

# Your Electric Vehicle Options. A survey of available plug-in vehicles, conversions & kits. July 2008

(originally presented at the SolWest Renewable Energy Fair,  
John Day, Oregon, July 27, 2008)

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# Content

- Disclaimer
- Background
- Survey of EVs
- List of North West EV dealers



# Disclaimer!

- This contains ONLY plug-in vehicles that were, are or plan to be in the USA for consumers (not just fleets).
- This is NOT an endorsement of any manufacturer or model!
- Information in these slides may contain errors, may be outdated, or may be incomplete.
- Buyer beware. Check out the company and the product before purchasing.



# EV Background

- Batteries;
  - Lead Acid (**PbA**) – best price/kWhr but heaviest. Shortest range.
  - Nickel Metal Hydride (**NiMH**) – in between.
  - Lithium Ion (**Li-Ion**) – most expensive/kWhr but lightest. Longest range.
- Propulsion/Drive Train;
  - DC - least expensive, but hard to get regen braking and has limited RPMs often requiring a transmission to reach highway speeds.
  - AC – most expensive, but you get free regen braking, and often can avoid a transmission due to its higher RPMs.
- Range; EPA vs “Maximum”. Ask the seller which it is. “Maximum” usually means flat ground, new batteries, room temperature, light foot.
- New vehicle roll out generally starts in country of origin, then US fleets, then US consumers. Add several years to the “introduction” date before you expect to get one.
- Service. Consider if you live close enough to factory or dealers to get service when needed. EV dealers are few & far between.



# Categories of EVs

- Neighborhood EVs
- Personal & Microcar EVs
- Sport EVs
- Sedan & SUV EVs
- Mainstream Factory EVs
- Conversion EVs & Kits
- Plug-in Hybrid EVs (**PHEV**) & Kits



# Neighborhood EVs (NEVs)

- Some built on golf-cart chassis
- Federally limited to 25 MPH
- Some states allow 35 MPH
- Good for pure in-town, short distance driving.
- Utility vehicle variants for campus maintenance.



# Global Electric Motorcar, GEM, NEV



- Made in Fargo ND. A Chrysler Company.
- Various models from 2 to 6 occupants.
- \$6800 & up price.
- 1850 lb GVWR (2 seater model)
- 30 mile range.
- Campus utility vehicle variants.
- [www.gemcar.com](http://www.gemcar.com)



# Columbia Electric Vehicles, Summit NEV



- Made in USA.
- 2 & 4 seater models.
- \$10,000 to \$11,200 depending on model.
- 35 to 40 mile max range depending on model.
- Mega truck campus utility NEV variant.
- [www.parcars.com](http://www.parcars.com)



# E-Ride Industries, EXV Series, NEV



- Made in USA?
- 2 & 4 seater models.
- Price unknown.
- DC or AC Drive.
- 55 mile max range.
- 3000 lb GVWR
- [www.e-ride.com](http://www.e-ride.com)



# Dynasty Electric Car Corp, IT Series, NEV



- HQ in BC, Canada
- 2 & 4 seater models.
- Price unknown.
- 30 mi max range.
- Available in sedan, sport, tropic, utility & van models.
- [www.itiselectric.com](http://www.itiselectric.com)



# Green Vehicles, Moose & Microwatt, NEVs



- Target availability Fall 2008.
- 2 or 4 seater.
- \$12K - \$13K price.
- 60 mile range.
- [www.greenvehicles.com](http://www.greenvehicles.com)



# Venturi, Eclectic, NEV



- Built in France
- Target availability 2009.
- 3 seater
- Price unknown.
- 35 mile range.
- Built-in solar charging.
- [www.venturi.fr](http://www.venturi.fr)



# Miles Electric ZX40 Series NEV



- Made in China.
- Not golf-cart based.
- Up to 4 occupants.
- Available in DC or AC drive.
- \$18,400 (AC model).
- 3000 lb GVWR.
- 40-50 mile range.
- Utility vehicle variant
- [www.milesev.com](http://www.milesev.com)



# Zenn Motor Car, Zenn, NEV



- Canadian based company.
- Not golf-cart based.
- Up to 2 occupants.
- DC Drive.
- EESstor batteries soon
- \$16 - \$18K price.
- 35 mile range.
- [www.zenncars.com](http://www.zenncars.com)



