



BLOCKEDGE

BLOCKCHAIN INFRASTRUCTURE

WHITEPAPER V1.0

**TOKENIZATION OF RENEWABLE ENERGY CERTIFICATES
(RECs)**

**TO ENABLE TRACEABLE, IMMUTABLE, AND ACCESSIBLE
CORPORATE SUSTAINABILITY.**

ISSUER: Blockedge Co., Ltd.

UNDERLYING ASSET: Verified Renewable Energy Certificates
(1 Token = 1 MWh)

CERTIFICATION STANDARD: The International REC Standard (I-REC)

Tokenization Objective:

The objective of this tokenization initiative by Blockedge Co., Ltd. is to finance and digitize the procurement of Renewable Energy Certificates (RECs). The tokenization ensures that environmental claims are traceable, immutable, and permanently removed from circulation upon redemption, thus allowing businesses and individuals to confidently report on Scope 2 emission reductions and achieve corporate sustainability (ESG) goals.

Accredited Custodian: REDEX (via ReHash Platform)

Official Registry: Evident

Smart Contract Auditor: Valix Consulting Co.,Ltd.

WARNING TO INVESTORS: Investments in digital tokens involve high risks. Investors may lose their entire investment. Before investing, investors must carefully study the information in this prospectus and evaluate the risks associated with the investment. Furthermore, investors should be aware of the restrictions on the transferability of digital tokens.

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BLOCKCHAIN INFRASTRUCTURE

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DEFINITIONS AND GLOSSARY

- **Blockedge / Issuer:** Blockedge Co., Ltd., the technology provider and official issuer of the REC Token.
- **CO2e Chain:** The Layer 3 Optimistic Rollup blockchain network built on Ethereum, utilized for issuing and tracking REC Tokens.
- **Evident:** The official global registry and platform for managing and tracking I-RECs.
- **I-REC Standard:** The International REC Standard, a globally recognized framework for issuing and tracking Renewable Energy Certificates.
- **REDEX:** The accredited REC Custodian responsible for holding the underlying I-REC certificates in trust via the ReHash platform.
- **NetZero Carbon:** The asset aggregator and strategic partner responsible for sourcing and structuring renewable energy assets for tokenization.
- **Smart Contract:** An electronic protocol on the CO2e Chain that autonomously executes, controls, and documents the issuance, transfer, and burning of REC Tokens.
- **Token Burn:** The irreversible cryptographic process of sending REC Tokens to a null address, signifying the retirement of the underlying environmental claim.
- **Scope 2 Emissions:** Indirect greenhouse gas emissions associated with the purchase of electricity, steam, heat, or cooling.

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1.1 General Information of the Digital Token



Item	Details
Token Name (English)	REC Token
Token Name (Thai)	โทเคนดิจิทัลเพื่อพลังงานหมุนเวียน (REC)
Token Type	Utility Token (Ready-to-use)
Issuer	Blockedge Co., Ltd.
Certification Standard	The International REC Standard (I-REC)
Underlying Asset	1 Token exactly represents 1 Megawatt-hour (MWh) of
Blockchain Network	CO2e Chain (EVM-compatible Layer 3 Optimistic Rollup)
Smart Contract Address (CO2e Chain)	0xE930e25f64b93f9d696F2Fe67E9D6223a7B50174
Smart Contract Address (Optimism Chain)	0xF4fEfEe4730Cf174608766877911F8D33735f9D7
Smart Contract Address (KUB Chain)	0x777777Be0A429aEF3D2eC27d452FA3591b8bE2Fa
Accredited Custodian	REDEX (Holding via ReHash platform)
Registry Platform	Evident
Legal Counsel	Baker & McKenzie Ltd.
Smart Contract Auditor	Valix Consulting Co.,Ltd.

1.2 Nature and Format of the Offering

The global demand for carbon credits and renewable energy is growing exponentially as regulatory, investor, and consumer pressures mandate tangible climate action. However, traditional carbon and energy markets are plagued by systemic issues, including a "Traceability Gap" (risks of double-counting), "Operational Friction" (slow manual procurement), and "Credibility Risk" (greenwashing accusations).

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The REC Token solves these inefficiencies by acting as a blockchain-based digital twin to a verified I-REC. Through a robust multi-party operational structure involving NetZero Carbon (Asset Aggregation), REDEX (Custody), and Blockedge (Tokenization), the REC Token ensures environmental claims are traceable, immutable, and permanently removed from circulation upon redemption.

1.3 Summary of Operations



- 1. Verification & Issuance:** Verification & Issuance: Hydroelectric renewable energy projects submit generation data to Evident. Evident validates the data under the I-REC Standard methodology and issues I-RECs.
- 2. Custody & Aggregation:** NetZero Carbon identifies and procures these I-RECs. The procured I-RECs are transferred to REDEX, acting as the secure custodian, and locked within the ReHash platform.
- 3. Tokenization (Two-Tier Structure):** Upon verification of the locked assets in ReHash, Blockedge mints Project-Specific I-REC Tokens at a strict 1:1 ratio.
- 4. Central Pool & Listing:** Holders of Project-Specific tokens can deposit them into the Central Pool. Upon deposit, they are automatically converted into Pool I-REC Tokens, which represent a fungible basket of pooled I-RECs. It is these Pool I-REC Tokens that are listed and traded on the compliant Licensed Exchange.
- 5. Redemption & Burning:** Corporate token holders initiate a redemption request (minimum 100 tokens). The Pool I-REC Tokens are burned, converting back to Project-Specific tokens under a First-In-First-Out (FIFO) allocation, which are then either transferred to the user's REDEX account or officially retired on their behalf.

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2.1 The Issuer: Blockedge Co., Ltd.

