# FLUX Methodology

Version 0.1. Rules for the measurement, evidence, review and registration of one FLUX unit

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## Status of this document

This is version 0.1. It is a working draft. The rules are numbered so that the working group can accept, change or strike each one by number. Open questions for the working group are marked **WG-n** and listed in Appendix B.

The methodology will be published under an open licence by the Solflow Standard Foundation. Proposed licence: CC BY-SA 4.0 (**WG-1**). Solflow Holding does not own the methodology. Solflow Holding never reviews or certifies a FLUX unit.

Nothing in this document is a forecast. All thresholds are working assumptions until the working group confirms them.

## 1. Purpose and the unit

**Rule 1.1.** One FLUX is one tonne of material demand met from flow sources instead of stock extraction, at a named site, in a named period, measured by mass balance, reviewed by an independent reviewer and recorded on the FLUX Register.

**Rule 1.2.** FLUX is a material unit. It is not a carbon credit, not an offset, not a security and not a token. A FLUX statement makes no carbon claim.

**Rule 1.3.** FLUX measures mass. It does not measure energy, water, carbon or biodiversity. Those quantities appear on a FLUX statement as co-benefits for information only. They are not counted.

**Rule 1.4.** The unit is conservative by design. Where two readings of a rule are possible, the reading that issues fewer units applies.

## 2. Terms

| Term | Meaning |
|---|---|
| Site | One production facility inside one boundary drawn on a map. One site, one register entry. |

| Term | Meaning |
|---|---|
| Issuer | The legal owner or operator of the site who submits a FLUX statement. |
| Period | The span of time a statement covers. See Rule 4. |
| Product | The material that leaves the site and is sold to a buyer. |
| Delivered mass | The mass of product that left the site boundary and reached a buyer in the period. |
| Flow source | Sunlight, water, air, and biology, plus material in a closed loop inside the site boundary. See Rule 5. |
| Stock | Any input that is not a flow source. Extracted, mined, drilled or purchased virgin material. |
| Flow fraction | The share of delivered product mass that came from flow sources. |
| Displaced material | The virgin material the buyer used before, for the same function. |
| Substitution ratio | The mass of displaced material replaced by one tonne of product. |
| Evidence bundle | The sealed set of raw files, computed results, logs and signatures behind one statement. |
| Reviewer | The independent person or firm who tests the statement against the bundle and signs. |
| Register | The public append-only record of sites, statements, reviews, issuances and retirements. Operated by the Foundation. |
| Working group | The group under the Foundation that owns this methodology. |

# 3. Eligibility

**Rule 3.1.** An issuer may submit a statement for a site when all of the following hold:

- The site is registered on the FLUX Register with a boundary map, a list of meters and a named responsible person.
- The product is a material. In v0.1 this means polymers, fibres, building materials, chemicals, feed and fertiliser. Food for human consumption, energy and water are out of scope (**WG-2**).
- The site has meters on every flow input and a weighbridge or calibrated scale on every output.
- The site has at least one buyer who signs a displacement letter under Rule 9.

**Rule 3.2.** The minimum issuance is one FLUX per statement. A statement that computes to less than one FLUX is recorded with zero units.

**Rule 3.3.** A site owned by the Foundation, by a Foundation board member, or by the reviewer's firm may not issue. A site owned by Solflow Holding or its funds may issue only when the reviewer is accredited under ISO/IEC 17029 (**WG-3**).

# 4. Period

**Rule 4.1.** A period is at most three calendar months. A period aligns with a calendar quarter unless the site's meter reading cycle makes that impossible. In that case the issuer states the reason in the bundle.

**Rule 4.2.** Periods do not overlap. Every delivery falls into exactly one period by its delivery date.

**Rule 4.3.** A statement is submitted within 60 days after the period ends.

# 5. Classification of inputs

Every input to the site is listed and tagged as flow or stock. The tag decides the flow fraction under Rule 8.

