# **A Definitive Intellectual Property and Strategic Blueprint for the Leo Climate Intelligence Stack (LCIS)**

## **I. Strategic Overview: The Nexus of Mobility, Climate, and Financial Innovation**

### **A. Vision and Mission**

The foundational vision of Leo Electric is to catalyze the transformation of developing economies by enabling access to affordable, clean, and efficient transportation. This mission extends beyond mere commerce to a deeper purpose: fostering economic empowerment in underserved and remote regions by connecting people to essential services and creating high-quality, future-forward jobs in local manufacturing and technology [Leo Explainer]. This is a strategic objective inspired by Singapore's own developmental history, which used investment in tech manufacturing to uplift a generation [Leo Explainer].

In the context of the global climate crisis, this vision positions Leo Electric as a critical agent of change. By focusing on two- and three-wheeler electric vehicles (E2W/E3W) and their supporting infrastructure, the company targets a transportation segment that is both ubiquitous and a significant source of emissions in its key markets. This approach aligns directly with global calls for a fundamental transformation of economic frameworks to address climate challenges, as articulated by initiatives like the Climate Legacy Commitment and the Action for Climate Empowerment guide. These frameworks emphasize the crucial role of business leaders in integrating sustainability into the core of their strategies to drive innovative climate solutions and reshape corporate norms.1 The Intellectual Property (IP) strategy outlined in this document is therefore not just a legal exercise but a blueprint for building a legacy asset that can be used to empower communities and advance global climate action.

### **B. The LCIS as a Vertically Integrated Advantage**

Leo Electric's core defensible edge lies in its vertically integrated pipeline, a strategic model that contrasts with the fragmented approaches of many competitors. The company combines field-proven hardware, including E2Ws/E3Ws and proprietary 8- and 10-bay battery swapping stations, with its unique supply-chain and certification know-how and a sophisticated cross-border data stewardship platform. This fusion of physical assets, operational expertise, and a digital intelligence layer—the Leo Climate Intelligence Stack (LCIS)—creates a robust ecosystem that is difficult for a single-product competitor to replicate.

Unlike companies that may specialize solely in battery manufacturing (e.g., Zoolnasm, JRH) or focus exclusively on swapping infrastructure (e.g., Gogoro, Oyika, Sun Mobility) without the deeper data and financial layers, Leo Electric’s model captures value at every point of the pipeline.3 For instance, while Gogoro is a significant first-mover with a robust presence in the Philippines, its core business model centers on its hardware and network, with a focus on ESG-linked financing.5 Oyika and Sun Mobility likewise focus on an interoperable Battery-as-a-Service (BaaS) model to address range anxiety and upfront costs, making them direct competitors in the physical and service layers.4

Leo Electric's strategic differentiation emerges from its capacity to translate its operational know-how and real-time telemetry into verifiable, monetizable climate outcomes. This capability, formalized through the LCIS, transforms the entire enterprise from a hardware or service provider into a climate technology and data company. This vertical integration allows Leo Electric to build a competitive moat around its data and analytical methods, which can be protected through a combination of patents and trade secrets, thereby securing its position as a holistic provider of sustainable solutions.

## **II. Technical and Data Foundation of the LCIS**

### **A. Reference System Architecture Analysis**

The LCIS is founded on a meticulously designed system architecture that ensures the integrity and security of data from the point of origin to the cloud. The system is comprised of several interconnected components, beginning at the vehicle level and culminating in a centralized cloud data plane.

At the most granular level, the Vehicle/Battery/BMS (Battery Management System) is the source of raw, real-time data, transmitting information such as pack voltage, current, state of charge (SOC), and cell temperature. This data is sent via standard protocols like CAN and RS-485 to a Telematics Edge device. The critical first point of data aggregation and security occurs here and at the Local Gateway of the Swap/Charge Station. Pseudocode provided in the initial brief demonstrates that each event is collected and then signed with a private key (EDGE\_PRIVATE\_KEY), creating a cryptographically attested record at the source. This process is foundational to the platform’s integrity, as it provides an immutable, verifiable data trail that is resistant to fraud and manipulation.

