

The Critical Mineral Export Control Stack

Four Simultaneous Regimes, One Bottleneck Architecture, and the Compliance Reality No Single Counsel Reads End to End

4 regimes

MOFCOM, EU CRMA, US BIS, INDONESIAN
DOWNSTREAMING:
SIMULTANEOUS, NON-SUBSTITUTABLE

11+

MINERAL CATEGORIES UNDER MOFCOM DISCRETIONARY LICENSING

~10%

SHARE OF GLOBAL CRITICAL-MINERAL TRADE UNDER EXPORT RESTRICTION BY 2023

EXECUTIVE DASHBOARD

The architecture of critical-mineral export controls is no longer a single-state instrument operating against a free-trade default. It is a four-regime stack, and each regime binds a distinct choke point on overlapping commodity chains.

THEESIS

The architecture of critical-mineral export controls is a four-regime stack. China's MOFCOM holds the upstream licensing layer across at least eleven mineral categories. The European Union has codified processing and source-diversification benchmarks in statute through the CRMA. The United States BIS has extended the Foreign Direct Product Rule and the Entity List into a downstream technology-control layer. Indonesia has hardened a downstreaming mandate that withholds ore at source. Each regime binds a distinct choke point. The choke points overlap on the same commodity chains, and the practical result for a multinational with mining, processing, defense, automotive, or semiconductor exposure is more binding bottlenecks per ton of throughput than the prior fifteen years combined. The operative question is not which regime is winning. It is which regime binds first on which commodity chain, and how compliance counsel, procurement, and capital planning are coordinated across four legal systems that share neither vocabulary nor cadence.

KEY STATISTICS

2023-08-01

MOFCOM gallium / germanium licensing effective (Announcement No. 23)¹

2023-12-01 / 2023-12-21

MOFCOM graphite licensing / rare-earth processing-tech ban^{2, 6}

~3x

antimony prices between Aug 2024 announcement and April 2025^{3, 8}

2024-12-03

MOFCOM US-targeting clarification: Ga / Ge / Sb / superhard / certain graphite^{7, 9}

2025-04-04MOFCOM Announcement 26: seven medium / heavy rare-earth categories^{5, 10}**~98 / ~60%**China share of refined gallium / refined germanium, 2024-2025^{11, 12, 13}**10 / 40 / 25 / 65%**CRMA 2030 extraction / processing / recycling / single-third-country cap¹⁴**47 projects**first EU CRMA Strategic Projects list, 25 March 2025, across 13 member states¹⁵

Scope & method. Open-source intelligence only, verified against AEIG Module 2 allowlisted Tier 1, 2, 3, and 4 sources. T4 emphasis (USGS Mineral Industry Surveys monthly series, UN Comtrade bilateral flows, Chinese General Administration of Customs monthly statistics, ICMM production data) is deliberately weighted at 10 percent of the registry. Chinese-language MOFCOM Announcements are read from the Chinese original where the English translation lags, and reconciled against CSIS and CEPA translation-and-commentary. Where Chinese customs data and UN Comtrade mirror data diverge on monthly granularity, both are reported and the divergence is treated as the load-bearing finding. License-issuance counts by destination are not published by MOFCOM; the architecture's discretionary behaviour is inferred from market signal and from institutional review. Chinese state media is cited as claim-source marker only and never load-bearing. Window: 2023 to mid-2026. Timeliness: DURABLE.

KEY JUDGMENTS

Seven judgments anchor this assessment. Each is tied to the cited evidence in the sections that follow and carries an explicit confidence level.

