

EV Road Trip

Lessons Learned with a non-Tesla Electric Vehicle

Presented at PATACS/OPCUG Meeting 21 January 2023 by Geoffrey Goodrum
Any opinions expressed are wholly my own

OUTLINE

- Objective
- Background
- Terms and Tips
- Useful Apps
- Future
- Conclusion
- Contact Information

OBJECTIVE

To impart Lessons Learned from my experience with hybrid and electric vehicles (EVs) and inform those considering an EV purchase in the near future

BACKGROUND

I am an early adopter, technology enthusiast and retired US Government physical scientist.

My previous vehicles include a 2002 Honda Insight First Generation Hybrid and a 2019 Kia Niro Plug-in Hybrid Electric Vehicle (PHEV).

My current vehicle is a 2022 Kia EV6 First Edition AWD Battery Electric Vehicle (BEV).

EV6 Road Trips:

- June 2022: day trip via I-81S and Skyline Drive to learn features and charging
- Sept 2022: car camping trip on the Blue Ridge Parkway and Skyline Drive
- Oct-Nov 2022: cross country car camping trip via Route 66, Pacific Coast Highway and Lincoln Highway

NOT REALLY NEW (1921 NEWSPAPER EV AD)

YOU CAN NOT KNOW THE JOY OF PERFECT MOTORING UNTIL YOU HAVE DRIVEN A RAUCH & LANG ELECTRIC AUTOMOBILE

The Challenge of the ELECTRIC Automobile



THE RAUCH & LANG ELECTRIC AUTOMOBILE—THE CAR FOR ALL THE FAMILY—RAUCH BROTHERS, BOSTON, MASS. AND BRANFORD, CONN.

they build—even, continuous torque without gaps of power, impacts and impulses, noise and vibration. Added to perfection of power, it has simplicity of construction. Battery—reservoir—brakes, each simple as the figure "7".

Because it is simple in structure—because it is driven by the simple yet greatest force in nature—the Rauch & Lang Electric Automobile is the practical realization of a scientific ideal. It is powerful yet requires and free from vibration. It is sturdy with few parts to get out of order, and friction reduced to a minimum. It is clean, roomy, comfortable—the ideal family car.

As the Rauch & Lang Electric sets the high mark of convenience and service, it sets the low mark of economy. The battery is recharged at night when the car is not in use—so simple as connecting an electric iron. Power costs you on an average of \$2.00 to \$3.00 per month. And here is the supreme economy—the owner

ELECTRICITY to-day dominates the world as the perfect driving power. You see its application everywhere. Enlisted to divergent leadership, chosen to drive great railway trains, called on the job where there is any big work to do, it advances in the practical power to drive automobiles. That is why motor car owners of all experience are today turning to the Rauch & Lang Electric Automobile.

They are fast discovering that for their actual needs—the use which makes their automobile worth having and worth maintaining—the Rauch & Lang Electric is scientifically and practically right.

Check Up Your Real Use of Your Car

The instant the automobile finds its true place in your life and your mind, the Rauch & Lang Electric will appeal to you as the logical car. Eliminate spots from the automobile of your dreams and let it breathe revealed to you car to take you from one spot to another—a car of usefulness. When you realize this, you too, with other men of insight and wisdom of common sense, will turn to the Rauch & Lang Electric, as a matter of course.

Check up on your actual use of your car—where you really go and how. Eliminate the trips you deem of value. Do this, and you will be amazed, or shocked to see how little the average speed and long distance traveling which you thought so important when you bought your car, actually serve you.

Tell yourself truthfully the number of miles from home, how many times you drive more than thirty miles an hour. How often have you been where the law allows you to drive more than twenty?

Isn't this essentially what an automobile means to you a *conscience to take you to and from work—to the club—to the store—to the homes of friends—to church, or for a short spin in the country*—No need of high speed, and seldom a chance to use it.

In short, you real use for an automobile is the kind of use which the Rauch & Lang Electric Automobile gives you in all types of work. It is here because it is more pleasant, more reliable and more economical to you.

When the Rauch & Lang Electric Automobile gives you in the service you need day in and day out—the perfection of service in driving in crowded traffic, over streets rough or smooth—quick starting—quick stopping—and above all, economy of operation and maintenance.

Practical Realization of Scientific Ideal

Built around electricity—the driving power which scientists and engineers alike agree is ideal—the Rauch & Lang Electric Automobile delimits the scientific and practical hand. It possesses new what automobile engineers are all striving for, no matter what type of car

SAFETY—the owner realizes the sense you acquire—so the driver needs no chauffeur.