Blockedge Co., Ltd. is a limited company registered under the laws of Thailand. It acts as the project whitelist authority and the technical issuer of the REC Token. Blockedge is responsible for developing, deploying, and maintaining the smart contracts on the CO2e Layer 3 network.

Management Team:

- **Mr. Dom Charoenyos (Founder & CEO):** A seasoned expert in decentralized systems, enterprise IT, and digital transformation. He provides strategic oversight and ensures market alignment across platform operations.
- **Ms. Getsara Tianchai (General Manager):** Oversees daily operations, compliance, and partnership management.

2.2 Strategic Partner: NetZero Carbon Co., Ltd. (Asset Aggregator)

Project Sourcing & Strict Whitelisting: NetZero Carbon is responsible for identifying and procuring renewable energy assets. To maintain the highest quality and compliance, all assets entering the tokenization pool must pass three strict whitelisting criteria:

1. **Geographic Boundary:** The renewable energy project must be located within the Southeast Asia (SEA) region.
2. **Asset Exclusivity (Hydro Only):** The asset must be exclusively certified under the International REC Standard (I-REC) and generated strictly from Hydroelectric power projects. No other energy types (e.g., solar, wind, biomass) are permitted in the pool.
3. **24-Month Validity Limit:** The I-RECs entering the pool are strictly valid for a maximum of 24 months from the date the I-REC Standard officially approves and certifies the project developer.

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Due Diligence: Conducting preliminary audits on energy generation data to ensure strict compliance with the aforementioned whitelisting criteria before procurement.

Procurement & Transfer: Legally securing the I-RECs and facilitating their transfer into the REDEX custody environment.

2.3 Custodian: REDEX and the ReHash Platform

To guarantee the absolute integrity of the REC Token, a legally binding custody structure is enforced, separating the token issuer from the underlying asset holder.

- **The Custodian:** All underlying digital I-REC certificates are securely held in trust by REDEX, an internationally accredited REC custodian.
- **The Holding Structure:** The certificates are locked within REDEX's proprietary "ReHash" platform.
- **Immutability Guarantee:** Blockedge cannot mint a REC Token without an officially verified proof-of-lock from REDEX, confirmed via formal email communication and cross-referenced on the official platform website. This strict manual verification structure explicitly prevents the underlying I-REC from being sold or claimed in the traditional OTC market while the REC Token is circulating on the blockchain.

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3.1 Concept of the International REC (I-REC) and Scope 2 Emissions

What is an I-REC? The International Renewable Energy Certificate (I-REC) is a globally recognized Energy Attribute Certificate (EAC). When a renewable energy facility (such as a hydroelectric plant) generates 1 Megawatt-hour (MWh) of electricity and feeds it into the shared power grid, it is impossible to physically track where those specific "green electrons" go. The I-REC Standard solves this by unbundling the physical electricity from its "environmental attributes." Therefore, 1 I-REC represents the verified, auditable proof that 1 MWh of renewable energy was generated and added to the grid on the buyer's behalf.

I-RECs vs. Carbon Credits: It is a common market misconception to confuse RECs with Carbon Credits.

- **Carbon Credits** represent 1 metric ton of CO₂ that was avoided or removed from the atmosphere (e.g., through forestry or direct air capture). They are primarily used to offset Scope 1 (direct) and Scope 3 (value chain) emissions.
- **I-RECs** specifically represent renewable electricity generation. They are the official instrument recognized by the GHG Protocol to neutralize Scope 2 emissions (the indirect emissions resulting from the electricity a company purchases and consumes). By retiring an I-REC, a corporate entity can legally and transparently claim that the electricity powering their operations came from a zero-emission renewable source.

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3.2 Market Trends and Surging Corporate Demand

The demand for I-RECs, particularly in Southeast Asia, has transitioned from a voluntary Corporate Social Responsibility (CSR) initiative into a mandatory business requirement driven by global supply chain pressures and verifiable data.

- **The RE100 Initiative:** RE100 is a global corporate initiative bringing together hundreds of the world's most influential businesses committed to 100% renewable electricity. These global corporations now strictly require their supply chain partners and manufacturers in Southeast Asia to also power their factories with 100% renewable energy. To comply and maintain their manufacturing contracts, Thai and SEA-based factories are purchasing I-RECs at unprecedented volumes.
- **Science Based Targets initiative (SBTi):** As more global companies pledge to reach Net Zero emissions by 2050 under SBTi guidelines, the procurement of Energy Attribute Certificates (like I-RECs) is explicitly mandated as the primary method to reduce Scope 2 market-based emissions.
- **Market Growth and Referenced Data:** According to the Evident Global Registry and historical tracking data from the I-REC Standard Foundation, the issuance and redemption of I-RECs have seen exponential year-over-year growth globally. In Asia specifically, the transition toward renewable energy procurement is accelerating due to the impending implementation of international carbon border taxes, such as the EU's Carbon Border Adjustment Mechanism (CBAM), which financially penalizes products manufactured using fossil-fuel-heavy electricity. This macroeconomic shift practically guarantees sustained and growing demand for verifiable I-RECs in the region.

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3.3 The I-REC Standard, Jurisdictional Validity, and Cross-Border Claims

The I-REC Standard: The International REC Standard (I-REC) is a globally recognized framework that provides a robust accounting tool to prove that 1 MWh of electricity was generated from an eligible renewable energy resource. Under the Science Based Targets initiative (SBTi) Mitigation Hierarchy, companies must abate their own Scope 1, 2, & 3 emissions by 90% or more. RECs are considered an "in-value chain instrument" essential for Scope 2 emission reduction under the Market-based Method.

