Mastering EV Battery Chemistry 101: Two Important Investing Guides

With the United States having the CHIPS Act, and China, Russia, Saudi Arabia, Australia, several African countries, and Canada holding the majority of natural resources, it becomes clear that the green transition is not a simple snap-your-fingers affair. The vision of everyone driving electric vehicles with a “Tesla Solar Roof” on their homes is not an overnight reality. Nevertheless, the widespread adoption of Zero Emission Vehicles (ZEV) will undoubtedly lead to a high demand for critical materials, including Cobalt, Copper, Graphite, Iridium, Lithium, Manganese, Nickel, Platinum, and other selected rare earth

elements.

You might be wondering, in terms of battery cathodes, the most commonly used chemistries are Nickel Cobalt Aluminum Oxides (NCA), Nickel Manganese Cobalt Oxides (NMC), and Lithium Iron Phosphate (LFP). NMC and LFP-based batteries are expected to dominate in this decade. As technology advances, emerging technologies such as sodium-ion batteries could potentially disrupt the EV battery market by providing a more cost-effective and abundant alternative, potentially replacing critical materials like Cobalt and Lithium.

Here's the thing: before rushing to invest in these critical materials for the green transition, it is imperative and crucial to understand electric vehicle (EV) battery chemistry. The most common chemistry mixes in EV batteries include the following:

1. Lithium Iron Phosphate (LFP)
2. Lithium Manganese Oxide (LMO)
3. Nickel Cobalt Aluminum Oxide (NCA92)
4. Nickel Cobalt Aluminum Oxide (NCA 90)
5. Nickel Manganese Cobalt oxides (NMC)
6. NMC 811
7. NMC 622
8. NMC 532
9. NMC 111

Lithium Iron Phosphate (LFP):

Introduced in 1996 to address the low-cycle life of LMO and LCO-based batteries, LFP cathodes are primarily used in lower-priced, entry-level EV models due to their lower manufacturing cost.

Advantages:

- High cycle-life of 4,000 cycles
- C-rate of 2/5 or higher

- High thermal stability
- Can withstand mechanical disturbances.
- Lower thermal runaway risk

Disadvantages:

- Lower efficiency at extreme temperatures
- Lower energy density (up to 160Wh/kg)
- Limited driving range

Lithium Manganese Oxide (LMO):

Launched in the mid-90s as an alternative to LCOs, LMO cathodes offer lower internal resistance, great thermal stability, and higher current levels.

Advantages:

- Lower internal resistance
- Excellent thermal stability with reduced overheating risk
- Higher current levels
- Higher C-rate

Disadvantages:

- Low cycle life (1,000-2,000 cycles)
- Not ideal for longer applications

Nickel Manganese Cobalt Oxides (NMC 811, NMC 622, NMC 532, NMC 111):

NMC is the most common cathode material in today's EV batteries, offering higher energy densities than its predecessors. NMC cathodes consist of Nickel, Manganese, and Cobalt in different compositions.

NMC 811: 80% Nickel, 10% Manganese, 10% Cobalt

NMC 622: 60% Nickel, 20% Manganese, 20% Cobalt

NMC 532: 50% Nickel, 30% Manganese, 20% Cobalt

NMC 111: 33% Nickel, 33% Manganese, 33% Cobalt

Advantages:

- Higher energy density,
- Thermal stability
- Nominal voltage of 3.7V
- Decent cycle life of 2,000 cycles
- Good charging performance (C-rate of 1/3)

Disadvantages:

- Shorter life cycle
- The use of expensive materials

Nickel Cobalt Aluminum Oxides (NCA 92, NCA 90):

NCA offers higher energy density than other composites, such as NMC. It comes in two compositions: NCA 92 and NCA 90.

