EPD OPTIMIZATION REPORT

LEED Credit: LEED v4.1 MRc2 — Environmental Product Declarations, Option 2 (Optimization Assessment)

Product:	Manufacturer:
OPC (CEM I 42.5 N)	Union Cement Company
Issue Date:	**Expiry Date:**
26-Mar-2026	25-Mar-2031

EPD Reference and Optimization Basis

شركة أسمنت الإتحاد (ش.م.خ.)
UNION CEMENT COMPANY (Pr.J.S.C)

Product: Ordinary Portland Cement (CEM I 42.5 N)
Declared Unit: 1 metric ton
System Boundary: Cradle-to-gate with options (A1-A4, C1-D)
Manufacturer: Union Cement Company (Pr.J.S.C), UAE
Program Operator: International Climate Intelligence System (ICIS)
EPD Number: ICIS-202603-126
Issue Date: 26-Mar-2026
Expiry Date: 25-Mar-2031

Basis of Assessment

- Baseline EPD: Ordinary Portland Cement (CEM I 42.5 N) EPD (ICIS-202603-126).
- Same product optimization; no third-party manufacturer EPDs used.
- System boundary: cradle-to-gate (A1–A3); declared unit: 1 metric ton.
- Modeled optimization scenario corresponding to an indicative 12-14% reduction in A1–A3 GWP.
- Improvements limited to manufacturer-controlled parameters in A1 and A3 with unchanged production technology.

Purpose

The purpose of this report is to assess potential cradle-to-gate (A1–A3) environmental impact reduction opportunities for Union Cement Company's Ordinary Portland Cement (CEM I 42.5 N) through a modeled optimization scenario, in accordance with the requirements of LEED v4.1 MRc2 – Environmental Product Declarations (Option 2).

Methodology

The optimization assessment was conducted using a life cycle assessment-based approach consistent with EN 15804+A2 and ISO 14025 principles, aligned with the requirements of LEED v4.1 MRc2 Option 2.

The current Ordinary Portland Cement (CEM I 42.5 N) EPD (ICIS-202603-126) was used as the baseline. A modeled optimization scenario was developed for the same product by adjusting selected, manufacturer-controlled parameters within the cradle-to-gate (A1–A3) system boundary, while keeping the declared unit, production route, and system boundaries unchanged.

The methodology focuses on identifying realistic improvement levers within the A1 (raw material supply) and A3 (manufacturing) stages, including clinker factor optimization and kiln energy efficiency improvements. No changes were made to product classification, functional performance, or downstream life cycle stages.

Environmental impacts were evaluated using the same impact assessment method applied in the baseline EPD to ensure consistency and comparability between the baseline and modeled optimization scenario.

