

2030: At least 1 in 5 vehicles must be EV

What will it take?

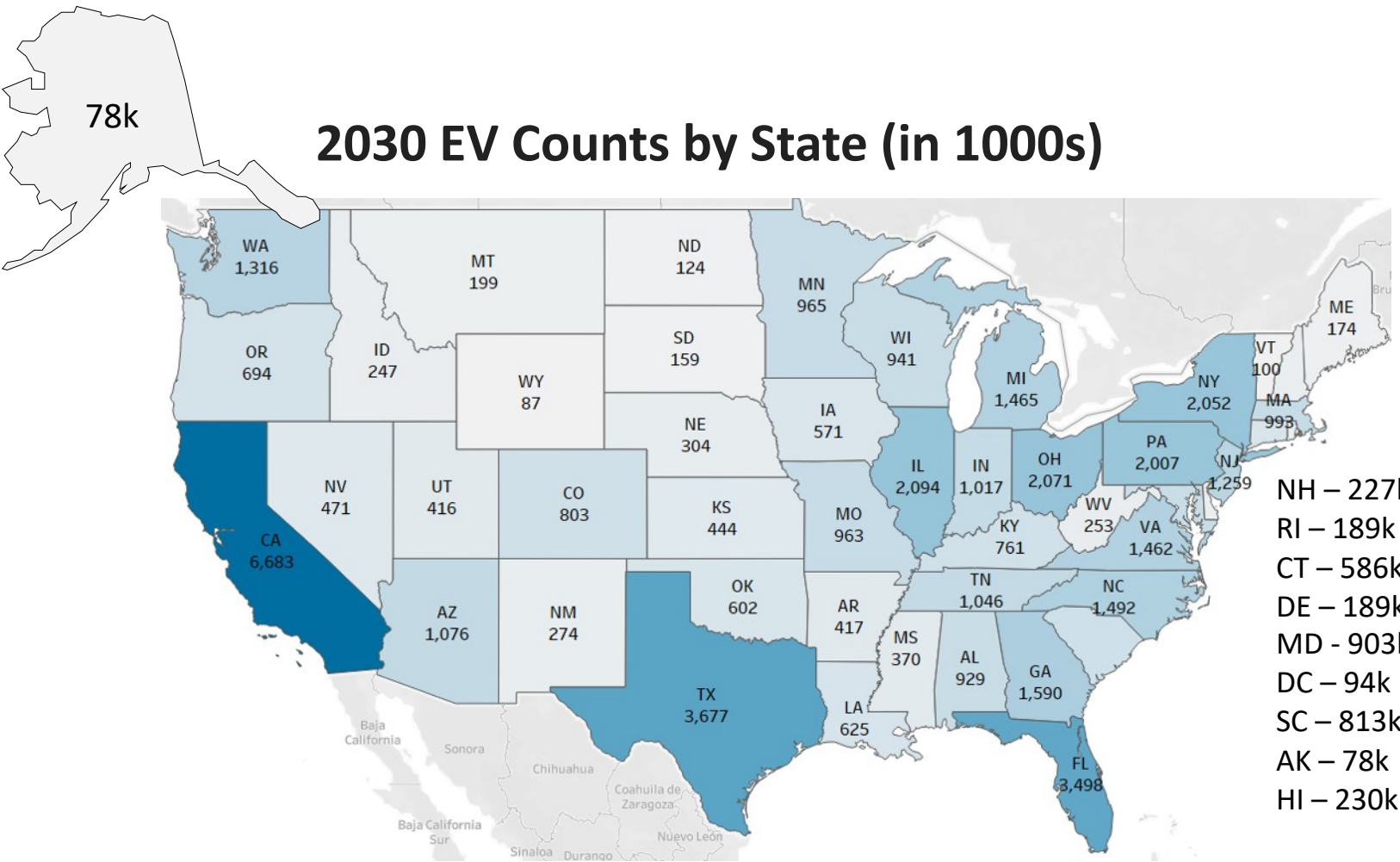
16 September 2020

Britta K. Gross
RMI, Managing Director

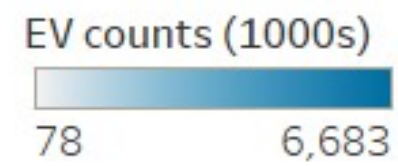


Climate Target: >50M EVs by 2030 (currently: 1.5mil EVs)

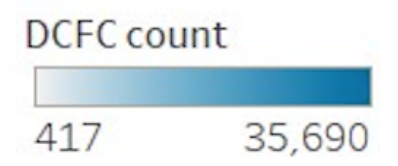
How might EVs and DC Fast-Chargers be distributed? (currently: 5,000 DCFC)



50M EVs in 2030:
 • 17 states with > 1mil EVs



300k DCFC in 2030:
 • 78% Home charging (EEI)



Near-term action is critical as States will be very challenged to support this scale of EV and EV Charging Infrastructure growth if we delay (need to install 30,000 DCFC/yr)

