2026 · EDITION I

The Critical Minerals *Report*

Who produces the metals powering AI, defense and the energy transition — who refines and consumes them — where demand is heading, and where the supply chain breaks.

60 USGS commodities | Producer concentration | Offtaker & midstream | Demand to 2035 | Supply-risk matrix | Policy timeline

MetalsIntel

AN ATLAS MARKETS PUBLICATION
SOURCED: USGS MCS 2025 · IEA · S&P · BENCHMARK

THE THESIS IN ONE PAGE

00 — EXECUTIVE SUMMARY

Mining is dispersed. Power is concentrated.

The minerals behind AI datacenters, defense systems and the energy transition are not scarce in the ground — they are scarce in the *supply chain*. The world mines critical minerals in many places but **refines them in one**. That asymmetry, not geology, is the defining risk of the decade.

~70%
China's average share of refining across 19 of 20 energy-related minerals (IEA GCMO 2025)

30%
Projected copper supply shortfall by 2035 under current policy (IEA)

12 of 17
Rare earths under Chinese export licensing at the 2025 peak (MOFCOM / CSET)

What this report finds

- **Concentration is rising, not easing.** The top-3 countries' share of *mining* rose from 73% to 77% (2020→2024); their share of *refining* rose from ~82% to ~86%. (IEA GCMO 2025)
- **The chokepoint is midstream.** DR Congo mines ~76% of cobalt but refines almost none; China refines >75%. China mines ~69% of rare earths but separates ~85–90%. The leverage is in processing, not ore.
- **AI is now a first-order demand driver — through power, not chips.** Datacenter electricity roughly doubles to ~945 TWh by 2030 (IEA); the copper is in the grid that feeds them, and datacenter gallium demand could exceed 10% of today's global supply by 2030. (IEA Energy and AI 2025)
- **Policy is the new price signal.** China imposed export controls on gallium & germanium (2023), graphite (2023), antimony (2024), and rare earths (2025) — then banned gallium/germanium/antimony to the US outright in Dec 2024, before a one-year truce in Nov 2025.
- **The US is 100% net import-reliant** on graphite, gallium, manganese, niobium, tantalum, indium, arsenic and fluorspar — and >50% reliant on cobalt, rare earths, tungsten, tin, zinc, platinum, antimony, magnesium and titanium. (USGS MCS 2025)

How to read this report. Production and US import-reliance figures are from the USGS *Mineral Commodity Summaries 2025* (2024 data year). Refining/midstream shares are largely IEA/industry estimates (the USGS tabulates mine output, not refining) and are labelled as such. Demand paths to 2030/2035 are **modeled scenarios** from the IEA, S&P Global, Benchmark Mineral Intelligence and Adamas — they are illustrative of direction and magnitude, not forecasts of price or returns.

01 — THE SUPPLY MAP

Who produces what, and how concentrated it is

Ranked selection of strategic mineral commodities by producer concentration. **Share** = approximate % of global *mine / primary* production, 2024 (USGS-derived). **Import reliance** = US net import reliance as % of apparent consumption. `CRIT` = on the USGS 2022 Final List of Critical Minerals.

MINERAL	TOP PRODUCERS (MINE SHARE, 2024)	US IMPORT RELIANCE	CHINA MIDSTREAM	LIST	KEY SUPPLY RISK
Cobalt	DR Congo **~76%**, Indonesia ~10%, Russia ~3%	**76%**	**>75%**	CRIT	DRC concentration + Chinese refining; artisanal/ESG exposure
Rare earths	China **~69%**, US ~12%, Myanmar ~8%	**80%**	**~85–90%**	CRIT	China dominates separation + magnet alloy; export licensing
Graphite (nat.)	China **~79%**, Madagascar ~6%, Mozambique ~5%	**100%**	**~98%**	CRIT	China mining + near-total anode processing; Dec-2023 controls
Gallium	China **~99%**, Russia, Japan/Korea	**100%**	**~98%**	CRIT	China banned all exports to US (Dec 2024); GaN/GaAs chips
Magnesium	China **~95%**, others ~2% each	**>75%**	**~95%**	CRIT	~95% single-country; only US smelter idle since 2021
Niobium	Brazil **~92%**, Canada, DR Congo	**100%**	—	CRIT	Single-country (Brazil) dependence; US 100% reliant since 1959
Tungsten	China **~83%**, Vietnam ~4%, Russia ~3%	**>50%**	**dominant**	CRIT	Chinese production + APT/carbide conversion dominance
Platinum	South Africa **~71%**, Zimbabwe ~11%, Russia ~11%	**85%**	—	CRIT	Extreme S. Africa concentration; grid/load-shedding risk
Vanadium	China **~70%**, Russia ~21%, S. Africa ~8%	**40%**	**dominant**	CRIT	China + Russia ~91%; no US primary production
Indium	China **~70%**, S. Korea ~17%, Japan ~6%	**100%**	**~61%**	CRIT	100% reliant; China dominates output + exports (ITO coatings)
Titanium sponge	China **~64%**, Japan ~16%, Russia ~6%	**>95%**	**dominant**	CRIT	Aerospace-grade sponge China-concentrated; 1 small US plant
Fluorspar	China **~62%**, Mexico ~13%, Mongolia ~13%	**100%**	**dominant**	CRIT	100% reliant; Chinese mining + HF/fluorochemical dominance
Antimony	China **~60%**, Tajikistan ~17%, Russia ~13%	**85%**	**dominant**	CRIT	China banned exports to US (Dec 2024); price ~tripled
Nickel	Indonesia **~60%**, Philippines ~9%, Russia ~6%	**~100%***	**controls Indo.**	CRIT	Single-country supply; *ex-scrap reliance near 100%