The data is then transmitted to the LCIS Cloud Data Plane via secure protocols like MQTT and HTTPS with TLS. This central hub is partitioned into four primary functions: Ingest, Store (Data Lake), Model (MRV/ML), and Serve (APIs). It is in the "Model" and "Serve" layers where the core intellectual property is executed. The LCIS processes the attested data to generate verifiable credit ledgers, run predictive models, and provide an API for external access. By adhering to industry standards like OCPP/OCPI for communication with charge stations, Leo ensures compatibility with the broader EV ecosystem while building its proprietary, value-added layers on top. This strategic use of a standards-based foundation, combined with proprietary extensions, positions the company as an innovator rather than a proprietary silo.

### **B. The LCIS Data Model: A Blueprint for Verifiable Climate Action**

The LCIS data model is the legal and technical backbone of Leo Electric’s climate claims and trade secrets. It is designed to capture, process, and attest to every data point necessary for credible carbon accounting and asset valuation. Each data model serves a specific purpose, collectively creating a comprehensive and auditable record.

The telemetry data from the vehicle/BMS captures real-time operating conditions, including soc, soh, v\_pack, and temp\_cell\_max. These fields are vital for calculating the Battery-degradation adjustment to the carbon credit calculation, a key differentiator of Leo’s methodology. Similarly, the station event data model, with fields like kWh\_in, kWh\_out, and safety\_aerosol\_status, provides the necessary inputs for energy consumption and serves as a quality gate for data integrity. The integration of Microgrid/Utility data and Emission Factors (EF) further enables a granular, time-and-location-specific carbon calculation.

The entire system culminates in a detailed Credit MRV ledger lifecycle: observed → computed → attested → verified → issued → retired. This process is not merely a sequence of steps; it is a mechanism for building trust. The inclusion of cryptographic hash and signature at each stage provides an irrefutable audit trail, which is essential for ensuring the veracity of the climate credits in the voluntary carbon market. This cryptographic attestation at the source directly addresses the inherent weaknesses of traditional, manual MRV, which is often costly, time-intensive, and prone to data integrity issues.12 By embedding integrity controls directly into its hardware and software at the point of origin, Leo Electric creates a real-time, tamper-resistant system for carbon credit generation, a foundational and patentable innovation that provides a distinct competitive advantage. The LCIS thus transforms raw operational data into a credible, auditable, and monetizable climate asset.

**Table 1: Core Data Schemas and Their Strategic Purpose**

| Data Model Component | Key Fields | Strategic Purpose |
| --- | --- | --- |
| Telemetry (Vehicle/BMS) | soc, soh, v\_pack, temp\_cell, odo\_km | Foundation for per-trip CO2e calculation, degradation modeling, and route plausibility integrity checks. |
| Station/Swap Event | kWh\_in, kWh\_out, battery\_id, bay\_id | Primary data for energy consumption measurement and validation. Provides basis for energy arbitrage and kWh\_consumed in CO2e calculation. |
| Station Integrity Checks | firmware\_hash, safety\_aerosol\_status | Critical quality gates for data admissibility and anti-fraud attestation. Establishes a verifiable chain of custody for the battery asset. |
| Microgrid/Utility | pv\_gen\_kWh, grid\_import\_kWh, tariff\_block | Enables microgrid-coupled credit models, energy arbitrage optimization, and real-time load shifting based on tariff data. |
| Emission Factors (EF) | EF\_avg\_kgCO2e\_kWh, EF\_marg\_kgCO2e\_kWh | Provides the crucial CO2e multiplier for converting energy consumption into emissions. Location and time-specific data ensures accuracy. |
| Credit MRV Ledger | hash, signature, verifier\_id | The cryptographic backbone of the system, providing an immutable, auditable, and verifiable record for credit issuance and retirement. |
| Valuation Inputs | R\_credit(t), C\_energy(t), WACC, etc. | Translates operational and environmental data into financial metrics, enabling the blended asset valuation and securitization models. |

## **III. The Intellectual Property Portfolio: Deconstructing Novelty and Defensibility**

### **A. Patentability Analysis of Core Inventions (Claims A-H)**

The LCIS is supported by eight distinct inventions, each with unique potential for intellectual property protection. A careful analysis of each claim against the patentability criteria of novelty, inventive step, and industrial application reveals a strong and defensible portfolio.14

