
ELECTRIC VEHICLE MYTHS AND REAL-WORLD OWNERSHIP EXPERIENCE



BRIAN ANDERSON



Senior Research Program Manager (retired)

Medtronic Corporate
Minneapolis, Minnesota

39 YEARS

Hardware/software product development in multiple industries

25 YEARS

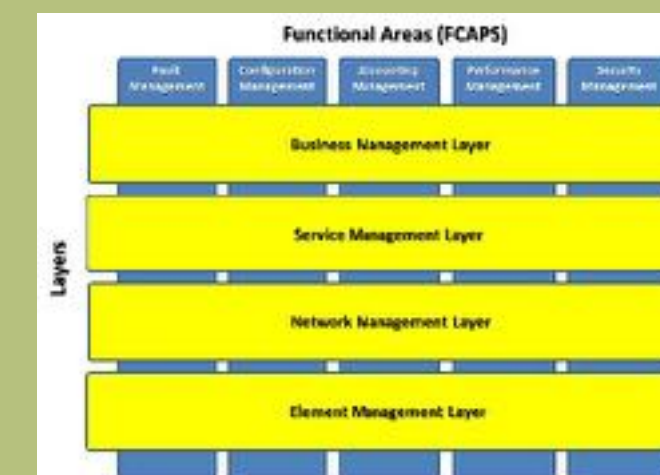
Medical device software development and quality

About Me

- ❖ Hometown: Portage, Wisconsin
- ❖ Current Residence: Plymouth, MN
- ❖ Family: Wife Karen, Son Tor (28), Daughter Louise (21)
- ❖ EV driver since Oct 2015
- ❖ Home powered by solar since Sep 2015

Professional Experience

- ❖ RF Design - 2-way radios & power amps
- ❖ Automotive Diagnostic Software
- ❖ Telecommunications Systems and Software
- ❖ Medical Device Systems and Software



Fun Facts

- ❖ At Argonne National Labs outside Chicago, my father experimented using CP-5. This sparked my interest in science and engineering.
- ❖ Of the 18 countries I have visited, 5 begin with the letter 'I' (there are only 9 in total).
- ❖ I love to talk to people about electric vehicles and renewable energy. One year, my Tesla Model 3 was on display at the State Fair for several days.

Hobbies

- ❖ Camping /Hiking
- ❖ Cycling
- ❖ Tree Care Advisor
- ❖ Music
- ❖ Travel
- ❖ Electric vehicle & Renewable Energy advocacy

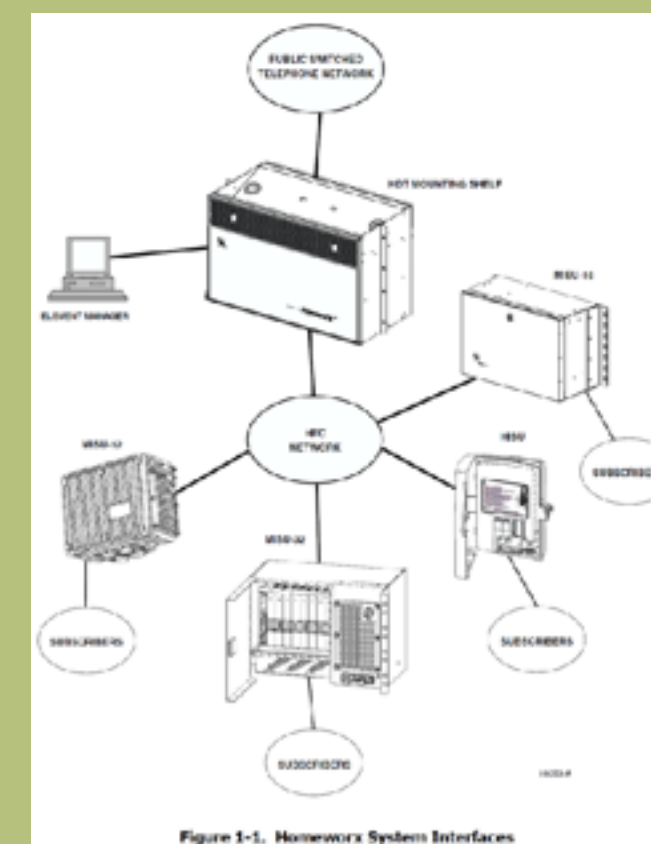
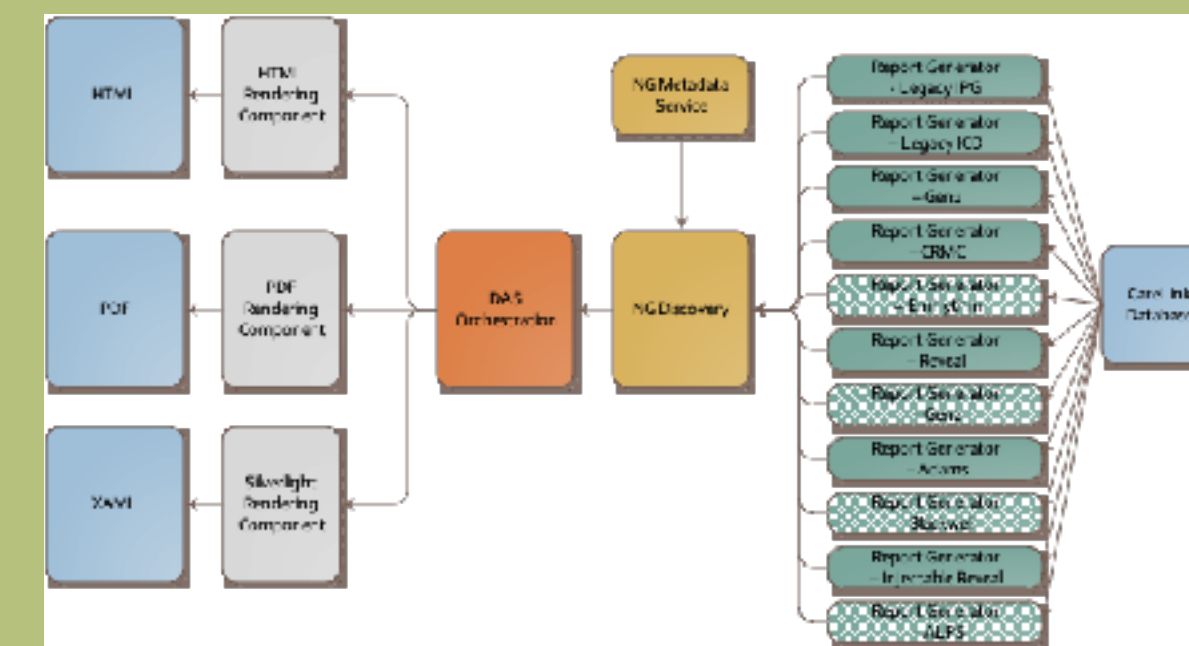


