Rogue Valley Green Car Guide

June 2019 Updated Edition

How to Select and Purchase or Lease Your Ideal Low- or No-Emissions Vehicle

By Bruce Borgerson

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We need to put a price on carbon in the markets, and a price on denial in politics.

Former Vice President Al Gore, Jr.

Opening Caveat

Nothing in this document should be construed as expressing a blanket endorsement of, or preference for, motorized transportation. Active human-powered transport – pedestrian or bicycle – should have first priority in forming public policy. Second priority goes to public mass transit, although significant "greening" of vehicles is required here as well. This document simply recognizes that personal vehicular transportation will continue in the Rogue Valley, and it is imperative that we reduce our individual carbon footprints by making wise choices when selecting a car.

What's New in the Guide for 2019?

New models listed – Several new 2019 models have been added to the listings. The number of EVs available continues to creep upward while a few larger gas powered cars have just squeezed under the limit. Also new this year: Nissan claims the first gas-powered, non-hybrid crossover (Kicks) to make the cut; Toyota has introduced – finally! – an all-wheel drive (AWD) Prius; and Subaru brings back its Crosstrek plug-in hybrid.

On the down side, a number of other green cars are no longer available or disappearing soon. The Focus EV is gone, and the Ford C-Max hybrid has been deleted. And, alas, the gas-sipping conventional Smart cars are no longer available in the U.S. The Smart ED (electric drive) remains in national distribution, but is no longer available locally. The pioneering Chevrolet Volt is still listed here as some are still available, but production ceased in March. The same applies to Chevrolet's gas-sipping Cruze models. See listings pages 13 to 15.

Inventory shown – New models usually kept in inventory are shown in bold type keyed to local dealer(s). A total of 46 different green car models were on hand at local dealerships as of June 1 with another 31 (including Tesla) available by special order. You have plenty of climate-friendly options!

That's the good news. The bad news is that the local inventory of all-electric vehicles is spotty at best. Chevy Bolt, Nissan Leaf and Kia Niro were readily available when I checked, but other all-electrics are harder to find. As for PHEVs, roughly half of those marketed in the US were on local lots as of June 1.

Categories improved – I've grouped the listings in what I think is more useful way, now with four categories: Subcompacts and City Cars, Family Sedans and Hatchbacks, SUVs/Crossovers and Minivan, and Luxury Plug-ins.

Tax credits and rebates updated – Important changes here, as some makers are losing their full tax credit status. See page 10.

Tesla included – Now that the Model 3 is in full production (albeit with vanishing tax credit), Tesla is in!

More guidance on buying used – Tips on affordable models and how to find them. See page 17.

Ashland, the Rogue Valley…and All of Oregon

This booklet started out as the "Ashland Green Car Guide." It was initially limited to my home city because Ashland is unique in that it is the only community in Southern Oregon contracting with the Bonneville Power Administration (BPA) for electric power. BPA's power generation – overwhelmingly hydroelectric – is significantly greener than that serving Southern Oregon as a whole, which is principally supplied by Pacific Power. At least regarding where your money goes, this tips the balance more in favor of plug-in vehicles in Ashland when compared to other places in the Rogue Valley.

My principal source of comparison between plug-in and fossil fuel vehicles is fueleconomy.gov. It lets you compute upstream greenhouse gas (GHG) emissions for any plug-in vehicle by entering a zip code; the resulting figures reflect the GHG emissions of the electricity grid used for charging. But it cautions that the results shown are "for your region." It turns out the regions are quite wide, and seem to correspond roughly to those shown in this map from the Union of Concerned Scientists. In other words, when looking up the upstream greenhouse gas emissions for a particular vehicle, I found no differences anywhere on the West Coast, from Tacoma to Los Angeles, including checks for Grants Pass, Medford and Ashland. However, when I checked upstream emissions from the electricity grids in Denver, Minneapolis and Wheeling, West Virginia, the GHG numbers were much higher – double for Denver!

So I decided to expand the scope of this guide to the entire Rogue Valley. I surmise that plug-in cars could be considered greener when charged in Ashland, but quantifying any precise differential would be complicated and subject to variability. However, the relative rankings of specific plug-in vehicles – when compared to each other and to fossil fuel vehicles – will be valid throughout the Rogue Valley, and probably in all of Oregon, despite any variations in upstream emissions from electricity generation.

The grid is greening. Cars are stalled.

This booklet is for Rogue Valley residents who are concerned about climate change. If you're simply looking to save a lot of money, this may not help much – at least not in the short run. (Better prospects over the long run.) And if you're looking for driving thrills…well, maybe a bit. Electricity delivers torque!

For most of us, the driving force is climate change. We crossed a critical threshold in 2016. At some point during that year, according to the (Obama Administration's) Energy Information Administration, transportation surpassed electricity generation as the prime contributor to greenhouse gas (GHG) emissions in the USA. [1] Bringing it all back home, personal vehicles – cars and light trucks – are now responsible for more than half of direct, primary GHG emissions in the average American household. [2]

This change in "worst offenders" is largely because the electricity grid is getting greener. Not fast enough, but we are making gains nationwide. We are now at an awkward plateau because much of the recent progress in the electricity sector is due to the changeover from coal (horrendous) to natural gas (just plain bad). So we still have a long way to go. Nevertheless, hydroelectric remains a reliable resource regionally, with solar and wind making slow but steady gains in the GHG-free mix.

Consequently, despite regulation rollbacks by the current administration, the grid will likely continue to make "green gains" based on changing economics and enlightened state and local actions.

At the same time, the personal transportation sector has flat-lined due to "fracking"- low fuel prices. [3] While average vehicle fuel economy has improved, more drivers are choosing to purchase larger and more powerful vehicles. Progress has stalled when we look at total emissions from privately owned vehicles. Too many Americans are making questionable choices at car dealerships, either because they are not informed or they just don't care about the future of the planet.

But it's no use pointing fingers. That doesn't get us anywhere. If we want to bend the line down on transportation GHG emissions, we all must choose vehicles that produce lower emissions. A lot lower. If we're not part of the solution, we're part of the problem. Maybe not as much of a problem as some other folks, but that's no excuse. We're all on this warming planet together.

