

MSR-X — Public LCA Technical Summary

Carbon Avoidance (CA) per Polymer — Cradle-to-Gate
Version 2 — Public Disclosure (October 2025 Update)

Document Control

Field	Detail
Prepared by	Xworks Holdings Ltd (United Kingdom)
Reviewed by	Control Union — October 2025
Framework Alignment	ISO 14040 / 14044 / 14067 · Gold Standard GS23382
Status	Public Disclosure — Stakeholder & Registry Publication

Public Summary

This document provides a transparent, ISO-aligned overview of how **MSR-X** quantifies *carbon avoidance* (CA) from verified plastics-recycling projects.

It demonstrates scientific rigour and alignment with ISO 14040, 14044, and 14067, and Gold Standard GS23382, while safeguarding proprietary methodological constants and coefficients developed by Xworks AI Ltd (2023–2025) and now maintained by Xworks Holdings Ltd..

Confidential annexes and calculation models are maintained under NDA for accredited **Validation & Verification Bodies (VVBs)** only.

Built-in conservativeness is ensured through:

- Polymer-specific yield and purity factors
- Conservative defaults (75 % yield, 85 % purity)
- A unified 10 % final buffer applied after verification

1 · Standards & Alignment

- **ISO 14040 / 14044 / 14067** — Life-Cycle Assessment & Carbon Footprint quantification
 - **Gold Standard GS23382** — Avoidance-project compatibility
 - **Life-Cycle Thinking:** Cradle-to-gate with system expansion
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2 · Boundary and Allocation

- **System boundary:** Collection → Pelletising → Delivery of secondary raw material
 - **Allocation principle:** System expansion (avoided burden) — recycled polymer displaces virgin resin
 - **Use-phase:** Excluded to prevent double counting
 - **Leakage:** 0 — assured by Digital MRV traceability
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3 · Functional Unit

All impacts normalised to **1 tonne of recycled polymer output**;
results expressed as **tCO₂e avoided per tonne**, aggregated per batch and per project.

4 · Data Foundations

Priority	Data Source / Purpose
1	Primary data — weighbridge & energy meters
2	UK Gov GHG Conversion Factors 2025 — plastics, freight, energy, waste (IPCC AR5)
3	Ecoinvent v3.11 — processes not in UK tables

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4	Peer-reviewed literature / sector benchmarks
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All datasets are **version-controlled, hash-anchored in the Xworks AI MRV ledger**, and fully auditable by VVBs.

Precision Policy — Source data retained at 4–6 decimals; rounding to two decimals only at final reporting stage.

5 · Calculation Framework (Overview Only)

1. Mass balance → verified secondary output
2. Substitution benefit → avoided virgin emissions
3. Project deductions → transport + energy + residual disposal
4. Net avoided = (Avoided Virgin) – (Project Emissions)

A unified 10 % final buffer is applied post-verification to cover residual uncertainty.
Full equations available only to VVBs under NDA.

6 · Emission Factor Mapping — Scope & Sources

Category	Accounted Activity	Primary Source (Public)
Virgin production	Cradle-to-gate EF per polymer	UK GHG Conversion Factors 2025
Freight / Transport	Tonne-km by mode (road + sea)	UK GHG Conversion Factors 2025 – Freight
Processing energy	Electric & thermal use	UK GHG Conversion Factors 2025 – Energy
Waste / Reject disposal	Non-usable fractions	UK GHG Conversion Factors 2025 – Waste

All sources are publicly verifiable and auditable.

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7 · Polymer Performance — Yield & Purity Benchmarks

Polymer	Yield Status	Purity Status
PET	Measured / Typical / Above-benchmark	Measured / Typical / Above-benchmark
HDPE	Measured / Typical / Above-benchmark	Measured / Typical / Above-benchmark
PP	Measured / Typical / Above-benchmark	Measured / Typical / Above-benchmark
LDPE / LLDPE	Measured / Typical / Above-benchmark	Measured / Typical / Above-benchmark
PS / EPS	Measured / Typical / Above-benchmark	Measured / Typical / Above-benchmark
PVC	Measured / Typical / Above-benchmark	Measured / Typical / Above-benchmark
ABS	Measured / Typical / Above-benchmark	Measured / Typical / Above-benchmark

Default assumptions (75 % yield, 85 % purity) used only where site-specific data are absent.

8 · Conservativeness · QA · Traceability

- Measured data override benchmarks
- Missing data → defaults (75 / 85 %)
- Rejected fractions excluded from crediting
- Leakage = 0 through mass balance + geo-tracking
- Each dataset rated via **Data Quality Rating (DQR)**

- All datasets version-controlled and hash-anchored
 - Unified 10 % final buffer applied post-calculation
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9 · Governance & Transparency

- Methodology updates issued whenever EF datasets or scientific references change
 - Independent VVB access under NDA for replication and audit
 - Public summaries validated by VVB before publication
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10 · Carbon Credit Derivation & Issuance

Each LCA yields a net avoided emission value (tCO₂e) per polymer batch.
After verification and buffer application:

1 MSR-X Credit = 1 tCO₂e avoided (after 10 % buffer)

Credits are issued via the **Gold Standard Registry** (or equivalent) and tokenised on-chain for end-to-end traceability.

Each token includes:

- Unique identifier
- Validator signature
- Metadata linking to the verified MRV record and LCA summary

Every MSR-X Credit represents a verified, traceable, non-reusable unit of carbon avoidance.

Proof-of-Integrity Layer

Field	Detail
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Anyone can verify this document's authenticity by matching the hash above to the public MRV ledger entry.

Disclaimer

This public summary omits all proprietary equations, constants, and coefficients to protect MSR-X intellectual property.

It is published solely to illustrate methodological logic, life-cycle structure, and compliance with ISO and Gold Standard requirements for verifiable carbon-avoidance crediting.

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