



***Nickel – Canada’s Energy Advantage  
for the Electric Revolution***



# Topics

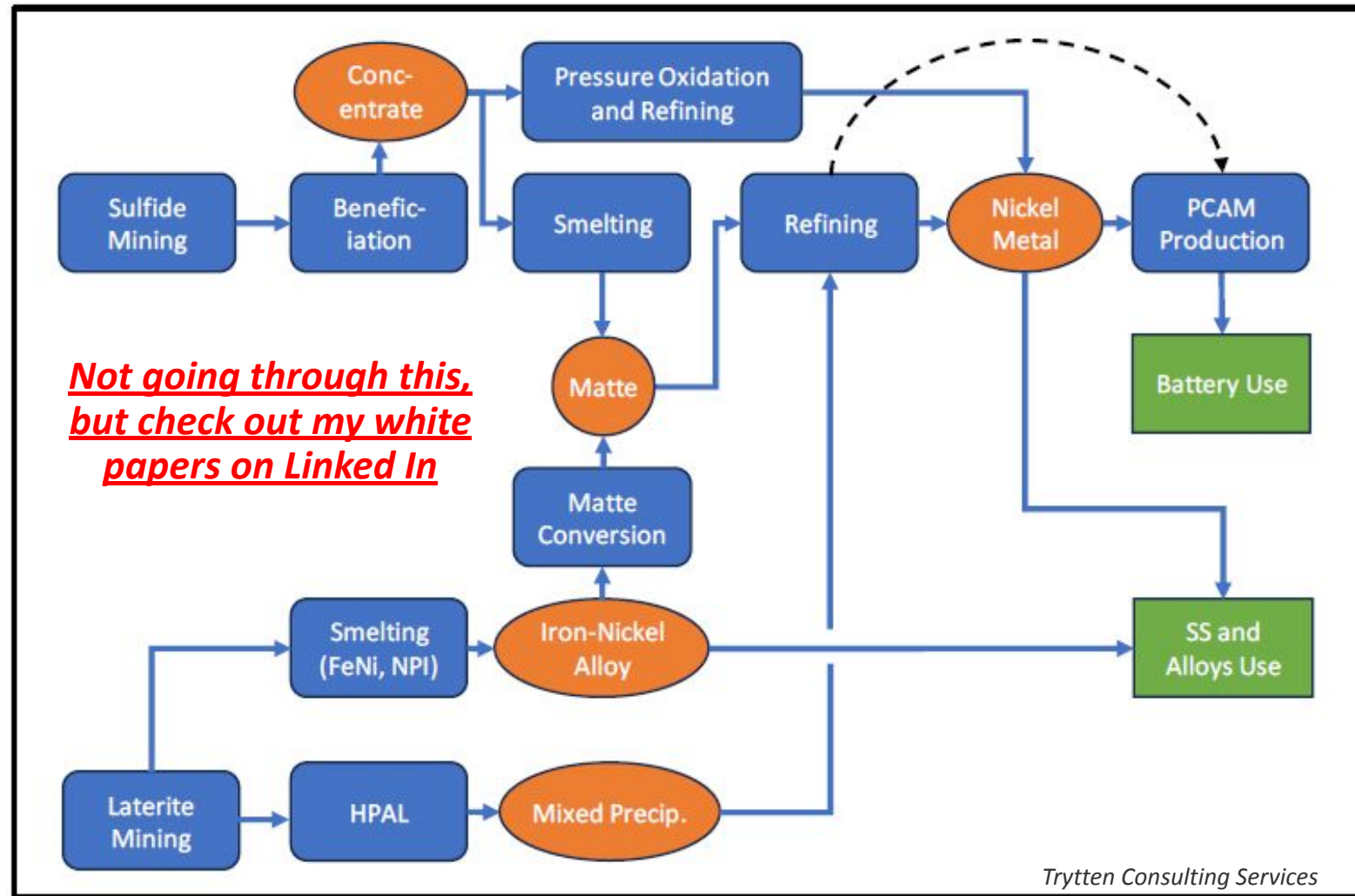
## ■ Why Nickel?