A Great Place to Plug In: Oregon's Greener Grid

Most of us don't stop to think about it. We pull up to the gas pump and ask the friendly attendant (perhaps after some delay) to fill the tank with regular. The tank is filled and – perhaps after more delay – the attendant gives you your receipt and you drive away.

There, now you've done it. For every gallon of gas you just put in the tank, you've committed to dumping another 8.9 kilograms (19.6 pounds) of greenhouse gas emissions into the atmosphere. Always remember, every dollar you spend at the pump directly supports – at multiple levels – the global fossil fuels industry. There has to be a better way.

In Ashland, fortunately, there is. Ashland is among a dozen or so municipalities in the Pacific Northwest that have contracted to receive electricity from the Bonneville Power Administration (BPA), the government-owned agency created to market electricity generated by the hydroelectric dams spanning rivers in the region. In recent decades, the BPA portfolio has expanded to include increasing amounts of solar and wind generation capacity. As a result, the overall generation profile of BPA is about 95% free of GHG emissions. (Roughly ten percent of the BPA total is from nuclear, which although free of direct carbon emissions does have its down sides.) [4] Granted, the power generation that Ashlanders pay for may not match the power actually coming out of the wall socket because generating facilities throughout the Northwest are interconnected. (How this works is complicated and varies according to several factors.) However, even if we simply align it with the Oregon average, Ashland's grid is still among the cleanest in the nation in terms of low GHG emissions. [5]

Very clean, but not perfect. So if you do opt for a plug-in vehicle, you will have to factor in the small estimated amount of "upstream" GHG emissions involved in charging your battery. Nevertheless, you will be far, far ahead of the game – mile for mile – when compared to any car of comparable size that is directly powered by fossil fuels.

You could go the final step. If you are among the dozens of area residents who have their own rooftop solar capacity at home, you can have the ultimate with a new electric vehicle (EV): absolute zero emissions motorized transportation! (Well, except for the manufacturing penalty as noted later.)

From MPG (Miles per Gallon) to GPM (Grams per Mile)

What is a "green car?" In the broadest terms, it's a personal motor vehicle that operates with minimal impact on the environment. Most notably, the vehicle itself produces little or no emissions of either toxic or greenhouse gases.

The "no" part is easy to define. That means zero. There is no consumption of fossil fuels by the vehicle itself. However, as just noted, absolute zero GHG emission is possible only with a 100% renewable electricity source.

The "little" part is subjective. Vehicle types are not a certain guide. True, all vehicles that fall into the electric vehicle (EV) and plug-in hybrid (PHEV) categories will at least potentially qualify as "green." (With some PHEVs it will depend on the electric/gasoline driving mix.) But not all hybrids fall into that category, as some large hybrid vehicles – luxury sedans, pickups and SUVs – are worse emitters than the best conventional, gasoline- powered cars.

The key metric here is not the vehicle type or even – strictly speaking – fuel efficiency. Rather, it is the amount of GHG emissions per distance traveled, here expressed as weight in grams per mile.

The emissions-per-mile metric is closely related to miles-per-gallon (mpg), but there are discrepancies because different fuels will produce different amounts of greenhouse gases. Diesel fuel, for example, produces about 15% more greenhouse gases per mile than gasoline. [6] Consequently, no diesels qualify as green cars under the strict definition given below. However, because the diesel GHG mix is different than with gasoline, some studies maintain newer diesels can be more climate-friendly. Yet this is hardly an issue here because, following the demise of Volkswagen's TDI models, no new diesel models come close to qualifying with the sole exception of the remaining stock of Chevrolet Cruze diesels.

Vehicle greenhouse gas emissions, as listed on the EPA site and used in my rankings here, are calculated using GREET Model 1.8 (U.S. Department of Energy, Argonne National Laboratory) and include the three major greenhouse gases emitted by motor vehicles: CO2, nitrous oxide, and methane.

For the purposes of "apples to apples" comparison of different vehicle types, all GHG emissions given here also include upstream emissions. For EVs and the electric component of PHEVs, that includes emissions created during electric power generation. (These are estimated for each vehicle on the fueleconomy.gov site; figures given here from the Ashland ZIP code but valid throughout the area.) That

is why no "zero emissions" vehicles are listed, as I'm assuming few will be charged from personal solar installations. For gasoline, the upstream component covers emissions from exploration, extraction, refining and transportation of the gasoline, adding about 20% to tailpipe emissions.[7]

So, What Qualifies as a Green Vehicle?

Ultimately it's a judgement call. For the purposes of this booklet, I'm going to draw the line at 333 grams (about ¾ pound) per mile of combined tailpipe and upstream GHG emissions. It's admittedly arbitrary but there's some logic to it. First, that figure is derived from the current average for light vehicles in America, which I calculate as around 500 grams per mile. (This is based on the tailpipe average of 411 grams plus about 20% from upstream emissions.)[8] Lop a full third off that figure and you get 333 grams per mile, which I consider as the maximum tolerable for transportation of up to five people and a reasonable amount of luggage. Anything above that number, to my mind, is unconscionable when acquiring a new (or newer used) car as it constitutes a small but measureable – and completely unnecessary – threat to the survival of our global civilization.

The second reason is that, under this limit, you can still buy six vehicles from local dealers (two each from BMW, Subaru, and Toyota plus one from Nissan) that offer all-wheel drive (AWD). With Tesla, AWD is standard or optional on all vehicles. All-wheel drive comes with a built-in climate penalty; compared to two-wheel drive equivalents, AWD cars require more fuel (or electricity) and thus generate more GHGs, tailpipe and/or upstream. Unless you are an avid skier or commute to Klamath Falls during the winter, you probably don't need AWD. Front wheel drive with good tires, traction control and vehicle stability control (standard on all newer cars)will get you through slippery weather just fine.

To get oriented with this concept, let's look at three examples. A 2019 Subaru Forester SUV emits 381 grams of greenhouse gases per mile, which is a notable engineering achievement for a spacious SUV with AWD. Nevertheless, that's 14% over what we should consider the highest permissible amount for a green car, and nearly four times the upstream emissions of a roughly comparable EV that likely could do the job just as well 99% of the time – at least for folks outside heavy snow zones. However, Forester emissions are not so bad that, if you just bought one, you must get rid of it right away. As will be explained later, the "manufacturing penalty" could be too high for acting now.

