



SCAQMD

Cleaning the air that we breathe...

ADVISOR

2015

Clean Car Buying Guide

About This Clean Car Guide

2015 Expected To Be a Big Year for Fuel Cell Vehicles



Hyundai Tucson Fuel Cell

The vehicles featured in this Special Edition of the SCAQMD Advisor can do much more than get you from point A to point B. Some can get you there sooner, like plug-in electric cars with green stickers that allow solo drivers access to HOV lanes. Some can get you there cheaper, by lessening your trips to the pump, saving you money and time. Others still, with their futuristic design, will get you there with style as you cruise down the highway. Regardless of your preference, the South Coast Air Quality Management District produced this annual guide to help you make a more informed decision about purchasing an alternative fuel vehicle, lower your carbon footprint, and help you do your part to clean the air that we breathe. Visit SCAQMD's Clean Air Choices website at aqmd.gov/cleanairchoices/ to find more information on specific models.

The green car market is set to grow as Toyota plans to introduce its new Mirai Sedan Hydrogen Fuel-Cell in 2015. The vehicle's release in the summer of 2015 follows Hyundai, which has already made a hydrogen fuel-cell version of its Tucson cross-over vehicle available for lease.

Many other car brands are working to develop their own fuel-cell models, with Honda announcing that its fuel-cell vehicle (FCV) will be released in 2016 in the U.S. following its release in Japan the same year. These FCV's are expected to have a range of more than 300 miles with a hydrogen tank able to re-fill in about three minutes. With their impressive mileage and fast refueling, these vehicles are poised to challenge standard gasoline-powered vehicles for a share of the market.

Fuel-cell vehicles have been highly anticipated by drivers looking for zero-emission models because these vehicles emit nothing but water vapor from the tailpipe, and they can run on renewable hydrogen gas. They also can travel a much greater distance on a full tank than current battery-electric vehicles can travel on a fully charged battery. The hurdle for widespread adoption of fuel cell vehicles is the limited refueling infrastructure.

To spur the development of a fuel-cell market worldwide, Toyota recently announced it would make nearly 5,700 of its patents on fuel-cell related technology available for free through 2020. These patents include many useful tools for the development of hydrogen fueling infrastructure. California is investing in the establishment of hydrogen fueling stations across the state. According to the California Fuel Cell Partnership, approximately 50 stations will be in operation by 2016, with about half located across Southern California.

For information on current stations go to cafcp.org/stationmap or download the SCAQMD smartphone app which has a map of all alternative fuel stations in the South Coast basin.



Which clean vehicles are being designed and manufactured in Southern California? Clean Buses and Trucks, of course.

When it comes to Southern California, many people see the hustle and bustle of a thriving metropolitan area. In order to keep things moving in a sustainable manner, Southern California has become a strategic location in the development and manufacturing of clean buses and trucks.

Complete Coach Works, based in Riverside, CA, specializes in alternative fuel conversions that span multiple transportation modes, including buses, utility and dump trucks, waste disposal fleets, and off-road equipment, which can be converted to compressed natural gas (CNG), liquefied natural gas (LNG), liquefied petroleum gas (LPG), and battery-electric engines. It was recently recognized with a 2014 Clean Air Award by SCAQMD for retrofitting transit buses with its Zero-Emission Propulsion System (ZEPS) which uses an advanced lithium battery and liquid cooled drive system to provide a pollution-free, noise-free transit bus with a 120-mile range between charges. SCAQMD is currently providing funding to CCW to develop an all-electric transit bus with a 150-mile range. CCW will soon demonstrate the bus in service with different transit agencies.

Another Riverside bus company is EIDorado National, the largest volume producer of commercial buses in North America. An industry leader in the design and manufacturing of alternative fueled buses, it offers buses fueled by CNG, LNG and diesel/electric hybrid propulsion systems. Recently it produced two new hydrogen fuel-cell buses for Thousand Palms-based Sunline Transit Agency. This adds to two earlier fuel-cell buses also

produced for Sunline by EIDorado National. These buses utilize fuel-cells developed by British Columbia-based Ballard. In the 1980s, SCAQMD support helped Ballard develop its original fuel-cells for transit buses. It also utilizes a propulsion system from Ontario, CA-based BAE Systems.

