



Pensana PLC

Green Bond Second Opinion

13 July 2022

Executive Summary

UK headquartered Pensana intends to create a sustainable magnet metal supply chain, with a rare-earth processing facility at Saltend Chemicals Park in Hull, UK, and mining in Angola. The Saltend facility is set to produce some 12,500 tonnes of rare earth oxides yearly, of which 4,500 will be neodymium and praseodymium oxides (“NdPr”), or an estimated 5% of global production in 2025. Operations are planned to start in 2024.

The framework will exclusively finance project related capex and construction costs of the Saltend refinery, where the main product is a key element in permanent magnets needed in electric motors and generators. The issuer intends to sell NdPr to manufacturers supplying automotive industries in the EV segment and wind turbine producers, thereby enabling the transition to cleaner technology; excluding activities that have no role in a low carbon and climate resilient future. Some climate considerations, such as installing solar panels, have been taken in the design of the refinery and efforts are made to reduce emissions associated with chemicals and energy use. However, due to lack of data, it is not yet possible to conclude on the NdPr’s carbon footprint compared to other producers, although it appears likely to be lower than the NdPr currently dominating the market.

The sourcing of raw materials to Saltend has environmental and social risks that are inherent to mining activities. At its Longonjo operations in Angola, Pensana has followed global guidelines aiming at limiting negative local impacts to a minimum, including engaging an independent NGO to perform a human rights impact assessment. The development of the mine and supporting infrastructure has required relocation of agricultural activities; people losing their land will be compensated through a “land for land” programme. Note that our governance assessment is not a substitute for a full evaluation of the governance of the issuing institution and does not cover social issues nor corruption.

We rate the framework **CICERO Light Green** and give it a governance score of **Good**. The NdPr production at the Saltend refinery is an important enabling activity for the decarbonization of the energy and transport sectors, but the construction of the refinery does not in itself follow the highest climate standards and there is not yet conclusive evidence of a lower carbon footprint for the NdPr product. Environmental considerations are integrated in the company strategy and risk assessment, and we welcome Pensana’s plans to publish scope 1, 2 and 3 emissions data once available. When possible, we encourage Pensana to report to investors on actual end-uses of its products.

SHADES OF GREEN



°CICERO
Light Green

GOVERNANCE ASSESSMENT



GREEN BOND PRINCIPLES

Based on this review, this framework is found to be in line with the principles.



Key Strengths

Pensana's strategic focus on supplying to end-uses that are key in a low carbon future, specifically EVs and wind turbines, represent a strength. NdPr has a wide range of end-uses, including several types of electronics, so it is important that Pensana is committed to delivering to those industries that are most needed in a 2050 perspective. Nevertheless, some of its products will be sold through trading houses, where end-use applications likely also include those uses that do not make a significant contribution to the transition to a low carbon future, such as consumer electronics. However, based on the expected growth in demand from the electric generator market, as well as Pensana's policies, we find it likely that most of the produced NdPr at Saltend will go to applications that enable the clean energy transition. It is Pensana's responsibility to carefully select customers, follow up and implement its policy on these aspects and report on them to investors.

Key Pitfalls

Embodied emissions in construction materials have not been considered and the Saltend plant is dependent on natural gas power generation. We are not aware that efforts have been made to choose low carbon building materials in the construction of the Saltend refinery. Since construction costs are included in the framework, this represents a pitfall as embodied emissions in new construction, for example in concrete and steel, are typically high. While it is positive that Pensana will have access to renewable energy from solar panels and offshore wind, the refinery will also depend on electricity from natural gas power generation. We note that Pensana has concrete plans for increasing its access to cleaner energy, including from blue hydrogen (derived from natural gas with carbon capture and storage).

A full LCA screening is yet to be completed, and without data on scope 3 emissions from chemicals, it is not possible to conclude that the NdPr from Saltend will have a lower footprint than relevant comparable NdPr. While NdPr is needed in the clean energy transition, it remains crucial to reduce the emissions associated with its manufacture. Pensana demonstrates a commitment to emissions reductions and has already taken actions to reduce emissions in the design of its facility. We welcome the issuer's intentions on performing a full LCA screening in the future as well as its plans on how to further reduce emissions and encourage transparency to investors on the results of the life cycle assessment, when available.

