



## Green Auto Market

The Business of Green Cars, Fuels & Technologies

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### The Big Picture

#### Green vehicle technologies recognized in award nominations



While alternative fuel and fuel efficient vehicles have been honored with plenty of awards lately, the technologies that drive them are now being recognized. *Green Car Journal* released its nominees for the 2014 Green Car Technology Award, which will be handed out January 22 at the Washington DC Auto Show. *WardsAuto* released its 2014 Ten Best Engines with one being electric and three clean diesel. Here's some of the interesting findings:

- For the [Green Car Technology Award](#), there's a three-motor, all-wheel-drive hybrid –the Acura Sport Hybrid and the

turbocharged direct-injection engine in the Audi 3-liter TDI diesel engine.

- The BMW i3 electric car is acknowledged for its carbon-fiber body.
- The Cadillac ELR extended range/plug-in hybrid will start being delivered to dealers next month. Its regenerative braking and declaration charging system have been acknowledged in the award nomination.
- The tiny 1-liter EcoBoost turbocharged engine for the 2014 Ford Fiesta is on the list.
- The Honda Accord's plug-in charging system is getting attention with its 115 MPGe.
- The new Hyundai Tucson's fuel cell system is on the list.
- The Ram pickup's new diesel engine, Porsche's plug-in hybrid system, and Mazda's i-ELOOP Brake Energy Regeneration System are also in the competition.
- [WardsAuto did recognize one electrified drive](#) – that of the Fiat 500e. Those testing the cars were impressed with its 147 lb-ft of torque with its power boost, and how it outperformed the official 85 mile range given by the EPA.
- Clean diesels were honored – the Chevrolet Cruze Diesel's 2.0L inline four, the Ram 1500 EcoDiesel's new 3.0L V6 engine, and BMW's 3.0L inline six cylinder placed in the BMW 535d and X5 SUV made the list.
- Another interesting engine to make the list is Ford's 1.0L EcoBoost three-cylinder found in the Fiesta – and which also made the *Green Car Journal* nomination list. The idea behind it was to deliver the power of a 1.6L engine from the efficient 1.0L engine.

## **Tesla-Mania: Yes, there's more drama**

- **Reports of another fire** involving a Tesla surfaced today, but not as severe as usual. In the latest report, the car itself was fine, except for some light smoke damage. The culprit may have been Tesla's wall-mounted charging unit, located inside a garage in California, according to the local fire department.
- **Ohio dealers have sued** to block Tesla from selling cars in the state. Tesla had been looking good recently when a proposed amendment to an unrelated bill was dropped. Dealers were hoping to block Tesla from selling in the state. The new lawsuits wants the state to revoke Tesla's license to sell cars, stating that the automaker hasn't met all its necessary legal requirements.
- **Outgoing GM CEO Dan Akerson** had some critical things to say at a media conference this week about what Tesla's going through with its battery fires; he compared it to be battery fire in the test lab incident with the Volt that happened in late 2011 and basically boasted about all the proactive responses that GM carried out instead of standing off to the sidelines.

## **Hyundai pitching its fuel cell car**

"Today, right here, the hydrogen fuel cell vehicle is making the shift from a research project to a real consumer choice," says Hyundai Motor America president and CEO John Krafcik. [See how the automaker is promoting its new Tucson Fuel Cell model in this new video](#), which it calls "The Next Generation Electric Vehicle."

## **Colorful comments on first-ever woman CEO at GM by Bob Lutz**

Changing of the guard is starting to happen in Motor City. Right after General Motors paid off the federal government for its post-bankruptcy bailout loan, CEO Dan Akerson announced he's leaving his job and that GM is getting its first female CEO, Mary Barra. She's previously served as senior vice president of global product development and has championed [GM's leadership role in electrified and fuel efficient vehicles](#). Ford Motor Co. is also flooded with gossip about its shining star CEO Allan Mulally leaving and going back to Washington to captain the Microsoft ship. As for Barra, ex-Chevy Volt guru and former GM vice chairman Bob Lutz had his usual bit of banter to share. On a Detroit radio talk show last week, Lutz praised Barra for leading GM's product development and had [something very Lutz-like to say](#): "I don't know if you know what she looks like, but she is medium height with an attractive, athletic build, nice face -- she's not a little old lady with glasses; she is very athletic looking, very active and it's easy to imagine her behind the wheel of a car." So, she may not be a car guy, but she's alright with Bob Lutz.

