

<a href="#">Home</a>
<a href="#">Topics</a>
<a href="#">Monthly Archives</a>
<a href="#">Resources</a>
<a href="#">Perspective</a>

Google  
  
GCC  Web

Tweets From the Editor  
(different than  
@GreenCarCongres headlines in  
horizontal menu)

## Tweets

 **Mike Millikin**  
@mmillikin  
DOE chief says driverless car sup  
Expand

 **Mike Millikin**  
@mmillikin  
Toyota cheers plan for U.S. hyc

 **Mike Millikin**  
@mmillikin  
Smog war skirmish: Calif. univers

 **Mike Millikin**  
@mmillikin  
2015 Passat w/ plug-in hybrid n  
[Show Summary](#)

 **Mike Millikin**  
@mmillikin  
ABS to Class North America's Fir

 **Mike Millikin**  
@mmillikin

[« Integral Technologies and BASF jointly to explore North American market for automotive applications of Electriplast conductive thermoplastics](#) | [Main](#) | [Statoil makes new oil discovery offshore Canada](#) »

[Twitter](#) [Facebook](#) [Email](#) [Print this post](#)

## Toyota broadly outlines next-generation Prius; developing wireless inductive charging for the plug-in model; bullish on hydrogen

28 August 2013

Toyota's next-generation Prius will deliver significantly improved fuel economy in a more compact package that is lighter in weight and lower in cost, [according](#) to Toyota Motor Corporation (TMC) Managing Officer Satoshi Ogiso. Ogiso—who earlier in his career had been the chief engineer for the Prius, chief engineer for the Prius family, and chief engineer, product planning—made the remarks at the "2013 Toyota Hybrid World Tour" event the company staged in Ypsilanti, Michigan.

The performance of this new generation of powertrains will reflect significant advances in battery, electric motor and gasoline engine technologies. Among the broad technology advances Ogiso outlined during his talk were:

- The next Prius will feature improved batteries with higher energy density. Toyota has stepped up its research, development and production capacity of both NiMH and Li-ion batteries and will use these technologies where appropriate in its expanding focus on electrification of the automobile.

"In its three generations, Prius MPG has improved on average by about 10%, each generation. The challenge to continue to improve at this rate—to beat your own record—becomes very difficult, but makes it all the more motivating. We are very motivated to beat our record."  
—Satoshi Ogiso

Toyota has also ramped up development on new battery technologies such as solid state and lithium air, as well as devoting resources focused on chemistries beyond lithium, such as magnesium and other low-valence materials.

- The next Prius will also feature electric motors that will be smaller in size. Ogiso noted that the current Prius motors have four times the power density of the first model and that "the next will be even higher."
- The gasoline engine in the next-generation Prius powertrain feature thermal efficiency of greater than 40%; the thermal efficiency of the gasoline engine in the current Prius is 38.5%.

To complement these substantial gains in powertrain development the next Prius will ride on a vastly improved chassis, Ogiso said. The next Prius will feature the Toyota New Global Architecture (TNGA). It will have a lower center of gravity and increased structural rigidity. This, along with many other improvements will allow for beneficial gains in ride-and-handling, agility and aerodynamics.

Improved aerodynamics will contribute to an all-new exterior design. Ogiso promised a roomier interior and significant refinements in design, layout and ease of operation.

**Prius PHV.** The next-generation Prius PHV (plug-in hybrid vehicle) is being developed in parallel with the standard Prius model.

*We have been listening very carefully to Prius PHV owners and are considering their requests for additional all-electric range. We have also heard from owners that they would like a more convenient charging operation. In response, we are developing a new wireless/inductive charging system that produces resonance between an on-floor coil and an onboard coil to transmit power to the battery, providing charging without the fuss of a cable.*

—Satoshi Ogiso

Ogiso said verification work on the system will be conducted in Japan, the US and Europe in 2014.

**Hydrogen.** Ogiso re-emphasized the importance of hydrogen fuel cell vehicles, which he said "will be in our future for a long time". Toyota's first commercially available hydrogen fuel cell vehicle will go on sale in global markets in 2015.

This year at the Tokyo Motor show, Toyota will unveil a well-defined mid-size four-door sedan hydrogen fuel cell concept. That vehicle will make its North American debut at the 2014 Consumer Electronics Show in Las Vegas in January.

