

What's Up with EV's?

Preparing for a Plug-in Future

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What's Up with EV's?

- *What's this EV thing anyway?*
- *Is this EV thing just a fad?*
- *What will drive or slow customer adoption?*
- *How fast will customer adoption occur?*
- *What are your utilities doing to prepare?*

What is this EV thing anyway?

Hybrid Electric



- ICE engine with electric motor assist
- Don't plug-in
- Regenerative braking recharging
- Boosts fuel economy; battery powered at low speeds
- Toyota Prius, Honda Insight, Toyota Highlander Hybrid

Plug-in Hybrid



- Electric motor in series or parallel with ICE
- Plug-in
- ICE and regenerative braking recharging
- 4 to 20 kWh battery capacity
- Battery range of 20-60 miles
- Chevy Volt, Ford Fusion Energi, Kia Optima, Toyota Prius Prime

Battery Electric



- Electric motor only
- Plug-in
- Regenerative braking recharging
- 20-100 kWh battery
- Battery ranges of 80-250+ miles
- Nissan Leaf, Chevy Bolt, Tesla, BMW I3

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Is this EV thing just a fad?



- *Pets.com raised \$82 million with IPO at \$14/share in 2000 to a low of \$0.22/share after 9 months*
- *Part of the “dot.com” Super Bowl XXXIV in 2000 that also included Epidemic.com, E-Stamp.com, e1040.com, OnMoney.com and Computers.com*
- *So was the dot.com business just a fad?*

Were dot coms just a fad?



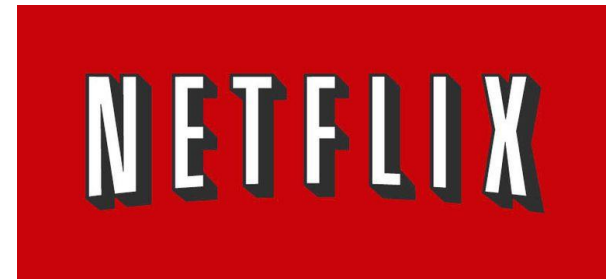
amazon

Google



NETFLIX

Dot coms have disrupted the familiar.



Is this EV thing just a fad?



- *GM EV1 (1996-1999)*
- *Looked like an EV car*
- *Used lead-acid batteries with 70-100 mile range*
- *Climate change as a national issue was still in it's infancy*
- *Faced tremendous resistance from major automakers and other special interests*

Is this EV thing just a fad?



- *Look like conventional vehicles*
- *Use lithium-ion batteries*
- *Climate change has become a national and global issue*
- *Automakers are responding*





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What will drive or slow customer adoption?

Sticker Price Premium

Acquisition cost for BEVs vs. comparable ICEVs

BEV	EV Range	Sticker Price	Comparable ICEV	Comparable ICEV Price Premium	Segment Price Premium
 Chevy Bolt	238 miles	\$36,620	\$21,920 (Chevy Cruze)	\$14,700	\$16,620
 Nissan Leaf	151 miles	\$32,490	\$16,500 (Nissan Versa)	\$15,590	\$5,490
 Tesla Model 3	220 miles	\$42,000	\$40,250 (BMW 330)	\$1,750	
 Tesla Model X	263 miles	\$125,000	\$124,600 (Porsche Cayenne Turbo)	\$400	

Courtesy of:

