CLEAN TEQ

Powering innovation

A focus on nickel in electric vehicle batteries

Understanding cost and the carbon footprint

BMO Metals & Mining, February 2020

Sam Riggall, CEO

TSX CLQ

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In addition, all disclosure in this or other presentations related to the results of the Sunrise Project’s Definitive Feasibility Study (the “DFS”) announced on June 25, 2018, constitute forward-looking statements and forward-looking information. The forward-looking statements includes metal price assumptions, cash flow forecasts, projected capital and operating costs, metal recoveries, mine life and production rates, and the financial results of the DFS. These include statements regarding the Sunrise Project IRR; the Project's NPV (as well as all other before and after taxation NPV calculations); life of mine revenue; average annual EBITDA; capital cost; average C1 operating cash costs before and after by-product credits; proposed mining plans and methods, the negotiation and execution of offtake agreements, a mine life estimate; project payback period; the expected number of people to be employed at the Project during both construction and operations and the availability and development of water, electricity and other infrastructure for the Sunrise Project, as well as the indicative project schedule.

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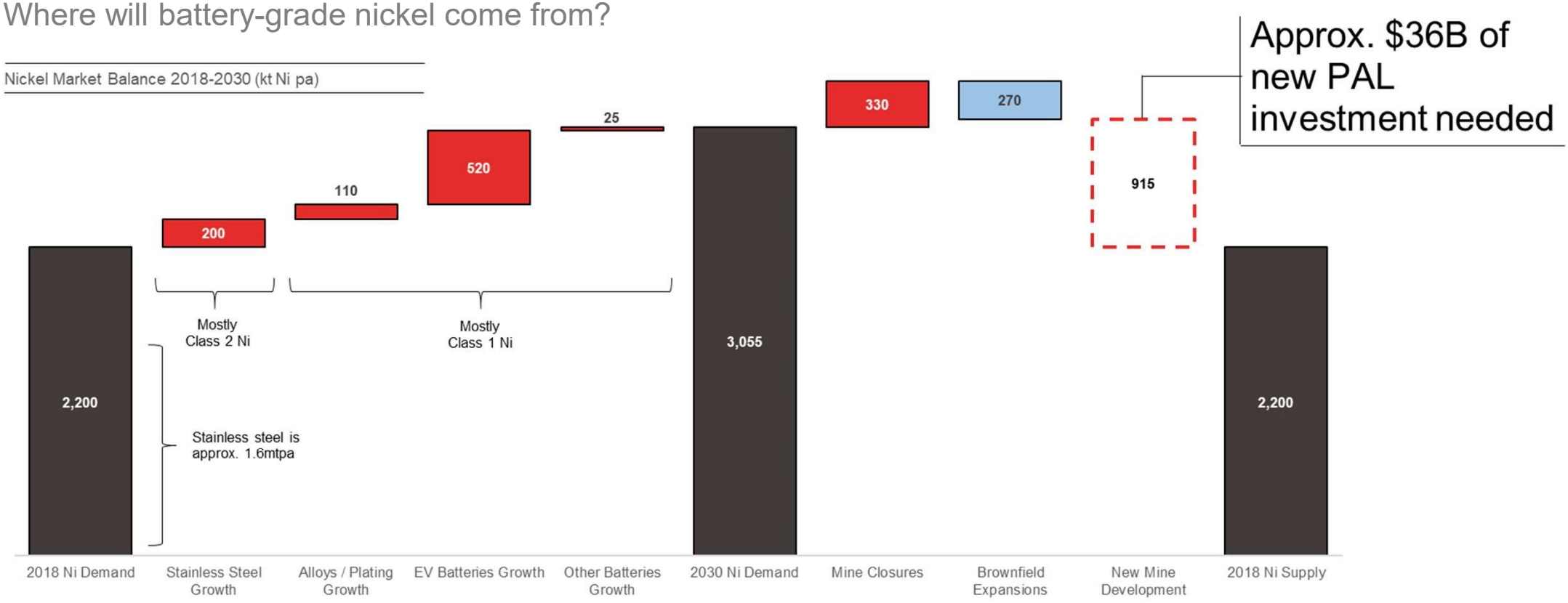
Streamlined Life Cycle Analysis by Energetics, Feb 2020. The GHG emission intensities of alternative processing routes are based on literature data that cannot be effectively harmonized. For comparison purposes the only harmonization that has occurred has been on end product (NiSO4) and using economic allocation to end products. Any comparison against Sunrise should be considered indicative only.