Pensana has made significant efforts to mitigate the inherent environmental and social risks associated with mining, which is relevant due to the supply chain to Saltend. Among others, it has followed the newly established Global Industry Standard on Tailings Management, an industry standard aimed at limiting negative harm, including to the environment, to a minimum through implementing best practices. Environmental risks relate among others to safe handling of waste, which are stored in tailing ponds, which need to be carefully monitored and managed. Such waste also includes some radioactive waste, which will be subject to a radiation monitoring programme.



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1 Pensana's environmental management and green bond framework

Company description

Pensana was founded in 2006, is listed on the London Stock Exchange and headquartered in the UK. The company intends to establish a sustainable supply chain for the rare earth metals vital for electric vehicles, wind turbines and other strategic green technology industries.

Pensana plans to build a rare-earth processing facility at Saltend Chemicals Plant in Hull, UK. The facility will produce some 12,500 tonnes of rare earth oxides yearly, of which 4,500 will be neodymium and praseodymium oxides (NdPr), representing an estimated 5% of global production in 2025. Some 95% of revenues are expected to come from the sale of NdPr, to be used in permanent magnets, which is in high demand for use in electric vehicles and wind turbines. For the by-products Cerium and Lanthanum, of which there generally is a surplus, Pensana will strive to find new uses, such as water treatment, glass polishing, LED and catalysis.

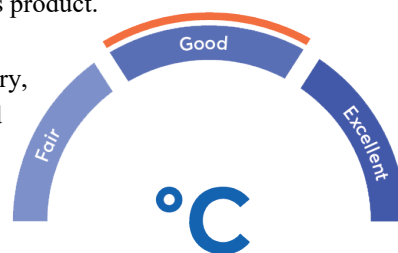
In January 2022, Pensana signed a cooperation agreement with the Norwegian oil and gas company Equinor, forming a working group to develop a low energy method for recycling end-of-life magnets at Saltend. Yearly, some 4,000 permanent magnets reach end-of-life status, and there is currently no effective system for the collection and separation of rare earth element-containing products.

Governance assessment

Pensana is in the early stages of formalizing its environmental strategies and policies but given that its main focus is on supplying inputs to the green energy transition, sustainability is at the core of its policies and operations.

Pensana has an ESG sub-committee, a Head of Sustainability reporting to the CEO and ESG risks are integrated in general risks assessment, as well as in procurement and contracts. The issuer does not have quantified targets for its scope 1, 2 or 3 emissions nor a target for the emissions intensity of its product.

As the only investment under the framework concerns the Saltend refinery, there is no selection process per se. The company will report on proceed allocation and impact in its annual report and has chosen relevant impact metrics. In addition to the chosen metrics, we encourage the issuer, to the extent possible, to report on the fraction of annual output of NdPr used in electric wind turbines and EVs.



The overall assessment of Pensana's governance structure and processes gives it a rating of **Good**.



Sector risk exposure

The industrial sector has a vital role to play in achieving the net zero goal: its emissions must fall by 90% by 2050 to align with the IEA's net zero by 2050 scenario. As industrial production is expected to increase to meet growing demand for clean technologies, the EU Taxonomy states that the manufacturing of low carbon technologies should demonstrate life cycle GHG emission savings compared to the best performing alternative.

The extraction and further processing of many of the minerals and metals needed in the clean energy transition have negative local environmental impacts and are associated with high social risks. These need to be managed carefully.

Physical climate risks. The mining and industrial sectors are highly exposed to physical climate risk. They are exposed to supply chain disruptions, for example caused by extreme weather events. In Africa, the top risks are expected to be flooding (from increased extreme precipitation), drought and water stress, sea level rise and heat stress. In Europe, based on the latest IPCC physical impacts report, heat stress and increased precipitation appear to be main concerns, including for the UK, while sea level rise is a relevant risk for areas on the coastline.

Transition risks. Due to the profound changes needed to limit global warming to 2°C, transition risk affects all sectors. While the transition to low carbon technologies represents a transition opportunity for Pensana, it is exposed to transition risks from stricter policies on greenhouse gas emissions and pollution, including at the mining sites.