## **SAE adopting natural gas vehicle standards**

At the Society of Automotive Engineers 2013 Commercial Vehicle Engineering Congress, held in October in Rosemont, Ill., industry participants in a Blue Ribbon Panel on natural gas were unanimous that [standards will help the industry to quicker embrace the natural gas based technologies](#). In response to the heavy-duty trucking industry need, SAE International Truck and Bus Council launched an effort to establish relevant SAE standards. "The use of natural gas as a transportation fuel is extremely important," said Ron Eickelman, President, Agility Fuel Systems. "All indicators point to increase in the number of vehicles fueled by natural gas. To achieve universal levels of safety, reliability, and performance, there is no question that codes and improved standards are needed now!"



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## New Vehicle Sales & Remarketing

### Hybrid Electric Vehicle Sales: November 2013 – Top 10 and US Market Total

Make	Model	November 2013	Vs. October 2013	Vs. November 2012	CY 2013	US Hybrid Share
Toyota	Prius Liftback	9,801	19.0%	9.8%	135,291	27.16%
Toyota	Prius C	3,001	--1.1%	--3.9%	39,169	8.32%
Toyota	Camry Hybrid	2,994	3.1%	--23.9%	41,722	8.30%
Ford	Fusion Hybrid	2,769	7.5%	51.0%	34,502	7.67%
Toyota	Prius V	2,227	--1.2%	--17.2%	32,879	6.17%
Hyundai	Sonata	1,866	41.6%	17.4%	19,640	5.17%
Toyota	Avalon Hybrid	1,532	9.6%	NA	14,988	4.25%
Ford	C-Max Hybrid	1,457	1.3%	--59.4%	26,855	4.04%
Lexus	ES Hybrid	1,393	1.9%	--2.2%	14,856	3.86%
Kia	Optima Hybrid	1,233	7.1%	81.1%	12,929	3.42%
	<b>Total Hybrid Sales</b>	<b>36,085</b>	<b>7.5%</b>	<b>3.1%</b>	<b>459,530</b>	<b>2.91%</b>
	<b>Total Auto Sales</b>	<b>1,238,362</b>	<b>3.1%</b>	<b>8.6%</b>	<b>14,179,416</b>	

## Plug-In Electric Vehicle Sales – November 2013

Make	Model	November 2013	Vs. October 2013	Vs. November 2012	CY 2013	US Plug-In Share
Nissan	Leaf	2,003	0.0%	30.1%	20,081	22.68%
Chevrolet	Volt	1,920	--5.0%	26.4%	20,702	21.74%
Tesla	Model S	1,400	7.7%	75.0%	16,950	15.85%
Toyota	Prius Plug In	1,100	--47.5%	--37.7%	11,169	12.45%
Ford	C-Max Energi	941	--13.8%	--25.3%	6,327	10.65%
Ford	Fusion Energi	870	--20.0%	NA	5,298	9.85%
Smart	ForTwo EV	153	37.8%	5,000.0%	756	1.73%
Ford	Focus EV	130	13.0%	--24.4%	1,580	1.47%
Chevrolet	Spark	87	31.8%	NA	463	0.98%
Honda	Accord Plug In	68	--4.2%	NA	488	0.77%
Toyota	RAV4 EV	62	--31.9%	93.8%	1,068	0.70%
Fiat	500E	60	20.0%	NA	355	0.68%
Honda	Fit EV	23	--42.5%	--11.5%	518	0.26%
Mitsubishi	i	12	--57.1%	--71.4%	1,018	0.14%
Porsche	Panamera SE-Hybrid	4	0.0%	NA	39	0.05%
	<b>Total Plug-In Sales</b>	<b>8,833</b>	<b>--13.2%</b>	<b>23.4%</b>	<b>86,812</b>	<b>0.71%</b>
	<b>Total Auto Sales</b>	<b>1,238,362</b>	<b>3.1%</b>	<b>8.6%</b>	<b>14,179,416</b>	