Figure 1-5. Homework System Interfaces








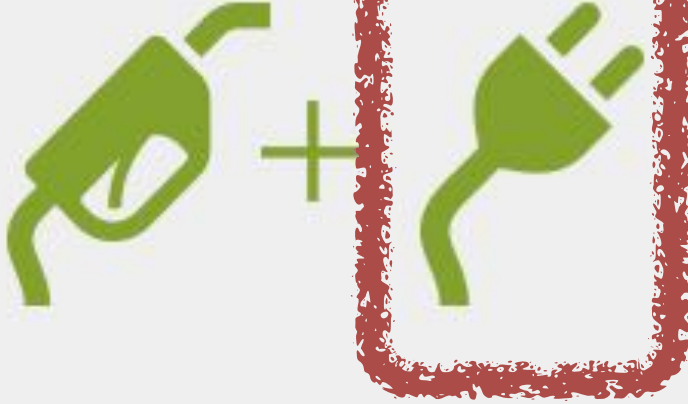











Our EV experience started in 2015 with leasing a BMW i3 and we have been 100% EV since March 2020.



BMW i3 charging at Carlton College in Northfield, MN

The source of energy for a vehicle is key to understanding its environmental impact. For example, hybrids are 100% fossil fuel powered.

				 PHEV	 BEV
		CONVENTIONAL	HYBRID	PLUG-IN HYBRID	ALL-ELECTRIC
SOURCES OF ENERGY					
		Internal Combustion Engine Vehicle (ICEV)			Electric Vehicle (EV)
CONSUMPTION					
EMISSIONS					 NO EMISSION

MYTH: It will take decades for the the industry to convert over to producing primarily electric vehicles.

5th AVE NYC

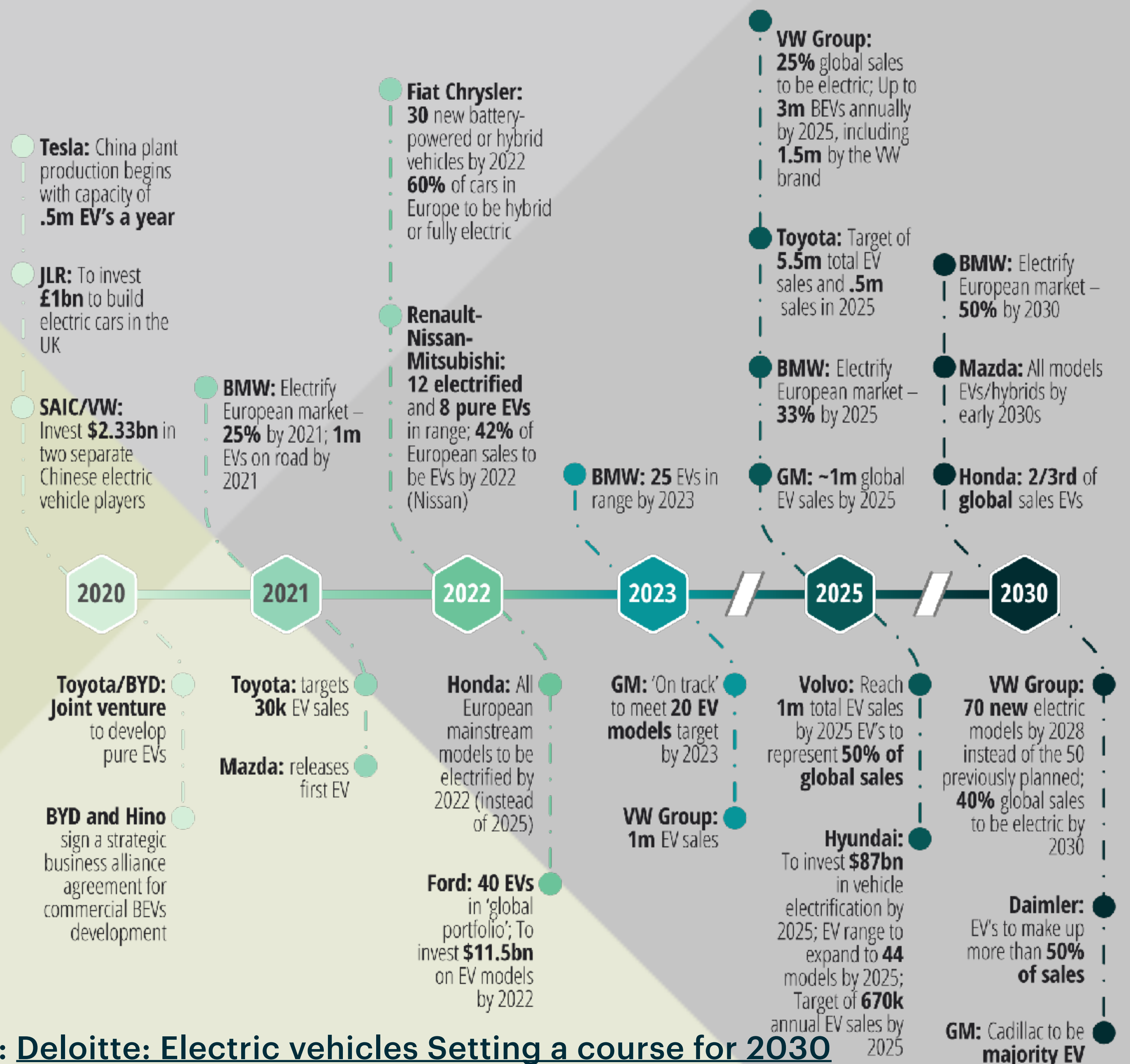
1913

Where is
the
horse?



