Executive Summary

🌍 Vision

MINERA is a meme coin with a mission: to revive the UK's historic mining regions — Cornwall, Wales, and the Midlands — by funding sustainable recovery of cobalt, lithium, tin, tungsten, and rare earths. By combining blockchain innovation with credible investor-grade reporting, MINERA bridges meme culture and real-world impact.

□ The Coin

- **Name: MINERA ($MINERA)**
- **Avatar: as a sword rising from a mystical Cornish lake, encircled by Merlin's runes, with Celtic accents.**
- **Utility: Funding engine, staking rewards, governance rights, NFT branding, and royalties.**
- **Transparency: Placeholder smart contract deployed with zero supply, vesting contracts enforce allocation discipline, multisig governance ensures security.**

📊 Tokenomics

- **Presale (50%):**
- **Staking Pool (20%):**
- **Liquidity (10%): Exchange listings and stability.**
- **Treasury (10%): Flexible release for grants and partnerships.**
- **Marketing (3%): Immediate access.**
- **Team (3%): Immediate access**
- **Giveaways (2%)**
- **Partners (2%)**

🚀 Roadmap

- **Phase 1: Website launch, smart contract deployment, presale/fair launch.**
- **Phase 2: Geological surveys, tailings feasibility, partnerships, DEX listing.**
- **Phase 3: Pilot cobalt recovery, lithium exploration, team expansion, EU grant applications.**

- **Phase 4: Scale operations, diversify minerals, integrate renewables, expand token utility.**

⚡ **Investor Outlook**

- **Upside: Rising demand for ethical cobalt, lithium, and rare earths.**
- **Risk Mitigation: Diversification, compliance, transparent reporting, community governance.**
- **Impact: Jobs, heritage preservation, reduced pollution, strengthened supply chains.**

✅ **Conclusion**

MINERA is more than a meme coin. It's a movement to turn heritage into opportunity, memes into minerals, and blockchain into real-world sustainability. Investors join not just a token, but a revival.

This report provides an in-depth analysis of historical and potential mineral production across Cornwall, western England, Wales, and, where relevant, the Midlands. It addresses the legacy of mining in these regions, evaluates the geological and economic feasibility of reopening or repurposing closed mines, and focuses specifically on the prospects for cobalt and lithium. The report also explores the broader spectrum of minerals—such as rare earth elements (REEs), tin, tungsten, graphite, copper, and zinc—that may now be economically viable due to modern technological demands. Environmental, regulatory, and infrastructure considerations are critically assessed, and the report incorporates recent case studies, market outlooks, and the evolving investment landscape. Inline citations are provided throughout to substantiate all findings and analyses.

1. Historical Mineral Production in Cornwall, Western England, and Wales

1.1 Cornwall and Devon: The Heart of British Metalliferous Mining

Cornwall and Devon have been central to the UK's mining history, with activity dating back to the early-middle Bronze Age. The exploitation of cassiterite (tin ore) marked the beginning of large-scale mining, and by the medieval period, Cornwall and Devon were the principal sources of tin and copper for the UK and much of Europe. The region's mining industry reached its zenith in the 19th century, with hundreds of steam engines operating to pump water from deep mines.

Key minerals historically produced include:

- **Tin (cassiterite):** Cornwall was renowned for its tin, with production peaking in the 19th century. The South Crofty mine, near Camborne, was the last working tin mine in Europe, closing in 1998 but now the focus of renewed investment and reopening efforts.

- **Copper:** The South Caradon Copper Mine was the largest in the UK during the late 19th century. Copper mining was often associated with the extraction of arsenic, silver, and zinc as by-products.
- **Tungsten and Tin:** The Hemerdon (Drakelands) Mine in Devon, discovered in the 19th century, is one of the world's largest tungsten-tin deposits and has seen several periods of operation and redevelopment.
- **Arsenic:** Cornwall was a global leader in arsenic production in the late 19th century, with the Devon Great Consols mine producing over half the world's arsenic at its peak.
- **Other metals:** Lead, silver, zinc, uranium, and kaolin (china clay) have also been significant, with kaolin extraction remaining economically important into the 20th century.

Table 1: Historical Mineral Production in Cornwall and Devon (Selected Years)

Year	Tin (tons)	Copper Ore (tons)	Lead Ore (tons)	Silver (oz)	Zinc (tons)	Uranium (tons)	Tungsten (tons)	Arsenic (tons)
1845		149,834	6,063					
1860	11,121	145,359	4,243	7.31			19	515
1880	22,655	26,737	570	0.38			1	2,044
1890	24,442	5,271	0	0	0	22	104	3,143
1900	11,055	5,926	0	0	4	41	8	1,160
1985	5,200						5,344	
1998	500							

Totals (historic): Tin (White): 457,969 tons; Tin (Black): 798,696 tons; Copper Ore: 4,072,680 tons; Copper Metal: 219,951 tons; Lead Ore: 170,470 tons; Silver: 223,275 oz; Zinc: 101,343 tons; Uranium: 1,543 tons; Tungsten: 6,328 tons; Arsenic: 114,729 tons.