Critical Mineral for key areas including electrification, defence

## ■ Outline

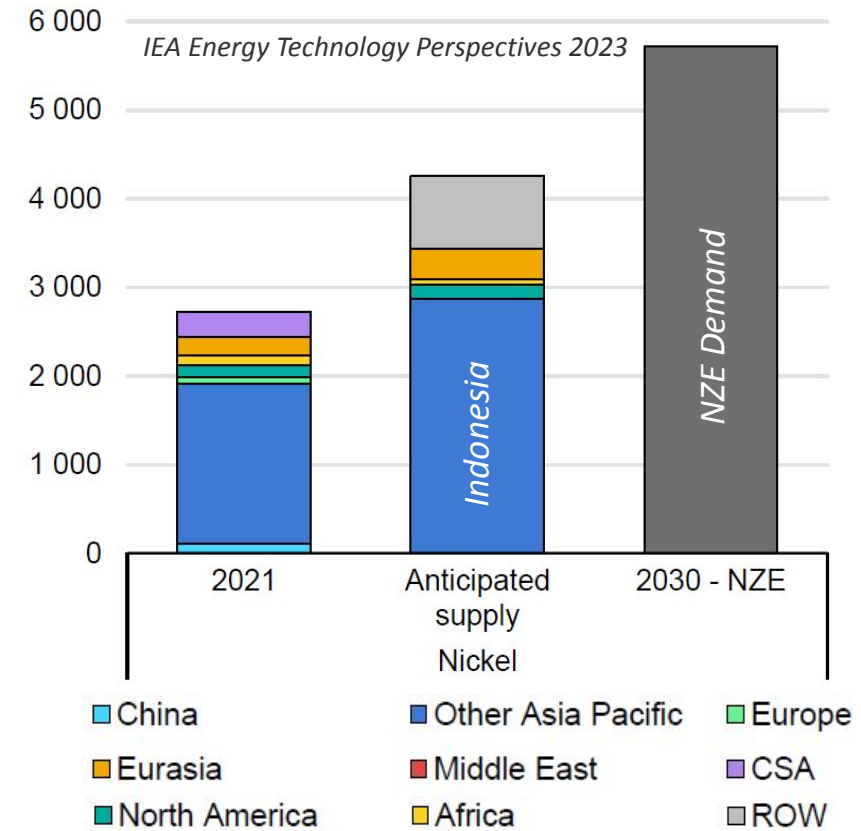
- Global Overview
- Canadian Overview
- Canada's Energy Advantage
- Nickel Supply Issues

