

# Risk Assessment - Cobalt Refining Concentration

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|------------|---------------------------------------------------------------|
| Report ID  | LIQ-SHOWCASE-RISK-ASSESSMENT-COBALT-R                         |
| Generated  | 2026-07-15 19:15:42 UTC                                       |
| Shape      | Risk Assessment                                               |
| Confidence | MEDIUM (mixed source quality, some estimates or temporal lag) |
| Sections   | 9                                                             |

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## Beat 1 - Scope & Framing

Subject: Cobalt refining supply-chain concentration risk.

Timeframe: 24 months from issue date (July 2026 - July 2028).

Geography: Global, with material nodes in the Democratic Republic of Congo (mine production), Lualaba province (DRC smelting/refining), Zhejiang province (China refining), Central Ostrobothnia (Finland refining), Belgium, Ontario, and the United States.

Data domain: The source packet draws on USGS Mineral Commodity Summaries 2025, NRCan Critical Minerals Database 2024, company annual reports and regulatory filings (Freeport-McMoRan 10-K, Umicore 2024 Annual Report, Glencore FY2025 Production, Li-Cycle 8-K Chapter 11 filings), the RMI Responsible Minerals Initiative facility registry, EU Comext/Eurostat trade data, and DOE Loan Programs Office 2024 disclosures. The packet covers 1 critical mineral, 36 producer/facility records across 9 producing countries, and 6 trade routes.

Coverage caveat: Capacity figures are populated for only a subset of the 36 facilities. Thirty of the 36 records carry no operational-status designation; five are confirmed operating and one is under construction. The producer-concentration HHI and shares are computed over capacity/volume weights by country - not over a verified census of world refining output - and should be read as a concentration signal within the retrieved data, not as a definitive global market-share statement.

## Beat 2 - Key Assumptions

| #  | Assumption                                                                                                                                                                                                                                    | Basis in the data                                                                            | If wrong                                                                                                                                                                                                                                           |
|----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A1 | DRC mine production (~220,000 t, ~76% of world mine output in the packet) continues to flow to downstream refiners without systemic interruption                                                                                              | USGS MCS-2025 production figures; DRC geopolitical-risk score absent from the country record | If DRC output is curtailed, the top-3 mine-country share of 89% (USGS MCS-2025) collapses into a supply shock with no near-term substitute                                                                                                         |
| A2 | The five confirmed-operating facilities in the data represent the active refining base; the one facility under construction (Electra Battery Materials Cobalt Refinery, Ontario, 6,500 t/yr) reaches commissioning within the 24-month window | Company disclosures / DOE Loan Programs Office 2024                                          | If commissioning slips, the North American refining capacity increment does not materialise; if additional facilities among the 30 status-undesigned records are actually offline, effective capacity is lower than the concentration math implies |
| A3 | The three trade-route origins in the concentration rollup (Australia 40%, Belgium 32%, Cuba 28%) represent the dominant volume corridors within the retrieved route data                                                                      | EU Comext/Eurostat; USGS MCS-2024                                                            | If DRC-origin routes (recorded separately but absent from the route-concentration rollup) carry the dominant real-world volume, the route-HHI understates the true chokepoint risk                                                                 |
| A4 | Li-Cycle's Chapter 11 filing does not trigger cascading closure of its Rochester Hub (35,000 t/yr stated capacity) or Alabama Spoke (10,000 t/yr)                                                                                             | Li-Cycle 8-K filings 2024; Glencore 2024 Annual Report DIP disclosure                        | If those facilities cease operations, a material share of North American recycling throughput is lost, tightening the refined-cobalt balance                                                                                                       |
| A5 | China's geopolitical-risk score (55/100) and governance score (48/100) reflect a stable, if elevated, operating environment for Zhejiang-based refining (Huayou Cobalt Quzhou, 40,000 t/yr)                                                   | Producing-countries record                                                                   | If Sino-Western trade tensions escalate to export controls on refined cobalt, the 10.7% Zhejiang share of producer capacity in the data becomes an acute access risk for non-Chinese buyers                                                        |