EV Market Barriers

1. Battery and EV Cost/Affordability

- #1 automaker priority is to get cost out of these technologies
 - EVs (and EVSE) are broadly unprofitable today

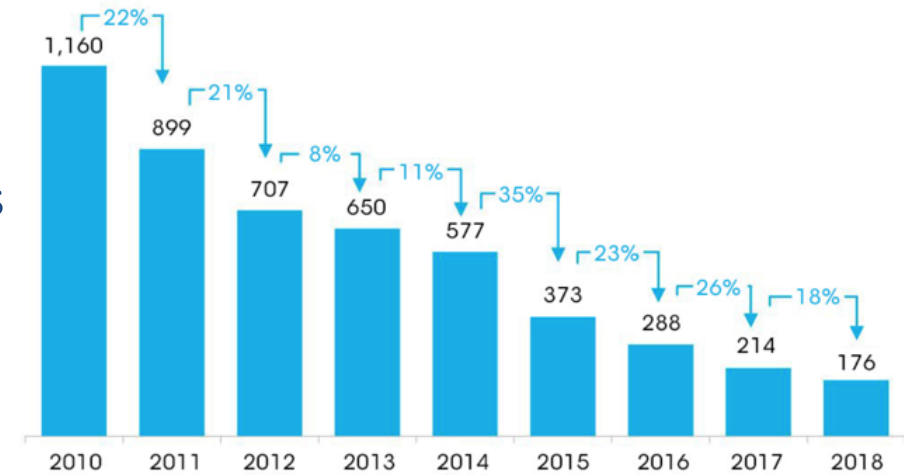
2. Lack of Charging Infrastructure

- Address both the “Perception” (public charging) and the “Reality” (home and workplace charging)

3. Build EV Demand

- Drive Consumer and Fleet Demand through Infrastructure, Awareness and Policy

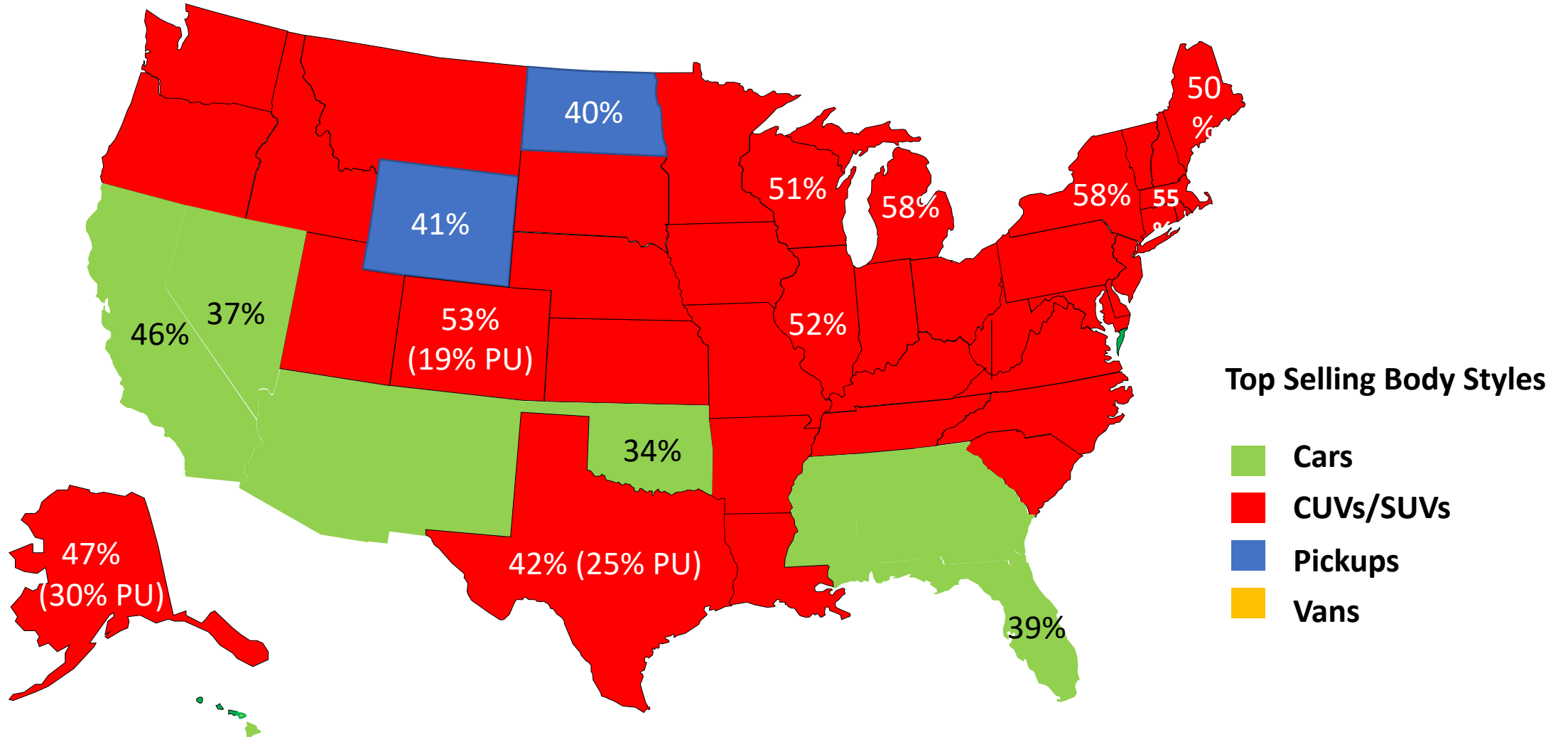
Battery Pack Price (real 2018 \$/kWh)