## Major Global Nickel Processing Routes



# Global Overview

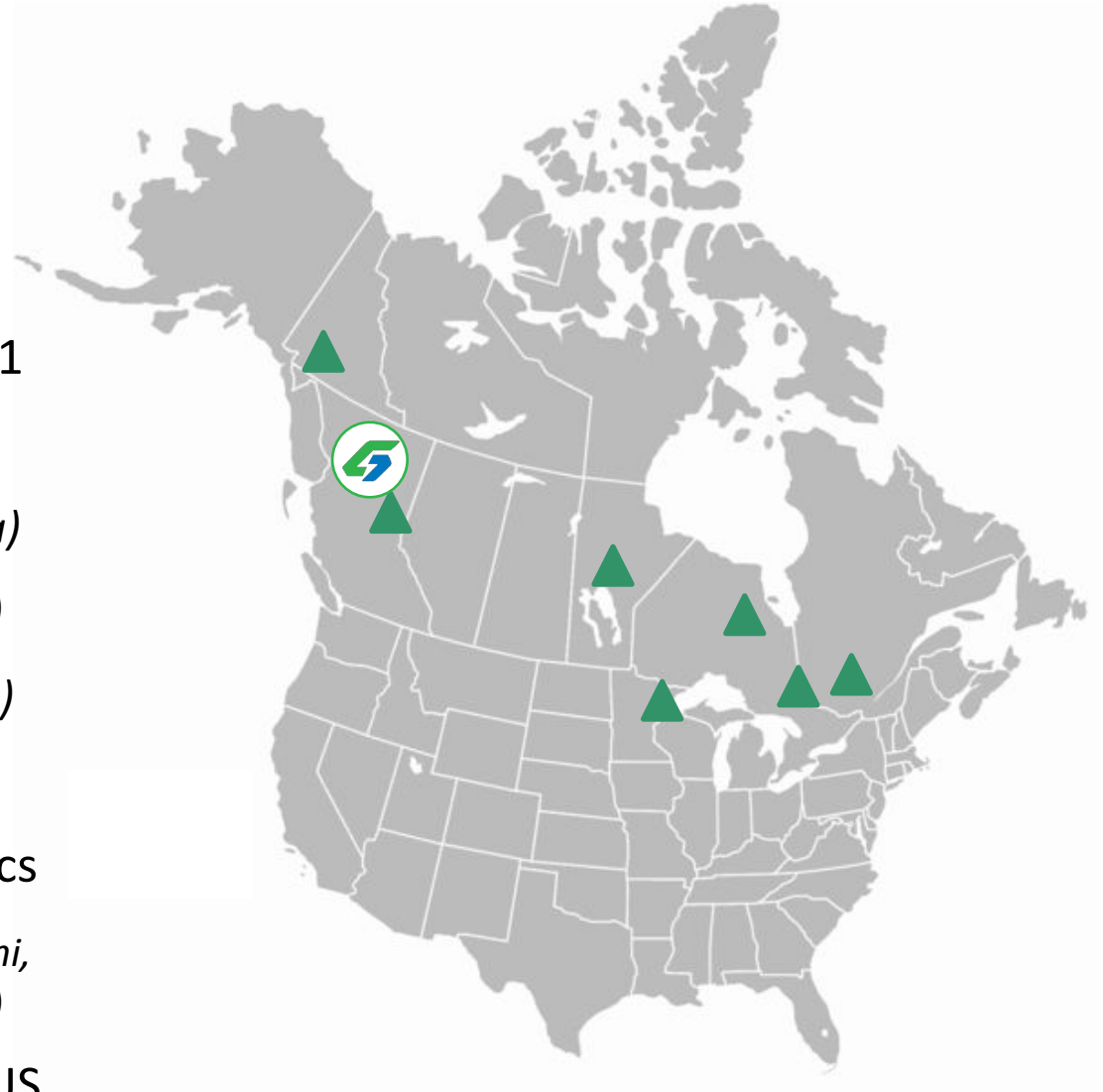
- Used in SS/alloys (75%, 2.3% CAGR), batteries (11%, **13% CAGR**)
- Sold in three finished forms: Class 1, Class 2, chemical
- Two dominant mineral forms: laterite (oxide) and sulfide
- Majority of global production, resources, and growth from laterites
  - ~3.5 Mt global supply, ~50% from Indonesia (Class 2, increasing chemical)
  - New Class 1 supply from China
  - 7.5% CAGR supply last 8 yrs
- Other large suppliers: China ↑ Russia ↓ Japan ↓ Australia ↓ Canada ↓
- No great projects: high grade and production, long-life, good location



**2040 demand**  
**7.6 Mt/y**  
**49% batteries**  
**40% stainless steel**  
*(Benchmark Mineral Intelligence per Giga PFS)*

# Canadian Overview

- Canada was globally dominant (1960s/70s)
- Nickel mines, smelters, and refineries □ Class 1
- All Canadian nickel mines are sulfides
- Most concentrate treated in Canada (*1 to China*)
- One smelter exports intermediates (*to Norway*)
- One refinery imports intermediates (*from Cuba*)
- Production falling
- Many new projects with range of characteristics
- Some projects with major partners (*i.e. Mitsubishi, Outokumpo, Anglo American, Agnico-Eagle, Samsung SDI*)
- Massive supply and resource advantage over US