Sources for Hybrid and EV Sales Figures: HybridCars.com and Baum & Associates

[November sales weren't much different than October's for plug-ins.](#) The Nissan Leaf came in at 2,003 deliveries in November – one more than the Chevrolet Volt sold in October and higher than the 1,920 Volts sold in November. Tesla doesn't report Model S numbers, but it was selling about 1,500 per month during the previous quarter. Ford saw a tough month where sales of C-Max Hybrid and C-Max Energi plug-in hybrid dropped 59% and 25%, respectively, from a year ago. Hybrids did better – up 7.5% from October and 3.1% from the previous year.

**Speaking of hybrids, the Toyota Prius Liftback** topped Consumer Reports' annual value list for the second straight year. The attractive base price (\$24,025), mileage (44 mpg but can be higher depending on how you drive), and resale value gave it the thumbs up. The Honda Fit subcompact, starting at \$15,425, scored in second place for the compact/subcompact class.

## Fuel & Energy

### Natural gas vehicles: Facts and figures

Learning about any of the clean transportation technologies involves a lengthy learning curve. It's good for all of us to stay current and refresh the ABCs once in a while. Natural gas vehicles is a great topic to research and share educational content on, as it's spreading out widely to vehicles and fueling stations across the US and several other markets around the world. So here are a few topical categories to cover (and please post comments if I missed anything or got it wrong).....

### Fuel stations:

- Number of compressed natural gas (CNG) stations in the US: 1,389
- Number of liquefied natural gas (LNG) stations in the US: 150

**CNG vs. LNG:**

- CNG is used in light and medium duty cars and trucks, while LNG is used mainly in heavy duty trucks.
- LNG only needs 30% of the space that CNG uses for on-board vehicle storage for the same amount of energy. LNG requires on-board storage in thermal tanks capable of keeping the fuel at -260 degrees Fahrenheit. LNG vehicle conversions and their fueling stations are much more expensive than CNG.
- CNG needs to be stored on-board in a cylinder tank at 3,000 to 3,600 pounds per square inch.

**Vehicle powertrains:** Very similar to gasoline and diesel powered engines as they basically do the same thing with ignition of the fuel to power the engine. Conversions need to be made for the fuel storage tank, fueling receptacle/nozzle, and in the engine.

**Hydraulic fracturing (“fracking”):** The question of whether shooting water into gas fields to extract natural gas is environmentally safe is being fought out in several state capitals, but it’s never really been affiliated with natural gas vehicles. The criticism has to do with how the natural gas is removed from the ground and harmful consequences it could cause – tainting aquifers, causing earthquakes, and using way too much water. UC Berkeley physics professor Richard Muller contends in a paper that environmentalists should embrace hydraulic fracturing as a means to mitigate climate change and ease air pollution.

**Vehicle acquisitions:** Clean Energy Fuels Corp. just reported that customers using its fueling stations ordered 70% more NGVs in the first nine months of 2013 compared to the same period in 2012. The company said Cummins Westport thinks it will make 2,400 natural gas engines this year and 10,000 next year. On the retail side, there’s the Honda Civic NGV and CNG-powered pickups from Chrysler, Ford, and GM – some of them bi-fuel and some pure natural gas. Honda is reporting its sales numbers – 2,080 units for this year had been sold through the end of November.

**Renewable natural gas:** Natural gas coming from renewable sources, or biomethane, is gaining traction, especially in California where it’s eligible for low carbon credits; and sometimes it qualifies for the US Environmental Protection Agency’s Renewable Identification Numbers and its credit system. Fair Oaks Farms, based in Fair Oaks, Ind., won a 2013 NGV Achievement Award last month. AMP Americas works with Fair Oaks Farms to fuel its 42 milk delivery tanker trucks with renewable natural gas (RNG). In 2012, they set up a biodigester that processes agricultural waste to produce RNG. There are several other waste (biomass) sources being analyzed to produce RNG/biomethane from organic matter. (RNG is also called biogas.)

