



S&P Global Energy

Yttrium Market Report

Yttrium (Y)

October 2026

Preamble

This draft **Yttrium Market Report** aims to increase transparency within the Yttrium (Y) oxide supply chain, helping public and private stakeholders make more informed investment decisions across the commodity lifecycle. It briefly outlines current supply chain bottlenecks, resiliency issues, and the market signals needed to support a more robust and diverse supply base. Y is a heavy rare earth element (HREE) that occurs in fewer economically recoverable deposits, and requires complex separation processes, resulting in a more constrained supply chain. As a critical input for advanced electronics, aerospace, energy, and defense applications, secure access to yttrium is becoming increasingly important for resilient supply chains. S&P Global conducted a bottom-up, asset-level analysis of production costs for rare earth oxide production, and in particular, Y oxide. These production cost curves provide an independent view of supply economics and identify the marginal supplier in a structurally tight market.

This analysis reflects a multi-year effort combining bottom-up asset modelling, proprietary market intelligence, extensive research, expert assumptions, and industry consultation to overcome significant data limitations across these opaque mineral value chains.

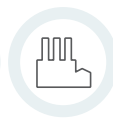
The market values in this report represent a fundamentals-based assessment of the cost and the break-even range required for Y oxide production sources to remain economically viable and meet sufficient G7+Australia demand. This enhanced cost transparency can facilitate better-informed offtake agreements and investments throughout the supply chain. However, actual transactions also factor in inventory levels, broader market conditions, global trade dynamics, and other variables not included in this analysis.

These values are different to the spot market price assessments published by Platts, part of S&P Global Energy ([link](#)).

Given the limited availability of public data, this report is based on S&P Global's proprietary market and mineral intelligence and our analysis of company disclosures, and market information. We welcome input from market participants to support the ongoing refinement of future editions.

Contacts:

Critical Minerals Consulting
CERACriticalMinerals@spglobal.com



Key Takeaways

- S&P Global estimates structural cost ranges of \$8-9/kg Yttrium (Y) oxide by 2028 are required to support ~754 metric ton (t) Y oxide production under a more geographically diversified supply base¹. Current prices remain substantially above these levels due to tight availability in Western markets. Sustained high prices could support greater cost allocation to Y and improve overall project economics.
- Global yttrium demand is projected to grow ~17% between 2025 and 2035, driven by advanced electronics and thermal coatings outpacing declining demand for vehicle emission sensors.
- Resilient² Y mine production could expand more than tenfold by 2028, creating potential production volumes well above global projected demand. Yet only a portion is expected to be separated into Y oxide. By 2028, resilient Y oxide output could reach ~754 t, covering ~22% of G7+ Australia demand and requiring ~\$1.3B in CAPEX. By 2030, output rises to ~2,917 t, covering ~79% of demand with an additional ~\$0.5B in CAPEX. Despite sufficient announced separation capacity, production would remain constrained by feedstock grade and availability.

Introduction

Yttrium (Y) is a heavy rare earth element (HREE) primarily consumed as yttrium oxide (Y₂O₃). It is a critical input for advanced ceramics, phosphors, and other high-performance materials such as yttria-stabilized zirconia used in aerospace coatings. Its unique optical, thermal, and electrochemical properties make it hard to substitute in many high-value applications, including jet engine coatings, electronic components, industrial lasers, and defense technologies.

Yttrium is relatively abundant globally and is not considered geologically scarce. However, its economic recoverability varies across deposits, depending on ore grade and mineralogy. Y is typically recovered as a by-product rather than a primary investment driver, making supply dependent on broader REE economics and specialized separation capacity. As a result, the global supply chain remains highly concentrated.

China dominates global Y oxide production and, in April 2025, classified yttrium as a strategic material with both civilian and military applications, subjecting export to licensing requirements. These controls have reduced export volumes and tightened supply outside China, driving a sharp price divergence: FOB Chinese prices remain around \$8-12/kg, while cost, insurance, and freight (CIF) North America prices have been reported at \$900-3,000/kg in July 2026³. This pricing environment has increased investor interest in new Y-focused capacity and could support future investments. Starting January 1, 2027, US defense procurement restrictions on Chinese-sourced Y products will further reinforce the need for secure and traceable supply chains.

1. Estimates are highly sensitive to cost allocation, given the impact of recent price increases on Y share of revenue; 2. Resilient supply is defined as excluding assets located in Russia, China, and North Korea, as well as any assets worldwide that are majority-owned by Chinese companies; 3. Neodymium-praseodymium oxide spot price down as heavy rare earths see uptick, Platts, S&P Global Energy; 4. A 5.6 eV band gap limits electron excitation, making the material an excellent electrical insulator.

Sources: S&P Global Analysis and USGS

Yttrium's Properties

Conductivity (8 mol% YSZ @1000°C):

~0.1 S/cm

Allows rapid oxygen-ion transport in fuel cells, electrolyzers, and oxygen sensors

Melting Point:

~1,526 °C

Stable at extreme temperatures, supporting aerospace coatings and advanced ceramics

Band gap of Y oxide⁴:

