

BATTERY CHEMISTRY AND ECONOMICS

At current metal prices, the gross contained metal value of the cathode materials in a typical 85 kWh electric vehicle (EV) battery pack, weighing about 500 kg, for the most popular battery chemistries are estimated as follows:

	BATTERY CHEMISTRY					IN BATTERY TOTAL VALUE	BATTERY \$6.60/kg TIPPING FEE**
	LITHIUM	COBALT	NICKEL	MANGANESE	ALUMINIUM		
Price (\$/kg)*	\$42.29	\$60.00	\$10.14	\$1.98	\$1.80		
Lithium Cobalt (LCO)	11kg	93.7kg	0kg	0kg	0kg		\$3.00/lb
Est. Value	\$465.19	\$5,622.00	\$~	\$~	\$~	\$6,087.19	\$3,300.00
Nickel Manganese Cobalt (NMC)	9.7kg	27.5kg	27.4kg	25.6kg	0kg		
Est. Value	\$410.21	\$1,650.00	\$277.84	\$50.69	\$~	\$2,388.74	\$3,300.00
Nickel Cobalt Aluminium (NCA)	8.5kg	10.9kg	57.7kg	0kg	1.7kg		
Est. Value	\$359.47	\$654.00	\$585.08	\$~	\$3.06	\$1,601.60	\$3,300.00

Tonnes of Cobalt per 100,000 batteries***

LCO 9,370 tonnes NMC 2,750 tonnes NCA 1,090 tonnes

* Converted from carbonate to metal prices for Nickel, Aluminium are sourced from Kitco.com; for Electrolytic Manganese Dioxide at USGS; for Lithium sourced from the Outsiders Club, and Cobalt from infomine.com

** Currently a tipping fee of \$3.00/lbs is charged per battery.

*** The cathode scrap market which represents 10% of all the production, requires no disassembly. Scraps are a perfect feed stock for American Manganese recycling program allowing the company to potentially eliminate tipping fees and offer other potential inducements to the battery manufactures to deliver their scrap cathode material for recycling.