The Cobalt Supply Chain and Its Impact on Life Cycle Assessment of Lithium-ion Battery Energy Storage Systems

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Why Are We Studying Cobalt Supply Chain?

• Cobalt is used in many battery electric storage systems, especially those in EV’s
• Mining and processing cobalt ore leads to environmental impacts
• Understanding where, when and how impacts occur can help industry design lower environmental routes and processes

What are some Questions We Seek to Answer?

• How will changes in ore quality impact environmental footprint?
• How will changes in refinery locations affect environmental footprint?
• How do impacts of different battery chemistries compare?
LCA of Global Supply Chain for Cobalt – Cradle-to-Gate

Source: created with data on various company reports
Scenarios Considered

- 1 Mining location – Democratic Republic of Congo
- 3 Battery chemistries – NMC111, NCA, NMC811
- 3 Refining locations – China, Canada, Finland
- 10 Ore grades – ranging from 0.1 – 1.0%

90 scenarios total
Results

Impact of ore grade on GWP per 1 MWh storage

Impact of refining location on GWP

GWP from batteries, including augmentation and replacement
Results

Variation in GWP with ore grade, refining location, and battery chemistry

Single score results of environmental impacts for the defined scenarios for an ore grade of 1.0%

Das et al. (2023)
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Any Questions?