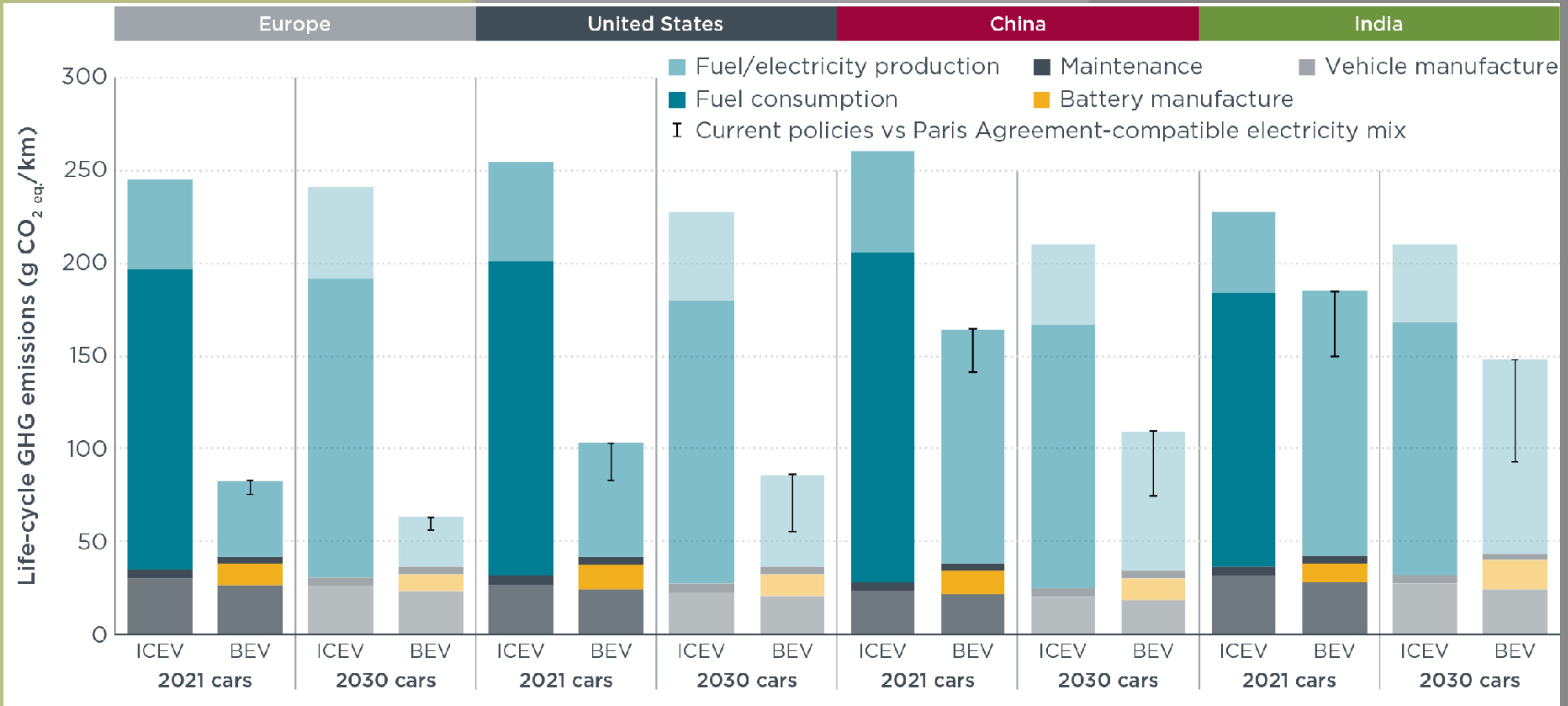
MYTH: It will take decades for manufacturers to convert over to producing EVs (from ICEVs).

Reality: The 2020s are last ICE decade.



Source: [Deloitte: Electric vehicles Setting a course for 2030](#)

MYTH: Electrically powered vehicles pollute just as much as, or more than, ICE vehicles (the long tailpipe concept).



Source: <https://theicct.org/publications/global-LCA-passenger-cars>

Several models have been for sale in MN for years and have used model availability.



2021 Nissan LEAF (2011 - LEAF 1)

Many new EV models have been introduced or are in the pipeline for 2022 release. ~~2022~~ 2023 is the year of the electric pickup!



Mustang Mach-E (Now)

All EVs available for purchase in Minnesota

Plug-in vehicles available in Midwest (January 2019) Midwest EVOLVE

Manufacturer			Seating	PEV Type	FWD/ RWD/ AWD	Base MSRP	Federal tax credit	Price after federal tax credit	Battery size (kWh)	Range		Charging speed (miles/hr)			Performance					
Name	Model	Photo								Electric Range (miles)	Total Range (miles)	Level 2 Charging Rate (kW)	Level 1 120v	Level 2 240v	DCFC 400+v	MPGe/MPG	Top Spd (mph)	0-60 mph (sec)	Towing capacity (lbs)	NHTSA Crash Rating
Audi	A3 E-Tron		5	PHEV	FWD	\$38,900	\$4,168	\$34,732	9	17	430	3.3	3	8	N/A	86/39	130	7.6	0	NR
BMW	i3		4	BEV	RWD	\$44,450	\$7,500	\$36,950	42	153	153 (200)	7.4	4	27	166	124 (39)	93	6.9-7.2	0.0	4 star
BMW	i8		4	PHEV	AWD	\$147,500	\$3,793	\$143,707	7.2	15	330	3.3	3	7	N/A	76/28	155	4.2	0	NR
BMW	X5 xDrive40e		5	PHEV	AWD	\$62,100	\$4,700	\$57,400	9	14	540	3.3	2	5	N/A	56/24	130	6.5	0	NR
BMW	330e		5	PHEV	RWD	\$45,600	\$4,000	\$41,600	7.6	14	350	3.7	3	8	N/A	72/31	130	5.9	0	NR
BMW	530e		5	PHEV	RWD/ AWD	\$51,400	\$4,200	\$47,200	9.2	16	370	3.5	3	7	N/A	72/29	146	6	0	NR
BMW	740e		5	PHEV	RWD/ AWD	\$117,700	\$4,200	\$113,500	13.2	14	340	3.7	2	7	N/A	64/17	130	5.1	0	NR
Chevrolet	Bolt EV		5	BEV	FWD	\$37,495	\$7,500	\$29,995	60	238	238	7.2	4	25	159	119	98	6.5	0	5 star
Chevrolet	Volt		4.5	PHEV	FWD	\$33,170	\$7,500	\$25,670	18.4	53	420	3.3	4	10	N/A	106/42	98	8.4	0	5 star
Chrysler	Pacifica Hybrid (PHEV)		7	PHEV	FWD	\$42,000	\$7,500	\$34,500	16	33	570	6.6	3	16	N/A	84/32	107	7.8	0	NR
Ford	Fusion Energi		5	PHEV	FWD	\$31,120	\$4,007	\$27,113	7.6	21	610	3.3	3	10	N/A	97/42	85	8.5	0	5 star
Honda	Clarity PHEV		5	PHEV	FWD	\$33,400	\$7,500	\$25,900	17	48	340	6.6	4	22	N/A	110/42	110	8.8	0	NA
Jaguar	I-PACE		5	BEV	AWD	\$69,500	\$7,500	\$62,000	90	234	234	7	4	18	180	76	124	4.5	0	NR
Kia	Niro PHEV		5	PHEV	FWD	\$27,900	\$4,543	\$23,357	8.9	26	560	3.3	4	10	N/A	105/46	107	9	0	NA
Mini	Cooper S E ALL4		5	PHEV	FWD	\$36,900	\$4,001	\$32,899	7.6	12	270	3.3	4	8	N/A	65/27	NA	6.8	0	NR

Click for full list

MYTH: EVs can't replace ICEVs in real-world use, or are at least, way less convenient.