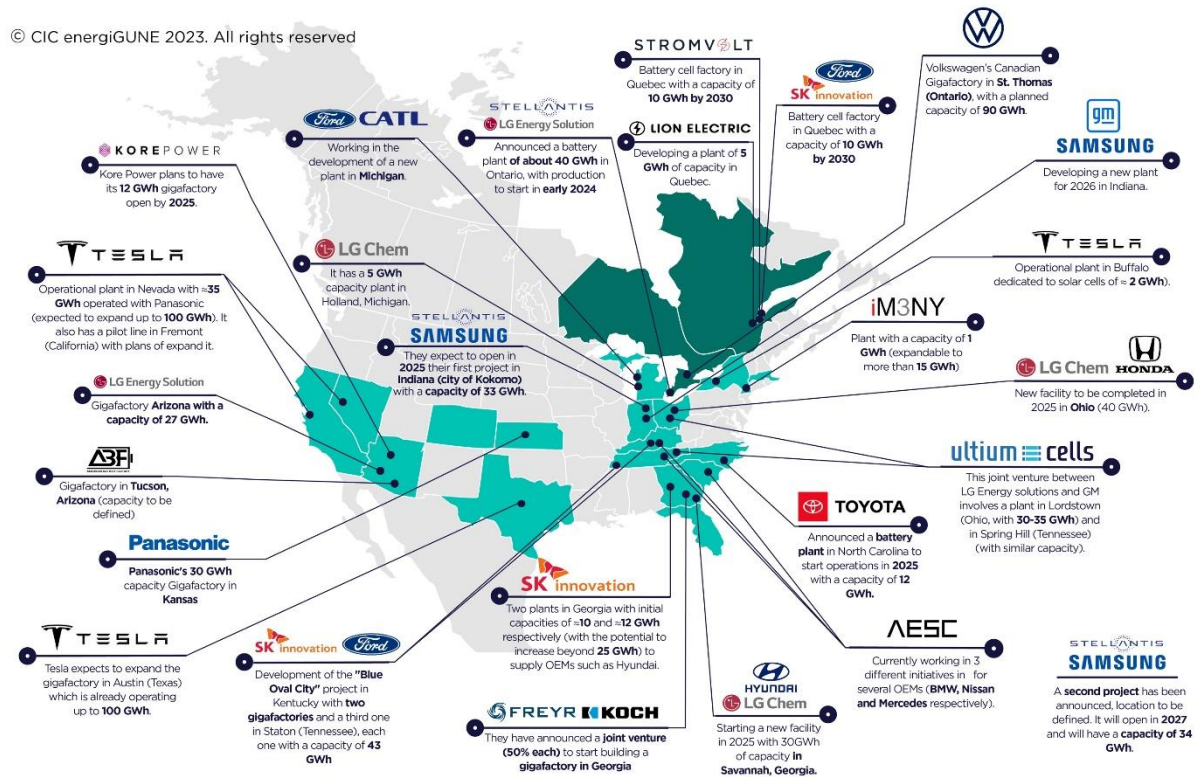


# Canada's New Energy Advantage

- **Nickel gives NMC/NCA batteries high energy density**
  - Ni content is increasing: NCA 85% Ni, NMC 50-80% Ni  
*Tesla and others testing 90% Ni*
  - Range anxiety a limiting factor for EV in North America
- Supply chain for new gigafactories is not resolved
- US needs ally production to avoid China dominance
  - IRA provisions
- **250,000 to 450,000 t/y of new nickel supply needed to feed announced battery projects in North America**
  - ~10 new large mines plus downstream processing
  - Demand depends on mix of LFP, nickel-rich, other

