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 about \$15,000 per tonne (02/2025) while alternate 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.
- There is heavy investment in new EV battery chemistries that do not need 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), 2 times the battery life, higher charge levels (100%), and much less expensive.

Tesla reported in 1Q22 earnings statement that nearly one half of their vehicles shipped with non-nickel LFP batteries. They have also transitioned their fixed storage systems to LFP batteries. In 2024 the LFP market share in China was 78% - 64% of all EVs are sold in China.

MINNESOTA NICKEL WILL MAKE NO DIFFERENCE IN THE GLOBAL SUPPLY

- USGS reports that only 0.22% of the world's supply of Nickel comes from the US (Michigan Eagle Mine)
- US only possesses 0.24% of the worldwide reserves of Nickel (Michigan and Tamarack)

NEW SODIUM-ION EV BATTERIES

- On November 18, 2024, CATL announced its second-generation sodium battery.
- New battery will be launched in 2025 with an energy density expected to exceed 200 Wh/kg (on par with LFP batteries).
- Mass production of the new product is not expected before 2027.
- NATRON (natron.energy) is also producing Sodium-Ion batteries for fixed applications.

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
- New Iron (metal) / air batteries under development are poised to address fixed storage markets

The success of the EV market depends on low cost EV batteries - no Nickel or Cobalt. Introducing LFP batteries today, followed by Sodium-Ion and Li-Sulfur promise to eliminate Nickel from EV batteries

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