*For now, I can tell you that the hydrogen fuel cell stack is currently developing 3 kW per liter of power density. We believe that's a "world's best" and about twice that of the fuel stack we have been using for the Highlander fuel cell hybrid vehicle that many of you have driven.* qdash; Satoshi Ogiso

**Motorsports.** Ogiso also highlighted how hybrid technology is influencing motorsports, and how motorsports will aid the development of better hybrid technologies in the future.

The challenge of the hybrid race car has been the added weight of the battery and electric motor, he noted. Toyota's TS-030 uses supercapacitors instead of batteries. The hybrid powertrain integrates a unique inverter, with a 300-hp electric

motor/generator sandwiched between the 6 speed-transmission and the 530-HP V8 engine.

*The extreme nature of racing, tests the durability and reliability limits of vehicle components, systems and software helping make TS-030 the world's fastest and possibly the most effective rolling hybrid laboratory program.*

—Satoshi Ogiso

**Market futures.** In a separate talk, Toyota Motor Sales (TMS) Senior Vice President of Sales Bob Carter issued a challenge for the industry to significantly step up its commitment to hybrids as a core technology.

*Bob Carter mentioned earlier today that to take full effect, hybrid technology must be consumed in high volume. Regulatory push cannot, on its own, induce consumer pull. To truly have an effect, our industry must develop a diverse array of products that consumers are willing to buy.*

*Where the cost premium is low convenience is high and the benefits to the environment and the pocketbook are clear. Which is precisely where we believed hybrids would be, 15 years ago.*

*Today, patience and a long vision are still the cost of admission. Because consumer adoption of less convenient and higher cost technologies have been slow and will continue so. But fifteen years from now, I believe that plug-in hybrids, battery electrics, and especially hydrogen fuel cells could be as common as hybrids are today.*

—Satoshi Ogiso

---

August 28, 2013 in [Batteries](#), [Deepwater](#), [Engines](#), [Fuel Cells](#), [Hybrids](#), [Hydrogen](#), [Smart charging](#) | [Permalink](#) | [Comments \(34\)](#) | [TrackBack \(0\)](#)

## TrackBack

TrackBack URL for this entry:

<http://www.typepad.com/services/trackback/6a00d8341c4fbe53ef019aff0ea146970c>

Listed below are links to weblogs that reference [Toyota broadly outlines next-generation Prius: developing wireless inductive charging for the plug-in model; bullish on hydrogen](#):

## Comments

In 15 years, HEVs would have been around for a total of 31 years. That's a very long time to move from one electrified vehicle generation to the next?

By 2028 (in 15 years) it is a sure bet that PHEVs, BEVs and FCEVs will be common place. In reality, it may come much sooner, or twice as soon?

Tesla Model X, Y and Z will be around much before 2028?.

Posted by: [HarveyD](#) | [August 28, 2013 at 06:07 PM](#)

TESLA IS AGREAT SUCCESS WHERE ALMOST EVERY OTHER NEW ENTRANT HAS FAILED.TESLA HAS TO MOVE QUICKLY TO LOW COST ELECTRIC CAR MAY BE MANUFACTURED IN EUROPE, INDIA AND CHINA TO ENABLE THE WORLD TO GET RID OF POLLUTION,OIL, TERRORISM AND POVERTY. WORLD CAN SURVIVE ONLY IN THIS WAY.

Posted by: [Nirmalkumar](#) | [August 28, 2013 at 11:46 PM](#)

Well, that is a welcome change of direction, since until now each succeeding model of Prius has increased the performance significantly more than it has the fuel economy.

Posted by: [Facebook](#) | [August 29, 2013 at 02:00 AM](#)

So the 4th generation Prius will get about 55mpg (US).

Good, but not exactly earth shattering.

If they could reduce the price as well, it would probably have a bigger impact.

No mention of supercaps for the standard Prius.

On the PHEV thing, it strikes me that what you want is a modular battery so people can decide for themselves how much they want to pay and how much trunk space they want to sacrifice for better E miles or mpg.

The problem is the trunk space - people will happily pay more for better numbers (as you can see with ICE engine size in BMW and Mercedes cars.) Let them slide the price to what they want to pay for the car.

However, if this is also at the cost of trunk space, and suddenly you can't put the golf clubs in the car, then you have a problem.

Nonetheless, I think the small battery PHEV is the way to go (until batteries get really cheap/high capacity).