* **Claim A: Telemetry-attested micro-mobility MRV.** This is a method that combines attested swap/charge events with time/location-specific emission factors and a degradation-adjusted loss model. While components of this claim exist in prior art, the *combination* of all these elements, specifically tailored for the dynamic, small-vehicle swap ecosystem, presents a strong argument for novelty and inventive step. Patents like US20230419234A1 discuss degradation-aware fleet management, and US20250166067A1 and US20130179061A1 cover blockchain and smart grid management with IoT.16 However, none explicitly describe the holistic, real-time, and cryptographically attested methodology for generating verifiable credits for micro-mobility. This integrated approach, which moves trust from a distant auditor to a verified data stream, represents a significant and non-obvious advancement in the field of carbon finance.
* **Claim B: Degradation-aware charging orchestration.** This invention assigns batteries to specific charging sources (PV vs. grid) based on their State of Health (SOH) and thermal metrics to maximize lifetime credits and throughput. This is a novel application that goes beyond general EV fleet management, which may focus on optimizing for delivery routes or grid stability.16 While US20230419234A1 mentions using a degraded battery for a specific purpose (e.g., a heavy load), Leo’s method is distinct in its focus on dynamic charging orchestration to extend battery life and maximize the financial yield from carbon credits.
* **Claim C: Swap-station integrity & quality-gate MRV.** This is a highly defensible and innovative claim. Using station safety states (e.g., safety\_aerosol\_status) and certification processes (e.g., TÜV) as digital quality gates for MRV data is an inventive approach to ensuring data credibility at the source. This is not obvious and directly addresses the high cost and time burden of manual, third-party verification, which is a major barrier for small-scale projects.12
* **Claim E: Blended asset valuation for EV portfolios.** This claim involves pricing EV assets by combining cash flows from operations, energy arbitrage, and carbon credits, yielding securitizable outputs. While valuation methodologies are generally not patentable as abstract business methods, a specific, technically-implemented algorithm that processes real-time, attested data to produce a new type of financial instrument for asset securitization may be considered a patentable process with a tangible technical effect.19
* **Claim F: Cross-border data stewarding for climate credits.** This invention focuses on privacy-preserving aggregation within a secure gateway that issues attested aggregates to registries and government programs. This claim's novelty lies in its specific application to cross-border data flows, a critical and legally complex issue for companies operating in multiple jurisdictions.

The remaining claims (D, G, H) also demonstrate novelty by addressing specific, unsolved problems within the micromobility and battery swapping sectors.

### **B. The Strategic IP Blueprint: Patenting for Protection, Trade Secrets for a Moat**

The decision to patent an invention versus maintaining it as a trade secret is a strategic trade-off between public disclosure and the scope and duration of protection. Leo Electric’s hybrid approach is designed to maximize its competitive advantage. Patents provide a 20-year monopoly on a publicly disclosed invention 15, while trade secrets offer indefinite protection as long as the information remains confidential.

The foundational, public-facing inventions, specifically the core MRV and valuation methodologies (A, E), the station integrity controls (C), and the data stewardship framework (F), should be prioritized for patent filing. These are the core innovations that define the LCIS platform and will be used to attract partners, investors, and government grants. Securing a patent on these methods creates a legal barrier that prevents competitors from building a similar, integrity-focused system. This provides a clear, defensible position in a rapidly evolving market.

Conversely, certain proprietary "recipes" and calibration data that are difficult to reverse-engineer and provide a marginal but crucial performance edge should be kept as trade secrets. This includes calibration tables for charger/battery losses by SKU and climate, internal swap queue heuristics, and supplier quality playbooks. These are the operational details that allow Leo to execute its strategy with superior efficiency and reliability. The value of this information is its secrecy; disclosing it would invite replication. By protecting this know-how through non-disclosure agreements (NDAs) and invention assignments with partners and factories, Leo can maintain a durable operational moat. This two-pronged strategy leverages the strengths of both patent and trade secret law to secure a long-term competitive advantage.

### **C. A Jurisdictional Filing Roadmap**

The strategic plan for IP protection must be executed on a global scale, prioritizing key go-to-market territories. A Patent Cooperation Treaty (PCT) filing strategy provides a flexible and cost-effective way to secure an early priority date and delay expensive national phase entries.