**Rule 5.1. Sunlight.** Electricity and heat generated inside the site boundary from solar or wind are flow.

**Rule 5.2. Grid electricity.** Electricity from a public grid is stock in v0.1. A cancelled guarantee of origin for the period does not change the tag in v0.1 (**WG-4**).

**Rule 5.3. Water.**

- Seawater, brackish water and rainwater are flow.
- Surface water and groundwater are flow only when the site holds an abstraction permit and the metered abstraction in the period is within the permitted volume. The permit is in the bundle.
- Water from a public utility is stock.

**Rule 5.4. Air and carbon dioxide.** Carbon dioxide taken from ambient air is flow. Carbon dioxide from an industrial flue is stock in v0.1 (**WG-5**).

**Rule 5.5. Biology.**

- Biomass grown inside the site boundary is flow.
- Purchased biomass, including agricultural and forestry residue, is flow. The origin is disclosed in the bundle.
- Seed, inoculum and culture stock are flow.

**Rule 5.6. Closed loop.** Material recovered and reused inside the site boundary is flow. Recycled material purchased from outside the boundary is stock in v0.1 (**WG-6**).

**Rule 5.7. Everything else is stock.** This includes mined nutrients, fossil feedstock, virgin polymer additives, solvents, catalysts and packaging.

**Rule 5.8.** Where the issuer cannot show the origin of an input, the input is stock.

# 6. Measurement and evidence tiers

**Rule 6.1.** Every input amount comes from a meter reading, a weighbridge ticket or a purchase invoice. Every output amount comes from a weighbridge ticket or a calibrated scale, matched to a delivery note and a sales invoice.

**Rule 6.2.** Every file in the bundle carries a hash, a role and the field it supports.

**Rule 6.3. Evidence tiers.**

| Tier | Evidence | Use |
|---|---|---|
| 1 | Default factors, estimates, self-reported totals without documents | Not eligible for issuance |
| 2 | Site meters, weighbridge tickets, invoices, delivery notes, signed displacement letter | Minimum for issuance under v0.1 |
| 3 | Tier 2 plus calibration certificates under 12 months old, laboratory analysis of product composition, and a reviewer site visit in the last 12 months | Required for statements used in fund reporting or EU Green Bond impact reports |

**Rule 6.4.** The tier is printed on the statement and on the register entry.

# 7. Mass balance

**Rule 7.1.** For every period the issuer reconciles the site mass balance:

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inputs by mass = delivered product + by-products + waste + stock change + losses
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**Rule 7.2.** The reconciliation gap is the unexplained difference as a share of total inputs by mass. The gap must be 5 percent or less (**WG-7**). A larger gap fails the statement.

**Rule 7.3.** Inputs without mass, such as electricity and sunlight, are not in the mass balance. They are disclosed under Rule 8.4.

**Rule 7.4.** The mass balance uses the product mass as delivered. Where the product moisture content exceeds 15 percent, the dry mass is used and the moisture analysis is in the bundle (**WG-8**).

# 8. Flow fraction

**Rule 8.1.** The flow fraction is the share of the delivered product mass that consists of material tagged flow under Rule 5.

**Rule 8.2.** Only material embodied in the product enters the flow fraction. Process inputs that do not sit in the product, such as nutrients, solvents and catalysts, do not reduce the flow fraction.

**Rule 8.3. Stock input intensity.** The issuer discloses the total mass of stock process inputs per tonne of delivered product. If stock process inputs exceed 25 percent of delivered product mass, the site fails the flow-source test and the statement is rejected (**WG-9**).

**Rule 8.4. Stock energy intensity.** The issuer discloses stock electricity and fuel per tonne of delivered product. No cap in v0.1 (**WG-10**).

**Rule 8.5.** Where the composition of the product is not measured, the flow fraction is computed from the recipe and the purchase records of every embodied input. Tier 3 requires a laboratory analysis.

# 9. Displacement and substitution ratio

**Rule 9.1.** A tonne of product counts only when it replaces a stock material for the same function at a named buyer.

**Rule 9.2.** The buyer signs a displacement letter. The letter names the displaced material, the application, the quantity replaced in the period, and the prior supplier or supply chain. The buyer attaches purchase records for the displaced material from the previous 12 months.

