Cascale

HIGG ASSESSMENT MODEL

Effective Energy Carbon Intensity (EECI)

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This document explains the Effective Energy Carbon Intensity (EECI) metric as it appears in the Higg Assessment Model — what it measures, how it's calculated, where it lives in the schema, and what modelling assumptions and caveats apply when consuming it.

Contents

Purpose of the Calculation **3**
Record Types **3**
Methodology **4**
Formula 4
FacilityType-level EECI 4
Scope 2 Methods 4
Modelling Assumptions 5
Data Quality **5**
Cadence Coverage **5**
Cadence Specific Guidance **6**
FEM 2017 through FEM 2025 6
FEM 2026 and later 6

This document explains the Effective Energy Carbon Intensity (EECI) metric as it appears in the Higg Assessment Model — what it measures, how it's calculated, where it lives in the schema, and what modelling assumptions and caveats apply when consuming it.

The EECI is Cascale's facility-level decarbonization performance metric. It rolls a facility's electric and thermal energy use into a single intensity figure, with a primary-energy weighting designed to recognise electrification as a decarbonization mechanism. The metric was introduced to industry in the 2026 State of the Industry report and is exposed on every FEM cadence's `Assessment` and `FacilityType` blocks. The full stakeholder-facing rationale is published separately by Cascale; this guide covers what's actually in the bundle.

Purpose of the Calculation

The metric exists to give analysts a single number per facility (or per facility-type within a facility) that captures the carbon intensity of the *energy sources* the facility relies on, with two behavioural goals:

1. **Reward electrification.** A traditional energy carbon intensity that just divides emissions by total energy use will *increase* when a facility electrifies a thermal process — because the electric replacement carries more upstream primary-energy overhead than the direct thermal source it replaced. The EECI weights electric energy by a fixed primary-energy factor (2.4) so that switching from a thermal fossil source to grid electricity registers as a decrease in intensity whenever the grid is cleaner than the displaced source.
    - **Example:** A facility that replaces a coal boiler with an electric boiler drawing from a natural-gas-dominant grid will show a higher traditional energy carbon intensity post-switch (more total MJ consumed for the same output) but a lower EECI. A consumer-facing surface using the EECI can therefore present the switch as decarbonization progress; a traditional metric would have classified it as regression.
2. **Decouple from final energy mix.** Because the metric is keyed to *primary energy* rather than final use, two facilities with very different on-site energy mixes but comparable upstream fossil dependency get comparable EECI values. This makes the metric usable for fairer cross-facility benchmarking than a final-MJ-based intensity would allow.

Record Types

The EECI is exposed as four fields, in two record types.

- `Assessment`: Whole-facility EECI. Use this when comparing a facility to itself across cadences, or comparing facilities at a portfolio level.
- `FacilityType`: Per-facility-type EECI within a single facility. Use this when decomposing a facility's emissions profile by what it's producing (`materialProduction`, `finalProductAssembly`, etc.). The facility-type-level EECI is calculated against the share of the facility's energy attributable to that facility type.

Each record carries four EECI fields:

- `market_eeci`: Market-based scope 2 accounting, including biogenic emissions.
- `market_eeci_zeb`: Market-based, zero-emission-biogenic — the biogenic component is excluded from the numerator. Use this when reporting against frameworks that treat biogenic CO_2 as climate neutral.
- `location_eeci`: Location-based scope 2 accounting, including biogenic emissions.

- `location_eeci_zeb`: Location-based, zero-emission-biogenic.

All four fields are `number?` — `undefined` when the facility's energy denominator is zero (no reported electric or thermal use attributed to the relevant scope).

Methodology

Formula

Every EECI field has the same shape:

> EECI = numerator / ((electric × 2.4) + thermal)

where:

- **numerator** is the total emissions at the chosen scope. When the field name ends `_zeb` the biogenic component is excluded; when not, biogenic emissions are added to the fossil total.
- **electric** is the MJ sum of `EnergyUse` blocks with the matching scope-2 method (market or location) and `energy_form: electric`.
- **thermal** is the same sum, scoped to `energy_form: thermal`.
- **2.4** is a fixed primary-energy weighting factor applied to electric energy. It approximates the average upstream primary energy required to deliver one unit of grid electricity (about 2.4 MJ of primary input per 1 MJ delivered). The value is held constant across cadences so EECI trends over time reflect facility-side changes, not changes in the weighting model.