Environmental risks. Mining of the ore in which rare earth elements are found, is associated with negative local environmental impacts, mainly related to the release of toxic chemicals into the environment. The most widely used mining techniques involve chemical processing, which create discharges of chemicals and toxic waste to the local environment, in addition to energy intensive processes using fossil fuels.

Social risks. Mining projects often require vast land areas. People living in or close to these areas risk being adversely negatively impacted by the projects. Angola is one of the countries in the world with the highest levels of corruption. Companies operating in such countries must follow their projects closely to ensure that international standards are respected throughout the project phases.

Environmental strategies and policies

Pensana's mission statement is to build the world's first sustainable magnet metal supply chain to meet the increasing demand from electric vehicles and wind turbines. Pensana has made conscious choices to reduce emissions from the value chain and is looking into ways of further reducing emissions. At this stage, the company does not have any quantified emission targets, but it has mapped its most significant scope 1 and 2 emissions (see more in section "*Greenhouse gas emissions from mine to factory gate*"). Pensana intends to perform a full GHG screening aligned with established standards in the next phase of operations. Once this screening is complete, Pensana intends to develop an action plan for a scientific aligned GHG reduction of scopes 1, 2 and 3.

The steps taken by Pensana so far to reduce its emissions for the different steps in the value chain, which are further described below, are as follows:

- Construction of a connection to Laúca hydropower plant to supply renewable power to mine operations



- Electric kiln at the processing plant (Angola), saving around 10 million litres of diesel per year
- Solar panels as part of Saltend construction and strategy for minimizing emissions from employee travel
- Sustainability considered for sourcing of reagents (chemicals) and chemical recycling, used both in Saltend refinery and Angola operations

Pensana has established an ESG sub-committee and its Head of Sustainability reports to the CEO. ESG risks are considered in the company's general risks assessment, as well as in procurement and contracts. Pensana follows principles for sustainable procurement, applicable to all suppliers as well as to any third parties sourcing suppliers on Pensana's behalf. Additional criteria for suppliers to take meaningful action to reduce direct and indirect emissions aligned to a global net zero by 2050 pathway apply in cases where Pensana deems appropriate from a risk perspective. Work is ongoing to make the company certified ISO 14001 (environmental management) and ISO 45001 (health and safety).

Pensana has considered the robustness of its strategy against climate models. The company's risk register includes identified physical climate risks for Pensana and its value chain for three different time horizons, which forms the basis of reporting to the group Audit and Risk Committee. According to the issuer, the construction of the Saltend refinery has been adjusted to consider flooding risks and to reduce pollution risks. In the future, Pensana intends to report according to the TCFD.

Pensana is a signatory to the UN Global Compact and plans to annually report on progress towards the Sustainable Development Goals. It has also adopted the Equator principles and is part of "Oh yes! Net zero", a community of private and public sector organisations committed to supporting the Humber region to reach net zero carbon emissions.

The Saltend refinery

The planned rare earth refinery is situated within the bounds of the Humber Freeport, in the Saltend Chemicals Park, an industrial cluster. The area hosts a range of companies including BP Petrochemicals technology, INEOS, Air Products, Triton Power, Nippon Gohsei and Tricoya. At the site, the refinery has access to utilities including water, power and gas. The international Port of Hull is only 2km away. The facility is located close to a Special Protection Area (RAMSAR site), but on farmland that has recently been earmarked to industrial development.

The facility will be regulated under the Environmental Permitting Regulations and the process to receive the permit from the relevant authorities is ongoing. The UK planning and permitting requirements have been followed, including assessments on flood risk, nature and biodiversity, noise and visual disruption, and in consultation with the local community. Although the Yorkshire Local Planning Authority has concluded that a full Environmental Impact Assessment is not needed, Pensana has had a third party perform an environmental assessment and is undertaking efforts to reduce its impacts on the natural habitat and local environment. The air quality assessment concludes that the facility's impact on air quality, arising from combustion and process plant emissions, is deemed "not significant" for all considered human receptor locations. Emissions of pollutants from the refinery include particulate matter, nitrogen oxide, sulphur oxides, volatile organic compounds and carbon monoxide, all of which will be within the limits of its environmental permit, which will also require the use of Best Available Technologies (mirroring the EU Directive on industrial emissions).