Jurisdictional Validity: I-RECs are internationally recognized and are specifically designed for countries and regions that do not have a mandatory national tracking system. Within Southeast Asia (SEA), countries such as Thailand, Vietnam, Malaysia, and Indonesia are highly active I-REC issuers. A REC Token minted on this platform represents a valid, Evident-registered I-REC that is fully compliant with the regulatory and voluntary environmental frameworks of the country in which the renewable energy was generated.

Cross-Border Recognition and Usage: A common regulatory consideration is whether a corporate entity in one country (e.g., Thailand) can legally utilize I-RECs generated from another country within the SEA region for local ESG claims. Under the GHG Protocol Scope 2 Guidance, companies are permitted to use Energy Attribute Certificates (EACs) across borders provided they adhere to the "Market Boundary" criteria. Because the Association of Southeast Asian Nations (ASEAN) is increasingly integrated via the ASEAN Power Grid (APG) initiatives, Southeast Asia is widely recognized as a single, interconnected market boundary for corporate renewable energy procurement. Furthermore, international voluntary reporting frameworks, including RE100 and SBTi, allow for cross-border REC procurement when local supply is insufficient or restricted, provided the geographic origin is transparently disclosed. Therefore, companies can legally and compliantly retire SEA-origin I-RECs from the REC Token ecosystem to offset their Scope 2 emissions globally, ensuring full compliance with international ESG reporting standards.

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3.4 Pricing Mechanism under the New Issuer Structure

The REC Token is not a speculative financial derivative. Its value is intrinsically linked to the actual cost of procuring, verifying, holding, and tokenizing the underlying renewable energy certificate within a highly regulated ecosystem.

Under the current operational structure, the primary market issuance price of a REC Token is calculated based on the following components rather than a fixed historical percentage:

REC Token Price = Base Asset Value (OTC) + Tokenization Platform Fee

- **Base Asset Value (OTC):** The current Over-The-Counter (OTC) market price of 1 MWh of an I-REC certificate. While the Central Pool is exclusively restricted to Hydroelectric I-RECs, the base price still fluctuates based on regional supply and demand, the specific geographic location of the dam, and the Vintage Year.
- **Platform Fee:** A standardized fiat operational fee applied to cover the end-to-end costs of digitizing the asset. This fee encapsulates the technical issuance charged by Blockedge (smart contract deployment, minting on the CO2e Layer 3 network, and blockchain gas fees), as well as the necessary Custody Costs required to securely lock and maintain the physical certificates within REDEX's ReHash platform.

Pricing vs. Reserve Allocation Independence: It is explicitly noted that the 60% Platform Reserve (Market Stabilization Reserve) outlined in the token allocation (Section 4.1) does not factor into the Tokenization Platform Fee. The 60% reserve is purely a structural tokenomics mechanism required for exchange liquidity and price stabilization; it is not a premium or cost passed onto the end-buyer. Buyers only pay the Base OTC value plus the standard fiat operational fee for the circulating tokens they actively purchase.

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REC Token Pricing Structure



COST COMPONENT	DESCRIPTION	ESTIMATED RATIO / VALUE	PRICE IMPACT
Base Asset Value (OTC)	The real-world cost to procure 1 MWh of certified renewable energy (I-REC). Fluctuates based on project type (Solar, Wind, Hydro), geographic location, and Vintage Year.	Variable (Market Driven)	Base Price
REDEX Custody Fee	Costs associated with securing and locking the physical I-REC certificates within the ReHash accredited custodian platform.	Included in Platform Fee	+ 0.00 THB (Bundled)
Tokenization Platform Fee	Blockedge's fee for smart contract deployment, token minting, infrastructure maintenance, and platform operations.	Fixed Operational Fee	+ Platform Fee
Network Gas Fees (L3)	Blockchain transaction fees required for minting, transferring, or burning the tokens on the CO2e Layer 3 network.	-0.01 - 0.05 THB / Tx	Negligible

ISSUANCE
PRICING
FORMULA

Asset
1 MWh I-REC (OTC)

+

Platform
Standardized Platform
Fees

=

Final Price
1 REC Token

3.5 Legal Justification for Cross-Border I-REC Claims (Thai Companies)

A common regulatory consideration is how a Thai corporate entity can legally utilize I-RECs generated from other countries within Southeast Asia (SEA) for local ESG claims.

Under the GHG Protocol Scope 2 Guidance, companies are permitted to use Energy Attribute Certificates (EACs), such as I-RECs, for market-based reporting provided they adhere to the "Market Boundary" criteria. Because the Association of Southeast Asian Nations (ASEAN) is increasingly integrated via the ASEAN Power Grid (APG) initiatives, SEA is widely recognized as an interconnected market boundary for corporate renewable energy procurement.

Furthermore, international voluntary reporting frameworks, including the Science Based Targets initiative (SBTi) and RE100, allow for cross-border REC procurement when local supply is insufficient or restricted, provided the geographic origin is transparently disclosed. Therefore, Thai companies can legally and compliantly retire SEA-origin I-RECs from the REC Token Central Pool to offset their Scope 2 emissions, ensuring full compliance with global ESG reporting standards.

Crucial Distinction for Domestic Tariffs: While SEA-origin I-RECs are fully compliant with international voluntary standards, they may be subject to different rules under specific domestic policies. If Thai regulatory bodies mandate that only RECs generated strictly within Thailand can be utilized to qualify for local Utility Green Tariffs (UGT) or domestic tax benefits, corporate buyers must be aware that the Central Pool contains aggregated SEA-wide assets. Corporate buyers intending to claim specific localized tariff benefits must independently verify domestic eligibility prior to redemption.