These figures underscore the immense scale and diversity of Cornwall and Devon's mineral output, which underpinned the region's economic and social development for centuries.

1.2 Wales: A Diverse Mining Heritage

Wales' mining history is equally rich, with evidence of copper mining dating back to the Bronze Age at sites such as the Great Orme near Llandudno. The Roman

occupation saw industrial-scale extraction of gold, copper, and lead. By the 19th century, Wales was a major producer of coal, slate, gold, lead, zinc, and copper.

- **Coal:** The South Wales coalfield was globally significant, with Barry and Cardiff becoming the world's largest coal-exporting ports by 1913.
- **Slate:** North Wales' Penrhyn and Dinorwig quarries were the largest in the world, with slate used for roofing and other purposes.
- **Gold:** Roman and 19th-century mining at Dolaucothi and in Snowdonia.
- **Lead and Silver:** The Cwmystwyth and Rheidol United mines were major producers, with galena (lead ore) often containing high silver content.
- **Zinc:** Sphalerite (zinc ore) was abundant but often left unprocessed in waste heaps.
- **Copper:** Parys Mountain on Anglesey was a major 18th-century copper producer.
- **Arsenic:** Commercial extraction occurred in the Clyne valley near Swansea.

Table 2: Summary of Historical Mineral Production in Wales

Mineral	Historical Locations	Time Period	Notes
Coal	Rhondda Valley, South Wales	19th–20th centuries	Major export product; Tower Colliery closed 2008
Slate	Penrhyn, Dinorwig, Nantlle Valley	Roman–19th century	Largest slate quarries and mines in the world
Gold	Dolaucothi, Snowdonia	Roman–19th century	Roman and 19th-century extraction
Lead/Silver	Cwmystwyth, Rheidol, Gwydir Forest	17th–19th centuries	Galena with high silver content; sphalerite (zinc) also present
Zinc	Cwmystwyth, Gwydir Forest	17th–19th centuries	Often unprocessed; remains in discard heaps
Copper	Great Orme, Parys Mountain, Sygun	Bronze Age–18th century	Ancient mining; Parys Mountain had massive deposits
Iron	South Wales Coalfield, Vale of Glamorgan	Roman–19th century	Ironstone in Lower Coal Measures
Arsenic	Clyne Valley	Unknown	Mined with other metals

Notable mines: Bryntail, Clogau Gold, Cwmystwyth, Dolaucothi, Great Orme, Parys Mountain, Van Leadmine, among others.

2. Geological and Economic Feasibility of Reopening or Repurposing Closed Mines

2.1 Geological Setting: The Cornubian Batholith and Associated Mineralization

The mineral wealth of Cornwall and Devon is fundamentally linked to the Cornubian Batholith—a vast mass of granite formed during the Early Permian period (c. 300–275 million years ago). This batholith, exposed at Dartmoor, Bodmin Moor, St Austell, Carnmenellis, Land's End, and the Isles of Scilly, is associated with extensive mineralization, particularly of tin, copper, tungsten, lithium, and other metals.

- **Mineralization Stages:** Four main stages are recognized, each associated with different temperature regimes and mineral assemblages:
    - **Exoskarns:** Tin, copper, iron, arsenic (375–450°C).
    - **Greisen-bordered veins:** Cassiterite (tin oxide), wolframite (tungsten) (high salinity, low CO_2 fluids).
    - **Main phase:** Tin, copper, arsenic, lead, zinc, iron sulfides (200–400°C).
    - **Crosscourses:** Lead, zinc, silver, uranium (100–170°C), often associated with cobalt and nickel.

The batholith is also enriched in lithium, boron, caesium, uranium, fluorine, gallium, germanium, rubidium, tin, tantalum, tungsten, and thallium, making it a prime target for modern critical mineral exploration.

2.2 Economic Feasibility: Modern Revival and Investment

2.2.1 Cornwall's Critical Minerals Renaissance

Recent years have seen a surge of investment and government support for critical minerals in Cornwall. The UK Government's updated Critical Minerals Strategy aims to meet at least 10% of domestic demand for key minerals through UK production by 2035, with Cornwall positioned as a national hub for lithium, tin, tungsten, and other critical minerals.