The facility will have on site solar power generation and has signed a letter of intent for a private connection to an offshore wind park, but will depend on electricity from natural gas power generation for remaining energy needs. Natural gas is also used in the production process. Pensana's purchases of feedstock and reagents will be aligned to its principles for sustainable purchasing. To reduce emissions associated with employee travel, the company has a target for 40% car sharing, will install EV charging point, while promoting cycling and public transport. Further reductions are planned through accessing cleaner electricity sources (solar and wind farm in conjunction with



battery storages, or blue hydrogen), and Pensana is currently in active dialogue with potential suppliers on such options.

Longonjo mine and feedstock for Saltend

Pensana has secured mining rights for extraction of rare earth elements in Angola in the planned Longonjo mine. The company intends to follow the IFC Environmental and Social Performance Standards¹, as well as the Global Industry Standard on Tailings Management (GISTM)² for the mining operations. According to Pensana, the IFC standards have been embedded throughout the mine planning, and the issuer's practices have followed those standards. The design of the Tailing Storage Facility (TSF) at the mining site has been aligned to the GISTM, and this has been achieved throughout engineering contractors, and peer reviewers have been appointed for the construction phase. The TSF is where waste from the chemical processing at the mining site is stored; the issuer intends to monitor tailing ponds in line with best practices. Waste includes some radioactive fractions, which will be deposited in non-soluble form (tailings) subject to a radiation monitoring programme. The company is in dialogue with Angolan regulators on this aspect. Prior to beginning operations, Pensana must apply to the Angolan government to which it must submit its environmental and social impact assessment.

Following extraction, the ore will be processed into mixed rare earth sulphate (MRES) carbonate at the Longonjo MRES plant and then transported to Saltend via rail and ship.

Greenhouse gas emissions from mine to factory gate

Pensana has mapped the material scope 1 and 2 emissions from its planned business, which include:

- The Longonjo mining operations, concentrator, MRES plant, tailings disposal along with associated mine site reagent production/handling infrastructure. These emissions include those from combustion of diesel (incl. plant vehicles) and natural gas, electricity and CO₂ from chemical reactions.
- Saltend separation refinery: steam, natural gas, electricity, diesel (incl. plant vehicles) and CO₂ from chemical processes.

Based on a recent comparative LCA of rare earth element production for permanent magnets³, the main contributors to NdPr's carbon footprint are typically scope 3 emissions from chemicals and energy use. Looking at the production steps, although those analysed in the LCA may not be directly comparable with Pensana, the largest impact on emissions is seen from solvent extraction.

Comparison of emissions data is challenging as production techniques and system boundaries vary, and also because access to good data is difficult. Pensana quantifies its scope 1 and 2 emissions to approx. 25 tonnes CO₂e/per tonne Nd metal content, compared to 75.8 tonnes for the Bayan Obo mine (China), referenced by the IEA⁴, which supplied 45% of global production in 2005. However, these numbers are not comparable, as Pensana's estimate includes scope 1 and 2 emissions, but not scope 3 emissions from chemicals, which are included in the Bayan Obo figure. According to data in the Ecoinvent database, the global average for Nd oxide is 52 tonnes CO₂e/tonne Nd oxide. This number also includes scope 3 emissions from chemicals but is likely less accurate than the detailed study as the Ecoinvent database partly relies on generic data.

¹ [Performance Standards \(ifc.org\)](https://www.ifc.org/standards) The IFC Performance Standards define IFC clients' responsibilities for managing their environmental and social risks. They cover eight areas of risk management, labour, resource efficiency, community, land resettlement, biodiversity, indigenous people and cultural heritage.

² [Global Industry Standard on Tailings Management | UNEP - UN Environment Programme](https://www.unep.org/standards) The GISTM has been developed jointly by experts from UNEP, the Principles for Responsible Investment (PRI) and the International Council of Mining and Metals (ICMM).