~5.6 eV

Exceeding silicon and gallium, ideal host for phosphors and lasers



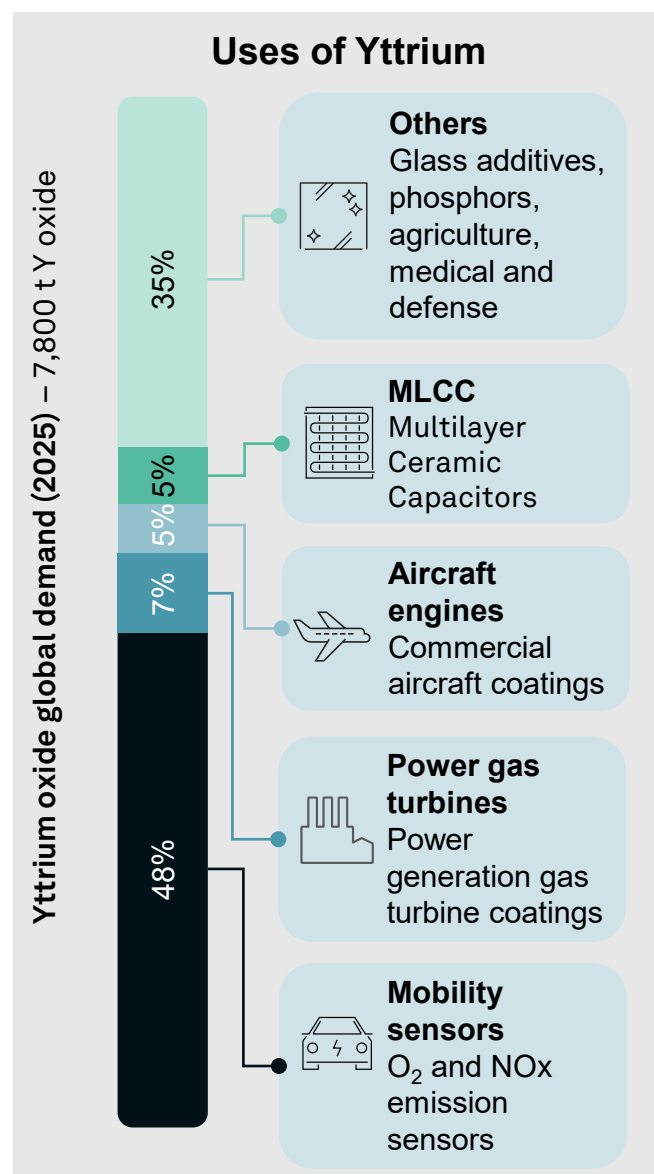


Yttrium demand

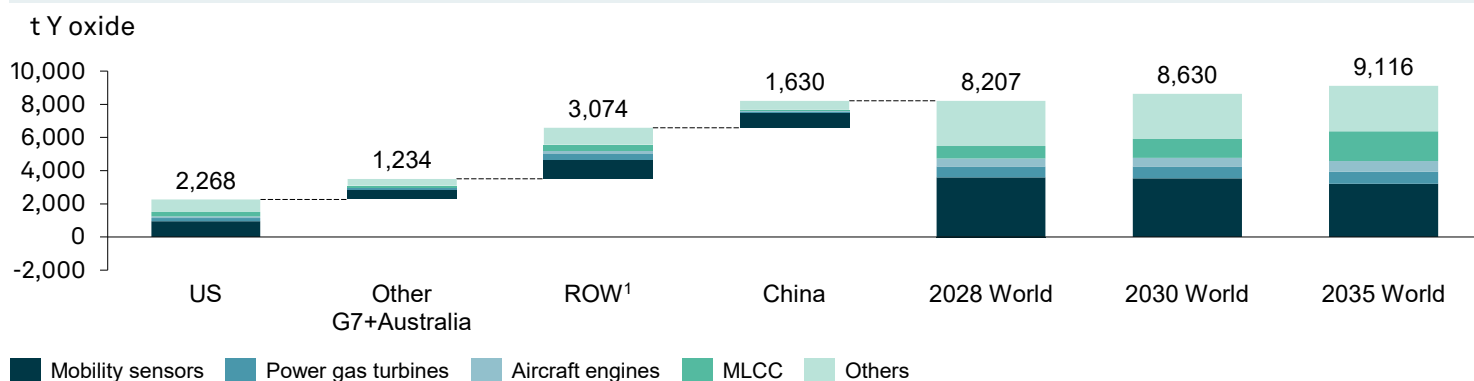
Yttrium demand spans strategic sectors including aerospace, defense, energy, and electronics. O₂ and NO_x sensors used in vehicle emissions monitoring account for ~48% of demand in 2025, but future growth is driven by electronics and thermal barrier coatings used in jet engines and gas turbines.

Global Y oxide demand is projected to increase from ~7,800 t in 2025 to around ~9,000 t by 2035, driven by growth in advanced electronics, aerospace, and energy applications. Multilayer Ceramic Capacitors (MLCCs) represent the fastest-growing major end use, with demand increasing nearly fivefold from ~400 t in 2025 to ~1,800 t by 2035. Demand from yttria-stabilized thermal barrier coatings used in aerospace and power is projected to increase from ~1,000 t to ~1,400 t over the same period. These gains are expected to more than offset declining O₂ and NO_x sensor demand, which is projected to fall from ~3,754 t in 2025 to ~3,202 t by 2035 as EV adoption reduces ICE vehicle sales. Other applications, including glass additives and phosphors, accounted for 35% of demand in 2025 and are expected to remain stable at around 2,700 tpa through 2035.

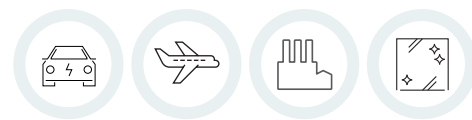
While demand growth is concentrated in advanced technology applications, the end-use demand remains geographically diversified. China accounted for ~27% of global demand in 2025 and the United States ~23%. Substitution for Y varies by application, with the lowest flexibility observed in defense, aerospace, energy, and specialty materials, reinforcing its strategic importance.