A third bus manufacturer in Southern California is BYD Bus Company, with its North American headquarters in Los Angeles and its U.S. manufacturing plant in Lancaster, CA. A Chinese company, BYD is set to deliver the first five of twenty-five 40-foot long, battery-electric transit buses in 2015 to the Los Angeles County Metropolitan Transportation Authority.

TransPower, based in Poway, CA, is using its ElecTruck battery-electric drive system to power all-electric drayage trucks and school buses. Their trucks will also be used at the ports of Los Angeles and Long Beach. In addition, TransPower has implemented a pilot program for its all-electric school bus fleet in Escondido, CA schools.

US Hybrid Corporation in Torrance, CA has developed electric and hybrid traction drive systems for medium and heavy-duty commercial trucks, municipal vehicles, and fuel-cell transit buses.

Finally, Balqon Corporation, based in Harbor City, CA, has developed electric vehicles, lithium batteries, and high-frequency rapid chargers.

These Southern California companies are all working on advancing heavy-duty vehicle technologies, and making transit and coach buses, drayage trucks, freight trucks, and waste collection vehicles emission-free.



Clean Air Choice Vehicles

Advanced Technology - Zero-Emission Vehicles (ZEVs)

ZEV is an acronym for Zero Emission Vehicle. A ZEV has zero tailpipe emissions and emits 98 percent cleaner emissions than the current model year's average vehicle. Electric-only vehicles and fuel-cell vehicles qualify as ZEVs.

2015 Models

as of 02/06/2015

ZEVs

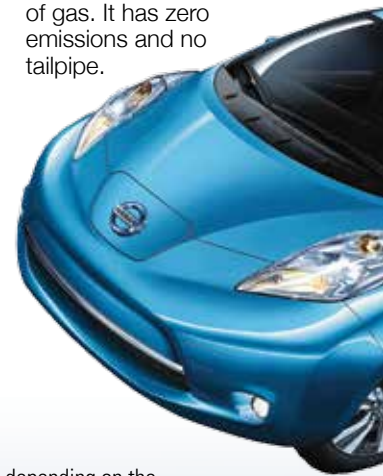
Vehicles	Incentives	Passengers	Carbon Footprint (CO ₂ tons/yr)*	Battery Range	240 V Charging Time (hrs)
BMW <i>i3 BEV</i> (City/Hwy)* 138/111	**	4	0	82	7
Chevrolet <i>Spark EV</i> (City/Hwy)* 128/109	**	4	0	82	7
Fiat <i>500e</i> (City/Hwy)* 122/108	**	4	0	87	4
Ford <i>Focus FWD BEV</i> (City/Hwy)* 110/99	**	5	0	76	3.6
Hyundai <i>Tucson Fuel Cell</i>	**	5	0	n/a	n/a
Kia <i>Soul Electric</i> (City/Hwy)* 120/105	**	5	0	82	7
Mercedes <i>B-Class Electric Drive</i> (City/Hwy)* 85/84	**	5	0	82	7

ZEVs

Vehicles	Incentives	Passengers	Carbon Footprint (CO ₂ tons/yr)*	Battery Range	240 V Charging Time (hrs)
Mitsubishi <i>i-MiEV</i> (City/Hwy)* 126/99	**	4	0	62	7
Nissan <i>Leaf</i> (City/Hwy)* 106/92	**	5	0	75	4
Smart <i>Convertible EV Coupe EV</i> (City/Hwy)* 122/93	**	2	0	76	6
Tesla <i>Model S 60kWh</i> (City/Hwy)* 94/97	**	7	0	208	10
Tesla <i>Model S 85kWh</i> (City/Hwy)* 88/90	**	7	0	208	10
Volkswagen <i>e-GOLF</i> (City/Hwy)* 126/105	**	5	0	103	6

LEAF

The Nissan LEAF is 100% electric. It has an EPA average range of 75 miles and does not use a single drop of gas. It has zero emissions and no tailpipe.