# ZAP Xebra Series NEV



- Based in Santa Rosa, CA. Made in China.
- Not golf-cart based.
- Up to 4 occupants.
- DC Drive.
- \$11,700 (sedan)
- 2800 lb GVWR
- 25 mile range.
- Utility vehicle variant
- [www.zapworld.com](http://www.zapworld.com)



# Revolution Electric Cars, Revolution, NEV



- Based in CA. Made in?
- Not golf-cart based.
- Up to 2 occupants.
- AC Drive.
- 5-speed manual trans
- Unknown price.
- Up to 60 mile range.
- [www.revolutionevusa.com](http://www.revolutionevusa.com)



# Personal & Microcar EVs

- 3-wheeled or sub-sub compact vehicles.
- 1 or 2 occupants with minimal baggage.
- Light weight (efficient).
- Some are fully enclosed & heated.
- Capable of highway speeds.
- Sometimes rated as a “motorcycle” in some states.



# Myers Motors, NmG, personal EV



- Formerly the Corbin Sparrow.
- Longest-lived EV on the market.
- Made in the USA.
- 1 occupant.
- DC Drive.
- \$30,000 (Lithium Ion battery option).
- Up to 45 miles range (Li-Ion).
- [www.myersmotors.com](http://www.myersmotors.com)



# Harvey Coachworks, Bug-E, personal EV



- Made in the USA
- Uses the Blue Sky Design kit.
- 50 MPH max.
- 1 occupant.
- \$9300 PbA, \$12,700 Li-Ion.
- 40 mile max range (PbA).  
120 mile max range (Li-Ion).
- [www.harveyev.com](http://www.harveyev.com)



# Vectrix, personal EV



- Based in Rhode Island
- All-electric motor cycle
- \$9400
- 35-55 mile range
- 0-50 in 6 seconds
- Up to 60 MPH
- [www.vectrix.com](http://www.vectrix.com)



# Venture Vehicles, VentureOne EV, microcar EV

The *VentureOne*™



- HQ in LA, CA
- Scheduled available in CA, 2008.
- Up to 2 occupants
- 120 mile range.
- In-wheel drive.
- \$20K to \$25K target price
- Available in HEV (e50) & PHEV too (Q100)
- [www.flytheroad.com](http://www.flytheroad.com)



# Aptera Motors, Typ-1e microcar EV

- Scheduled available in CA only, Oct '08.
- Will be made in USA.
- Up to 2 occupants.
- AC Drive.
- \$30,000
- 120 mile range.
- PHEV (h) variant to follow.
- [www.aptera.com](http://www.aptera.com)



# Green Vehicles, Triac, microcar



- Available now?
- HQ in San Jose, CA.
- Up to 2 occupants.
- AC Drive.
- \$20,000 price.
- 100+ mile range.
- [www.greenvehicles.com](http://www.greenvehicles.com)



# Commuter Cars, Tango, micro sport EV



- HQ in Spokane, WA.
- Up to 2 occupants (front, rear).
- DC Drive.
- \$108,000 price.
- 60 mi range PbA.  
200 mi range Li-Ion.
- 3060 lb GVWR
- Also FAST (0-60 MPH in 4 secs)
- Sold as a partial kit.
- [www.commutercars.com](http://www.commutercars.com)



# Subaru, R1e, microcar



- Testing in Japan.
- Possible import for US fleets in future (year TBD).
- Target price \$17,400 in 4 years.
- 50 mile range.
- [www.subaru-global.com](http://www.subaru-global.com)



# Th!nk Global, City, microcar



- Made in Norway.
- Trying to bring to USA, in 2010.
- Up to 2 occupants.
- \$25,000 target price.
- 110 mile range.
- Planning a convertible too (the “Open”)
- [www.think.no](http://www.think.no)



# Smart, ForTwo ED, microcar EV



- Initial trial in progress in Europe. Production expected in 2010.
- 2 seater.
- Up to 75 mile range.
- Hybrid variants too.