Yttrium end-use demand outlook 2028 - 2035



Sources: S&P Global Analysis



Yttrium supply

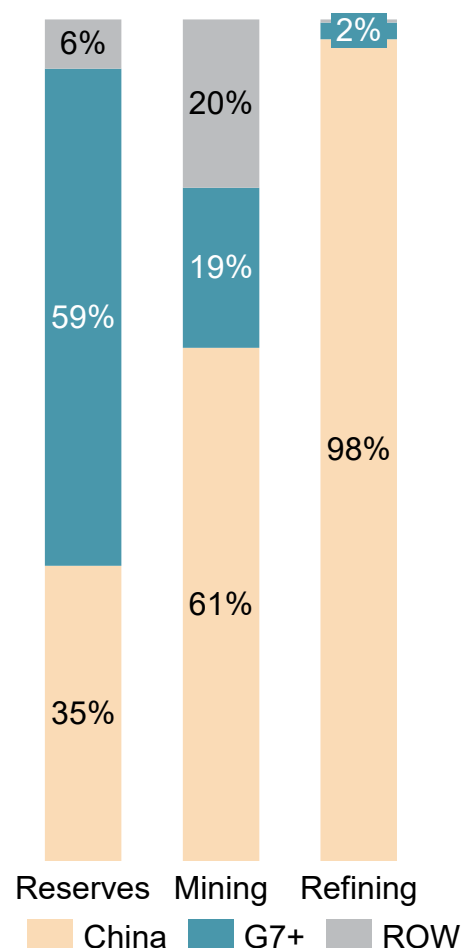
Y is typically recovered alongside HREE from xenotime, ion-adsorption clay, and monazite feedstock, although it may occur in lower concentrations in other REE minerals. Historically, Y accounts for only ~1-3% of project revenues¹, making it a minor economic driver, despite potential upside from higher Y prices vs other REOs.

The highest supply concentration in the Y value chain occurs at the refining stage, where China accounts for ~98% of global Y separation capacity and oxide production. Y is separated through complex, multi-stage solvent extraction circuits and is generally recovered late in the refining process. Production therefore requires specialized separation capabilities and additional processing stages that historically offered limited incentives for dedicated recovery outside China. Most projects prioritize NdPr, Dy, and Tb before expanding into Y recovery, while recycling remains constrained by technical complexity and low recovery rates.

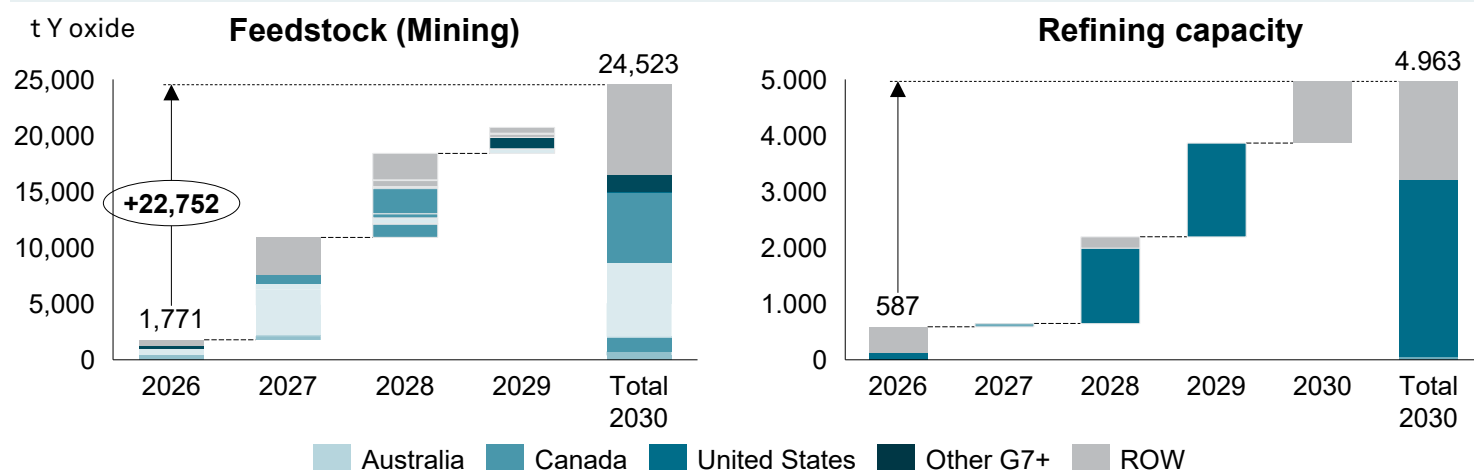
Expanding Y production depends on access to suitable feedstock. Recent industry activity highlights this, with Solvay signing a letter of intent with Viridis Mining and Minerals to source feedstock from Brazil for processing at its La Rochelle facility².

Only a few facilities outside the dominant market can separate Y oxide today, including IREL's Aluva facility (India), Solvay's La Rochelle facility (France), and Neo Performance Materials' Silmet facility (Estonia). By 2030, 8 projects could add ~4,400 t of resilient⁴ Y oxide refining capacity, including operating separation facilities adding dedicated Y separation capability. Proposed additions include Lynas' Y expansion in Malaysia and USA Rare Earth's Round Top facility, both pursuing integrated mine-to-refining value chains.

Market Structure (2025)³



Resilient Y oxide announced capacity⁴



The supply chart represents potential risk supply pipeline based on company announcements

1. Prices based on USGS-reported rare earth oxide prices for 2025; 2. [Strategic partnership aimed at securing critical feedstock to meet global rare earth demand](#), Solvay, June 2026; 3. Reserves and mining figures are reported on an REO-equivalent basis, while refining figures are reported as contained Y oxide equivalent; 4. Resilient supply is defined as excluding assets located in Russia, China, and North Korea, as well as any assets worldwide that are majority-owned by Chinese companies.

