



EV Basics, Industry Trends, and User Experience

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Evergy & Electrification

>evergy





Serving **1.6 million** customers in Kansas and Missouri



Evergy is focused on **people first** and **moving energy forward**, offering innovative solutions and providing reliable and safe energy to its customers



Nearly half the power Evergy generates for delivery to homes and businesses comes from **emission-free sources**



KS Central

KS Metro

Wichita



MO Metro

MO West

Electrification benefits reach many stakeholders



STATE

- Meet state targets
- Reduce emissions
- Funding availability
- Develop partnerships



LOCAL

- Meet sustainability goals
- Reduce pollution
- Economic development
- Energy access



RESIDENTIAL CUSTOMERS

- Improved performance and cost savings
- Health benefits
- Proactive engagement with utility



COMMERCIAL CUSTOMERS

- Lifecycle cost savings
- Improved performance
- Health and noise benefits
- Meet sustainability goals



- Flexible load growth
- Greater capacity utilization
- Proactive customer engagement
- Decarbonization

Utility has a responsibility to serve all customers and manage the grid



Evergy's role in the TE transition

Shorter-term programs support and inform the utility's longer-term responsibilities



• Primary levers are charging infrastructure and rate design

- Benefits of near-term EV
 adoption
 - Beneficial load (*trate pressure*)
 - Data / Relationships
 - Reduce adoption "hockey stick"
- Temporary role until stronger third-party investment emerges

Core responsibility and opportunity: Manage the transition to electrification at scale

Maximize benefits for all customers in the long-term

- Fill market gaps for underserved customers
- Create proactive, well-planned deployment of EV charging infrastructure
- Ensure many types of EV customers are served (e.g. fleets, rideshare, schools)
- Increase role in managed charging for grid benefits



EV Basics & Benefits



The alphabet soup of vehicle powertrains





Founded, 1885 (Karl Benz)





- ICE + E-Motor/Battery (small)
- E-motor is charged internally (ICE + regenerative braking)
- Many popular models offer HEV • versions (e.g. Toyota Camry)



externally

Newer PHEVs have battery—

only ranges of 30+ miles

- Bye bye, gas pump
 - New sales are about 2.5:1 BEV / PHEV

E V

100% Electricity



Public

Each powertrain has strengths and weaknesses

ICE / HEV

PHEV

BEV

PROS	Fueling options/availability	Can function as an EV during daily commute	Smooth, silent, responsive
	Affordability	Great range / Range security	Low fueling costs (non-public)
	No plug-in drama!	Availability of tax credits	Lowest life cycle emissions
	Great range	Plug-in drama - optional	Low maintenance requirements
			Availability of tax credits
	Fueling costs	Mechanical complexity (highest)	Fueling options/availability
	Life-cycle emissions	Maintenance costs	Range limited / weather impacted

CONS

Life-cycle emissions Maintenance costs Mechanical complexity Mechanical complexity (highest) Maintenance costs Model availability / affordability Waste of money if never plugged-in Powertrain space requirements Fueling options/availability Range limited / weather impacted Model availability / affordability Technology – maturity Technology – rate of innovation

Slide informed by <u>Edmonds.com</u>



>> A few more thoughts on EV emissions...

G

Lifecycle emissions associated with an EV are less than those from a comparable gasoline vehicle, and battery-electric vehicles have zero tailpipe emissions.*

With Evergy's commitment to expanded wind generation and reduced carbon output, EVs charging on our grid have the potential to be even greener.

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Public

Transportation electrification reduces harmful pollutants, which disproportionately impact low-income and urban communities.

*U.S. EPA estimates that a Chevy Bolt operating in Kansas City (MO or KS) produces 190 CO_2 g/mi compared to 410 CO_2 g/mi for the average new gasoline vehicle. For more, see <u>"A Global Comparison of the Life-Cycle Greenhouse Gas Emissions of Combustion Engine and Electric Passenger Cars"</u>, ICCT (2021)

EV Supply / Demand



Hey Tesla, you've got (deep-pocketed) company...