- **South Crofty Tin Project:** Now owned by Cornish Metals, South Crofty is fully permitted and has undergone a detailed Preliminary Economic Assessment (PEA) in 2025, showing robust economics: an after-tax NPV of £180 million, 20% IRR, and a 14-year mine life with potential for extension. The project is expected to produce ~4,700 tonnes of tin per year, with all-in sustaining costs under US$14,500/tonne—well below current tin prices (US$33,900/tonne).
- **Hemerdon (Drakelands) Tungsten-Tin Mine:** After several operational setbacks, the mine is now operated by Tungsten West plc, with a revised resource estimate of 218 million tonnes at 0.18% WO_3 and 0.02% Sn. The

site retains significant infrastructure and is poised for renewed production, with aggregate sales as a by-product.

- **Cornish Lithium:** Backed by over £53 million in recent investment (including £24 million from the UK Infrastructure Bank), Cornish Lithium is advancing both hard rock (Trelavour) and geothermal brine projects, aiming for 10,000 tonnes/year lithium hydroxide from Trelavour and 25,000 tonnes/year lithium carbonate equivalent from brines by 2030—potentially supplying 25% of UK demand.

2.2.2 Repurposing Closed Mines: Innovative Approaches

Beyond traditional mining, the UK is exploring innovative uses for abandoned mines, especially in Wales and the Midlands:

- **Geothermal Energy and Heat Storage:** Flooded coal mines can be repurposed as geothermal heat reservoirs, providing low-carbon heating for buildings and district heating networks.
- **Compressed Air and Pumped Storage:** Abandoned mine voids can serve as large-scale energy storage facilities, stabilizing the grid and supporting renewable energy integration.
- **Underground Farming:** Controlled environments in old mines can be used for hydroponic and vertical farming, enhancing food security.
- **Water Reservoirs:** Flooded mines can be managed as urban and rural water reservoirs, mitigating flood risks and providing drought resilience.

These approaches not only address environmental legacies but also create new economic opportunities and support the UK's decarbonization goals.

3. Cobalt and Lithium: Mineralogy, Occurrences, and Physical Properties

3.1 Cobalt: Mineralogy and Natural Occurrences

3.1.1 Mineral Forms

Cobalt occurs in nature primarily as:

- **Cobaltite (CoAsS):** A brittle, metallic, silver-grey mineral found in hydrothermal veins, often associated with arsenic, nickel, and silver. It is a primary source of cobalt in Cornwall and Wales.
- **Erythrite ($Co_3(AsO_4)_2 \cdot 8H_2O$):** Known as "cobalt bloom," this vivid pink, secondary arsenate mineral forms during the weathering of cobalt- and arsenic-bearing sulfides. It is conspicuous even in small quantities and is a key indicator of cobalt mineralization in mine tips and walls.

- **Skutterudite (CoAs□):** A tin-white to silver-grey, metallic arsenide mineral, often found in massive or granular form. It is a significant cobalt ore and is associated with arsenopyrite, native silver, and erythrite.

3.1.2 Occurrences in Cornwall and Wales

- **Cornwall:** Cobaltite, skutterudite, and erythrite have been confirmed in over thirty Cornish mines, including Fowey Consols, South Terras, Botallack, Levant, Geevor, and others. Cobalt is mainly associated with crosscourse structures—NNW–SSE to N–S trending faults that post-date the main lode mineralization. Production was historically small (a few hundred tons), but recent discoveries at Porthtowan indicate significant, previously unrecorded cobalt mineralization.
- **Wales:** Erythrite is found in the Dolgellau Gold-belt, Central Wales Orefield, and other localities, often as post-mining encrustations on cobaltite-bearing quartz. Cobaltite and erythrite are intimately associated in sheared mudstone and quartz veins.

3.1.3 Physical Description of Raw Cobalt

- **Elemental cobalt:** Hard, lustrous, silver-grey metal; density 8.9 g/cm³; melting point 1,495°C; magnetic and corrosion-resistant.
- **Cobaltite:** Metallic, silver-grey; brittle; Mohs hardness 5.5–6; specific gravity ~6.3.
- **Erythrite:** Vivid pink to deep reddish-pink; monoclinic crystals or drusy crusts; soft (Mohs 1.5–2.5).
- **Skutterudite:** Tin-white to silver-grey; metallic luster; Mohs hardness 5.5–6; specific gravity 6.5; black streak; cubic crystals or massive form.

3.2 Lithium: Mineralogy and Natural Occurrences

3.2.1 Mineral Forms

Lithium is found in two principal geological settings:

- **Hard Rock (Pegmatites):**
    - **Spodumene (LiAlSi□O□):** The most significant commercial lithium ore, found in lithium-rich granite pegmatites. Spodumene is a pyroxene mineral, typically pale green to white, with prismatic crystals up to several meters long. It is hard (Mohs 6.5–7) and has a density of 3.1–3.2 g/cm³.
    - **Lepidolite (K(Li,Al)□(Si,Al)□O□□(F,OH)□):** A lilac to pink mica, soft (Mohs 2.5–3), found in association with spodumene in pegmatites.