The immediate first step is to file 3-4 provisional patent applications in Singapore (SG), the company’s home jurisdiction, to secure an early filing date for the core inventions (MRV, valuation, station integrity, and data stewardship).14 Under Singapore law, a provisional application provides a priority date, and the complete application, including final claims, must be furnished within 12 months.14

Following this, a PCT application should be filed within 12 months, which extends the national phase entry deadline to 30 months from the priority date, providing time to assess commercial viability in each market before committing to costly national filings.21

The national phase entry strategy should be tailored to each target market:

* **Philippines (PH):** A crucial pilot market with a competitive landscape and a strong academic partner.5 The PCT application will need to be entered into the national phase within 30 months from the priority date, requiring a local agent and translated documents.22
* **Nigeria (NG):** A market with significant government engagement and a clear need for off-grid solutions.25 Nigerian law provides a 20-year patent term but only conducts a formal, not substantive, examination of patents.27 This makes the strength of a granted patent less certain, but a strong PCT filing still serves as a valuable defensive and promotional tool.
* **Saudi Arabia (SA) & India (IN):** These markets are critical for future expansion. Filing in Saudi Arabia requires an Arabic translation and a local agent.29 India's process is rigorous, involving a substantive examination, and requires a request for examination within 31 months of the earliest filing date.31

This phased approach ensures that Leo Electric secures its IP globally, strategically aligning its legal expenditures with its commercial expansion plans.

**Table 2: IP Protection Strategy: Patent vs. Trade Secret Allocation**

| Invention (Claim) | Recommended Protection | Rationale |
| --- | --- | --- |
| A) Telemetry-attested micro-mobility MRV | Patent | Foundational technology for verifiable credits. Patenting provides public credibility and legal defense against competitors seeking to build a similar system. |
| B) Degradation-aware charging orchestration | Patent | Novel method of optimizing charging for SOH and credit yield. Secures a key operational and financial advantage. |
| C) Swap-station integrity & quality-gate MRV | Patent | Addresses a core market integrity problem (data veracity). This non-obvious method provides a strong basis for a patentable claim that builds trust with registries and auditors. |
| E) Blended asset valuation for EV portfolios | Patent | The specific, technically-implemented algorithm that creates a securitizable asset class. Patenting protects this financial innovation from replication. |
| F) Cross-border data stewarding for climate credits | Patent | Novel method for handling complex, cross-jurisdictional data flows. Essential for global operations and provides a legal framework for data governance. |
| G) Swap-aware OCPP/OCPI gateway for 2W/3W | Patent (or Defensive Pub) | A protocol extension that provides a clear technical advancement. Patenting is preferred, but a defensive publication could be used if standardization is prioritized. |
| H) Sodium-ion integration policy | Trade Secret | The specific, proprietary policies and algorithms for optimizing sodium-ion with Li-ion are performance-enhancing and difficult to reverse-engineer. Secrecy is key. |
| Calibration tables for losses & swap queue heuristics | Trade Secret | These are operational "recipes" that provide a competitive edge. They are highly specific, easy to keep internal, and provide a marginal but critical performance advantage. |

## **IV. Financial and Climate Integrity: From Data to Value**

### **A. The Carbon Accounting Model: Credibility and Alignment with Global Standards**

The credibility of Leo Electric's business model is intrinsically linked to the integrity of its carbon accounting. The company’s proposed methodology for calculating CO2e\_avoided is a robust approach that incorporates per-trip calculations, degradation adjustments, and rigorous anti-fraud controls. This framework, formalized as D-MRV, is designed to align with and improve upon the methodologies of leading global registries like Verra and Gold Standard, which are essential for the issuance and sale of carbon credits.13

A careful comparison reveals that Leo’s D-MRV is well-positioned to meet the strict requirements of these bodies. Verra’s new VMR0014 methodology covers electric and hybrid vehicles and is a minor revision of the previous AMS-III.C standard.35 Leo’s approach of using telemetry to measure energy consumption, coupled with location-specific emission factors, directly corresponds to the core principles of such methodologies. The degradation adjustment (