## Beat 3 - Threats & Likelihood x Impact Matrix

| #  | Threat Vector                                                                                                                                                                                                                                                                | ICD-20<br>3 Likeli<br>hood<br>Band     | Impact<br>Tier  | Rationale (cited)                                                                                                                                                                                                                                                                                                                                                                 |
|----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| T1 | DRC mine-production disruption - governance failure, armed conflict, or fiscal-regime shock curtailing output from the country that accounts for the largest single mine-production figure in the packet (220,000 t; USGS MCS-2025)                                          | Likely<br>(55 - 80%)<br>over 24 months | CATAS<br>TROPIC | DRC governance score is absent from the country record; the Democratic Republic of Congo entry carries no geopolitical-risk score, which is itself a data signal of opacity. The top-3 mine-country share is 89% (USGS MCS-2025), making DRC irreplaceable at mine level within the timeframe.                                                                                    |
| T2 | Chinese refining access restriction - export controls, licensing friction, or trade-policy action limiting Western buyers' access to Zhejiang-province refining capacity (Huayou Cobalt Quzhou, 40,000 t/yr)                                                                 | Unlikely<br>(20 - 45%)                 | HIGH            | China geopolitical-risk score 55, governance score 48 (producing-countries record). Zhejiang represents 10.7% of producer capacity in the data. The packet does not quantify China's share of world refining, but notes that refining/processing concentration is "materially higher" than mine-production concentration for cobalt (USGS MCS-2025 basis note).                   |
| T3 | Li-Cycle insolvency cascade - Chapter 11 proceedings result in permanent closure of Rochester Hub (35,000 t/yr) and/or Alabama Spoke (10,000 t/yr), removing North American recycling throughput                                                                             | Roughly Even<br>Chance<br>(45 - 55%)   | MEDIUM          | Li-Cycle 8-K Chapter 11 filings 2024; Glencore DIP disclosure (Glencore 2024 Annual Report). The United States holds 38.8% of producer capacity in the data; Li-Cycle facilities are a component of that share. Loss would reduce the recycling buffer available to North American battery supply chains.                                                                         |
| T4 | Electra Battery Materials commissioning failure - Ontario refinery (6,500 t/yr, under construction) does not reach operational status within 24 months                                                                                                                       | Roughly Even<br>Chance<br>(45 - 55%)   | MEDIUM          | Facility recorded as "UNDER_CONSTRUCTION" (Company disclosures / DOE Loan Programs Office 2024). No commissioning date is present in the packet. The facility represents the sole confirmed pipeline addition in the data.                                                                                                                                                        |
| T5 | Trade-route concentration shock - disruption to one of the three origin corridors (Australia 40%, Belgium 32%, Cuba 28%) that together account for 100% of route volume in the data; route HHI 3,408 (HIGH per DOJ/FTC bands)                                                | Unlikely<br>(20 - 45%)                 | HIGH            | Route-concentration rollup (EU Comext/Eurostat; USGS MCS-2024/NRCan 2024). Australia geopolitical-risk 15, governance 92; Belgium geopolitical-risk 10, governance 90 - both low-risk. Cuba route (28% of route volume in the data, destination China) carries higher political-friction risk given US-Cuba relations, though the packet does not score Cuba's geopolitical risk. |
| T6 | Lualaba province operational concentration - simultaneous stress across Glencore Katanga (30,000 t/yr), Mutanda (25,000 t/yr), Tenke Fungurume (37,000 t/yr), and Kamoto (30,000 t/yr) mines, all located in Lualaba and representing 32.7% of producer capacity in the data | Very Unlikely<br>(05 - 20%)            | CATAS<br>TROPIC | All four facilities sourced to USGS MCS-2024/NRCan 2024 and Glencore FY2025 Production. Simultaneous disruption is low-probability but the geographic co-location means a single provincial-level event (regulatory, security, or infrastructure) could affect all four.                                                                                                          |
| T7 | Finnish refining single-point failure - Freeport Cobalt Kokkola (14,000 t/yr) and Umicore Kokkola (15,000 t/yr) together represent 7.8% of producer capacity in the data from a single municipality; a shared-infrastructure event could affect both                         | Almost No<br>Chance<br>(01 - 05%)      | MEDIUM          | Freeport-McMoRan 2024 10-K; Umicore Kokkola record (confidence HIGH). Finland geopolitical-risk 8, governance 96 - the lowest risk jurisdiction in the data. Probability is very low; flagged for completeness given co-location.                                                                                                                                                 |