1

High

Four distinct export-control regimes operate simultaneously on the critical-minerals stack as of mid-2026, and each binds choke points the other three do not address. The architecture is additive not substitutive.^{1, 14, 19, 24, 25, 13, 23}

2

High

The China MOFCOM layer is the most consequential of the four because it operates at the refining and processing layer (where global concentration is highest), and because it is administered as discretionary case-by-case licensing without published criteria or timelines for grant.^{11, 12, 24, 30, 13, 10, 8}

3

Moderate

The EU Critical Raw Materials Act is statutorily ambitious and operationally lagging. The 47-project March 2025 strategic list, the 40 percent processing benchmark by 2030, and the 65 percent single-source cap are not trajectory-consistent with current EU dependency shares on China.^{25, 13, 33}

4 **High** The US BIS layer is the legally most distinctive of the four because the FDPR architecture asserts extraterritorial reach into non-US-produced items containing US-origin technology.^{16, 17, 32, 18}

5 **Moderate** Indonesia's downstreaming model has achieved its headline domestic value-capture goal (60-65 percent refined nickel share against sub-30 percent mined share in 2014), at fiscal and environmental cost documented by NRG. The template is being imitated.^{19, 20, 22, 21}

6 **High** Multinational compliance burden under the four-regime stack is compounding rather than additive. Each regime requires its own legal counsel, screening protocols, and end-use certification, and the regimes do not share definitions or timelines.^{14, 19, 26, 27}

7 **Moderate** The combined stack is durable on a 12-month horizon irrespective of any single bilateral negotiation or WTO action. Each regime is statutorily entrenched in a distinct legal system; the political consensus underwriting each spans more than one electoral cycle.^{14, 25, 13, 28}

SECTION 01 • STRUCTURE

Four Regimes, One Bottleneck Architecture

The cleanest way into the architecture is to ask what each regime actually binds. The four regimes are not redundant; they bind different layers of the same commodity chain, and the overlaps multiply rather than substitute.

The China MOFCOM layer binds upstream refining and processing. Starting with the gallium and germanium licensing of August 2023, MOFCOM has extended discretionary case-by-case export licensing across at least eleven mineral categories: gallium, germanium, graphite (synthetic and natural), antimony, tungsten, tellurium, bismuth, molybdenum, indium, and seven categories of medium and heavy rare earths.^{1, 2, 3, 4, 5} Rare-earth extraction, separation, and magnet-manufacturing technology has been added separately as a banned-for-export category.⁶ On 3 December 2024 MOFCOM took a discrete additional step against the United States destination

specifically, banning export of gallium, germanium, antimony, certain superhard materials, and certain graphite products.⁷

The EU CRMA layer binds at the demand side through statutory benchmarks. Regulation 2024/1252 entered into force on 23 May 2024.¹⁴ It does not control exports. It sets benchmarks for the Union's own consumption profile: ten percent of annual consumption met from EU extraction, forty percent from EU processing, twenty-five percent from recycled material, and a ceiling of sixty-five percent of any strategic raw material from any single third country, all by 2030. The first strategic-projects list was published on 25 March 2025 with 47 projects across 13 member states.¹⁵

The US BIS layer binds at the technology and end-use layer through Federal Register rulemaking. The October-and-December 2024 China rule expanded the Foreign Direct Product Rule to capture non-US-produced semiconductor items containing US-origin technology above defined thresholds; it added 140 China-linked entities to the Entity List; it imposed new controls on high-bandwidth memory.^{16, 17}

The Indonesia downstreaming layer binds at the source. MoEMR Regulation 7/2020 hardened the 2014 nickel-ore export ban into a structural commitment.¹⁹ MoEMR Regulation 1437 K/2022 banned bauxite ore exports effective 10 June 2023.²⁰ A copper-concentrate framework has been under active consideration through 2025, conditional on smelter commissioning at Freeport's Manyar facility and at Amman Mineral's facility.²¹

The four regimes bind different layers. China binds processing. The EU binds demand-side diversification. The US binds technology and end-use. Indonesia binds source. A single commodity chain typically crosses two or three of the four layers, and the points of binding multiply rather than substitute. A neodymium-iron-boron permanent magnet sourced from a Chinese magnet manufacturer, sold to a tier-2 European supplier, integrated into a tier-1 automotive driveline module, and exported to a US automotive OEM crosses MOFCOM licensing (for the rare-earth feedstock and the dysprosium-terbium dopants), EU CRMA reporting (for the rare-earth content and the strategic-raw-material classification), US BIS end-use screening (for the destination and end-use of any US-technology-content portion of the manufacturing process), and (if the iron-ore or steel feedstock crosses Indonesian smelter capacity) the Indonesian permit perimeter as well.