On the other hand, let's say you now drive a 2007 Toyota Camry V-6. That car is responsible for 463 grams per mile, which is 40% over our maximum allowance. It's time to consider alternatives. And should your current vehicle be a 2007 Ford Explorer V-8 with four-wheel drive, you are spewing out 711 grams/per mile, which is nearly *nine times* the (all upstream) emissions of the top-rated Hyundai Ioniq and BMW i3 EVs. Yikes. It's gotta go!

To find the GHG emissions for your car, go to www.fueleconomy.gov and select Power Search under Find and Compare Cars. Enter the year, make and market class. (This is enough to give you a very short list.) Click "Search" then find your car by scrolling down the list. Click on exact car model (engine and transmission) name. Select the "Energy and Environment" tab. Under "Greenhouse Gas Emissions - Show" select "Tailpipe and Upstream." Add the two numbers and you have the total for your car.

Best: Electric Vehicle (EV)

An electric vehicle uses no fossil fuels at any time for powering the wheels. It is as green as the grid to which it is connected for charging. And in the Rogue Valley, that is very green indeed.

When charging from the local grid, how much better is an EV in comparison to a typical gasoline-driven vehicle? Somewhere between four and nine times better, and that's with upstream emissions factored in for both. [9] The variation depends on the age, size and type of the comparison vehicles and exactly how the upstream impact is calculated.

The two universal limitations on electric cars are range and charging times. Both are largely dependent on battery size. A larger battery will give the car greater range, but it will take more time to charge given the same charging system. More expensive EVs, most notably the Teslas, can be fully charged quite rapidly, but both the cars and the chargers are more costly. Less costly EVs generally have shorter range and longer charging times – though significant improvements have been realized on both fronts in recent years as battery technology continues to make rapid gains. If you expect to make road trips, make sure your EV has DC fast charging; on some EVs this is an added cost option.

A third limitation depends on your housing. If you live in an apartment complex or in other housing where the car cannot be parked in your own garage or in a driveway near the house, then you may have some difficulties with charging your EV or PHEV at home. We hope that future housing options will take this into account, and that some existing apartments will be retrofitted by enlightened landlords. In the meantime, you still have options with hybrids and very low emission standard vehicles.

In listings below, EVs are listed and ranked according to GHG emissions (all upstream of course) as calculated by the EPA specifically for the Ashland ZIP code. This allows for a fair comparison to other types of vehicles.

Transitional Technology: Plug-in Hybrid Electric Vehicle (PHEV)

Most plug-in hybrid electric vehicles are almost identical to their now-familiar hybrid gas-electric counterparts. The difference is that they are equipped with larger batteries and a plug socket for external charging. The car runs on the battery until it is nearly exhausted at which point the gasoline engine kicks in to operate the car as a typical hybrid. (The Chevy Volt and BMW i3Rex are technically unique in that they are extended range EVs, but from the owner's viewpoint they are functionally the same as the others.)

The PHEV lets you reduce vehicle emissions to zero while driving locally while eliminating range anxiety if you want to leave town. You can charge up at home, drive around town or – if range allows – around the valley as you please as a zero emissions EV. When you run out of battery juice, the engine kicks in and you keep on cruising, but using gasoline. Fuel economy while running on gasoline ranges widely, from excellent to poor – from lower fifties down to middle twenties – which means a few larger PHEVs (mostly SUVs) would not qualify as green vehicles under our criteria if driven under gasoline power predominantly.

To determine the critical GHG emissions equivalent per mile figure, the EPA assumes a PHEV will be driven 55% of the miles locally using electricity and 45% of the miles on the highway under gasoline power. Obviously this is a fluid number as it would drop with more miles under electric power and rise with more highway miles on gasoline. In most cases the GHG emissions would fall between pure EVs and standard hybrids, but if you expect to drive more than 70% of the time beyond the electric range you might fare better with a standard hybrid. Again, the numbers in the rankings (p. 13 - 15) include upstream emissions for both the electric and gasoline components.

Gas Stingy: Standard Hybrids

Hybrid cars have been with us since 2000, and they have made a solid contribution to … well, keeping things from getting even worse even faster. Hybrid propulsion is highly efficient because it recaptures otherwise wasted energy when the vehicle slows and stops. (This is why hybrids excel in stop-and-go urban driving but are closer to conventional compacts in highway mileage.) However, ultimately all energy for propulsion must come from fossil fuels as there is no option for plugging into a "green grid."

We should note here that hybrids have been a valuable proving ground for EV battery longevity. When hybrids were first introduced, there was some concern that the expensive batteries might have to be replaced in as little as five years. This has not been the case; useful battery life has largely exceeded expectations.

Hybrid technology continues to make gains, with several models easily exceeding 50 mpg combined. Again, only those hybrids with combined GHG emissions under 333 grams/mile will be listed below.

Think Small: Low-emissions Internal Combustion Engine (ICE)

When it comes to internal combustion engines, size matters. In fact, as an alternative or supplement to fuel taxes, several European countries tax new vehicles according to engine size. That's because, all other factors being equal, a smaller engine will burn less fuel and produce lower GHG emissions.

According to the guidelines set above, as a rough rule of thumb a gasoline-powered car must achieve better than 32 mpg combined city and highway in order to keep greenhouse gas emissions below our limit of 333 grams per mile. More than two dozen locally available models, available new or used, can qualify. These vehicles provide an option for individuals and families that want the reliability and safety features of a newer vehicle but either have problems with PHEV/EV charging or cannot afford the added cost of a hybrid. Because these cars are largely compacts and sub-compacts, most are relatively inexpensive – between $12,000 and $20,000 new.

Sub-compacts are also an economical option as a second car for households that honestly do need one larger car for some uses. A bonus feature of a sub-compact is that you can slip into tight parking spaces on the residential streets near the Ashland Food CO-OP that other cars have to pass by. And the smaller the car, the lower the manufacturing penalty, as discussed later.