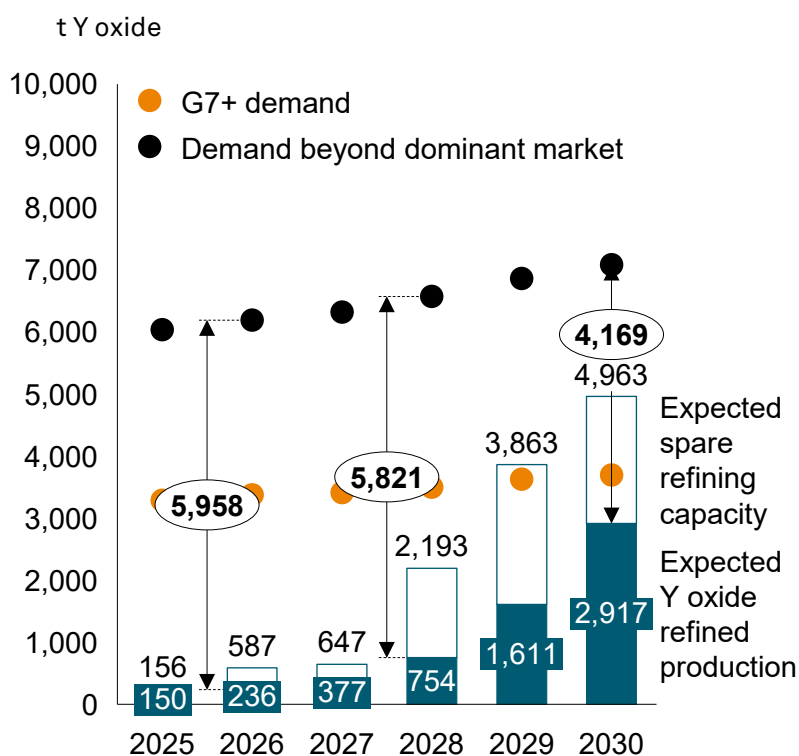
Sources: S&P Global, USGS (Yttrium 2026 Commodity Summary)

© 2026 by S&P Global Inc. All rights reserved.



Supply-demand balance

Oxide supply-demand balance beyond dominant market¹



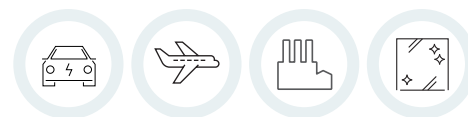
- Announced capacity grows through 2030, with average utilization forecast at ~55% reflecting ramp-ups, operational optimization, and feedstock alignment at new facilities. Proposed additions are Round Top (US) in 2029 and Lynas Rare Earths Y expansion (Malaysia) in 2030.
- In 2026, announced resilient Y oxide production totals 236 t, leaving a gap of ~6,000 t Y oxide relative to total demand beyond the dominant market.
- By 2028, production is expected to reach 754 t, still leaving a ~5,800 t gap to the total demand beyond dominant market.
- By 2030, expected production grows meaningfully to ~2,900 t. At full utilization, announced Y oxide could supply up to ~5,000 t, sufficient to meet G7+ demand (~3,700 t) but still below demand outside of the dominant market (~7,000 t).

Recent market events

- Aclara received a LOI of potential \$750 million financing from the US Export-Import Bank (EXIM) for its Louisiana rare-earth separation facility. The plant is expected to process heavy REEs including yttrium and strengthen downstream US refining capacity [[Aclara](#), September 2026].
- Aclara and JOGMEC formed a joint venture to explore ionic-clay deposits in Brazil. The agreement could support future HREE- and yttrium-bearing feedstock supply [[Platts](#), September 2026].
- Solvay and Viridis signed an LOI to supply Brazilian rare-earth feedstock to Solvay's La Rochelle plant, creating a potential new resilient source of yttrium-bearing material for European separation [[Solvay](#), June 2026].
- Up to \$1.6 billion in US government backing from the Department of Commerce has been made available to USA Rare Earth for its Round Top project. The finding strengthens domestic output and processing of yttrium and other heavy rare earths [[USA Rare Earth](#), June 2026].

1. The supply-demand analysis excludes supply assets located in Russia, China, and North Korea, as well as any assets worldwide that are majority-owned by Chinese companies, and demand from China

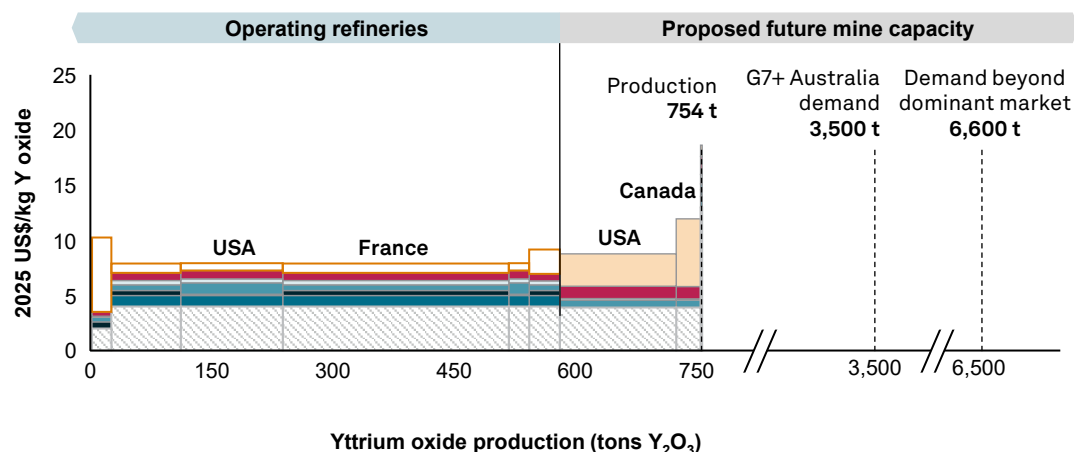
Sources: S&P Global Analysis for proposed projects; S&P Global Analysis based on Project Blue data for demand and recycling.