The OECD's structural baseline confirms the trend. The OECD Inventory of Export Restrictions on Industrial Raw Materials records a sustained rise in export-restriction measures across 2009-2023, accelerating after 2020, with approximately ten percent of global critical-mineral trade subject to some form of export restriction by 2023, roughly five times the 2009 figure.²³ Critical-mineral trade has been moving from free-trade default to managed-trade default for a decade; the four-regime stack is the culmination, not the inception, of that trend.

ASSESSMENT • HIGH CONFIDENCE

The four-regime architecture is the operative reality for any multinational with critical-mineral exposure in 2026. Compliance, procurement, and capital planning frameworks that treat any one regime as the dominant variable will misread the binding constraint at point of operation. The regimes do not substitute; they compound. The operative planning question is which of the four regimes binds first on each commodity chain a firm touches, and how the compliance function is structured to clear all four concurrently.

Rationale: Documentary record across MOFCOM, CRMA, BIS, and MoEMR primaries; OECD trend data; convergent institutional readings (CSIS, Carnegie, IEA, ICG); structural concentration data.

SECTION 02 • WALK-THROUGH

The China Layer in Detail

The MOFCOM regime is the layer where the four-regime stack does most of its work. Walking it mineral by mineral exposes the discretionary feature that distinguishes it from the other three.

Gallium and germanium (August 2023). Announcement No. 23 of 2023 placed gallium- and germanium-related items under licensing effective 1 August 2023.¹ China accounted for approximately 98 percent of refined gallium and approximately 60 percent of refined germanium globally as of 2024-2025.^{11, 12, 13} US net import reliance was 100 percent for both. In the months following, gallium and germanium prices roughly doubled.

Graphite (December 2023). Announcement No. 50 of 2023 placed synthetic and natural graphite items under licensing effective 1 December 2023.² China produced approximately 80 percent of global natural graphite and a substantially higher share of refined battery-anode graphite.^{11, 13} The licensing regime captures the chemistry on which the lithium-ion battery anode depends.

Rare-earth processing technology (December 2023). Announcement No. 39 of 2023 banned export of rare-earth extraction, separation, and magnet-manufacturing technology and equipment.⁶ This is a technology-control measure, not a commodity control. The implication for the EU CRMA's 40-percent-processing target is direct: the equipment needed to build the processing capacity that target requires is itself under export prohibition from the dominant supplier.

Antimony (August 2024). Announcement No. 33 of 2024 placed antimony, antimony oxide, and gold-antimony alloys under licensing effective 15 September 2024.³ Antimony is a defense-critical material. China produced approximately 60 percent of mined and 80 percent of refined antimony globally.^{11, 12}

Antimony prices roughly tripled between announcement and April 2025, the cleanest single market signal of MOFCOM licensing impact in the cycle.⁸

The US-targeting clarification (December 2024). On 3 December 2024 MOFCOM published an announcement banning export of gallium, germanium, antimony, certain superhard materials, and certain graphite products to the United States specifically.⁷ Reported US imports of antimony from China collapsed to zero that month.⁹ MOFCOM demonstrated, in a single action, the ability to switch the instrument from throttle to off-switch when it chose. The November-December 2024 BIS rule on semiconductor export controls is the proximate political trigger; the architecture is destination-discriminatory by design.

Tungsten, tellurium, bismuth, molybdenum, indium (February 2025). Announcement No. 18 of 2025 placed five additional metals under licensing.⁴ Tungsten is the most operationally consequential of the five for defense and industrial cutting: China produced approximately 80 percent of mined tungsten and a higher share of refined tungsten.^{11, 12} Tungsten APT and ferrotungsten prices rose materially across 2025 following the announcement.³¹

Medium and heavy rare-earth dual-use controls (April 2025). Announcement No. 26 of 2025 placed seven categories of medium and heavy rare-earth items under licensing: samarium, gadolinium, terbium, dysprosium, lutetium, scandium, and yttrium.⁵ Dysprosium and terbium are the load-bearing dopants for high-temperature NdFeB magnets, on which both wind turbines and high-end defense actuators depend, and heavy rare-earth separation capacity outside China is effectively zero. Chinese rare-earth magnet exports declined sharply in May-June 2025; CSIS characterised the architecture as discretionary case-by-case licensing with no published criteria or timelines for grant.^{24, 10}