Finding Your Best Choice: Single Vehicle Households

The American car consumer tends to ask, “What kind of car will fulfill all my needs all of the time?”

We have to stop asking that question. Instead we ask, “What’s the lowest GHG emission vehicle I can afford that will meet most of my needs most of the time?”

Three main factors come into play here:

1. How many passengers will I need to accommodate on a regular basis?
2. How much stuff do I need to haul around on a regular basis – not just occasionally?
3. Do I (honestly) really need all-wheel drive (AWD)?

There are too many large AWD SUVs – many accommodating 7 or 8 persons – driving around our valley with only the driver on board and otherwise empty. Some of these drivers only use their full capacity a few times a year. If you are a one car household, think differently. If you need to take more than three or four passengers, can you get somebody else to come along with their car? If you need to haul a bunch of stuff, can you rent a U-Haul van? Re-think what you really need.

Two or More: The Optimum Household Mix

It can get tricky when you have a household with two, three or four drivers and more than one vehicle. What if a teenager is on the high school ski team? What if you regularly haul food or clothing for charitable work? Yes, perhaps one vehicle needs to be larger and have AWD. But you use that one only when needed. For all the other times, get something greener. If both vehicles are needed at the same time, use the greener one for the longer trip.

That’s where we ended up in our household. We have an 11-year-old compact SUV that pumps out 485 grams per mile, but it stays in the driveway as much as possible. We expect it will only be driven about 1,000 miles in 2018. The other car, a PHEV (140 grams per mile), is first call otherwise and is used for all trips outside Ashland as it goes about 50 miles on electric and afterwards gets around 40 mpg on gas. Our goal is to reduce household gasoline consumption (both vehicles) below 120 gallons annually by 2020.

Your situation may differ, but the same rules apply. How can you drive the most miles using a vehicle with the lowest possible GHG emissions – and do so without imposing an excessive “manufacturing penalty?” It will take some research, some forethought and perhaps a significant financial investment. But it needs to be done, and we’ll all be glad you did it.

Plug-in Considerations: Downsides and Upsides

The only significant down side to owning a plug-in vehicle is finding a place to plug it in when you’re away from home. The shorter the range, the more often you have to plug it in. Because we have a PHEV, I haven’t had to go out of my way on long trips to find a juice source. On my last trip to Seattle I was pleased to find free charging at the Washington State rest area just north of Portland, and I brought

along my own charger to juice up when I stopped overnight at my brother's house in Corvallis. But otherwise, alas, I reluctantly resorted to gasoline, albeit at nearly 40 mpg.

My biggest gripe is that few hotels now offer charging. That has to change. But you can manage longer trips if you're patient and resourceful. I know of Bolt and Tesla owners who've driven from Ashland to the Bay Area with only a leisurely lunch or coffee charging break along the way.

When you are at home, plugging in is quick and easy. It takes me literally no more than ten seconds, twenty for a plug-unplug cycle. That's less time per mile driven than spent than going out of your way to get gas and (often) waiting several minutes for the attendant to finally get around to your turn.

There are side benefits to owning an electric car, some obvious, some less so.

1. Quiet! - The difference is noticeable and a blessing when listening to classical music.
2. Acceleration – Most EVs and some PHEVs with larger batteries can develop considerable torque, which means faster pick-up for passing and merging.
3. Frictionless braking – All plug-ins offer regenerative braking, which uses the frictionless magnetism of the motor to slow the car. If used regularly, you can probably go for 300,000 miles on the original brakes.
4. Lower maintenance costs – In addition to brakes, you'll save on oil changes and other engine maintenance. This applies to PHEVs as well, since oil life is extended as the engine isn't running when you're in electric mode.
5. Stability in wind – The battery weight of plug-in cars is low and evenly distributed, so the car is remarkably stable when buffeted by gale-force winds.
6. Overall safety – EVs and PHEVs as a category are safer on average than their ICE counterparts in the same vehicle categories, with better crash test performance and lower injury claims. Two standouts in their respective categories, according to this article in Clean Technica, were the Tesla Model S and Chevrolet Volt. Fewer claims usually mean lower insurance rates as well.

Resources for Decision-making

Fuel Economy.Gov – This web site is a treasure trove of information, with relevant details on all cars sold in America plus helpful background information on a variety of topics related to GHG emissions. Much of the content was developed during relatively enlightened administrations, and as far as I can tell it remains accurate. No guarantees going forward, though I suspect tampering with it has low priority and risks exposure as multiple independent sources are available both here and abroad for measuring what are essentially global vehicles. Also, mileage figures reported are largely consistent with independent testing from publications like Consumer Reports and Car and Driver. Nevertheless, this site will be closely scrutinized with any peculiarities or deviations noted.

Ashland City EV Pages - A first-rate overview on EVs and PHEVs, containing nearly all the general information here and presenting a great tutorial on the basics of the technology. It includes a nifty calculator for comparing your current gasoline vehicle's operating costs to battery-only EVs (not PHEVs), but has no further information relating performance and features of specific makes or models.

Consumer Reports – A reliable and comprehensive guide. Emphasis here is on bread-and-butter issues like safety, economy and reliability. It remains independent and trustworthy. But you do have to pay to access the details.

Car and Driver – The magazine and web site are geared toward automotive enthusiasts who are interested in technology and driving pleasure as well as the basics. You'll find more of an emphasis on performance – acceleration, handling and driver involvement – in their reviews and rankings.

Edmunds – A comprehensive free resource for detailed information, specifications, expert reviews and user reviews (including a couple of mine). Particularly useful is their comparison feature which lets you do detailed, side-by-side comparison of pricing and specifications on up to four cars.

US News and World Report car site is good in terms of overall information, though I find some of the rankings questionable.

Electric Vehicles Ashland – A good overview of what's available in EV's, with links to latest information on tax credits and rebates, including City of Ashland. As the name implies, does not include PHEVs or hybrids.

Green Car Reports – This web site covers all green cars, including hybrids. It is wide-ranging and comprehensive on every topic from a business and technology perspective, and includes exhaustive staff and user reviews. It is independent in the sense that it is not tied to any maker, but it obviously promotes the green vehicle industry as a whole.