Source: USGS Mineral Commodity Summaries 2025 (mine/primary production, 2024 est.); refining/midstream shares IEA/industry. Shares rounded. Continued overleaf.

The supply map — continued

MINERAL	TOP PRODUCERS (MINE SHARE, 2024)	US IMPORT RELIANCE	CHINA MIDSTREAM	LIST	KEY SUPPLY RISK
Lithium	Australia **~37%**, Chile ~20%, China ~17%	>50%	~60–65%	CRIT	Chinese chemical-conversion concentration; price-driven cuts
Tantalum	DR Congo ~42%, Nigeria ~19%, Rwanda ~17%	100%	metal/powder	CRIT	Conflict-affected Central-Africa sourcing; US 100% reliant
Manganese	S. Africa ~37%, Gabon ~23%, Australia ~14%	100%	alloy/battery	CRIT	US zero domestic ore; Chinese alloy + battery-grade processing
Germanium	China leading (~68% output), Russia, others	>50%	~68%	CRIT	China banned exports to US (Dec 2024); fiber/IR optics
Dysprosium / Terbium	China + Myanmar feedstock (heavy REE)	(REE 80%)	near-total	CRIT	Myanmar ion-clay → China separation; named in 2025 controls
Tin	China ~23%, Indonesia ~17%, Myanmar ~11%	73%	+ Indonesia	CRIT	Concentrated SE-Asian smelting; Myanmar (Wa) + Indo. policy
Zinc	China ~33%, Peru ~11%, Australia ~9%	73%	dominant	CRIT	China mining + smelting dominance; 2024 refined deficit
Aluminum / Bauxite	Bauxite: Guinea ~29%, Australia ~22% / **Al metal: China ~60%**	47%	~60%	CRIT	China ~60% of (coal-powered) smelting; Guinea bauxite risk
Palladium	Russia ~39%, S. Africa ~38%, Canada ~8%	36%	—	CRIT	Russia sanctions + SA grid; 2 countries ~77% of output
Titanium (mineral)	China ~37%, Mozambique ~21%, S. Africa ~15%	86%	led	CRIT	China-led mining/consumption; TiO_2 pigment feedstock
Arsenic	Peru ~47%, China ~41%, Morocco ~10%	100%	US imports	CRIT	Zero US output since 1985; ~96% of US metal from China
Tellurium	China ~75%, Russia ~7%, Japan ~7%	<25%	Cu-byprod.	CRIT	Byproduct of Cu refining (inelastic); CdTe solar
Copper	Chile ~23%, DR Congo ~14%, Peru ~11%	45%	~44%	–	Chinese smelting concentration; falling ore grades
Silver	Mexico ~25%, China ~13%, Peru ~12%	64%	—	–	Inelastic byproduct supply; 2024 consumption > supply
Uranium	Kazakhstan ~39%, Canada ~24%, Namibia ~12%	~92%	(Russia enr.)	fuel	~92% imported; Russian enrichment dominance

Reading notes. Copper & silver are *not* on the USGS 2022 critical list; uranium is excluded as a fuel mineral. Arsenic's top *producer* is Peru — China dominates US *import sourcing*, not global output. REE US import reliance is 80% (2024), down from >95% as US compound output rose. China's "midstream" column denotes refining/processing dominance, which the USGS does not tabulate (IEA/industry estimates).