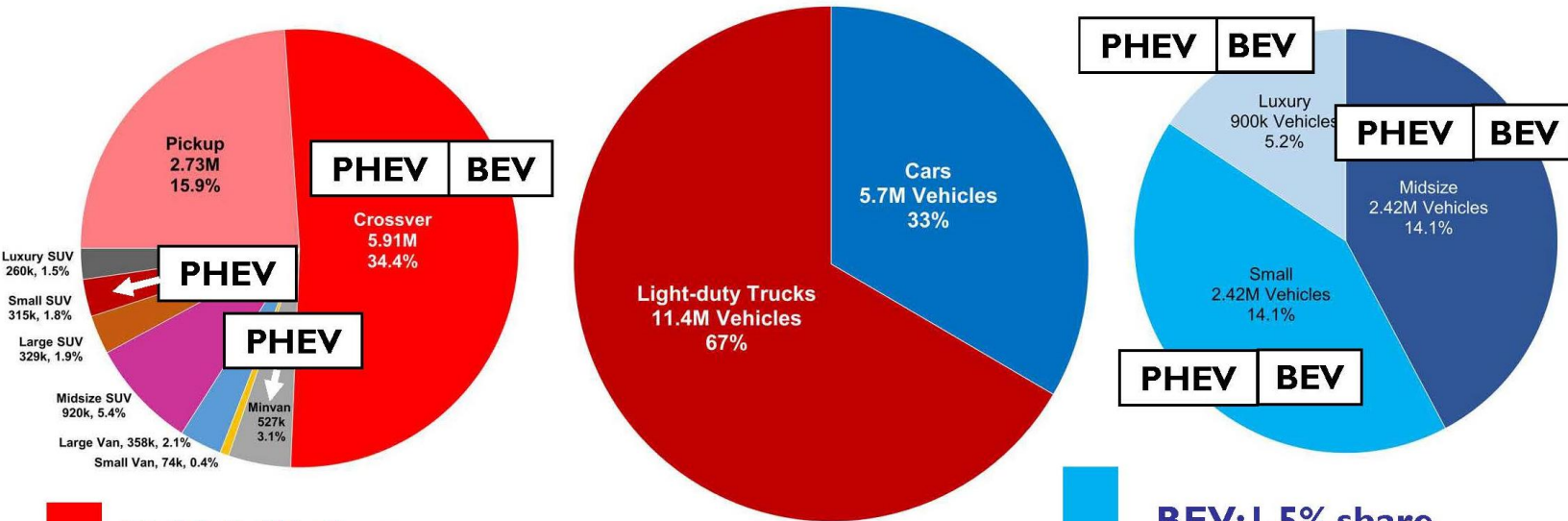


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What will drive or slow customer adoption?

Model Availability

Light-duty Vehicle Market Segments



Crossover
Minivan
Small SUV

BEV: 0.4% share
PHEV: 0.2% share

PHEV: 0.2% share

PHEV: 2.8% share

Small
Midsize
Luxury

BEV: 1.5% share
PHEV: 1.2% share

BEV: 0.5% share
PHEV: 1.7% share

BEV: 9.5% share
PHEV: 1.8% share

Courtesy of:

