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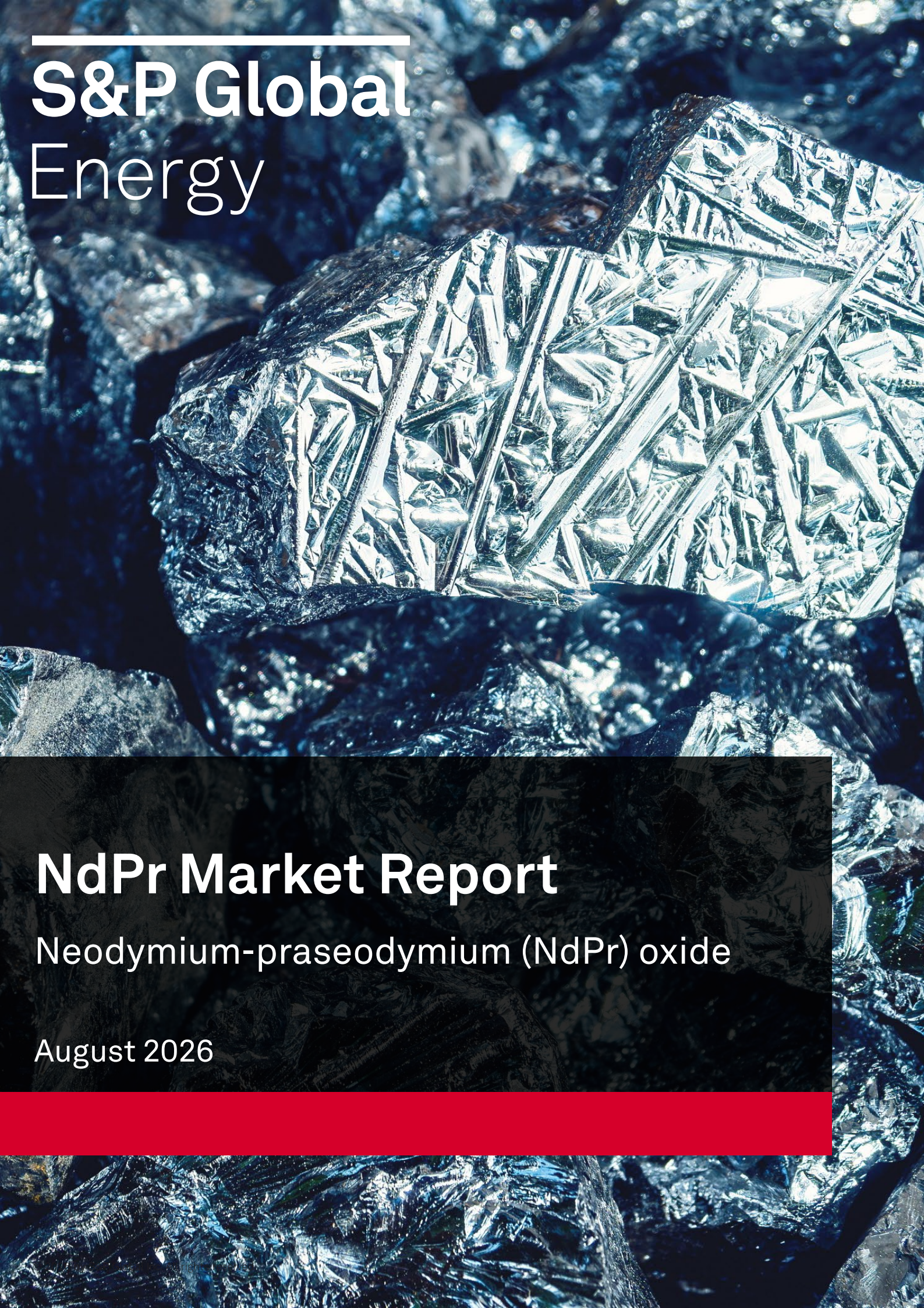

NdPr Market Report

Neodymium-praseodymium (NdPr) oxide

August 2026

Preamble

This draft **NdPr Market Report** aims to increase transparency within the NdPr oxide and permanent magnets 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. This is the first market report focused on rare earths and permanent magnets – this report will be followed by additional market reports on other rare earth oxides that are part of the same supply chain (DyTb, Samarium, Yttrium, etc.).

S&P Global conducted a bottom-up, asset-level analysis of production costs for rare earth oxide production, and in particular, NdPr oxide. These production cost curves provide an independent view of supply economics and identify the marginal supplier in a structurally tight market. The analysis excludes assets located in Russia, China, and North Korea, as well as any assets worldwide that are majority-owned by Chinese companies. All units in this report are presented in NdPr oxide equivalent.

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 the opaque mineral value chain.

The market values in this report represent a fundamentals-based assessment of the cost and the break-even range required for rare earth and NdPr 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.