Plug-in America – The focus here is exclusively on EVs and PHEVs. But it offers a wealth of information within that category. The same holds for a similar site, **PluginCars.**

Financing: Tax Credits and Rebates

Federal Tax Credit

The federal tax credit applies to new EV and PHEV purchases only.

The credit amount is based on the size of the battery with most EVs qualifying for the maximum $7500 tax credit. Lower credits apply to PHEVs. The amount of the credit for each vehicle is given at this link. Note that the tax credit is phased out starting at the point when a manufacturer sells 200,000 qualifying vehicles. Tesla passed this threshold in the summer of 2018, so tax credits already are now reduced for all Tesla cars and will disappear at the end of 2019. General Motors (Chevrolet) saw its credits halved starting in April and with sunset in 2020. With recent changes in control of the House of Representatives, chances are somewhat better that the full credits may be restored past the 200,000 sales threshold, though Senate approval would require sympathetic support from a few Republicans – perhaps from the Southern auto-making states (Nissan, Honda, VW etc.). Slim chance, but possible.

Oregon Plug-in Rebate

Effective January 1, 2018, the state of Oregon began offering a rebate on purchases of EVs and most PHEVs. This is a true rebate program, which means you fill out a form and the state sends you a check.

Standard rebate: no income restrictions:

- Purchases and leases (minimum 24 months) are eligible but for new vehicles only.
- EVs and PHEVs with a MSRP of more than $50,000 will not be eligible. So if you want a rebate on a Tesla, you'll have to buy a Model 3.
- All purchasers/lessees will be eligible for a rebate based on the size of the vehicle battery. This will be similar to the federal tax credit, with the maximum amount of $2500 for all EVs and a few longer range PHEVs like the Volt and Clarity. A smaller rebate amount will apply to most if not all other PHEVs. Unlike the federal tax credit, the Oregon rebate remains valid regardless of manufacturer sales thresholds (Tesla and Chevrolet not reduced).

"Charge Ahead" Rebate

Low- and moderate-income purchasers may be eligible for an *additional* "Charge Ahead" rebate based on annual family income. Threshold to qualify is about $53,000 for an individual and $60,000 for a two-person household. Used plug-in vehicles are eligible for the "Charge Ahead" rebate.

Updated information is available at this link.

Ashland Empower EV Incentive

As of this writing, customers of Ashland's municipal electric utility are eligible for a $300 rebate for the purchase or lease of a qualifying EV, and $200 for a qualifying plug-in hybrid. Both new and used models can qualify. In addition, commercial customers of the utility can qualify for a $500 rebate on installation of a vehicle charging unit. But the program will end when funds run out; current status at this link.

Should I Buy or Lease?

This is a critical question if the vehicle qualifies for the federal tax credit and you have limited federal tax liability. Be aware that the federal credit cannot be applied to a tax refund. In other words, the amount of your EV credit is limited by the amount of tax you owe. If you only owe $5000 in federal income taxes, then your $7,500 tax credit (if applicable) is effectively reduced to $5,000.

This is one reason why the majority of EV and PHEV transactions are leases. Because the leasing company (often a division of the car maker) is technically the purchaser, the company takes the federal tax credit and applies most of it to the lease as a "capital cost reduction", lowering the price of the car. That in turn lowers your lease payment and the residual amount – what you have to pay if you choose to buy the car at the end of the lease. As an example, this arrangement enabled us to lease our PHEV for $199 a month ($2200 at signing), which was competitive compared to similar "non-green" vehicles.

The flip side of the coin is that the up-front reductions have depressed used EV prices, so many first generation EVs and PHEVs have an end-of-lease residual cost ("buy-out") price that is well above current market value. In most cases, you can only negotiate with the leasing company (not the dealer) on a lower price, and it's rare they will do so – even if you still offer above current market value.

New Green Cars Available Locally

A number of green car makers are not included here as they have no "brick and mortar" presence in the Rogue Valley. Without local representation are Audi, Lexus, Jaguar, Mini, Mitsubishi, Porsche and Volvo: all have qualifying green cars in their current lineups.

However, **Tesla is included as** it does not have traditional dealerships anywhere but rather uses "showrooms". (Closest is in Portland area.) There is no local service shop (again, Portland closest), but during the warranty period Tesla will send a mobile tech to your home within a few days.

Of models shown here, only the best-selling are likely to be in dealer inventory at any given time; others must be ordered. Only 2019 models included though some local inventory may be equivalent 2018 model year.

ICE stands for "internal combustion engine", which means it's a conventional gasoline car – but with a small motor. Note that some models with the same name but different engines or transmissions may fail to achieve the combined city/highway rating of 32 mpg (333 grams/mile) or better required to meet our minimum "green car" criteria.

Cars in each category are ranked "best to worst"; from lower GHG emissions to higher. (Then sorted alphabetically by maker when emissions are the same.) All are automatic transmission except as noted. With some ICE models, the manual transmission model may be marginally worse than the automatic; these are omitted. The variant with the lowest MPG (GHG emissions) is listed; other variants of the same model may be slightly worse.

Note that EPA mileage figures (on which ICE GHG emissions are based) tend to be optimistic. In my experience they can be matched or even exceeded, but only under optimum conditions of weather, terrain, speed and tire pressure. Most real-world results will be lower, but will be uniformly low across most models for the same given conditions. Consequently, the *relative* rankings shown below should not be affected.

The designation **"CR-R" in Notes means that the car is recommended by Consumer Reports** based on broad measures of quality, reliability and performance. Those noted here have the same model name and engine though in a few cases they are not an exact match in trim level and/or transmission as exact cars tested by CR. In the case of some cars the designation was awarded primarily for the ICE variant but here is transferred also to EV, PHEV and/or hybrid variants.

Cost is for the lowest priced variant of the model listed in broad price ranges:

$ = Less than $16,000
$$ = $16,000 to $25,000
$$$ = $25,000 to $35,000
$$$$ = $35,000 to $50,000

Cost here is MSRP minus any applicable tax credits and/or Oregon rebates for EVs and PHEVs as of January 1. Models with MSRP above $50,000 are listed in a separate category; most will not qualify for the Oregon rebate. Actual selling price may drop to a lower range on borderline models if you can swing a "good deal." Prices for the Tesla Model 3 can vary considerably depending on options selected.