- Most EV “refueling” takes place in your garage. We never have to take any time to stop at a gas station to regularly handle an explosive, carcinogenic chemical in our daily routine.
 - Tesla and 3rd parties have built networks of DC fast chargers that allow travel to all 50 states. (More on that later).
 - Since 2015, we've driven about 75,000 all-electric miles in all weather across 5 different electric vehicles from 3 different manufacturers.
 - We have taken 6 multi-state road trips, including below 0 temps and towing a trailer.
-

MYTH: EVs are more expensive to own and operate than equivalent ICEVs.

Lifetime savings of Best Selling EVs under \$50,000 compared to Best Selling & Top Rated ICE vehicles in each EV's class

Consumer Reports

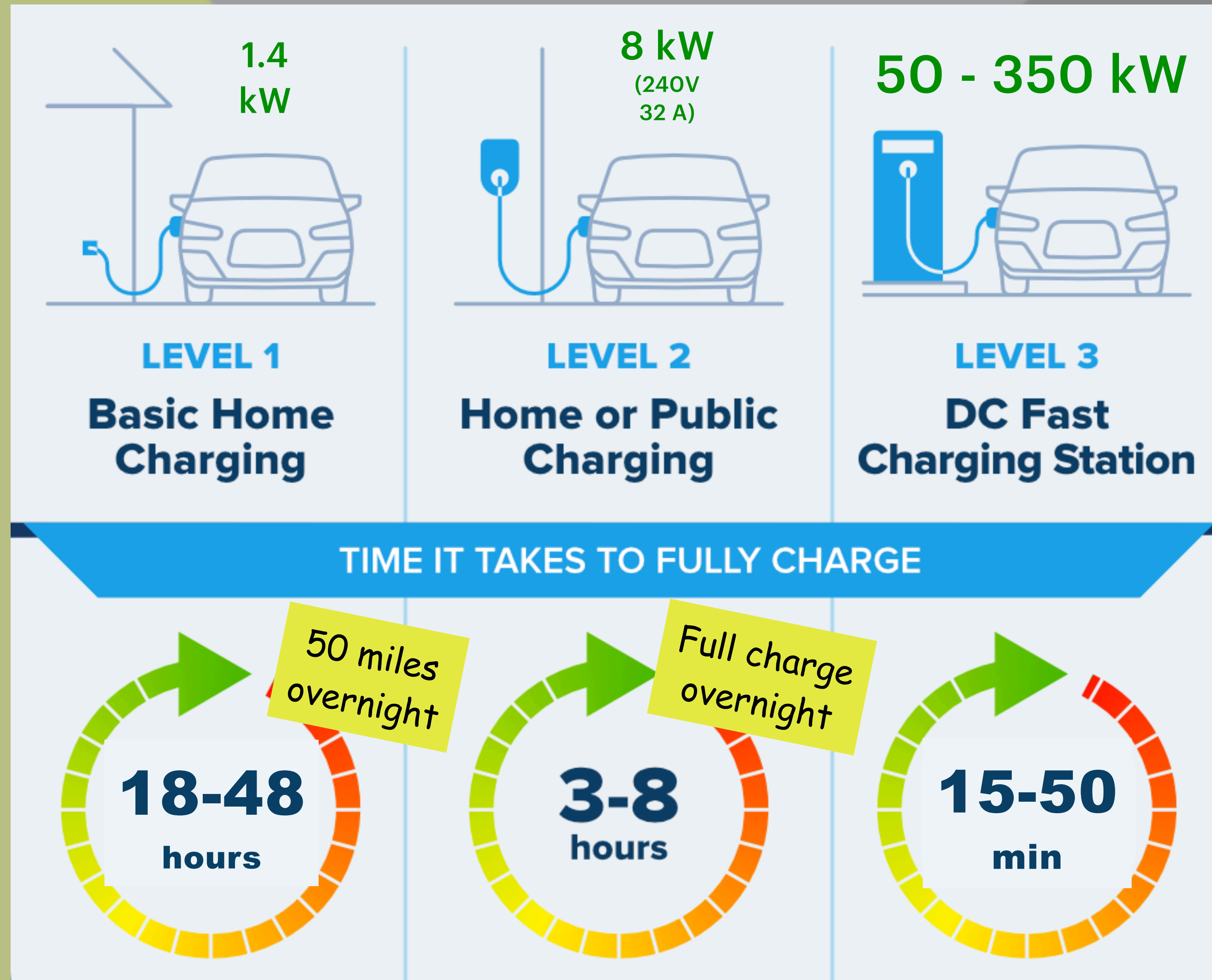


EV model and trim	Leaf E+ S+	Bolt LT	Prius Prime LE	Clarity PHEV	Mach E Select	RAV4 Prime SE	Escape PHEV SE	Model 3 SR Plus	Model Y LR
Best Selling	Civic Hatchback LX			Camry LE	RAV4 LE			330i	RX 350 FWD
Top Rated	Elantra GT automatic			Legacy 2.5	CX5 Sport			A4	QX50 Pure

Source: <https://www.consumerreports.org/hybrids-evs/evs-offer-big-savings-over-traditional-gas-powered-cars/>

ELECTRIC VEHICLE CHARGING

There are three levels of Electric Vehicle charging.



There are several types of Electric Vehicle charging equipment.



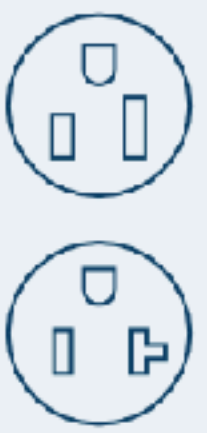






Portable EVSE
(home charger)
L1-L2
120V or 240V AC




Public DC Fast Charger
(Electrify America)
L3 - Main Battery DC Voltage

Public EVSE L2 240V AC



CONNECTORS	LEVEL	ASIAN MAKES	US / EU MAKES	TESLA
Wall outlets (Nema 515, Nema 520) 	1	With adapter	With adapter	With adapter
Port J1772 		✓	✓	With adapter
Nema 1450 (RV plug) 	2	With adapter	With adapter	With adapter
Tesla HPWC 		✗	✗	✓
CHAdeMO 		✓	✗	With adapter
SAE Combo CCS 	3	✗	✓	✗
Tesla supercharger 		✗	✗	✓

Utilities are providing incentive programs to install home charging.



Electric Vehicle Charging Programs

Over 80% of EV charging happens at home. Find the charging program and electric pricing plan that's best for you.

EV Accelerate At Home – Pay As You Go

With [EV Accelerate At Home](#) you can save on charging with a Level 2 charger, and we'll do all the work to set you up. You select a level 2 charger from one of our two pre-qualified options, we'll install it and maintain it; you charge for less when fueling overnight.