## Beat 4 - Ranked Exposures

Exposures are ordered by the combination of concentration magnitude and consequence severity. Where the source packet's computed rollups carry concentration figures, those values are reported exactly as computed.

## Exposure 1 - DRC Mine-Production Chokepoint [B/2]

The single largest mine-production node in the packet is the Democratic Republic of Congo at 220,000 tonnes (USGS MCS-2025), within a world mine-production total of 290,000 tonnes. The top-3 producing countries (DRC, Indonesia, Russia) account for 89% of world mine production on a USGS MCS-2025 basis. The DRC country record in the packet carries no geopolitical-risk score and no governance score - an honest absence that is itself analytically significant: it reflects data opacity for the highest-consequence node. This exposure sits upstream of all refining concentration; a DRC disruption propagates through every downstream refinery in the data regardless of geography.

\*Source reliability: USGS MCS-2025 (B/2 - reliable source, probably true).\*

## Exposure 2 - Producer Capacity Concentration: HHI 2,773 (HIGH) [B/2]

Across the 9 producing countries in the data, the producer-capacity HHI is 2,773, classified HIGH under DOJ/FTC bands ( $\geq 2,500$ ). The top single country - the United States - holds 38.8% of producer capacity in the data. The top three (United States 38.8%, Lualaba 32.7%, Zhejiang 10.7%) together account for 82.2% of producer capacity in the data. These figures are computed over the retrieved supply base, not asserted as global market shares.

The Lualaba share (32.7%) is particularly notable: it reflects the four large Congolese mines in the packet (Glencore Katanga, Mutanda, Tenke Fungurume, Kamoto), all in a single DRC province, compounding the country-level risk in Exposure 1.

The Zhejiang share (10.7%) is anchored by Huayou Cobalt Quzhou (40,000 t/yr), the single largest capacity figure in the producer records, operating in a jurisdiction with a geopolitical-risk score of 55 and a governance score of 48 - the highest-risk scores among jurisdictions with populated scores in the data.

\*Source reliability: Capacity figures from USGS MCS-2024/NRCan 2024, Freeport-McMoRan 2024 10-K, company disclosures (B/2 for named sources; no tag for records with null source).\*

## Exposure 3 - Trade-Route Concentration: HHI 3,408 (HIGH) [B/3]

Across the 3 origin corridors captured in the route-concentration rollup, the HHI is 3,408, classified HIGH. Australia accounts for 40%, Belgium 32%, and Cuba 28% of route volume in the data - and together these three origins account for 100% of the route volume in the rollup. This is a full-concentration result: any single-corridor disruption removes a material share of the retrieved trade flow with no in-data substitute.

Critical gap: The DRC is recorded as a separate route origin (EU Comext/Eurostat, MEDIUM confidence) but carries no volume figure and does not appear in the route-concentration rollup. Given DRC's dominance at mine level, the absence of a DRC volume in the route rollup is a significant data gap that likely understates true route concentration if DRC-origin flows are material.

The Cuba-China corridor (3,500 t, 2023 annual; USGS MCS-2024/NRCan 2024) warrants specific attention: Cuba is not scored in the producing-countries records, and the corridor's political environment is not characterised in the packet beyond the volume figure.

\*Source reliability: EU Comext/Eurostat (B/3 - fairly reliable, possibly true); USGS MCS-2024/NRCan 2024 (B/2).\*

## Exposure 4 - North American Recycling Capacity at Risk [C/2]

Li-Cycle Holdings is in Chapter 11 (8-K filings 2024; Glencore 2024 Annual Report DIP disclosure). Its Rochester Hub (35,000 t/yr) and Alabama Spoke (10,000 t/yr) are recorded as operating in the packet, but the insolvency proceeding creates material uncertainty about continuity. The United States holds 38.8% of producer capacity in the data, and Li-Cycle facilities are a component of that share. Loss of these facilities would reduce the recycling buffer available to North American supply chains and could shift sourcing pressure back onto primary refined supply.