**Rule 9.3.** The substitution ratio is 1.0 only when the product specification and the displaced material specification show the same function at the same mass. Otherwise the ratio is the mass of displaced material replaced per tonne of product, computed from the two specifications and stated in the bundle.

**Rule 9.4.** Where no specification match is possible, the working group publishes a default ratio per material pair. Defaults are conservative. Until a default exists, the ratio is 0.5 (**WG-11**).

**Rule 9.5.** Without a displacement letter, the delivered tonnes are recorded on the register with zero units.

# 10. Additionality

**Rule 10.1.** The buyer's purchase records under Rule 9.2 are the additionality evidence. They show that the demand existed and was met by stock before the period.

**Rule 10.2.** New demand that never used a stock material does not qualify in v0.1 (**WG-12**).

**Rule 10.3.** A buyer who is a related party of the issuer must be disclosed. The reviewer applies a higher sample under Rule 13.

# 11. Calculation

**Rule 11.1.**

```
FLUX = delivered mass × flow fraction × substitution ratio
```

computed per buyer, then summed over the period.

**Rule 11.2.** The result is rounded down to a whole number of units.

**Rule 11.3.** The calculation is performed by the reference rule engine published by the Foundation for the methodology version named on the statement. The issuer and the reviewer run the same engine on the same bundle and must obtain the same result.

# 12. Double counting and exclusivity

**Rule 12.1.** One tonne of delivered product produces at most one FLUX across all periods and all registers.

**Rule 12.2.** The issuer declares on the statement every other scheme under which the same site or the same product is certified or credited. Carbon credits on the same activity are disclosed. They do not block issuance, because FLUX makes no carbon claim.

**Rule 12.3.** A tonne recorded under another material-flow unit scheme may not be issued as FLUX (**WG-13**).

# 13. Review procedure

**Rule 13.1.** Every statement is reviewed before issuance by an independent reviewer under ISSA 5000 at limited assurance. Reasonable assurance may be requested by a holder and is stated on the entry.

**Rule 13.2. Independence.** The reviewer is not employed by, owned by or paid a contingent fee by the issuer, Solflow Holding, or the Foundation. The reviewer’s fee does not depend on the number of units. A reviewer rotates off a site after five consecutive years (**WG-14**).

**Rule 13.3.** The reviewer tests six assertions and records the test in the bundle:

| Assertion | Test |
|---|---|
| Existence | Delivery notes match weighbridge tickets, sales invoices and payment records |
| Completeness | The purchase ledger for the period contains no input missing from the input list |
| Accuracy | Meter readings agree with calibration certificates and with independent sources such as inverter logs |

| Assertion | Test |
|---|---|
| Cut-off | Every delivery date falls inside the period |
| Classification | Every stock tag and every flow tag is traced to an origin document |
| Boundary | The meters and scales sit inside the boundary on the map |

**Rule 13.4. Sampling.** The reviewer tests every item flagged by the evidence tools under Rule 14 and a random sample of at least three unflagged items per assertion. For a related-party buyer the sample doubles.

**Rule 13.5. Materiality.** An aggregate error above 5 percent of computed units fails the statement (**WG-15**).

**Rule 13.6. Site visit.** The reviewer visits the site before the first statement is issued and at least once every 12 months. A statement submitted more than 12 months after the last visit is recorded at Tier 2 at most.

**Rule 13.7. Outcome.** The reviewer signs the statement, or rejects it with the failed rule numbers. A rejected statement may be resubmitted once for the same period.

**Rule 13.8.** The reviewer's working papers are in the bundle. The reviewer's name, firm and signature are on the register entry.

# 14. Automated tools and agents

**Rule 14.1.** Automated tools, including AI agents, may read documents, extract fields, match records, classify inputs as a proposal, detect anomalies in meter data and draft working papers.

**Rule 14.2.** The FLUX count is produced only by the reference rule engine under Rule 11.3. No agent produces or adjusts a unit count.