Δ = (kWh\_in − kWh\_to\_pack) \* EF\_grid) is a key innovation that goes beyond standard practice, adding a layer of accuracy and integrity by accounting for energy losses from battery health. This is a potential enhancement that could be proposed to these registries as a new methodology or an extension of an existing one. Similarly, Leo’s focus on microgrid-coupled credits, where swaps are aligned with moments of high grid emission factors or PV generation, aligns with the Gold Standard’s emphasis on avoiding double-counting and maximizing the climate impact of renewable energy projects.38

Furthermore, the anti-fraud and attestation controls—including edge signatures, redundant sensing, and route plausibility checks—are a direct response to a major industry-wide challenge of ensuring data accuracy and preventing gaming of the system.12 This technological solution to a traditional integrity problem strengthens the case for Leo’s credits, making them more attractive to a market that is increasingly focused on the quality and provenance of offsets.39

**Table 3: MRV Methodology Alignment and Differentiation Analysis**

| Feature/Metric | Leo Electric (LCIS) | Verra VMR0014 | Gold Standard for Global Goals (GS4GG) |
| --- | --- | --- | --- |
| **Core Principle** | Vertically integrated D-MRV; attestation at source. | Method for GHG emission reduction from displacement of fossil fuel vehicles. | Certifies projects achieving GHG reductions and at least 2 SDGs. |
| **Data Integrity** | Cryptographic signatures (hash, signature), redundant sensing, route plausibility checks, station quality gates. | Relies on third-party verification bodies (VVBs) and monitoring procedures to ensure accuracy. | Relies on independent Validation and Verification Bodies (VVBs) to audit projects and ensure methodological integrity. |
| **Degradation Adjustment** | Explicitly models and adjusts for energy loss due to battery degradation (Δ). | Not explicitly mentioned as a core component of the public-facing methodology. | Not explicitly mentioned in the micromobility methodology. |
| **Energy Source Granularity** | Time/location-specific EF; microgrid-coupled credits (records dispatch intent vs. actual EF). | Quantifies GHG reductions from EVs, but specific, time-varying grid EF and microgrid dynamics are typically left to project design. | Specific requirements on how to account for renewable energy charging to avoid double-counting. |
| **Commercial Opportunity** | Unlocks blended asset valuation, securitizable cash flows; lower MRV costs via mini-bundles. | Focuses on issuing Verified Carbon Units (VCUs) for sale in the market. | Issues GS credits, often with a premium due to high integrity and SDG co-benefits. |

### **B. Blended Asset Valuation: Creating a New Financial Instrument**

The LCIS is more than a technical platform for carbon accounting; it is a financial innovation that transforms operational data into a new, securitizable asset class. Leo Electric’s blended asset valuation model, represented by the net present value (NPV) equation, is the central mechanism for this transformation.

The model computes the total cash flow for an asset (e.g., a vehicle) over time by combining three distinct revenue streams: operational revenues from vehicle sales or leasing (R\_ops), revenues from battery swapping (R\_swap), and the newly generated revenues from carbon credits (R\_credit). This model is not a simple accounting exercise. It is a tool for mitigating risk and attracting institutional capital by creating multiple, verifiable revenue streams from a single asset.

This is particularly significant in emerging markets where financing for capital-intensive projects can be challenging due to unpredictable cash flows and market volatility. By adding the verifiable income from carbon credits and energy arbitrage, the LCIS turns a risky operational asset into a predictable financial instrument. The LCIS’s ability to generate "audit-grade sustainability data" 40 provides the necessary proof of concept for these cash flows, a feature that institutional investors and financiers require for confidence. The LCIS can therefore be positioned as a platform for "sustainability-linked lending," a new and powerful financial tool.41 The inclusion of a scenario engine that models credit price paths and SOH decay curves further demonstrates a sophisticated understanding of financial risk and enhances the LCIS's value proposition to potential investors.

### **C. Global Carbon Pricing Context: Compliance vs. Voluntary Markets**

The LCIS's carbon accounting and valuation capabilities are designed to be flexible, allowing Leo Electric to operate in both voluntary and, where applicable, compliance carbon markets. The price of carbon is a critical input to the valuation model, and understanding the global landscape is essential for projecting revenue streams.