**Federal Tax Credit: is between \$2,500 and \$7,500 depending on the vehicle's battery capacity. The California state tax credit varies depending on the vehicle type: Fuel-Cell vehicles: \$5,000; Battery Electric Vehicles (BEV) \$2,500; Plug-in Hybrid Electric Vehicles (PHEV) \$1,500

*Approximate MPG based on 2014 model year data; Carbon Footprint information based on vehicle driven 15,000 miles per year.

Source: fuelconomy.gov For more information, see CARB's website at arb.ca.gov/msprog/onroad/cert/cert.php

Visit South Coast AQMD's website at aqmd.gov and cleanairchoices.org for its Clean Air Choices site.

MPGe: Miles per gallon gasoline equivalent (MPGe) is a measure of the average distance traveled per unit of energy consumed. Based on EPA formula of 33.7 kW/hour equal to one gallon of gasoline energy.



Tesla S

Zero to 60 MPH in 5.9 seconds. Top speed of 120 MPH. 302 hp (225 kW) Zero tailpipe emissions.

Clean Air Choice Vehicles

Advanced Technology-Partial Zero-Emission Vehicles (AT-PZEVs) and (TZEVs)

AT-PZEV is an acronym for **A**dvanced **T**echnology **P**artial **Z**ero **E**mission **V**ehicle. These are vehicles that meet the super ultra-low emission vehicle (SULEV) and PZEV tailpipe emissions requirements, but also include components on the cutting edge of technology that help to improve the fuel mileage of PZEVs. Hybrid drivetrain components are a good example. PZEVs run on gasoline, yet offer extremely clean SULEV tailpipe emissions with zero evaporative emissions and 150,000 mile emission warranty.

The term AT-PZEV is being replaced by the term **TZEV**, and is an acronym for **T**ransitional **Z**ero **E**mission **V**ehicle.

AT-PZEVs TZEVs

Vehicles	Incentives	Passengers	Carbon Footprint (CO ₂ tons/yr)*
Acura ILX (Hybrid gas-electric) (City/Hwy)* 39/38	**	5	3.8
Cadillac ELR (Hybrid gas-electric) (City/Hwy)* 25/35 (Electric) 82	**	4	2.1
Chevrolet Volt (Plug-In Hybrid gas-electric) (City/Hwy)* 35/40 (Electric) 98	**	4	1.4
Ford Fusion Energi (Plug-In Hybrid gas-electric) (City/Hwy)* 44/41 (Electric) 88	**	5	1.8
Ford C-Max Energi (Plug-In Hybrid gas-electric) (City/Hwy)* 42/37 (Electric) 88	**	5	1.8
Honda Accord (Hybrid gas-electric) (City/Hwy)* 50/45	**	5	3.1

AT-PZEVs TZEVs

Vehicles	Incentives	Passengers	Carbon Footprint (CO ₂ tons/yr)*
Honda Civic (Hybrid gas-electric) (City/Hwy)* 44/47	**	5	3.3
Honda Civic (Natural Gas) (City/Hwy)* 27/38	**	5	3.7
Honda CR-Z (Hybrid gas-electric) (City/Hwy)* 36/39	**	2	3.9
Hyundai Sonata, Sonata Limited (Hybrid gas-electric) (City/Hwy)* 36/40	**	5	3.9
Kia Optima, Optima Ex (Hybrid gas-electric) (City/Hwy)* 36/40	**	5	3.9
Mercedes E 400 (Hybrid gas-electric) (City/Hwy)* 24/30	**	5	5.6