# Sport EVs

- 1 to 2 occupants.
- HIGH performance acceleration.
- EXPENSIVE



# Tesla Motors, Roadster, sport EV



- Made by Lotus for Tesla, on a Lotus chassis.
- Just starting production – approx 12 month lead time.
- \$108,000
- 0-60 MPH ~ 4 secs.
- 221 mile range.
- AC Drive.
- [www.teslamotors.com](http://www.teslamotors.com)



# Venturi, Fetish, sport EV



- Custom built in France.
- Up to 2 occupants.
- \$300,000+ price
- 0-60 MPH < 5 secs.
- 150 mile range.
- [www.venturi.fr](http://www.venturi.fr)



# ZAP, Alias, sport EV.



- Target availability 2009.
- 3-wheeled.
- \$32,500 target price.
- 100+ mile range.
- Built on Lotus APX chassis.
- [www.zapworld.com](http://www.zapworld.com)



# Commuter Cars, Tango, micro sport EV



- HQ in Spokane, WA.
- Up to 2 occupants (front, rear).
- DC Drive.
- \$108,000 price.
- 60 mi range PbA.  
200 mi range Li-Ion.
- 3060 lb GVWR
- Also FAST (0-60 MPH in 4 secs)
- Sold as a partial kit.
- [www.commutercars.com](http://www.commutercars.com)



# Shelby SuperCars (SSC), Ultimate Aero EV, sport EV



- Based in Richland WA.
- Targeting initial deliveries 4Q2009.
- \$700K rumored.
- 500 HP & 1000 HP models planned.
- [www.shelbysupercars.com](http://www.shelbysupercars.com)



# Sedan & SUV EVs

- Capable of highway speeds.
- 4 or 5 occupants.



# AC Propulsion, eBox



- Built to order from customer supplied Scion xB donor vehicle.
- 4 door, 5 seat.
- \$55,000 + cost of donor.
- 120-150 mi range.
- AC Drive.
- Hwy Speeds
- [www.acpropulsion.com](http://www.acpropulsion.com)



# Phoenix Motorcar, SUT & SUV



- Available 3Q2008. SUV coming later.
- Up to 5 occupants.
- \$17,500 target price (rumor)
- 100 mile + range.
- 5280 lb GVWR
- [www.phoenixmotorcars.com](http://www.phoenixmotorcars.com)



# Miles Electric Vehicles, XS500



- Target US availability 3Q2009.
- Built on Saibao 3 (Chinese) chassis.
- 4-door.
- \$35-\$39K target price
- 120 mile max range.
- AC Drive.
- Highway speeds.
- [www.milesev.com](http://www.milesev.com)



# Hybrid Technologies, LiV Series



**DASH**  
PRICE \$43,500.00



**SURGE**  
PRICE \$55,000.00



**RUSH**  
PRICE \$100,000.00



**WISE**  
PRICE \$39,700.00



**FLASH**  
PRICE \$57,500.00

- You provide the donor car?
- Based on Smart, PT Cruiser, ?, Yaris, & Mini.
- 70 to 150 mile range depending on model.
- [www.hybridtechnologies.com](http://www.hybridtechnologies.com)

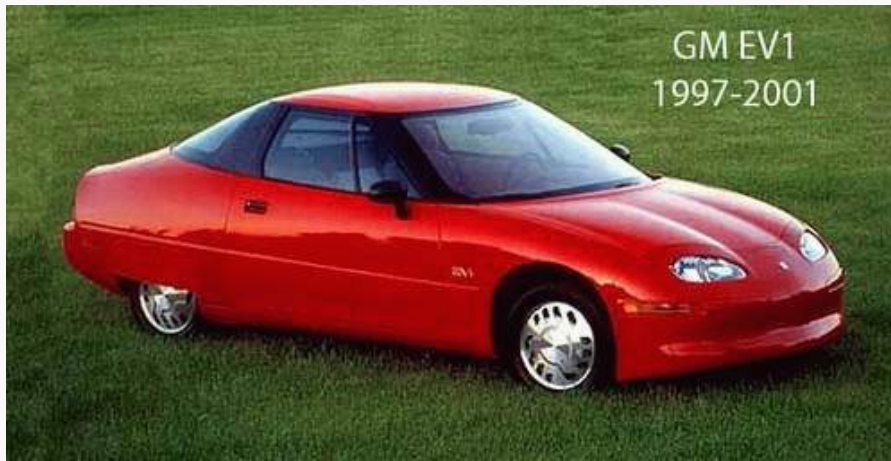


# Mainstream Factory EVs

- GM, Ford, Chrysler, Etc.
- Used, 1990's vintage vehicles from California's Zero-Emissions Mandate days
  - No longer supported by manufacturers (except for Toyota Rav4 EV)
  - Most batteries no longer available
  - AC drive trains with regen braking, AC, etc.
- New, vehicles on the horizon starting in 2010



# Discontinued: Chevy EV-1



- Best of breed.
- 1160 produced. All but a handful were crushed (who killed the electric car?).
- All remaining are in museums or universities.



