Green Token Center

Methodology Transparency Document

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This document describes the methodology, data sources, and calculation approach used in Green Token Center's GPU carbon footprint assessment reports.

All information here is shared for transparency and expert review. Proprietary algorithms and exact formula implementations are not disclosed.

1. Overview

Green Token Center provides automated carbon footprint assessment and I-REC offset matching for GPU compute operations. The service calculates carbon emissions from GPU electricity consumption using regional grid emission factors, then matches the calculated emissions with equivalent I-REC (International Renewable Energy Certificate) instruments.

The methodology is designed in alignment with ISO 14064-1:2018 (Greenhouse gases - Part 1: Specification for quantification and reporting of greenhouse gas emissions and removals).

2. Input Parameters

The assessment requires the following inputs from the client:

GPU Model — The specific GPU being assessed (e.g., H100, A100, B200). Power consumption is based on manufacturer Thermal Design Power (TDP) specifications at 100% utilization.

Quantity — Number of GPU units being assessed.

Operating Hours — Total hours of operation per month.

Grid Region — The geographic region where the GPUs are operating (e.g., EU Average, China Southern Grid).

3. Emission Factor Database

The assessment uses a database of 43 regional grid emission factors sourced from the following authorities:

Region Coverage	Source	Year
China (6 major grids)	Ministry of Ecology and Environment	2025
European Union (12 countries)	European Environment Agency / IEA	2025
United States (5 regions)	EPA eGRID	2024
Canada	IEA	2025
Asia-Pacific (8 countries)	IEA	2025
Middle East (3 countries)	IEA	2025
Global Average / Reference	IEA	2025

Emission factors represent grid average carbon intensity (kgCO2/kWh). Factors are updated annually following the release of new data by the respective authorities.

4. Calculation Logic

The carbon footprint is calculated following standard activity data x emission factor methodology:

Step 1: Calculate total energy consumption (kWh)

> Total kWh = GPU Power (kW) x Quantity x Operating Hours (h)

GPU Power (kW) = TDP rating / 1000. Example: H100 TDP = 700W -> 0.7 kW

Step 2: Calculate carbon emissions

> Carbon Emissions (tCO2e) = Total kWh x Grid Emission Factor (kgCO2/kWh) / 1000

Step 3: Determine I-REC requirement

> I-REC needed = max(1, ceil(Total kWh / 1000))

Each I-REC certificate offsets 1 MWh (1000 kWh) of electricity consumption.

Note: The above represents the standard calculation logic. Complete algorithm details, including boundary conditions, rounding rules, and validation logic, are implemented in the certified calculation engine.

5. Validation Example

Using publicly available data to verify calculation consistency:

Input: NVIDIA H100 (700W), 10 units, 730 hours/month, EU Average grid

Step 1: Total kWh = 0.7 kW x 10 x 730 h = 5,110 kWh

Step 2: EU Average factor = 0.251 kgCO2/kWh

Step 3: Carbon = 5,110 x 0.251 / 1000 = 1.28 tCO2e

Step 4: I-REC needed = max(1, ceil(5110/1000)) = 6 certificates

This example uses the EU Average emission factor (0.251 kgCO2/kWh, source: EEA 2025). Actual results vary by region. Users can verify these calculations independently using the same publicly available data sources.

6. I-REC Certificate Linkage

Each certification report includes I-REC certificates that are procured through authorized dealers and retired on behalf of the client. The linkage between calculated emissions and retired certificates is:

1. Calculate gross carbon emissions from GPU operations

2. Determine equivalent I-REC quantity (1 certificate per 1 MWh)

3. Procure certificates through I-REC authorized channels

4. Retire certificates in the I-REC registry

5. Generate retirement evidence with serial numbers

6. Include retirement details in the certification report

Clients can verify certificate retirement using serial numbers provided in their report through the I-REC International Registry (irecstandard.org/registry).

7. Limitations & Disclaimer

Scope: This assessment covers Scope 2 (market-based) CO2 emissions from purchased electricity only. Scope 1 (direct emissions), Scope 3 (supply chain), and other greenhouse gases are not included.

Utilization: Power consumption assumes 100% GPU utilization. Actual consumption may vary based on workload type, cooling efficiency, and power management features.

Factors: Emission factors represent annual averages. Actual grid carbon intensity varies by time of day and season.

Transmission losses: Distribution and transmission losses are not included in the assessment.

This methodology is self-declared as aligned with ISO 14064-1:2018 principles. Formal third-party review is planned for Q4 2026.