

January 19, 2011

A great misconception on lithium ion batteries is that they are so expensive because of the lithium content. In reality, lithium makes up only a tiny proportion of the battery cost.

Here's why:

According to the Wall Street Journal, "Nissan will spend less than \$18,000 on the battery, which would mean less than \$750 per kilowatt hour, said Mark Perry, the chief product planner for Nissan North America.

"That is below an estimate of the cost of such batteries of \$1,000 per kilowatt hour put out by PriceWaterhouse Coopers."

Lets use the Nissan Leaf as an example. The car carries a 24kWh battery, which costs to \$18,000 produce.

According to [Jon Hykawy](#), a researcher at Byron Capital Markets, the Nissan Leaf contains about 4kg of lithium metal, equivalent to 21kg of lithium carbonate. According to the [USGS](#) [pdf], lithium carbonate in 2009 cost \$4.47 per kg. Hykawy states that the price of battery-grade lithium carbonate is actually more like \$5.70 per kg.

Thus, the Nissan Leaf contains \$120 of lithium carbonate. That's 0.6% of the cost of the battery.

We can generalize and use the PriceWaterhouse Coopers figure of batteries costing \$1,000 per kwh. An electric vehicle requires between 1.4-1.5kg of lithium carbonate per kWh, or \$8.55. Thus lithium carbonate is less than one percent of the cost of a battery.

Here's how the [US Department of Energy Argonne National Laboratory](#) puts it:

The actual lithium compound used to make cathode materials, lithium carbonate ( $\text{Li}_2\text{CO}_3$ ), is considerably less expensive. The price history of lithium carbonate is shown in Figure 5.6. The average price reported for lithium carbonate in the United States at the end of 1999 was \$4.47/kg (\$2.03/lb). However, increased production in Chile and Argentina has led to a recent oversupply, and actual prices paid have been as much as 50% below the list, matching the price of only \$0.90/lb from Chile and Argentina. A shutdown of the Argentine production due to process problems caused the price to rise again, but the price was still below list in early 2000 (Ober 2000). Recycled materials and sales from DOE stock put further downward pressure on prices. Large demand for batteries could eventually drive the price up. **At the current list price, the lithium carbonate for the batteries in an EV like the Altra would cost about \$100, and the material for an HEV battery would cost about \$5.**