**Emissions:** NGVs are cleaner than vehicles powered by gasoline or diesel, though the figures vary. It tends to be considered to have about 25% less in greenhouse gas and carbon emissions than petroleum; and an even higher percentage in reductions of smog-creating tailpipe emissions that include hydrocarbons, nitrogen oxides, carbon monoxide, and particulate matter.

*Thanks to NGV America, US Dept. of Energy, Transport Topics, HybridCars.com, and Clean Cities for data and information.*

## Fuel economy in America: The latest ratings

For those following fuel efficient and alternative fuel vehicles, two news items came out this past week that were worth paying attention to. Fuel economy ratings on new vehicles sold are increasing again after dropping for two months. The corporate average fuel economy rating reached 24.8 mpg in November – still down from the all-time high of 24.9 mpg recorded with August new vehicle sales in the US. Given that gasoline prices have softened this year, it is impressive to see the fuel efficiency rate go back to increasing.

The fuel economy numbers are being tracked by the University of Michigan Transportation Research Institute (UMTRI), which has been keeping score on CAFÉ numbers since October 2007. Fuel economy is up 4.7 mpg since that time, and improvements in greenhouse gas emission reductions were also acknowledged in the study.

In still more analysis of fuel economy and emissions, the US Environmental Protection Agency and Department of Energy have [updated their annual rating](#) for the most fuel-efficient cars now available on the market. Every single one of the top 10 is powered by electricity or a hybrid version with electric and gasoline power. The Chevrolet Spark EV, which gets the equivalent of 119 mpg, topped the list. The Nissan Leaf moved back to number four, and the Chevrolet Volt was number nine. The list of plug-in electric vehicles is getting longer in the US – it's a lot more than the Leaf and Volt these days.

Toyota has two of the models on the top 10 list (actually there are 11 models overall since the Prius Plug-in tied for number 10 with the Ford Fusion Energi); The Toyota RAV4 EV is the other one on the list. Ford had two plug-ins models – the previously mentioned Fusion plug-in hybrid and the Focus Electric. Chevrolet had two models – the Volt and the fairly new Spark EV. The Tesla Model S with the 85 kilowatt hour power pack made the list at No. 8 (which some people would holler over). The Honda Fit EV finished at second place, the Fiat 500e came in at third, the Mitsubishi i-MiEV was number five, and the Smart ForTwo in coupe and cabriolet versions was number six.

Plug-ins have been getting kudos in high-level ratings this year – even though the competition is tough from fuel efficient gasoline small cars, clean diesel engines, and hybrids.

## Capital Investments

### Green Transportation Publicly Traded Companies

Company	Ticker	Share Price*	52 Week Range*	Market Cap*
<b>AeroVironment</b>	<a href="#">AVAV</a>	\$28.36	\$16.98-\$31.50	\$631.66 million
Supplies electric vehicle charging systems for the Nissan Leaf and other EVs; parent company also produces unmanned aircraft systems and efficient energy systems.				
<b>Ballard Power Systems</b>	<a href="#">BLDP</a>	\$1.53	\$0.57--\$2.39	\$152.55 million
Engages in the design, development, manufacture, sale, and service of fuel cell products. Has a long-standing relationship with Mercedes-Benz for its fuel cell stacks.				
<b>Clean Energy Fuels</b>	<a href="#">CLNE</a>	\$12.75	\$10.63--\$14.82	\$1.14 billion
A natural gas vehicle fueling station infrastructure builder installing stations with airports, municipalities, and fleets across the country.				
<b>Fuel Systems Solutions</b>	<a href="#">FSYS</a>	\$12.42	\$12.25-21.44	\$249.58 million
Fuel Systems Solutions, Inc. engages in design, manufacture, and supply of alternative fuel components and systems for use in transportation, industrial, and power generation markets.				