Source: BNEF - Survey data (volume weighted)

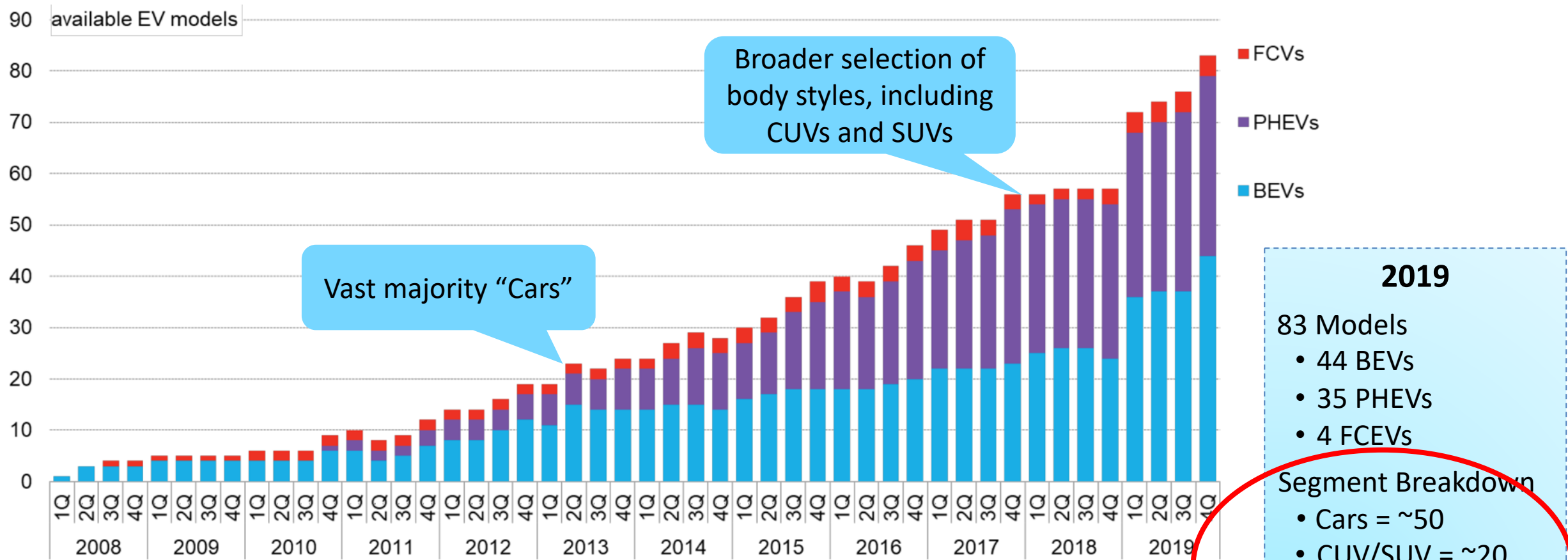
Despite significant (85%) battery price reductions since 2010, additional cost improvements are needed to achieve parity with conventional vehicles.

2018 Top Selling Body Style by State



Crossovers (CUVs) and SUVs make up the majority of new car sales in most states, creating a challenge for EV Manufacturers: larger batteries vs. consumer cost sensitivity

EV Model Availability in North America: 2008-2019



An increasingly broader selection of EV body styles is necessary (but still not sufficient) to drive EV adoption

BEV = Battery Electric Vehicle
 PHEV = Plug-in Hybrid Electric Vehicle
 FCEV = Fuel Cell Electric Vehicle
 SUV = Sport Utility Vehicle
 CUV = Crossover Utility Vehicle (or Compact SUV)

Some EV Models Expected 2020-2023



Audi Q4 e-tron (2021)



BMW iNext (2023)



BMW iX3 (2022)



Mazda MX-30 (2021)



Nissan Ariya (2021)



Mercedes-Benz EQC (2021)



Porsche Macan EV (2023)



Ford Mustang Mach-E (Late 2020)



Volvo XC40 Recharge (2020)



VW ID 4 (2021)



Ford F-150 Electric (2021)



Mercedes-Benz G-Class Electric (2022)



Bollinger B1 (2021)



Lordstown Endurance (2021)



GMC Hummer EV SUV (2021)