³ Comparative Life Cycle Assessment of NdFeB Permanent Magnet Production from Different Rare Earth Deposits, by Josefine Marx, Andrea Schreiber, Petra Zapp, and Frank Walachowitz, in ACS Sustainable Chemical Engineering 2018.

⁴ [GHG emissions intensity for production of selected commodities – Charts – Data & Statistics - IEA](https://www.iea.org/emissions-intensity)



Addressing social risk

To map and identify risks linked to the mining project, Pensana engaged an independent NGO to perform the mapping of affected land, identifying land ownership and compiling assessments of each affected community.

Pensana has described that its staff have taken an active role in ensuring public consultation aligned to the requirements of the IFC performance standards throughout the past three years of project development. Regular meetings involving Pensana staff alongside independent experts have been held with affected communities and the local area traditional leaders (Sobas) committee. A full-time community liaison officer has been appointed by the company, who travels into villages informally to field questions and is supported by both a country manager and a camp manager.

Pensana sees that there are serious human rights risks linked to the mining operation. As the project requires the removal of farmland of a population which relies on subsistence farming, measures to prevent interruptions in food supplies is a priority. There is a high level of illiteracy in the population. This makes it difficult for the population to take part in the training and qualify for the jobs that the company is planning. Hence, it is even more important that the company facilitates that the affected community can remain subsistence farmers. Regarding the new farming areas, Pensana has explained that in the instance (of one village) where pedestrian travel to replacement land may be longer, appropriate transport mitigation arrangements are underway.

Finally, there are certain risks that the population can get health problems while continuing to live in the mining area. This needs to be followed closely by the company.

Green bond framework

Based on this review, this framework is found to be in line with the Green Bond Principles. For details on the issuer's framework, please refer to the green bond framework dated April 2022.

Use of proceeds

For a description of the framework's use of proceeds criteria, and an assessment of the categories' environmental benefits, please refer to section 3.

Selection

Pensana's management and board of directors have evaluated the Saltend refinery project, with the conclusion it is aligned with the company's strategy and requirements. Hence, there is no dedicated green bond committee. According to the issuer, sustainability expertise is represented in the Board and the chair of the ESG committee engages with senior management to integrate sustainability considerations in decision making.

Management of proceeds

Net green bond proceeds will be transferred to a designated escrow account under the administration of a Nordic trustee. The proceeds will be released according to a pre-agreed release mechanism. Proceeds will not be used in any short-term placements; any possible surplus funds will be allocated to advancing the project further downstream towards magnet metal production. While Pensana ultimately intends to convert the NdPr oxide to metal at the Saltend facility, this metal conversion will not initially take place there but rather contracted to a third party.

Reporting

Pensana will report on the construction process of the Saltend refinery and the allocation of green bond proceeds in its annual report. The reporting, including the impact metrics will be externally reviewed, and metrics will, at a



minimum include GHG emissions (scope 1, 2 and 3), health and safety indicators, environmental indicators, water consumption, biodiversity, social and community impact, governance aspects.



2 Assessment of Pensana's green bond framework

The eligible projects under Pensana's green bond framework are shaded based on their environmental benefits and risks, based on the "Shades of Green" methodology.

Shading of eligible projects under the Pensana's green bond framework

- Proceeds from Pensana's green bond framework will exclusively finance project related capex or costs incurred for the construction of the Saltend refinery. The recycling facility for permanent magnets has a longer time horizon and will not be financed under this framework.
- The Saltend refinery will not own nor operate and will not invest in fossil or nuclear energy generation projects.

Category	Eligible project types	Green Shading and considerations
Manufacture of low carbon technologies	Project related capex or costs incurred for the construction of the Saltend refinery.	Light Green <ul style="list-style-type: none">✓ While the NdPr produced at Saltend has a key role in the decarbonization of the energy and transport sectors, efforts to reduce emissions associated with the construction of the refinery are not the highest. Embodied emissions have not been considered when choosing building materials. Meanwhile, efforts have been made to reduce energy related emissions. The Saltend plant will have solar panels, and Pensana has recently signed a letter of intent for a private wire connection to battery storage giving access to 4MW rising to 10 MW of electricity from offshore wind (Yorkshire Energy Park) for 10 years. Remaining electricity needs will be covered by natural gas power generation.✓ Climate resilience has been considered. According to the issuer, the construction of the refinery has been adjusted to consider flooding risks, while physical climate risks across the value chain have been assessed.✓ Currently available information does not show that the produced NdPr will have lower associated emissions than relevant comparable products. A full life cycle screening is yet to be conducted, and due to lacking data on scope 3 emissions from chemicals, it is not possible to compare available emissions data from Pensana with numbers for NdPr from other sites. Nevertheless, given Pensana's commitment to consider scope 3 emissions from chemicals used in Saltend and Angola and efforts to reduce energy emissions, it appears likely that its NdPr will have a lower footprint than the NdPr currently dominating the