Models in inventory at local dealership(s) as of January 5 are shown in bold. If there is more than one local dealer for the make, bold indicates inventory at all dealers UNLESS letters in parentheses after model: the letters indicate inventory only at dealer(s) keyed to the letters in dealer listings on pages 17 to 19. Cars listed but not shown in inventory can be ordered from at least one dealer.

Subcompacts and "City Cars"

These are smaller cars primarily designed for driving around the local area, although longer road trips with minimal luggage are possible. Cars will seat 5 "in a pinch" unless otherwise noted.

Make	Model	Type	GHG Emissions	EV/PHEV elec. range	Notes (CR-R =Consumer Reports recommended)	Cost
BMW	i3 BEV	EV	80 g/mile	114 miles	Seats 4	$$$
BMW	i3s	EV	100 g/mile	153 miles	Seats 4	$$$
BMW	**i3 REX**	PHEV	100 g/mile	97 miles	Total range 180 miles; seats 4	$$$
Honda	**Fit 1.5L**	ICE	296 g/mile		CR-R	$$
Toyota	**Yaris 1.5L**	ICE	305 g/mile		CR-R	$
Nissan	**Versa 1.6L**	ICE	314 g/mile			$
Chevrolet	**Spark**	ICE	323 g/mile		Seats 4	$
Kia	**Rio 1.6L**	ICE	333 g/mile			$
Hyundai	**Accent 1.6L**	ICE	333 g/mile			$

Compact to Mid-size Sedans and Hatchbacks

Cars here fall into a broad "family car" category. Most are spacious enough for reasonable comfort on long road trips, and will carry five adults and luggage without being too cramped – with exceptions noted. Otherwise, size, amenities and cost vary widely.

Make	Model	Type	GHG Emissions	EV/PHEV elec. range	Notes (CR-R =Consumer Reports recommended)	Cost
Hyundai	Ioniq	EV	80 g/mile	124 miles		$$
Chevrolet	**Bolt (b,c)**	EV	90 g/mile	238 miles	CR-R	$$$
Tesla	Model 3	EV	90 g/mile	260 miles		$$$$
Volkswagen	**e-Golf**	EV	90 g/mile	125 miles		$$
Honda	Clarity	EV	100 g/mile	89 miles	Lease only	N/A
Kia	Soul electric	EV	100 g/mile	111 miles	CR-R	$$

Nissan	**Leaf**	EV	100 g/mile	151 miles		$$
Chevrolet	**Volt (b,c)**	PHEV	140 g/mile	53 miles	420 miles total range; center rear seat has limited legroom	$$
Honda	**Clarity**	PHEV	140 g/mile	47 miles	340 miles total range	$$
Hyundai	**Ioniq**	PHEV	140 g/mile	29 miles	630 miles total range	$$
Toyota	**Prius Prime**	PHEV	140 g/mile	25 miles	640 miles total range; roomy but seats 4 only; CR-R	$$
Ford	Fusion Energi	PHEV	180 g/mile	26 miles	610 miles total range	$$$
Kia	Optima	PHEV	180 g/mile	29 miles	610 miles total range; CR-R	$$$
Hyundai	Ioniq Blue	Hybrid	184 g/mile			$$
Hyundai	Sonata	PHEV	190 g/mile	27 miles	590 miles total range; CR-R	$$$
Hyundai	Ioniq	Hybrid	194 g/mile			$$
Honda	**Insight**	Hybrid	205 g/mile		CR-R	$$
Toyota	**Camry Hyb (j)**	Hybrid	205 g/mile		CR-R	$$$
Toyota	**Prius 1.8**	Hybrid	205 g/mile		CR-R	$$$
Toyota	**Prius AWD (j)**	Hybrid	213 g/mile		AWD	$$$
Honda	**Accord**	Hybrid	222 g/mile		CR-R	$$$
Chevrolet	Malibu Hyb.	Hybrid	232 g/mile			$$$
Toyota	Prius C	Hybrid	232 g/mile			$$
Toyota	Avalon	Hybrid	242 g/mile		CR-R	$$$
Ford	Fusion Hyb.	Hybrid	254 g/mile			$$$
Hyundai	Sonata Hyb.	Hybrid	254 g/mile		CR-R	$$$
Kia	**Optima**	Hybrid	260 g/mile		CR-R	$$$
Toyota	Camry XLE/SE	Hybrid	281 g/mile		CR-R	$$$
Honda	**Civic 1.5L**	ICE	296 g/mile		CR-R	$$
Hyundai	**Elantra 1.4L**	ICE	305 g/mile		CR-R	$$
Kia	**Forte FE**	ICE	305 g/mile		CR-R	$$
Toyota	**Corolla 1.8**	ICE	314 g/mile		CR-R	$$
Volkswagen	**Jetta**	ICE	314 g/mile			$$
Merc - Benz	C350e	PHEV	320 g/mile	9 miles	410 miles total range	$$$$
Chevrolet	**Cruze 1.4L**	ICE	323 g/mile		CR-R	$$
Honda	**Accord 1.5L**	ICE	323 g/mile		CR-R	$$
Hyundai	**Elantra SE 2.0**	ICE	323 g/mile		CR-R	$$
Chevrolet	**Cruze Hatcbk**	ICE	333 g/mile		CR-R	$$
Chevrolet	**Malibu 1.5L**	ICE	333 g/mile			$$
Chevrolet	Sonic	ICE	333 g/mile		Manual transmission	$
Mazda	**3 2.0L**	ICE	333 g/mile			$$
Nissan	**Altima 2.5L**	ICE	333 g/mile		CR-R	$$
Nissan	**Sentra 1.8L**	ICE	333 g/mile			$$
Toyota	**Camry 2.5L**	ICE	333 g/mile		CR-R	$$
Subaru	**Impreza 2.0L**	ICE	333 g/mile		AWD, 4-door only; CR-R	$$
Volkswagen	**Golf**	ICE	333 g/mile		CR-R	$$

Crossovers/SUVs/Minivan

The line between “hatchback” and “crossover” is a fuzzy one, but in general crossovers will offer a bit more cargo room with a more squared-off rear end. The SUVs will sit up higher and have greater road clearance as well as more interior space. The Chrysler Pacifica minivan seats 7.