Automakers have pledged over \$50 Billion towards domestic EV manufacturing by 2025





Example all-electric vehicle production goals:

- GM: 2035
- Volvo: 2030
- Honda: 2030
- Jaguar: 2025
- Ford: 2030 (Europe)
- Toyota: 70% of U.S. sales to be BEV/PHEV by 2030

U.S. EV start-ups add pressure:

- Tesla
- Rivian
- Lion Electric
- Lordstown
- Proterra
- and more...



Here come the EVs...



Internal Use Only





EV Owner Experience

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Things EV owners love and hate about (B)EVs

While increasingly capable, BEVs are not (yet) a great fit for <u>all</u> usage profiles



(1) New PHEVs and BEVs may be eligible for a federal income tax credit of up to \$7,500. See Federal Tax Credits for All-Electric and Plug-in Hybrid Vehicles (fueleconomy.gov).

Expectations Check - GM and Tesla have phased-out of the income tax credit because both companies have exceeded the EV sales threshold



Public

Deep dive into EV charging – charging levels and rates

Level 1

VOLTAGE: 120V 1-Phase AC

AMPS: 12-16 Amps

CHARGING LOAD: 1.4-1.9 kW

CHARGING TIME: 3-5 Miles per Hour

Level 2



VOLTAGE: 208V or 240 V 1-Phase AC

AMPS: 12-80 Amps (Typ. 32 Amps)

CHARGING LOAD: 2.5-19.2 kW (Typ. 6.6 kW)

CHARGING TIME: 12-60 Miles per Hour

Source: advancedenergy.org

DC Fast Charge



VOLTAGE: 208V or 480V 3-Phase AC

AMPS: >100 Amps

CHARGING LOAD: 50-350 kW

CHARGING TIME: 60-80 Miles in 20 Minutes The actual Level 2 charging rate is limited to the lower of the car's onboard A/C charger rating or the circuit capacity. For example, a Nissan Leaf plugged into a NEMA 14-50 outlet (9.6kW) will charge at 6.6kW because the Leaf's onboard A/C charger is rated at 6.6kW.

Similarly, the maximum rate of charging via DC Fast Charge stations is make/model specific.

Sedan efficiency is typically within the range of 3.0-4.0 miles per kWh.

Full-size truck efficiency is more like 1.5-2.0 miles per kWh.

Consult online resources for estimates of how weather effects a given make/model's efficiency.



16 Public

Deep dive into EV charging – residential level 2 charging

Soon, Evergy will offer rebates to EV owners/leasees that install L2 home charging



Method 1 – "Smart" Charging Station

- Networked (WiFi)
- Capable of communications with utility (future?)
- Hardwired or plugged into 240V outlet
- Some utilities bill from these devices, making them effectively a separate meter





- No communication capability
- Hardwired or plugged into 240V outlet
- Alternative for EV owners who want to keep their OEM mobile cordset in their vehicle
- Charging controlled/monitored by mobile app (EV OEM and/or third party)



Method 3 – EV OEM Mobile Cordset

- Increasingly, EVs are shipped with dual voltage (120V/240V) cordsets
- Many owners use these cordsets for everyday use at home
- No communication capability (typically)
- Charging controlled/monitored by mobile app (EV OEM and/or third party)



Looking Ahead & References



Some of the places EVs are going....

The EV industry has attracted about \$100B of investment since 2020

1) Batteries, Batteries, Batteries!!

- a. Chemistry Shifting to "green" raw materials
- b. Recycling Improving end-of-life material collection and reuse
- c. Capability Increasing charging rate and energy density (range)

2) Consumer Choice

a. Nearly every OEM has announced a timeline for phasing-out ICE vehicles

3) Reimagined Utility/Consumer Relationship

- a. Deeper coordination between utility and customer
- b. Utility managed charging and/or demand response programs





InsideEVs | Electric Vehicle News, Reviews, and Reports General EV information for all OEMs. Beware getting sucked down the "drag race" rabbit hole!

<u>Compare Electric Cars: EV Range, Specs, Pricing & More (insideevs.com)</u> Scroll to the bottom of this page for links to very useful EV comparison charts

Green Car Reports - Hybrid and Electric Car News, Reviews and Buying Guides

Federal Tax Credits for All-Electric and Plug-in Hybrid Vehicles (fueleconomy.gov)







Thank you!

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