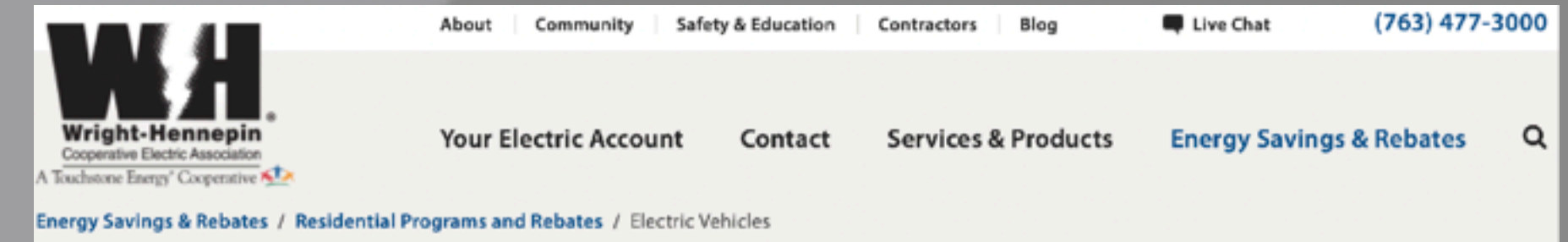
Time of Day – Separate Meter

The [Time of Day – Separate Meter plan](#) is for drivers who can charge their vehicles at night and on weekends but use energy for other activities during the day. Investment in a separate electric meter and service is required, but pricing for energy is about half the amount of the regular residential rate for overnight and weekend use while your home stays on the regular residential plan.



You can charge your EV while you sleep!

85% of charging happens at home so focus first on figuring out your home charging setup. After that you can take a look at the public charging to support your road trips and travel needs.

