 2019

And some governments are even planning to ban gas cars!



What have we learned, and what's next?

- Over the last decade, we've seen a huge body of pro-EV policies implemented all around the world
- Sharing of policy strategies across governments has been immensely successful and has converged to several sets of notable policies
  - Emissions/efficiency standards (US, EU, China)
  - ZEV sales regulations (CA, China, South Korea)
  - Purchase subsidies
  - Gasoline car bans
- What's next? EVs in developing countries, environmental justice/equity issues