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4.1 Tokenomics, Total Supply, and Allocation

The REC Token is an ERC-20 compatible utility token deployed on the CO2e Chain. The CO2e Chain is an EVM-compatible Layer 3 blockchain utilizing Optimistic Rollup technology, specifically designed for environmental asset tokenization. It provides enterprise-grade security inherited from Ethereum, sub-5 second transaction speeds, and highly cost-efficient gas fees (up to 90% lower than Layer 1), making it ideal for scalable, sustainable, and high-frequency token operations.

Total Supply Dynamics & Hard Cap: The REC Token has a strictly enforced Maximum Supply of 100,000,000 Tokens. However, there is no pre-mined reserve waiting to be dumped on the market. The circulating supply is strictly dynamic and minted on-demand. New tokens are only minted into circulation (up to the 100 million hard cap) when new I-RECs are physically locked in the REDEX ReHash platform, and the supply contracts when tokens are burned for retirement. This ensures a permanent, mathematically guaranteed 1:1 backing (1 Token = 1 MWh of locked renewable energy).

Token Issuance & Distribution Mechanism: The ecosystem operates on a strict "mint-on-demand" protocol. Tokens are only generated when verifiable Hydro I-RECs are locked in the REDEX platform at a 1:1 ratio. The issuance is distributed through two specific functional pathways:

- **40% - Direct Corporate Distribution:** This portion is minted and allocated directly to the corporate entities or end-users who funded the initial asset procurement. These tokens are utilized by the buyers to offset their ESG emissions or hold in their private wallets.
- **60% - Liquidity & Market Stabilization Reserve:** To ensure retail investors have continuous access to the market without facing extreme price volatility, this portion is allocated to a dedicated reserve. Blockedge deposits these tokens into the Central Pool and lists them on the Licensed Exchange (Bitkub) strictly for the purpose of providing public liquidity and market stabilization. This reserve is not utilized for general corporate expenses.

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Unalterable Traceability (Wallet vs. Pool): Regardless of whether a user chooses to keep their tokens in a personal digital wallet or deposit them into the Central Pool, the traceability of the underlying asset remains completely intact. Every token includes embedded, immutable metadata ensuring full protocol compliance. This allows anyone to transparently trace the underlying asset at all times, including the following required data points:

- **I-REC Certificate ID:** Unique ID from the I-REC registry
- **Standard:** I-REC Standard
- **Accredited Issuer:** (e.g., EGAT or the authorized issuer in the host country)
- **Project Developer:** Name and contact of the renewable energy provider
- **Location:** Country and GPS/region of generation
- **Project Type:** Hydroelectric
- **Technology Type & Capacity:** (e.g., Run-of-River Hydro, 50 MW)
- **Generation Period & Issuance Date:** Start/end dates of the MWh generation and official certificate issuance date
- **Vintage Year:** Year in which the renewable energy was produced (Strictly limited to a 24-month validity period from the date of project developer certification by I-REC).
- **Verification Status:** Confirmed issuance under I-REC rules
- **Tracking Platform URL:** Link to verify the I-REC in public or private registries
- **Retirement Status:** Burned or unburned (active)

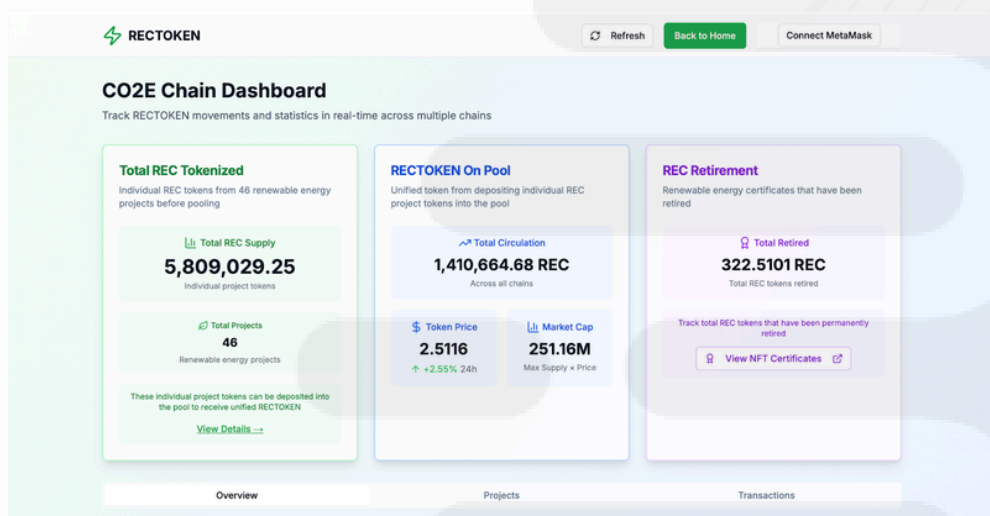
4.2 Strict Double Counting Prevention

Double counting (claiming the same environmental benefit twice) is the primary risk in carbon markets. Blockedge mitigates this through a tripartite synchronization process:

- **One-Way Bridging:** Once an I-REC is moved to REDEX and tokenized, it is locked. It cannot be moved back to the Evident open market without burning the corresponding REC Token.

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- **Quarterly Supply Audits:** To ensure absolute trust and transparency, an independent audit of the token supply and underlying assets is conducted by Valix Consulting Co., Ltd. Blockedge officially publishes this comprehensive quarterly audit report to all investors and the general public within 7 days after the end of each quarter. This report cross-references the total circulating supply of REC Tokens on the CO2e Chain Explorer against the total locked I-RECs held securely in REDEX's ReHash platform.
- **Public Dashboard Transparency:** A real-time tracking dashboard (accessible via the Blockedge portal) continuously displays the total supply, circulating supply, retired tokens, and the underlying project breakdown.