\*Source reliability: Li-Cycle 8-K (A/2 - completely reliable, probably true); DOE Loan Programs Office 2024 capacity figures (B/2).\*

## Exposure 5 - Pipeline Thinness: One Confirmed Addition [B/2]

Of the 36 producer/facility records, only one is confirmed under construction: the Electra Battery Materials Cobalt Refinery in Ontario (6,500 t/yr; Company disclosures / DOE Loan Programs Office 2024). No commissioning date is present in the packet. The Bécancour Battery Materials Plant and Ford EV Battery Plant (both Quebec, NRCAN Open Data) are in construction status but are processing plants, not refineries, and carry no capacity figures. The pipeline is thin: a single refinery addition of known size, with uncertain timing.

\*Source reliability: Company disclosures / DOE Loan Programs Office 2024 (B/2).\*

## Exposure 6 - Cobalt Supply-Risk Classification: CRITICAL [B/1]

The material record classifies cobalt's supply-risk score as CRITICAL and supply-risk level as HIGH (USGS MCS-2025 / NRCAN Critical Minerals Database 2024, HIGH confidence). World reserves stand at 11,000,000 tonnes against 2024 estimated mine production of 290,000 tonnes - a reserve-to-production ratio the packet does not compute, and which this assessment does not derive, as the packet does not provide a production-rate basis for that calculation. The CRITICAL classification is the packet's own designation and is cited as such.

\*Source reliability: USGS MCS-2025 / NRCAN 2024 (A/1 - completely reliable, confirmed by independent sources).\*

## Beat 5 - Analysis of Alternatives

The following alternative outcomes represent the principal ways the load-bearing assumptions could fail. This is an analysis of alternatives.

Alternative 1 - Benign: DRC production holds and Chinese refining remains accessible (probability: Unlikely, 20 - 45%)  
If DRC governance stabilises and Sino-Western trade relations do not deteriorate into cobalt-specific export controls, the 24-month supply picture is one of high concentration but manageable flow. The Electra Ontario refinery commissions on schedule, adding 6,500 t/yr of Western-aligned refining capacity. Li-Cycle's DIP financing (Glencore 2024 Annual Report) preserves Rochester Hub operations. In this scenario, the HHI of 2,773 remains a structural vulnerability but does not translate into an acute supply event. The primary residual risk is price volatility driven by demand-side battery-sector fluctuations, which the packet does not characterise.

Alternative 2 - Adverse: DRC fiscal or security shock triggers a production curtailment (probability: Likely, 55 - 80%)  
A governance or security event in DRC - the country with the largest mine-production figure in the packet (220,000 t; USGS MCS-2025) and no geopolitical-risk score in the data - reduces output materially. Because the top-3 mine-country share is 89% and Indonesia (28,000 t) and Russia (8,700 t) are the only material alternatives at mine level in the packet, there is no short-cycle substitute. Downstream refiners in Lualaba (32.7% of producer capacity in the data) are directly exposed. This is the highest-consequence alternative and, given the absent risk score, cannot be probability-bounded with precision - the Likely band reflects the structural fragility, not a specific intelligence indicator.

Alternative 3 - Severe: Chinese export controls on refined cobalt (probability: Unlikely, 20 - 45%)  
China's geopolitical-risk score of 55 and governance score of 48 are the highest-risk populated scores in the data. If Beijing imposes export licensing or volume controls on refined cobalt products - a policy instrument the packet does not record as active but which the risk scores make plausible - Western battery supply chains lose access to Huayou Cobalt Quzhou (40,000 t/yr, the largest single capacity figure in the data) and potentially Jinchuan and Huayou Tongxiang refineries (both China, RMI registry, no capacity figures). The packet's own note that refining/processing concentration is "materially higher" than mine-production concentration for cobalt (USGS MCS-2025 basis note) means this alternative could be more severe than the mine-level HHI implies.