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Key Takeaways

- S&P Global projects that a structural cost range of $75-80/kg NdPr will be necessary in 2028 to ensure production of ~27 kt (thousand metric tons) of NdPr oxide across more than 20 projects. While spot prices will fluctuate, this cost represents a threshold to sustain long-term production
- Global NdPr demand is projected to grow 32% from 2025 to 2030
- China currently accounts for 84% of global NdPr oxide supply, highlighting the strategic importance of supply diversification for Western governments
- By 2030, more than 20 projects could add ~44 kt of ex-China NdPr refining capacity, out of which 27 kt is concentrated in projects located in Australia and United States
- By 2028, announced ex-China capacity reaches 58 kt, however, production is expected to remain at 27 kt, ~25 kt below ex-China demand, reflecting commissioning and feedstock constraints

Introduction

Neodymium (Nd) and praseodymium (Pr), collectively known as NdPr, are rare earth elements (REE) that are the key raw materials used to manufacture NdFeB (neodymium-iron-boron) permanent magnets. NdFeB magnets are essential in advanced technologies such as electric vehicles, renewable energy generation and defense systems, where performance and efficiency are critical.

The NdPr and rare earths supply chain is highly concentrated, with China dominating rare earth mining, refining, metallization, and permanent magnet production. China's April 2025 export licensing requirements for REE-based permanent magnets and other selected rare earth products and technologies highlighted the vulnerability of downstream manufacturers and end-users to disruptions in Chinese supply. As a result, select US auto manufacturers had to temporarily shut down production of some vehicle lines. In early 2026, China imposed additional export controls on certain rare earth products destined for Japan.

These supply concerns accelerated efforts by governments and industry to diversify REE and magnet supply chains outside China. In June 2026, G7 leaders committed to reducing dependence on any single supplier outside the G7 and partner countries to below 60% of rare earth and permanent magnet imports by 2030, while the U.S. government announced support in July 2025 for MP Materials' integrated mine-to-magnet rare earth supply chain.

NdPr oxide prices subsequently increased from approximately US$74/kg in December 2025 to US$120/kg in mid-2026, reflecting heightened concerns around supply security and reinforcing the strategic importance of NdPr to industrial policy, energy security and defense supply chains.

NdPr's Properties

Magnetic pulling power:

~199 – 414 kJ/m³

Highest of any magnet – ferrite, SmCo, AlNiCo

Magnetism kept under stress:

~955 – 2,785 kA/m

Above ferrite and AlNiCo, matches SmCo (under high heat conditions)

Density:

7.5 to 7.7 g/cm³

Above ferrite, similar to AlNiCo, below SmCo

Sources: S&P Global Analysis for NdPr supply, demand and costs; USGS (Rare Earths 2026 Commodity Summary); Platts prices

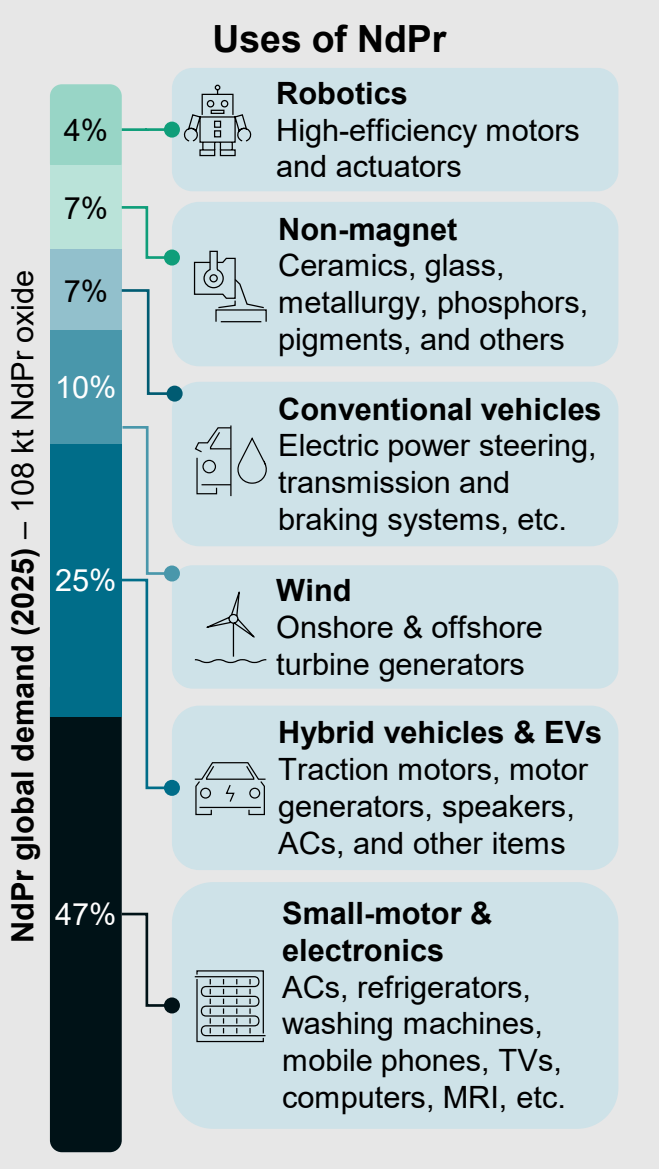
NdPr demand

NdFeB magnets account for approximately 97% of global NdPr demand. NdFeB magnets are the strongest commercially available permanent magnets due to their high magnetic strength, durability and resistance to demagnetization. NdFeB magnets are essential in electric vehicle motors, wind turbine generators, industrial automation, robotics, aerospace, defense systems and consumer electronics.