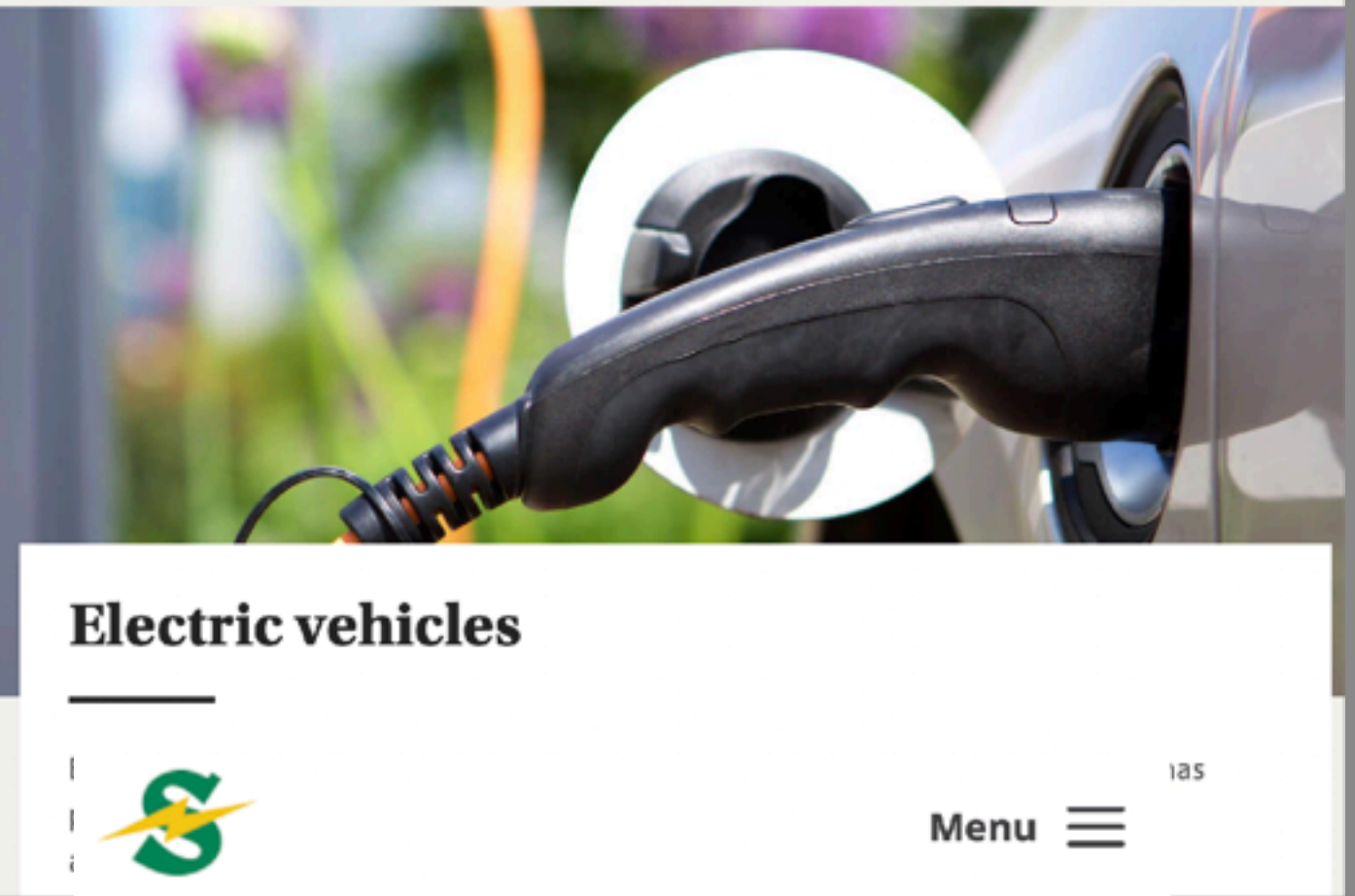


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Electric vehicles

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ELECTRIC VEHICLES

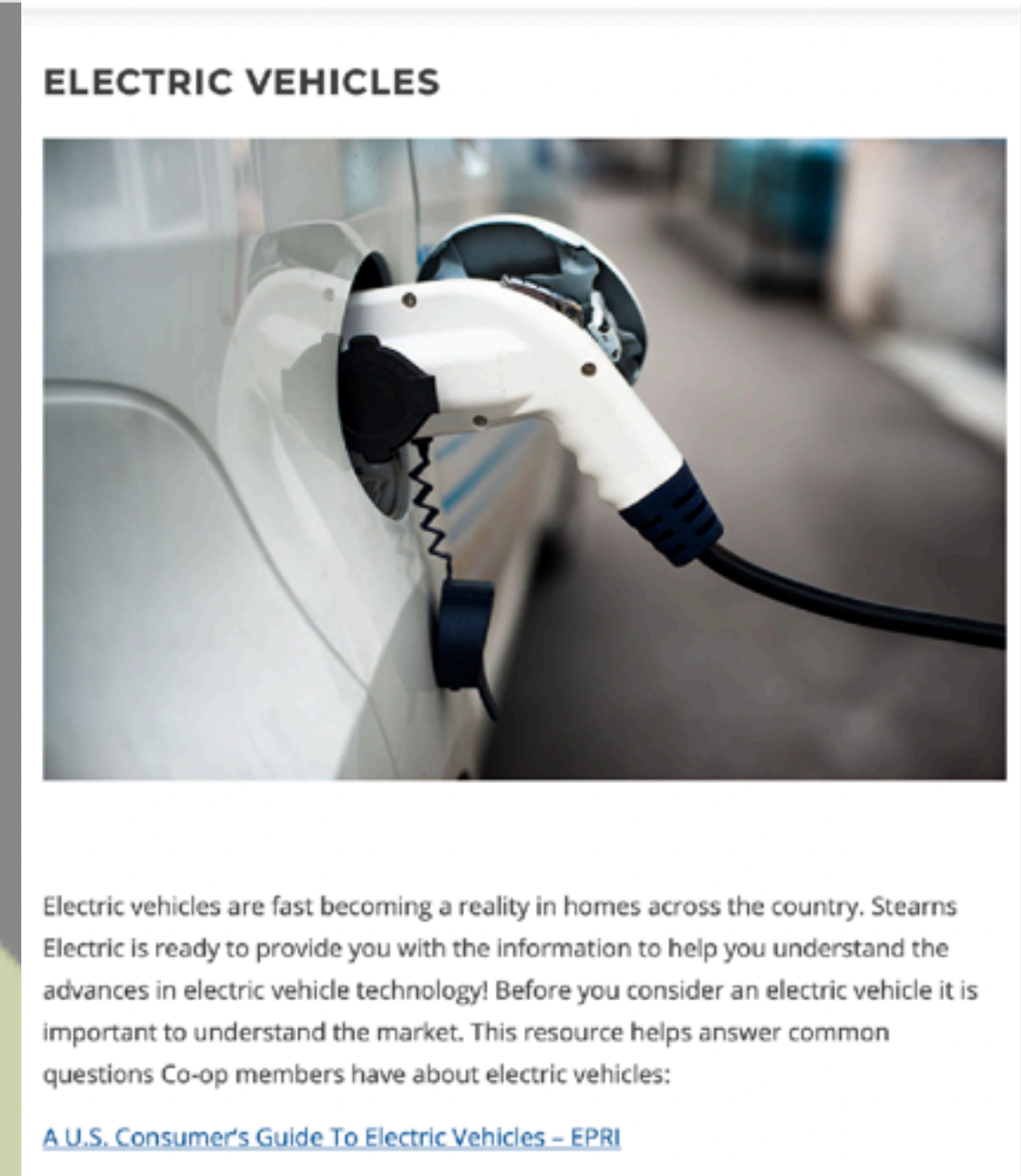
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Electric Vehicle Offers & Information

Time-Of-Day Program

Our EV Time-of-Day (TOD) Program offers an affordable rate to members who purchase an electric vehicle to meet