    - **Petalite, Amblygonite-Montebrasite, Elbaite, Eucryptite:** Other lithium minerals found in evolved pegmatites and aplites, such as the Meldon Aplite in Devon.

- **Brine Pools and Geothermal Waters:**
    - **Lithium-enriched geothermal brines:** In Cornwall, lithium is present in deep geothermal waters circulating through permeable granite structures. Direct lithium extraction (DLE) technologies are being piloted to recover lithium from these brines.

3.2.2 Occurrences in Cornwall and the UK

- **Cornwall:** The St Austell granite pluton and the Meldon Aplite in Devon are enriched in lithium, with minerals such as lepidolite, elbaite, petalite, and amblygonite-montebrasite identified. Cornish Lithium is developing both hard rock (Trelavour) and geothermal brine projects, with significant resource potential.
- **Wales and Midlands:** No major lithium deposits are currently known, but exploration is ongoing.

3.2.3 Physical Description of Raw Lithium

- **Elemental lithium:** Soft, silvery-white alkali metal; density 0.535 g/cm³; melting point 180.5°C; highly reactive and flammable; stored in mineral oil.
- **Spodumene:** Pale green to white, prismatic crystals; hard and dense.
- **Lepidolite:** Pink to lilac, micaceous, soft.
- **Lithium brine:** Clear, saline water with dissolved lithium salts; processed to produce lithium carbonate or hydroxide.

Table 3: Key Properties of Raw Cobalt and Lithium

Property	Cobalt	Lithium
Appearance	Hard, silver-grey metal	Soft, silvery-white metal
Density (g/cm³)	8.9	0.535
Melting Point (°C)	1,495	180.5
Mohs Hardness	5.5–6 (cobaltite, skutterudite)	0.6 (elemental), 6.5–7 (spodumene)
Main Minerals	Cobaltite, erythrite, skutterudite	Spodumene, lepidolite, petalite, brine

Property	Cobalt	Lithium
Main Occurrences	Cornwall, Wales (crosscourses, pegmatites)	Cornwall (St Austell, Meldon Aplite, geothermal brines)

4. Broader Scope: Other Potentially Viable Minerals

4.1 Rare Earth Elements (REEs)

- **Cornwall and Wales:** The Cornubian granites are enriched in REEs, particularly in monazite, xenotime, and allanite. In Wales, nodular monazite occurs in Ordovician and Silurian mudstones, with placer concentrations in alluvial sediments. While grades are generally low, some areas in south-central Wales have concentrations exceeding 1% monazite in sediment fractions, comparable to minimum exploitable grades elsewhere.
- **Economic Viability:** No commercial REE production currently exists in the UK, but demand for REEs (especially neodymium, dysprosium, praseodymium, terbium) is projected to increase 3–7 times by 2040 due to electric vehicles and wind turbines.

4.2 Tin and Tungsten

- **Tin:** Cornwall remains one of the world's richest tin provinces. The South Crofty project is expected to be a low-cost, long-life producer, with robust economics and strong government support.
- **Tungsten:** The Hemerdon (Drakelands) Mine is the fourth largest tungsten deposit globally, with significant tin by-product. The Redmoor project in Cornwall is also highlighted as a strategic resource in the UK Critical Minerals Strategy.

4.3 Graphite

- **Natural graphite:** Identified as a UK growth mineral, with demand projected to rise from 9,070 tonnes in 2024 to 449,100 tonnes by 2035, driven by battery and fuel cell technologies. While no major deposits are currently exploited in the UK, exploration is ongoing.

4.4 Copper, Zinc, Lead, Uranium

- **Copper:** Historically abundant in Cornwall and Wales, with renewed interest due to its role in electrification and renewable energy infrastructure.
- **Zinc and Lead:** Present in sulfide veins and crosscourses; zinc was often left unprocessed in Wales but may now be viable due to higher prices and improved processing.
- **Uranium:** Minor production historically, with potential for by-product recovery in polymetallic veins.

4.5 Other Critical and Growth Minerals

The UK's Critical Minerals Strategy lists 23 growth minerals, including aluminium, antimony, beryllium, chromium, gallium, germanium, hafnium, indium, iridium, magnesium, manganese, nickel, niobium, phosphorus, platinum group metals, rhenium, silicon, tantalum, titanium, vanadium, and others. Many of these are present as trace or accessory minerals in Cornubian granites and associated mineralization.

