

LCA Action Plan Report

LEED v4.1 Life Cycle Impact Reduction Action Plan TrueGreen Hot Rolled Reinforcement Bars in Long/Coil Form

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EPD valid until: 21 April 2030

Baseline inventory year: 2023

Product system: DRP1-DRP2, SMP1-SMP2, with RM1, RM2, RM3 and RM5

Public EPD link: <https://environdec.com/library/epd19773>

Public action plan URL: [Responsible Customer Relationship – EMSTEEL](#)

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Abbreviations

Abbreviation	Full form
A1-A3	Product stage: raw material supply, transport and manufacturing
C1-C4	End-of-life stage: deconstruction, transport, waste processing and disposal
CCUS	Carbon Capture, Utilization and Storage
DRI	Direct Reduced Iron
DRP	Direct Reduction Plant
EDF	Electric Arc Furnace
EPD	Environmental Product Declaration
GWP	Global Warming Potential
KPI	Key Performance Indicator
LCA	Life Cycle Assessment
LCIA	Life Cycle Impact Assessment
LRF	Ladle Refining Furnace
Module D	Benefits and loads beyond the product system boundary
PCR	Product Category Rules
REC	Renewable Energy Certificate
RM	Rolling Mill
SMP	Steel Melting Plant
WDP	Water Deprivation Potential

1. Purpose and LEED Applicability

This LCA Action Plan translates the findings of the product-specific Life Cycle Assessment (LCA) and Type III Environmental Product Declaration (EPD) for **TrueGreen Hot Rolled Reinforcement Bars in Long/Coil Form** into a structured programme for maintaining and improving environmental performance over the action-plan period.

The report is intended to support **LEED v4.1 Building Product Disclosure and Optimization - Environmental Product Declarations, Option 2 / Life Cycle Impact Reduction Action Plan** by providing a product-specific, time-bound plan based on the same declared unit and LCA basis as the published EPD.

The Action Plan is intended to:

- Identify the largest life-cycle impact areas and the principal manufacturer-controlled improvement levers;
- Define specific actions, indicators, owners and dated milestones;
- Establish a quantitative GWP reduction objective for the A1-A3 product stage;
- Distinguish current controls from future improvement measures;
- Maintain traceability to the underlying LCA/EPD and support future LCA and EPD updates; and
- Provide customers with a standalone document for LEED documentation once the approved plan is publicly available.

2. Basis, Document Control and Reference Documents

Underlying EPD. EPD-IES-0019773:007, TrueGreen Hot Rolled Reinforcement Bars in Long/Coil Form, published in the International EPD System. The EPD is in accordance with ISO 14025:2006 and EN 15804:2012+A2:2019/AC:2021, uses PCR 2019:14 Construction Products, version 1.3.4, and is independently verified by Bureau Veritas Certification Sweden AB.

Document control item	Definition
Action plan ID	EMSTEEL-LCA-AP-REBAR-SMP12-2026-01
Product	TrueGreen Hot Rolled Reinforcement Bars in Long/Coil Form
Action plan creation date	26 September 2026
Action plan expiration	21 April 2030 (not later than the current EPD validity date)
EPD registration	EPD-IES-0019773:007, Version 5
EPD publication / update	21 April 2025 / 20 August 2026
EPD expiration	21 April 2030
Foreground data year	Calendar year 2023
Programme operator	EPD International AB - The International EPD System
Independent verifier	Bureau Veritas Certification Sweden AB
Public EPD URL	https://environdec.com/library/epd19773
Public action plan URL	Responsible Customer Relationship – EMSTEEL

Reference basis: EPD-IES-0019773:007, updated 20 August 2026; USGBC LEED v4.1 BD+C Addenda, 14 February 2025, action-plan guidance.