# Discontinued: Chevy S10 EV



- Mini Pickup format.
- 492 produced between 1997 & 1998. About 60 avoided being crushed.
- Shares drive train with EV-1. Front wheel AC drive!
- Available in PbA (45 mi range) or NiMH batteries (90 mi range).
- EV Bones, Mesa AZ.



# Discontinued: Ford Ranger EV



- Mini Pickup Format.
- 1500 manufactured between 1998 & 2002. A few hundred remain.
- Rear-wheel, direct AC drive.
- Available in PbA (50 mile range) or NiMH batteries (85 mile range).
- Blue Sky Motors, Sacramento, CA.



# Discontinued: Toyota Rav4-EV



- SUV format.
- 1249 manufactured from 1997 to 2002. None crushed.
- Only factory EV still supported by the mfg.
- 100 mile + range (NiMH batteries).
- Sells for > \$40K used.



# Discontinued: Solectria



- Solectria now Azure Dynamics.
- E-10 mini pickup (Chevy S-10 chassis).
- Force sedan (Geo Metro chassis)
- Sunrise sedan (Toyota Spectrum chassis)



# Discontinued: Others



- Honda EV Plus – 300 made between 97-99.
- Chrysler TEV & EPIC Vans – 207 made between 93-99.
- Nissan Altra – 130 made.
- These are relatively rare.



# Future: Chevy Volt



## Related vehicles:

- Cadillac Provoq, Equinox
- Saturn VUE, Flexstream
- European Opel

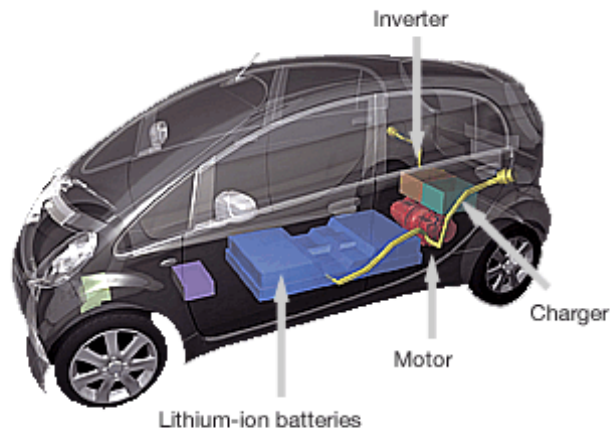
- Expected on market 2010
- Based on GM's E-Flex platform.
- Electric AC drive, with optional series hybrid generator engines (gas, diesel, hydrogen). Plans for PHEV.
- 40 mile electric-only range.
- Introductory price expected to be \$40K-\$48K.
- [www.gm-volt.com](http://www.gm-volt.com)



# Future: Mitsubishi, iMiEV



- Based on the 660 cc “i” minicar.
- Fleet testing in USA this year.
- Up to 4 occupants.
- 16kWhr Li-Ion batteries.
- [www.mitsubishi-motors.com/special/ev/](http://www.mitsubishi-motors.com/special/ev/)



# Future: Others

Rumors of:

- BMW Mini Cooper EV
- BMW “Isetta” EV
- Nissan Cube EV



# Do-It-Yourself EV Conversion Kits

- Some manufacturer's provide materials & instructions – local fabrication needed.
- Some manufacturer's produce bolt-in kits.
- Sometimes long lead times.
- Traditionally DC drive train, but starting to see AC options available.
- Check out the company before purchasing.



# Canadian EV



On Vancouver Island, BC  
Full Kit for Chevy S-10 mini  
pickup, starting at \$9600.

Conversion parts for:

- Geo Metro
- Air cooled VW
- Toyota Scion & Echo
- Toyota 22R engines

[www.canev.com](http://www.canev.com)



# EV America



In Wolfeboro, NH.

Kits for:

- Chevy S-10
- Geo Metro
- VW Bug

Parts, materials &  
instructions supplied.  
Fabrication needed.

[www.evamerica.com](http://www.evamerica.com)



# Electro Automotive



In California.

Full kits for VW:

- Rabbit-based (Cabriolet, GTI, Jetta, & Scirocco)
- Porsche 914
- \$10K - \$15K

“Universal” AC & DC kits.