4.3 Holder Rights, Transferability, and Cancellation Policy

- **Transferability:** Tokens may be freely transferred peer-to-peer between standard digital wallets or traded on compliant third-party exchanges approved by the SEC.
- **Right to Offset:** The primary right of the token holder is the ability to redeem the token to offset verified Scope 2 emissions and receive a digital retirement certificate.
- **Cancellation Policy (Pre-Burn):** If a user initiates a transfer or purchase but the transaction fails or is canceled prior to network confirmation, the assets remain in the user's wallet.

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- **Irreversibility (Post-Burn):** Once a holder initiates a "Retirement Request," the action is strictly final. Because burning the token triggers the permanent retirement of the physical I-REC on the Evident registry, the burn process cannot be canceled, reversed, or refunded under any circumstances.
- **Project Termination:** In the event of a force majeure where the underlying energy project's certification is retroactively invalidated by Evident, Blockedge retains the right to administratively burn the affected unredeemed tokens and compensate holders according to the user agreement terms.

4.4 Project Scope, Central Pool Transfers, and Whitepaper Updates

The Two-Token Ecosystem: The primary scope of this project involves tokenizing verified I-RECs from whitelisted renewable energy projects into Project-Specific I-REC Tokens. However, to ensure consistent market liquidity and standardized trading, holders of these specific tokens have the right to transfer them into a designated "Central Pool."

Conversion to Pool I-REC Tokens: Upon transfer into the Central Pool, Project-Specific tokens are automatically converted by the smart contract into Pool I-REC Tokens (1 Pool Token = 1 Project-Specific Token = 1 MWh). The Pool I-REC Token is a fungible utility token representing a pooled basket of whitelisted I-RECs. It is this Pool I-REC Token that is officially listed and actively traded on the Licensed Exchange. The holder of the Project-Specific token remains the legal owner of the newly converted Pool Token.

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Criteria for Updating the Whitepaper: Because the composition of the Central Pool is dynamic due to continuous seller transfers and buyer redemptions, the Issuer utilizes the real-time Public Dashboard to reflect daily token supply and underlying project origins. This whitepaper will only be formally updated and republished under the following criteria:

1. When there is a material change to the underlying smart contract architecture, legal structure, or tokenomics.
2. When a distinctly new classification of renewable energy assets (outside the currently defined scope) is introduced to the Central Pool.
3. Note: Routine transfers of equivalent, verified I-RECs into the Central Pool by sellers will not trigger an immediate whitepaper revision, provided the assets meet the existing quality standards and I-REC certifications outlined herein.

4.5 Expiration Management Policy for Underlying Assets

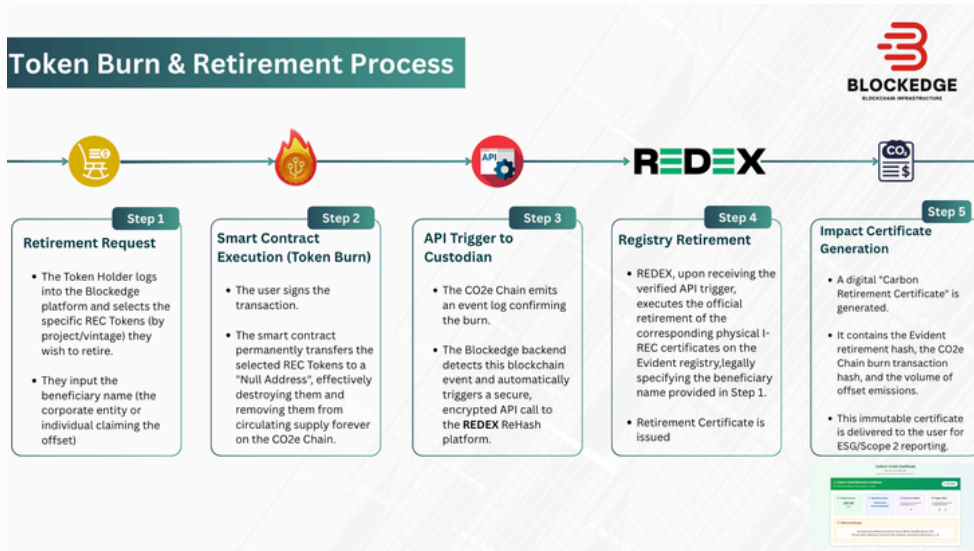
Because the underlying Hydro I-RECs have a strict 24-month validity period, the Issuer enforces a proactive Expiration Management Policy to protect token holders and ensure the integrity of the Liquidity Reserve.

- **Active Monitoring:** Blockedge continuously monitors the vintage and expiration dates of all physical I-RECs locked in the custodian platform that back the tokens circulating in the Liquidity & Market Stabilization Reserve.
- **Burn and Replace Mechanism:** If tokens held within the Issuer's exchange liquidity pool are backed by I-RECs nearing their expiration date (e.g., within 30 days of expiry) and have not been purchased by the public, Blockedge will systematically withdraw those specific tokens from the exchange and permanently burn them. The corresponding near-expired I-RECs are officially removed or retired from the REDEX registry.
- **Consumer Protection:** Blockedge will then replenish the liquidity pool by minting new tokens backed by fresh, newly certified Hydro I-RECs. This mechanism mathematically guarantees that retail investors on the secondary market will never purchase a token backed by an expired or invalid asset.

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05 REDEMPTION, RETIREMENT, AND BURN PROCEDURES

The retirement process is the final lifecycle stage of the REC Token. It translates the digital token into a legally recognized corporate ESG claim.