Make	Model	Type	GHG Emissions	EV/PHEV elec. range	Notes (CR=Consumer Reports recommended)	Cost
Hyundai	Kona	EV	90 g/mile	258 miles	CR-R	$$$
Kia	**Niro**	EV	100 g/mile	239 miles		$$$
Kia	**Niro**	PHEV	170 g/mile	26 miles	560 miles total range	SSS
Chrysler	**Pacifica**	PHEV	210 g/mile	33 miles	570 miles total range; seats 7	$$$
Kia	**Niro FE**	Hybrid	213 g/mile			$$
Subaru	**Crosstrek**	PHEV	240 g/mile	17	480 miles total range; CR-R	$$$
Kia	**Niro EX-Touring**	Hybrid	248 g/mile			$$$
Nissan	Rogue	Hybrid	314 g/mile		Front-wheel drive (FWD); CR-R	$$$
Nissan	Rogue	Hybrid	323 g/mile		All-wheel drive (AWD); CR-R	$$$
Nissan	**Kicks**	ICE	323 g/mile		Subcompact crossover	$$
Toyota	**RAV-4 (j)**	Hybrid	333 g/mile		All-wheel drive (AWD)	$$$
Volkswagen	SportWagen	ICE	333 g/mile		1.4L manual only	$$

Luxury Plug-ins

Even with applicable tax credits, these will likely set you back more than $50,000 and if so you will not be eligible for Oregon rebate. Tesla offers several options within each model; variant with lowest GHG emission listed here.

Make	Model	Type	GHG Emissions	EV/PHEV elec. range	Notes (CR=Consumer Reports recommended)	Cost
Tesla	3 AWD	EV	100 g/mile	310		$$$$$
Tesla	S	EV	110 g/mile	259		$$$$$
Tesla	X	EV	120 g/mile	238		$$$$$
Lincoln	MKZ Hybrid	Hybrid	267 g/mile			$$$$$
Cadillac	CT6	PHEV	280 g/mile	31 miles	430 miles total range	$$$$$
BMW	330e	PHEV	290 g/mile	14 miles	350 miles total range	$$$$$
BMW	**i8**	PHEV	300 g/mile	15 miles	330 miles total range; 4 passenger roadster	$$$$$
BMW	530e	PHEV	300 g/mile	16 miles	370 miles total range	$$$$S
BMW	530e X-drive	PHEV	310 g/mile	15 miles	AWD; 360 miles total range	$$$$S
BMW	740e X-drive	PHEV	330 g/mile	14 miles	AWD; 340 miles total range	$$$$$

Most Popular Plug-in Cars Available in the Rogue Valley

Following is a list of the ten best-selling plug-in cars sold locally. Tesla is again included, though technically not sold or serviced locally. Local new inventory as of June 1 shown in bold.

List below is ranked by cumulative US sales from January through April of 2018 as listed by Inside EVs .

1. Tesla Model 3
2. **Toyota Prius Prime**
3. **Chevrolet Bolt**
4. Tesla Model X

5. **Honda Clarity**
6. Tesla Model S
7. **Nissan LEAF**
8. **Chevrolet Volt**
9. Ford Fusion Energi
10. BMW 530e

The Manufacturing Penalty and Used Options

Should I buy a new green car now? Or a used one? Or keep driving what I have?

There are no easy answers to those questions, as we have to deal with some fuzzy grey areas. The only obvious answer is that when you buy any car, new or used, it's always better to buy one with lower GHG emissions as opposed to one with higher emissions. And the greener the better when you're buying new, as that will shorten the time required to amortize what I call "the manufacturing penalty."

Manufacturing just about anything other than handmade reed baskets involves GHG emissions, and cars are no exception. The size of the penalty is difficult to compute, but some estimates make it equivalent to more than three years of driving a typical vehicle. The only certainty here is that a larger and more complex car – green or otherwise – will impose a greater manufacturing penalty than a smaller and simpler car. More steel and aluminum and plastic, plus more manufacturing processes, result in higher GHG emissions. Therefore, even though a fully loaded Tesla Model X may be impressive in its low emissions per mile, it will take longer to overcome the manufacturing penalty than with a smaller and less sophisticated Chevy Bolt, Nissan Leaf or even Tesla Model 3. It might even take that Model X five years or more to break even with a petite, gas-driven Toyota Yaris!

The duration of the penalty also depends on annual miles driven. If you drive your personal vehicle less than 10,000 miles a year and your present vehicle emissions are under 400 grams/mile, then maybe it's better to hang in there for a few more years and wait for both the cars and the grid to get even greener. (This assumes it generally meets your needs and is not on the verge of falling apart.) However, if your present vehicle emits over 400 grams/mile and you drive more than 10,000 miles a year, then the planet may be better served if you make a change sooner rather than later.

All new cars impose a "manufacturing penalty", regardless of how powered. It is true that, for cars of equivalent size (e.g. Nissan Leaf to Toyota Corolla), the EV will have about a 15% higher penalty, largely because of the battery. However, a recent "cradle to grave" study by the Union of Concerned Scientists shows that this additional penalty is canceled out within 6 – 13 months of typical driving.[10] Also, you can offset your net penalty in part by refraining from purchase of other energy-intensive manufactured goods (appliances, electronics etc.) that you may crave but don't really need.

Here's an example that might prove helpful. Let's say you now own a 2008 Honda Accord with the 2.4 L 4-cylinder engine and 5-speed automatic transmission. In its day it was considered an "economy car" but it nevertheless emits 444 grams/mile of GHG. We will assume you drive it 10,000 miles a year, split about evenly between around town and highway trips. If you were to replace it with a comparably sized

PHEV (Honda Clarity or Toyota Prius Prime), your GHG emissions for one year would drop by 3.04 metric tons. Is this significant? The average American is responsible for about 16 metric tons of total direct emissions (those over which we have some personal control) every year[11], a figure that includes car emissions. So yes, cutting that number to below 13 metric tons (a 19% decrease) would amortize the additional manufacturing penalty in a relatively short period.