NCA 92: Lithium, Nickel, Cobalt, Aluminum

NCA 90: Lithium, Nickel, Cobalt, Aluminum

Advantages:

- High energy density

- Good charging performance
- No use of unsustainable manganese

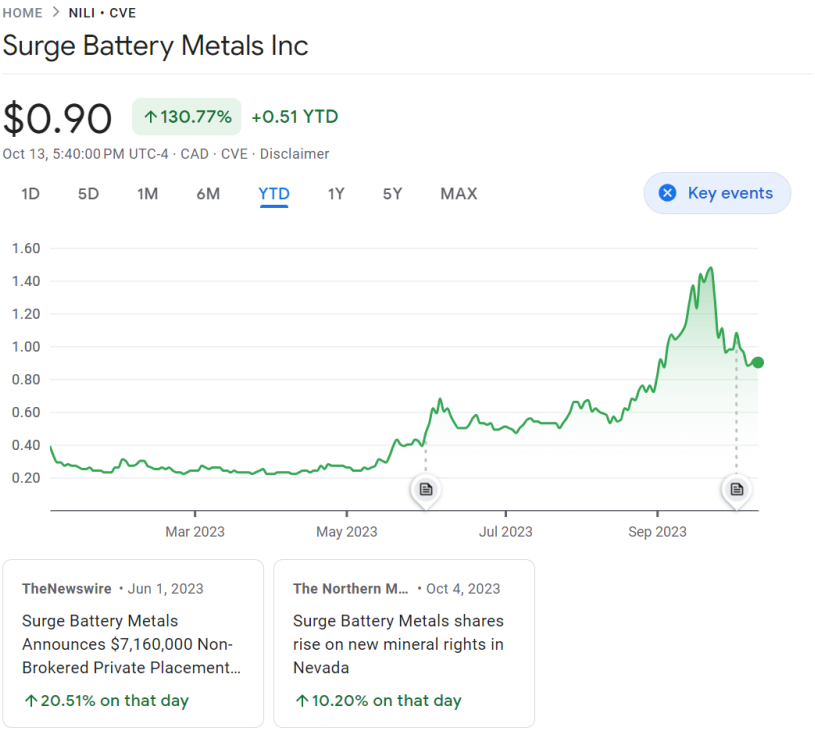
Disadvantages:

- Low cycle life (about 1,000 cycles)
- High thermal runaway risk
- Unsustainable (expensive materials)

While Lithium-ion batteries currently dominate the EV industry, advancements in critical components have a significant influence on material demand. For instance, graphite-based anodes hold a 70% market share due to their established performance reputation. In this ever-evolving EV landscape, with the growing demand for critical elements, it's essential for investors to be fully aware of the market demand for these materials and the future market characteristics before investing in any green transition minerals.

MY CURRENT GUIDING PRINCIPLES…YES, MY TWO IMPORTANT INVESTING GUIDES:**

Personally, I look out for Nickel, Copper, and Lithium projects that are possibly owned and controlled on private land (Rule #1). For instance, consider Surge Battery Metals ($NILI) as an example.