Posted by: [mahonj](#) | [August 29, 2013 at 02:01 AM](#)

The current Prius consumes 3.9 l/100 km in the NEDC. If we anticipate -10% in Prius IV, we get 3.5 l/100 km. My Focus Station Wagon diesel consumes 3.4 l/100 km in the NEDC. Performance is comparable, trunk space is much bigger in the Focus but cost and perhaps quality differ a lot. If we do not bother too much

about the different energy content per liter for each fuel, fuel consumption is comparable. When Prius IV will be introduced, we could anticipate some diesel cars to offer even lower fuel consumption. This shows the difficulties HEV technology has to compete in Europe with regard to low fuel consumption (and CO2). Of course, diesel fuel has a price advantage in some countries but not in all of them. If we consider that Toyota should compete with Audi, BMW and Mercedes, we should note that generally, they provide at least close to 200 hp but often much more. Although we could consider Toyota to be a premium car, they would have to be competitive also regarding performance with these brands, to be an option to consider by those buyers. Perhaps Prius provide a different kind of image but I will not go into that this time. In summary, Prius provide good fuel consumption but not significantly better than diesel cars, performance is not impressive but could be improved if necessary but at the cost of increased fuel consumption. I think the main problem for HEVs is the cost penalty.

Posted by: [Peter XX](#) | [August 29, 2013 at 04:46 AM](#)

Allowing for charging losses the 100 mile rated Toyota SUV EV with a 40kwh battery pack gets something like 450wh/mile.

At the typical efficiency of the US grid, around 33%, the total consumption including generation and transmission losses is around 1,350Wh/mile

The FCEV version gets 68mpge (1kg of hydrogen) allowing for reforming and compression losses of around a third and taking 1kg of hydrogen at 33kwh, the FCEV uses around 750Wh/mile.

The FCEV also has more space and a lot more range.

Posted by: [Davemart](#) | [August 29, 2013 at 05:17 AM](#)

@Nirmalkumar : your CAPS-lock was stuck, and I doubt if the electric car will save the world, anyhow:

Toyota is clearly on the way of further electrifying the world car fleet, one mile at a time.

"Toyota has stepped up its research, development and production capacity of both NiMH and Li-ion batteries"

That is interesting, because in 2015 the patent rights owned by Chevron on NiMH-plugin batteries are finally no longer valid. Toyota can than finally deliver every Prius with a Plug, as they had always planned to do.

If Toyota implements induction charging very well it may set the standard for his in the industry, and maybe we will see traffic light fast charging introduced.

Posted by: [Larsboelen](#) | [August 29, 2013 at 05:42 AM](#)

Peter,

The Prius's main markets (California and Japan) both effectively outlaw cheap passenger car diesels for public health reasons, so the comparison isn't all that enlightening. If you live somewhere where smog and particulates aren't a big concern, diesel can be a valid option.

It's good to see that Toyota is working on improving handling. The current Prius can be scary at highway speed. That's nothing to do with the hybrid tech, the Corolla is just as bad.

Posted by: [Bernard](#) | [August 29, 2013 at 06:17 AM](#)

I've already got the next-generation Prius plug-in with improved room and handling. It's called the Ford Fusion Energi.

Posted by: [Engineer-Poet](#) | [August 29, 2013 at 08:52 AM](#)

I believe that HEV and PHEV should not share the same engine and drive train. The PHEV should have 1/2 the engine of the HEV version, having 2 cylinders instead of 4 cylinders. This will allow savings in cost, weight, and internal space. The shorter engine in the front will yield room for another battery pack, in order increase trunk space in the rear.

Additionally, in the PHEV version, Toyota's HSD architecture is no longer necessary, nor desirable. Honda Accord PHEV's 2-motor electric CVT is simpler and more functional in the PHEV mode. However, when converting the Honda Accord Hybrid to the PHEV version, the engine, the generator and the motor can all be downsized. The reason for this is that with a smaller engine, there is no need for a large generator. Then, one may ask, why also down size the motor? Answer: the motor can be downsized if in the electric-only mode, the generator can also provide power. In order to do that, another clutch is needed between the engine and the generator. Thus, the engine is declutched, and the generator now can contribute power to the drive train. Thus, instead of having a 124 kW motor, and then another 100kW generator in the HEV vehicle, the PHEV version will only need a 60 kW generator/motor and a 84 kW motor. The advantages of engine and motor/generator downsizing are obviously weight, cost, and space saving in order to make up for the larger battery of the PHEV.