Decarbonisation – the industrial challenge of this century

Metals are the new oil – for electrical generation, storage, distribution and light-weighting

Nickel - mind the gap

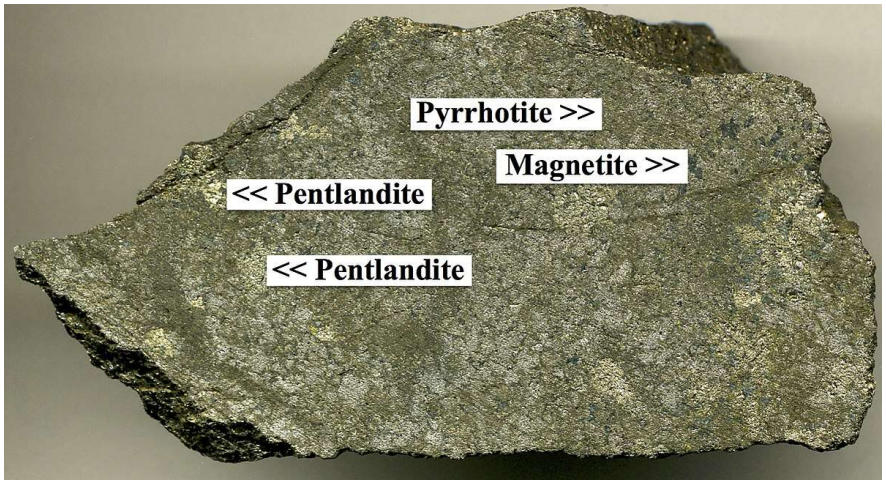
Where will battery-grade nickel come from?



Source: Internal analysis assuming 1.5% pa global passenger vehicle growth and a 15% EV penetration rate by 2030. Battery chemistry demand by 2030 is 90% split between NCM622 / NCM811 / NCA and 10% LFP. Average battery pack size is 50kWh. Stainless growth is 1% per year, Alloys / Plating growth is 1.5% per year. Mine closure and expansion data from Wood Mackenzie nickel market forecasts, September 2019. Forecast for PAL investment assumes industry standard capital intensity for 520ktpa of incremental LME Class 1 growth from laterite ore.

Nickel - ore styles and ore genesis

Laterites will need to service both stainless steel and EV markets



Laterite ore

Sulfide ore

Feedstocks – many routes to nickel sulfate

Cost and complexity are a function of impurity loads in the feedstock

Nickel Pig Iron
(Class 2)
8 - 16% Ni

FerroNickel
(Class 2)
20 - 25% Ni

MHP
(Intermediate)
~40% Ni / 1.5% Co

MSP
(Intermediate)
~60% Ni / 4.0% Co

Matte
(Intermediate)
~75% Ni / 1.5% Co

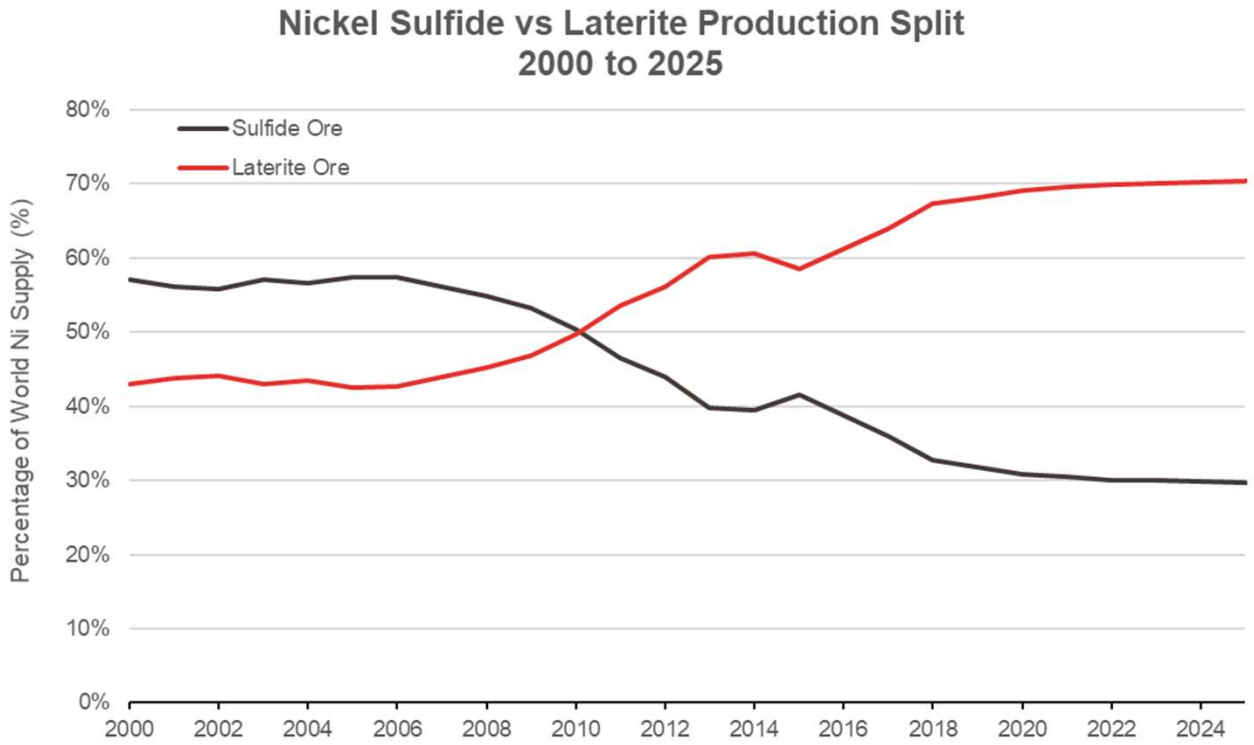
Sunrise Eluate
(Intermediate)
70% Ni / 18% Co