The CSIS one-year review of the MOFCOM rare-earth regime reads the license-issuance pattern as substantially divergent between allied and non-allied destinations.³⁰ The architecture has three distinguishing features. First, it operates at the refining and processing layer, where global concentration is highest. Second, it is administered as discretionary case-by-case licensing without published criteria, which makes it harder to model, harder to litigate, and easier to recalibrate. Third, it can be switched from throttle to embargo for any single destination, as the December 2024 US-targeting clarification demonstrated.

ASSESSMENT · HIGH CONFIDENCE

The China MOFCOM layer is the operative binding constraint on critical-mineral throughput for any multinational with US-nexus exposure or with end-use ambiguity that MOFCOM could read as such. The license-issuance opacity is not an oversight; it is the policy feature. Modeling the China layer requires treating license issuance as a discretionary input with a 0 to 12-week lag, not as a regulatory pass-through.

Rationale: MOFCOM Announcements S001-S007; refining-share metrics; market-impact data; CSIS one-year review.

SECTION 03 · POLICY

The EU CRMA: Statutorily Ambitious, Operationally Lagging

The European Union's Critical Raw Materials Act is the most architecturally complete of the four regimes on paper and the most operationally lagging in practice.

The regulation entered into force on 23 May 2024 with four statutory benchmarks for 2030: at least ten percent of annual EU consumption from EU extraction; at least forty percent from EU processing; at least twenty-five percent recycled-content contribution; and no more than sixty-five percent of any strategic raw material from any single third country.¹⁴ The list of strategic raw materials includes seventeen materials; the broader critical raw materials list extends to thirty-four.

The implementation track is the Strategic Projects designation. The European Commission published its first Strategic Projects list on 25 March 2025: 47 projects across 13 member states.¹⁵ Strategic Projects are eligible for permitting acceleration (target 27 months for extraction projects, 15 months for processing and recycling), for streamlined access to financing, and for recognition as overriding public interest in environmental and planning law.

The implementation gap is the operative finding. Carnegie's September 2024 analysis read the CRMA's processing benchmark as not trajectory-consistent with current EU dependency shares.²⁵ The IEA's Global Critical Minerals Outlook 2025 reported that the average market share of the top three producing countries across a basket of critical-mineral refining stages remained around 86 percent in 2024, broadly unchanged from prior years.¹³ On several strategic raw materials, current EU dependency on China exceeds 90 percent, well above the 65 percent statutory cap, with no clear pathway to compliance by 2030. Bloomberg's first-list assessment characterised the March 2025 strategic-projects portfolio as falling short of the throughput required to deliver the 40 percent processing target on the statutory timeline.³³

Three structural features sit behind the gap. First, processing capacity is capital-intensive and long-cycle: a rare-earth separation facility from greenfield to qualification runs five to seven years on best-case European construction timelines, and the qualification cycle for the downstream metallurgy is itself measured in years. Second, the equipment to build that processing capacity is itself under export prohibition from China (MOFCOM Announcement No. 39 of 2023), which forces European projects to develop processing technology independently or to source equipment from non-Chinese suppliers, compounding the time and capital cost. Third, the EU's environmental and permitting framework imposes constraints that even Strategic Projects acceleration cannot fully shortcut.

ASSESSMENT · MODERATE CONFIDENCE

The EU CRMA is structurally durable as a regulatory architecture but operationally lagging against its own 2030 trajectory. The Strategic Projects designation track is the right instrument; the 47-project March 2025 list is not throughput-consistent with the 40 percent processing benchmark; current dependency shares on China for several strategic raw materials exceed 90 percent, well above the 65 percent ceiling. A mid-term review or amendment cycle is more likely than not before 2028.

Rationale: Carnegie gap analysis; IEA processing-concentration metric; Bloomberg first-list assessment; statutory benchmarks against documented dependency shares.