market, which is produced in China. Also, reagent recycling is implemented throughout the process to reduce the need for chemicals.

✓ Pensana has made additional efforts to reduce emissions from its upstream value chain. For instance, to reduce emissions from the MRES processing plant in Angola, where the rare earth sulphate is extracted from the ore, Pensana has installed an electric kiln (instead of diesel). Nevertheless, natural gas is still needed in the processing.

✓ To reduce the emissions associated with mining, it is positive that a new power line connecting the mining site to a hydropower plant has been constructed. In the future, Pensana plans to electrify mining operations, replacing fossil fuel machinery.

✓ The issuer intends to sell its NdPr only to industries associated with the clean energy transition, with a focus on wind turbines and electric vehicles. While no off-take agreements have been signed yet, Pensana expects to sell both directly to automotive industries and wind power manufacturers, but also to magnet manufacturers and trading houses. Customers' own ESG strategies will be part of client selection. Pensana's sustainable sales strategy and the expected increase in demand for NdPr from the clean energy transition gives us comfort that most of the NdPr output from Saltend will be used in technologies needed in the transition to a low carbon future.

✓ Pensana has assessed its business plans against the International Energy Agency's World Energy Outlook Scenarios and specifically how Pensana's products are needed, based on the "The Role of Critical Minerals in Clean Energy Transitions" report. According to the issuer, the IEA modelled that in the "well below 2 °C" there is a seven-fold increase in demand for rare earths in clean energy technologies. Even if well below 2C is not achieved the "Stated Policies" scenario, which only uses already enacted policies, showed the need for a threefold increase in demand for rare earths in clean energy technologies.

✓ Mining for the raw material needed to produce NdPr at Saltend generally has negative local environmental and social impacts. According to the issuer, its mine in Angola is being constructed in line with the Global industry Standard on Tailings Management, and it has, according to the issuer, been developed in line with the IFC Environmental and Social Performance Standards. Following these standards mitigates the most serious environmental and social risks, but investors should be aware that farmers living on subsistence farming have lost their land to the mining site. Pensana has established a "land-for-land" compensation programme, where farmers will receive new agricultural land.

Table 1. Eligible project categories



More on rare earth elements and permanent magnets

Rare earth elements

There are in total 17 Rare Earth Elements (“REE”). These elements are all metals, and have many equivalent properties, which often causes them to be found together in geologic deposits. Contrary to what their name suggests, these elements are not scarce. However, economically feasible deposits of mineral ores with a sufficient concentration of REEs are rare.

The rare earth value chain has many steps: mining of ore, extraction of rare earth carbonate from the rare earth concentrate, separation of the different rare earth elements from the rare earth carbonate, further refining and processing of these elements into metal alloys, production of magnets and finally use in applications such as electric vehicles.

Most of the global production of rare earth oxides takes place in China, whose official production in 2019 accounted for 62% of the total supply. Other major suppliers are based in the United States (12% of global production), Myanmar (10%), and Australia (10%)⁵. Separation and refining of rare earth elements are currently almost exclusively performed in China⁶. China is also dominating the mining of the ore, but the mining segment is currently diversifying, with mines opening in Australia, Canada, and the US. No mining is currently taking place in Europe.

Permanent magnets

Permanent magnets have replaced other types of magnets in many applications where strong permanent magnets and high efficiency are required. The magnets typically contain the four rare earth elements: neodymium, praseodymium, terbium and dysprosium. Permanent magnets are important components of electric vehicle motors and wind turbine generators, but are also used in equipment such as laptops, mobile phones and cameras, electrical appliances and cordless power tools, missile guidance systems and robots, as well as medical resonance imaging equipment. Additionally, combat aircrafts and drones also use permanent magnets.