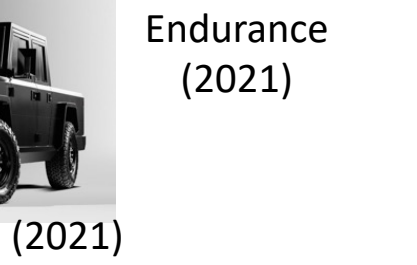
Tesla Cybertruck (2022)



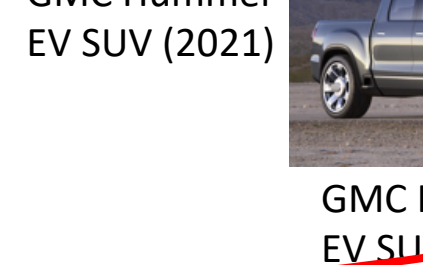
Rivian R1S (2021)



Bollinger B2 (2021)



GMC Hummer EV SUV (2022)



VW I.D. Buzz (2022)

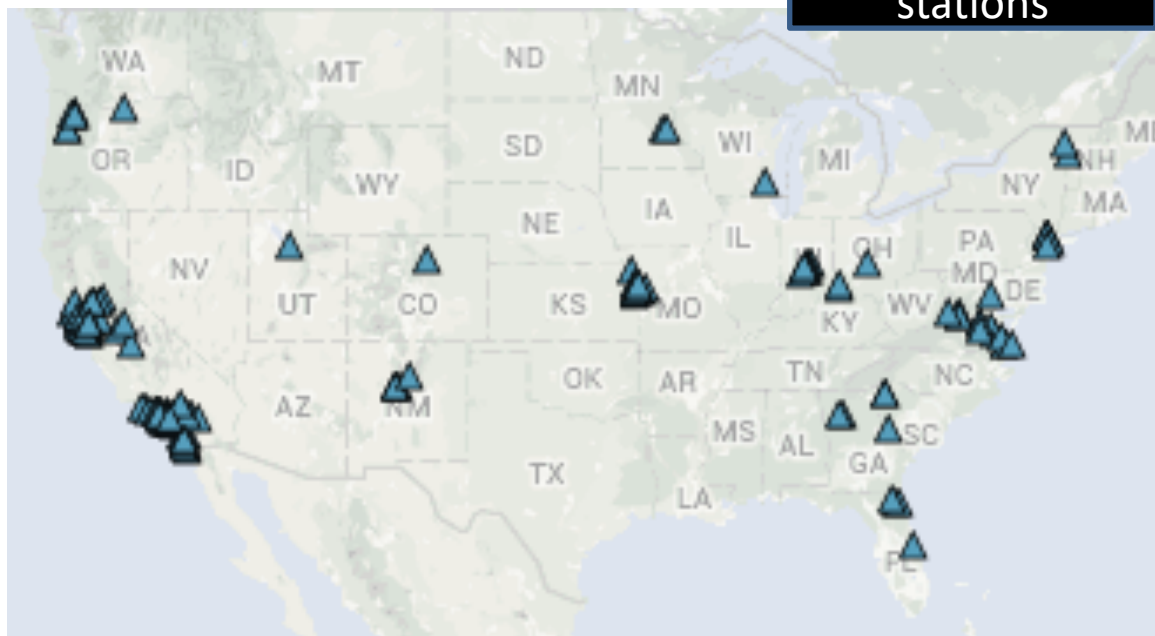


Rivian R1T (2021)

EV Charging Infrastructure Growth (2015-2020)