5.1 Redemption and Retirement Workflow (FIFO Allocation)

The redemption process translates the digital token into a legally recognized corporate ESG claim. The redemption process translates the digital token into a legally recognized ESG or environmental claim.:

Prerequisites and Eligibility: Redemption is available to both Corporate Entities and Individual Retail Users, utilizing two distinct operational pathways due to registry constraints:

- For Corporate Entities: Must open and maintain an active account on the REDEX platform.
- For Individual Users: Because the official registries (Evident/REDEX) primarily restrict direct account creation to corporate entities, Blockedge provides an official "On-Behalf" retirement service for individuals.
- There is a strict Minimum Redemption Amount of 100 Pool I-REC Tokens per transaction for all users.

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Step-by-Step Redemption Flow: To ensure compliance and accurate registry allocation, the redemption process follows a strict operational workflow:

Step 1: Submission of Information: The Token Holder notifies the Company of their intention to redeem by submitting the following details via the official Blockedge portal: Full legal name, quantity of Pool I-REC Tokens to be burned, and contact information.

(Note: Corporate entities must provide their REDEX account details. Individual users must provide the exact personal name to be listed as the End Beneficiary).

Step 2: Company Verification and Confirmation The Company reviews the submitted information and confirms acceptance within three (3) business days from the receipt of complete and correct data. The confirmation is sent to the Token Holder's official email and recorded in the internal system for audit purposes.

Step 3: Transfer of Tokens by Token Holder Upon receiving confirmation, the Token Holder must transfer the specified quantity of Pool I-REC Tokens from their personal wallet to the Company's designated blockchain wallet address.

Step 4: Execution of Redemption Option (FIFO Allocation): Once received, the Company burns the Pool I-REC Tokens. The system strictly enforces a First-In-First-Out (FIFO) allocation. The Company then executes the chosen option:

- **Option 1 (Receive Active I-RECs - Corporates Only):** The Company transfers the actual, unretired I-REC certificates directly into the Corporate Token Holder's REDEX account.
- **Option 2 (Retire I-RECs - Corporates):** The Company officially retires the I-RECs on the REDEX platform on behalf of the Corporate Token Holder.
- **Option 3 (Retire I-RECs "On-Behalf" - Individuals):** The Company burns the tokens and executes the official retirement on the REDEX platform utilizing Blockedge's authorized corporate registry account. During execution, the Company explicitly designates the Individual Token Holder's personal name as the official "End Beneficiary". This ensures the individual receives a valid Retirement Certificate reflecting their personal environmental claim, compliant with registry guidelines.

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Step 5: Confirmation and Certificate Delivery

- **For Option 1:** Token Holders may review the completion of the transfer through their REDEX account. The Company will issue a formal confirmation of the I-REC deposit to the Token Holder.
- **For Option 2:** The Company will issue a confirmation of retirement and deliver a digital Retirement Certificate (Impact Certificate) to the Token Holder to be used for ESG and Scope 2 compliance reporting.

5.2 System Resilience and Audited Processing

To ensure operational continuity and protect token holders from disruptions, the ecosystem incorporates strict Service Level Agreements (SLAs) for manual processing and security.

- **Processing SLA:** The retirement process relies on secure, verified communications between Blockedge and the REDEX ReHash platform. Blockedge enforces a strict operational SLA to ensure that all valid retirement requests are processed, verified, and executed with REDEX within a maximum of three (3) business days without requiring further user intervention.
- **Audited Execution Process:** To ensure the Token Holder successfully receives their Impact Certificate, the process is highly secured:
 - **Incident Logging & Verification:** The on-chain burn hash (proving the user destroyed the token) is manually verified by the Blockedge technical team.
 - **Multi-Sig Authorization:** To initiate the registry retirement, cryptographic approval is required via a Multi-Signature (Multi-sig) control panel from authorized administrators. This prevents any unilateral manipulation of the retirement process.
 - **Manual Retirement Execution:** Upon joint approval, authorized personnel manually submit the retirement data to the REDEX portal for processing.

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- **Audit Trail Recording:** Every step of this retirement process is permanently recorded in the platform's internal security logs. These logs are mandatorily reviewed by the independent auditor, Valix Consulting Co., Ltd., during the quarterly supply audit to ensure absolute transparency and strict adherence to double-counting prevention protocols.

5.3 Legal Confirmation Regarding the Redemption Process

The Issuer officially confirms that the redemption, retirement, and token burn procedures strictly constitute the execution of a defined utility function (claiming an environmental offset). The process guarantees a definitive 1:1 outcome based on user initiation and involves no elements of chance, randomization, lotteries, or speculative drawing. Therefore, the redemption and retirement process definitively does not fall under the scope of, nor does it constitute an offense under, the Gambling Act B.E. 2478 (1935) of Thailand.

5.4 Fees and Costs for Redemption

While Blockedge standardizes the tokenization process, the final redemption of tokens into physical I-RECs (Option 1) or retired I-RECs (Option 2) may incur third-party registry costs. Any fees, charges, or costs imposed by third parties (including official registries, the REDEX platform, or intermediaries) in connection with the transfer, receipt, or retirement of I-RECs shall be strictly borne by the Token Holder.