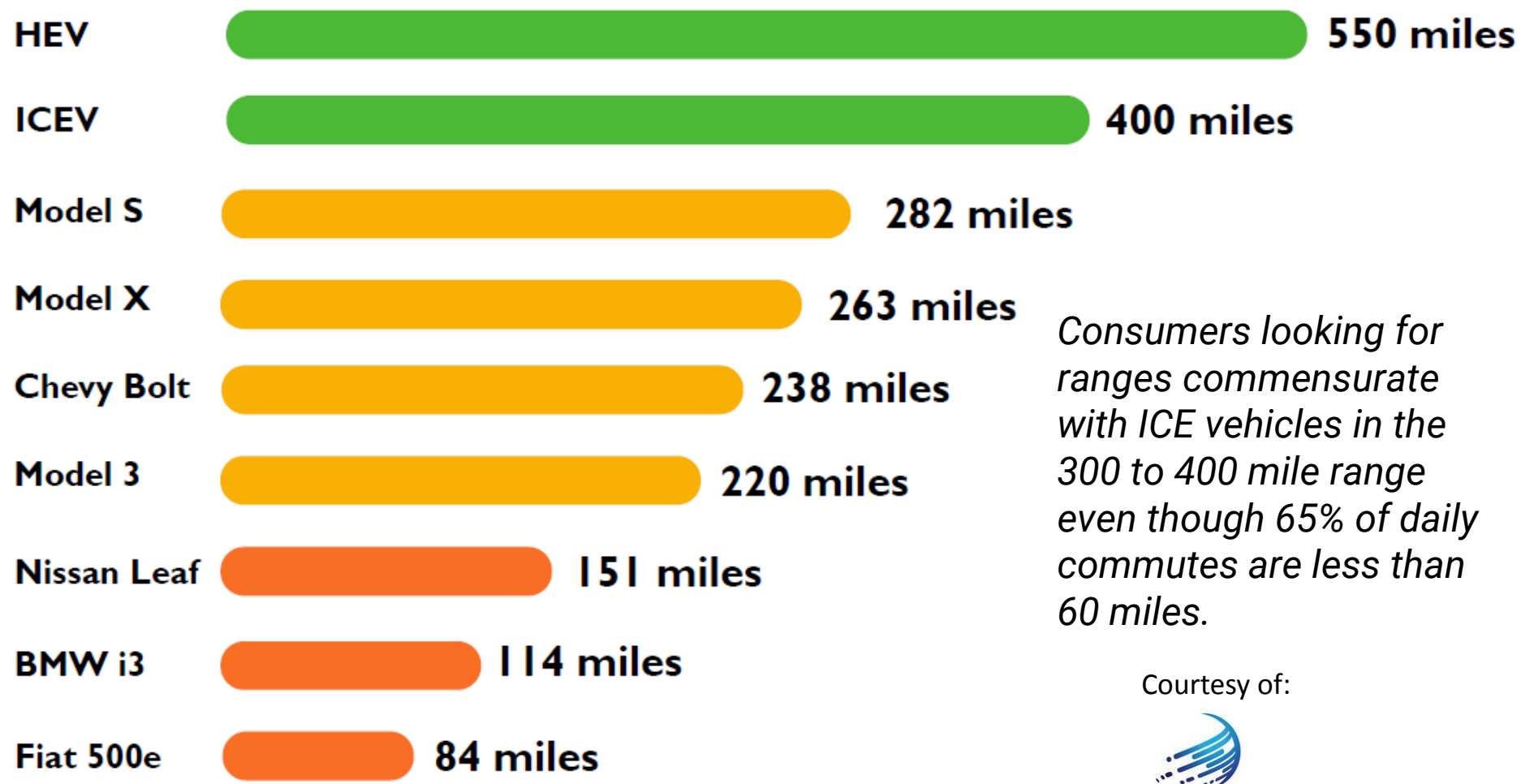


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What will drive or slow customer adoption?