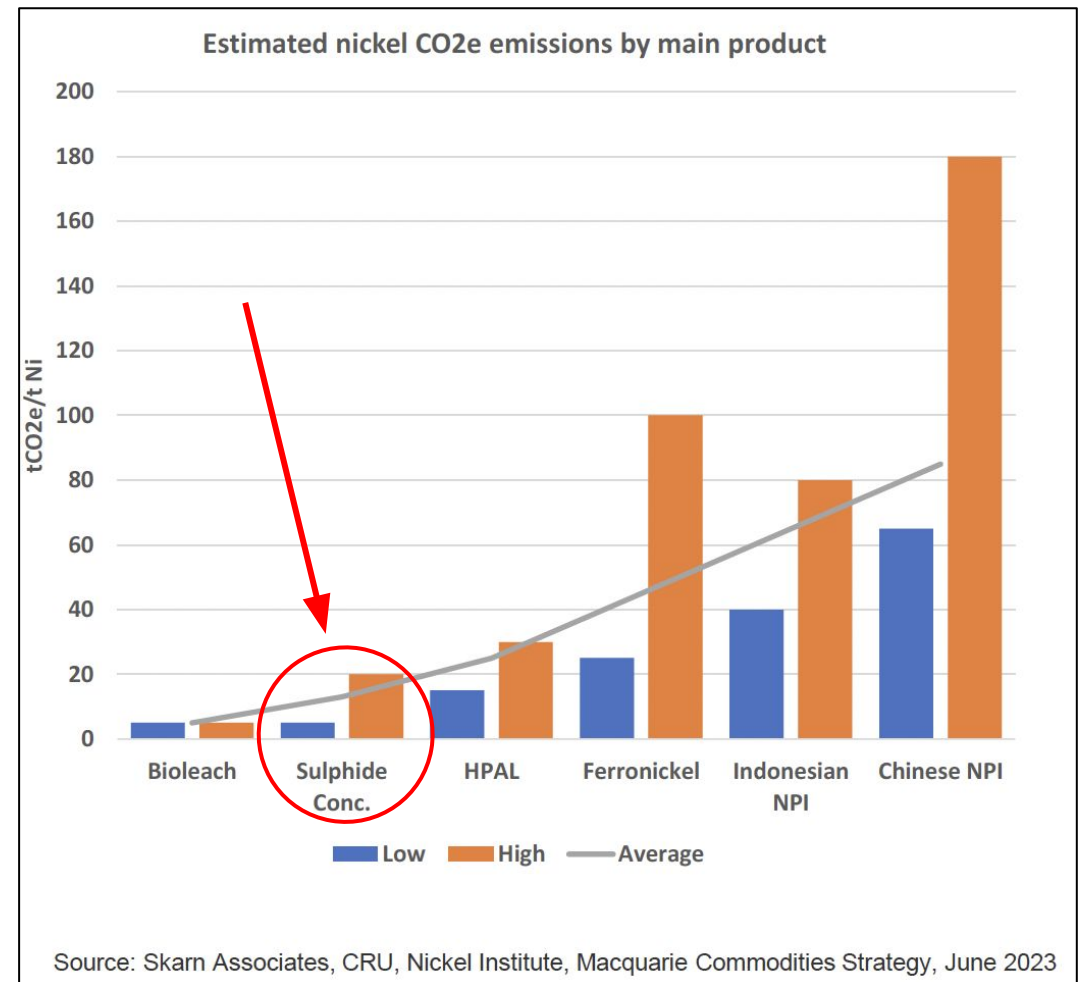
## NORTH AMERICAN BATTERY INITIATIVES

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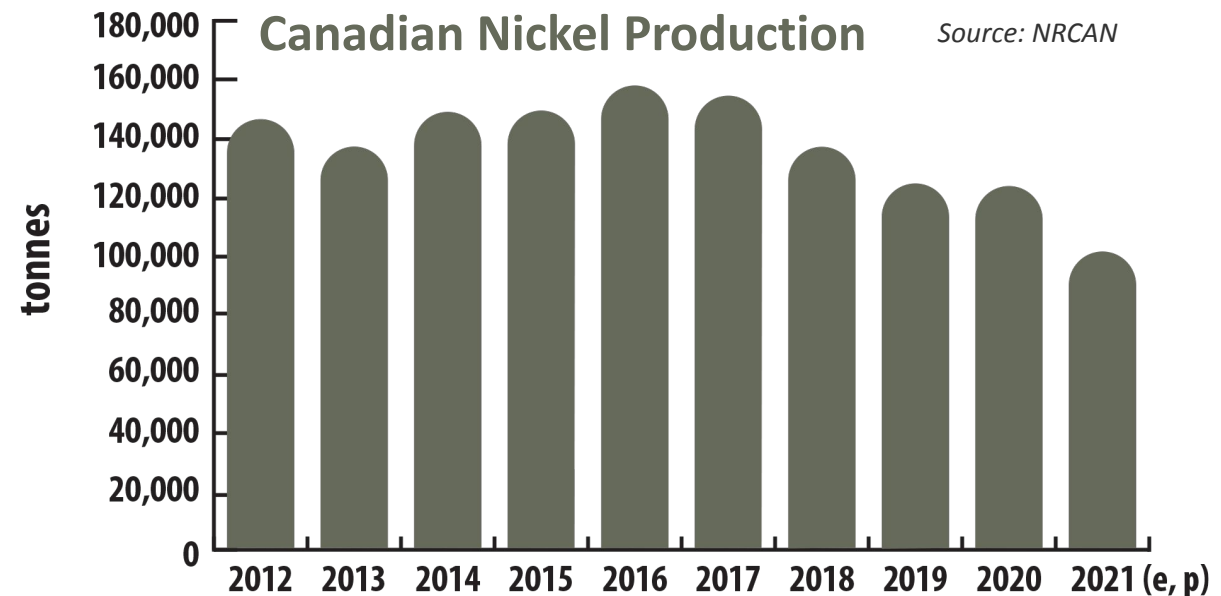
# Why Canadian Nickel is so Important