A Common Sense Joy Ride

To drive a Rauch & Lang Electric Automobile is joy. You start the car as easily as you press a light button. Controlled by a touch of your hand, promptly, almost to your thought. You guide it as easily as you will—step in as readily as you lay your step. Aid all motions as the right.

Yet it is an automobile for a driver who wants to get there—for real blooded men and women. Rugged and powerful it glides down the avenue ahead of cars of other types. It climbs hills with ease unattended by many cars and climbs them without splutter, jolt and jar.

You cannot know perfect motoring until you have driven in a Rauch & Lang Electric Automobile. Just call on the Rauch & Lang dealer in your city, or telephone and he will arrange to take you for a drive. If there is no dealer in your city, write us.

Every automobile owner should drive within for an hour every month in the "The Car Family Test" to tell you whether you need it or not.

Rauch & Lang ELECTRIC Automobile

RAUCH & LANG, INCORPORATED
CHICOPPEE, FALLS, MASS.

Consolidated Motors Co., 2801 Main St., Kansas City, Mo.
Whaley Motor Co., 414 South Basileur, Tulsa, Ok.
Cummins Motor Co., Great Island, N.Y.
Rauch & Lang Sales and Service Co., Omaha, Neb.
Inclined Car Work, Sept. 24 to 29.

Reference:

<https://gizmodo.com/electric-car-ad-1921-drivers-brutally-honest-rauch-lang-1849543806>

TERMS

Powertrains

ICE: Internal Combustion Engine, traditional gas/diesel fueled vehicle with friction braking

Hybrid: combination ICE and electric motor vehicle with high voltage battery charged by the engine and captured braking energy (i.e. regenerative braking)

PHEV: Plug-in Hybrid Electric Vehicle, hybrid vehicle with regenerative braking and external electric charging

BEV: Battery Electric Vehicle, electric motor only vehicle with regenerative braking and external electric charging

TERMS

Charging (1 of 2)

EVSE: Electric Vehicle Support Equipment, cable and control electronics to charge an EV, sometimes erroneously called a “charger.”

AC Level 1: EV charging from a 120VAC circuit (e.g., NEMA-15R wall outlet, 1.4kW@12A)

AC Level 2: EV charging from a 240VAC circuit (e.g., NEMA 14-50R or hardwired, 9.6kW@40A). Equivalent to Tesla Destination Charger.

DC Fast Charging: EV charging from a commercial DC charger (e.g., 350kW). Equivalent to Tesla Supercharger.

TERMS

Charging (2 of 2)

800V Architecture: Latest EV standard allows lighter wiring and faster charging

J1772: North American connection standard for AC Level 1 and 2 charging

CCS: Combined Charging System, extends the J1772 connection standard to include DC Fast Charging. Combo 1 used in North America, Combo 2 in Europe.

CHAdeMO: connection standard used in Japanese EVs (e.g., early Nissan Leaf), being phased out in US.

NACS: North American Charging Standard, Tesla connector also adopted by Aptera



← NACS

J1772 →



← CHAdeMO

CCS1 →





My First DC Fast Charge



TIPS

EV Tax Considerations

Federal Tax Credits became more complicated with the Inflation Reduction Act (IRA) signed in August 2022.

- <https://www.irs.gov/credits-deductions/credits-for-new-electric-vehicles-purchased-in-2022-or-before>
- <https://www.irs.gov/credits-deductions/credits-for-new-clean-vehicles-purchased-in-2023-or-after>

State and local incentives vary.

Some states (Virginia included) have an annual highway use fee for EVs.

- https://www.dmv.virginia.gov/vehicles/#highwayuse_fee.asp

TIPS

Maintenance

Tires: rotation, balance, inflation

Brakes: fluid, pads

High Voltage Battery (HVB): coolant

12V Battery for accessories, critical system backup, power relay to engage HVB

Cabin air filter

I: Inspect and if necessary, adjust, correct, clean or replace.

R: Replace or change.