<b>GasFrac</b>	<a href="#">GFS.TO</a>	\$1.63	\$1.26--\$2.89	NA
GasFrac uses propane and butane in the hydraulic fracturing (fracking) process, not water, which eliminates the troubling groundwater issues affecting the fracking sector; fracking is a growing source of natural gas extraction in the US.				
<b>KIOR</b>	<a href="#">KIOR</a>	\$1.53	\$1.30-\$7.60	\$168.41 million
Renewable fuels company produces and sells cellulosic gasoline and diesel from non-food biomass using its proprietary biomass-to-cellulosic fuel technology platform.				
<b>Quantum Fuel Systems</b>	<a href="#">QTWW</a>	\$7.11	\$1.85--\$7.64	\$130.95 million
Develops and produces natural gas, fuel cell, and other propulsion systems, including producing Ford F-150 plug-in hybrid electric pickups, and renewable energy generation systems and services.				
<b>Rentech</b>	<a href="#">RTK</a>	\$1.65	\$1.55--\$3.18	\$374.25 million
Develops technologies that enable the production of synthetic fuels, renewable power, and hydrogen when integrated with third-party technologies in the US.				
<b>SolarCity</b>	<a href="#">SCTY</a>	\$56.90	\$10.11--\$65.30	\$4.73 billion
Designs, installs, and sells and leases solar energy systems to residential and commercial customers, and government entities in the US; and is working with Tesla Motors.				
<b>Solazyme</b>	<a href="#">SZYM</a>	\$9.49	\$6.81--\$13.09	\$646.77 million
The company's proprietary technology produces renewable oil and bioproducts from a range of plant-based sugars. The company is providing algae diesel with Propel Fuels.				
<b>Tesla Motors</b>	<a href="#">TSLA</a>	\$140.72	\$32.11-\$194.50	\$17.25 billion
The company that brought the high-priced Roadster electric sports car to market before creating joint ventures with Toyota and other OEMs to produce EV technologies, and the Model S.				
<b>Westport Innovations</b>	<a href="#">WPT.TO</a>	\$18.83	\$18.29-\$36.57	\$1.18 billion
Provides low-emission engine and fuel system technologies that enable light, medium, heavy-duty, and high-horsepower petroleum-based fuel engines to use natural gas and alternative fuels.				

*\*As of close of business day Thursday, Dec. 19, 2013.*

## Company News:

**Hydrogen stocks** have been up quite a lot this year – an average of 131% for the market. Hydrogen fuel cell and hydrogen system company stocks have performed well. Plug Power, which makes hydrogen fuel cell systems for off-road vehicles is up 122% this year. Ballard Power Systems, a maker of hydrogen fuel cell systems for a number of industries, is up 133% this year. Quantum Fuel Systems Technologies Worldwide, a maker of fuel systems and drivetrain components for NGVs, EVs, and hydrogen FCVs, has gone up 146% and 261% from its low in April. [Small investors have been the main buyers](#) of hydrogen stock. Institutional owners have keep their stake fairly small.

## Transportation Fuel Prices

### Current Prices

Gasoline, Diesel and E85 US national averages  
Source: AAA's Daily Fuel Gauge Report

**Gasoline** (regular): \$3.212

**Diesel:** \$3.846

**E85:** \$2.794

**E85 (adjusted):** \$3.677

(MPG/BTU)