Thus, a dedicated PHEV design from a clean-sheet approach needs not much cost more, nor weight a lot more, nor having less trunk space than a HEV, yet will offer higher saving in fuel cost and more energy independence. This will open for much higher penetration of PHEV than is the case right now. In the future, we may see PHEV's to be predominant over HEV's with battery prices going down and performance going up. BEV's are there to satisfy BEV purists or to satisfy the anti-

ICE faction group, but PHEV's are actually more practical, having dual power plants in one vehicle.

Of course, FCV's will have their own niche, which will grow over time. Do not discount FCV's.

Posted by: [Roger Pham](#) | [August 29, 2013 at 10:06 AM](#)

Strange guy. 40% efficiency and only 55 MPG? With that efficiency you have to be in range of 100 MPG since with only 33% power generation (according Devenmart) efficiency you could go 100 miles with 20 kWh. One gallon is around 33 kWh of energy and you could go only 55 miles.

Posted by: [Darius](#) | [August 29, 2013 at 11:24 AM](#)

@Davemart,  
Actually people throw around that 33% number as "the US grid". But that's really just the average of the coal plants which is now only 37% of US electric generation.

The weighted average for the entire US Grid is actually 39% efficient and getting higher because NG is 42% efficient and replacing coal. Hydro is MUCH more efficient than any of them but is pretty much capped at about 6-7% of the grid here in the US but still helps bring the average efficiency up.

You can do the math by looking at this link and going to the excel spreadsheet on line 1.1:  
<http://www.eia.gov/electricity/monthly/index.cfm>

And the efficiency for each source can be found here:  
[http://www.eia.gov/electricity/annual/html/epa\\_08\\_01.html](http://www.eia.gov/electricity/annual/html/epa_08_01.html)  
Just divide 3,412 by each of the numbers in that second link and you get efficiency for each source over the last 10 years.

Posted by: [DaveD](#) | [August 29, 2013 at 11:56 AM](#)

@Darius:  
These are totally different types of figures, and you can't compare them that way.

Posted by: [Davemart](#) | [August 29, 2013 at 12:03 PM](#)

DaveD:  
I gave grid efficiency, not production efficiency.  
The US grid loses a pretty horrid 7% of its power in transmission.  
<http://www.eia.gov/tools/faqs/faq.cfm?id=105&t=3>

I have done the exercise of looking at each power source in the past, but am not going to repeat it as they bounce around, although it takes some time for the averaged figures over a few years to alter much due to momentum.

At the moment NG prices have risen somewhat, so more coal is being burnt, which has a different efficiency to NG.

NG can be burnt very efficiently, but is often used and peaking power not too efficiently as that costs more, and increasing wind and solar mean that such sub optimal use is increasing.

Nuclear also acts as a stabilising influence, as the efficiency is something like 32% from memory as it operates at a lower temperature than coal or gas turbines, and since that comes out to around 25% after transmission losses and makes up around 18% of electricity it keeps the overall efficiency low, although in nuclear's case it doesn't much matter as the fuel is so cheap and carbon emissions so low.

So I am comfortable in my ~33% figure at the wall socket.  
There is also a surprisingly high 20% loss in charging the batteries in the Leaf, for instance, according to the Leaf owner's forum.

Posted by: [Davemart](#) | [August 29, 2013 at 01:04 PM](#)

@Darius,  
40% efficiency at the engine to the wheel for 55 mpg. For BEV or PHEV, the efficiency is ~75% from wall socket to the wheel for >100 MPGe. All very consistent.

33% at the power plant to the wall socket does not count in the computation. Otherwise, BEV will have lower efficiency from fossil fuel to wheel than HEV from fuel to wheel. This is a well known fact. BEV and PHEV are most efficient when using solar or wind energy directly.

Posted by: [Roger Pham](#) | [August 29, 2013 at 03:34 PM](#)

@Davemart,

Granted, I wasn't counting "to the socket". But you were also using a fairly horrid example in that RAV4 SUV in efficiency. The Model S is ~27% more efficient and the newer models coming on the market like those two VW EVs announced yesterday are twice as efficient as the Model S.