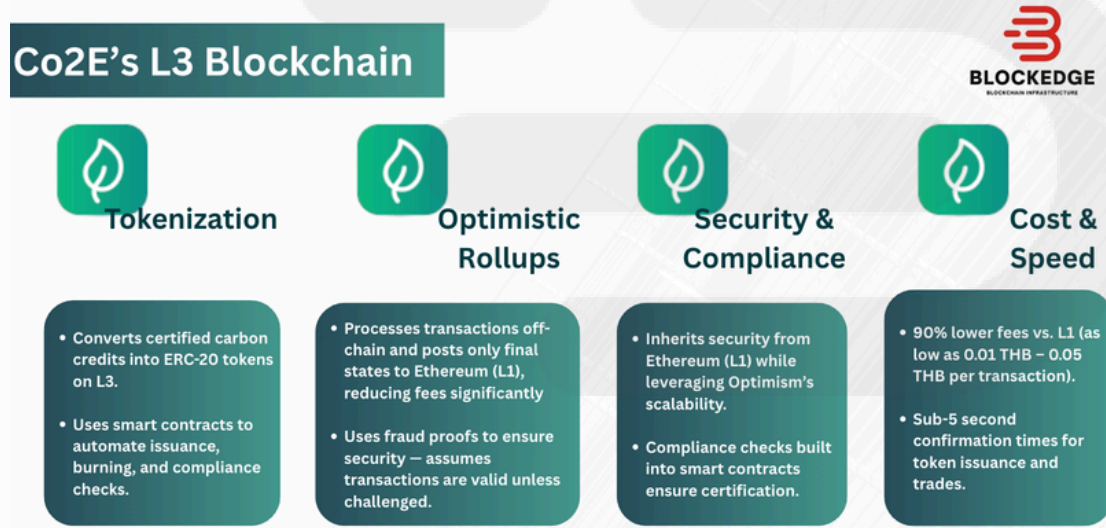
Blockedge may adjust its prevailing schedule of charges from time to time, which will be published on the official platform website. The Token Holder is responsible for settling all relevant redemption costs promptly upon request prior to the final delivery of the I-RECs or the Impact Certificate.

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6.1 The CO2e Chain (Layer 3 Optimistic Rollup)

The REC Token infrastructure utilizes the CO2e Chain, a bespoke Layer 3 blockchain utilizing Optimistic Rollup technology.

- **Cost Efficiency:** Operating on L3 reduces gas fees by up to 90% compared to Ethereum L1 (transaction costs as low as 0.01 - 0.05 THB), making micro-offsets financially viable.
- **Speed:** Near-instant token issuance and transfer (sub-5 second confirmation times).
- **Security:** By utilizing Optimistic Rollups, CO2e processes transactions off-chain but posts final states to Ethereum (L1). It inherits the robust, decentralized security of Ethereum via fraud proofs—assuming transactions are valid unless mathematically challenged.



CO2E's L3 blockchain leverages Optimistic Rollup technology to deliver a fast, cost-effective, and compliant solution for carbon credit tokenization, securing a first-mover advantage in Thailand."

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6.2 Smart Contract Audits and Security Protocols

The smart contracts governing the REC Token have undergone rigorous static code analysis, dynamic analysis, and manual review by Valix Consulting Co.,Ltd. a premier blockchain security auditor.

Multi-Sig Wallets & Admin Controls:

To protect against electronic theft and ensure enterprise-grade compliance, critical smart contract functions (such as pausing the contract during an emergency or executing an Admin Transfer) are secured via Multi-Signature (Multi-sig) Wallets.

- A transaction affecting the core protocol requires cryptographic signatures from multiple designated authorities across Blockedge and its platform partners.
- **Clawback Mechanism (Admin Transfer):** In the event a corporate user loses access to their digital wallet, or if tokens are stolen via documented cybercrime, the Issuer Administrator can initiate an Admin Transfer. This requires a formal request, documented proof of corporate ownership, and Multi-sig approval to forcibly move the stolen/lost tokens to a new secure wallet, ensuring users do not permanently lose their ESG assets.

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Investing in or holding REC Tokens involves several risks. Prospective holders should carefully consider the following:

7.1 Regulatory and Compliance Risks

- **Changes in Digital Asset Laws:** The SEC of Thailand or international regulatory bodies may amend laws governing digital tokens, potentially restricting the trading, transfer, or holding of REC Tokens.
- **Changes in Environmental Standards:** If the SBTi, GHG Protocol, or Evident alters the criteria for what constitutes a valid Scope 2 offset, the utility and demand for specific vintages of REC Tokens may decline.
- **Domestic Tariff and Cross-Border Restrictions:** Under current international frameworks, cross-border redemption within ASEAN is generally accepted. However, if Thai laws or local Utility Green Tariff programs explicitly restrict compliance or financial benefits exclusively to RECs generated within Thailand, Thai corporate users may not be able to utilize SEA-origin I-RECs for those specific local benefits. Because token redemption follows a strict First-In-First-Out (FIFO) allocation without the ability to select the project's country of origin, corporate buyers bear the absolute risk that the I-RECs received upon redemption may not qualify for localized domestic tariff schemes.

7.2 Technology and Cybersecurity Risks

- **Blockchain Network Failure:** While the CO2e Chain inherits Ethereum's security, any catastrophic failure, fork, or congestion on the underlying Ethereum network could delay transactions or burn processes.
- **Smart Contract Vulnerabilities:** Despite rigorous auditing by Inspex, unforeseen bugs or vulnerabilities in the smart contract code could be exploited by malicious actors, leading to token theft or loss.
- **Platform Outages:** The redemption process relies on APIs connecting Blockedge, REDEX, and Evident. Downtime in any of these third-party systems could temporarily halt the ability to retire tokens.

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- **Transaction Priority and FIFO Allocation Risk:** While the redemption of Pool I-REC Tokens strictly follows a First-In-First-Out (FIFO) principle based on the pool's inventory, final allocation cannot be 100% guaranteed until on-chain execution. Because blockchain networks process transactions based on gas prices (network fees), if two users submit a redemption request concurrently, the transaction with the higher gas fee priority may be processed first by the network validators, altering the expected FIFO allocation outcome for the standard user.