- Western EV buyers, manufacturers want **clean Ni**
- Laterite projects have higher carbon emissions, some with other ESG issues
- Sulphide projects have lower GHG intensity due to ore beneficiation, sulfur □ energy
- Canadian projects should be amongst lowest GHG globally **if hydro powered**
- Most new supply at higher end of carbon curve



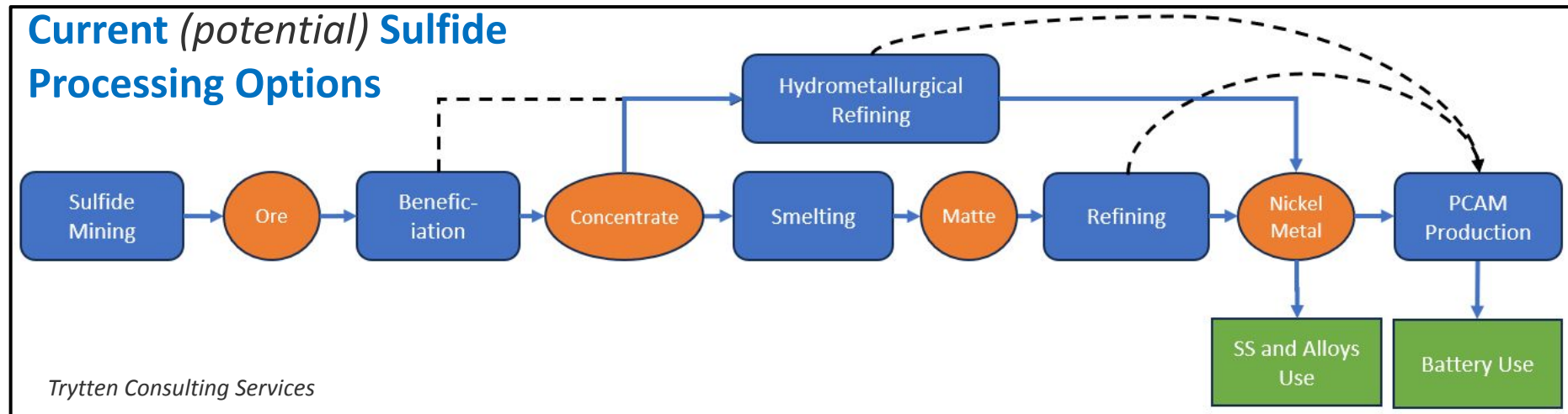
# Nickel Supply Issues

- Domestic production has been **falling: mines deplete** and close or are renewed
- No announced significant processing capacity additions
- Several new mining projects from PEA to FS: **not enough** to meet domestic demand
- Mine financing is challenging; nickel market surplus
- Mine and refinery Catch-22
- **Recycling is not the answer for 30 yrs or more**
- Giga factories take a few years, **a mine takes a decade** or more
- Every concentrate and processing facility is different – can there be **one solution?**