The denominator is *always* the same energy total regardless of biogenic treatment — only the numerator changes between the `_zeb` and plain variants.

FacilityType-level EECI

When EECI is calculated at the `FacilityType` level, the formula's shape is unchanged but the denominator's `electric` and `thermal` sums are filtered to `EnergyUse` blocks attributed to a single facility type that matches the record's `facility_type_key`. To avoid double-counting energy shared across multiple facility types within an assessment, the FT-level denominator also adds that facility type's share of the assessment-wide domestic-energy and vehicle-fuel allocations. The numerator follows the same FT-aware aggregation used elsewhere in the FacilityType record.

The practical consequence: summing the per-facility-type EECI denominators across an assessment will *not* equal the assessment-level denominator. Each FT-level denominator includes a prorated share of facility-wide energy that's shared across types.

Scope 2 Methods

The market-based and location-based variants encode the same Scope 2 distinction the GHGP itself draws — see `guidance-ghgp-fem.md` for the underlying methodology.

- **Market-based** EECI uses emission factors and energy quantities tied to the facility's specific energy procurement (EACs, contracts, on-site generation). Appropriate when the facility is reporting against contractual instruments and wants the metric to reflect those instruments.
- **Location-based** EECI uses grid-average emission factors and grid-attributed quantities. Appropriate when comparing facilities by their physical location regardless of procurement, or when no contractual instruments are involved.

A single facility will typically have noticeably different `market_eeci` and `location_eeci` values; the difference itself is informative, capturing the gap between what the facility has procured and what its local grid provides.

Modelling Assumptions

The denominator and numerator are downstream of the same `EnergyUse` and `Emissions` blocks the GHGP-compliant calculations produce, and inherit their modelling assumptions wholesale. The ones with the largest impact on EECI:

- **Primary energy factor of 2.4.** This is the EECI-specific weighting; everything else in the formula reflects upstream GHGP-flow choices.
- **Off-site renewable attribution.** Location-based EECI attributes off-site renewable generation (geothermal, hydro, wind) to purchased electricity, so location-based denominators count this energy as electric × 2.4 weighted MJ. See `guidance-ghgp-fem.md` for the underlying reasoning.
- **Unknown-source renewables fall to grid average.** When a facility reports purchased renewable energy without specifying the source, the contributing emission factor in the numerator is the grid average rather than zero. This means an unsupported renewable claim will not pull EECI down.
- **Unknown-source purchased steam is treated as coal-generated.** The conservative assumption in the GHGP calculation flow carries through to EECI's thermal denominator and emissions numerator.

Data Quality

The EECI inherits `pass_data_quality` and `data_quality_flags` behaviour from the `Assessment` record. An EECI value should be read alongside the assessment's data quality flags — a low EECI on an assessment flagged for implausibly low energy reporting is not the same signal as a low EECI on a clean assessment.

EECI does not introduce its own data-quality checks beyond those already documented in `guidance-ghgp-fem.md`.

Cadence Coverage

EECI is available for every FEM cadence (fem2017 through the latest released cadence) because the calculation is part of the GHG Protocol model layer shared by every cadence.

The four EECI fields and the 2.4 weighting factor are stable across cadences. The numerator and denominator both depend on `EnergyUse` and `Emissions` blocks whose composition does evolve cadence-to-cadence (see `guidance-ghgp-fem.md` for the cadence-specific FEM methodology); EECI inherits those changes automatically. The metric's own definition has not changed since introduction.

Cadence Specific Guidance

FEM 2017 through FEM 2025

EECI is calculated at the `Assessment` level only. The four fields behave as documented above.

FEM 2026 and later

The `FacilityType` record gains the same four EECI fields. The FT-aware variant of the formula (described in the *FacilityType-level EECI* section) is what populates them. The `Assessment`-level fields are unchanged.

This is purely additive — consumers that were only reading assessment-level EECI continue to work. New consumers can opt into the per-facility-type breakdown by reading the `FacilityType` blocks.