SECTION 04 · STAKEHOLDER

The US BIS Layer: FDPR, Entity List, and the Extraterritorial Reach

The US Bureau of Industry and Security's contribution to the regime stack is architecturally distinctive. The FDPR extends US export controls to non-US-produced items containing US-origin technology above defined thresholds.

The October-and-December 2024 China rule was the principal action of the cycle. BIS expanded the FDPR scope-of-application to capture non-US-produced semiconductor items containing US-origin technology above the defined thresholds.^{16, 18} It added 140 China-linked entities to the Entity List, requiring a BIS licence (typically presumed denial) for any export, re-export, or in-country transfer of subject items to those entities.¹⁷ It imposed new controls on high-bandwidth memory (HBM), the memory architecture on which AI training systems depend.¹⁶

The legal architecture distinguishes BIS from the other three regimes on three counts. First, the FDPR's extraterritorial reach means that a foreign manufacturer outside the United States, producing a non-

US-origin item, can become subject to US export controls if the item is made using US-origin technology above the threshold. Second, the Entity List is a published designation with explicit license-presumption rules, which makes it the most procedurally transparent of the four regimes (in contrast to MOFCOM's unpublished license-issuance criteria). Third, the Section 232 import-side process under the Department of Commerce produces parallel actions on selected mineral imports, which integrates the BIS layer with broader US trade policy.

The compliance reality for a multinational with US-nexus exposure is that the BIS layer functions as the regime most likely to extend by rule revision rather than by new statute. The Federal Register process is procedurally fast, the FDPR threshold can be revised within the existing statutory framework, and the Entity List can be extended without new legislation. Brookings characterised the environment as one in which compliance teams must monitor the Federal Register at a cadence comparable to monitoring MOFCOM Announcements, with comparable operational lead times.³²

The interaction with the China layer is the second-order feature worth surfacing. The December 2024 MOFCOM US-targeting clarification was, by the consensus of CSIS, CEPA, and PIIE analysis, the proximate Chinese response to the October-December 2024 BIS rule.^{24, 29, 18} The escalation pattern is structurally bilateral: BIS rule, MOFCOM response, MOFCOM tightening, BIS extension.

The Department of Defense's 2024 Industrial Capabilities Report to Congress identifies critical-mineral feedstock concentration as a defense industrial base risk across multiple material classes.²⁷ The DOE 2023 Critical Materials Assessment identifies gallium, dysprosium, neodymium, iridium, and graphite as short-term-critical for clean-energy applications.²⁶ Both documents are demand-side US-Government recognition of the structural exposure that the BIS layer is designed to address from the export-control side.

ASSESSMENT · HIGH CONFIDENCE

The US BIS layer is the legally most distinctive of the four because the FDPR architecture asserts extraterritorial reach into the technology and equipment supply chain on which critical-mineral processing depends. The BIS layer is also the regime most likely to extend by rule revision rather than by new statute. The compliance lesson is to monitor the Federal Register at Announcement-level cadence and to treat FDPR scope-of-application as an active variable rather than a static rule.

Rationale: PIIE comparative architecture analysis; Brookings sectoral analysis; the December 2024 China rule's FDPR scope-of-application; documented MOFCOM-BIS escalation pattern.

SECTION 05 • CAPITAL

Indonesia: The Downstreaming Template

Indonesia's contribution to the regime stack is the most structurally distinct of the four. The architecture withholds ore from export and forces processing capacity to come to the resource.

The architecture has three statutory anchors. MoEMR Regulation 7/2020 hardened the 2014 nickel-ore export ban into a structural commitment, ending the relaxation period and locking the policy into a long-cycle architecture.¹⁹ MoEMR Regulation 1437 K/2022 banned bauxite ore exports effective 10 June 2023, extending the nickel template to a second mineral.²⁰ A copper-concentrate framework has been under active consideration through 2025, conditional on smelter commissioning at Freeport's Manyar facility and at Amman Mineral's facility.²¹

The headline result is unambiguous. Indonesia produced approximately 60 percent of global mined nickel and 60-65 percent of refined nickel by 2024-2025, up from a sub-30 percent mined share in 2014 prior to the ore-export ban.^{11, 13, 22} The downstreaming capacity that absorbs the captive ore is largely Chinese-financed: the IMIP and IWIP industrial parks in Sulawesi and North Maluku host the dominant share of Indonesia's nickel smelting and HPAL capacity, with majority Chinese equity and operating control.