Yttrium oxide structural cost

2028 Yttrium oxide resilient production structural cost curve

Feedstock
 Energy
 Other
 CapEx
 Labor
 Reagents
 Operational margin
 Levelized CapEx (operational facilities)



Structural Cost: Represents the full cost required for an asset to achieve its target return on investment, assuming projects are developed in line with announced timelines and operate at capacity. This cost considers an unrisks projection subject to normal industry attrition and delays.



Structural cost - Findings

- S&P Global CERA estimates that a structural cost range between \$8-9/kg Y oxide would support over 85% of current and possible supply over the long term, representing ~640 t Y oxide.
- Relative to pre-export restriction prices, these structural cost ranges would result in approximately \$2.6-3.2 million in additional spending in 2028.
- By 2028, an aggregate capital investment of \$1.3 billion will be required to unlock all Y announced supply. This supply equates to ~22% of G7+ Australia demand.
- Feedstock is expected to remain the largest cost component for Y at ~\$5/kg Y oxide by 2028. Cost variability is driven by mineral type, REE grade, and the composition and economic value of the contained REEs. These values represent production costs rather than market-based feedstock prices.
- Separation costs are estimated at \$0.8-3/kg Y oxide¹. REE extraction involves a trade-off between higher-CapEx nitrate circuits and lower-CapEx chloride circuits with higher OpEx.



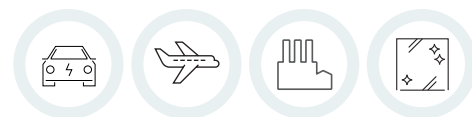
Structural cost - Approach

- Reflects Market Complexity: Built on extensive research and bottom-up modelling, incorporating asset-level data, industry consultation, benchmarking, and expert assumptions to navigate a highly opaque supply chain.
- Targets the Marginal Supplier: The 80th-90th percentile identifies the highest-cost producers. Long-term commodity prices naturally gravitate toward the cost of the last unit needed to meet demand. This percentile filters out extreme outliers while capturing the true marginal cost.
- Incentivizes Supply Resiliency: Analysis establishes a long-term structural benchmark.
- Allocates Costs: Cost allocation is a key consideration in Y production as multiple REEs are recovered through the same separation process. Costs are allocated across the REE basket based on the historical sales value of saleable products.

Note: The analysis excludes assets located in Russia, China, and North Korea, as well as any assets worldwide that are majority-owned by Chinese companies.

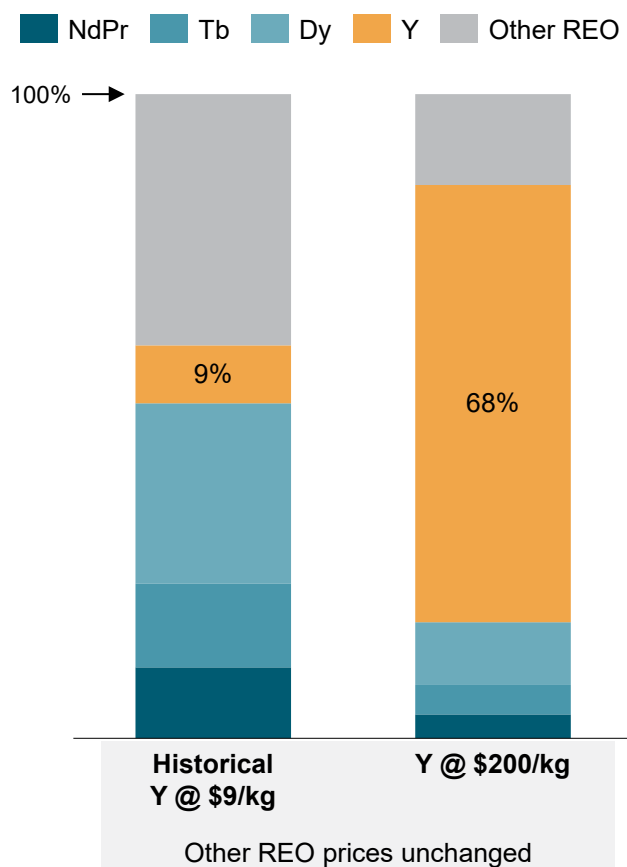
1. Excluding feedstock costs and operational margin. Separation costs are influenced by recovery rates, but recovery optimization is not a key focus of this analysis.

Sources: S&P Global, Tungsten demand was based on S&P Global analysis of Project Blue data