Table 4: Comparison of Mineral Types, Historical Production, and Modern Viability

Mineral	Historical Production	Modern Viability	Key Locations	Estimated Profit Margin*
Tin	High	High	Cornwall, Devon	High
Tungsten	Moderate	High	Devon (Hemerdon), Cornwall (Redmoor)	High
Lithium	None	Very High	Cornwall (St Austell, geothermal brines)	Very High
Cobalt	Minor	Moderate	Cornwall, Wales	Moderate
REEs	None	Potential	Cornwall, Wales	Moderate
Graphite	None	Potential	Cornwall, Wales	Moderate
Copper	High	Moderate	Cornwall, Wales	Moderate
Zinc	Moderate	Moderate	Cornwall, Wales	Moderate
Lead	Moderate	Moderate	Cornwall, Wales	Moderate
Uranium	Low	Moderate	Cornwall	Moderate

*Profit margins are indicative and depend on market prices, extraction costs, and regulatory factors.

5. Economic Feasibility and Marginal Profit Analysis

5.1 Impact of Modern Techniques

Advances in mining and processing technologies have significantly improved the economic viability of extracting both traditional and critical minerals:

- **Ore Sorting and Pre-Concentration:** Technologies such as X-ray Transmission (XRT) ore sorting are being deployed at South Crofty to double processed tin grades and reduce costs.

- **Direct Lithium Extraction (DLE):** Enables recovery of lithium from geothermal brines with minimal environmental impact, as piloted by Cornish Lithium at Cross Lanes.
- **Hydrometallurgical Processing:** Modern plants can efficiently process complex ores, recover multiple metals, and minimize waste. For cobalt, hydrometallurgical methods (leaching, solvent extraction, precipitation, electrowinning) are now standard, allowing for high-purity battery-grade products.

5.2 Marginal Profit Gains

- **Tin:** South Crofty's PEA projects all-in sustaining costs under US$14,500/tonne, with tin prices at US$33,900/tonne, yielding EBITDA margins over 60% and a payback period of 3.3 years.
- **Lithium:** Despite a recent price crash (lithium carbonate fell from US$32,694/tonne in 2023 to US$9,147/tonne in 2025), the cost of production for Cornish Lithium's projects is expected to be competitive, especially as prices are forecast to recover to US$13,250–17,077/tonne by 2028. The incentive price for new projects is estimated at over US$20,000/tonne, suggesting strong margins for efficient producers.
- **Tungsten:** Hemerdon's costs are competitive, with tungsten prices having risen fivefold since 2003, supporting renewed investment.
- **Cobalt:** UK demand for cobalt is projected to rise from 6,089 tonnes in 2024 to 163,000 tonnes by 2035, driven by batteries and superalloys. Modern hydrometallurgical processing allows for efficient recovery from complex ores and recycling, improving margins.

Table 5: Estimated Profit Margins and Economic Feasibility (Indicative)

Mineral	Modern Demand	Extraction Cost (US$/tonne)	Market Price (US$/tonne)	Estimated Margin (%)
Tin	High	~14,500	~33,900	~57%
Lithium	Very High	~8,000–15,000 (varies)	~13,250–17,000 (2026–28)	~20–50%+
Tungsten	High	Competitive	High	High
Cobalt	High	Competitive	~30,000 (2024)	Moderate
REEs	High	High	High	Moderate

6. Environmental, Regulatory, and Infrastructure Considerations

6.1 Environmental Legacy and Remediation

Historic mining has left a significant environmental legacy, particularly in Cornwall and Wales:

- **Heavy Metal Pollution:** Abandoned mines continue to release harmful metals (lead, cadmium, copper, zinc, nickel, arsenic) into rivers and estuaries. In Cornwall alone, 249 km of rivers are polluted by zinc, 173 km by copper, and 206 km by cadmium. The UK government has set a legally binding target to halve the length of polluted rivers by 2038, with nature-based treatment schemes being implemented.
- **Mine Waste and Tailings:** Arsenic and other heavy metals were often deposited in waste tips, posing ongoing risks. Modern remediation includes soil stabilization, revegetation, decontamination, and enhanced water evaporation to manage contaminated water and tailings.
- **Acid Mine Drainage:** Treatment plants, such as at Wheal Jane, pump and treat billions of liters of mine water annually to prevent catastrophic pollution events.

6.2 Regulatory Framework

- **Planning Permission:** All mineral workings require planning permission from the relevant Minerals Planning Authority (MPA), with careful examination of environmental and community impacts. Permissions are subject to legally enforceable conditions, including restoration requirements.
- **Environmental Permits:** The Environment Agency controls emissions to air and water, and the management of mining waste. Permits are required for any activity that could pollute air, water, or land, and for flood risk activities.
- **Restoration and Afteruse:** All sites must be restored to an agreed afteruse, with restoration guarantees (bonds, insurance) often required. Restoration commitments are attached to the land, not the operating company.