Alternative 4 - Compounding: Li-Cycle insolvency plus Electra commissioning delay (probability: Unlikely, 20 - 45%)  
If Li-Cycle's Chapter 11 results in Rochester Hub closure and Electra's Ontario refinery does not commission within 24 months, North American refined-cobalt capacity loses its two most visible near-term additions simultaneously. The United States' 38.8% share of producer capacity in the data would be reduced, and the region would become more dependent on imports from the Belgium and Finland nodes. This is a compounding scenario with individually moderate-probability components; the joint probability is lower but non-trivial given the shared financing-environment driver.

## Beat 6 - Mitigations & Triggers

### Mitigations, Ranked by Lead Time

| Rank | Mitigation                                                                                                                                                                                                                                                                    | Lead Time                                                  | Basis                                                                                                                                                           |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | Activate strategic stockpile or inventory buffer - the fastest available lever; no new capacity required                                                                                                                                                                      | Immediate-3 months                                         | No stockpile level is recorded in the packet; this is a structural recommendation based on the CRITICAL supply-risk classification (USGS MCS-2025 / NRCan 2024) |
| 2    | Secure long-term offtake from Finland nodes - Freeport Cobalt Kokkola (14,000 t/yr) and Umicore Kokkola (15,000 t/yr) are in the lowest-risk jurisdiction in the data (geopolitical-risk 8, governance 96; Finland producing-countries record); contracting priority is clear | 3 - 12 months                                              | Freeport-McMoRan 2024 10-K; Umicore Kokkola record                                                                                                              |
| 3    | Accelerate Electra Battery Materials commissioning support - the sole confirmed refinery under construction in the data (6,500 t/yr, Ontario); DOE Loan Programs Office engagement is already recorded                                                                        | 12 - 24 months                                             | Company disclosures / DOE Loan Programs Office 2024                                                                                                             |
| 4    | Resolve Li-Cycle DIP / restructuring to preserve Rochester Hub - Glencore's DIP role (Glencore 2024 Annual Report) creates a lever; preserving 35,000 t/yr recycling throughput avoids a North American capacity loss                                                         | 6 - 18 months                                              | Li-Cycle 8-K 2024; Glencore 2024 Annual Report                                                                                                                  |
| 5    | Diversify route origins beyond the three current corridors - the route HHI of 3,408 with 100% top-3 concentration leaves no in-data buffer; developing Philippines or DRC direct-route volume (both recorded as route origins with no volume) would reduce concentration      | 18 - 36 months (beyond assessment window but planning now) | EU Comext/Eurostat route records                                                                                                                                |

### "What Would Change My Mind" Triggers

Trigger 1 - DRC Production Signal (bound to: USGS MCS-2025 DRC output figure; threshold: a reported or estimated decline of  $\geq 15\%$  from the 220,000 t baseline; direction: downward; fires into: upgrade T1 from Likely to Very Likely and elevate overall assessment to CRITICAL-ACUTE)

The DRC mine-production figure of 220,000 t (USGS MCS-2025) is the single most load-bearing number in the assessment. Any credible report of output falling materially below that baseline - whether from USGS, NRCan, or company production disclosures - would immediately elevate the top-line risk rating and trigger reassessment of all downstream refinery exposure.

Trigger 2 - Chinese Export-Control Action (bound to: Chinese government regulatory announcements on cobalt exports; threshold: any formal export-licensing or volume-quota announcement covering cobalt metal, cobalt sulfate, or cobalt hydroxide; direction: any restriction; fires into: upgrade T2 from Unlikely to Very Likely and elevate Zhejiang/China exposure to CATASTROPHIC tier)

The packet records China's geopolitical-risk score at 55 - the highest populated score in the data. Any formal export-control measure would validate the alternative-3 scenario and require immediate reassessment of the 10.7% Zhejiang share and the unquantified broader Chinese refining share (noted as "materially higher" than mine-production concentration in the USGS MCS-2025 basis note).