Cost allocation sensitivity

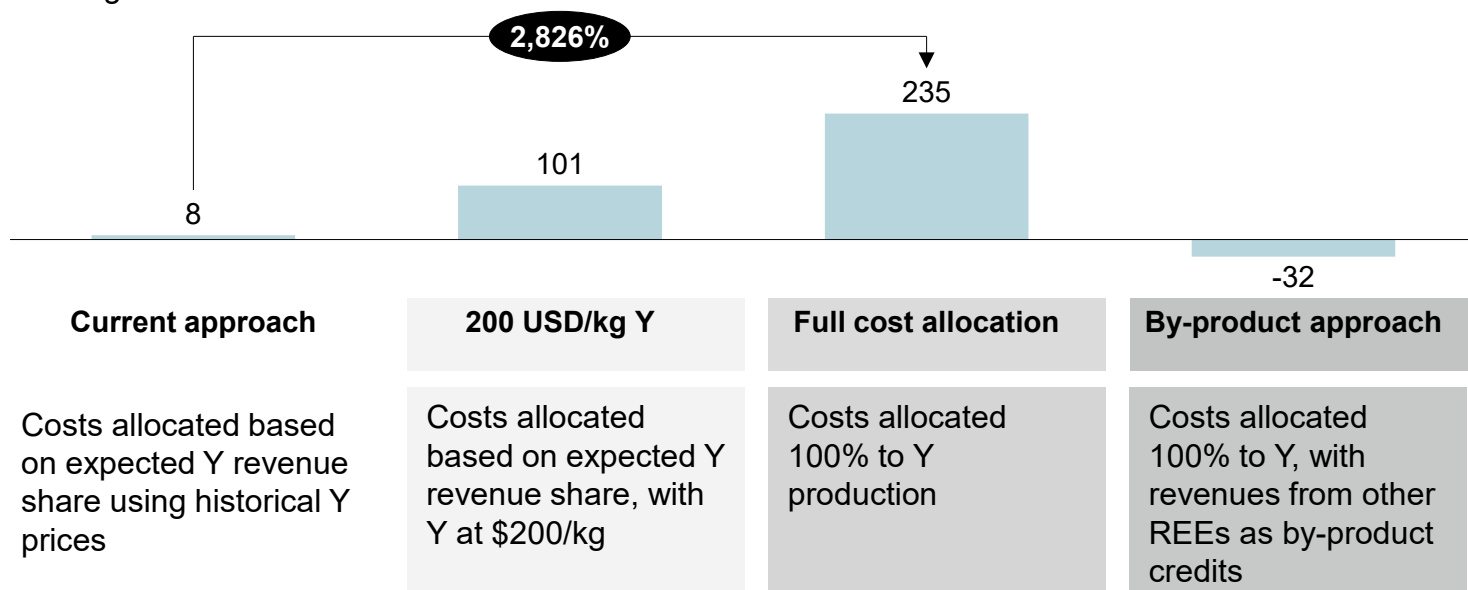
Rare earth oxides (REO) revenue share – high grade Y feedstock



- Given the magnitude of recent changes in Y prices, the role of Y in refinery economics can differ significantly from the past.
- For a high Y content asset, at historical REE prices, yttrium oxide (~\$9/kg) typically accounted for less than 10% of refinery revenue. This suggests that Y has generally not been a primary driver of refinery economics or investment decisions.
- Y economics are highly sensitive to price. For a deposit containing 44% Y, its revenue contribution rises from ~9% under historical pricing to ~68% at \$200/kg Y (with other REO prices unchanged), demonstrating how Y could shift from a by-product to the main product.
- As a result, the allocation of costs to Y relative to other separated REEs becomes highly sensitive to the underlying price assumptions.
- Cost allocation to Y may also increase where offtake agreements place a premium on secure Y supply, particularly for strategic applications such as defense, aerospace, and advanced electronics.

Y oxide production cost sensitivities – high grade Y feedstock

USD/kg Y





Challenge of cost components and methodological approach

Feedstock specification is an important determinant of downstream processing costs. Differences in total REE grade, individual REE concentration, mineralogy, and impurity content influence reagent consumption, power requirements, recovery rates, and process complexity. As a result, two feedstocks with similar Y output can have materially different separation costs and overall project economics.

Mining and Processing costs



Feedstocks: Feedstock costs are based on each facility's sourcing strategy, using associated mining costs for vertically integrated facilities and weighted average feedstock costs for non-vertically integrated facilities based on the feedstock type. Overall asset level mining and processing costs are estimated following a similar asset level approach to the separation of costs allocated across NdPr, Dy, Tb, Sm, Eu, Gd and Y according to expected revenue share.



Labor¹: Labor costs are estimated using labor cost factors per metric ton of feedstock processed, differentiated by feedstock type and separation process. Labor costs are scaled based on wage rates by country.



Separation OpEx

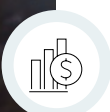


Energy¹: Includes fuel, power and utility costs, estimated using energy intensity factors differentiated by feedstock type and separation process. Energy demand is assumed to comprise 80% natural gas and 20% electricity, with costs based on facility throughput and adjusted for country-level natural gas prices and wholesale electricity tariffs.

Reagents¹: Reagent costs are estimated using chemical consumption rates per metric ton of production and corresponding regional prices. Estimates are based on a combination of reagent-specific consumption data and reported overall reagent costs.



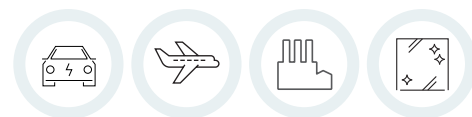
Operational margin: An operational margin is applied to represent the facility-level profit margin, ongoing sustaining capital requirements, and return on investment. The margin is assumed to be 10% of total facility costs, excluding initial and sustaining CapEx.



Separation CapEx

Capital expenditure: Includes levelized initial CapEx, allocated to each facility and recovered over a 20-year project life using a 7% discount rate. Sustaining CapEx represents ongoing investments required to maintain operations and productive capacity, estimated as a percentage of initial CapEx. Capital costs were allocated across NdPr, Dy, Tb, Sm, Eu, Gd, Y and Ho based on their estimated revenue share.

1. Operational costs (Labor, Energy, Reagents) are allocated across all rare earth products announced by each facility, assuming the facility is able to separate and commercialize its full rare earth product basket.

