Swiss Energy Strategy 2050
A miner’s perspective

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Bern, 17 January 2020
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1. Context and key observations
2. Glencore and the mining industry can be key enablers of the energy and mobility transition
3. Concluding remarks
Context & Key observations
Key observations

The world’s reliance on fossil fuels remains high\(^{(1)}\)
- More than 80% of global energy demand met by fossil fuels in 2018
- This is unlikely to change materially by 2040 under current and announced policy intentions

GHG emissions continue to increase\(^{(2)}\)
- 2017: +1.5%, 2018: +2.1%, 2019F: +0.6%

Future emissions need to fall rapidly to meet Paris Agreement goals

Higher living standards, poverty reduction and urbanisation all require affordable and reliable energy (UN SDG 7)
- Another 1.9bn people in the world by 2050 will add to the challenge\(^{(3)}\)

The policy response needs to be global
- Unaligned national and or regional measures will be muted by emission developments elsewhere

Mining companies need to mobilise additional resources to enable the transition to renewables, energy storage systems and the transformation of global mobility systems

Notes
Mining has a key role to play in decarbonising tomorrow’s world.
Founded in Switzerland over 40 years ago, we are one of the world’s largest globally diversified natural resource companies.

At our Swiss headquarters in Baar, we employ more than 850 people, making us one of the major employers in Central Switzerland.

Our Swiss location is the centre of our global business:
• Key personnel are based here, including CEO, CFO and divisional heads.
• With the exception of oil, all our commodity businesses are run from Baar with support of locally based management.
Our global footprint
Responsibly sourcing the commodities that advance everyday life

- We are present at every point in the value chain from where commodities are sourced to where they are consumed
- We employ 158,000 people globally and are invested and active in all major geographies, producing 60 commodities from 150 sites
- We live our core company values: Safety, Entrepreneurialism, Simplicity, Responsibility and Openness
The mining industry has underpinned the fundamental shift in global living standards since the Industrial Revolution

- The single greatest increase has emerged from China’s urbanisation and industrialisation over the last 40 years with c.750 million people lifted out of extreme poverty since 1990

Mining and the commodities we produce are part of our everyday life

- **Steel** in construction, **copper** in power grids, **aluminium** in packaging, **coal** for cement production, power generation and steel making, **nickel** and **cobalt** in high performing alloys and battery packs and stainless steel for food contact materials and medical appliances

Mining is even more relevant today – the metals needed to decarbonise energy underpin:

- Battery backed energy storage
- Electrification of mobility
- 5G, artificial intelligence, big data and a more connected world

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**Swiss Energy Strategy 2050, A miner’s perspective**

## Commodities that Glencore produces

We are a major responsible supplier of many of the enabling commodities needed for the transition.

<table>
<thead>
<tr>
<th>Commodity</th>
<th>Copper</th>
<th>Cobalt</th>
<th>Nickel</th>
<th>Lead</th>
<th>Zinc</th>
<th>Vanadium</th>
<th>Thermal Coal</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Glencore production</strong>&lt;sup&gt;(1)&lt;/sup&gt;</td>
<td>1.45Mt</td>
<td>42kt</td>
<td>124kt</td>
<td>273kt</td>
<td>1.1Mt</td>
<td>9.1kt</td>
<td>118Mt</td>
</tr>
<tr>
<td><strong>Global supply</strong>&lt;sup&gt;(2)&lt;/sup&gt;</td>
<td>20.7Mt</td>
<td>124.5kt</td>
<td>2.4Mt</td>
<td>4.9Mt</td>
<td>12.9Mt</td>
<td>95kt</td>
<td>6 billion tonnes</td>
</tr>
</tbody>
</table>

Nickel supply and demand
A case study of nickel’s key role in enabling the transition to a low/net-zero carbon future

Nickel is a relatively small market at 2.45Mt
- Aluminium: 65Mt, copper: 23.5Mt

Stable demand growth underpinned by:
- Austenitic stainless steel: >65% of nickel demand and used in infrastructure, construction, architecture, food contact surfaces, automotive, aerospace, oil and gas and LNG
- >20% nickel containing alloys: high-end industrial use, particularly in LNG, wind farms, solar, aerospace, nuclear and medical
- Consumes more than 400kt of primary nickel annually with increasing demand as material performance requirements and safety factors increase

Current nickel market (Mt Ni)

- Batteries
- Plating
- Nickel alloys
- Stainless steel

Annual average demand growth

<table>
<thead>
<tr>
<th></th>
<th>Last 30 years</th>
<th>Last 10 years</th>
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<tbody>
<tr>
<td></td>
<td>5%</td>
<td>6%</td>
</tr>
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</table>

(1) Source: International Nickel Study Group
**Electrification of Mobility**

- **Significant demand growth emerging as the world adopts new NMC and NCA battery chemistries**
  - Nickel battery demand: c.50kt in 2010, c.200kt in 2019F, >500kt in 2025F (inc 400kt Ni in EV)
  - Nickel in Electric Vehicles forecast at 800kt by 2030
  - Trend for higher EV penetration, larger battery size and higher nickel chemistries (811 vs 622) suggest even higher nickel demand than forecast