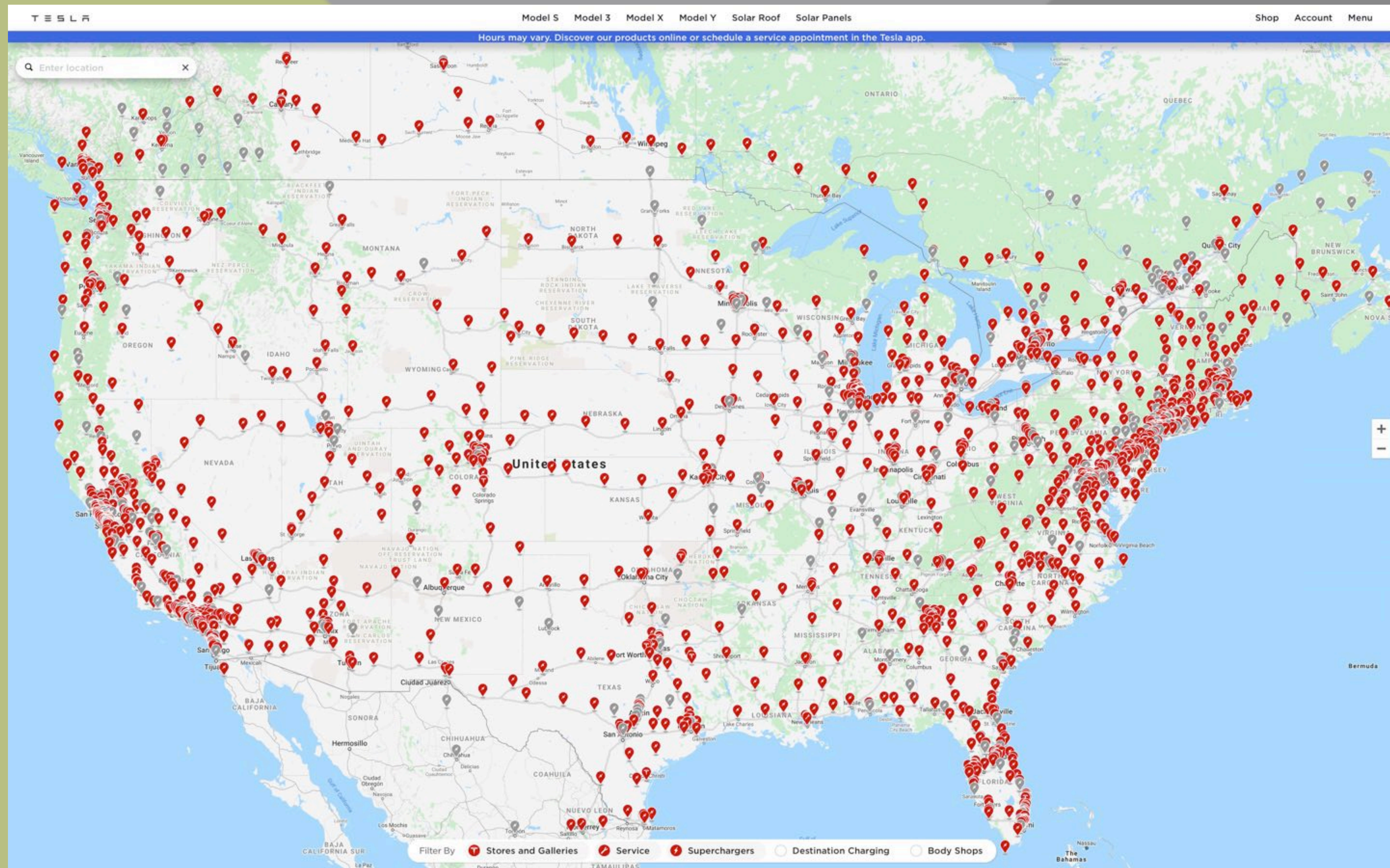


ELECTRIC VEHICLES

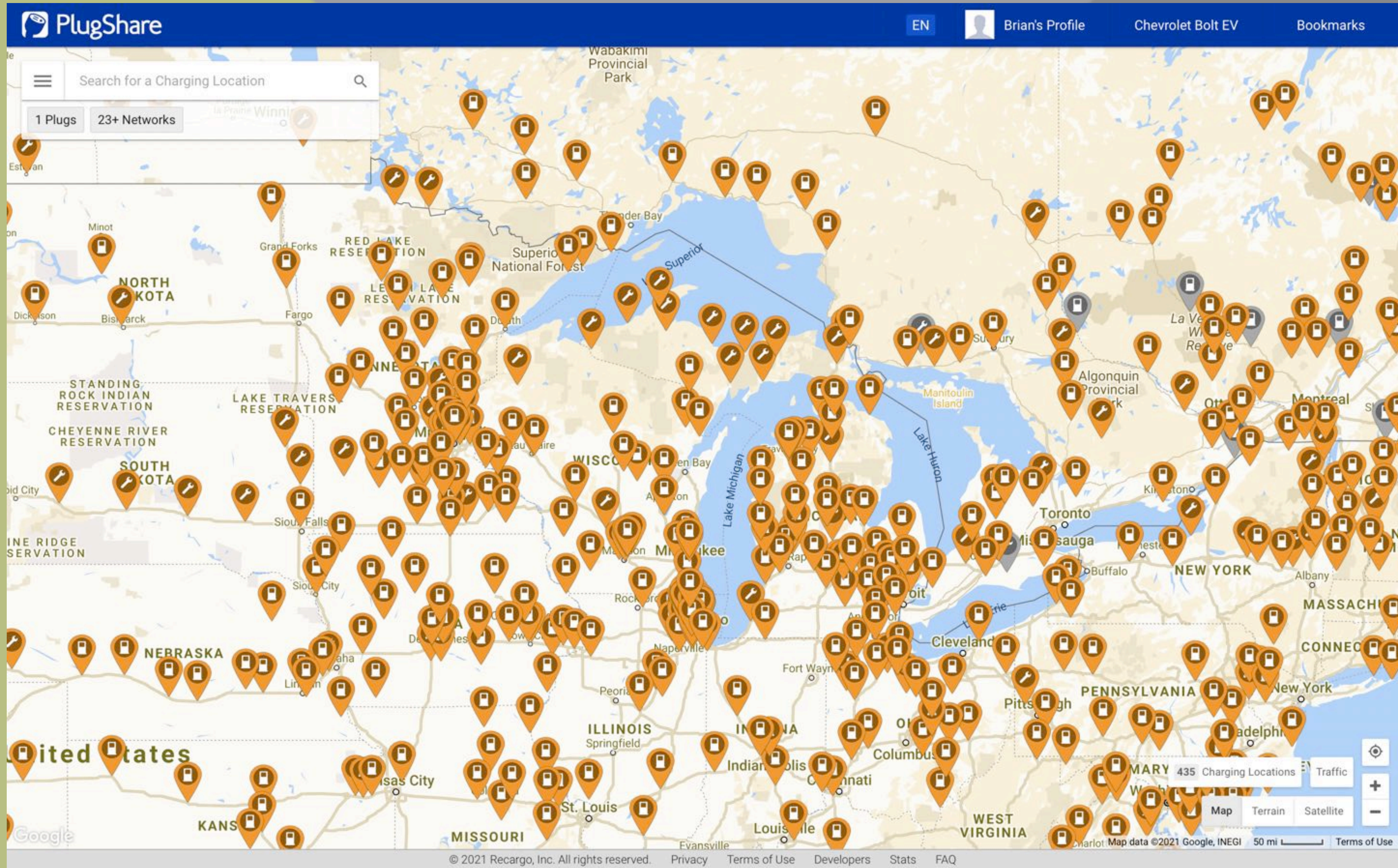
Electric vehicles are fast becoming a reality in homes across the country. Stearns Electric is ready to provide you with the information to help you understand the advances in electric vehicle technology! Before you consider an electric vehicle it is important to understand the market. This resource helps answer common questions Co-op members have about electric vehicles:

[A U.S. Consumer's Guide To Electric Vehicles – EPRI](#)

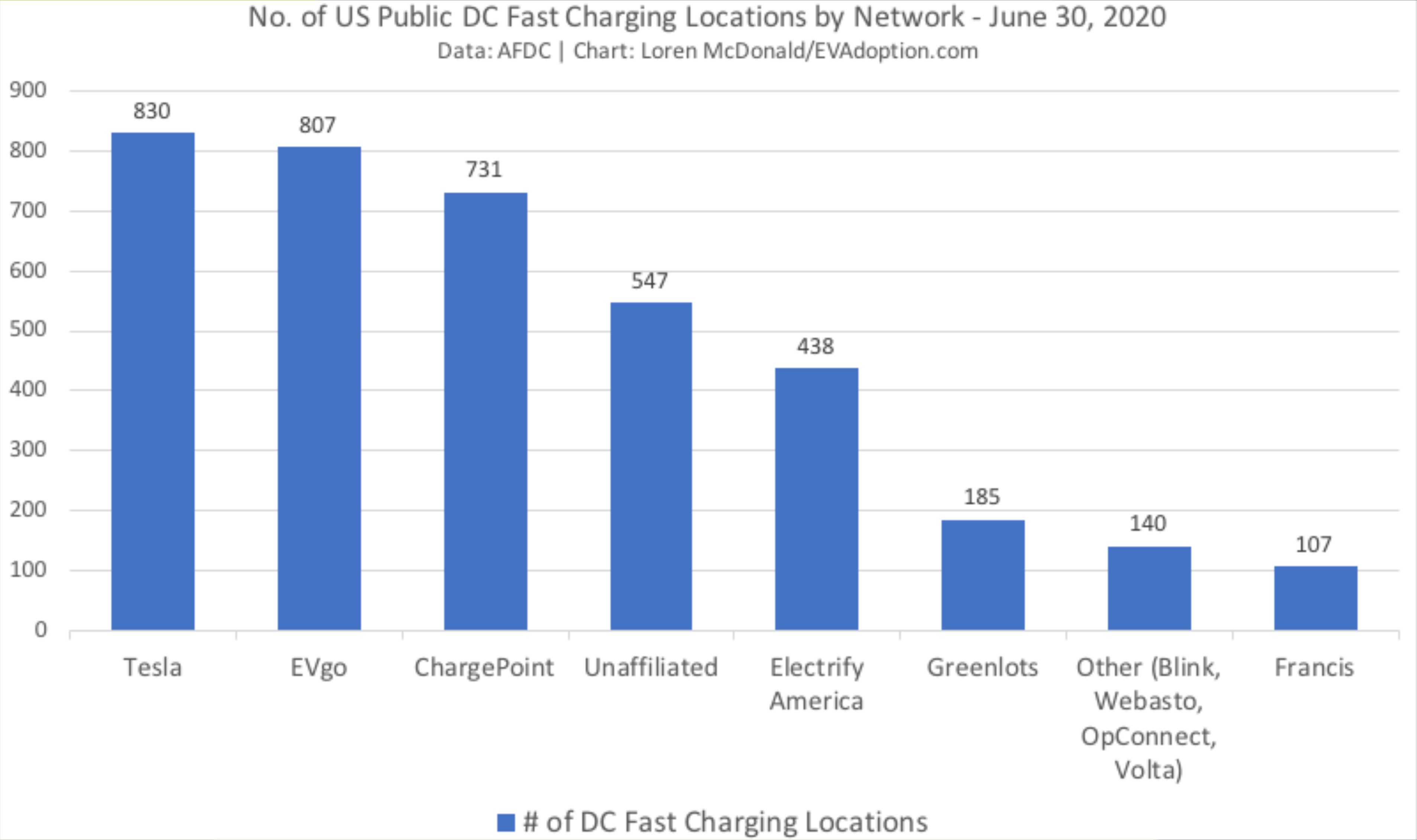
The Tesla charging network provides convenient travel to any location via the in-car navigation and automatic billing for energy.