On the other hand, if your Accord is a 2014 model, with the same size engine but the newer transmission, your emissions are about 356 grams/mile. That's a significant improvement, and it might be better to keep the car for several more years until EV technology advances even further.

New or Used?

As a general rule that I apply to all car transactions, I advise buying new only if you reasonably expect to keep the car for at least ten years. The same applies to a lease: fine to do so as outlined above, but only if you would consider a purchase at the end of the lease if all is satisfactory. The only down side to hanging on to it after the lease expires is that you are not helping to increase the supply of used green cars, which does have benefits to others in the market. Again, it all boils down to the same conundrum. The global climate would benefit greatly if we quit making and buying cars altogether – ceasing all driving and instead walking, cycling and using (more electrified) public transit exclusively. However, that's simply not going to happen anytime soon, so it's best to tilt the balance toward greener vehicles every step along the way.

Shopping for a used green car is generally the same as shopping for any other used car, with all the attendant hassles and frustrations. (Been there, done that – too many times!) Used conventional hybrids are generally available in the Rogue Valley at reasonable prices, thanks in large part to the "fracking" low gas prices. EVs and PHEVs may be harder to find as there haven't been that many sold in the area in past years. You may have to travel up to Eugene or Portland if you're looking for a particular model or condition. If it's an older EV with limited range, getting it home may require one or two extended stops for charging or paying to have the car shipped home.

The best resources for a used car search are **Craigslist** , **Autotrader and Car Gurus**. With all three you can adjust your search for distance from you location, type of powering (EV/plug-in, hybrid, conventional) and price. Autotrader and Car Gurus also search by gas mileage. Both will come up with good selections, with many EV and hybrid options in the $8,000 to $15,000 range if you search at least as far as Eugene. Note that Autotrader and Car Gurus listing are not complete and definitive; many more cars are available than are listed.

Closing Caveat

Figures given for total combined GHG on EVs and PHEVs are computed for the power grid of this region. They should remain valid if you expect to continue living anywhere on the West Coast. If you plan to move to a state more dependent on coal-powered generation (e.g. Colorado, West Virginia) the relative EV advantage will diminish substantially. If you move to Vermont, however, your EV will be marvelously close to a true zero emissions vehicle when charged from that progressive state's ultra-clean power grid.

Local Sources for New "Green Cars"

(Lower case letters keyed to vehicle inventory in model listings. See note on page 12.)

Ashland

a Butler Ford
1977 Hwy 99 N
800-283-9241
Note: Hyundai and Kia models may be test-driven and purchased at Butler's Ashland location; however, warranty service is provided only at the respective Medford locations.

b TC Chevy
2045 Hwy 99 North
541-552-5300

Medford

c Airport Chevrolet, GMC, Buick and Cadillac
3001 Biddle Road
541-770-1300

d Butler Hyundai
5000 Crater Lake Ave
888-366-9458

e Butler Kia
4950 Crater Lake Ave
800-687-2795

f Crater Lake Ford, Lincoln and Mazda
2611 Biddle Road
541-887-6176

g Lithia Chrysler, Dodge, Jeep and Fiat
4540 Grumman Drive
541-930-3023

h Lithia Honda
4095 Crater Lake Hwy
541-930-3021

i Lithia Nissan
4560 Grumman Drive
541-930-3025

j Lithia Toyota
1420 N. Riverside Ave
541-930-3030

k Mercedes-Benz of Medford
3240 Crater Lake Ave
541-774-1000

l Medford BMW
4600 Grumman Drive
541-930-3024

m Southern Oregon Subaru
3103 Biddle Road
541-245-2000

Grants Pass

n Grants Pass Toyota
375 Redwood Highway | (541) 982-4995

o Jim Sigel Automotive
Chevrolet – Honda - Nissan
1601NE 7th Street | (541) 476-0811

p Lithia Chrysler – Dodge of Grants Pass
1421 NE 6th Street | (541) 291-9880

q Mocks Ford – Lincoln – Mazda
913 SE 6th Street | (541) 476-6656

About the Author

An Ashland resident since 1989, Bruce Borgerson is a self-employed technical writer and a member of the city's Transportation Commission, the Sierra Club, SOCAN (Southern Oregon Climate Action Now) and SOHEVA (Southern Oregon Hybrid and Electric Vehicle Association, local chapter of the Electric Auto Association). He has purchased more new and used cars in his lifetime than he cares to admit. Current vehicles in his household are a 2017 PHEV (140 grams/mile), a 2006 compact SUV (485 grams/mile) and a 2017 subcompact (323 grams/mile) for his grown daughter. Please e-mail any questions or corrections to wave@mind.net.

Notes:

(1) https://www.eia.gov/todayinenergy/detail.php?id=29612

(2) http://css.umich.edu/factsheets/carbon-footprint-factsheet

(3) https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions

https://www.eia.gov/todayinenergy/detail.php?id=29612

(4) https://www.bpa.gov/news/pubs/factsheets/fs-201303-measuring-the-carbon-ontent.pdf

https://www.bpa.gov/news/pubs/generalpublications/gi-bpa-facts.pdf

(5) https://www.washingtonpost.com/graphics/national/power-plants/?utm_term=.e2ea8e0b802f

(6) https://www.eia.gov/tools/faqs/faq.php?id=307&t=11

(7) Calculated by comparing upstream and tailpipe emissions for multiple vehicles at fueleconomy.gov.

(8) https://www.epa.gov/greenvehicles/greenhouse-gas-emissions-typical-passenger-vehicle

(9) Derived from comparing emissions of EVs and a number of comparable fossil-fuel vehicles at fueleconomy.gov, with upstream emissions included for both. Also from:

https://energy.gov/eere/vehicles/fact-950-november-7-2016-well-wheel-emissions-typical-ev-state-2015

(10) http://www.ucsusa.org/sites/default/files/attach/2015/11/Cleaner-Cars-from-Cradle-to-Grave-full-report.pdf

(11) https://calculator.carbonfootprint.com/calculator.aspx?tab=8 This methodology also includes secondary emissions from purchase of goods and services by individuals.