Trigger 3 - Li-Cycle Restructuring Outcome (bound to: Li-Cycle court filings and operational status updates; threshold: court approval of a liquidation plan or confirmed closure of Rochester Hub; direction: closure; fires into: upgrade T3 from Roughly Even Chance to Likely and reduce the US producer-capacity share in the data)

The Rochester Hub's 35,000 t/yr stated capacity is the largest single recycling-facility figure in the data. A confirmed closure would remove a material component of the US capacity share and narrow the North American recycling buffer.

## Beat 7 - Confidence & Outlook

\*(Per CFA ROS § 11.0 - Oct 2004.)\*

Three-axis rating:

- Recommendation certainty: MEDIUM - The concentration signals (producer HHI 2,773, route HHI 3,408, top-3 mine-country share 89%) are robust and directionally unambiguous. Precision on the highest-consequence node (DRC) is limited by absent risk scores and no DRC volume in the route rollup.
- Time horizon: 24 months (July 2026 - July 2028)
- Risk exposure: HIGH - The CRITICAL supply-risk classification (USGS MCS-2025 / NRCan 2024), the HIGH producer and route concentration HHIs, and the Li-Cycle insolvency overhang collectively place the exposure in the HIGH tier. It would reach CATASTROPHIC if DRC disruption and Chinese access restriction were to coincide - a compounding scenario the data does not rule out.

Drivers OF confidence:

- USGS MCS-2025 and NRCan 2024 provide a consistent, high-confidence mine-production baseline.
- Multiple independent sources (RMI, company 10-Ks, SEDAR+, EU Comext) corroborate facility existence and operational status for key nodes.
- The HHI methodology is transparent and consistently applied (DOJ/FTC bands, (share<sup>2</sup>)).

Drivers CAPPING confidence:

- Capacity figures are absent for the majority of the 36 facilities; the concentration math rests on a subset.
- The DRC country record carries no geopolitical-risk or governance score - the highest-consequence node is the least characterised.
- The route-concentration rollup excludes DRC-origin volume, which is likely material given DRC's mine-production dominance.
- Thirty of 36 producer records carry no operational-status designation; effective operating capacity may differ materially from stated capacity.
- The packet does not quantify China's share of world cobalt refining, despite noting it is "materially higher" than mine-production concentration - a gap that limits precision on T2.

Freshness & half-life: The mine-production data is USGS MCS-2025 (data year 2024 estimated); trade-route volumes are 2023 annual. The assessment's half-life is approximately 6 months - it should be refreshed if: (a) USGS releases updated production estimates, (b) Li-Cycle's restructuring reaches a definitive outcome, (c) Electra Battery Materials announces a commissioning date, or (d) any Chinese export-control action is announced.

## Data Limitations & Confidence

1. DRC risk scores absent: The DRC entry in the producing-countries records carries no geopolitical-risk score and no governance score. This is the most consequential gap in the assessment; the DRC is the dominant mine-production node (220,000 t; USGS MCS-2025).
2. Majority of facilities lack capacity figures: 36 producer records are in the data; capacity figures are populated for approximately 12. The producer-concentration HHI is computed over the subset with populated values.
3. Route volumes thin: Only three of six route records carry volume figures. The DRC-origin route has no volume. The route-concentration rollup covers only three origins.
4. China refining share unquantified: The packet notes that cobalt refining/processing concentration is "materially higher" than mine-production concentration but does not provide a refining-specific HHI or share for China. This is the single most important missing figure for assessing T2.
5. Li-Cycle operational continuity uncertain: Chapter 11 status is confirmed; whether facilities remain operational through the assessment window is not resolved in the packet.
6. Cuba not scored: The Cuba-China corridor represents 28% of route volume in the data; Cuba carries no geopolitical-risk or governance score in the producing-countries records.

What would raise confidence: A refining-specific concentration dataset for China; populated DRC geopolitical-risk scores from a consistent scoring framework; volume figures for the DRC-origin trade route; and updated Li-Cycle restructuring outcomes.