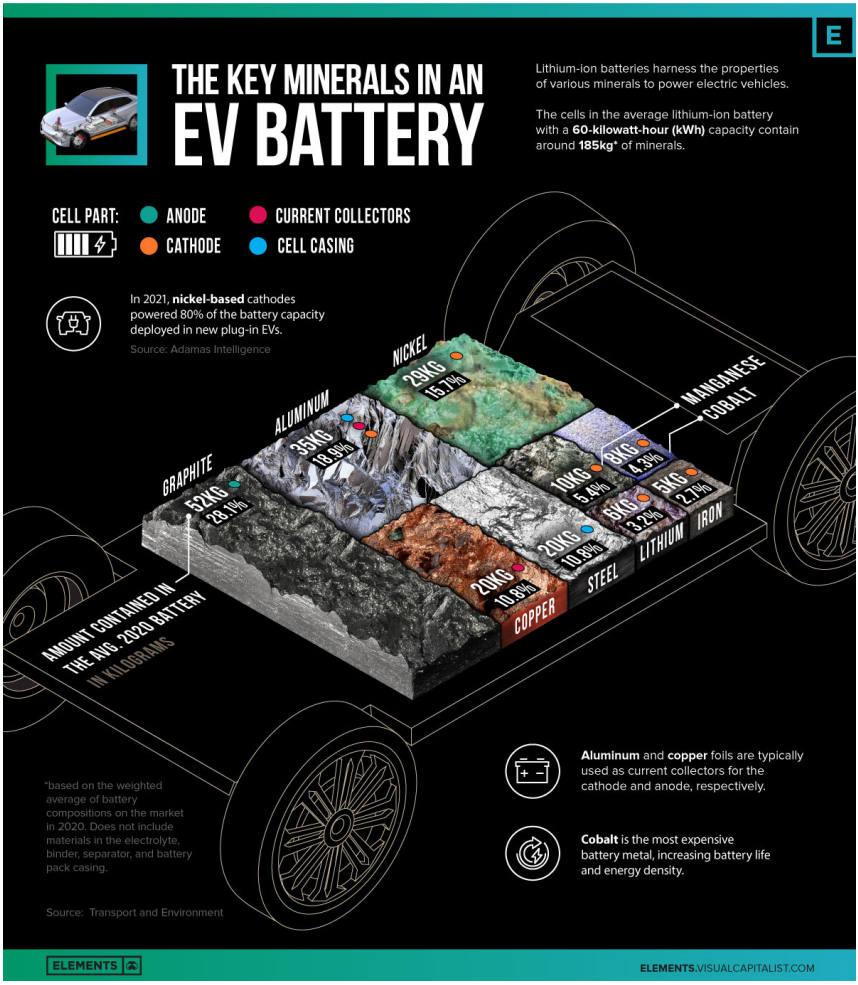


Source: Google Stock Chart, Surge Battery Metals Inc

As soon as my proprietary notification

gave me the signal on June 6, 2023, along with other fundamental factors, I quickly conducted some research on "***SedarPlus,***" and I was all in on Surge Battery Metals, riding it from 0.54c to $1.32 for a 144.4% gain. I'm still considering trading back in for the tax-loss selling season. Without seeing that land is privately owned, I tend to be more cautious with my investments.

Secondly (Rule #2), keep an eye out for new EV battery chemistries, as there's always something new, and auto manufacturers are continually seeking the most cost-effective and range-maximizing options for EV batteries. As soon as I post this mini thought, it might already become obsolete.



[Source: Visual Capitalist]

Unlocking NetZero Success: Prime Minister Rishi Sunak’s Hidden Sentiment Indicator (Revealed)

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Carbon Border

Adjustment Mechanism (CBAM) kicks into gear today, October 1, 2023

Key takeaways:

- **CBAM is part of the "Fit for 55" Green New Deal, aiming to transform a $500 billion industry and help Europe reduce greenhouse gas emissions by 55% by 2030 and ultimately achieve a 100% reduction by 2050.**
- **There's concern that CBAM transition costs may lead to higher consumer prices in the**

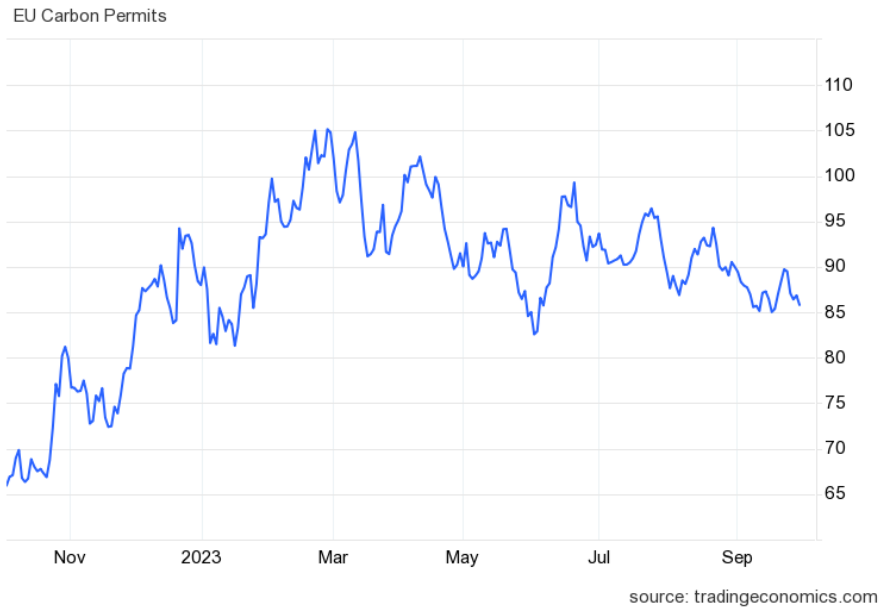
European Union, affecting economic sentiment and employment expectations.