7.3 Market and Price Volatility Risks

- **Price Fluctuations:** The OTC price of renewable energy certificates is subject to market forces (supply of renewable energy, corporate demand for ESG). The REC Token price will fluctuate accordingly. Holders purchasing tokens in the secondary market may experience capital loss if the market price of RECs drops.
- **Liquidity Risk:** Depending on the volume of tokens minted and the activity on compliant exchanges, there may be periods of low liquidity, making it difficult for token holders to sell their tokens at a desired price.

7.4 Operational Risks

- **Third-Party Reliance:** The entire ecosystem relies heavily on NetZero Carbon (for sourcing), REDEX (for custody), and Evident (for final registry). If REDEX were to suffer a systemic failure or lose its accreditation, the backing of the REC Tokens could be compromised.
- **Dependency on External Registries:** The entire lifecycle of the REC Token is fundamentally dependent on the continuous operation and legal validity of external registries, specifically the Evident registry and the REDEX platform. If these third-party registries change their operational rules, experience prolonged system failures, or if the underlying I-REC Standard is unexpectedly altered or deprecated by global authorities, it may directly impact the token's utility, the ability to redeem tokens, or the legal recognition of the environmental offsets.

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7.5 Business Continuity and Disaster Recovery (BCDR) Backup Plans

To actively mitigate the aforementioned technological, cybersecurity, and operational risks, the Issuer has implemented a comprehensive Business Continuity and Disaster Recovery (BCDR) plan to serve as a robust backup for the ecosystem:

- **Data and Infrastructure Redundancy:** All off-chain platform data, user interfaces, and API gateways are hosted on highly available, geographically distributed, enterprise-grade cloud infrastructure. Automated data backups are performed daily and stored in isolated cold storage environments to prevent data loss during localized server outages or catastrophic cloud failures.
- **Blockchain State Fallback:** The CO2e Chain operates across multiple distributed validator nodes. If individual nodes fail, the network remains operational. Furthermore, because CO2e operates as an Optimistic Rollup, the ultimate backup of all cryptographic state transitions is securely anchored to the Ethereum Layer 1 mainnet. Even if the L3 network experiences severe downtime, the state history is preserved on Ethereum, preventing catastrophic asset loss.
- **Operational Backup (API & Custody Failures):** If the automated API connections between Blockedge, REDEX, and Evident experience prolonged downtime, the platform does not permanently halt. As detailed in Section 5.2, the strict Service Level Agreement (SLA) utilizing the Audited Manual Override process serves as the official operational backup plan. This guarantees that Token Holders can still successfully execute their ESG retirements manually via authorized multi-sig administrators.
- **Smart Contract Circuit Breakers:** In the extreme event of a zero-day cybersecurity threat or a critical vulnerability identified by the auditor, the smart contracts are equipped with a Multi-Sig authorized "Pause" function (circuit breaker). This acts as the ultimate security backup measure to temporarily freeze token transfers and burns, securing user assets from theft while the technical team deploys audited security patches.

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8.1 Governance, Minting Authority, and Conflict of Interest Mitigation

Blockedge has a fiduciary duty to act in the best interest of the token holders. To ensure absolute transparency and prevent conflicts of interest or unauthorized supply inflation, strict governance protocols are enforced:

- **Governance of Minting vs. Unlocking:** The REC Token ecosystem operates strictly on a "Mint-on-Lock" mechanism. There are no pre-mined tokens waiting to be "unlocked." Tokens are only minted into existence when NetZero Carbon provides verifiable proof that an I-REC has been legally transferred and locked inside REDEX's ReHash platform.
- **Multi-Sig Minting Approval:** The execution of the mint function on the smart contract cannot be triggered unilaterally by Blockedge. It requires a Multi-Signature (Multi-sig) cryptographic approval involving authorized keys from both the Issuer (Blockedge) and the Asset Aggregator (NetZero Carbon) after verifying the REDEX custody receipt.
- **Segregation of Duties:** Blockedge (Tech Issuer) has no ownership claim over the physical I-RECs held in REDEX. REDEX acts as an independent, third-party custodian, while NetZero Carbon handles procurement.
- **Transparent Pricing & Allocation:** The platform's fee structure and the 60% Market Stabilization Reserve allocation are standardized, publicly disclosed, and hardcoded into the distribution logic to ensure transparency and market stability.

8.2 Custody and Backing Guarantee

The Issuer legally guarantees that every REC Token in circulation is fully backed 1:1 by an equivalent, verified I-REC held in custody by REDEX. To maintain strict asset standardization and regulatory clarity, the REC Token ecosystem is 100% backed by I-RECs only. The platform explicitly does not tokenize, integrate, or hold traditional carbon credits. In the event of company liquidation, the underlying physical I-REC assets held in REDEX will be liquidated or transferred to token holders proportionally.

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8.3 Standard ERC-20 Interoperability and Compliance

The REC Token is deployed as a standard ERC-20 utility token on the CO2e Chain to ensure seamless ecosystem interoperability. The token smart contracts do not utilize hardcoded address whitelisting or transfer restrictions at the protocol level. This allows the circulating REC Token to be freely integrated into standard digital wallets and seamlessly traded on licensed digital asset exchanges in accordance with applicable digital asset regulations.

8.4 Liability and Recourse

This whitepaper constitutes a legally binding arrangement between the Company (as the token issuer) and the Token Holders to the extent permitted by applicable law.

The Company shall be directly liable to the Token Holder for any direct damages strictly arising from the Company's failure to fulfill the documented Redemption Options (Receiving or Retiring I-RECs), subject to the SLA and Force Majeure conditions outlined herein. Furthermore, the Company retains the absolute right to seek legal recourse against the original Asset Seller (the energy generator) for any damages, fraud, or invalidation of certificates caused by the seller that impacts the Token Holders.

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