No Exchange Rate: Carbon in the Economics of AI Compute

Revision record

Canonical version: jamesemurphy.com/ai-economics/carbon-ai-compute · SSRN: ssrn.com/abstract=7216759 · doi:10.2139/ssrn.7216759

Substantive changes since the first version posted to SSRN on 1 August 2026, newest first. Typographic, formatting, and version labeling changes are not recorded.

v1.1 · 11 August 2026

Section	Kind	Change
4	Addition	The divergence between accounting bases is shown to affect decisions, not only reports: the basis chosen changes which schedule a carbon optimizer selects, and physical emissions can rise while reported savings improve.
4	Addition	The physical account is divided into average grid intensity, which answers an attributional question, and marginal emissions rates, which answer a consequential one. The two can rank the same siting or scheduling options differently.
4	Clarification	Divergence between accounts is distinguished from treating all accounts as equally informative: within the contractual account, how finely a claim is matched in time is a quality dimension, and finer matching changes physical outcomes as well as reported ones.
4	Clarification	The paper's neutrality is bounded explicitly: neutral on which decision rule a firm adopts, not neutral on whether the granularity of a claim is disclosed.
2	Addition	The instrument register now records each contractual instrument's matching interval, market boundary, and whether the underlying generation is additional, so annual, monthly, and hourly claims are never read as the same object.
3	Addition	The requirement that a carbon value suit its decision purpose is made specific: four defensible pairings of value to purpose are stated, and two substitutions are named inadmissible in any framing.
3	Clarification	The instrument table now distinguishes an internal shadow price, which only reorders options, from an internal fee, which moves money between units.
5	Addition	Of the three decision architectures, only the constraint form binds on an absolute quantity, which makes an emissions ceiling the one form that induced demand cannot defeat.

Section	Kind	Change
5	Addition	An unresolved question is recorded: whether a firm should minimize the emissions attributed to its own consumption or maximize the emissions its spending displaces system wide. The paper takes no side and requires only that the choice be named.
7	Addition	A ninth reporting rule, on provenance: state whether each reported quantity is metered, modeled, or extrapolated, cite a primary source that is publicly retrievable or flagged as proprietary, and give the vintage of every emissions factor applied.
7	Addition	A tenth reporting rule, on totals: report absolute totals for each ledger beside the per outcome intensities and never intensity alone, since a falling intensity and a rising total are compatible.
7	Addition	The sixth reporting rule gains a control on optimization: drive optimization from the physical account and report both accounts.
7	Clarification	The reporting profile's scope is stated: it addresses the party that holds the measurements, and is a management measurement discipline rather than a disclosure standard.
2, 7	Addition	The dependency on hardware power reporting standards is named, and water is identified as a fourth ledger the architecture extends to but this paper does not carry.
4, 5	Repair	Three of the paper's own figures re marked under the new provenance rule: the worked case is constructed rather than measured, the intensity curve is a representative profile, and the grid intensity range is modeled rather than measured at the point of consumption.
References	Addition	Twelve references added in support of the changes above.

v1.0 · 1 August 2026

Section	Kind	Change
All	Posting	First version posted.