3. Product and Assessment Scope

Element	Baseline definition
Product	TrueGreen Hot Rolled Reinforcement Bars in Long/Coil Form
Declared unit	One metric ton of TrueGreen Hot Rolled Reinforcement Bars in Long/Coil Form used for industrial applications.
Manufacturing route	Imported iron ore pellets -> gas-based DRI production -> EAF melting with DRI and scrap -> LRF refining -> continuous casting -> hot rolling -> cooling and finishing.
Facilities	DRP1/DRP2, SMP1/SMP2 and RM1/RM2/RM3/RM5 at Emirates Steel, Abu Dhabi, UAE.
System boundary	Cradle-to-gate with options: A1-A3, C1-C4 and Module D. A4, A5 and B1-B7 are not declared.
End-of-life scenario in EPD	70% recycling and 30% landfilling; Module D reports recycling potential beyond the product system boundary.
Product content note	EPD reports approximately 98% total iron content by weight and 5% post-consumer recycled material content by weight.

4. LCA Methodology, Data Sources and Modelling

LCA standards and PCR. The product-specific LCA follows ISO 14040:2006 and ISO 14044:2006 and the EPD conforms to ISO 14025:2006 and EN 15804:2012+A2:2019/AC:2021 using PCR 2019:14 Construction Products, version 1.3.4.

LCA modelling item	EPD basis
LCA software	SimaPro Experts, version 9.5.0.2
Background database	Converted ecoinvent 3.9.1 data as unit processes with links to other processes; compiled January 2023
LCIA method	EN 15804 +A2 (adapted) V1.00 / EF 3.1 normalization and weighting set
Foreground data	Primary operational data collected for calendar year 2023 from Emirates Steel production facilities
Electricity modelling	Market-based electricity mix: 16% grid electricity and 84% clean sources; the clean-source mix modelled in the EPD is 25.72% solar and 74.28% nuclear
Allocation	Mass-based allocation where needed, including SMP2 billet/beam-blank outputs, rolling-mill outputs and water allocation as described in the EPD
Geographical scope	Global EPD scope; manufacturing site in Abu Dhabi, UAE

Data-quality objective. The Action Plan will preserve traceability between operational data, energy certificates, allocation calculations, upstream datasets and future LCA updates. Changes that materially affect the product system will be screened before environmental improvements are made.

5. Environmental Baseline and Life-Cycle Hotspots

Controlling baseline. The published EPD is the controlling environmental baseline for this plan. The table below reproduces selected impact indicators by declared module for one metric ton of product. Module D is reported separately as a potential benefit/load beyond the product system boundary and is not used to reduce the A1-A3 target baseline.

Indicator	Unit	A1-A3	C1	C2	C3	C4	D
GWP-total	kg CO2e	582	46.4	53.3	224	1.83	-262
GWP-fossil	kg CO2e	579	35.6	53.2	222	1.82	-262
GWP-luluc	kg CO2e	0.520	10.7	0.026	0.224	0.0011	-0.200
Acidification potential	mol H+ eq.	5.01	0.144	0.319	0.00884	0.00687	-3.65
Eutrophication - freshwater	kg P eq.	0.0186	0.138	0.000497	0.00453	0.0000178	-0.0121
Eutrophication - marine	kg N eq.	1.27	0.0914	0.130	0.173	0.00524	-1.02
Eutrophication - terrestrial	mol N eq.	14.5	0.480	1.41	1.96	0.0565	-11.7
Photochemical ozone formation	kg NMVOC eq.	5.18	2.77	0.453	0.624	0.0197	-4.29
ADP - fossil	MJ	27,200	570	780	1,490	45.4	-25,000
Water deprivation potential	m3 deprived	147	8.84	3.94	22.3	2.01	-116

Source: EPD-IES-0019773:007, environmental performance results. Values are rounded for presentation; the published EPD remains the controlling source.