AT-PZEVs TZEVs

Vehicles	Incentives	Passengers	Carbon Footprint (CO ₂ tons/yr)*
Toyota Camry LE, Camry SE, Camry XLE (Hybrid gas-electric) (City/Hwy)* 43/39	**	5	3.6
Toyota Prius Hybrid gas-electric (City/Hwy)* 51/48	**	5	3
Toyota Prius (Plug-In Hybrid gas-electric) (City/Hwy)* 51/49 (Electric) 95	**	5	3
Volkswagen Jetta (Hybrid gas-electric) (City/Hwy)* 47/46	**	5	3.3

**driveclean.ca.gov for list of incentives

Chevrolet Volt

When the gas-powered generator kicks in, producing electricity to power the engine, the range of the Volt extends to an EPA-estimated 380 miles with a full charge and a full tank of gas.



Clean Air Choice Vehicles

Partial Zero-Emission Vehicles (PZEVs)

PZEV is an acronym for **P**artial **Z**ero **E**mission **V**ehicle. PZEVs are modern vehicles with advanced engines equipped with cutting-edge emissions controls. PZEVs run on gasoline, yet offer extremely clean emissions with zero evaporative emissions. However some PZEVs don't concurrently offer outstanding fuel mileage, with the majority of them falling in line with current model year averages.

Vehicles	Passengers	Carbon Footprint (CO ₂ tons/yr)*
Audi A3, A3 Cabriolet, A3 CabrioletQuattro, A3 Quattro (City/Hwy)* 23/32	5	5.3
BMW 228i, 228i xDrive, 328i, 328i xDrive, 328i Gran Turismo, 328i xDrive Gran Turismo, 428i Convertible, 428i Coup, 428i Gran Coupe, 428i xDrive Coupe, 428i xDrive Convertible (City/Hwy)* 23/35	4/5	5.3
Chrysler 200FWD (2.4) (City/Hwy)* 20/31	5	6.2
Dodge Dart (City/Hwy)* 20/31	5	6.2
Ford Focus (2.0) (City/Hwy)* 27/37	5	4.8
Ford Fusion (1.5) (City/Hwy)* 23/36	5	5.3
Honda Civic (1.8) (City/Hwy)* 28/39	5	4.6
Hyundai Elantra Limited (1.8) (City/Hwy)* 28/38	5	4.6
Hyundai Elantra, Elantra Coup (2.0) (City/Hwy)* 24/34	5	5.3
Kia Forte (1.8) (City/Hwy)* 25/36	5	5.1
Kia Forte (2.0) (City/Hwy)* 24/34	5	5.3

Vehicles	Passengers	Carbon Footprint (CO ₂ tons/yr)*
Kia Optima (2.4) (City/Hwy)* 23/34	5	5.3
Mazda 3 (2.0) (City/Hwy)* 30/41	5	4.3
Mazda 6 (2.5) (City/Hwy)* 26/38	5	4.8
Mercedes GLK 350, GLK 350 4MATIC (City/Hwy)* 19/26	5	6.8
Subaru Impreza (2.0) (City/Hwy)* 27/36	5	4.9
Subaru Impreza Sport (2.0) (City/Hwy)* 27/36	5	4.9
Subaru Forester (2.5) (City/Hwy)* 24/32	5	5.4
Subaru XV Crosstrek AWD (2.0) (City/Hwy)* 25/33	5	5.2
Toyota Camry (2.5) (City/Hwy)* 25/35	5	5.2
Volkswagen Beetle, Beetle Convertible (1.8), (City/Hwy)* 24/32	4	5.9
Volkswagen Beetle, Beetle Convertible (2.0), (City/Hwy)* 23/29	4	5.9
Volkswagen CC (2.0) (City/Hwy) 21/31	5	5.8