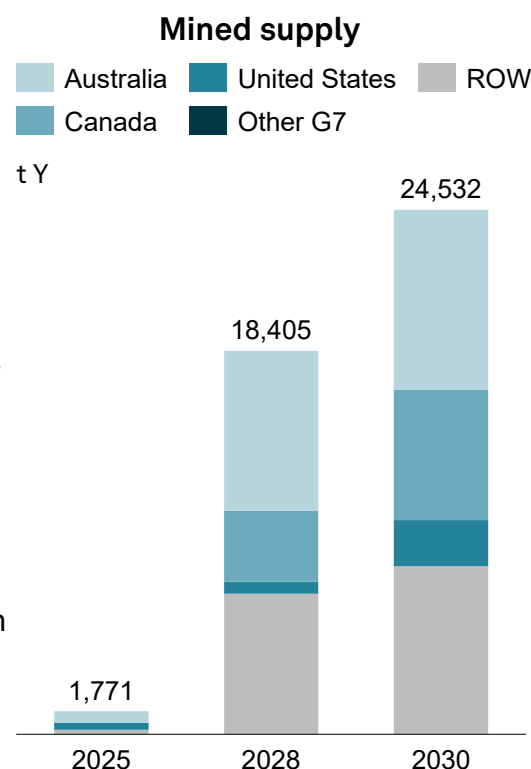


Appendix: Y Mining

Resilient Y mined supply is expected to increase from ~1,700 t in 2025 to ~24,500 t in 2030, supported by a diverse range of deposit types including xenotime, ion-adsorption clays, monazite, and other hard-rock projects. Unlike other HREE, Y is more broadly distributed across the rare earth resource base.

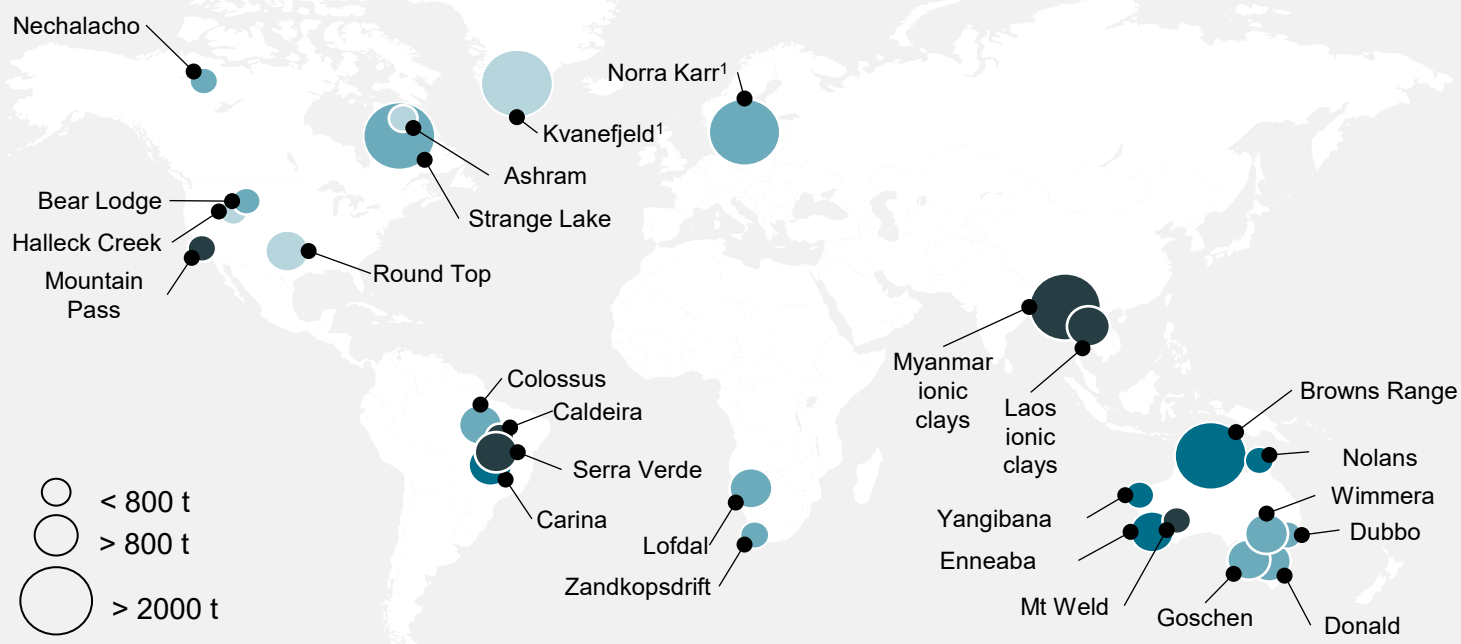
Australia, Canada, and the United States are expected to become key contributors to Y supply growth, driven by yttrium-rich projects including Browns Range in Australia, Strange Lake and Ashram in Canada, and Round Top in the United States. Round Top is expected to emerge as a significant new source of supply, with publicly disclosed plans for ~1,600 t Y per year.

Recent developments highlight growing integration between yttrium-rich feedstocks and downstream processing, including Caldeira's feedstock agreements with Ucore, USA Rare Earth's acquisition of Serra Verde and investment in Carester, and new medium and heavy rare earth separation capacity. While yttrium is rarely the primary economic driver of a project, expansion of broader rare earth supply chains is expected to increase Y availability outside China.