Hotspot interpretation and action linkage

Impact area	LCA/EPD finding	Action-plan response
GWP-total / GWP-fossil	A1-A3 is the largest positive contribution.	Maintain CCUS contribution represented in the underlying LCA; increase clean-electricity coverage; improve DRI natural-gas efficiency, EAF electrical efficiency and production yield.
GWP related to land use and land-use change	C1 is the largest contribution in the EPD.	Maintain transparent end-of-life assumptions and data quality. This is not treated as a manufacturer-controlled reduction lever unless EMSTEEL can directly influence the relevant process.
Freshwater eutrophication	C1 is the largest contribution.	Maintain and improve modelling quality for end-of-life assumptions; focus manufacturer-controlled operational measures on water/resource efficiency.
Abiotic depletion - minerals/metals	C3 is the largest contribution.	Review end-of-life datasets and assumptions. Avoid claiming reductions from scenario changes alone.
Water deprivation and net freshwater use	A1-A3 is the main operational focus.	Monitor withdrawal, consumption and discharge; implement technically feasible water-efficiency measures.
Waste and circularity	A1-A3 non-hazardous waste disposed is 488 kg/t in the EPD.	Continue assessment and implementation of recovery/beneficial-use options for EAF slag, LRF slag, mill scale and metallic recovery where feasible.

CCUS sensitivity note. The source action plan records that the underlying product-specific LCA included a CCUS sensitivity analysis and identified CCUS as a material GWP lever. The numerical sensitivity scenario is not reproduced in this revised report because the verified EPD baseline is 582 kg CO₂e/t A1-A3 and the supporting LCA report was not provided with this revision. This avoids mixing non-EPD scenario values with the controlling verified baseline.

6. Priority LCA Improvement Actions

6.1 Action 1: Maintain and Monitor CCUS Performance

Objective. Maintain the CCUS arrangement represented in the underlying LCA baseline and monitor its continued contribution to product climate performance.

Specific implementation steps.

- Monitor captured and transferred CO₂ quantities relevant to the assessed production route;
- Maintain a documented allocation approach for captured CO₂ to the product system;
- Record material operational changes, outages or changes in capture/transfer arrangements;
- Screen material changes for LCA recalculation before making product-level environmental claims.

KPIs.

- CO₂ captured and transferred
- Captured CO₂ allocated to the assessed product system
- Material CCUS changes screened for LCA relevance

Owner. Operations / Decarbonization

6.2 Action 2: Increase Clean-Electricity Utilization and Improve Energy Efficiency

Objective. Reduce manufacturer-controlled energy-related impacts across DRI, EAF, casting and rolling while maintaining robust evidence for market-based electricity sourcing.

Specific implementation steps.

- Maintain records supporting clean-electricity Environmental attributes (i.e. IRECs);
- Progress toward 100% clean electricity by 2030, subject to contractual availability and traceable energy attributes;
- Improve energy efficiency by approximately 1% year on year in line with the existing decarbonization strategy;
- Improve natural-gas efficiency in DRI production and electrical efficiency in EAF operations;
- Track production yield and model material process changes before claiming product-level improvement.

KPIs.

- Electricity per tonne of finished reinforcement bar
- Fuel / natural gas intensity
- Clean-electricity coverage (%)
- Finished-product yield (%)

Owner. DRP / SMP / RM Operations, Energy, Decarbonization

6.3 Action 3: Improve Water and Waste / Resource Efficiency

Objective. Improve resource efficiency through operational water management and recovery or beneficial use of production residues where technically, environmentally and commercially feasible.

Specific implementation steps.

- Reconcile LCA water indicators with the operational water balance;
- Monitor water withdrawal, consumption and discharge;
- Continue assessment and implementation of feasible recovery / beneficial-use routes for EAF slag, LRF slag and mill scale;
- Assess metallic recovery opportunities and document implemented changes.

KPIs.

- Freshwater consumption per tonne of product
- Waste sent to disposal per tonne
- Waste recovered/recycled per tonne
- Implemented recovery projects and quantified material flows

Owner. Environment / Operations

6.4 Action 4: Strengthen LCA Data Quality and Upstream Data

Objective. Improve accuracy, representativeness and traceability of data used in future product-specific assessments.