Permanent magnets generators are particularly attractive in offshore wind turbines, as they allow for high power density and small size with high efficiency at all speeds. Nearly all offshore and wind turbines in Europe use permanent magnets. For praseodymium and neodymium, wind turbines and electric vehicles were in 2020 estimated to account for only 7% and 9% of the overall demand, respectively, according to a study by the Joint Research Centre, the European Commission’s science and knowledge service, also referenced above⁷.

It is estimated that 1MW of wind turbine capacity (notably offshore turbines) may require around 500 kg of permanent magnets; a typical electric vehicle requires around one to two kg of magnets⁸. For wind turbines, an average permanent magnet contains 28.5% neodymium, 4.4% dysprosium, 1% boron and 66% iron, and weighs up to four tonnes, according to the previously referenced JRC study.

Due to the environmental and social risks of mining, efforts have been and are still being made to produce magnets without rare earth elements, both for electric motors and wind turbines. However, to date, most replacements for permanent magnets are less efficient and have lower performance.

⁵ Alves Dias, P., Bobba, S., Carrara, S., Plazzotta, B. (2020), The role of rare earth elements in wind energy and electric mobility, EUR 30488 EN, Publication Office of the European Union, Luxembourg, ISBN 978-92-79-27016-4, doi:10.2760/303258, JRC122671. JRC Publications Repository - The role of rare earth elements in wind energy and electric mobility (europa.eu)

⁶ Ibid

⁷ Ibid

⁸ [Digging deep to fuel Europe's energy transition \(smart-energy.com\)](https://smart-energy.com/)









3 Terms and methodology

This note provides CICERO Shades of Green's (CICERO Green) second opinion of the client's framework dated April 2022. This second opinion remains relevant to all green bonds and/or loans issued under this framework for the duration of three years from publication of this second opinion, as long as the framework remains unchanged. Any amendments or updates to the framework require a revised second opinion. CICERO Green encourages the client to make this second opinion publicly available. If any part of the second opinion is quoted, the full report must be made available.

The second opinion is based on a review of the framework and documentation of the client's policies and processes, as well as information gathered during meetings, teleconferences and email correspondence.

'Shades of Green' methodology

CICERO Green second opinions are graded dark green, medium green or light green, reflecting a broad, qualitative review of the climate and environmental risks and ambitions. The shading methodology aims to provide transparency to investors that seek to understand and act upon potential exposure to climate risks and impacts. Investments in all shades of green projects are necessary in order to successfully implement the ambition of the Paris agreement. The shades are intended to communicate the following:

Shading	Examples
 Dark Green is allocated to projects and solutions that correspond to the long-term vision of a low-carbon and climate resilient future.	 Solar power plants
 Medium Green is allocated to projects and solutions that represent significant steps towards the long-term vision but are not quite there yet.	 Energy efficient buildings
 Light Green is allocated to transition activities that do not lock in emissions. These projects reduce emissions or have other environmental benefits in the near term rather than representing low carbon and climate resilient long-term solutions.	 Hybrid road vehicles

The "Shades of Green" methodology considers the strengths, weaknesses and pitfalls of the project categories and their criteria. The strengths of an investment framework with respect to environmental impact are areas where it clearly supports low-carbon projects; weaknesses are typically areas that are unclear or too general. Pitfalls are also raised, including potential macro-level impacts of investment projects.

Sound governance and transparency processes facilitate delivery of the client's climate and environmental ambitions laid out in the framework. Hence, key governance aspects that can influence the implementation of the green bond are carefully considered and reflected in the overall shading. CICERO Green considers four factors in its review of the client's governance processes: 1) the policies and goals of relevance to the green bond framework; 2) the selection process used to identify and approve eligible projects under the framework, 3) the management of proceeds and 4) the reporting on the projects to investors. Based on these factors, we assign an overall governance grade: Fair, Good or Excellent. Please note this is not a substitute for a full evaluation of the governance of the issuing institution, and does not cover, e.g., corruption.