02 — OFFTAKER & MIDSTREAM

Where mining ends and China's midstream begins

The single most important structural fact in critical minerals: **ore is mined widely, but turned into usable material in very few places.** The IEA finds China is the dominant refiner for **19 of 20** energy-related minerals, with an average processing share around **70%**. The geographic mismatch between mine and midstream is where supply risk actually lives.

China's processing share, by mineral

MINERAL	CHINA PROCESSING / REFINING SHARE	MINING REALITY (FOR CONTRAST)	SOURCE
Rare earths	~85–90% of separation	China ~69% mined — the chokepoint is separation, not ore	IEA / USGS
Graphite (anode)	~98% battery-grade	China ~79% mined; ~74% of full anode chain	Benchmark
Gallium	~98% low-purity	~50% at refined high-purity stage	USGS / CSIS
Cobalt	>75% refined	DR Congo ~76% mined but refines almost none	IEA
Germanium	~68% of output	Few Western refiners remain	USGS / CSIS
Lithium (refined)	~60–65%	Australia/Chile dominate mining; China dominates conversion	IEA
Aluminum (primary)	~60% smelting	Bauxite spread across Guinea, Australia, China	USGS
Copper (refined)	~44%	vs ~8% of mine output — the clearest mine-vs-midstream split	USGS / IEA
Nickel (Indonesia)	>75% of Indo. capacity is Chinese-controlled	Indonesia processes ~45% of refined nickel	NBR / ORF

The consuming hubs — and how exposed they are

- **European Union** sources **~98% of its rare-earth magnets** and effectively 100% of heavy REEs from China. (WEF / EU auditors 2025)
- **Japan** is the world's largest rare-earth importer — **~63% of REE-metal imports from China** in 2024. **South Korea** is ~70% China-dependent for key strategic minerals (targeting 50% by 2030). (ORF / CSIS 2025)
- **United States** — 100% net import-reliant on natural graphite (~43% from China) and gallium; ~80% on rare earths (~70% of imports from China). (USGS MCS 2025)
- **The policy yardstick:** the EU's Critical Raw Materials Act targets ≤65% of any strategic raw material from a single country, plus 40% domestic processing, by 2030 — far from today's reality. (European Commission)

> **Caveat.** Several China-share figures (refined lithium/cobalt >60%) include IEA *2035 projections*; present-day actuals are refined cobalt >75%, REE separation ~85–90%. Gallium "~98%" is low-purity-stage specific.

03 — THE AI / DATACENTER PULL

The metals the AI build-out actually needs

AI's mineral footprint is not mainly in the chips — it is in the **power**. Building, connecting and energising datacenters is a copper, gallium and rare-earth story before it is a silicon one.

~945 TWh
Datacenter electricity by 2030 — more than double 2024's ~415 TWh (IEA Energy & AI 2025)

>10%
Share of *today's* global gallium supply that datacenter demand alone could reach by 2030 (IEA)

2.5 Mt/yr
Datacenter copper demand by 2040; AI + defense each ~triple (S&P Global, Jan 2026)

Copper — the grid is the story

Datacenters are becoming *less* copper-intensive per facility, but **getting power to them** — substations, transmission, distribution — is where the incremental copper sits. Estimates vary by scope, so the scope matters more than the number:

SCOPE	INCREMENTAL COPPER	SOURCE
Datacenter-direct, peak	~400 kt/yr avg, peak ~572 kt (2028); >4.3 Mt cumulative by 2035	BloombergNEF, Aug 2025
Datacenter + grid connections	~1 Mt added by 2030	Trafigura
Grid-to-datacenter (broad)	up to ~5 Mt in new T&D through 2030	Wood Mackenzie
Datacenter, 2040	2.5 Mt/yr (range 1.7–2.7)	S&P Global

Intensity: roughly 30–40 tonnes of copper per MW of datacenter capacity (S&P). Against this, the IEA projects a **~30% copper supply shortfall by 2035** under current policy — widening on faster-decarbonisation paths.

Gallium, germanium & rare earths — the quiet dependencies

- **Gallium** is the standout exposure: GaN power electronics for high-density (800V, >1 MW) racks — and China supplies ~99% and banned US exports in Dec 2024.
- **Rare-earth magnets** (Nd, Dy, Tb) drive cooling fans, pumps and HDD motors; the shift to liquid cooling moves demand from fans to pumps without reducing it.
- **Germanium** underpins fiber-optic interconnect; **Li/Co/Ni** sit in backup-power systems.