LME Ni
(Class 1)
99.8% Ni

Sunrise $NiSO_4.6H_2O$
(LiB High Purity)
99.94% Ni

Sulfide vs laterite ore

Laterites will need to service both stainless steel and EV markets

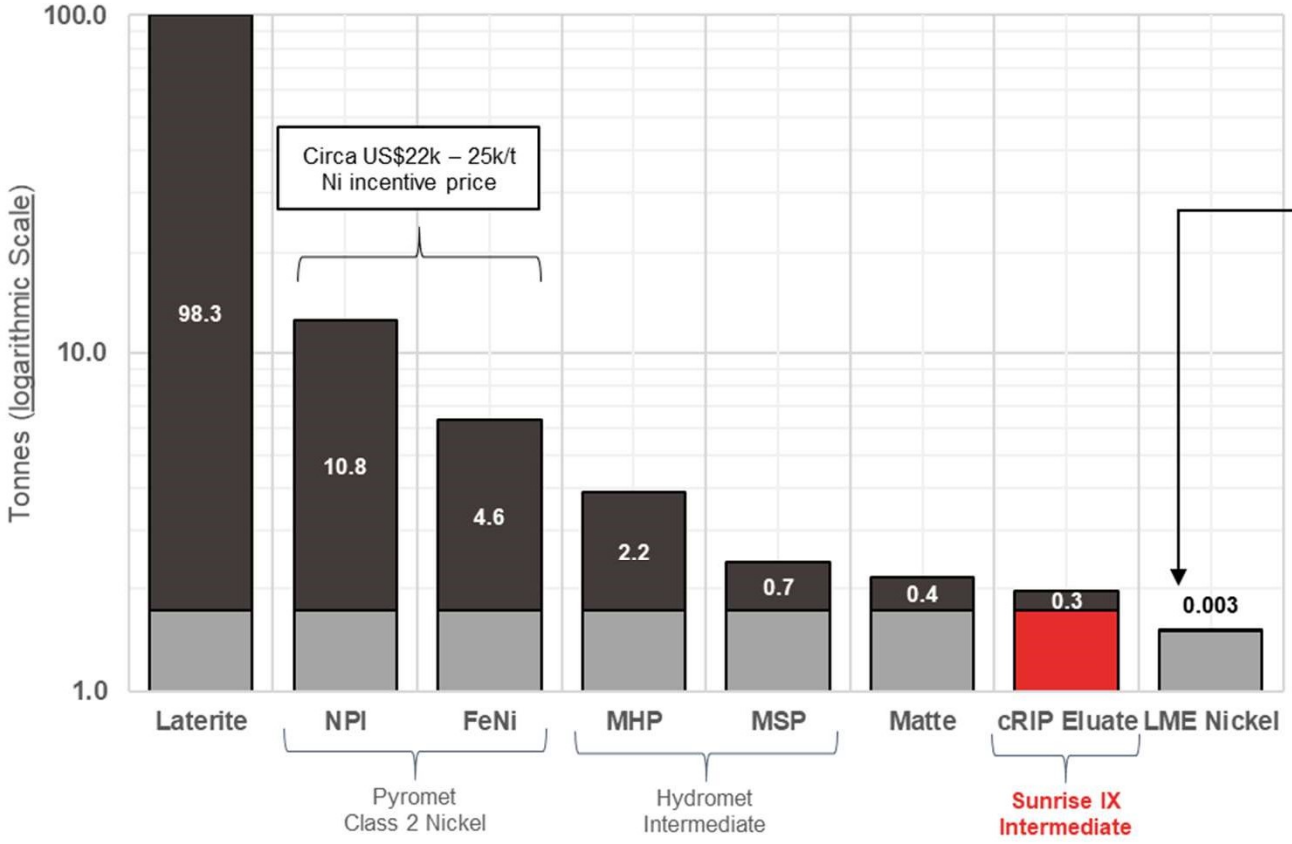


Source: CRU Nickel & Cobalt Market Study, October 2018

- The world is increasingly dependent on nickel laterite ores
- Nickel sulfide resources are geologically scarce and insufficient to support forecast EV growth
- Pyrometallurgical processing of laterite ore will service stainless steel markets (NPI / FeNi)
- Hydrometallurgical processing of laterite ore (pressure acid leach, or PAL) will service battery markets