# Nickel Supply Issues - Processing

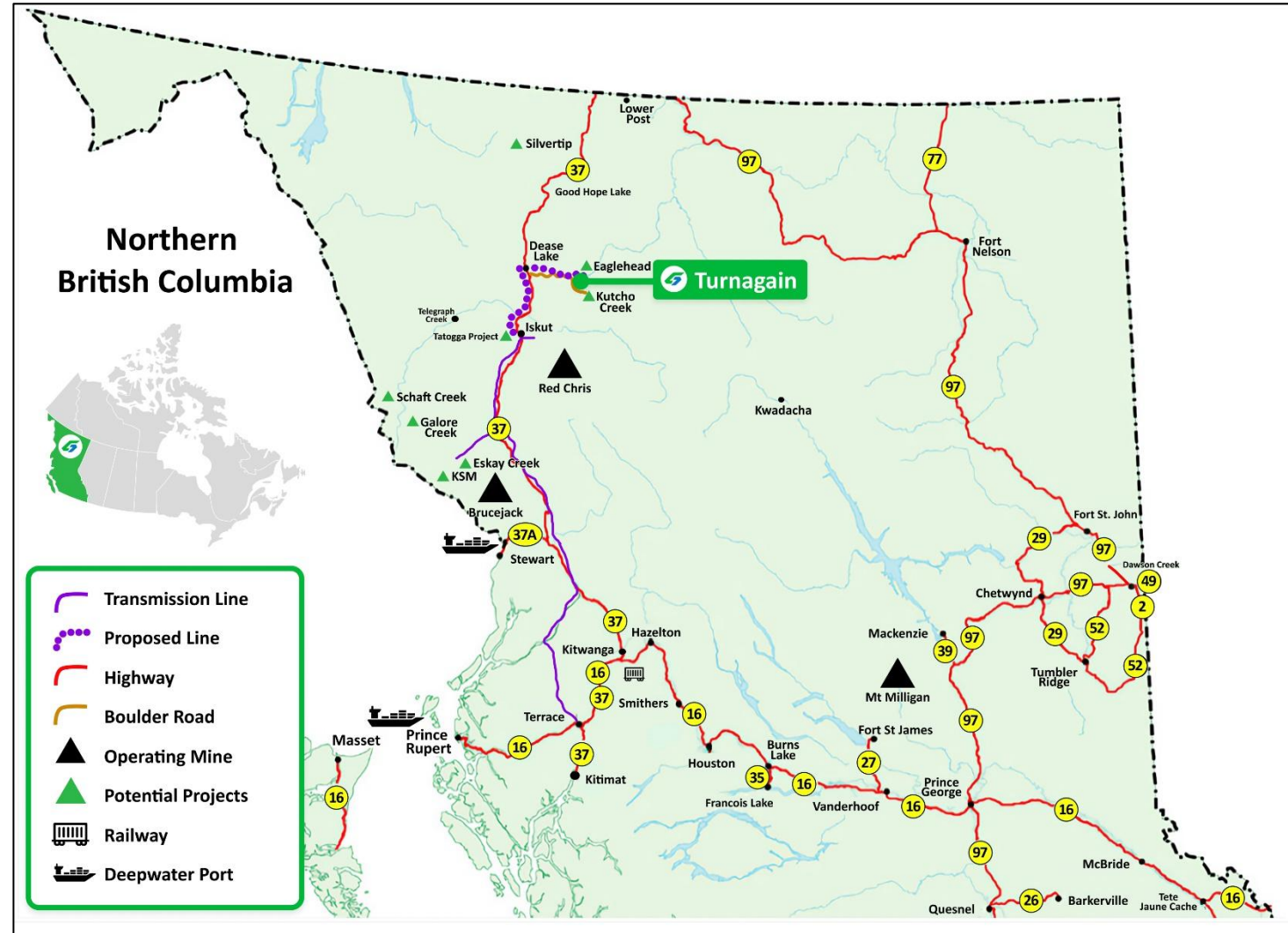
- Different feed mineralogy □ different process needs
- Multiple processing methods for operational sites – in Canada and globally
  - Beneficiation and downstream processing
- Process options not yet widely adopted for nickel – will they ever be?
  - Roasting, heap leaching, alternate reagents, etc
- Potential to integrate new material processing and recycling in one facility





# Turnagain Project Characteristics

- JV with Mitsubishi Corp
- 30 yr project at 37 kt/y Ni+Co
- Very low strip ratio (0.4 LOM)
- Simple flowsheet – crush, grind, float
- High-grade clean standard concentrate
- Multiple product routes to market
- Strong ESG practices
- Access to deep-water Pacific ports, rail
- Located in Tahltan, Kaska Dena Territory



Base map from BC Ministry of Transport and Infrastructure



**Where will all the nickel come from?**

# Let's Talk.

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# Simplified Processing Flowsheet

- Processing plant will be installed in slightly offset stages to maximize efficiency of construction and commissioning.
- Primary crusher is located adjacent to the mine to reduce haul distances
- Main processing facility including secondary and tertiary crushing, grinding, and flotation located above the TMF