Vehicles	Passengers	Carbon Footprint (CO ₂ tons/yr)*
Volkswagen Golf, Golf Sportwagen (1.8) (City/Hwy)* 23/30	5	5.7
Volkswagen Passat (1.8) (City/Hwy)* 24/34	5	5.3
Volkswagen Jetta (1.8) (City/Hwy)* 25/36	5	5.1
Volkswagen GTI (2.0) (City/Hwy)* 24/32	5	5.5
Volkswagen Jetta GLI (2.0) (City/Hwy)* 23/29	5	5.7
Volvo XC60 AWD (3.2) (City/Hwy)* 18/25	5	7.1
Volvo XC70 AWD (3.2) (City/Hwy)* 18/25	5	7.1

Subaru Forester

Every Forester 2.5i model is a Partial Zero Emission Vehicle (PZEV), meaning it exceeds California's stringent emissions standards and offers lower emissions than some hybrid or alternative fuel vehicles.



Approximate MPG based on 2014 model year data; Carbon Footprint information based on vehicle driven 15,000 miles per year.

Source: fuelconomy.gov For more information, see CARB's website at arb.ca.gov/msprog/onroad/cert/cert.php

Visit South Coast AQMD's website at aqmd.gov and cleanairchoices.org for its Clean Air Choices site.

MPGe: Miles per gallon gasoline equivalent (MPGe) is a measure of the average distance traveled per unit of energy consumed. Based on EPA formula of 33.7 kW/hour equal to one gallon of gasoline energy.

Comparing Vehicle Technologies: The Benefits of Alternative Fuel Vehicles

Fuel Economy & Greenhouse Gas Rating – A 1(worst) to 10 (best) rating system on greenhouse gas and tailpipe emissions.

MPG – Miles per gallon.

MPGe – Miles per gallon equivalent. This is a measure used by the U.S. Environmental Protection Agency (EPA) to explain the energy consumption of an advanced technology vehicle in comparison to the fuel economy of a conventional internal combustion engine.

Smog Rating - This rating reflects vehicle tailpipe emissions that contribute to local and regional air pollution. Vehicles that score a 10 are the cleanest.

Vehicle Type Diesel Vehicle	MPG 25 MPG	Cost Savings in 5 Years N/A	Driving Range 400 - 500+ miles
Refuels with: Diesel	Average Charging/Refueling Time 5-10 Minutes	Smog Rating 6	Fuel Economy & Greenhouse Gas Rating 5

Vehicle Type Gasoline Vehicle	MPG 19 MPG	Cost Savings in 5 Years N/A	Driving Range 200 - 300+ miles
Refuels with: Gasoline	Average Charging/Refueling Time 5-10 Minutes	Smog Rating 7	Fuel Economy & Greenhouse Gas Rating 6

Vehicle Type Compressed Natural Gas (CNG) Vehicle	MPG 31 MPG (CNG only)	Cost Savings in 5 Years \$6,250	Driving Range 200-225 miles
Refuels with: Compressed Natural Gas (CNG)	Average Charging/Refueling Time 5-10 Minutes	Smog Rating 9	Fuel Economy & Greenhouse Gas Rating 8

Vehicle Type Extended Range Plug-In Hybrid Electric Vehicle	MPG 98-100 MPGe; 35-45 MPG	Cost Savings in 5 Years \$8,000	Driving Range 20-80 Miles (electric only); 250-300 (electric and gasoline)
Refuels with: Gasoline and Electricity	Average Charging/Refueling Time 8-12 Hours (120V); 3-4 Hours (240V)	Smog Rating 9	Fuel Economy & Greenhouse Gas Rating 10

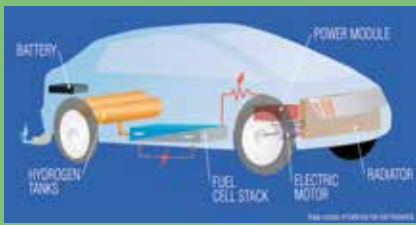
Vehicle Type Plug-In Hybrid Electric Vehicle (PHEV)	MPG 95-115 MPGe; 45-50 MPG	Cost Savings in 5 Years \$6,750	Driving Range 10-20 Miles (electric only); 450-500 Miles (electric and gasoline)
Refuels with: Gasoline and Electricity	Average Charging/Refueling Time 3-7 Hours (120V); 1.5-3 Hours (240V)	Smog Rating 9	Fuel Economy & Greenhouse Gas Rating 10