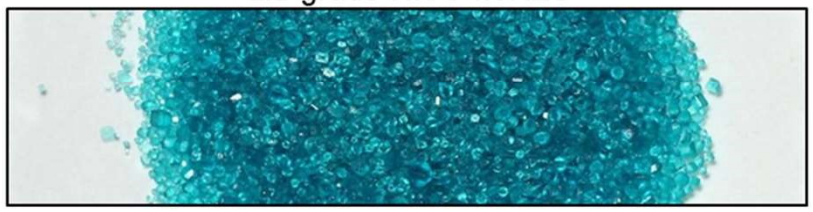
Feedstock impurity loads impact conversion cost

Impurities increase conversion costs to nickel / cobalt sulfate, but…



1.5 tonne of LME-grade nickel contains ~3.0kg of impurities, of which ~2.1kg needs to be removed to produce battery-grade nickel sulfate

LiB grade NiSO4.6H2O



Assumes laterite grading 1.5% Ni and 0.075% Co. Nickel equivalent grade calculated using a US$7.5/lb Ni price and a US$22.5/lb Co price. cRIP eluate impurities include all compounds other than payable nickel, cobalt and sulphate mass. LME Nickel and LiB grade NiSO4.6H2O use nickel grade only, not nickel equivalent (hence a reduction in payable metal).

Introducing carbon

…cost is only one issue - why it's critical for OEMs to understand mining

Source: Volkswagen

If electric vehicles are to be a net benefit to society, they must be designed around the battery

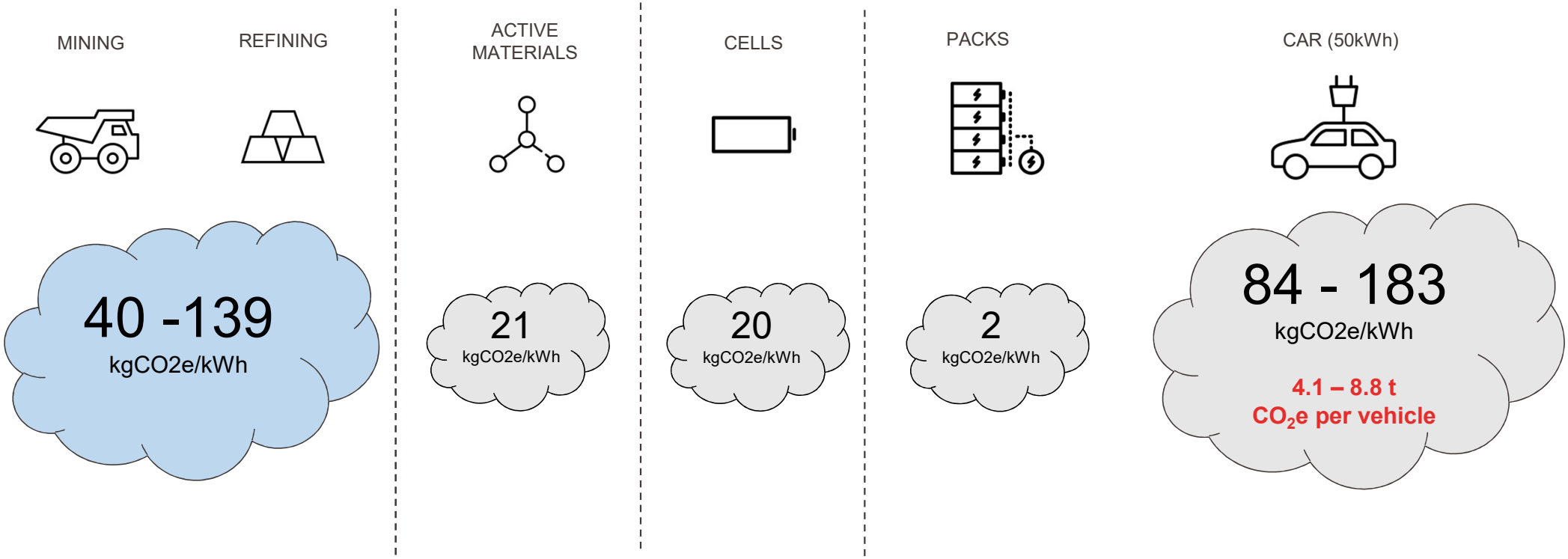
Raw materials (mining and processing) in the battery leave the biggest footprint on the supply chain