The global voluntary carbon market saw significant growth, with a transaction value of over $10.8 billion in 2023, and forecasts predict it could grow 15-fold by 2030.46 In this market, the average price of a carbon credit fell to $4.8 per ton in 2024, a 20% decline from the previous year.47 However, high-integrity credits, particularly those from nature-based projects, command a significant premium, with some high-quality credits trading at prices over $30 per ton in the first half of 2025.49 This suggests that the LCIS's focus on high-integrity, digitally attested MRV (D-MRV) will be crucial for maximizing the value of the credits it generates.49

Compliance markets, on the other hand, are regulated by governments and often feature significantly higher carbon prices. These markets, like those in Singapore and China, provide a clear pricing signal that can be leveraged by a company like Leo Electric.

**Compliance Carbon Prices by Jurisdiction (2025)**

| Country/Region | Instrument Type | Latest Price (USD/tCO2e) | Date of Price Data | Key Notes |
| --- | --- | --- | --- | --- |
| Uruguay | Carbon Tax | $160 | May 2025 | One of the highest global carbon prices |
| Switzerland | Carbon Tax | $132.12 | 2024 | 28 |
| Liechtenstein | Carbon Tax | $132.12 | 2024 | 28 |
| Sweden | Carbon Tax | $127.26 | 2024 | 28 |
| Norway | Carbon Tax | $107.78 | 2024 | 28 |
| Finland | Carbon Tax | $100.02 | 2024 | 28 |
| California | ETS | $94.92 (Price Ceiling) | 2025 | Tier 1: $60.47, Tier 2: $77.70 |
| Netherlands | Carbon Tax | $71.51 | 2024 | 28 |
| Canada (Federal) | Carbon Tax / OBPS | $62.43 (2024 tax value) | 2024 | Consumer fuel charge zeroed out April 2025; industrial price remains |
| Portugal | Carbon Tax | $60.48 | 2024 | 28 |
| Ireland | Carbon Tax | $60.22 | 2024 | 28 |
| Luxembourg | Carbon Tax | $49.92 | 2024 | 28 |
| Germany | Carbon Tax | $48.39 | 2024 | 28 |
| Austria | Carbon Tax | $48.37 | 2024 | 28 |
| France | Carbon Tax | $47.96 | 2024 | 28 |
| UK ETS | ETS | £41.84 (approx. $53.00) | Jan 2025 | Price for civil penalties; 2024 average was £37 |
| Iceland | Carbon Tax | $36.51 | 2024 | 28 |
| Denmark | Carbon Tax | $28.10 | 2024 | 28 |
| Singapore | Carbon Tax | $19.55 | 2019 | Latest available data in snippet 28 |
| Slovenia | Carbon Tax | $18.60 | 2024 | 28 |
| Spain | Carbon Tax | $16.13 | 2024 | 28 |
| Latvia | Carbon Tax | $16.13 | 2024 | 28 |
| China National ETS | ETS | $13.33 | April 2025 | Average secondary market price; expanded to steel, cement, aluminum in 2025 |
| South Africa | Carbon Tax | $10.69 | 2018 | Latest available data in snippet 28 |
| South Korea K-ETS | ETS | $7.60 | 2024 | Average auction price |
| Estonia | Carbon Tax | $2.18 | 2024 | 28 |
| Ukraine | Carbon Tax | $0.77 | 2024 | 28 |
| Poland | Carbon Tax | $0.10 | 2024 | Also part of EU-ETS |

Note: Prices are converted to USD for consistency where original currency was provided. Dates reflect the latest available information within the provided research material for each specific price point. Some countries may have multiple carbon pricing instruments or different rates for various sectors.

### **D. From Carbon Credits to Community Empowerment: A Practical Example**

A central part of Leo Electric's mission is to empower communities, and the LCIS provides a tangible mechanism to achieve this by transforming the environmental benefits of EV adoption into a community-managed financial asset. This model moves beyond abstract climate metrics to create a direct, traceable, and impactful social return on investment.

Consider a pilot project in a rural community in the Philippines, where local farmers and drivers, previously using gasoline-powered tricycles, transition to Leo Electric's E3W vehicles. The LCIS's D-MRV system can calculate the precise carbon emissions avoided by each driver on a daily basis.

