Carbonero Foundation: A Blockchain-Based System for Renewable Energy Incentives and Carbon Offsets

A Whitepaper by the Carbonero Foundation
October 2025

Abstract
We propose a blockchain-based system to incentivize renewable energy production and provide verifiable carbon offsets. Using Bitcoin's blockchain and AI, the Carbonero Foundation issues Carbon tokens, tradeable assets tied to renewable energy and CO_2 offsets. The system ensures transparency, prevents double-counting, and targets 21 million tons of CO_2 removal by 2050 via 35 billion kWh of clean energy.

1. Introduction
The voluntary carbon offset market, valued at $2–5 billion in 2025, is projected to reach $250 billion–$2 trillion by 2050, driven by corporate net-zero goals and regulations (e.g., EU CSRD, SEC rules). Traditional carbon credits lack provenance and risk double-counting. The Carbonero Foundation's blockchain-based system rewards producers with Carbon tokens, verified by AI, ensuring credible offsets. This paper details the token issuance, verification, and trading mechanisms for a 25-year mission to remove 21 million tons of CO_2.

2. Carbon Token Mechanism
2.1 Token Specification
- Total Supply: 121,000,000 Carbon tokens.
- Distribution:
  - Rewards: 99,218,750 tokens (82%).
  - Presale: 10,781,250 tokens (9%).
  - Team: 11,000,000 tokens (9%).
- Reward Rate: 0.01 Carbon tokens/kWh, halving every 3 million tons of CO_2 offset.
- CO_2 Metric: 0.6 kg CO_2/kWh (0.0006 tons), per IRENA/IEA.

2.2 Reward System
Producers earn Carbon tokens proportional to energy output. A solar farm producing 1,000 kWh receives 10 Carbon tokens (1,000 × 0.01), equating to 600 kg (0.6 tons) CO_2 offset. Tokens are claimed via a pull mechanism on Bitcoin's blockchain using Tap Protocol.

3. Verification and Transparency
3.1 AI Verification
AI validates energy production in real-time via smart meters, geolocation, and device authentication. For 1,000 kWh:
- CO_2 offset: 1,000 × 0.6 kg = 600 kg (0.6 tons).
- Geolocation: e.g., Lat: 40.7128, Lon: -74.0060.
- Hash ensures data integrity.

3.2 Blockchain Logging
AI-verified production data (kWh,CO_2) is inscribed on Bitcoin via Tap Protocol to issue Carbon tokens.
Example signed JSON payload:


```
{
  "p": "tap",
  "op": "token-auth",
  "sig": {
    "v": "0",
    "r":
"23989187440842794585023793567427384513403262109645630423114882391095764525967",
    "s": "621224455189178232250834114398666977680570871128337034357950931934268815687 4"
  },
  "hash": "5602d75116e9bca031b3ac491e504f2aade83fd04ebd43720c5d00cf7b6d41f4",
  "salt": "carbon-epoch-2025W39-n20001",
  "redeem": {
    "auth": "91823c88dddcd84f360e4d271bd9812bb016ca8f1dd6f549721610448ab37b52i0",
    "items": [
      {
        "tick": "carbon",
        "amt": "10.00000000",
        "address": "bc1psxnpdcznnm5wa3qhnd0lhmjep7v3tmr9ld7my8u57vnsx2fhjhtsxhu77f",
        "dta":
"kwh=1000.00000000;co2t=0.60000000;geo=44.8176,20.4569;mission=solar_verification;src=AIv1;rate=0.01"
      }
    ],
    "data": "epoch=2025W39;n=20001;exp=2025-10-
15T00:00:00Z;policy=reward_halving;co2pkwh_t=0.0006"
  }
}
```


Data is auditable on Bitcoin explorers (e.g., mempool.space).

4. Halving and Scarcity
The reward rate halves every 3 million tons of CO_2 offset (5 billion kWh per halving). The schedule is:

Halving	CO_2 (Mt)	Cum. CO_2 (Mt)	Rate (Tokens/kWh)	kWh	Tokens	Cum. Tokens
Initial	3	3	0.01	5B	50M	50M
1	3	6	0.005	5B	25M	75M
2	3	9	0.0025	5B	12.5M	87.5M
3	3	12	0.00125	5B	6.25M	93.75M
4	3	15	0.000625	5B	3.125M	96.875M
5	3	18	0.0003125	5B	1.5625M	98.4375M
6	3	21	0.00015625	5B	0.78125M	99.21875M

Total: 99,218,750 Carbon tokens, 35 billion kWh, 21 million tons CO_2.

5. Carbon Swap Marketplace
The Carbon Swap Marketplace facilitates token trading:
- Certified Burn: Tokens are burned upon purchase, retiring offsets permanently.
- Offset Vault: Tokens can be locked, with transferable ownership, for delayed burning.
- Monetization: Producers sell tokens directly for financial rewards.

5.1 Burn Mechanism
Carbon tokens matching cumulative CO_2 offset in mission state are eligible for certified burns.

6. Guardrails
- Nonce and expiry in token-auth prevent replays and ensure timely claims.
- Reward pool capped at 99,218,750 tokens.
- Mission state (kWh, CO_2) is embedded in transaction metadata.

7. Why Bitcoin and Tap Protocol
Inscribing production data (kWh, CO_2, geolocation) on Bitcoin's blockchain, secured by proof-of-work, ensures tamper-proof records through 2050. Tap Protocol enables efficient inscription and reward distribution.

8. Market Opportunity
The voluntary carbon market, valued at $2–5 billion in 2025, is projected to grow to $250 billion–$2 trillion by 2050 (Ecosystem Marketplace, Morgan Stanley). A 1% market share represents a $2.5–20 billion opportunity. The Carbonero Foundation's blockchain-based system ensures transparency and credibility.

9. Conclusion
The Carbonero Foundation's Carbon token system incentivizes renewable energy and provides transparent CO_2 offsets, solving provenance and double-counting issues. By 2050, the system will remove 21 million tons of CO_2. Offset tokens will be burned, leaving ~21 million as a clean currency for eco-conscious transactions.

References
- Ecosystem Marketplace, State of the Voluntary Carbon Markets 2025.
- Grand View Research, Voluntary Carbon Market Report 2024.
- MSCI, Carbon Markets Outlook 2024–2025.
- Morgan Stanley, The Carbon Offset Opportunity, 2024.
- IRENA and IEA, CO_2 Offset Benchmarks, 2023.
- Cambridge Bitcoin Electricity Consumption Index, 2025.