- **Non-EU manufacturing entities should explore carbon offset options**

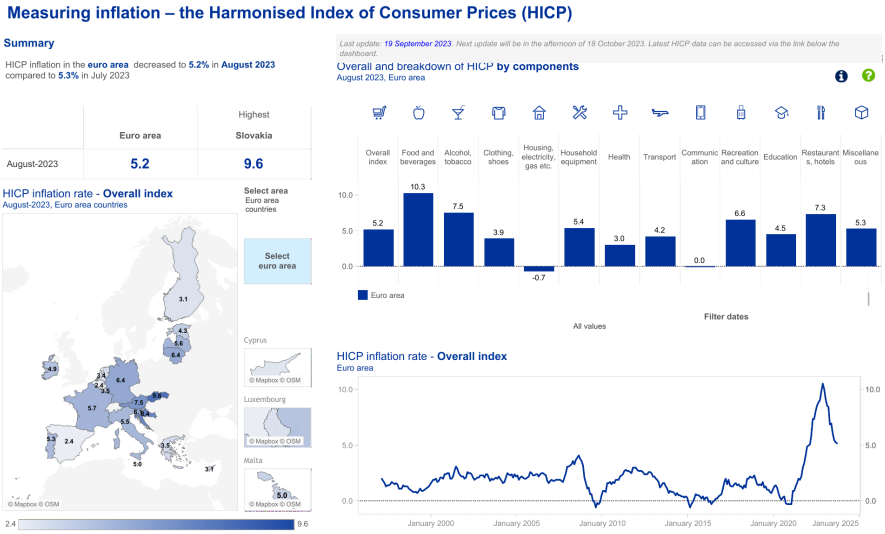
An estimated $500 billion industry faces a significant transformation today with the European Commission's proposed Carbon Border Adjustment Mechanism (CBAM). This initiative, designed as part of the "Fit for 55" Green New Deal, aims to help Europe achieve its 55% reduction in greenhouse gas emissions (GHG) by 2030 and ultimately achieve a 100% reduction in emissions by 2050.

All eyes are still on the EU Emissions Trading System (EU ETS). Countries without mandatory carbon pricing mechanisms risk fines for inadequate accounting of their carbon footprint associated with imported goods into the

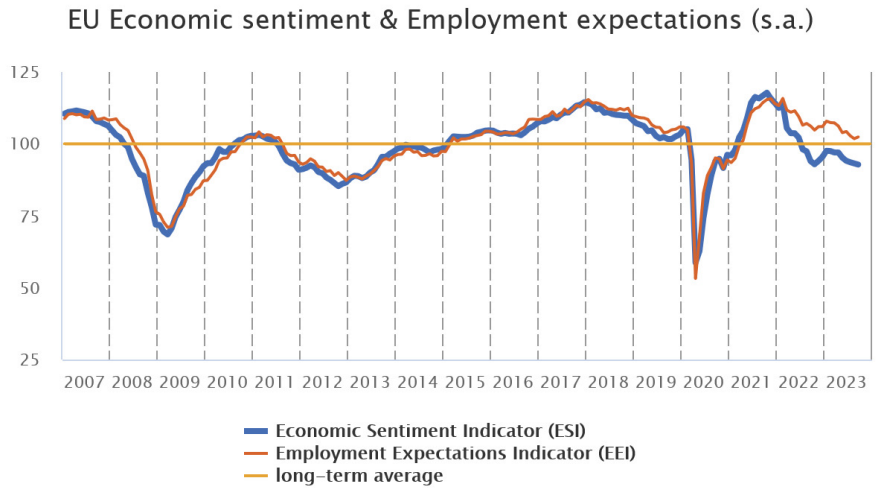
European Union, and also leads to taxation through allowances.



The question that lingers is whether companies will pass on the implementation transition costs of CBAM to European Union entities. This could potentially lead to a surge in the Harmonized Index of Consumer Prices (HICP), also known as the Consumer Price Index, reminiscent of its previous peak in October 2022 at 10.6% annually.



The European Union’s economic sentiment and employment expectations as of September 2023 are already showing a decline of -0.4 points to 92.8. Is CBAM a harbinger of higher and longer-lasting global interest rates? This is a question that remains unanswered by this policy.



source: European Commission services
To zoom in, please select a period by clicking in the graph and moving the cursor.

SO, WHAT HAPPENS DURING TODAY'S CARBON BORDER ADJUSTMENT MECHANISM (CBAM) TRANSITIONAL PERIOD?