* **Baseline Emission Calculation:** A typical gasoline tricycle driver in the Philippines travels about 70 km per day and uses approximately 4 liters of fuel.50 Assuming a standard emission factor for gasoline, this equates to roughly 9.2 kg of CO2e per day.
* **EV Emission Calculation:** For the same distance, an e-tricycle consumes approximately 3.5 kWh of electricity.50 The LCIS system measures the energy consumed and applies a specific, time-of-day grid emission factor to determine the associated emissions.
* **Carbon Credit Generation:** The LCIS calculates the avoided emissions by subtracting the e-tricycle's emissions from the gasoline tricycle's baseline. This results in a net avoidance of approximately 2.65 metric tons of CO2e per driver annually. This figure, digitally attested by the LCIS, represents a single, verifiable carbon credit.

Leo Electric's model, which includes "mini-bundles" of credits per city or campus 2, aggregates the credits from all participating drivers in a community. For instance, a fleet of 100 drivers would generate 265 metric tons of avoided emissions per year. These aggregated credits can then be sold on the voluntary carbon market. While the value of carbon credits fluctuates, a conservative estimate of $5 per ton (in line with the average 2024 price) would generate an annual revenue of approximately $1,325 for the community fund. This revenue stream is direct, traceable, and generated by the community's collective sustainable action.

This pooled revenue can be reinvested into the community for a range of social benefits. For example, a community-managed fund could allocate a portion of these revenues to a school fund, providing scholarships or educational resources for the children of the participating drivers. The ability of carbon projects to provide co-benefits like access to education and improved quality of life is a key principle of programs like Verra's VCS.51 By using the LCIS, Leo Electric provides the verifiable data needed to attract the financing and partners—such as NGOs and philanthropic investors—who seek to invest in projects that deliver both a climate impact and tangible social returns.52

## **V. Competitive Landscape and Market-Specific Strategy**

### **A. Competitive Analysis: Leo Electric’s Unique Position**

The market for E2W/E3W battery swapping is global and competitive, with several key players already establishing a presence in Leo Electric’s target territories. A comparative analysis reveals that while competitors have strengths, Leo's LCIS provides a unique and powerful point of differentiation.

* **Gogoro:** As a market leader in Asia, Gogoro has successfully launched its battery-swapping ecosystem in Manila, Philippines, through a joint venture with a major local conglomerate.5 Gogoro’s strengths lie in its scale, established network, and a proven hardware and software ecosystem. Leo Electric’s differentiation lies in its more sophisticated D-MRV and financial valuation framework. While Gogoro’s system certainly enables carbon reductions, Leo's platform is explicitly designed to translate those reductions into a verifiable financial asset, which may be a more compelling value proposition for institutional partners and financiers.
* **Oyika:** Another Singapore-based company, Oyika has a strong presence in Southeast Asia, with a business model centered on being "bike-agnostic" and offering a BaaS subscription model to overcome upfront costs and range anxiety.4 Oyika's strength is its interoperability and local-market insights. The LCIS can complement this by providing the data layer that goes beyond simple energy and location tracking, offering deeper financial and climate intelligence that can optimize operations and unlock new revenue streams from carbon credits and energy arbitrage.
* **Sun Mobility:** Dominant in India, Sun Mobility’s model is built on an interoperable, "pay-as-you-go" system with a focus on high-throughput swapping stations and an open-architecture approach for multiple vehicle platforms.3 Sun Mobility’s emphasis on scale and efficiency is a direct competitive challenge. Leo’s LCIS differentiates itself by providing a higher-level of value proposition—not just efficient refuelling, but the intellectual core for monetizing sustainability itself.

This analysis underscores that Leo Electric is not merely a competitor in the hardware or service layer. The LCIS is the platform that adds the intellectual and financial layers to the business, allowing Leo to partner with, or compete against, these players by offering a superior, holistic solution.

### **B. Tailored Market Engagement in Key Territories**

The LCIS enables Leo Electric to tailor its value proposition to the specific pain points of each market.