Posted by: [DaveD](#) | [August 29, 2013 at 09:20 PM](#)

@Bernard  
Diesel cars are not outlawed in the USA or in Japan. Please update yourself on the legislations. If people do not buy diesel cars, or car manufacturers do not supply

them, due to the offensive propaganda in both cases that is something else. Regarding particulates, I have conducted measurements on my present car and my previous car. Both have particulate levels lower than the ambient air in the rural area where I live. I am cleaning the air when I am driving. If I drive into the city center, the effect is even greater. Toyota Prius can hardly achieve that. However, due to the flaws in the regulations, we do not even have certification values for particle mass and number from gasoline cars. In the USA, you have not even thought about regulating particle number emissions (the most relevant emission component for health effects) from any type of vehicle. Obviously, the concern for people's health in the USA is not very well developed.

In the absence of a diesel car market in the USA, I could agree that my comparison is more valid for Europe.

Posted by: [Peter XX](#) | [August 30, 2013 at 02:34 AM](#)

@DavidD:

I am using the Toyota because it is a SUV by the same manufacturer. As an SUV, of course it is inefficient energetically.

That seems to me to be the appropriate metric for comparison, just as the efficiency of the grid needs to be measured at the socket.

Posted by: [Davemart](#) | [August 30, 2013 at 07:32 AM](#)

Sorry Devenmart.

It is completely the same figures. Thermal efficiency is thermal efficiency and physics is physics. Probably physics doesn't work with FC.

Posted by: [Darius](#) | [August 30, 2013 at 07:35 AM](#)

Roger Pharm,

MPGe is very confusing therefore I always been against it. I am talking about thermal efficiency of fuel. In case you combust 34 kW of coal with 33 % efficiency according Devenmart you can get 11,5 kWh and on that amount of electricity you could go 50 miles with BEV. BEV efficiency is 75% therefore overall coal to wheels thermal efficiency is 24%. In case coal to wheels thermal efficiency would be 40% I would be able traveling around 80 miles.

The same with gasoline. With 34 kW gasoline energy with 40% thermal efficiency I must go the same 80 miles. That's physics and full stop.

Posted by: [Darius](#) | [August 30, 2013 at 07:52 AM](#)

@Darius:

Physics is the more usual spelling.

That aside, I was talking about grid efficiency, not combustion efficiency, ie after losses from transmission.

The thermal efficiency of an engine is not the power that the wheels get. There are all sorts of losses before it reaches them in the drivetrain and gearbox.

Posted by: [Davemart](#) | [August 30, 2013 at 08:05 AM](#)

P.S.

For me as utility guy is always strange to hear "superb" ICE thermal efficiencies. Very often they exceeding carefully maintained steadily operated super efficient power plant's outputs.

Posted by: [Darius](#) | [August 30, 2013 at 08:15 AM](#)

@Davemart,

OK, you get to pick a sloppy implementation of an SUV because they came from the same company and I can see your logic.

But I'm going to pick the 117Wh/m VW Up! which would use 351Wh/mile by your calculations and wait until ANYONE builds a H2FC vehicle with matching efficiency

Your truly,  
EV fan boy, DaveD  
:-)

Posted by: [DaveD](#) | [August 30, 2013 at 11:42 AM](#)

Peter,

Small diesels are "effectively" outlawed in California because the cost of emissions equipment and of diesel fuel makes them more expensive to purchase, maintain and run than hybrids. Bigger diesels in pickups and German luxury cars do better, but those markets are not as price-sensitive.

The only small diesels sold in CA are the Golf/Jetta and now the Cruze. If you go to fueleconomy.gov, you will see that either of these will run you 70% extra in fuel costs compared to a less expensive Prius. The Cruze diesel actually costs 10% more to run than the cheaper Cruze Eco.

That's why I wrote that small diesels are effectively outlawed at the price-sensitive end of the market. There are lots of diesels sold in heavy trucks and (German) luxury cars.

Posted by: [Bernard](#) | [August 30, 2013 at 03:25 PM](#)

@DaveD:

You are not following the rules of being a proper EV fanboy.  
The Toyota BEV SUV drive package was designed by Tesla, and hence by definition has to be supernaturally good! :-)

In fact, the Tesla S is so heavy that it uses a fair amount of juice too.....

Posted by: [Davemart](#) | [August 30, 2013 at 03:49 PM](#)

[Next »](#)

*Post a comment*

This weblog only allows comments from registered users. To comment, please [Sign In](#).