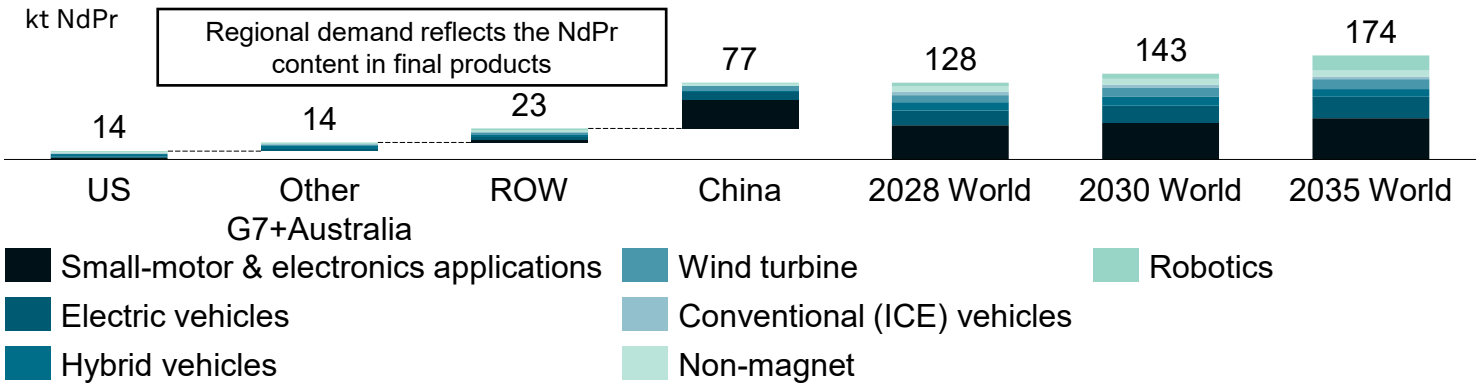
Global NdPr oxide consumption reached 108 kt in 2025, projected to grow by ~6% annually to 143 kt by 2030. Small motors and consumer electronics are the largest source of demand (47%), followed by hybrid vehicles & EVs (25%) and wind generators (10%). Robotics account for ~4% of demand in 2025, yet it is the fastest-growing end-use sector, with demand expected to double by 2030.

Due to its dominant position in permanent magnet manufacturing, China accounts for ~86% of first-use NdPr consumption. However, many of these magnets are ultimately exported either directly or within finished goods, resulting in China's magnet demand accounting for only ~62% of global end-use demand.

Substitution of NdFeB magnets in motors is one possible solution to reduce NdPr demand. Renault has commercialized PM-free[1] EESM motors since 2012, while BMW is advancing PM-free[1] motors for next-generation EVs. However, these typically require larger batteries to achieve comparable performance, increasing vehicle weight and cost. As a result, NdFeB permanent magnet motors are expected to remain the dominant EV motor technology, accounting for ~50% of the market.



NdPr end-use demand outlook 2028 - 2035



1. PM-free = permanent magnet free

Sources: S&P Global Analysis

NdPr supply

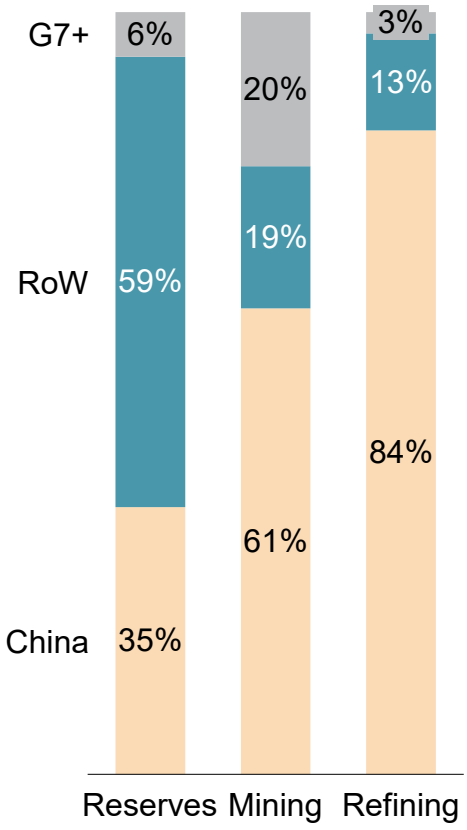
China accounts for approximately 35% of global rare earth reserves and 61% of mine production. Globally, significant deposits are identified across Australia, Brazil, Greenland, Russia, Vietnam, North America and Africa.