Third party networks also cover the US and are expanding rapidly.

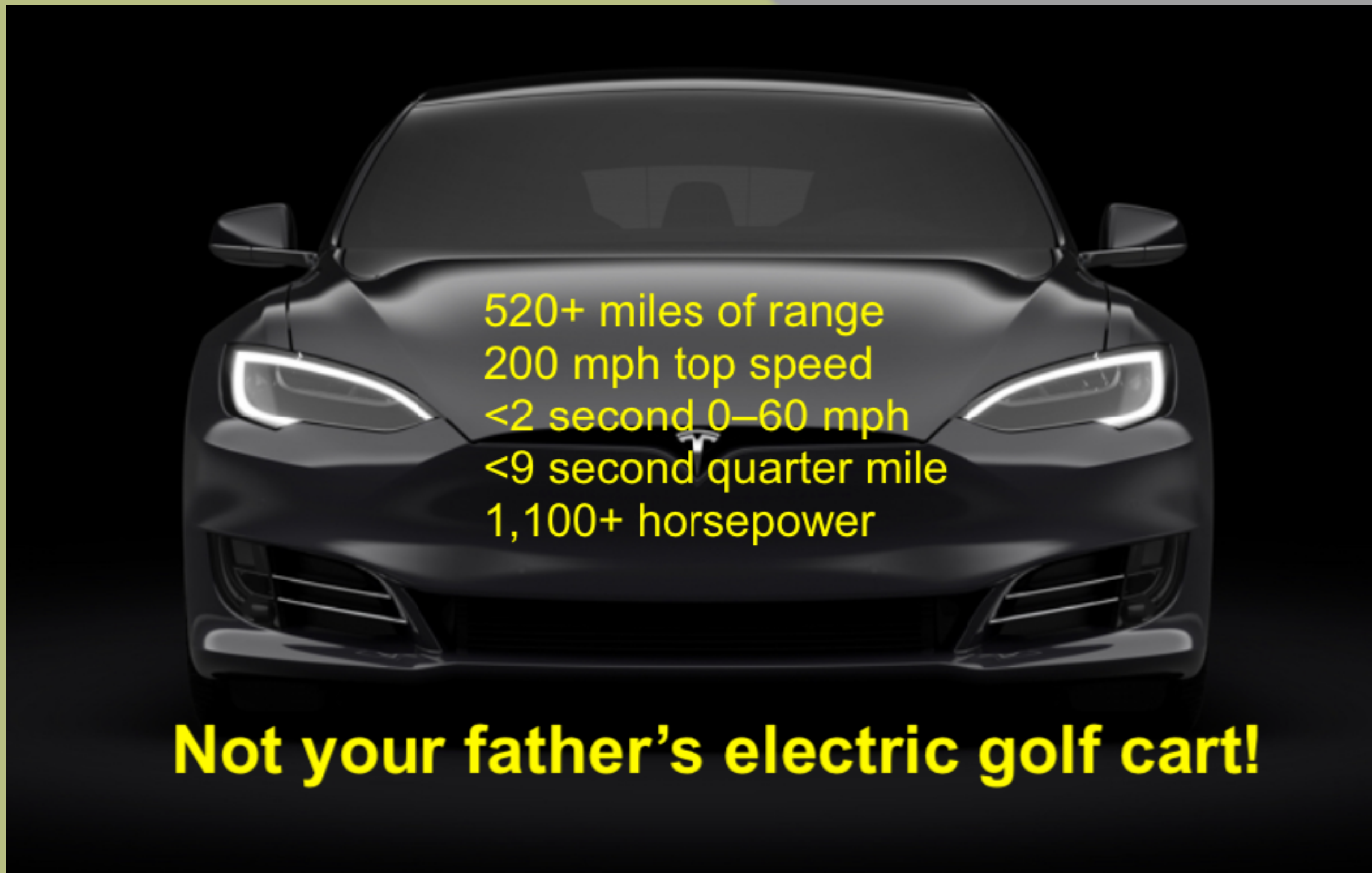


DC fast charging infrastructure is already robust and is in a high-growth mode. Tesla has fewer locations, but more connections / location.



US Public DC Fast Charging (DCFC) Locations

Electric Vehicles provide a better ownership experience!



Chevrolet Certified Service	7,500 miles	15,000 miles	22,500 miles	30,000 miles	37,500 miles	45,000 miles	52,500 miles	60,000 miles	67,500 miles	75,000 miles	82,500 miles	90,000 miles	97,500 miles	105,000 miles	112,500 miles	120,000 miles	127,500 miles	135,000 miles	142,500 miles	150,000 miles	
Rotate tires, if recommended for the vehicle, and perform Required Services.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Replace passenger compartment air filter (or 2 years, whichever comes first).			✓			✓			✓			✓			✓			✓			
Drain and fill vehicle coolant circuits.																					✓



Resources

- [Loup: Tesla Model 3 Cost of Ownership Slightly Cheaper Than a Camry](#)
 - [Deloitte: Electric vehicles Setting a course for 2030](#)
 - [Shift2Electric: Available EV Model Lists](#)
 - [Electric Cars vs Gas Cars Cost in Each State](#)
 - [EVadoption: EVGo and GM Partner to Add 2,700 New Fast Chargers Over the Next Five Years](#)
 - [ICCT: A global comparison of the life-cycle greenhouse gas emissions of combustion engine and electric passenger cars](#)
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