Vehicle Type Hydrogen Fuel-Cell Vehicle	MPG 50-70 MPGe (hydrogen only)	Cost Savings in 5 Years \$6,000	Driving Range 200-300+ miles
Refuels with: Hydrogen	Average Charging/Refueling Time 3-8 Minutes	Smog Rating 10	Fuel Economy & Greenhouse Gas Rating 10

Vehicle Type Electric Vehicle	MPG 76-115 MPGe	Cost Savings in 5 Years \$8,500	Driving Range 70-200 miles
Refuels with: Electricity	Average Charging/Refueling Time 20 Hours (120V); 8 Hours (240V); 20-40 Minutes (480V)	Smog Rating 10	Fuel Economy & Greenhouse Gas Rating 10

With recent fluctuations in gas prices and a growing awareness of air quality, more and more people are turning to alternative fuel vehicles. Yet because of the emerging and unfamiliar technologies, many consumers are still skeptical of vehicles without gasoline-powered internal combustion engines. However, alternative fuel vehicles offer a number of lasting benefits, including better warranties, reduced air emissions, greater fuel economy, and increased energy security.

In California, vehicles with a smog rating of 9, also known as a Partial Zero Emission Vehicle (PZEV),



come with a 15 year/150,000 mile warranty on the emissions system. This warranty is required by the California Air Resources Board to ensure that in 15 years, the emissions from these vehicles will be as clean as they were the day they were purchased.

Alternative fuel vehicles also achieve greater fuel economy than internal combustion engines. According to the U.S. Department of Energy (DOE), a 2012 hybrid electric vehicle gets the equivalent of 44 miles per gallon compared to a conventional gasoline-powered vehicle's estimated 32 miles per gallon. Because the cost of electricity is far cheaper than the cost of gasoline, alternative fuel vehicles inherently become the more economical choice. Not only is electricity more cost efficient than gasoline, it provides our nation greater energy security.

Because of America's dependency on foreign sources of oil, drivers of gasoline-powered vehicles are subject to fuel price changes and supply disruptions. According to the U.S. DOE, nearly all of our nation's electricity is produced from domestic resources. Those who drive alternative fuel vehicles, therefore, are not vulnerable to an unstable and unpredictable market for their fuel.

There is a growing market for the sale of alternative fuel vehicles of all types. With technology advancing exponentially, alternative fuel vehicles have the potential to improve our air quality and lessen our dependency on harmful conventional fuels.

Everything Old Is New Again with Electric Vehicles

With a resurgence in electric vehicles in the past five years, it is interesting to note that over a century ago electricity was among the preferred methods for automobile propulsion.

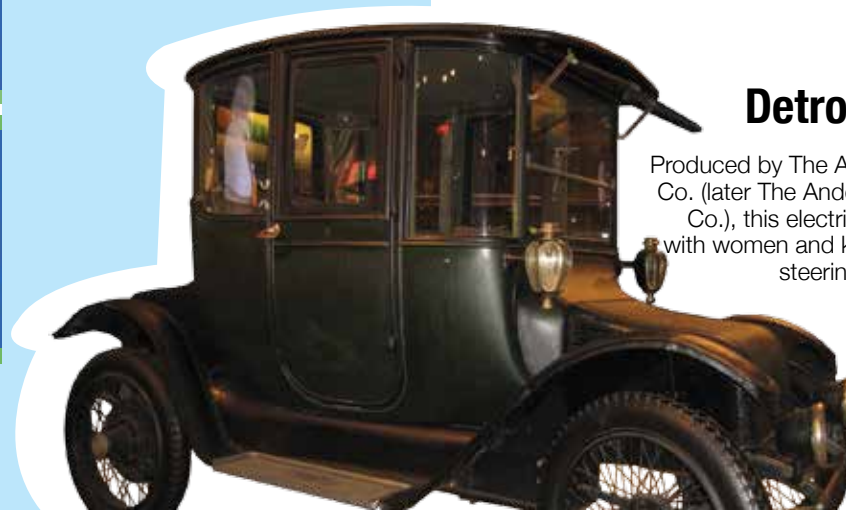
Exactly who invented the electric car is difficult to determine, as a series of advances (from the battery to the electric motor) ultimately led to the first electric vehicle's development.