> **Verification note.** The IEA primary summary quantifies the ">10% of today's gallium supply by 2030" figure directly. Widely-circulated per-mineral breakdowns (e.g. "+11% gallium / 512 kt copper") attributed to IEA appear via secondary relays and are not in the primary text; S&P figures here are verified via S&P's Jan 2026 press release, not the paywalled report.

04 — DEMAND TO 2035

Modeled demand across AI, EVs, energy & defense

All figures below are **modeled scenarios** from named sources, not forecasts of price or returns. IEA multiples are robust on direction and magnitude; absolute tonnages by scenario live in the IEA Critical Minerals Data Explorer.

MINERAL	DEMAND TRAJECTORY	PRIMARY DRIVERS	SOURCE / SCENARIO
Lithium	~5× by 2040 (STEPS); up to ~7× by 2035 (NZE). 1→>3 Mt LCE by 2030	EVs/batteries ~80% of growth; grid storage	IEA; Benchmark
Copper	28→42 Mt by 2040 (+50%); ~30% supply gap by 2035	Grid + AI datacenters + defense (each ~3× by 2040); EVs	S&P; IEA
Rare-earth magnets	NdFeB demand ~4× to >880 kt by 2040; ~206 kt/yr shortfall by 2035	EV motors, wind, robotics (~29% CAGR), defense, datacenter motors	Adamas; IEA
Graphite	Battery-sector ~+250% (≈3.5×) 2023→2030; total 2× by 2040	EV/battery anodes (~86% of demand), grid storage	Benchmark; IEA
Gallium	Datacenter demand >10% of today's supply by 2030; power-GaN market ~42% CAGR	GaN power chips (datacenter PSUs, EV inverters), defense radar/EW	IEA; Yole
Cobalt	+50–60% by 2040 (STEPS); up to ~3× by 2035 (NZE)	Batteries; aerospace superalloys/defense. LFP shift = headwind	IEA
Nickel	~2× by 2040 (STEPS) — a more balanced market	EV batteries; stainless steel baseline	IEA

The four demand engines

- **AI & grid** — copper (transmission), gallium (GaN power), REE magnets (cooling/HDD motors). The newest and fastest-moving vector.
- **EVs & batteries** — lithium, graphite, nickel, cobalt. Still the largest single driver of battery-metal demand (~85% of 2022–24 growth).
- **Clean energy** — copper & REE (wind), silver & tellurium (solar), grid storage. Renewables use 2.5–7× the copper of fossil generation.
- **Defense** — REE magnets (~417 kg per F-35), gallium/germanium (radar, EW, IR optics), cobalt superalloys, titanium.

> **Scope discipline.** "Datacenter copper" is the biggest source of confusion in this market: datacenter-*direct* (~400–575 kt/yr) is not the same as datacenter-*plus-grid* (~1 Mt+). Private forecasts (Adamas, Benchmark, Yole, S&P) are directionally strong but proprietary — cited as industry estimates, not government data.

05 — SUPPLY-RISK MATRIX

Concentration × import-reliance × policy exposure

A composite read of structural risk. **High** = single-country dominance *and* high US import reliance *and* active export-control exposure. **Elevated** = two of three. **Moderate** = concentrated but with diversification or balanced supply.

MINERAL	PRODUCER CONCENTRATION	US IMPORT RELIANCE	POLICY / CONTROL RISK	COMPOSITE
Gallium	China ~99%	100%	US export ban (Dec 2024)	High
Germanium	China leading	>50%	US export ban (Dec 2024)	High
Rare earths / heavy REE	China ~69% mine, ~90% sep.	80%	12/17 licensed (2025 peak)	High
Graphite (natural)	China ~79%, ~98% anode	100%	Export licensing (Dec 2023)	High
Antimony	China ~60%	85%	US export ban (Dec 2024)	High
Tungsten	China ~83%	>50%	Added to China controls	High
Magnesium	China ~95%	>75%	No active ban	Elevated
Cobalt	DR Congo ~76%	76%	China refining leverage	Elevated
Niobium	Brazil ~92%	100%	Allied supplier	Elevated
Platinum / Palladium	S. Africa / Russia	85% / 36%	Russia sanctions exposure	Elevated
Lithium	Australia ~37%	>50%	China conversion concentration	Elevated
Nickel	Indonesia ~60%	~100% ex-scrap	Chinese-controlled capacity	Elevated
Copper	Chile ~23% (dispersed)	45%	China ~44% smelting	Moderate
Uranium	Kazakhstan ~39%	~92%	Russian enrichment	Elevated

How to use this. The matrix is a structural screen, not a trade signal. The highest-composite minerals (gallium, germanium, heavy REE, graphite, antimony) are precisely those where China has paired near-total supply control with active export policy — the cases where a single policy decision, not a mine outage, sets the price.