The highest supply concentration in the NdPr value chain is separation and refining, where China accounts for ~84% of global rare earth separation capacity and NdPr oxide production[1].

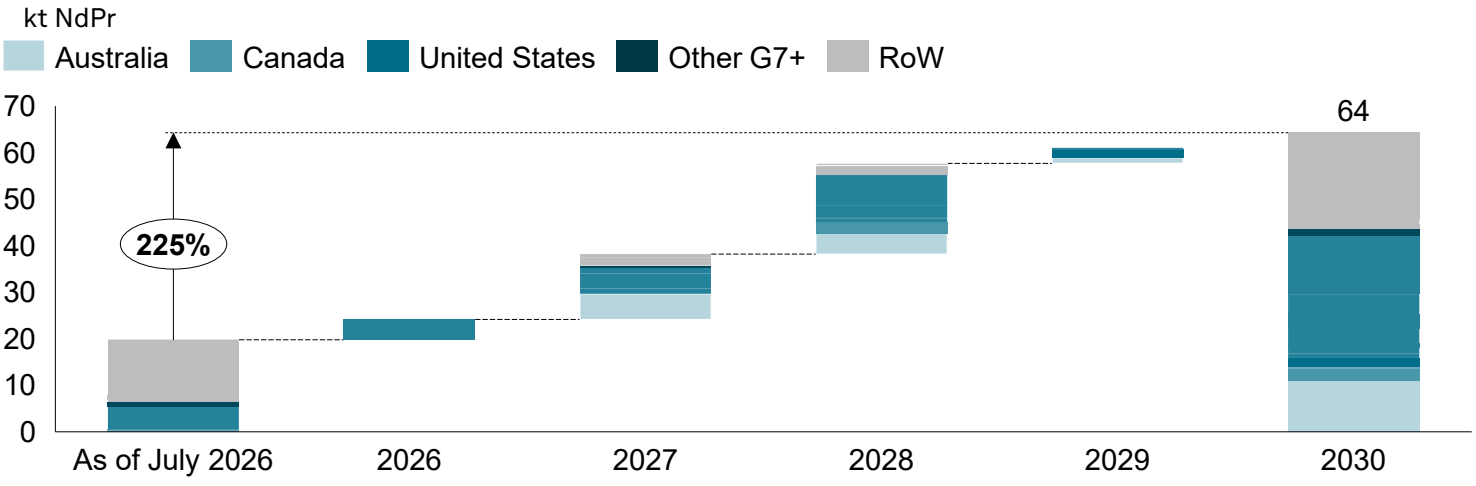
REEs are all contained within the same ore minerals, resulting in all REEs being recovered during mining. Once the ore is mined, upgraded, and leached, it is precipitated into a mixed rare earth concentrate. From this concentrate, refineries then separate commercially viable products like NdPr oxide.

By 2030, more than 20 new and existing projects could add ~44 kt of ex-China NdPr refining capacity. However, for refining to be developed, corresponding investment in magnet manufacturing capacity will be required to absorb additional NdPr supply. Recent government support measures, strategic investments, and offtake agreements have increased momentum across the rare earth industry as observed in the July 2025 MP Materials-DoD agreement including a NdPr price floor and support for downstream magnet production, as well as Energy Fuels & USA Rare Earths announcements. However, rare earth project development remains challenging, with projects such as Nolans in Australia requiring nearly two decades to reach FID.

Market Structure (2025)



NdPr oxide ex-China Announced Refining Capacity[2]



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

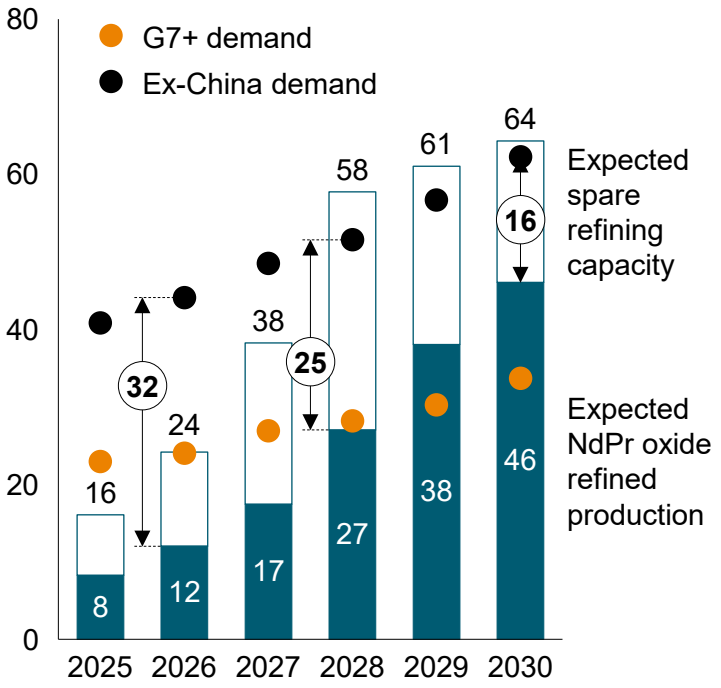
1. In contrast to refining, recycling contributes an estimated 34% of global NdPr supply, much of it originating in China through closed-loop recycling of magnet manufacturing. End-of-life recycling remains limited by scrap collection and processing costs but could become an increasingly important source of supply. 2. The analysis excludes assets located in Russia, China, and North Korea, as well as any assets worldwide that are majority-owned by Chinese companies. 3. Based on company announcement