OEMs need measurable carbon data to benchmark performance

Nickel and cobalt are the major contributors to an EV's carbon footprint, which varies widely depending on the source of metal and the processing route

Carbon accounting for the battery supply chain

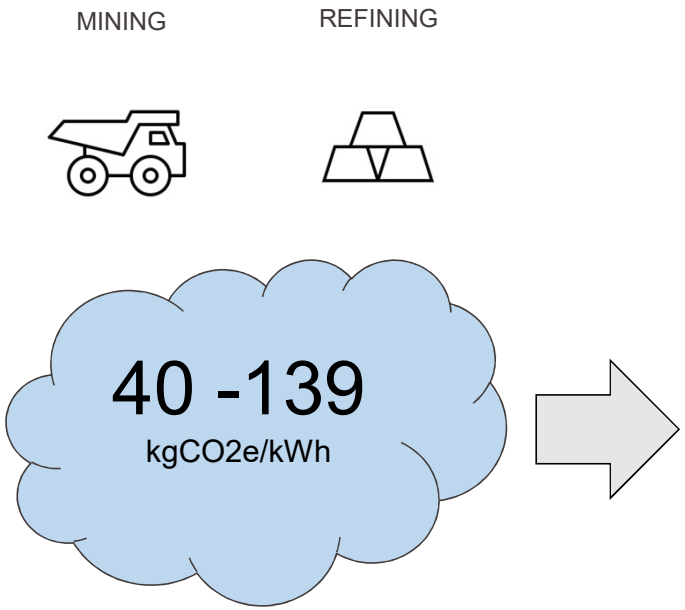
The carbon footprint of the battery pack is determined by mining/refining process routes….



Source: Energetics report and internal company analysis (GREET; ANL BatPac Model; Avicenne; Bernstein), modified to reflect the kg CO2e per kWh of pack capacity utilizing NMC 811 cathode chemistry. Mining and Refining, assumes nickel and cobalt is refined through to nickel and cobalt sulfate for conversion to precursor. Electrical energy mix assumes FeNi and NPI production is in China, HPAL in Indonesia (using black coal) and NiS is in Australia. Note that the technology for conversion of FeNi or NPI to battery-grade sulfate has not been proven at industrial scale, may not be economically viable and may add further GHG emissions which have not been accounted for in this study.

Carbon accounting

… where nickel and cobalt make up between one-quarter and two-thirds of total pack emissions