Number of months or driving distance, whichever comes first												
Months	12	24	36	48	60	72	84	96	108	120	132	144
Miles×1,000	8	16	24	32	40	48	56	64	72	80	88	96
Km×1,000	13	26	39	52	65	78	91	104	117	130	143	156
Tire rotation	Rotate every 8,000 miles (13,000 km)											
Reduction gear fluid	-	-	-	I	-	-	-	I	-	-	-	I
Climate control air filter	I	R	I	R	I	R	I	R	I	R	I	R
Brake fluid	Inspect every 8,000 miles (13,000 km) or 12 months Replace every 48,000 miles (78,000 km) or 48 months											
Coolant*	At first, replace at 120,000 miles (195,000 km) or 120 months After that, replace every 24,000 miles (39,000 km) or 24 months											
Air conditioner refrigerant												
Air conditioner compressor												
12V Battery condition												
Brake discs and pads	I	I	I	I	I	I	I	I	I	I	I	I
Brake lines, hoses and connections												
Suspension ball joints												
Steering gear rack, linkage and boots												
Drive shaft and boots	-	I	-	I	-	I	-	I	-	I	-	I
Cooling system	-	-	-	I	-	I	-	I	-	I	-	I

TIPS

Charging at home

AC Level 2 EVSE purchase cost varies (\$80-\$1000) with features (e.g. WiFi, UL listing, amperage)

Installation cost varies with home readiness (existing 200A panel, wiring and outlet)

- Apartment and rental residents have fewer options

States and electric utilities may provide EVSE rebates and use plans

- <https://afdc.energy.gov/laws/search>

TIPS

Road trips

Use route planning app for DC Fast Charging on the way

- Verify next charger on route is available before proceeding

Stay at hotels with AC Level 2 chargers for overnight charging

- Consider carrying a J1772 adapter for Tesla Destination Chargers

Bring a compatible portable EVSE (e.g. 40A, NEMA 14-50P) for campsites with power hook-ups (check site policy first)

Speed and weather affects range (same for ICE vehicles)

TIPS

Cold Weather

Expect reduced range, more frequent charging

Use heated seats and steering wheel (options) over cabin heat

Heat pump option is much more efficient than resistive cabin heat

Keep EV in garage if you have one

Use scheduled climate feature while plugged in

Preconditioning (warming) HVB reduces DC fast charging time

TIPS

EV Etiquette at Public Chargers

Never unplug a charging vehicle without permission

Move EV out of charging space as soon as charging completes

- Not a parking space (“ICEing”)
- Extra charges may apply after 10 minutes idle

Charge to no more than 80% if other drivers are waiting

USEFUL APPS

A Better Route Planner (ABRP): online route planner (of course)

- <https://abetterrouteplanner.com/>

PlugShare: crowd-sourced information on charger location and status

- <https://www.plugshare.com/>

Google Maps: search for EV charging stations

Charging Networks (e.g. Electrify America, ChargePoint, Shell Recharge)

- <https://www.electrifyamerica.com/>, <https://www.chargepoint.com/>

Vehicle Remote Management (e.g. Kia Connect): climate and charging control

PLUGSHARE MAP VIEW

The image is a screenshot of the PlugShare website's map view. At the top, there is a blue navigation bar with the PlugShare logo on the left, and links for "PlugShare for Business", "EN", "Login", and "Register" on the right. Below the navigation bar is a search bar with the text "Search for a Charging Location" and a magnifying glass icon. To the left of the search bar, it displays "8 Plugs" and "24+ Networks". The main area is a map of Fairfax, Virginia, showing various charging stations marked with green and orange pins. Labeled locations include Walmart Supercenter, Costco Wholesale, Wegmans, Amazon Fresh, The Home Depot, Inova Fairfax Hospital, and several schools like James W. Robinson, Jr. Secondary School. A small box in the bottom right of the map area indicates "33 Charging Locations". At the bottom of the page, there is a footer with copyright information: "© 2023 Recargo, Inc. All rights reserved." and links for "Privacy", "Terms of Use", "Developers", "Stats", "FAQ", and "Advertise".

ELECTRIFY AMERICA CHARGER NETWORK



FUTURE

Charging infrastructure

- Government incentives, building codes

Charge Connector Standard

- CCS is the industry standard

Wireless Charging

- Embedded in road surface and parking spaces

Battery Technology Improvements

- Solid State Batteries with higher energy density

CONCLUSION

Charging infrastructure needs to expand beyond highways and urban centers

- Risk if EV sales outpace availability
- Road trips still need advance planning
- Promote charging in public garages, apartment complexes

Standardization is immature

Multiple apps are needed for multiple charging networks

EV drivers must understand what affects range



Tesla Supercharger



Electrify America Charging Station

CONTACT INFORMATION

Potomac Area Technology and Computer Society (PATACS)

- <https://patacs.org/>

Osher Lifelong Learning Institute Personal Computer User Group (OPCUG)

- <https://olligmu.org/opcug/index.html>

Geoffrey Goodrum

- geosorcerer@gmail.com