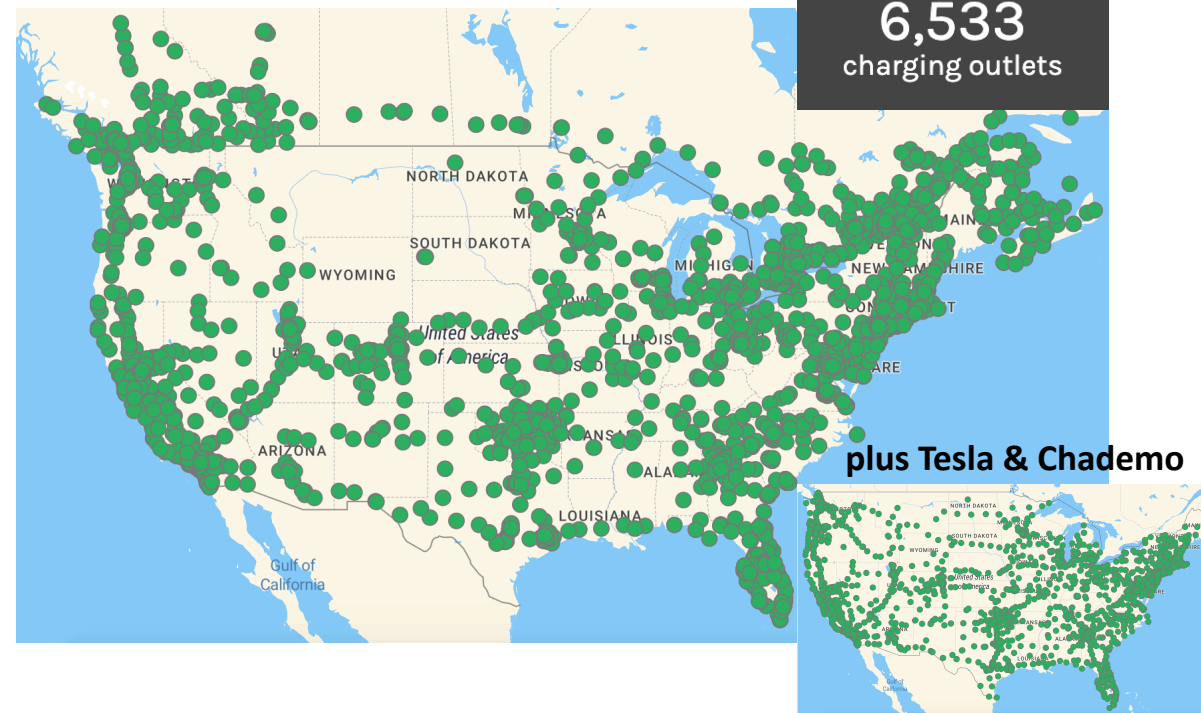
SAE DC Fast-Chargers July 2015

204
stations



SAE DC Fast-Chargers Sept 2020

3,297
stations
6,533
charging outlets



Good progress has been made in building EV charging station infrastructure, but it is nowhere near sufficient to actually drive EV adoption (to achieve the EV scale required by 2030)

3 Areas of Key Infrastructure Investment

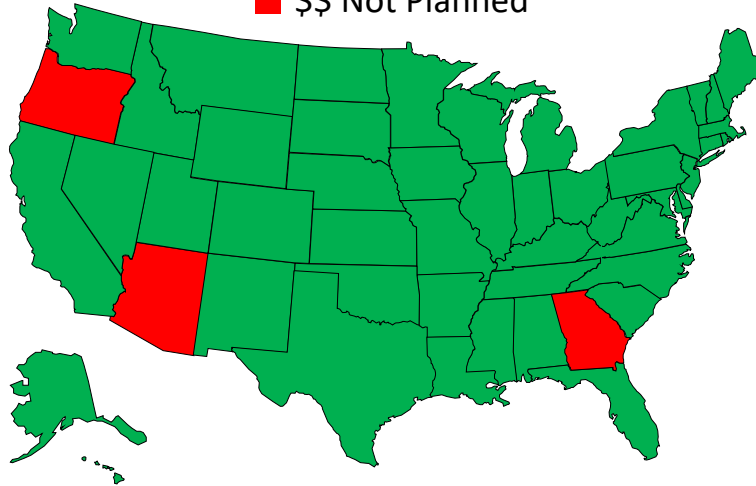
Electrify America (VW Settlement)



- Compelling “storytelling”
- Part of a planned \$2Bil investment (439 sites operating; 1,939 EVSE)

State App. D Funds (VW Settlement)

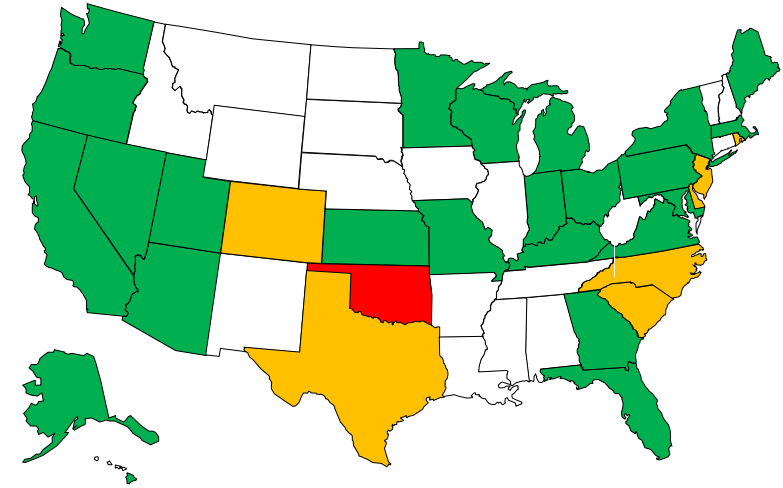
- EV Infrastructure \$\$ Planned
- \$\$ TBD
- \$\$ Not Planned



- 47 States to invest in EV charging
- \$316 mil investment

Utility Investment

- Filings Approved
- Filings Pending
- Filings Rejected



- Utility engagement is key
- \$1.5B approved; \$1.4B pending (2,500 DC + 50,000 L2)

Only 13% of EV charging investment to date has come from the private sector, due to the challenging business case; utility engagement is imperative

We're Losing Time

Current charging **infrastructure debates are over short-term** issues:

- cost-shifting from EV drivers to non-EV drivers
- cost recovery from utility investments in EV charging infrastructure
- regulator reluctance to let utilities invest
- utility reluctance to bring a rate case before skeptical regulators
- distribution of costs among market participants

... and thus we are woefully behind on building the home, workplace, and public charging networks we urgently require

Why Electrify?