6.3 Infrastructure and Logistics

- **Transport:** Cornwall and Devon have a legacy of mineral railways and quays, with modern projects benefiting from proximity to ports, rail, and road networks. The West Midlands Interchange exemplifies the integration of logistics and supply chain infrastructure for industrial development.
- **Power and Grid Capacity:** A major constraint in Cornwall is the lack of electricity grid capacity, which threatens to undermine the development of critical minerals supply chains. Upgrades are needed to accommodate renewable energy (wind, solar, geothermal) and support new mining operations.
- **Workforce and Skills:** Cornwall benefits from a mature mining ecosystem, with over 100 geo-resources businesses and world-class institutions like the

Camborne School of Mines. Workforce development is a key focus, with training centers planned at new mines.

7. Case Studies: Reopened and Repurposed Mines

7.1 South Crofty Tin Project (Cornwall)

- **Status:** Fully permitted, with a 14-year mine life and robust economics (NPV £180 million, 20% IRR).
- **Production:** ~4,700 tonnes/year tin; all-in sustaining costs under US$14,500/tonne.
- **Innovation:** Use of XRT ore sorting, water treatment plant, and on-site training center.
- **Impact:** Over 300 direct jobs, 1,000 indirect jobs, and significant local economic activity.

7.2 Hemerdon (Drakelands) Tungsten-Tin Mine (Devon)

- **Status:** One of the world's largest tungsten deposits; now operated by Tungsten West plc.
- **Production:** Resource of 218 million tonnes at 0.18% WO□ and 0.02% Sn.
- **Processing:** Modern plant with gravity separation, dense media separation, flotation, and roasting.
- **Challenges:** Previous operator failed to meet extraction and financial targets; new management has revised processing and business model.

7.3 Cornish Lithium (Cornwall)

- **Status:** Developing both hard rock (Trelavour) and geothermal brine projects.
- **Production Target:** 10,000 tonnes/year lithium hydroxide (Trelavour); 25,000 tonnes/year lithium carbonate equivalent (brines) by 2030.
- **Innovation:** Direct lithium extraction (DLE) from geothermal waters; integration with renewable energy.
- **Investment:** Over £53 million raised, including £24 million from the UK Infrastructure Bank; designated as a Nationally Significant Infrastructure Project.

8. Market Demand and Price Outlook

8.1 Lithium

- **Demand:** UK demand for lithium is projected to rise from 2,525 tonnes (2024) to 339,200 tonnes (2035), driven by electric vehicles and battery storage.

- **Price Outlook:** After a sharp crash (US$32,694/tonne in 2023 to US$9,147/tonne in 2025), prices are forecast to recover to US$13,250–17,077/tonne by 2028. The incentive price for new projects is estimated at over US$20,000/tonne, supporting new domestic production.

8.2 Cobalt

- **Demand:** UK demand for cobalt is projected to rise from 6,089 tonnes (2024) to 163,000 tonnes (2035), with batteries and superalloys as key drivers.
- **Price Outlook:** Cobalt prices have fallen from US$70,000/tonne (2022) to US$30,000/tonne (2024), but are expected to stabilize as battery demand grows and recycling increases.

8.3 Tin, Tungsten, REEs

- **Tin:** Prices remain strong (US$33,900/tonne), supporting the reopening of South Crofty and other projects.
- **Tungsten:** Prices have risen fivefold since 2003, supporting renewed investment at Hemerdon and Redmoor.
- **REEs:** Demand is projected to increase 3–7 times by 2040, driven by electric vehicles and wind turbines.

9. Exploration Methods and Indicators

- **Geochemical Pathfinders:** For lithium, pathfinder elements include Rb, Cs, Sn, F, and B. K/Rb ratios are effective in distinguishing mineralized pegmatites from barren rocks. Portable XRF and machine learning models are increasingly used for rapid, non-invasive exploration.
- **Soil and Stream Sediment Surveys:** Used to identify REE and lithium anomalies in Wales and Cornwall.
- **Drilling and Geophysical Surveys:** Extensive drilling at Hemerdon and South Crofty has delineated resources and informed mine planning.

10. Potential for Co-Production and Circular Economy

- **Geothermal Energy:** Co-production of geothermal heat and lithium from deep brines is being piloted in Cornwall, offering a low-carbon, integrated approach to resource development.
- **Aggregate Sales:** Hemerdon is selling aggregate as a by-product of tungsten-tin mining, enhancing project economics.
- **Recycling:** Battery recycling is expected to supply up to 20% of cobalt demand by 2030, with similar trends for lithium and other critical minerals.