NRGI's five-year audit of the downstreaming policy documents both the value-capture gain and the cost.²² The fiscal cost includes foregone tax revenue from the holiday and incentive structures used to attract smelter capital, plus the subsidy structure underwriting electricity supply to the industrial parks. The environmental cost includes deforestation around the industrial park sites, tailings-management challenges, and the carbon intensity of the captive coal-fired power that underwrites smelter electricity. NRGI's read is that the headline value-capture figure is meaningfully different from the net-of-cost value-capture figure.

The propagation question is the operative open issue. The copper-concentrate framework under consideration through 2025 is the closest near-term extension.²¹ Cobalt has been publicly proposed as a third candidate. Outside Indonesia, the template is being studied actively by the Philippines (which sits on substantial nickel reserves), by selected African producers, and by Australia.

The WTO architecture's relationship to the Indonesian template is structural. The 2022 WTO panel finding in DS592 against Indonesia's nickel-ore export ban is on the record, but the Appellate Body remains non-functional, and the panel ruling has not been operationalised into remedy. The architecture cannot deliver the dispute resolution even where the case is filed and won; the Indonesian policy operates regardless. The lesson for the wider regime stack is that WTO remedies are not the operative deterrent against downstreaming mandates on a 12-month horizon.

ASSESSMENT · MODERATE CONFIDENCE

The Indonesia downstreaming model has achieved its headline domestic value-capture goal, at fiscal and environmental cost that NRGi has documented. The template is being imitated because the headline success metric is the cleanest single host-state achievement in critical-mineral policy over the past decade; the copper-concentrate extension is the closest near-term test of replicability. The compliance lesson is that the architecture is structurally durable, that the equity and operating-control allocation behind the value-capture headline favours Chinese counterparties materially, and that WTO remedies are not the operative deterrent.

Rationale: NRGi five-year audit; MoEMR regulation text; trade-press coverage of copper extension; documented WTO architecture status; IEA processing-concentration metric.

SECTION 06 · TRANSMISSION

The Compliance Reality

The four-regime stack is best understood from the operator's seat, where the compliance burden compounds rather than substitutes. A walk through five archetypal exposures clarifies what a real compliance function faces in 2026.

Mining majors with cross-jurisdiction footprints face the four-regime stack at the offtake end of the chain. The four-regime stack binds the company's customers: a copper concentrate sold to a Chinese smelter requires consideration of whether the buyer is subject to BIS Entity List restrictions, whether the smelter's downstream production is destined for embargoed end-users, and whether the trade route triggers CRMA reporting obligations on the European leg. The compliance burden falls heaviest on the marketing function. ICMM member companies' production data, captured in the ICMM Annual Tax Contribution Report and Production Database, supplies the substrate for cross-jurisdiction mapping.³⁸

Processors and refiners face MOFCOM's upstream control and CRMA's processing benchmarks simultaneously. A European rare-earth separation project under CRMA Strategic Project designation faces a compliance load that includes CRMA Strategic Project reporting requirements; BIS end-use screening on any US-technology-content portion of the separation equipment; and MOFCOM-comparable export-control screening on the finished separated product if any portion of the equipment or feedstock has Chinese-origin content. The capital cost of the project is amplified by the compliance cost.

Defense procurement is the most acute exposure because feedstock concentration is highest for the defense-critical minerals (antimony, tungsten, gallium for radar GaN devices, dysprosium and terbium

for high-temperature magnets) and because end-use sensitivity is highest. A US defense prime sourcing tungsten-carbide cutting tools faces MOFCOM licensing at the Chinese supplier, US BIS end-use screening for the finished part, EU CRMA reporting if the part transits or is sold into the EU, and Indonesian permit screening if the carbide-grade tungsten is processed through an Indonesian smelter. DoD's 2024 Industrial Capabilities Report identifies critical-mineral feedstock concentration as a defense industrial base risk across multiple material classes; defense primes are quietly building dual-supply qualified sourcing on a multi-year capital plan.²⁷