Vehicle Benefits

- **Better** driving experience (acceleration, handling)
- **Quiet**, less stress (engine vibration)
- **Safe** and **convenient** home "fueling" (~ a cell phone)
- Fuel **savings** (\$12k/EV over 14 yr life)
- Electricity price **stability**
- **Clean**

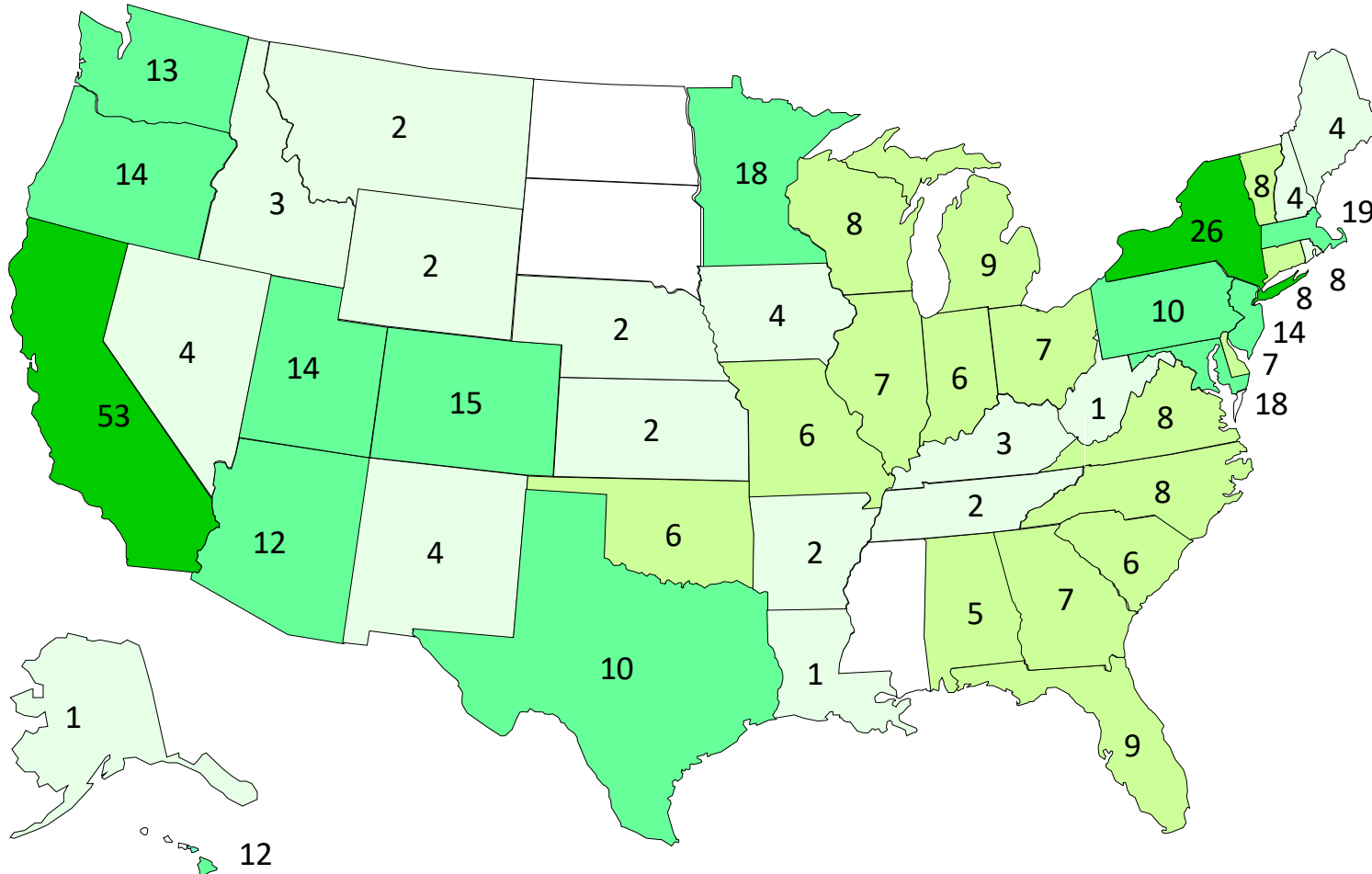
Beyond-Vehicle Benefits

- **US competitiveness** and jobs
- **Electricity price stability** (fleet operators)
- State **economic growth**: >90% of electricity sales revenue stays in the state (\$7,000/EV over 14 yrs)
- Grid **Efficiency**: new loads (and fixed transmission costs) benefit all ratepayers (\$3,500/EV over 14 yrs)
- Increased use of grid **renewables**
- **Clean air** and **health**
- Carbon reduction and **climate**

EVs benefit not only EV drivers, but also all ratepayers, power generators, charging providers, and the states themselves

Policy May Play the Most Important Role in EV Adoption

of Key EV-enabling Policies by State



EV-enabling Policy (# of states)