11. Economic Incentives, Funding, and Investment Landscape

- **Government Support:** The UK's Critical Minerals Strategy provides a clear framework for investment, with priority-tracked permitting, expanded public finance mechanisms, and a new £50 million funding package for critical minerals projects.
- **Private Investment:** Significant private capital is flowing into Cornish Lithium, Cornish Metals, Tungsten West, and other projects, often matched by government funding.
- **Regional Development:** Cornwall is recognized as a key cluster for critical minerals, with targeted investment in skills, infrastructure, and supply chain resilience.

12. Environmental, Regulatory, and Infrastructure Considerations: Synthesis

- **Environmental Remediation:** Legacy pollution from historic mining is being addressed through nature-based treatment schemes, enhanced water evaporation, and comprehensive remediation plans.
- **Regulatory Framework:** Stringent planning and environmental permitting systems ensure that new projects meet high standards for environmental protection, community engagement, and site restoration.
- **Infrastructure:** Upgrades to the electricity grid, transport networks, and workforce training are essential to unlocking the full potential of Cornwall and other mineral-rich regions.

Conclusion

The mineral-rich regions of Cornwall, western England, and Wales are poised for a major revival, driven by the UK's strategic need for critical minerals, advances in extraction and processing technologies, and robust government and private sector support. While environmental legacies and infrastructure constraints present challenges, the region's unique geology, skilled workforce, and mature mining ecosystem provide a strong foundation for sustainable, responsible resource development. The focus on lithium and cobalt is particularly timely, given their central role in the energy transition, but a broader suite of minerals—including tin, tungsten, REEs, and graphite—also offer significant opportunities. With careful management, continued investment, and a commitment to environmental stewardship, these regions can once again become engines of industrial growth and innovation for the UK and beyond.

Historic Mineral Outputs by Region

Region	Key Minerals Historically Produced	Notes on Past Economic Importance
Cornwall & Devon	Tin, Copper, Arsenic, Tungsten, Kaolin	Global tin hub in 18th–19th centuries; copper and arsenic significant exports
Wales	Coal, Iron Ore, Slate, Lead, Zinc	Coal drove industrial revolution; slate quarries world-renowned
Midlands	Coal, Ironstone, Limestone	Backbone of steel and heavy industry

Cobalt Ore Types vs. Extraction Feasibility

Ore Type	Appearance (Raw State)	UK Occurrence	Modern Extraction Potential
Cobaltite	Grey metallic mineral	Trace in copper/tin mines	Possible recovery via reprocessing tailings
Erythrite	Pink/reddish “cobalt bloom”	Rare, secondary mineral	Indicator mineral, limited direct yield
Skutterudite	Silvery-white metallic ore	Not widely reported in UK	Potential if found in polymetallic veins

Lithium Sources vs. UK Geological Likelihood

Source Type	Appearance (Raw State)	UK Occurrence	Modern Extraction Potential
Spodumene (hard-rock)	Light green/pink crystal	Possible in granite-rich Cornwall	Could be viable with modern processing
Brine deposits	Salty water pools	Unlikely in UK geology	Low feasibility compared to South America

Modern Minerals, Uses, and UK Potential

Mineral	Modern Tech Use	UK Occurrence	Profit Potential (Marginal Gains)
Tin	Electronics, alloys	Strong historic presence in Cornwall	Moderate — tailings reprocessing
Tungsten	Aerospace, hard metals	Cornwall veins	High — global demand rising

Mineral	Modern Tech Use	UK Occurrence	Profit Potential (Marginal Gains)
Rare Earths	Magnets, wind turbines	Trace in granites	Emerging — requires advanced separation
Graphite	Battery anodes	Limited natural deposits	Low — but synthetic/processing options

Profitability & Extraction Advances

Technique	Description	Impact on Marginal Gains
Bioleaching	Using microbes to extract metals	Lower cost, eco-friendly recovery
Hydrometallurgy	Chemical leaching of ores	Higher yields from low-grade ores
Automation	Robotics in mining	Reduced labour costs, improved safety
Tailings reprocessing	Mining waste re-extraction	Unlocks overlooked cobalt/tin/lithium

Mining in Cornwall, Wales, and the Midlands has historically underpinned the UK's industrial strength, producing tin, copper, coal, iron, and other minerals that fuelled global trade. While many of these mines closed during the 20th century, modern technology and shifting demand for critical minerals now present an opportunity to revisit these regions with a fresh lens.

