

EV ECONOMICS – Spring 2011

By

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INTRODUCTION

Spring 2011 are proving to be quite exciting for the EV enthusiasts as gasoline prices increase to \$4/ gal.

At the close of 2010, the Chevrolet Volt and the Nissan Leaf became available. Both have been highly publicized. There are two questions:

- 1. Does the hype live up to reality?*
- 2. What is the true cost?*

You will have to answer the first. The Volt has already been criticized for being a hybrid instead of a true electric. The Leaf has raised questions because buried in the fine print it may only do 100 miles at 22 mph. This is not much different than a conversion costing much less.

In our economic analysis, six vehicles were compared on a cost/mile basis. The vehicles were a 2011 Toyota Camry (gasoline), a Prius Hybrid, a 144V EV Conversion with lead acid batteries, an EV Conversion with Lithium batteries, the Chevrolet Volt, and the Nissan Leaf.

ANALYSIS

Table 1 presents the initial cost for the four vehicles. For the conversion, the additional cost of components and batteries were included. Then the fuel cost, maintenance cost, insurance cost, and interest cost was estimated. These are only estimates because the actual cost may vary from state to state (e.g. insurance cost, fuel cost). Maintenance cost for the Volt and Leaf are unknown. Although it was boldly assumed that they would be equal to the Camry; they might be 50% higher adding 2-3 cents/mile. The conversion was assumed to be equal to the other vehicles even though most of the maintenance will be done by the owner.

The Toyota Camry life cycle cost is \$.47/ mile at \$4/gal. Each \$.50 increase in the Cost of gasoline adds \$.02 per mile.

For the Chevy Volt, use of gasoline was not assumed. This could add up to \$.08 / mile if totally run on gasoline, similar to the Toyota Camry.

For the Nissan Leaf, the additional cost associated with the charger and its special installation are not included in the evaluation. This cost may be \$2000-\$4000. The Nissan Leaf has many claims regarding range from 62-138 miles based on various driving cycles.

(<http://www.nissanusa.com/leaf-electric-car/tags/show/performance#/leaf-electric-car/range-disclaimer/index>)

Do your own analysis; see if you come to the same conclusions? Please let us know.

CONCLUSION

The general conclusions from this analysis are:

- Both conversions have a lower cost/ mile compared to buying a new vehicle. That should not be a surprise.
- The Lithium conversion is lower than the lead acid conversion. This assumes 5 year life for the lithium battery. The warranty is typically only 2 years.
- The Chevrolet Volt has the highest cost/mile compared to the other vehicles even when no gasoline is consumed. The cost is 62% higher than a simple conversion.
- The Leaf did better than the Volt only because of its lower initial costs.

Anyway, enjoy!

**TABLE 1
ECONOMIC
COMPARISON**

Parameter	2011 Toyota Camry Gasoline	2011 Toyota Prius Hybrid	Electric Conversion Lithium	Electric Conversion Lead Acid	Chevrolet VOLT Electric	Nissan LEAF Electric Notes 3,4
Vehicle						
Price	\$22,000	\$23,800	\$3,000	\$3,000	\$40,000	\$33,500
Tax Credit - Note 5		\$0	\$2,250	\$1,300	\$7,500	\$7,500
Life / miles	100000	100000	50000	50000	100000	100000
Use (miles/ year)	12000	12000	12000	12000	12000	12000
Life, years	8.3	8.3	4.2	4.2	8.3	8.3
Salvage Value	\$6,819	\$7,376	\$1,000	\$1,000	\$10,073	\$8,058
Cost/ Mile	\$0.15	\$0.16	-\$0.01	\$0.01	\$0.30	\$0.25
Conversion Cost						
Price			\$7,500	\$7,500		
Life / miles			50000	50000		
Use (miles/ year)			12000	12000		
Life, years			4.2	4.2		
Salvage Value			\$2,500	\$2,500		
Cost/ Mile			\$0.10	\$0.10		
Battery Cost			Lithium Ion	Lead Acid		
Price			\$12,000	\$2,500		
Life / miles			60000	12000		
Use (miles/ year)			12000	12000		
Life, years			5.0	1.0		
Salvage Value			\$1,000	\$0		
Cost/ Mile			\$0.18	\$0.21		
Total Cost - Net	\$22,000	\$23,800	\$20,250	\$11,700	\$32,500	\$26,000

Electricity Cost						
\$/ kw-hr (Note 6)		\$0.13	\$0.13	\$0.13	\$0.13	\$0.13
miles/ kw-hr		NA	4	3	4	4
Fuel Cost/ mile		\$0.00	\$0.03	\$0.04	\$0.03	\$0.03
Fuel use						
Range, miles/ charge	NA	40	84	47	40	68 - 138
miles/gal	25	50				
\$/gal	\$4.00	\$4.00				
Fuel Cost/ mile	\$0.16	\$0.08				
Maintenance (\$/mile)						
	\$0.05	\$0.05	\$0.05	\$0.05	\$0.05	\$0.05
Insurance (\$/mile)						
	\$0.07	\$0.08	\$0.01	\$0.01	\$0.13	\$0.11
Interest (\$/mile)						
	\$0.04	\$0.04	\$0.01	\$0.01	\$0.05	\$0.04
Summary (w/tax credits)						
Total Cost	\$22,000.00	\$23,800.00	\$20,250.00	\$11,700.00	\$32,500.00	\$26,000.00
Life Cycle Cost (\$ / mile)	\$0.47	\$0.41	\$0.38	\$0.43	\$0.56	\$0.49
Additional Cost/Year	\$1,117	\$411	Base	\$658	\$2,254	\$1,338

Notes:

1. At \$3.50 /gal the Camry life cycle cost is \$0.45 / mile.
2. A 10% tax credit is available for conversions.
3. Does not assume the cost of special chargers
4. Nissan Leaf range varies based on driving cycle.
5. Toyota Hybrid tax credit phased out.

6. Average U.S. Electric rate Ref: <http://www.eia.doe.gov/emeu/steo/pub/gifs/Fig23.gif>

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