Are Plug-In Hybrids an Important Transition Option?

Alan Betts

An article in the August issue of *Green Energy Times* debunked the webs of lies about electric vehicles (EVs) that have reduced their sale in the US, where only 5% of new cars sold in 2021 were EVs. Globally the U.S. is second to the bottom in this EV transition. Contrast northern Europe where in Norway, the global leader, 86% of new cars were EVs last year.

One of the strange aspects of the discussion of the transition from gasoline to electric cars is that I have never seen an accurate analysis of the huge impact that efficient plug-in hybrids can make in reducing gasoline use. So here is my analysis based on owning a Toyota Prius Prime plug-in for five years. We have driven a total of 48000 miles through all conditions, summer and winter, and to-date averaged 164 mpg. These figures are on the dashboard when I turn the car on!

The author driving his Prius Prime plug-in hybrid during the winter in Pittsford, Vermont. (Courtesy photo)

How is this possible, when the car has an all-electric range of only 30 mi (less in winter), and the dealer claims that running on gasoline as a hybrid it only gets 54 mpg? I was stunned our first year, so let me explain. First, the plug-in Prime is probably the most efficient vehicle of its type, and it is way beyond a simple hybrid. With computer control on the two coupled engines and electromagnetic braking, its battery is large enough to always recover substantial energy from slowing down, coming down hills or even large mountains (see below).

Many of my trips in Vermont of about 30 miles total between Pittsford and Rutland run all electric. However, consider a 60-mile trip to Burlington, which is twice my electric range. Running on gasoline on rural roads at 50 mph the Prime will average 65 mpg. This means my average with half-trip electric is 130 mpg. If I can plug in a level two charger, which recharges in two hours, this will be my average for the return trip also. If I cannot recharge in Burlington, my 120 mi round trip with only 30 miles on electric will average just under 87mpg. So, for reference a 95-mile trip starting charged uses just one gallon of gas for a 95mpg mean.

These give a realistic sense of the capabilities of an efficient plug-in hybrid. A related perspective is that whether running on electricity or gasoline the Prime is the most efficient car available. At 164 mpg, I have reduced my gas consumption by 85% compared to perhaps 25 mpg for a summer-winter mean for some less efficient hybrids. Practically I have to add about five gallons of gas to my 10-gallon tank every month to drive 10,000 miles per year. A 6-kWh electricity recharge costs about $1, and we have solar panels in an array to pay this.

Now running on the highway at 65 mph, the Prime will still average 60 mpg, so its highway range on its 10-gallon gasoline tank approaches 600 miles – more than any other car. At 75mph and a heavy foot, this drops about 10% to the 54 mpg reported by test drivers!

Consider this 2100 mi long-distance trip lasting 14 days that my wife and I made through mountainous terrain from Vermont through the Canadian Atlantic provinces to the Nova Scotia coast. This illustrates the remarkable overall efficiency. We were able to plug-in a regular 110V socket on all nights except one for the 6 kWh recharge to give us our nominal 30 mile electric range. Our trip average was 82 mpg, which means that going up and down long mountains we still averaged 65 mpg, because energy recovery going downhill typically slips the car back into all-electric mode.

Don't forget that maintenance is much less than for gasoline cars – we are advised to change sparkplugs every ten years, and soon we will have to change the rear brake pads at 50,000 mi. In addition, the Toyota Prius Prime only costs about $27K after credits.

I have been amazed that the technical press and even the Toyota dealer do not provide realistic data and analysis. I think because usage will vary widely, the dealer does not want to be held responsible for misleading the public. Enough smart drivers understand that the waiting list for these cars is months long.

But the energy-aware community can grasp reality: a 120-mile local commute in a Prius Prime starting with a 30-mile electric charge averages 87mpg and reduces daily gasoline consumption by about 70%. It is satisfying buying so much less gasoline for a quiet, comfortable efficient car. The U.S. and the planet badly need this for the transition away from fossil fuel.

Dr. Alan Betts of Atmospheric Research in Pittsford, VT is a climate scientist. See alanbetts.com. ♻