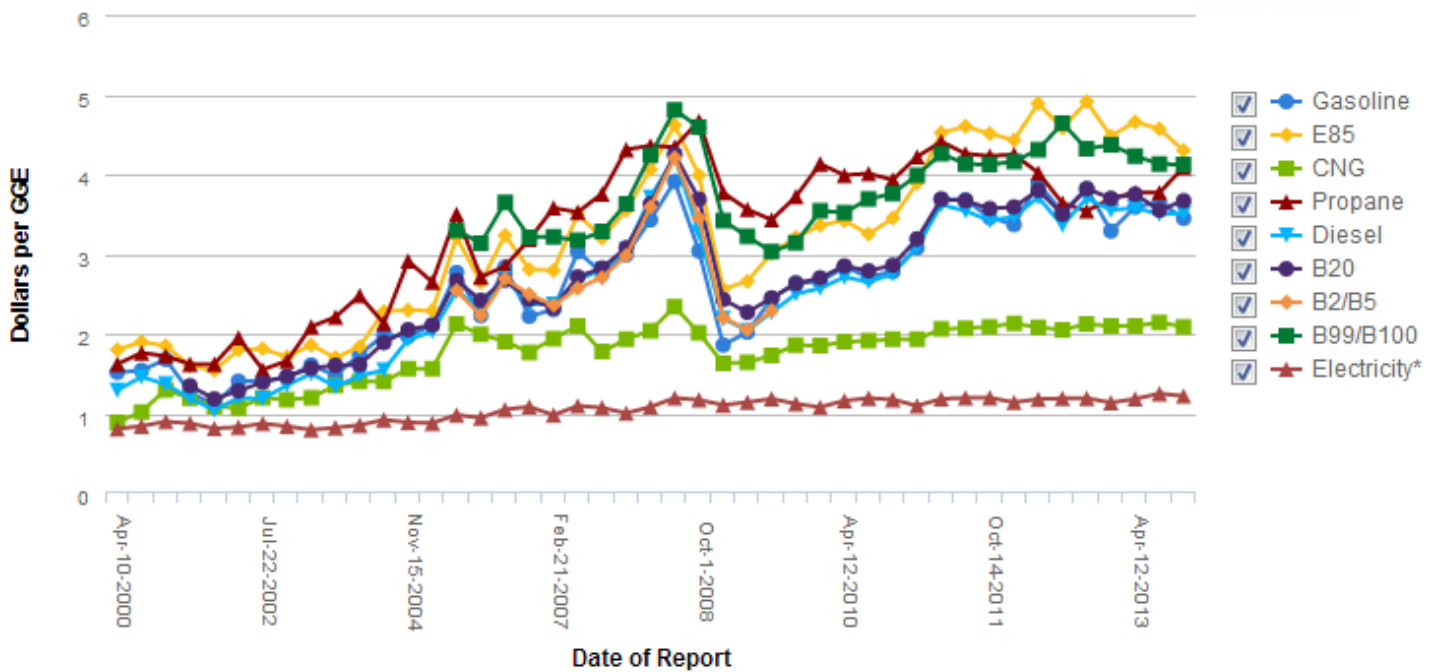
BTU-adjusted price is adjusted by AAA to reflect lower energy content; according to Energy Information Administration, E85 delivers approximately 25% fewer BTUs by volume than conventional gasoline. Pricing information was captured on 12/19/13.

**October 2013 Overall Average Fuel Prices on Energy-Equivalent Basis**

	Nationwide Average Price in Gasoline Gallon Equivalents	Nationwide Average Price in Diesel Gallon Equivalents	Nationwide Average Price in Dollars per Million Btu
Gasoline	\$3.45	\$3.84	\$29.85
Diesel	\$3.51	\$3.91	\$30.39
CNG	\$2.09	\$2.33	\$18.07
Ethanol (E85)	\$4.30	\$4.80	\$37.29
Propane	\$4.09	\$4.56	\$35.46
Biodiesel (B20)	\$3.67	\$4.09	\$31.79
Biodiesel (B99-B100)	\$4.12	\$4.59	\$35.70

Source: Clean Cities Alternative Fuel Price Report

**Average Retail Fuel Prices in the U.S.**



Source: Clean Cities Alternative Fuel Price Report  
GGE is gasoline gallon equivalent

\*Electric prices are reduced by a factor of 3.4 because electric motors are 3.4 times more efficient than internal combustion engines.

**Infrastructure: US Fueling and Charging Stations**

Biodiesel (B20 and above):	328
Compressed Natural Gas (CNG):	644
Electric Vehicle Charging Stations:	6,712
Ethanol (E85):	2,332
Hydrogen	10
Liquefied Natural Gas (LNG):	45
Liquefied Petroleum Gas (Propane):	2,715

Source: Clean Cities Alternative Fuels Data Center