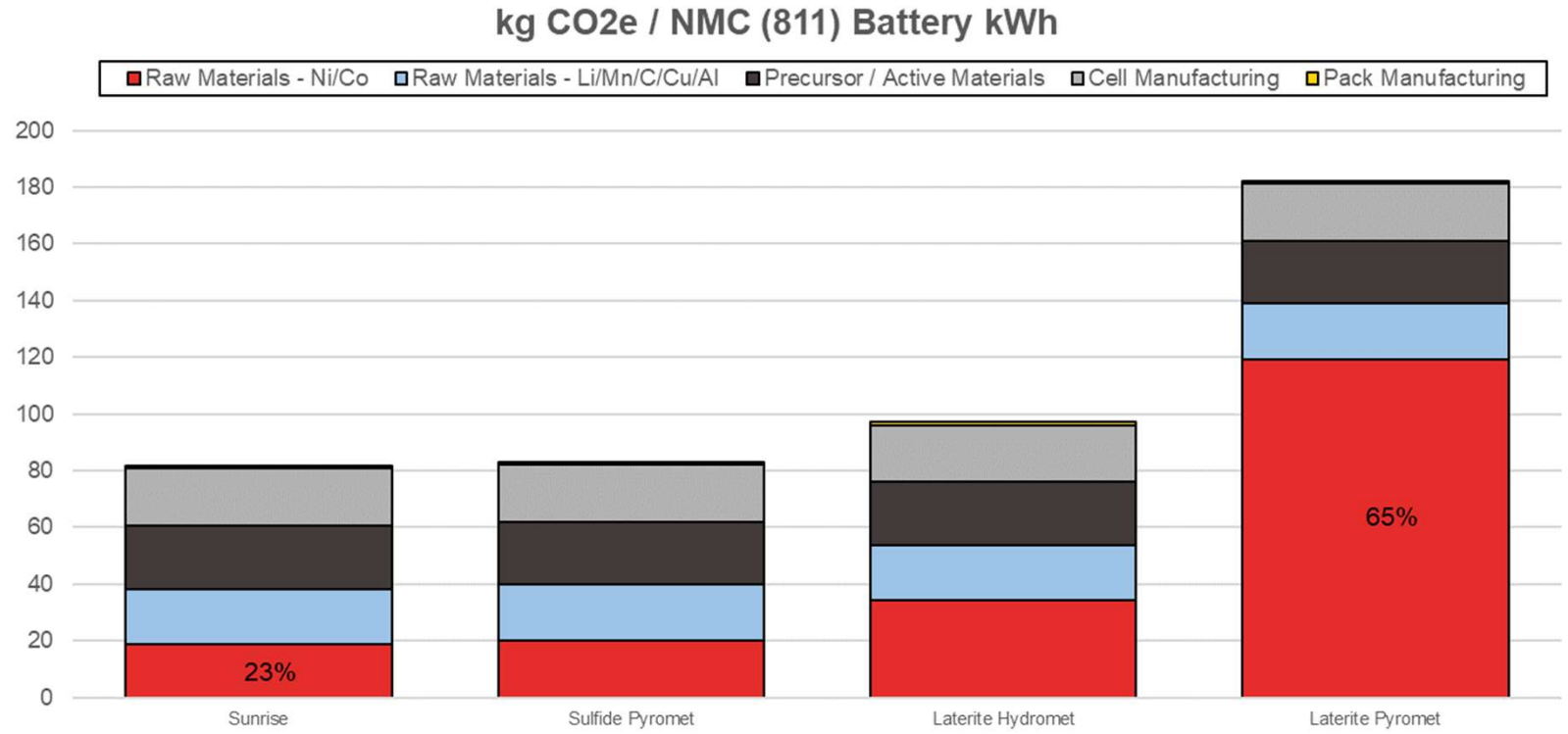


Process and feedstock	kg CO2e / kWh for Ni+Co	Ni+Co as % of total pack emissions
Nickel Sulfide Pyromet	20	25%
High Pressure Acid Leach (HPAL)	34	35%
Ferronickel (RKEF)	89	59%
Nickel Pig Iron (BF)	50	44%
Nickel Pig Iron (EAF)	119	65%
Clean TeQ Sunrise (renewables)	**19**	**23%**
Clean TeQ Sunrise (grid)	**26**	**29%**

Source: See note on previous page. Sunrise range based on 100% renewable power supply versus Australian grid energy mix. Note that while a theoretical process was developed and evaluated to convert FeNi and NPI to battery grade sulfate, an industrial scale process has yet to be proven.

Nickel sulfate process routes

The environmental promise of EVs depends greatly on procurement strategy



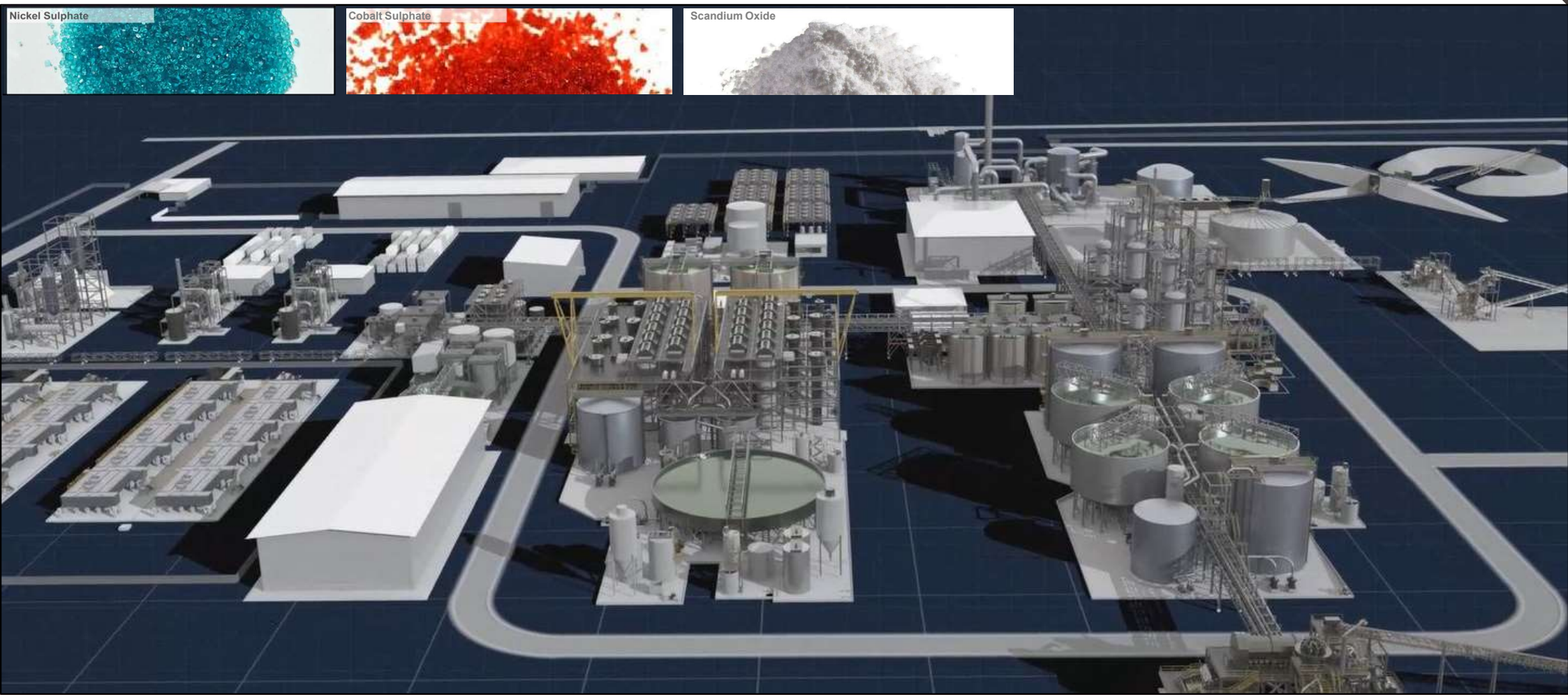
Source: See note on previous page. Sunrise emissions based on renewable electricity supply.