Entities outside the European Union that import items such as cement, aluminum, fertilizer, electricity, hydrogen, iron & steel, and other downstream goods will be required to meet specific reporting obligations for CBAM. These obligations

will include:

1. Reporting the total quantity of imported items into the European Union, the carbon footprint of these items, and the financial liabilities associated with their carbon footprint.
2. The initial reporting deadline is January 31, 2024, for items imported from October to December 2023, with the final reporting obligation due on January 31, 2026, for items imported from October to December 2025.
3. Failure to adhere to the proper carbon footprint calculation rules for imported items may result in substantial fines.
4. A secure database will store all private data of the reporting entities, accessible only to designated individuals involved in the reporting process.
5. Further details and rules can be

found in the Official Journal of the European Union under *COMMISSION IMPLEMENTING REGULATION (EU) 2023/1773* AND *GUIDANCE DOCUMENT ON CBAM IMPLEMENTATION FOR IMPORTERS OF GOODS INTO THE EU* AND *GUIDANCE DOCUMENT ON CBAM IMPLEMENTATION FOR INSTALLATION OPERATORS OUTSIDE THE EU*.

In summary, these four points represent the major aspects of the transitional period concerning emissions reporting.

Non-EU manufacturing entities should immediately focus on these simple steps if they intend to continue trading with the European Union:

1. Understand CBAM Requirements Early
2. Budget for Transition Costs
3. Start Carbon Footprint Assessment
4. Implement Carbon Accounting Systems
5. Gather Necessary Data
6. Secure Data Handling
7. Monitor EU Policy Changes

8. Advocate for Global Carbon Pricing
9. Explore Carbon Offset Options

WHAT COMES AFTER TODAY?

Starting from January 1, 2026, payment requirements for CBAM will be implemented in phases, leading to a gradual reduction in the free allowances granted to EU manufacturing entities, continuing until 2034. The scale-back of free allowances will follow this timeline:

- 2026: 2.5%
- 2027: 5%
- 2028: 10%
- 2029: 22.5%
- 2030: 48.5%
- 2031: 61%
- 2032: 73.5%
- 2033: 86%
- 2034: 100%

The Carbon Border Adjustment Mechanism

(CBAM) of the European Commission is a significant step in the direction of lowering greenhouse gas emissions and finally setting a price on carbon globally. However, because businesses may have to pass on the changeover expenses to consumers, prices may rise for electric vehicles, food, building materials and so on. While this legislation intends to restructure a $500 billion business in line with European climate goals, its financial effects are still unknown. Is this the beginning of another trade war to lead the global south and global north populous into dismay or is the green transition truly here to stay and meet the average target for the globe to achieve 100% reduction in emissions by 2050.

Karbon Offsets Launches Website for Carbon Offsets & Green Transition Insights

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Edmonton, Alberta, Canada., September 28, 2023 – Today, Karbon Offsets launches a knowledge hub for those seeking insights into emissions offsets and the green transition. As Global Bank-Aligned Triple Helix partners and countries race to address the extensive impacts of natural catastrophes and environmental changes, the demand for timely information and

data liquidity has never been more crucial for institutional and retail players. Karbon Offsets, operating under the name “Karbon Offsets,” has become a trusted source, dedicated to bridging markets with daily insights on voluntary emission offsets, green transition policies, ESG risks, carbonomics, and technology-neutral solutions focused on reducing GHG emissions.

Your Gateway to Green Solutions

Karbon Offsets takes immense pride in being the first and only website connecting all stakeholders of the green transition. We offer a one-stop shop for news, events, real-time stock, and exchange-traded fund (ETF) prices of carbon offsets and sustainability stocks, a curated podcast page to keep you informed about the evolving green economy, free educational courses with certificates, a list of experts in the emissions offsets and green transition

space, syndication opportunities, and much more to come. Join its newsletter waitlist for soon-to-come proprietary weekly insights on developments in the carbon offsets and green transition space set to offer exclusive research and analysis content.

Join Us in the Journey Toward a Greener Tomorrow

As Karbon Offsets embarks on this transformative journey, connect with Karbon Offsets on X (formerly Twitter) or LinkedIn using the name "Karbon Offsets" and share your ideas to help better the website or reach out via the "Contact Us" page on the website, www.karbonoffsets.com, to be part of the mission towards a green economy and world. Join us as the flow of capital moves towards green minerals for a just transition and the global movement for a sustainable future hits the airwaves.