Sources: S&P Global Analysis

Supply demand balance

Supply demand balance outside of China[1]

kt NdPr



- Announced capacity is expected to ramp up rapidly, but production is projected to operate at an average utilization rate of ~74% through 2030, reflecting. commissioning and feedstock constraints
- In 2026, announced ex-China NdPr oxide production totals 12 kt, leaving a gap of ~32 kt NdPr oxide versus ex-China demand.
- By 2028, announced ex-China capacity is expected to reach ~58 kt, exceeding ex-China demand. However, due to commissioning and ramp-up constraints, actual production is expected to be ~25 kt below ex-China demand.
- By 2030, expected production reaches ~46 kt NdPr oxide. At full capacity, NdPr oxide supply could meet G7+ demand (~34 kt) and ex-China demand (~62 kt).

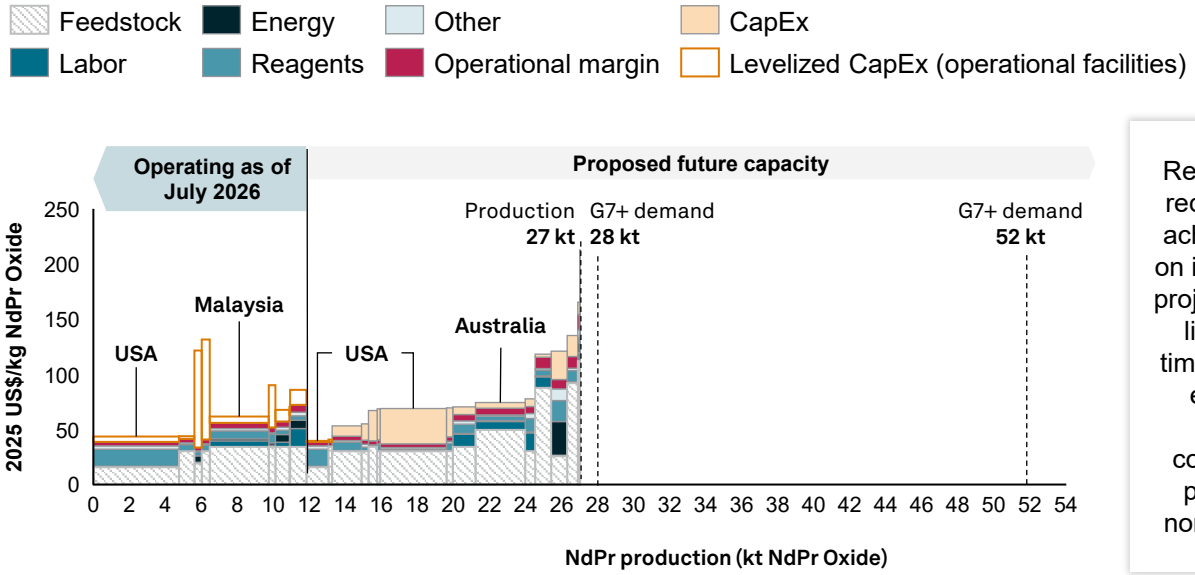
Recent market events

- MP Materials and the U.S. government announced a $110/kg contractual price floor for NdPr in July 2025. Backed by federal loans, equity investments, and Department of Energy grants, it serves as a "strategic-security pricing" benchmark. [Platts, May 2026]
- USA Rare Earth is building a $1.2 billion refined metals and magnet manufacturing plant in South Carolina, aiming to commission 6,400 mt/year of magnet capacity by 2028. [Platts, March 2026]
- Energy Fuels acquired VAC (magnet manufacturer) for $1.9 Billion and announced first commercial heavy rare earth production [Energy Fuels, July 2026] alongside the acquisition of Australian Strategic Materials (ASM) for US$299 million to produce NdPr metal [Energy Fuels, January 2026]
- Europe is actively establishing midstream separation and downstream magnet manufacturing to bypass Chinese processors. NEO Performance Materials (Estonia) is scaling up its Silmet separation facility and commissioning a 5,000 tpa magnet plant (Narva) [Platts, April 2026]
- USA Rare Earth's acquisition of a 13.6% stake in Carester secures offtake rights from the upcoming Caremag plant in France. Set to commission in late 2026, the facility will produce 800 tpa of NdP, 500 tpa of Dy, and 100 tpa of Tb oxides. [Platts, July 2026]

