



Developing Sustainable Alternatives to Fossil Energy

There is no such thing as “Zero Emissions”

There is no such thing as a “zero emissions” vehicle; and surprisingly, using ethanol fuel in existing vehicles may be a greener and more cost effective solution to oil imports & climate change than building “eco-friendly” vehicles.

The emissions associated with producing a new vehicle are significant, as are the emissions from producing and using any energy as fuel. This is true even if the vehicle does not actually ‘produce’ emissions (electric vehicles). Epiphergy believes that vehicle fuels and technologies should be compared using Total Lifecycle Emissions (TLE) as a benchmark. TLE takes into account emissions from manufacturing, fuel production, AND vehicle operations.

Manufacturing emissions:

Automobile manufacturing emissions range from 0.10 - 0.14 pounds of co2 per vehicle mile (for family-sized gasoline vehicles) to 0.14 - 0.21 pounds of CO2 per vehicle mile (for comparable electric vehicles).

Simply put, building “eco-friendly” (electric/hybrid) vehicles produces about 50% more emissions than building comparable “gasoline” vehicles or flex fuel vehicles.

Operating emissions:

Burning a gallon of gasoline releases about twenty pounds of carbon dioxide, so the emissions from operating a vehicle on gasoline generally range from 0.6 to 1.0 pounds of co2/mile, depending on fuel economy. Using electricity from fossil sources (at 1.3 pounds of CO2 per kwh), a Chevy Volt’s operating emissions are about 0.25 pounds of co2/mils. In contrast, operating emissions from a Chevy Volt could be under 0.02 pounds of co2/mile if 100% solar electricity is used.

However, ethanol fuel from a solar-powered MicroFueler can also achieve emissions of under 0.02 pounds of co2/mile.

Fuel production:

A MicroFueler uses 3 - 4 kwh of electricity to produce a gallon of ethanol. Using the same amount of electricity, a Chevy Volt (5 - 6 miles/kwh) could travel 15 - 24 miles. If the same amount of electricity yields the same number of miles, then per-mile fuel production emissions are equivalent.

Ethanol is not a “one size fits all” solution

Maybe a brand new ultra eco-friendly vehicle doesn’t fit your needs and/or lifestyle. Maybe it doesn’t fit your budget either. You decide what to drive. You should decide how your fuel is made.

Making a difference:

In many cases, the best option is to simply keep the vehicle you already have and reduce your emissions by using a MicroFueler to make your own ethanol fuel. This avoids the additional emissions from producing a new vehicle (or at least delays them), and also helps you achieve immediate and long-term cost savings.

At 25 mpg and a net production cost of \$0.50 per gallon (\$0.02/mile), ethanol fuel is just as cost effective and environmentally friendly (if not more so) than a similar electric vehicle that gets five miles per kwh at \$0.10 per kwh. The differences are that a MicroFueler costs significantly less than a brand new electric/hybrid vehicle, and the auto industry doesn’t make “electric” trucks, vans, etc.

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Remember, if solar power can be used to charge the batteries of an electric vehicle, then solar power can also be used to operate a MicroFueler. Ultimately, ethanol fuel can be just as “carbon neutral” as solar electricity.

For comparison:

Based on the assumptions as shown, the hypothetical Ford Focus running 100% ethanol achieves a higher efficiency, lower operating cost, and lower overall carbon emissions than the Chevy Volt. In fact, even E85 (85% ethanol, 15% gasoline) emissions and costs are at least comparable with the Volt. This is true in both “Grid Electricity” and “Solar Electricity” scenarios (assuming Volt and MicroFueler both use same electricity).

Modifying the assumptions can create several different scenarios for comparison. Please contact Epiphery to customize this assessment based on your particular situation.

	<i>Electricity</i>	<i>Ethanol</i>	<i>E85</i>	<i>E50</i>	<i>Gasoline</i>
Head to Head Comparison	Chevy Volt	Ford Focus	Ford Focus	Ford Focus	Ford Focus
Vehicle Cost	\$40,000	\$25,000	\$25,000	\$25,000	\$25,000
Miles per gallon (combustion)	n/a	19.6	21.91	27.3	35.0
Miles per kwh (electricity)	5.50	5.60	n/a	n/a	n/a
Manufacturing Emissions (lbs co2/mile)	0.175	0.120	0.120	0.120	0.120
Grid Electricity Emissions (lbs co2/mile)	0.273	0.268	0.228	0.134	n/a
Solar Electricity Emissions (lbs co2/mile)	0.015	0.014	0.012	0.007	n/a
Gasoline Operating Emissions (lbs co2/mile)	n/a	n/a	0.103	0.343	0.686
Grid: Total Mfg + Op Emissions (lbs co2/mile)	0.448	0.388	0.451	0.597	0.806
Solar: Total Mfg + Op Emissions (lbs co2/mile)	0.190	0.134	0.235	0.470	0.806
Amortized Vehicle Cost (\$/mile)	\$0.267	\$0.167	\$0.167	\$0.167	\$0.167
Grid Electricity Cost (\$/mile)	\$0.022	\$0.021	\$0.018	\$0.011	n/a
Solar Electricity Cost (\$/mile)	\$0.036	\$0.036	\$0.030	\$0.018	n/a
MicroFueler Cost (\$/mile)	n/a	\$0.033	\$0.033	\$0.033	n/a
Other Fuel Costs (\$/mile)	n/a	\$0.030	\$0.038	\$0.058	\$0.086
Grid: Total Operating Costs (\$/mile)	\$0.288	\$0.251	\$0.256	\$0.268	\$0.252
Solar: Total Operating Costs (\$/mile)	\$0.303	\$0.265	\$0.268	\$0.276	\$0.252

Assumptions	
Miles driven per year	15,000
Gasoline Cost	\$3.00
Ethanol cost	\$1.00
Grid Electricity: Lbs CO2/kwh (1.3 - 1.8)	1.50
Solar Electricity: Lbs CO2/kwh (0.04 - 0.11)	0.08
Gasoline: Lbs CO2/gallon (20 - 25)	24
Ethanol Mileage Penalty	44%
Grid Electricity Cost per kwh	\$0.12
Solar Electricity Cost per kwh	\$0.20
MicroFueler Installed Cost	\$5,000.00
MicroFueler Gallons per year	1,600
MicroFueler & Vehicle Life Span (years)	10