Range Anxiety

BEV low ranges require more frequent refueling



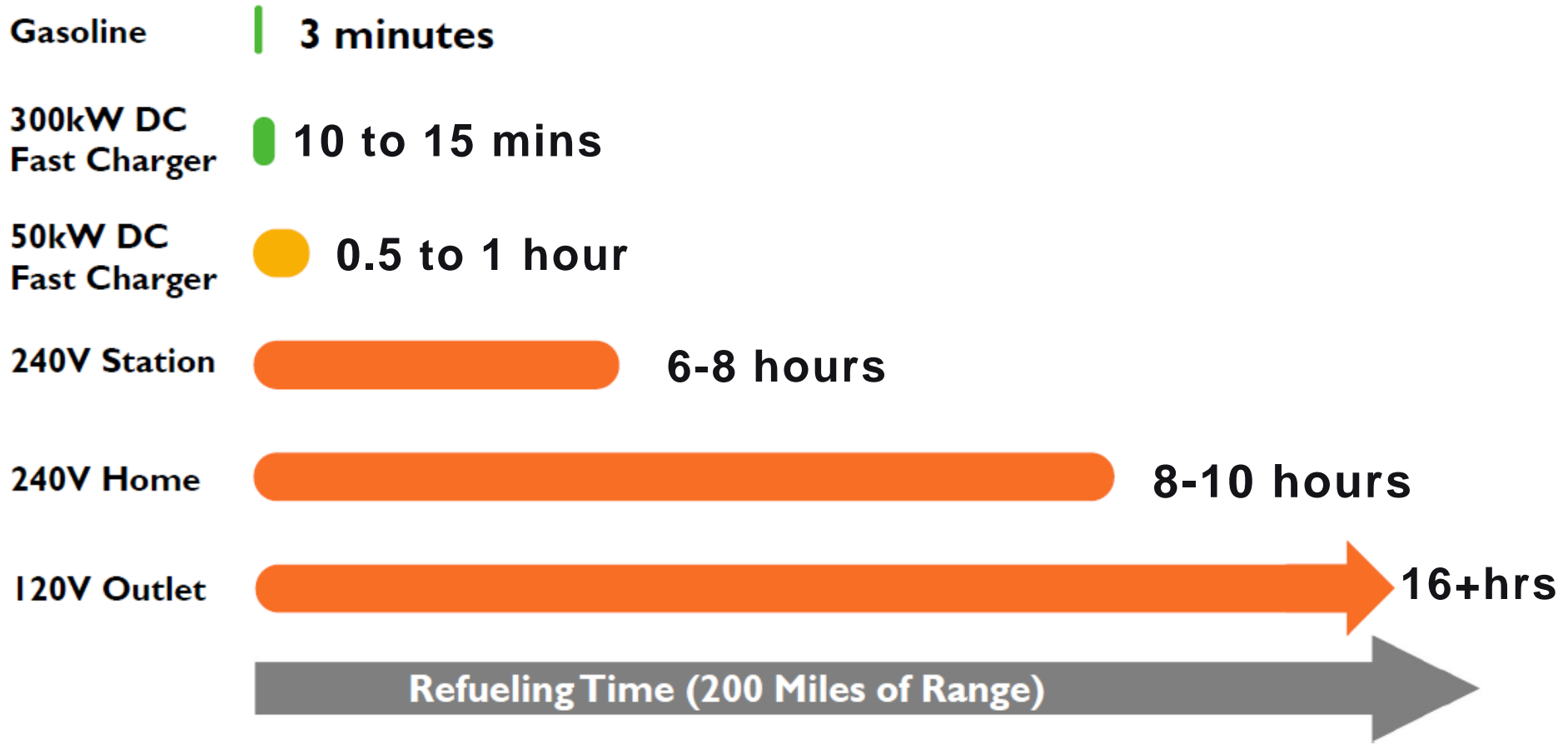
Consumers looking for ranges commensurate with ICE vehicles in the 300 to 400 mile range even though 65% of daily commutes are less than 60 miles.

Courtesy of:



What will drive or slow customer adoption?