1. The supply analysis excludes 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 Analysis; Platts prices

2028 NdPr oxide ex-China production structural cost curve



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 expected utilization rates[2]. This cost considers an unrisked projection subject to normal industry attrition and delays

Structural cost - Findings

- S&P Global CERA estimates that a structural cost range between $75-80/kg NdPr oxide would support over 90%, or ~24 kt NdPr oxide, of current and possible supply over the long term. Excluding CapEx, a cost range between $69/kg to $73/kg would be sufficient to sustain operation of these projects once commissioned
- Feedstock costs are typically the largest cost factor to NdPr oxide costs. In 2028 these are expected to vary from ~$15/kg to more than ~$100/kg NdPr oxide. Major drivers of cost are REE content in ore, individual REE content (valuable or not), deposit types and mining and milling capacity
- NdPr oxide separation costs are estimated at between $15- $40/kg NdPr. Rare earth extraction involves a key trade-off: the modern nitrate route requires high CapEx but yields lower OPEX, whereas the traditional chloride route features lower CapEx but higher ongoing reagent and labor costs

Structural cost - Approach

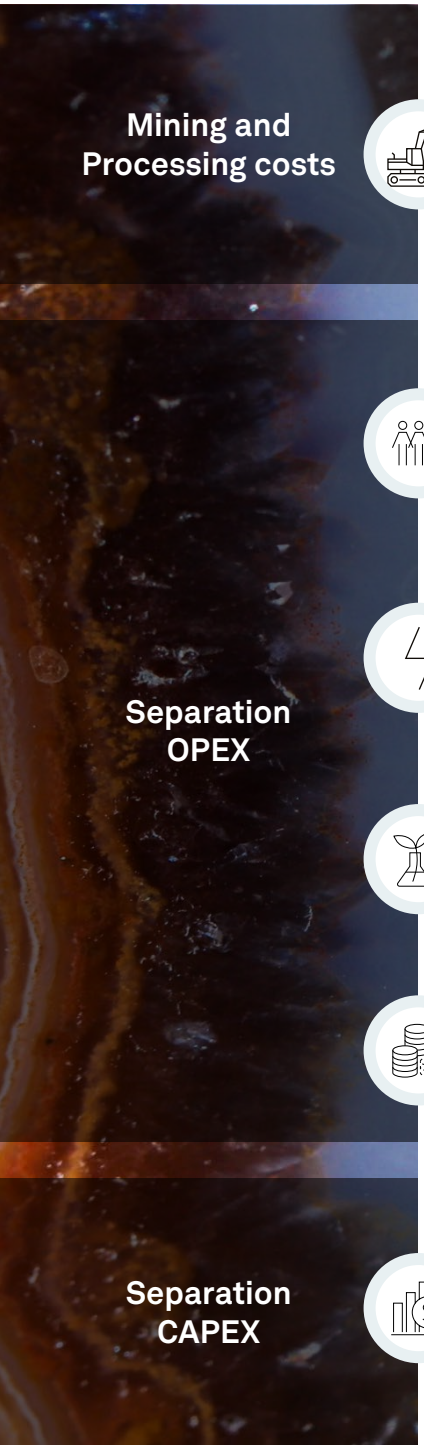
- Reflects Market Complexity: Built on extensive research and bottom-up modelling, incorporating asset-level data, industry consultation, benchmarking, and expert assumptions to navigate a highly opaque supply chain
- Targets the Marginal Supplier: The 80th-90th percentile identifies the highest-cost 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: It establishes a long-term structural benchmark capturing the full asset economics
- The challenge for NdPr costing is that high-purity production requires separating multiple REEs. Some have high market value and can be sold, while others have almost no market value. Costs are allocated based on historical sales price of elements separated and marketed

1. The analysis excludes assets located in Russia, China, and North Korea, as well as any assets worldwide that are majority-owned by Chinese companies; 2. Utilization rates were estimated using project-announced operating assumptions where available, derived from concentrate grade availability where applicable, and otherwise assumed at 85%

Sources: S&P Global Analysis for NdPr supply, demand and costs; USGS (Rare Earths 2026 Commodity Summary)

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 NdPr output can have materially different separation costs and overall project economics.



Feedstocks: Feedstock costs were 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 were estimated following a similar asset level approach to the separation costs however were allocated across NdPr, Dy, Tb, Sm, Er, Gd and Y according to expected revenue share.

Labor[1]: Labor costs were estimated using labor cost factors per t of feedstock processed, differentiated by feedstock type and separation process. Labor costs were scaled based on wage rates by country.