Automotive OEMs face the most opaque exposure because sub-tier supplier visibility is structurally limited. A US, EU, or Japanese automotive OEM sourcing electrified-driveline components depends on rare-earth permanent magnets supplied by tier-2 component manufacturers, which source magnet alloy from tier-3 rare-earth oxide refiners, which source rare-earth concentrate from tier-4 mining and primary-separation facilities. MOFCOM's April 2025 dual-use controls on medium and heavy rare earths bind the tier-3 layer, and the tier-1 OEM has limited visibility into license-issuance status at that layer.^{25, 32}

Semiconductor supply chain is the most architecturally distinctive exposure because it sits at the intersection of the BIS FDPR architecture and the MOFCOM gallium / germanium licensing. Gallium nitride (GaN) and silicon carbide (SiC) are the load-bearing chemistries for power electronics, radio-frequency, and high-voltage applications; germanium is load-bearing for fibre-optic and infrared applications. The FDPR captures non-US-produced semiconductor items containing US-origin technology; MOFCOM licensing captures the upstream gallium and germanium feedstock. PIIIE's 2025 comparative architecture analysis is the cleanest institutional read.¹⁸

The aggregate compliance burden is non-trivial. A multinational with exposure across two or three of these archetypes maintains two or three distinct legal-counsel functions, each tracking a different regulatory architecture on a different cadence. None of the four regimes substitutes for any other. The DOE 2023 Critical Materials Assessment and the DoD 2024 Industrial Capabilities Report are both US-Government recognitions of the underlying exposure, and both are demand-side complements to the BIS export-control architecture.^{26, 27}

ASSESSMENT · HIGH CONFIDENCE

The compliance burden under the four-regime stack is compounding rather than additive. Each regime requires its own legal counsel, screening protocols, and end-use certification. The defense procurement and semiconductor segments face the most acute exposure; the automotive segment faces the most opaque exposure; the processing and refining segment faces the most expensive exposure. The function is no longer a single-counsel single-cadence operation. It is a multi-regime, multi-counsel, multi-cadence coordination problem, and the coordination cost is the structural addition to the operating cost base.

Rationale: DOE Critical Materials Assessment; DoD Industrial Capabilities Report; structural concentration data; PIIE comparative architecture analysis; Carnegie and Brookings sectoral analyses; ICMM production data.

SECTION 07 · OUTLOOK

Three Scenarios, 12-Month Horizon

Construction confidence reflects analytical quality, not probability. Each scenario carries a triggering signal and a primary impact for the CFO or CRO lens.

Baseline · The Stack Persists, the Licensing Layer Tightens

CONSTRUCTION CONFIDENCE: HIGH · VELOCITY: GRADUAL

Through mid-2027 the four-regime architecture remains intact. MOFCOM extends the discretionary licensing layer to one or two previously uncontrolled commodities (lithium hydroxide, cobalt sulfate, or manganese flake are the leading candidates) inside the next 12 months, anchored to perceived geopolitical pressure rather than to mineral-specific events. The EU CRMA's first strategic-projects list is supplemented by a second tranche of designations in late 2026 or early 2027, with implementation lag persistent against the 2030 trajectory; no statutory amendment is proposed in this window. The US BIS extends FDPR scope by Federal Register rulemaking on selected non-semiconductor critical-mineral-processing technologies, maintaining the bilateral escalation cycle with MOFCOM. Indonesia finalises a copper-concentrate framework with effective date inside the window.

