

NICKEL NOT NEEDED FOR FUTURE EV BATTERIES

FUTURE EV BATTERIES - NO NICKEL

- Today's energy dense batteries use lithium, nickel and cobalt creating a very expensive product.
- Nickel is selling at \$20,000 to \$30,000 per tonne while alternate battery materials such as iron, sulfur and sodium are only hundreds of dollars per tonne.
- Auto manufacturers realize EV's will only be successful when low cost batteries are available - no nickel / cobalt.
- This is driving heavy investment in new EV battery chemistries eliminating expensive metals (like nickel).
- Industry is currently shifting to lower cost lithium Iron phosphate (LFP) batteries in standard range EV's.
- LFP batteries (with no nickel) offer many advantages: higher thermal stability (much safer), longer battery life, higher charge levels, better low temperature performance for Northland, and much lower cost.

Tesla reported in 1Q22 earnings statement that nearly one half of its vehicles shipped with non-nickel LFP batteries. They will shift their entire fixed storage (Powerwall) battery line to LFP this year.

MINNESOTA NICKEL WILL MAKE NO DIFFERENCE IN THE GLOBAL SUPPLY

- Only 0.5% of the world's supply of nickel comes from the US (Michigan Eagle Mine) (USGS Survey)
- US only possesses 0.375% of the worldwide reserves of nickel (Michigan and Tamarack) (USGS Survey)
- Instead of shipping this nickel into global markets / China, should we not save our reserves for the future?

NEW SODIUM-ION BATTERIES

- CATL, world's largest supplier of EV batteries announced the launch of a sodium-ion battery for 2023.
- NATRON also producing sodium-ion batteries for fixed applications.
- Recharge faster than lithium-ion cousins, much better cold weather performance important for Northland.
- Energy density currently falls short in comparison to lithium batteries but will improve over time.
- These batteries eliminate lithium, nickel and cobalt so MUCH less expensive

NEW HIGH ENERGY EV BATTERIES

- Lithium-sulfur batteries have potentially 3-5 TIMES the energy density of the best li-nickel batteries.
- Lyten Company next generation lithium-sulfur (Li-S) batteries are safer, charge faster, perform better in low temps, and have much higher density than li-nickel based battery packs.
- Theion GmbH is a Berlin-based battery startup focusing on lithium-sulfur batteries.

The success of the EV market depends on low cost EV batteries - no nickel or cobalt. Introducing LFP batteries today, followed by sodium-ion, li-sulfur and other new battery chemistries promise to eliminate nickel from EV batteries.

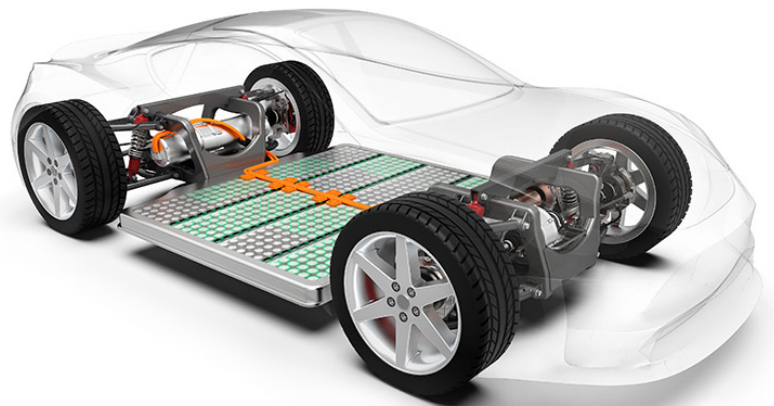
* USGS Survey - <https://pubs.usgs.gov/periodicals/mcs2023/mcs2023-nickel.pdf>

* Tesla - <https://www.recurrentauto.com/research/lfp-battery-in-your-next-ev-tesla-and-others-say-yes>

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