Specific implementation steps.

- Review significant proxy and background datasets at least annually;
- Seek supplier-specific data for material upstream inputs where available and sufficiently robust;
- Review allocation calculations and end-of-life assumptions during each annual screening;
- Maintain an annual LCA change register;
- Screen significant operational, sourcing and methodology changes to determine whether recalculation is required.

KPIs.

- Unresolved material data gaps
- Supplier-specific data coverage for material inputs
- Annual LCA change screening completed

Owner. ESG & Sustainability / Procurement / Operations

7. Four-Year Implementation and Monitoring Schedule

The following schedule provides specific dated milestones for implementation, monitoring and LCA review. *Operational improvement measures remain subject to technical feasibility, plant operating conditions and*

formal internal approval; however, the monitoring and review milestones are mandatory actions under this plan.

Period / due date	Required milestone	Primary output / evidence	Owner(s)
By 31 Dec 2026	Establish controlled 2023 LCA baseline file, annual change register, action owners and evidence folders. Confirm public action-plan publication route.	Controlled baseline; owner matrix; publication plan	ESG & Sustainability
By 31 Mar 2027	Complete first annual reconciliation of CCUS, electricity certificates, energy intensity, yield, water and waste; record material changes since baseline.	2026 performance and change-screening record	Operations / ESG & Sustainability
By 31 Dec 2027	Implement approved energy/resource-efficiency measures and review supplier-specific upstream data opportunities.	Implementation evidence; KPI trend; data-gap update	Operations / Procurement / ESG & Sustainability
By 31 Mar 2028	Complete annual LCA change screening and quantify progress against the 10% A1-A3 GWP reduction objective using updated operational data where available.	2027 annual review and LCA screening	ESG & Sustainability / Decarbonization
By 31 Dec 2028	Continue clean-electricity progression and approved DRI/EAF/RM efficiency measures; implement feasible water/waste recovery actions.	Implementation evidence and KPI trend	Operations / ESG & Sustainability
By 31 Mar 2029	Complete annual LCA change screening; review background datasets, allocations, end-of-life assumptions and supplier-specific data availability.	2028 annual review and data-quality assessment	ESG & Sustainability
By 31 Dec 2029	Prepare final action-plan-period LCI dataset using the most representative operational and upstream data available; close data gaps material to the product result where feasible.	Updated LCI dataset and change log	& Sustainability / Operations / Procurement
By 31 Mar 2030	Recalculate / screen the product-specific LCA sufficiently to determine whether the targeted A1-A3 GWP reduction has been achieved and whether an EPD update is required.	Updated LCA results or documented screening decision	ESG & Sustainability (LCA practitioner)
By 21 Apr 2030	Complete management review of the action plan; publish/update supporting product documentation as applicable before the current EPD expires.	Final action-plan review; EPD update/re-verification decision	SVP ESG & Sustainability / ESG

8. GWP Reduction Target

Baseline. The verified EPD reports A1-A3 GWP-total of 582 kg CO₂e per tonne of TrueGreen Hot Rolled Reinforcement Bars in Long/Coil Form.

Action-plan target. EMSTEEL targets an approximately 10% reduction in A1-A3 GWP-total over the action-plan period relative to the 2023 baseline, equivalent to a target level of approximately 524 kg CO₂e/t or lower, subject to successful implementation and technical feasibility of the identified manufacturer-controlled measures.

Metric	Baseline	Target reduction	Indicative target level
A1-A3 GWP-total	582 kg CO ₂ e/t	Approximately 10%	<= 523.8 kg CO ₂ e/t (approximately 524)

Important LEED interpretation. This Action Plan establishes a future improvement objective; it does not itself demonstrate that a 10% GWP reduction has already been achieved. Any future claim of achieved optimization should be supported by an updated product-specific LCA/EPD and the applicable verification/comparability requirements at the time of the claim.