## Methodology

This assessment is a single-pass synthesis over the source records provided in the user message. All factual claims are cited to named source records. No external knowledge, price data, named historical events, or figures not present in the source packet have been introduced. Concentration figures (HHI values, shares, counts) are taken directly from the computed rollups in the source packet and not recomputed from recall. Gaps in the data are surfaced as honest absences rather than filled from inference.

\*This product is intelligence analysis, not investment advice. It reflects the state of the cited source records as of the issued date and should not be relied upon as a complete or current characterisation of the cobalt market.\*

## Figures

Supply — market concentration (HHI)



Figure 1: Supply - market concentration (HHI)

Source: LodeIQ computed rollup over 52 packet records (15 sources: USGS Mineral Commodity Summaries 2025 / NRCAN Critical Minerals Database 2024; NRCAN Open Data; CNGR Advanced Material Co. (Shenzhen 300919) FY2023 Annual Report + H1 - 2024 financial report; +12 more).  
Computed deterministically by LodeIQ from the report's source packet - Source tier: T3

Supply — share by producer capacity by country

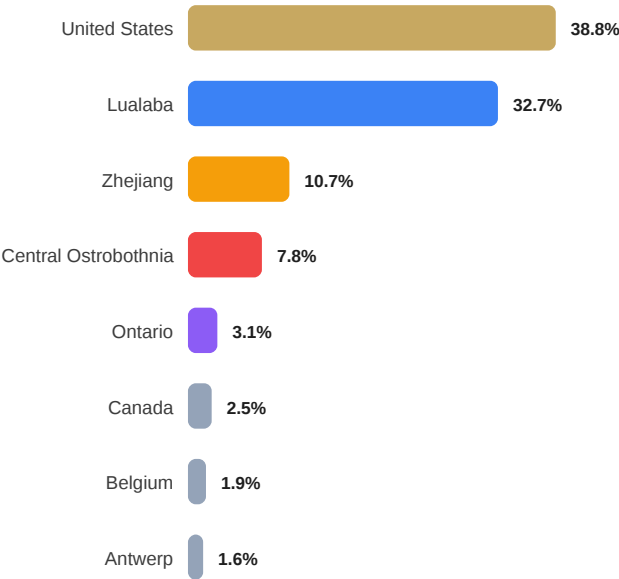


Figure 2: Supply - share by producer capacity by country

Source: LodeIQ computed rollup over 52 packet records (15 sources: USGS Mineral Commodity Summaries 2025 / NRCAN Critical Minerals Database 2024; NRCAN Open Data; CNGR Advanced Material Co. (Shenzhen 300919) FY2023 Annual Report + H1 - 2024 financial report; +12 more).  
Computed deterministically by LodeIQ from the report's source packet - Source tier: T3

Supply — market concentration (HHI)



Figure 3: Supply - market concentration (HHI)

Source: LodeIQ computed rollup over 52 packet records (15 sources: USGS Mineral Commodity Summaries 2025 / NRCan Critical Minerals Database 2024; NRCan Open Data; CNGR Advanced Material Co. (Shenzhen 300919) FY2023 Annual Report + H1 - 2024 financial report; +12 more).  
Computed deterministically by LodeIQ from the report's source packet · Source tier: T3

Supply — share by trade-route volume by origin



Figure 4: Supply - share by trade-route volume by origin

Source: LodeIQ computed rollup over 52 packet records (15 sources: USGS Mineral Commodity Summaries 2025 / NRCan Critical Minerals Database 2024; NRCan Open Data; CNGR Advanced Material Co. (Shenzhen 300919) FY2023 Annual Report + H1 - 2024 financial report; +12 more).  
Computed deterministically by LodeIQ from the report's source packet · Source tier: T3

Supply — operational status



Figure 5: Supply - operational status

Source: LodeIQ computed rollup over 52 packet records (15 sources: USGS Mineral Commodity Summaries 2025 / NRCan Critical Minerals Database 2024; NRCan Open Data; CNGR Advanced Material Co. (Shenzhen 300919) FY2023 Annual Report + H1 - 2024 financial report; +12 more).  
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