* **Philippines:** Leo’s partnership with De La Salle University (DLSU) and its focus on microgrids directly addresses the "lack of reliable electricity" in rural communities [Leo Explainer]. While Gogoro is focused on urban areas like Manila, Leo can leverage its LCIS to prove the climate impact and financial viability of its rural microgrid projects. The microgrid-coupled credits (Section 4) and degradation-aware policies are not just technical features; they are a direct response to a local market need and a key differentiator from the competition.
* **Nigeria:** The existing MoU with Bluennovate Consult provides a strategic entry point into a market with a strong government vision but a need for execution capacity [Leo Explainer]. The LCIS can be positioned as the "knowledge transfer and tech roadmap from Singapore," providing the data-driven systems and IP framework needed to build a sustainable, scalable EV ecosystem from the ground up [Leo Explainer]. The focus here is on a government-to-government (G2G) partnership model, a key use case for the LCIS.
* **Saudi Arabia:** The exploratory discussions with Jeeny for a potential acquisition of a majority stake present a long-term, high-stakes opportunity [Leo Explainer]. Jeeny is a profitable, pre-IPO company that is likely focused on demonstrating long-term value to investors.42 The LCIS’s blended asset valuation and prediction capabilities are the most compelling value propositions for this market. Leo can demonstrate how its platform can generate new, predictable, and securitizable cash flows from carbon credits and energy arbitrage, thereby enhancing Jeeny’s enterprise value and supporting a future public listing.

This tailored market approach, enabled by the modularity and intelligence of the LCIS, allows Leo to navigate diverse international markets with a capital-light and highly strategic footprint. The LCIS is the intellectual core that powers a portfolio of diverse, sustainable business ventures.

## **VI. Actionable Recommendations and Implementation Roadmap**

### **A. Phase 1 (0-90 Days): Securing the Foundation**

The immediate priority is to formalize and secure the intellectual property that forms the foundation of the LCIS. The initial steps are technical, legal, and operational, designed to build a solid foundation for future growth.

1. **IP Filing:** Finalize the patent claim scaffolds for the core inventions (MRV, valuation, station integrity, and data stewardship). File a minimum of 3-4 provisional patent applications in Singapore to secure an early priority date.
2. **Technical Deployment:** Finalize the data schemas and deploy the necessary firmware with cryptographic signature capabilities to the first pilot sites, such as the campus in the Philippines or city clusters in Nigeria.
3. **Data Infrastructure:** Stand up the cloud data plane with ingest, lake, and feature store capabilities to begin collecting and organizing the first stream of attested data.

### **B. Phase 2 (91-180 Days): Building Momentum and Credibility**

With the IP foundation secured, the next phase focuses on building credibility and commercial momentum.

1. **Third-Party Attestation:** Engage with accredited third-party auditors and carbon registries (e.g., Verra, Gold Standard) to initiate the validation and verification process for the LCIS methodology. This proactive step will build trust and prepare for the eventual issuance of credits.
2. **Model Validation:** Train the initial forecasting and SOH models using the data from the pilot sites and begin running "shadow credits" to test the system's accuracy and integrity in parallel with real-world operations.
3. **Financial Product Development:** Develop the valuation console for financiers and begin drafting lease term-sheets that are backed by the projected cash flows from carbon credits. This moves the business model from a concept to a tangible, bankable financial product.

### **C. The Long-Term Legacy: Beyond a Commercial Asset**

Beyond its commercial success, the LCIS can be positioned as a long-term legacy asset that extends Leo Electric's mission to empower sustainable change. The platform’s ability to generate granular, verifiable climate data from on-the-ground operations in developing economies is a powerful tool with applications far beyond corporate finance.

The LCIS can serve as a data hub that provides open, anonymized, and aggregated climate data to non-profits, academic institutions, and government agencies. This could be used to create a "Climate Data Collaborative" 43 that provides real-time insights into the progress of electrification and emission reduction in underserved communities. This data can inform policy, attract grant funding, and support climate advocacy efforts. This initiative would transform Leo Electric from a business into a "citizen science" platform 44 that empowers a broader community to participate in and benefit from climate action. By providing this data as a public good, Leo Electric can cement its brand as a force for positive change, creating a lasting legacy that endures beyond the lifespan of its patents and trade secrets. This dual focus on commercial success and public empowerment is the ultimate expression of the company's founding vision.

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