While Robert Anderson, a British inventor, first developed a crude version of an electric carriage in the early 1900s, the first practical electric cars were not developed until decades later. In the United States, it was the introduction of a six-passenger electric vehicle in the 1890s that generated wider interest in electric vehicles. That car, successfully introduced by Iowa chemist William Morrison, was capable of reaching a top speed of 14 miles per hour.

Electric vehicles were competing with internal combustion engines and steam powered vehicles. Electric vehicles were at their peak around 1900 when approximately one-third of all vehicles on the road were powered by electricity. Steam engines required long start-up times sometimes up to 45 minutes in the cold, and needed to be refilled with water, which resulted in limited range. Internal combustion engines were noisy, smelly, and needed to be started with a manual crank. They also needed a lot of effort to change gears. Electric cars had none of these issues, and their range was not a concern given the short length of car trips at the time due to the poor road conditions.

Many car companies worked to develop electric models, including Porsche, Oldsmobile and Studebaker. But when Henry Ford developed the assembly line to mass-produce his gasoline-powered Model T, this was the beginning of the end for the electric car. Through mass production, instead of building each car by hand, it made the Model T widely available and much more affordable. With the development of a national road system in the 1920s, the limited range of electric vehicles was also a problem, and it led to a decline in the use of electric vehicles. In 1999, Honda released its hybrid-electric Insight, and the next year Toyota's hybrid-electric Prius became widely available. Within a few years, Nissan released its all-electric LEAF and other car companies have followed with their own plug-in EVs.

According to the Electric Drive Transportation Association, as of January 2015, over 280,000 total plug-in vehicles were sold since their market roll-out in 2010, with nearly 119,000 of those sold in 2014 alone.



1912 Detroit Electric

Produced by The Anderson Carriage Co. (later The Anderson Electric Car Co.), this electric vehicle, popular with women and known for its easy steering and quick start, was one of eight different models manufactured by the company.



South Coast
AQMD

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Decals Allow a Range of Clean Vehicles to Use HOV Lanes

Clean Air Vehicle decals allow the use of carpool or High Occupancy Vehicle (HOV) lanes for cars with just a single occupant. The California Department of Motor Vehicles currently issues two types of decals: white and green.

White decals are available to an unlimited number of vehicles that qualify as Federal Inherently Low Emission Vehicles (ILEVs). Cars that meet the ILEV requirement are typically those certified as either zero-emission vehicles (100% battery electric and hydrogen fuel cell) or compressed natural gas (CNG) vehicles.

Cars meeting California's transitional zero emission vehicles (TZEV) requirement are eligible to obtain a green decal. These include all plug-in hybrid vehicles, also known as advanced technology partial zero emission vehicles (AT PZEVs). Green decals were previously capped at just 55,000, but a new state law has made another 15,000 decals available.

Both the white and green decals permit single occupant vehicles to use HOV lanes until the programs expire on January 1, 2019.



SCAQMD **ADVISOR**

This bimonthly news publication is produced by the South Coast Air Quality Management District's (SCAQMD) Legislative & Public Affairs Office. SCAQMD is the air pollution control agency for Orange County and major portions of Los Angeles, San Bernardino and Riverside Counties. *SCAQMD does not endorse or warrant any products, services or companies mentioned in this publication.*

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