Y Mined Supply Capacity

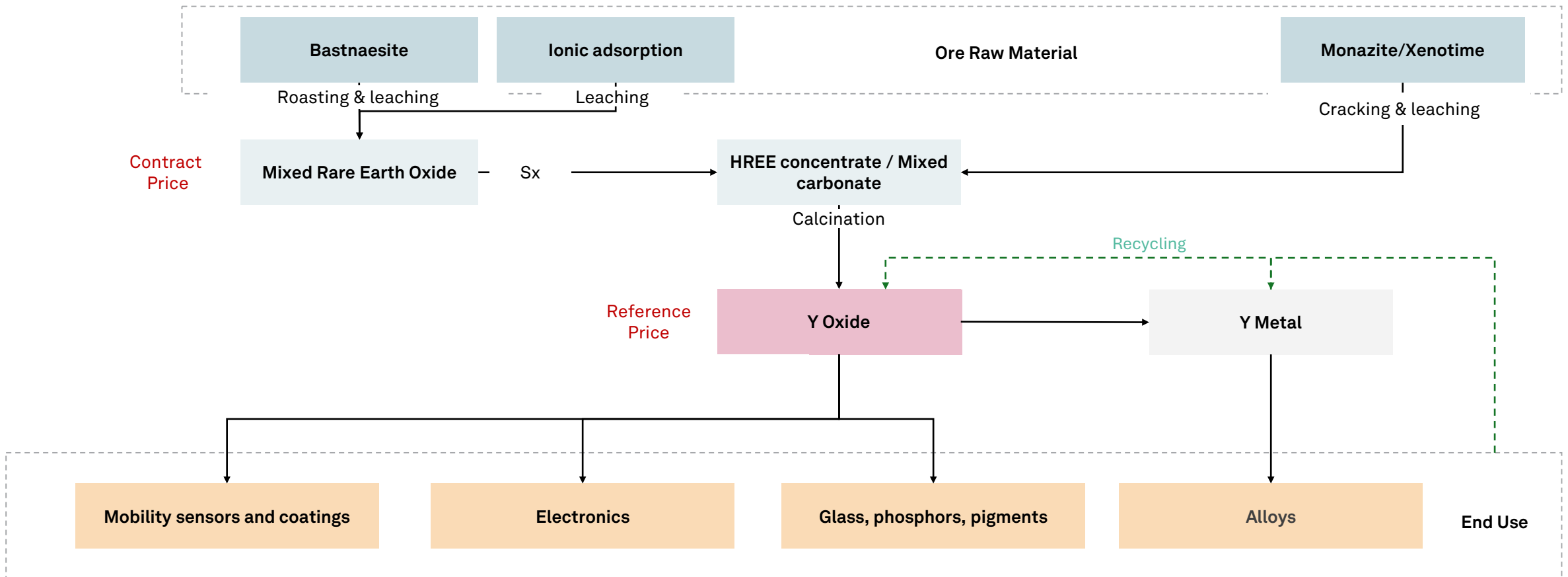
● Operating ● Highly probable ● Probable ● Early stage



1. Processing for Eudialyte- and Steenstrupine-hosted deposits has not been demonstrated at commercial scale

Y Market Report | October 2026

Y value chain



Disclaimer

S&P Global Energy (“SPGE”) is a business division of S&P Global Inc. This document (“Materials”), including all data and information in it is the copyrighted property of SPGE and represents data, research, opinions, or viewpoints of SPGE. The Materials speak to their original publication date only. The Materials’ contents are from sources considered by SPGE (in its professional opinion) to be reliable, but SPGE does not assume responsibility for the accuracy or completeness thereof, nor is their accuracy or completeness or the opinions and analyses based upon them warranted. The Materials should not be construed or regarded as a recommendation of any specific price assessment or benchmark. Forecasts are inherently uncertain because of events or combinations of events that cannot reasonably be foreseen including the actions of government, individuals, third parties and competitors.

To the extent permitted by law, SPGE shall not be liable for any errors or omissions or any loss, damage, or expense incurred by reliance on the Materials or any statement contained therein, or resulting from any omission. THE MATERIALS ARE PROVIDED “AS IS” AND TO THE MAXIMUM EXTENT ALLOWED BY LAW, NEITHER SPGE, ITS AFFILIATES NOR ANY THIRD-PARTY PROVIDERS MAKES ANY REPRESENTATION, WARRANTY, CONDITION, OR UNDERTAKING, WHETHER EXPRESS, IMPLIED, STATUTORY OR OTHERWISE, RELATING TO THE MATERIALS OR THE RESULTS OBTAINED IN USING THEM; INCLUDING: A) ITS MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE; OR B) ITS CONTINUITY, ACCURACY, TIMELINESS OR COMPLETENESS. The Materials are supplied without obligation and on the understanding that any recipient who acts upon the Materials or otherwise changes its position in reliance thereon does so entirely at its own risk.

The Materials should not be construed as financial, investment, legal, or tax advice or any advice regarding a recipient’s corporate or legal structure, assets or, liabilities, financial capital or debt structure, current or potential credit rating or advice directed at improving a recipient’s creditworthiness nor should they be regarded as an offer, recommendation, or as a solicitation of an offer to buy, sell or otherwise deal in any investment or securities or make any other investment decisions. The Materials should not be relied on by any recipient in making any investment or other decision and should not in any way serve as a substitute for other enquiries or procedures which may be appropriate. The Materials should not be used as the basis of or input for any ESG rating, score, opinion, or evaluation. The Materials should not be reproduced or made available to any other person without SPGE’s prior written consent. Recipient may not use the Materials to transmit, undertake or encourage any unauthorised investment advice or financial promotions, or to generate any advice, recommendations, guidance, publications or alerts made available to its own customers or any other third-parties. Nothing in the Materials constitutes a solicitation by SPGE or its Affiliates of the purchase or sale of any loans, securities or investments. SPGE personnel are not providing legal advice or acting in the capacity of lawyers under any jurisdiction in the publication or delivery of the Materials. SPGE is not a registered lobbyist and cannot advocate on anyone’s behalf to government officials regarding specific policies. The Materials contain the results of SPGE’s independent research and analysis and are intended for general informational purposes only. The Materials are not intended, and may not be used, to promote, directly or indirectly, the supply or use of any product or business interest, including, but not limited to, the benefits of any product, business, or business activity for protecting or restoring the environment or mitigating the causes or effects of climate change. No data or opinions contained in the Materials constitutes a representation to the public with respect to the benefits of any product, business or business activity, and should not be relied on as a recommendation for any specific action to be taken.

SPGE owns all rights, title, and interest in and to the Materials. The SPGE name(s) and logo(s) and their related trademarks appearing in the Materials are the property of S&P Global Inc. or their respective owners.

S&P Global
Energy