[www.electroauto.com](http://www.electroauto.com)



# Lion Electric Vehicles



- Asian company with presence in VA and Alabama.
- DIY Ford Ranger EV Kit for 2001-2008 models.
- DIY Ford Escape EV Too?
- Separate Electronics & Metal options.
- Price \$10K-\$11K (excluding batteries)
- [www.lionev.com](http://www.lionev.com)

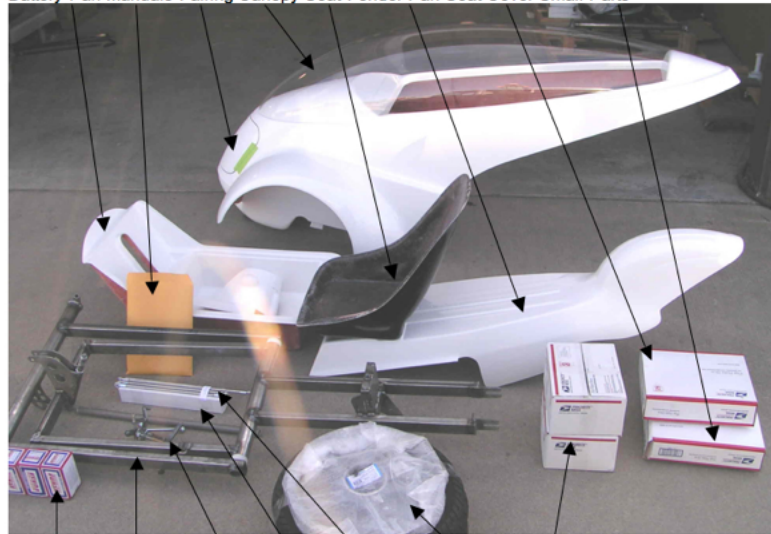


# Blue Sky Design



BugE Kit Parts

Battery Pan Manuals Fairing Canopy Seat Fender Pan Seat Cover Small Parts



Inner Tubes Chassis Spindles Shock Tire Rods Tires & Wheels 12 volt Lighting Kit (optional)

- In Creswell OR
- Unique, 3-wheel motorcycle design.
- DIY Kit.
- Approx \$5K for entire kit (some parts & batteries to be obtained locally by builder).
- [www.bugev.net](http://www.bugev.net)



# Other EV Conversion Part Sources



**METRIC MIND CORPORATION**

- EV Source, Logan, UT.

[www.evsource.com](http://www.evsource.com)

- EV Parts, Sequim, WA.

[www.evparts.com](http://www.evparts.com)

- Metric Mind, Happy Valley, OR.

[www.metricmind.com](http://www.metricmind.com)

Specialize in high-end, AC components



# Other EV Conversion Part Sources



- KTA Services Inc.  
Ramona, CA. Offering parts & generic kits.

[www.kta-ev.com](http://www.kta-ev.com)

- Electric Vehicles USA,  
Piedmont, SC

[www.electricvehiclesusa.com](http://www.electricvehiclesusa.com)

- Battery Powered Systems,  
Clarkeville, GA

[www.beepscom.com](http://www.beepscom.com)



**Battery Powered Systems**



# Other EV Conversion Part Sources

**electricvehiclesupply**  
[www.ev-supply.com](http://www.ev-supply.com)

- EV Supply, Bellevue, WA.

[www.ev-supply.com](http://www.ev-supply.com)



- Electric Motor Sport, Oakland, CA.  
Specializing in EV motorcycles & parts.

[www.electricmotorsport.com](http://www.electricmotorsport.com)



# Plug-In Hybrids & Retrofits

- Non of today's factory Hybrids offer grid charging of vehicle batteries.
- Most Hybrids are capable of driving several miles on electric-only.
- After-market, third-party kits add more battery capacity (10-20 miles) and provide modifications to allow operation in electric-only mode. Most require factory or dealer installation.
- Vehicle manufacturers are making plans for factory Plug-in Hybrids to come to market soon.
- Visit [www.calcars.org](http://www.calcars.org) for good info.