06 — POLICY TIMELINE

Export controls & the friend-shoring response

Since 2023, policy — not geology — has been the dominant price signal in critical minerals. The timeline below is corroborated across multiple sources (Reuters, CSIS, CSET/Georgetown, IEA, European Commission, US Treasury/White House).

AUG 2022
US Inflation Reduction Act. Ties EV credits to FTA-partner mineral sourcing; excludes "foreign entities of concern."

JUL–AUG 2023
China: gallium & germanium licensing. Gallium exports fell from 6,876 kg (Jul) to 227 kg (Oct).

OCT–DEC 2023
China: graphite export controls (eff. Dec 1). Covers synthetic high-purity + natural flake/spherical.

DEC 2023
China bans REE processing-tech exports — targets separation & magnet-making *know-how*, not just material.

MAY 2024
EU Critical Raw Materials Act enters force. 34 critical / 17 strategic materials; 2030 benchmarks.

AUG–SEP 2024
China: antimony export controls. Exports later fell ~97%; price spiked from ~$1,400 to ~$38,000/t.

DEC 2024
China bans gallium, germanium & antimony exports to the US specifically (MOFCOM 2024 No. 46) — retaliating for US semiconductor controls.

MAR 2025
US EO 14241 / Defense Production Act mobilised to boost domestic output (adds copper, uranium, potash).

APR 2025
China licenses 7 medium/heavy REEs + magnets. EU Dy/Tb prices spiked up to ~6×; some automakers cut output within weeks.

JUL 2025
US takes $400M equity stake in MP Materials + $110/kg NdPr price floor; ~$2B for the National Defense Stockpile.

OCT 2025
China escalates to 12 of 17 REEs (MOFCOM 2025 No. 61) + extraterritorial 0.1% de-minimis rules on foreign products.

OCT–NOV 2025
One-year truce. After the Trump–Xi meeting, China suspends the 2025 REE controls for ~12 months (through ~Nov 2026) — a pause, not a rollback.

> **The pattern.** Each escalation followed a US technology control; each was answered with mineral leverage. The Nov 2025 truce is explicitly time-boxed — the structural dependency it papers over is unchanged, which is why the supply map in Section 01 still governs.

APPENDIX

Methodology, sources & disclosures

Methodology

Mine/primary production tonnages and US net import-reliance percentages are quoted from the USGS *Mineral Commodity Summaries 2025* (published Jan 2025; data year 2024, estimated), with country shares derived arithmetically from USGS world-production tables and rounded. Refining/midstream shares are **not** from the USGS (which tabulates mine output) — they are IEA and industry estimates and are labelled as such throughout. Critical-list membership refers to the USGS 2022 Final List of 50 Critical Minerals (Federal Register 87 FR 10381); a newer 2025 list exists but is not used here. Demand trajectories are modeled scenarios from the named sources.

Primary sources

USGS *Mineral Commodity Summaries 2025* · IEA *Global Critical Minerals Outlook 2025* · IEA *Energy and AI* (2025) · S&P Global *Copper in the Age of AI* (Jan 2026) · BloombergNEF (Aug 2025) · Adamas Intelligence · Benchmark Mineral Intelligence · Yole Group · CSIS · CSET / Georgetown · European Commission / Consilium · Wood Mackenzie · CRU · Trafigura · World Nuclear Association & EIA (uranium).

Selected data caveats

- REE US import reliance is **80%** (2024), not 100% — US compound output has risen.
- Nickel reliance is below 50% only because scrap is counted; ex-scrap it is near 100% (USGS).
- Arsenic's top *producer* is Peru (~47%); China dominates US *import sourcing* (~96% of metal).
- Bauxite's top producer is Guinea (~29%), narrowly ahead of Australia; aluminium *metal* is China ~60%.
- Several IEA China-processing figures are 2035 projections — present-day actuals differ and are noted inline.