Sunrise Integrated Battery Complex

A template for industry-leading emissions and cost performance across the cathode supply chain

Sunrise Battery Materials Complex

Sunrise Battery Materials Complex



GHG intensity of Clean TeQ Sunrise

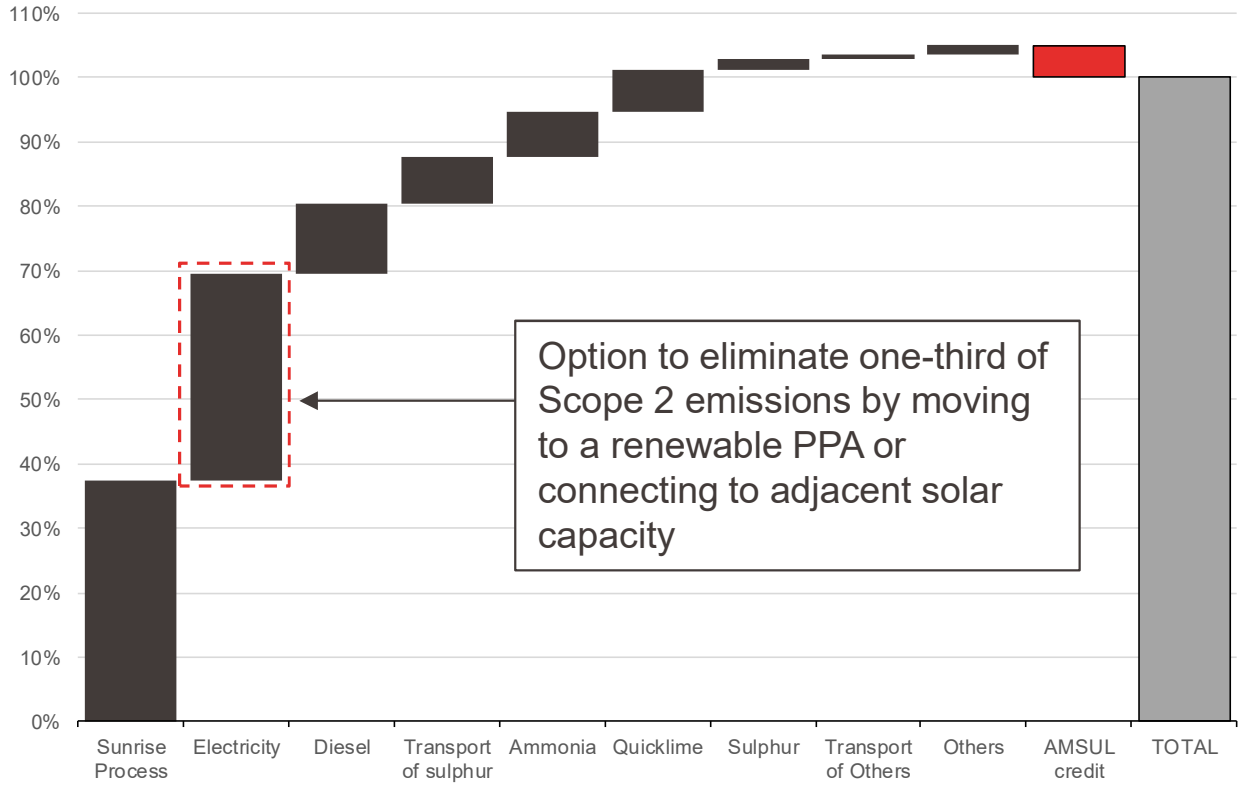
Understanding the Sunrise emission hot spots

Indicator	Unit	Value	
Total Sunrise Project, cradle to gate	t CO2e/year	571,457	
- scope 1 emissions	*t CO2e/year*	*265,577*	
- scope 2 emissions	*t CO2e/year*	*165,844*	
- scope 3 emissions	*t CO2e/year*	*140,036*	
Nickel carbon intensity	kg CO2e/kg Ni	17.2	→ 354kt CO2e pa
Cobalt carbon intensity	kg CO2e/kg Co	45.4	→ 204kt CO2e pa
Scandium carbon intensity	kg CO2e/kg Sc	2,107	→ 14kt CO2e pa

Source: Energetics Report and internal company analysis. Assumes Australian grid energy mix in carbon calculation (scope 2).