Key Opportunity Areas:

- **Cobalt**: Found in association with copper and tin deposits, cobalt ores such as cobaltite and erythrite may be recoverable through reprocessing of historic mine tailings. Demand for cobalt in battery production and renewable energy systems continues to rise.
- **Lithium**: Cornwall's granite formations may host spodumene deposits, offering potential for hard-rock lithium extraction. While brine deposits are unlikely in UK geology, hard-rock sources could provide marginal gains if modern processing techniques are applied.
- **Other Minerals**: Tin, tungsten, rare earth elements, and graphite all align with current technology needs. Historic deposits in Cornwall and Wales may yield renewed value through advanced extraction methods.

Marginal Profit Gains:

- Advances in **bioleaching, hydrometallurgy, and tailings reprocessing** allow recovery of metals from low-grade ores and historic waste, reducing costs and environmental impact.
- Automation and improved infrastructure lower operational risks and enhance efficiency, making smaller-scale projects economically viable.
- Marginal gains are most likely in **cobalt and tin recovery**, with lithium and rare earths offering medium- to long-term potential.

Strategic Outlook:

- Reviving UK mining for modern minerals offers diversification away from global supply risks, particularly in cobalt and lithium markets dominated by Africa and South America.
- Environmental and regulatory frameworks in the UK demand sustainable practices, but also provide credibility for investors seeking ethically sourced minerals.
- Infrastructure in Cornwall and Wales, including ports and transport links, supports export potential, while Midlands deposits remain strategically positioned for domestic industry.

Conclusion: The UK's historic mining regions present a credible opportunity for marginal profit gains through targeted recovery of cobalt, lithium, and other critical minerals. By leveraging modern extraction techniques and focusing on sustainability, investors can unlock overlooked value in previously closed mines while aligning with global technology demand.

Investor Outlook

The revival of mineral extraction in Cornwall, Wales, and the Midlands offers investors a unique opportunity to capture **marginal profit gains** in critical minerals while leveraging the UK's reputation for regulatory integrity and sustainable practices.

Risk/Reward Profile

- **Upside Potential**:
    - Rising global demand for cobalt, lithium, and rare earths driven by battery and renewable energy markets.
    - Competitive advantage in reprocessing historic mine tailings with lower upfront capital costs.
    - Strategic diversification away from supply chains concentrated in politically volatile regions.
- **Risks**:

    - Geological uncertainty regarding economically viable deposits.
    - High compliance costs under UK/EU environmental regulations.
    - Market volatility in cobalt and lithium pricing.

Partnership Opportunities

- Potential Collaboration with technology firms seeking ethically sourced minerals for batteries and electronics.
- Potential Joint ventures with local councils and infrastructure providers to align community benefits with investor returns.
- Potential government support through green energy and critical mineral initiatives.

Long-Term Viability

- **Cobalt**: Short- to medium-term gains through recovery from copper/tin tailings.
- **Lithium**: Medium- to long-term potential if spodumene deposits prove viable.
- **Other Minerals**: Tungsten and rare earths offer diversification and resilience against single-mineral dependency.
- Infrastructure in Cornwall and Wales supports export readiness, while Midlands deposits strengthen domestic supply chains.

Strategy for a phased approach:

1. **Immediate focus** on cobalt recovery from historic tailings for near-term marginal gains.
2. **Exploratory investment** in lithium and rare earths to position for future demand.
3. **Diversification** into tin and tungsten to balance risk and broaden revenue streams.

Final Conclusion

The historic mining regions of Cornwall, Wales, and the Midlands hold untapped potential for a modern revival. While these areas once fuelled the UK's industrial rise through tin, copper, coal, and iron, today's global demand for **critical minerals**—particularly cobalt, lithium, tungsten, and rare earths—creates a new opportunity to extract value from previously closed mines.

Modern extraction techniques such as **bioleaching, hydrometallurgy, and tailings reprocessing** make it possible to recover metals from low-grade ores and historic waste, turning overlooked deposits into profitable ventures. Cobalt recovery from

copper and tin tailings offers immediate marginal gains, while lithium exploration in Cornwall's granite formations positions the UK for medium- to long-term relevance in the battery supply chain. Diversification into tungsten and rare earths further strengthens resilience against market volatility.

For investors, the opportunity lies not in large-scale industrial mining, but in **targeted, sustainable projects** that balance profitability with environmental responsibility. The UK's regulatory framework ensures credibility and ethical sourcing, while existing infrastructure supports both domestic supply and export potential.

Final Considerations: By pursuing a phased strategy—starting with cobalt recovery, advancing into lithium exploration, and diversifying into other critical minerals—stakeholders can unlock overlooked value, achieve marginal profit gains, and position themselves at the forefront of Europe's sustainable mineral supply chain. This approach combines heritage, innovation, and market demand.