Energy[1]: 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.

Reagents[1]: Reagent costs were estimated using chemical consumption rates per ton of production and corresponding regional prices. Estimates were based on a combination of reagent-specific consumption data and reported overall reagent costs.

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

CAPEX: 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 then allocated across NdPr, Dy, and Tb, based on their estimated revenue share.

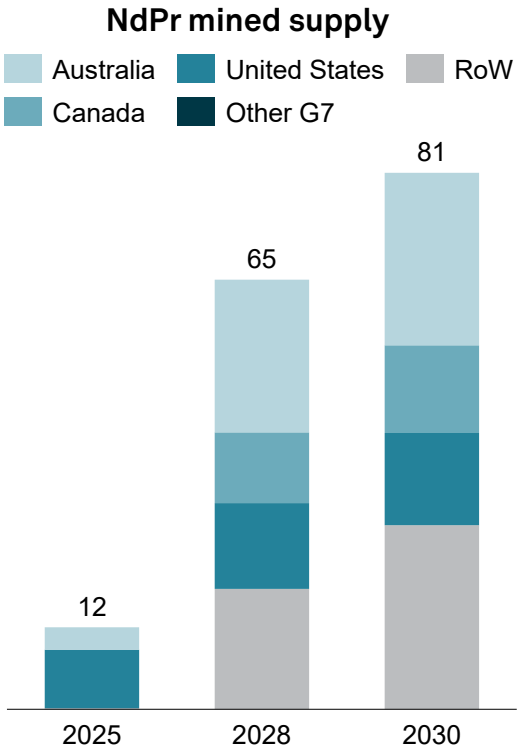
Notes: 1. Operational costs (Labor, Energy, Reagents) are allocated across all rare earth products announced by each facility, assuming the facility is able to separate and commercialize its full rare earth product basket.