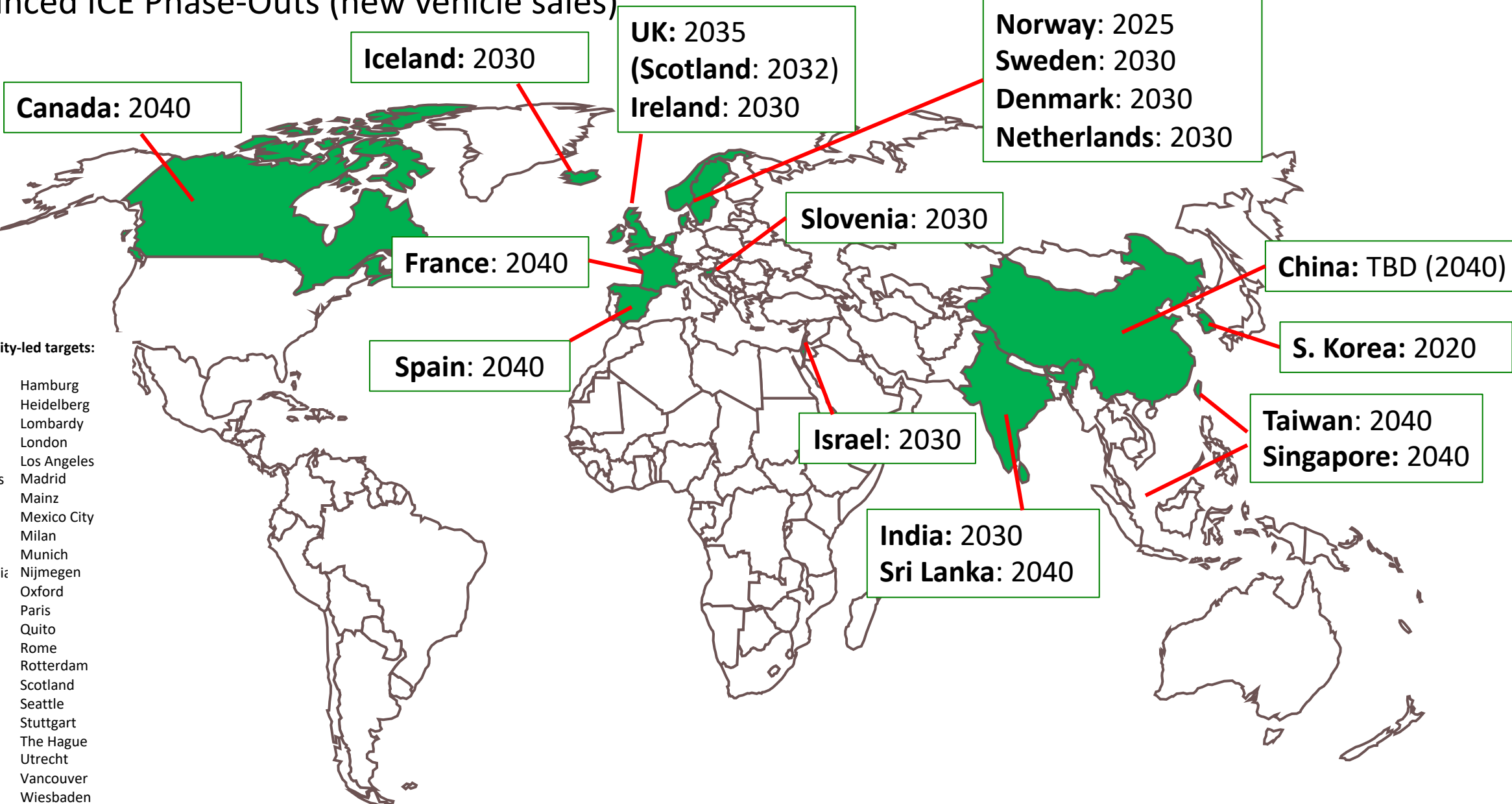
- Building Codes (3 → 5)
- Charging Incentive (21 → 29)
- Charging Service Provider (20 → 27)
- EV Charging Rate (17 → 18)
- HOV Exemption (11)
- MD/HD Incentive (new --> 9)
- NGO Incentive (2)
- REV West Plan (8)
- BEV Incentives (12 → 17)
- State Fleet Incentive (3 → 6))
- PHEV Incentive (12 → 15)
- Transportation Elect Plan (24)
- Transportation Elect Target (14)
- Utility Enabling Legislation (4 → 8)
- Utility Filing (30 → 33)
- Utility Incentive (20)
- Utility Own/Operate (11 → 12)
- VGI Strategy (new → 3)
- ZEV Program (12)