About Karbon Offsets:

Karbon Offsets is a leading information provider, addressing the growing demand for insights into voluntary emissions offsets and the green transition. As Global Bank-Aligned Triple Helix partners emerge to create a more resilient world in the face of severe catastrophic events, we are dedicated to connecting markets and acting as a knowledge hub for all. Discover our one-stop shop for events, news, research and analysis, jobs, education, and more. Connect with us now at www.karbonoffsets.com.

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What They Don’t Tell You About These Two Beasts of Words…

The global population has reached a massive 8 billion this year. In addition to this milestone, the International Energy Agency (IEA) projects that renewable energy capacity additions could grow exponentially to a record-breaking 107 gigawatts (GW), surpassing 440 GW in 2023. On the contrary, fossil fuel subsidies to oil & gas and coal during the year 2022 amounted to $7 trillion or 7.1 percent of global GDP per the International Monetary Fund (IMF) ***report***.

We mustn’t overlook the mounting

pressures from climate activists worldwide relentlessly urging policymakers, such as MIGA and heads of states, to divest from fossil fuel subsidies and instead invest in clean energy or renewable sources.

With policy support and ever-increasing innovations in the sustainable energy sector, clean energy and renewable energy could soon replace fossil fuels due to their benefit of lower carbon emissions.

Clean Energy? Renewable Energy? Is there a Difference?

Although clean energy and renewable energy are often used interchangeably, the two terms do not mean the same thing. Renewable energy is produced from natural sources or readily replenished processes such as solar, wind, large hydro, biomass, geothermal, and renewable storage. On the other hand, clean energy comes from zero-emission sources such as

large hydro and nuclear. As such, not all renewable energy sources are clean energy sources. That said, even nuclear and hydro may not be considered 100% clean if their construction, operation processes, and waste management are not emissions-free and environmentally sustainable.

A ***2022 report*** released by the International Atomic Energy Agency (IAEA) revealed that about 390 million metric tonnes of spent nuclear fuel had been generated globally by the end of 2016. About two-thirds of the waste is in secure storage facilities, with the remaining one-third reprocessed.

Due to the radioactive nature of nuclear waste and the intricate facilities needed to handle them, fears have also been growing over ***radioactive nuclear waste piling up*** to unmanageable levels as data reveals 88,000 metric tonnes of nuclear waste from commercial reactors are stranded at US reactor sites.

Surprisingly, the quantity is expected to grow by about 2,000 metric tonnes annually.

With such a high rate of nuclear waste pileup, policymakers and relevant authorities must focus on innovative or technology-neutral solutions to ensure the entire process is clean—from mining raw materials to proper management of radioactive waste to keep nuclear energy as clean as possible.

According to the IEA World Energy Investment ***2023 report***, global investment in clean energy is projected to grow significantly to USD 1.7 trillion in 2023, outpacing spending on fossil fuels, which have long been linked to climate change. The increasing investment in clean energy technologies will help global economies build a sustainable future for all.

In conclusion, while the terms “clean

energy” and “renewable energy” are often used interchangeably, it is important to recognize the key differences between them. Renewable energy derives from naturally replenished sources, encompassing solar, wind, large hydro, biomass, geothermal, and renewable storage. On the other hand, clean energy comprises zero-emission sources, including large hydro and nuclear. Notably, not all renewable sources fall under the clean energy category, as their environmental impact depends on factors such as construction, operation processes, and waste management.

The issue of nuclear waste, as highlighted in a 2022 report by the International Atomic Energy Agency, underscores the importance of ensuring the cleanliness of energy production from nuclear sources. With concerns about the increasing accumulation of radioactive waste, it becomes imperative for policymakers and relevant authorities to

prioritize innovative and technology-neutral solutions across the entire nuclear energy lifecycle, from raw material mining to proper radioactive waste management.

The trajectory of global investment in clean energy, as indicated in the IEA World Energy Investment 2023 report, presents a promising outlook. The substantial growth in clean energy investments, projected to reach USD 1.7 trillion in 2023, surpassing fossil fuel spending, holds the potential to pave the way for sustainable and environmentally friendly energy solutions, thus contributing to a more sustainable future for all.