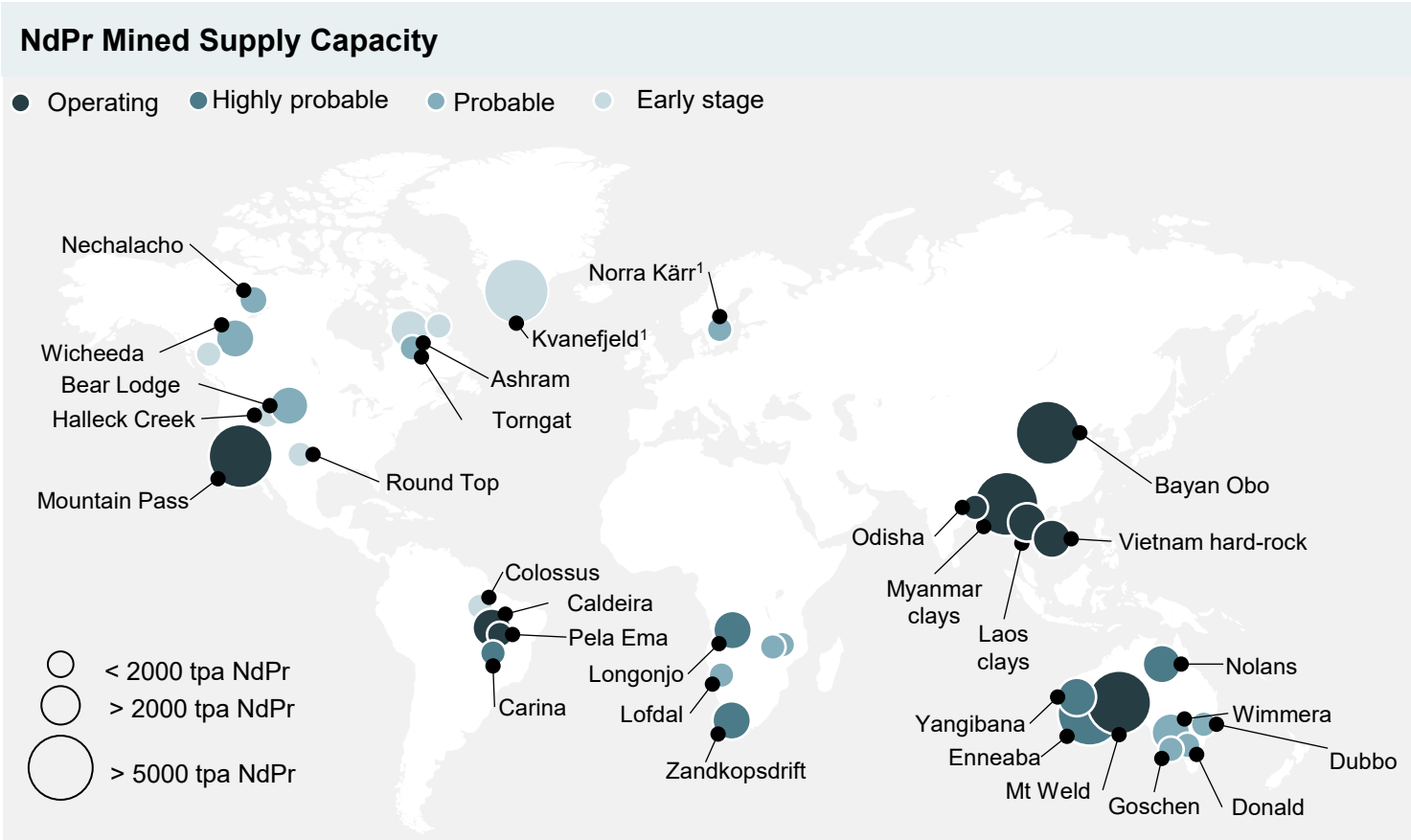
Appendix: NdPr Mining

NdPr may be recovered from hard-rock, ionic clay and mineral sands rare earth deposits. While China accounts for ~ 61% of global rare earth mine supply, NdPr production outside China is projected to increase from ~12 kt in 2025 to ~81 kt in 2030, driven by expansions and a pipeline of more than 30 projects.

Australia is expected to contribute ~34% of supply growth by 2030, through projects such as Mt Weld Expansion, Nolans, Yangibana, Enneaba, Donald, Goschen, and Wimmera. New supply is also expected from North America (~18 kt) Africa (~16 kt), and South America (~6 kt).

Vertical integration is increasing across the rare earth sector. MP Materials, Lynas and India Rare Earth Limited (IREL) operate integrated mining and refining businesses. Advanced projects such as Nolans are also pursuing their own mine-to-separation strategies. Commercial linkages are also expanding across mines and refineries, including Caldeira's feedstock agreements with Silmet and Ucore, USA Rare Earth (Round Top and Serra Verde) investment in Carester, and Energy Fuels partnership with the Donald Project.





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

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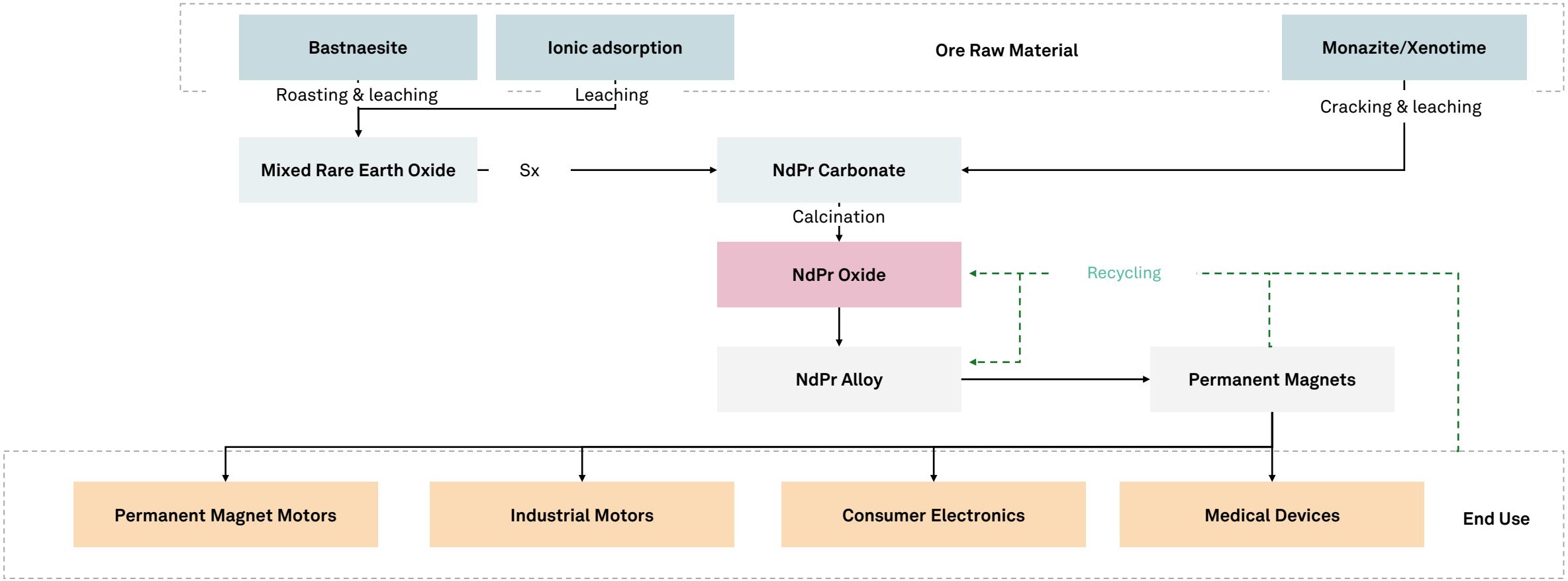
NdPr value chain



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