Arrows represent increases over past ~2 years

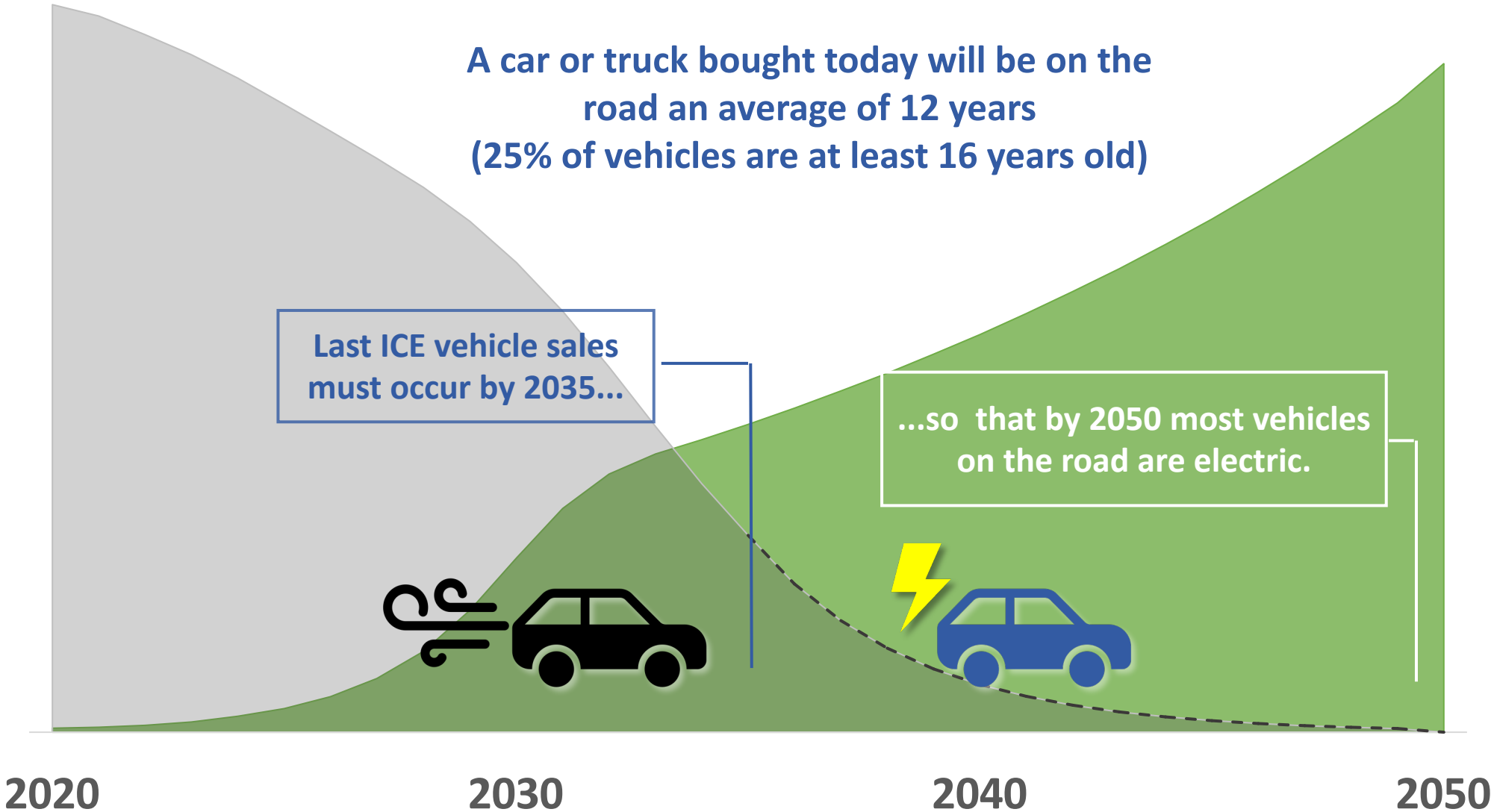
Purchasing an EV has to be a more attractive option than buying an ICE – have these policies achieved this?

Policy May Play the Most Important Role in EV Adoption

Announced ICE Phase-Outs (new vehicle sales)



CAPITAL STOCK TURNOVER



What It Will Take to Achieve >50M EVs by 2030?



- **Acknowledge the full value of transportation electrification**
 - Benefits to ratepayers, states, US competitiveness, a cleaner/resilient grid, and societal goals (health, air quality, equity and climate impact)
- **More EV charging infrastructure!**
 - National EV strategy with aligned infrastructure plans for home, work, public charging
 - Utility-investment and engagement (all 3,200 utilities)
 - Ensure that installed EV chargers maximize the public benefits (e.g. renewables, off-peak charging)
- **Drive demand certainty and EV awareness**
 - Government, corporate, and commercial fleet commitments
 - Sustained financial and non-financial incentives and perks

What It Will Take to Achieve 50M EVs by 2030?



“Just” 1 in 5 of us need to switch to an EV within the next 10 years:

- The average transaction price for a new vehicle in 2019 was \$38,948
- 60% of Americans live in single-family homes
- 66% have more than 2 vehicles in the household
- 80% of Americans commute less than 40 miles/day to and from work

This is Doable!

RMI's Recent Mobility Thought leadership