**Rule 14.3.** The following decisions are made by the reviewer and recorded with a timestamp in the bundle. No tool makes them:

- The stock or flow tag on every input
- The substitution ratio
- The materiality judgment
- The site visit finding
- The signature

**Rule 14.4.** Every tool output in the bundle carries the tool name, version, model identifier where a language model is used, the input file hashes and the output hash. Every run is reproducible from the bundle.

**Rule 14.5.** The reviewer does not rely on a tool output without testing it under Rule 13.4. This follows the ISSA 5000 application material on overreliance on automated tools.

# 15. The evidence bundle

**Rule 15.1.** The bundle contains:

1. Site record: boundary map, meter list, responsible person, other schemes under Rule 12.2
2. Period statement: the fields in Appendix A
3. Raw files: meter exports, weighbridge tickets, delivery notes, invoices, permits, calibration certificates, displacement letters, specifications
4. Evidence index: every file with hash, role and supported field
5. Tool outputs under Rule 14.4
6. Rule engine result and rule log for the methodology version
7. Reviewer log: every decision under Rule 14.3 with timestamp, sampling record, assertion tests, working papers
8. Signatures: issuer, reviewer

**Rule 15.2.** The bundle is sealed. The seal is a hash over the bundle content. The hash is on the register entry. Any change to the bundle after sealing breaks the seal.

**Rule 15.3.** Raw files stay confidential to the issuer, the reviewer and the Foundation. The register shows the statement fields and the hash. A holder may disclose selected fields to a third party with proof against the seal. Selective disclosure is phase 2.

# 16. The FLUX Register

**Rule 16.1.** The Foundation operates the FLUX Register. The register is public, append-only and hash-chained. The register specification is a separate document.

**Rule 16.2.** Entry types: site registration, period statement, review, issuance, transfer, retirement, correction, revocation.

**Rule 16.3.** A unit is issued when the review entry is signed. A unit is retired when a holder uses it in a report or a claim. A retired unit cannot be transferred.

**Rule 16.4.** A correction entry references the entry it corrects. No entry is deleted or edited.

**Rule 16.5.** The Foundation revokes units when a review is found to be wrong or fraudulent. The revocation entry names the reason. Revoked units are removed from every holder’s balance.

# 17. Governance and versions

**Rule 17.1.** The working group owns this document. The Foundation board approves each version. The board has a majority of members with no role in Solflow Holding.

**Rule 17.2.** A statement names the methodology version it was computed under. A version change does not alter issued units.

**Rule 17.3.** Version 0.x is a pilot. Units issued under 0.x are marked “pilot” on the register. Version 1.0 requires at least three issued statements from at least two sites and one full review cycle.

# 18. Worked example

Site: an algae bioreactor in Guanacaste, Costa Rica. Product: biopolymer film grade. Period: 1 January to 31 March 2027. All numbers are invented for illustration.

### Inputs

| Input | Amount | Evidence | Tag | Rule |
|---|---|---|---|---|
| Solar electricity | 120 MWh | Inverter meter export | Flow | 5.1 |
| Grid electricity | 8 MWh | Utility invoice | Stock, energy | 5.2 |
| Seawater | 4,000 m³ | Intake flow meter | Flow | 5.3 |
| Carbon dioxide from air | Derived from biomass carbon content | Harvest log, composition | Flow | 5.4 |
| Phosphate nutrient | 1.2 t | Purchase invoice | Stock, process | 5.7 |
| Plasticizer additive | 0.5 t | Purchase invoice | Stock, embodied | 5.7 |

### Outputs

| Output | Amount | Evidence |
|---|---|---|
| Biopolymer delivered | 10.0 t | 14 weighbridge tickets, 14 delivery notes, 3 invoices |
| Residue sold as feed | 2.0 t | Weighbridge ticket, invoice |
| Dry biomass harvested | 12.5 t | Harvest log |
| Losses and stock change | 0.5 t | Reconciliation |

**Mass balance (Rule 7).** 12.5 t biomass plus 0.5 t additive in. 10.0 t product, 2.0 t residue, 0.5 t losses, 0.5 t additive accounted inside product. Gap 0 percent. Pass.