9. Monitoring, Change Control and Review

Annual monitoring. Progress will be reviewed at least annually against the implementation schedule and KPIs in Sections 6 and 7. The LCA change register will record material changes and the evidence used to determine whether recalculation is necessary.

The Action Plan will be reviewed when there is a material change in:

- CCUS performance or allocation
- Electricity sourcing or certificate coverage
- Energy intensity or production yield
- Raw-material or supplier sourcing
- Water consumption or allocation
- Waste-management or recovery route
- LCA datasets, software, allocation rules or methodology
- Product composition or manufacturing process
- Applicable PCR, EPD programme or LEED requirements

EPD change control. The published EPD states that an EPD should provide current information and may be updated if conditions change. EMSTEEL will therefore assess material changes against the applicable International EPD System requirements in force at the time, rather than applying an unsupported fixed threshold in this Action Plan.

10. Public Availability and Customer Use

Underlying EPD. The current Type III EPD is publicly available through the International EPD System: <https://environdec.com/library/epd19773>

Action Plan publication gate. Before this report is issued to customers as LEED documentation, the final approved and signed version must be publicly available. The public URL should replace the cover-page placeholder and remain accessible for the duration of the plan.

Customer documentation package. For project submissions, EMSTEEL should provide the current public EPD together with the public, signed Action Plan. The customer/project team remains responsible for confirming the applicable LEED rating-system version and credit interpretation for its project.

11. Conclusion

The verified EPD establishes a transparent product-specific baseline, with A1-A3 GWP-total of 582 kg CO2e/t and a cradle-to-gate-with-options system boundary covering A1-A3, C1-C4 and Module D. **This Action Plan focuses improvement efforts on manufacturer-controlled levers and strengthens the evidence, schedule and governance needed for LEED customer support.**

1. Maintain and monitor the CCUS contribution represented in the underlying LCA and retain traceable evidence.
2. Progress clean-electricity sourcing and improve energy/process efficiency across DRI, EAF, casting and rolling.
3. Improve water and waste/resource efficiency through operational controls and feasible recovery measures.
4. Strengthen LCA data quality, upstream supplier data and annual change screening.
5. Assess progress against the approximately 10% A1-A3 GWP-total reduction objective before EPD expiry and update/re-verify product documentation as applicable.

Appendix A. LEED v4.1 Action Plan Alignment

This appendix maps the report to the principal LEED v4.1 action-plan information requirements identified in the USGBC BD+C Addenda dated 14 February 2025.

LEED action-plan requirement	Where addressed	Status
Standalone product-specific action plan	Entire report; Sections 1-3	Covered
Unique document ID	Cover; Section 2	Covered
Product type/name or product line	Cover; Sections 2-3	Covered
Creation and expiration dates; maximum four years	Cover; Section 2	Covered - expiration aligned with EPD validity
Product-specific LCA / Type III EPD based on EN 15804 or ISO 21930	Section 2	Covered
Dataset, software or LCA platform	Section 4	Covered - SimaPro 9.5.0.2 / ecoinvent 3.9.1
Public link to underlying LCA/EPD	Cover; Sections 2 and 10	Covered
Summary of largest life-cycle impacts including GWP	Section 5	Covered by module and impact area
Narrative of impact areas targeted for reduction	Sections 5-6	Covered
Specific implementation steps, including manufacturing/process changes	Section 6	Covered
Specific dates and full timeline	Section 7	Covered
Publicly available action plan	Cover; Section 10	Covered
Prepared by individual with product-LCA experience	Cover approval note	Covered, Both Manal and Akshat are LCA experts
Signed by manufacturing-company executive	Cover approval table	Covered

References: (1) EMSTEEL EPD-IES-0019773:007, Version 5, updated 20 August 2026. (2) U.S. Green Building Council, LEED v4.1 BD+C Addenda, 14 February 2025, Embodied Carbon/LCA Action Plan guidance. (3) The International EPD System public EPD library entry for EPD-IES-0019773:007.