Assessment of alignment with Green Bond Principles

CICERO Green assesses alignment with the International Capital Markets' Association's (ICMA) Green Bond Principles. We review whether the framework is in line with the four core components of the GBP (use of proceeds, selection, management of proceeds and reporting). We assess whether project categories have clear environmental benefits with defined eligibility criteria. The Green Bonds Principles (GBP) state that the "overall environmental profile" of a project should be assessed. The selection process is a key governance factor to consider in CICERO Green's assessment. CICERO Green typically looks at how climate and environmental considerations are considered when evaluating whether projects can qualify for green finance funding. The broader the project categories, the more importance CICERO Green places on the selection process. CICERO Green assesses whether net proceeds or an equivalent amount are tracked by the issuer in an appropriate manner and provides transparency on the intended types of temporary placement for unallocated proceeds. Transparency, reporting, and verification of impacts are key to enable investors to follow the implementation of green finance programs.



Appendix 1:

Referenced Documents List

Document Number	Document Name	Description
1	Pensana PLC Green Bond Framework, April 2022	
2	ARA 20-21 ESG Chapter	
3	ESG Committee minutes, October and November 2021, February 2022	
4	ESG Committee Terms of Reference	
5	HCV Africa Stakeholder Engagement Plan and Grievance Mechanism	
6	Health, safety, environment and social policies	
7	Pensana ESG materiality assessment	
8	Planning – Air Quality Assessment	
8	Planning Ecology Assessment	



9 Principles for sustainable procurement

10 Planning – Flood Risk Assessment

11 Comparative Life Cycle Assessment of NdFeB Permanent Magnet Production from Different Rare Earth Deposits, by Josefine Marx, Andrea Schreiber, Petra Zapp, and Frank Walachowitz, in ACS Sustainable Chemical Engineering 2018. Environmental impacts during the production of a 1 kg of neodymium iron boron (NdFeB) magnet from three major deposits are quantified using life cycle assessment (LCA).



Appendix 2: About CICERO Shades of Green

CICERO Green is a subsidiary of the climate research institute CICERO. CICERO is Norway's foremost institute for interdisciplinary climate research. We deliver new insight that helps solve the climate challenge and strengthen international cooperation. CICERO has garnered attention for its work on the effects of manmade emissions on the climate and has played an active role in the UN's IPCC since 1995. CICERO staff provide quality control and methodological development for CICERO Green.

CICERO Green provides second opinions on institutions' frameworks and guidance for assessing and selecting eligible projects for green bond investments. CICERO Green is internationally recognized as a leading provider of independent reviews of green bonds, since the market's inception in 2008. CICERO Green is independent of the entity issuing the bond, its directors, senior management and advisers, and is remunerated in a way that prevents any conflicts of interests arising as a result of the fee structure. CICERO Green operates independently from the financial sector and other stakeholders to preserve the unbiased nature and high quality of second opinions.

We work with both international and domestic issuers, drawing on the global expertise of the Expert Network on Second Opinions (ENSO). Led by CICERO Green, ENSO contributes expertise to the second opinions, and is comprised of a network of trusted, independent research institutions and reputable experts on climate change and other environmental issues, including the Basque Center for Climate Change (BC3), the Stockholm Environment Institute, the Institute of Energy, Environment and Economy at Tsinghua University, the International Institute for Sustainable Development (IISD) and the School for Environment and Sustainability (SEAS) at the University of Michigan.



- ★ **2020 External Assessment Provider Of The Year**, Environmental Finance Green Bond Awards
- ★ **2020 Largest External Review Provider In Number Of Deals**, Climate Bonds Initiative Awards
- ★ **2019 External Assessment Provider Of The Year**, Environmental Finance Green Bond Awards
- ★ **2019 Largest Green Bond SPO Provider**, Climate Bonds Initiative Awards
- ★ **2018 External Assessment Provider Of The Year**, Environmental Finance Green Bond Awards
- ★ **2018 Largest External Reviewer**, Climate Bonds Initiative Awards
- ★ **2017 Best External Assessment Provider**, Environmental Finance Green Bond Awards
- ★ **2016 Most Second Opinions**, Climate Bonds Initiative Awards