Breakdown of CO2e releases for Sunrise

Integrating renewable power at Sunrise reduces carbon by circa 30%

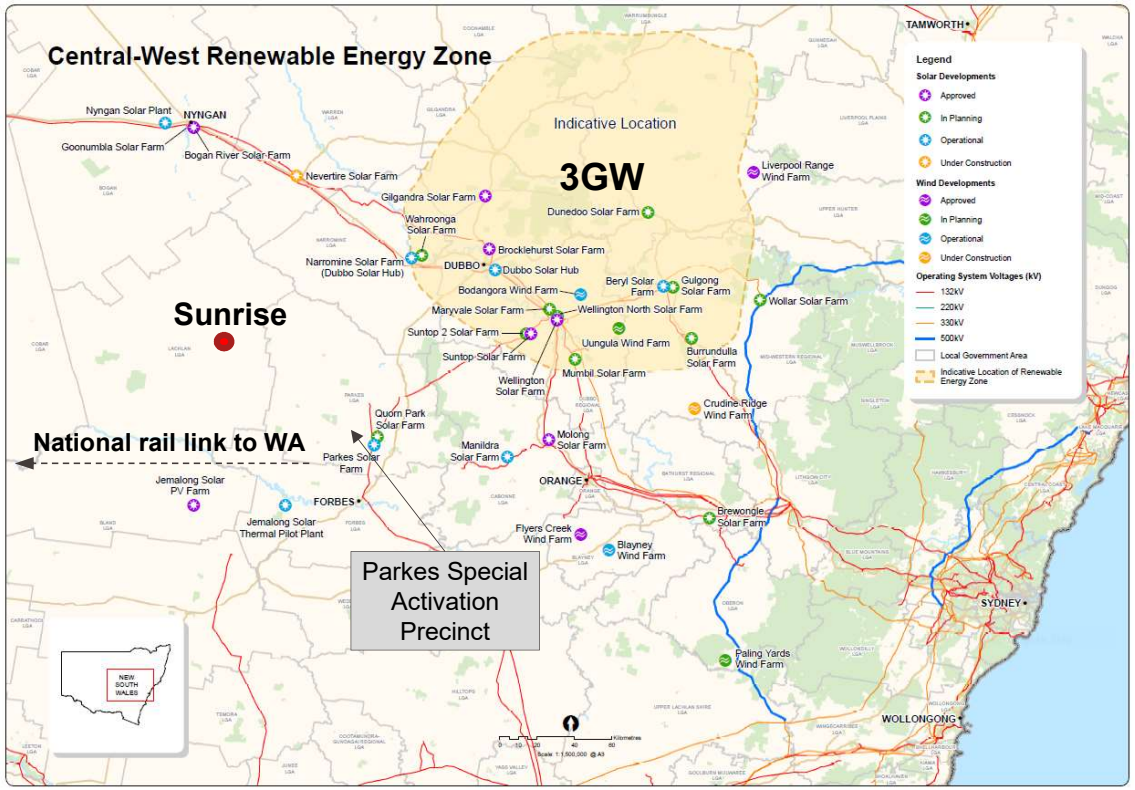


Source: Life Cycle Analysis by Energetics, February 2020.

Indicator	Unit	Value
Sunrise (Imported Power)		
Per kg Ni metal produced	kg CO2 e/kg	17.2
Per kg Co metal produced	kg CO2 e/kg	45.4
Per kg Sc metal produced	kg CO2 e/kg	2,107
Sunrise (Renewable Power)		
Per kg Ni metal produced	kg CO2 e/kg	10.8
Per kg Co metal produced	kg CO2 e/kg	28.4
Per kg Sc metal produced	kg CO2 e/kg	1,318

A vision for Sunrise: An Integrated Plan

Integrated precursor / cathode production, renewable generation and recycling



Renewable Power: The Central-West Renewable Energy Zone (REZ) will deliver 3GW of new solar generation capacity to Sunrise's doorstep

Linking Li – Ni - Co: The east-west national rail corridor connects at Parkes, linking east and west coast battery materials markets

Active material production: The Parkes Special Activation Precinct is a dedicated industrial zone incorporating recycling/reuse facilities powered by waste-to-energy

Recycling: Excess autoclave and refining capacity allows cost-effective recycling of used cathode to recover metals

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