**Flow fraction (Rule 8).** Product 10.0 t. Embodied stock 0.5 t. Flow fraction 9.5 / 10.0 = 0.95. Stock input intensity 1.2 / 10.0 = 0.12 t per t. Under the 0.25 cap. Pass. Stock energy intensity 0.8 MWh per t. Disclosed.

**Displacement (Rule 9).** Buyer letter names virgin polyethylene film, same application, 10.0 t replaced, prior supplier named, 12 months of polyethylene invoices attached. Specifications match at equal thickness. Ratio 1.0.

**Calculation (Rule 11).** 10.0 × 0.95 × 1.0 = 9.5. Rounded down. **9 FLUX.**

**Review (Rule 13).** Tier 2. Limited assurance. Site visited 12 January 2027. Three flags from the matching tool: one delivery note with a date outside the period, resolved as cut-off error, tonnes moved to next period; two invoice amounts with rounding differences under 1 percent, accepted. Random sample of three per assertion, no findings. Materiality 5 percent, aggregate error 0.3 percent. Signed.

**Register.** Site entry, statement entry, review entry, issuance of 9 pilot units to the issuer. Bundle hash on the entry.

# Appendix A. Statement fields

| Field | Content |
|---|---|
| Site ID and name | Register ID |
| Period | Start and end date |
| Product | Name and specification reference |
| Delivered mass | Tonnes, per buyer |
| Flow fraction | Share and the embodied stock list |
| Displaced material and buyer | Per buyer, letter reference |
| Substitution ratio | Per buyer, basis |
| FLUX issued | Whole units |
| Stock input intensity | Tonnes per tonne |
| Stock energy intensity | MWh per tonne |
| Evidence tier | 2 or 3 |
| Assurance level | Limited or reasonable |
| Methodology version | 0.1 |
| Reviewer | Name, firm, signature, date of last site visit |
| Other schemes | Rule 12.2 disclosure |
| Bundle hash | sha256 |

| Field | Content |
|---|---|
| Co-benefits | Flow electricity, flow water, jobs, other. Information only. |

# Appendix B. Working group questions

| ID | Question | Rule |
|---|---|---|
| WG-1 | Licence: CC BY-SA 4.0 or CC BY 4.0 | Status |
| WG-2 | Scope of products in v0.1: include food? | 3.1 |
| WG-3 | Conditions for Solflow-owned sites to issue | 3.3 |
| WG-4 | Guarantees of origin for grid electricity | 5.2 |
| WG-5 | Industrial flue carbon dioxide as flow or stock | 5.4 |
| WG-6 | External recycled material with chain of custody | 5.6 |
| WG-7 | Reconciliation gap threshold | 7.2 |
| WG-8 | Moisture threshold for dry mass | 7.4 |
| WG-9 | Stock input intensity cap | 8.3 |
| WG-10 | Cap on stock energy intensity | 8.4 |
| WG-11 | Default substitution ratios per material pair | 9.4 |
| WG-12 | New demand without a stock baseline | 10.2 |
| WG-13 | Recognition of other material-flow schemes | 12.3 |
| WG-14 | Reviewer rotation period | 13.2 |
| WG-15 | Materiality threshold | 13.5 |

# Appendix C. Standards this methodology draws on

| Standard | What is taken |
|---|---|
| ISCC PLUS | Three-month balance period, input classification, annual site audit |
| ISO 14040 and 14044 | The functional unit behind the substitution ratio |
| GHG Protocol | Evidence tiers, conservatism, baseline logic |
| ISSA 5000 | Review engagement standard, limited and reasonable assurance, treatment of automated tools |

| Standard | What is taken |
| --- | --- |
| ISO/IEC 17029 and ISO 14065 | Accreditation of reviewers for Tier 3 use |
| ESRS E5 | Resource inflow and outflow reporting in tonnes, the reporting hook for CSRD reporters and Article 9 funds |