- **Lifecycle of nickel and cobalt well understood and readily recyclable**
  - Majority of nickel containing steels/alloys are recycled
  - Glencore processed 35kt of recycled material to recover 5kt nickel and 3kt cobalt in 2019

- **We are investing more than $2bn developing the next generation of Canadian nickel sulphide mines while upgrading our metallurgical facilities to responsibly supply nickel from our global operations**

**Notes**:
1. Glencore estimates, B3, based on 11.5Mt new passenger EV sales by 2025, ca. 10% penetration rate.

| Nickel demand in electric vehicles (kt Ni)\(^{(3)}\) |
|---|---|
| 2019F | 2025F |
| 2.4Mt | 24Mt |
| +330kt of new EV nickel demand by 2025 |

| Cobalt demand in electric vehicles (kt Co)\(^{(3)}\) |
|---|---|
| 2019F | 2025F |
| 120kt | 120kt |
| +73kt of new EV cobalt demand by 2025 |

2018 nickel market: 2.4Mt
2018 cobalt market: 120kt
Decarbonisation of energy:

- What holds for nickel and cobalt is equally true for copper
  - Decarbonising energy primarily impacts electricity generation, industrial processes and mobility
  - Renewable energy sources are much more copper intensive than conventional energy generation – additional copper required in generators, transformers, inverters and extra copper cabling
  - Implementation of current CO2 emission policies is forecast to require an additional 22 million tonnes of copper by 2030. (1)

- Meeting this demand will require the mining industry to invest billions of dollars in capital each year to prolong the life of existing mines and develop new resources that are increasingly scarce

Decarbonisation requires a lot of copper

Additional cumulative Cu demand needed (Mt Cu) (1)

- Current Government policies to reduce CO2 emissions by 2030 will require an additional cumulative 22Mt of copper by 2030 (1)

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Seaborne coal demand expected to remain broadly stable over the next 5 years
• Robust demand growth from new Asian capacity expected to offset lower demand in Europe and the USA
• Asia’s share of global coal power generation up from c.20% in 1990 to almost 80% in 2019 – “coal’s fate is increasingly tied to decisions made in Asian capitals.”

Supply increasingly at risk
• Accelerating depletion of the seaborne coal reserve base
• Our production capacity is capped at 150Mtpy and will decline as our existing portfolio depletes without reinvestment
• Development approval delays and shrinking financing options likely to limit planned future supply

Growing risk of failure to meet energy needs and compromised economic growth
• Balance required between the need for affordable/reliable energy and accelerating the shift to renewables
• High quality coal is part of the energy solution

## Reducing our CO2 footprint

### Emissions reduction initiatives

<table>
<thead>
<tr>
<th>CCS</th>
<th>Electrification</th>
<th>Automation</th>
<th>Connected mines</th>
<th>Brownfield priority</th>
<th>Renewables roll out</th>
<th>Energy capture</th>
</tr>
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<tbody>
<tr>
<td>Carbon Capture and Storage (CCS) is a key enabler of decarbonisation(^{(1)})</td>
<td>Hybrid and fully electric mining equipment options now available</td>
<td>Fully automated mine fleets are becoming a reality</td>
<td>Big data, data analytics, basic artificial intelligence are already enabling productivity gains through improved mine planning and fleet utilisation</td>
<td>Prioritising brownfield versus greenfield investments to drive higher returns and utilise existing mining and processing infrastructure</td>
<td>We have installed 2 x 3MW wind turbines, and associated energy storage systems at our Raglan Ni and Cu mine in Nunavik, Northern Quebec. These turbines generate c.15% of the power the isolated site requires, displacing over 4M litres of diesel annually</td>
<td>Furnace offgases are now being harvested at a number of sites to reduce primary energy needs</td>
</tr>
<tr>
<td>Glencore’s CTSCo project is designed to provide insight into development of CCS in an industrially scalable, safe and cost effective manner</td>
<td>Will be deployed at our new fully electric Onaping Depth mine project in Canada’s Sudbury basin</td>
<td>We plan to deploy autonomous equipment at Onaping Depth</td>
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Notes: \(^{(1)}\) IEA 2019 SPS includes doubling of global CCUS volumes by 2030 and five-fold increase by 2050.
Renewable energy is key to achieving a low-carbon reality

- Getting there requires a fundamental shift in how we power the world

The metals and minerals responsibly produced by the mining industry will underpin this change

- The industry also needs to lead the development and adoption of new technologies and process innovation to both increase its own productivity and accelerate emission reductions

Glencore is well positioned to play a key role in enabling this transition

- We are a responsible supplier of the commodities that are critical for the shift to a low/net-zero carbon reality

We have set ambitious goals for ourselves, including the prioritisation of capital investment into commodities that support the transition and the development of long-term targets to reduce our emissions
Q&A