Refueling Experience

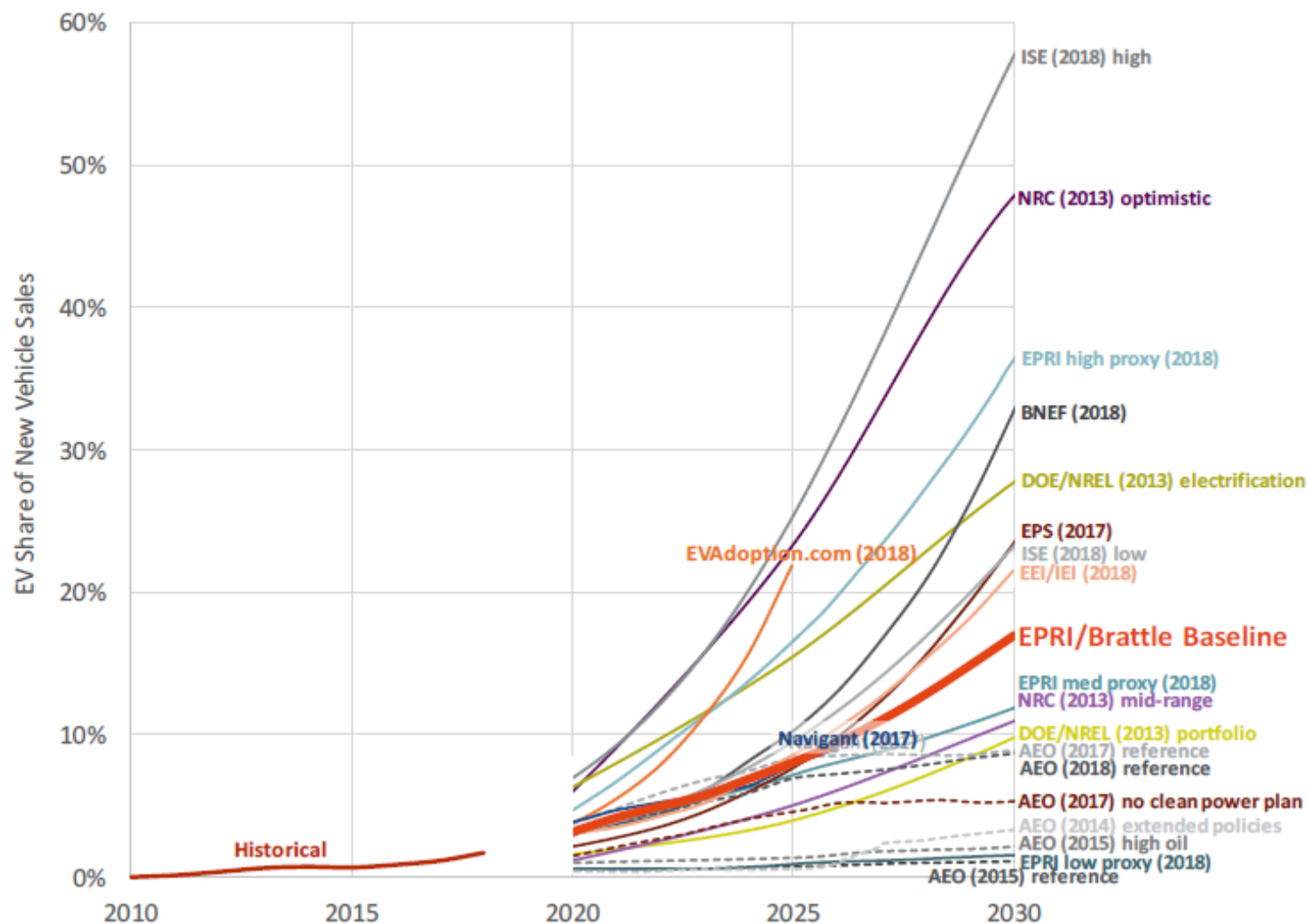


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How Fast Will Customer Adoption Occur?

Annual EV Share of New Vehicle Sales



How Fast Will Customer Adoption Occur?

Factors Contributing to EV Sales Market Share By US State

EV Sales and Market Share By US Red vs. Blue State and Multiple Factors

State: Red or Blue	EV Sales Share(1)	ZEV / ZEV Mandate State	EV Rebate/ Tax Credit	EVs to Charging Plugs	Gas Price / Gallon (2)	% Light Trucks Purchased (3)	Household Median Income
California	9.96%	ZEV + Mandate	YES	24.21	\$3.65	50.70%	69,759
Oregon	4.12%	ZEV + Mandate	YES	13.14	\$3.22	68.60%	64,610
Washington	3.54%	ZEV	NO	15.3	\$3.42	65.70%	75,418
District of Columbia	3.40%	ZEV	NO	7.45	\$2.83	49.50%	83,382
Hawaii	2.69%	N/A	NO	17.36	\$3.85	59.90%	73,575
Colorado	2.46%	N/A	YES	9.68	\$2.75	72.90%	74,172
Arizona	2.46%	N/A	NO	12.92	\$2.87	63.00%	61,125
Massachusetts	2.19%	ZEV + Mandate	YES	10.91	\$2.75	66.10%	73,227
Maryland	2.18%	ZEV + Mandate	YES	9.64	\$2.48	60.00%	81,084
Virginia	1.97%	N/A	NO	10.35	\$2.41	60.40%	71,293

Courtesy of
EVAdoption.com

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Nebraska	0.75%	N/A	NO	8.81	\$2.49	73.00%	59,619

Courtesy of
EVAdoption.com

How Fast Will Customer Adoption Occur?

Nebraska EV Ownership as of June/2019

	Nebraska	LES
BEV	982	221
PHEV	1,167	248
Total Plug-Ins	2,149	469
Conventional	2,086,940	267,809

Courtesy of
Electric Power Research Institute (EPRI)

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What Are Your Utilities Doing to Prepare?

- Piloting local public charging stations
- Incenting purchase of plug-in vehicles and home charging stations
- Collecting and analyzing EV charging data
- Gathering and analyzing EV owner insights
- Engaging with current and prospective EV owners



Questions

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