SIGNAL TO WATCH: CHINESE POLICY SHIFT SIGNALLED BY DIRECT REMOVAL OF ONE OR MORE MINERALS FROM THE LICENSING LIST WOULD PUSH TOWARD STABILIZATION; A US ACTION TARGETING EU OR JAPANESE RELIANCE ON CHINESE PROCESSING WOULD PUSH TOWARD DETERIORATION

Deterioration • The Bilateral Escalates and a Third Regime Hardens

CONSTRUCTION CONFIDENCE: MODERATE · VELOCITY: RAPID

The MOFCOM-BIS escalation cycle accelerates. China extends the US-targeting clarification to additional commodities or to additional destinations beyond the United States; one EU member state or the EU as a whole is named in a destination-discriminatory MOFCOM action. BIS extends the FDPR to a non-semiconductor critical-mineral category by rule revision and adds further Chinese counterparties to the Entity List. The EU, faced with the gap between the CRMA's statutory benchmarks and operational reality, accelerates a defensive trade measure (Carbon Border Adjustment extension, anti-coercion instrument deployment) that adds a fifth de facto regime layer to the stack. Indonesia tightens the copper-concentrate framework into a hard ban with effective date inside the window, and proposes a cobalt extension. Trade flows decline materially across multiple mineral categories.

SIGNAL TO WATCH: DISCRETE CHINESE ACTION AGAINST AN EU MEMBER OR AGAINST JAPAN; FDPR EXTENSION TO A NON-SEMICONDUCTOR CRITICAL-MINERAL CATEGORY; AN INDONESIAN COBALT-EXPORT BAN

Stabilization • The Bilateral De-Escalates and a Restoring Mechanism Emerges

CONSTRUCTION CONFIDENCE: LOW-MODERATE · VELOCITY: STRUCTURAL

A discrete bilateral US-China track produces a partial roll-back of the December 2024 US-targeting MOFCOM action, with one or two embargoed commodities returning to the licensing layer rather than the categorical-embargo layer. The EU CRMA's mid-term review is initiated formally, with statutory benchmarks softened or paired with extended timelines, and the diplomatic posture toward the MOFCOM regime softens. BIS pauses further FDPR scope extension on critical-mineral-related categories, holding the existing architecture rather than tightening. Indonesia finalises the copper-concentrate framework but defers cobalt and tin extensions, signalling a pause in template propagation. A WTO dispute filed against one of the MOFCOM actions produces a panel ruling that, while not enforceable through Appellate Body remedy, signals diplomatic consensus on the architecture's overreach.

SIGNAL TO WATCH: DISCRETE US-CHINA BILATERAL AGREEMENT; CRMA MID-TERM REVIEW COMMUNICATION FROM THE COMMISSION; AN INDONESIAN DEFERRAL OF COBALT-EXTENSION

ASSESSMENT · MODERATE CONFIDENCE

Across all three scenarios the four-regime architecture remains the operative environment for any multinational with critical-mineral exposure on a 12-month horizon. Baseline implies the architecture intensifies; Deterioration implies the compliance burden moves from compounding to acute; Stabilization implies the trajectory of further tightening pauses. None of the three imply the architecture disappears. The planning question is which of the firm's critical-mineral exposures is most sensitive to which scenario, and what compliance and capital plan is consistent with each.

Rationale: Documented regime durability across MOFCOM, CRMA, BIS, and MoEMR primaries; CSIS and IEA reads on tightening trajectory; structural absence of WTO remedy capacity; bilateral escalation pattern across 2024-2025.

SOURCE REGISTRY

1. China MOFCOM, "Announcement No. 23 of 2023: Export Control on Gallium- and Germanium-Related Items," 2023-07-03.
2. China MOFCOM, "Announcement No. 50 of 2023: Export Control on Graphite Items," 2023-10-20.
3. China MOFCOM, "Announcement No. 33 of 2024: Export Control on Antimony Items," 2024-08-15.
4. China MOFCOM, "Announcement No. 18 of 2025: Export Controls on Tungsten / Tellurium / Bismuth / Molybdenum / Indium," 2025-02-04.
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Timeliness: DURABLE. This brief is classified DURABLE. The four-regime architecture is observable across the 2023-2026 window and is statutorily entrenched in distinct legal systems. AEIG will issue an Update Addendum on a discrete supersession event: a new MOFCOM licensing Announcement on a previously uncontrolled commodity, a US BIS Federal Register rulemaking extending FDPR scope to a non-semiconductor critical-mineral category, a CRMA mid-term review or amendment communication from the European Commission, an Indonesian MoEMR regulation finalising the copper-concentrate export ban with effective date, or a WTO dispute filing or panel ruling on any of the four regimes.

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