# Hymotion PHEV Kit

CAD ANIMATION ▶



- For Toyota Prius, 2004-2008 model years.
- \$10,000 price.
- 5 kWhr A123 Li-Ion pack.
- [www.a123systems.com/hymotion](http://www.a123systems.com/hymotion)



# Plug-in Supply, PHEV Kit



- For Toyota Prius, 2004-2008 model years.
- \$5,000 price.
- 5 kWhr PbA pack. 2 yr battery life expectancy.
- 10 to 15 miles in electric-only mode.
- 52 MPH max in electric-only mode.
- Working on Li-Ion pack.
- [www.pluginsupply.com](http://www.pluginsupply.com)



# Harvey Coachworks, PHEV Conversion



- For Toyota Prius.
- Starting at \$8500, installed.
- 3 electric-only mileage options – 25 miles.
- [www.harveyev.com](http://www.harveyev.com)



# Hybrids-Plus PHEV Conversions

*HybridsPlus*



- For Ford/Mercury Escape/Mariner (retooling for Prius).
- \$32K-\$36K installed (in Boulder CO).
- 50 mi “blended” (100 MPG) range.
- Working on V2G (vehicle-to-grid)
- [www.hybrids-plus.com](http://www.hybrids-plus.com)



# OEMtek BREEZ PHEV Conversion



80% of Americans drive 50 miles a day or less. 50% drive 25 miles or less.

With a fully-charged OEMtek BREEZ, you can travel 50 miles of PHEV driving at 100+MPG1.

- Production starts 2008.
- For Toyota Prius and Ford Escape.
- \$12,500 (installation included?)
- 9 kWhr Li-Phosphate battery pack.
- 30 mile electric-only range.
- [www.oemtek.com](http://www.oemtek.com)



# E-Drive Systems, PHEV Kit



- Not yet in production. Web site says “Summer”.
- Apparently for Toyota Prius.
- [www.edrivesystems.com](http://www.edrivesystems.com)



# Lion Electric Vehicles, PHEV Conversion



- Asian company with presence in VA and Alabama.
- For Ford Escape Hybrid
- Price \$40K (vehicle included?)
- Also does EV DIY kits for Ford Ranger & Escape.
- [www.lionev.com](http://www.lionev.com)



# Hybrid Electric Vehicles Technologies, PHEV Conversion



- Makers of Hybrid Bus conversions.
- For Ford F150
- 12 kWhr battery pack.
- Projecting 40 MPG for 30 mile commute.
- \$60K initially.
- Hevt.com



# Future: Chevy Volt PHEV



## Related vehicles:

- Cadillac Provoq, Equinox
- Saturn VUE, Flexstream
- European Opel

- Expected on market 2010
- Based on GM's E-Flex platform.
- Electric AC drive, with optional series hybrid generator engines (gas, diesel, hydrogen). Plans for PHEV.
- 40 mile electric-only range.
- Introductory price expected to be \$40K-\$48K.
- [www.gm-volt.com](http://www.gm-volt.com)



# Future: Toyota

- Promises production of a PHEV in 2010.



# Future: Fisker Coachworks, Karma, Sports PHEV



- Target availability 4Q2009.
- Series, Plug-in Hybrid.
- Seats 2.
- \$80,000.
- 50 mile all-electric range.



# Future: Aptera Motors, Typ-1h Microcar PHEV

- Scheduled available in CA only.
- Will be made in USA.
- Up to 2 occupants.
- Series Hybrid with Gas ICE.



# Venture Vehicles, VentureOne Q100, microcar PHEV

The *VentureOne*™



- HQ in LA, CA
- Scheduled available in CA, 2008.
- Up to 2 occupants
- 20-40 mile all-electric range. 100 MPG.
- In-wheel drive.
- 0-60 MPH in 7 seconds.
- \$20K to \$25K target price
- Available in HEV (e50) too
- [www.flytheroad.com](http://www.flytheroad.com)



# Northwest EV Dealers

- Sell and service new EVs (NEVs for the most part) from independent manufacturers.
- Resell used EVs.
- Some offer conversion kits and sell installation services.



# Northwest Dealers



- In Seattle & Portland
- Phone 800-732-1108
- [www.mcev.biz](http://www.mcev.biz)
- Columbia, E-Ride, Miles, Zenn

- In Bellevue, WA
- Phone 425-820-4549
- [www.thegreencar.com](http://www.thegreencar.com)
- Xebra, Smart, PHEV conversions, Vectrix, & bio-diesel vehicles.



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Makers of **WinLink™** & **WinVerter™**

Specializing in EV & RE data logging