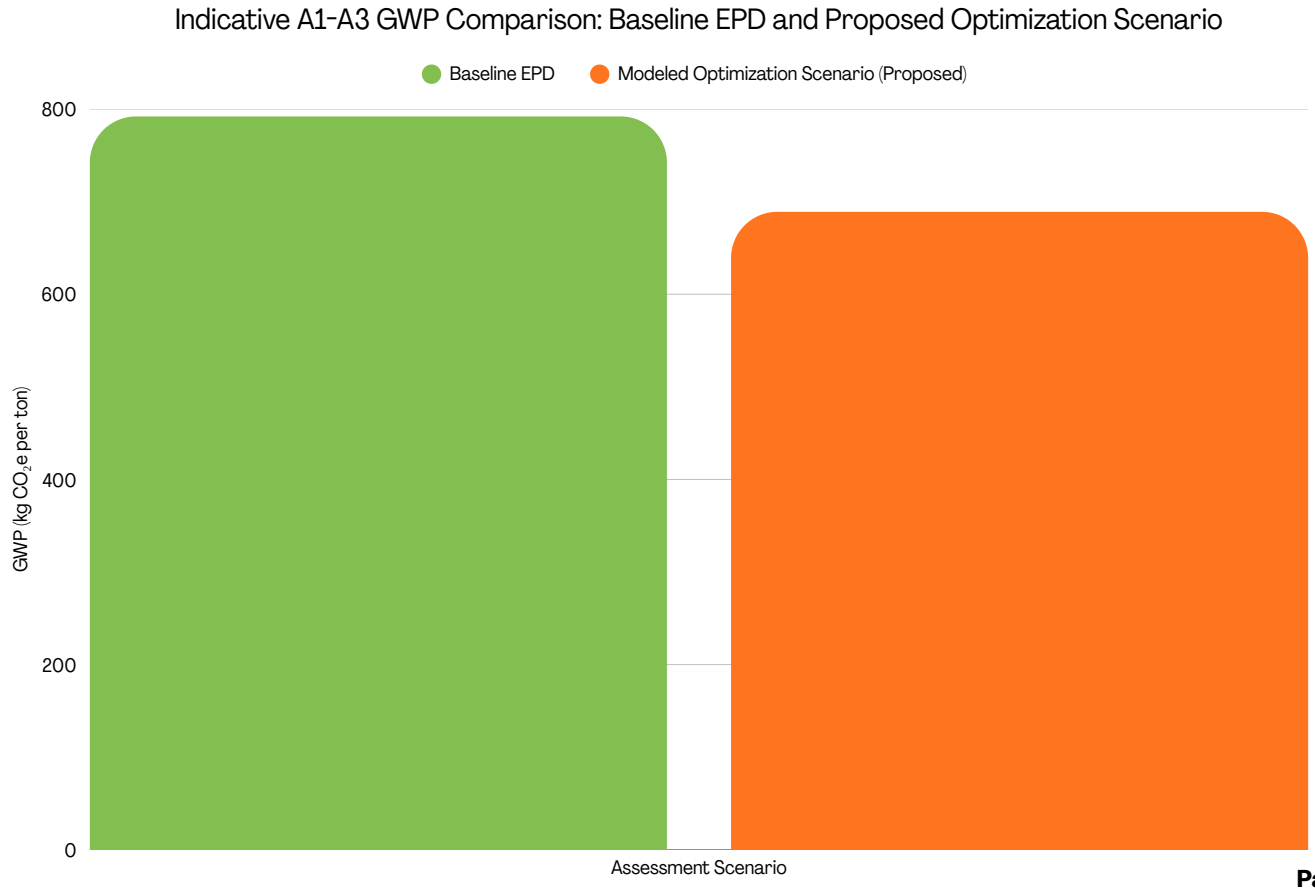
As the optimization scenario is modeled for the same product and manufacturer using identical declared unit, system boundaries, and impact assessment method, the baseline and optimization results are directly comparable.

Results

The cradle-to-gate (A1–A3) Global Warming Potential (GWP) results for the baseline EPD and the modeled optimization scenario are summarized below.

Scenario	**A1-A3 GWP (kg CO_2e / ton)**
Baseline EPD	792
Modeled Optimization Scenario (proposed)	~681-697

The modeled optimization scenario represents a proposed potential reduction of approximately 12-14% in A1–A3 GWP relative to the baseline EPD, subject to implementation of the identified optimization measures.



Key Optimization Opportunities (A1 & A3)

A1 – Raw Material Supply (Clinker System & Inputs)

- Optimize clinker factor (~4–6%) via SCM integration while maintaining CEM I 42.5 N mineralogical and performance compliance.
- Prioritize lower-carbon inputs using supplier-specific emissions data for clinker, gypsum, and corrective materials.
- Improve raw mix design to reduce limestone intensity and process CO_2 from calcination.
- Enhance material efficiency to achieve target strength with reduced clinker through optimized phase composition.
- Optimize packaging and upstream inputs to reduce embodied impacts within A1.

A3 – Manufacturing (Kiln & Grinding Operations)

- Improve kiln thermal efficiency via optimized preheater–precalciner operation and reduced specific heat consumption (GJ/ton clinker).
- Increase alternative fuel substitution rate (AFR) to reduce fossil-derived CO_2 emissions during clinkering.
- Optimize clinker cooling and heat recovery to improve thermal integration and reduce energy losses.
- Enhance grinding efficiency through process optimization and reduction in specific electricity consumption (kWh/ton cement).
- Improve process stability and minimize material losses across pyroprocessing and finish grinding stages.

Key Findings

- The optimization assessment indicates that meaningful reductions in A1–A3 GWP are achievable for OPC through targeted improvements in clinker factor and kiln energy performance within manufacturer-controlled processes.
- A3 remains the dominant contributor to total GWP, with reductions primarily driven by improved pyroprocessing efficiency, thermal energy optimization, and fuel-related emission reduction.
- A1 reductions are governed by clinker intensity, where controlled SCM integration and raw mix optimization provide the most effective pathway for lowering embodied carbon.
- The identified measures focus on material and process efficiency improvements without altering product classification, functional performance, or underlying production technology.
- The reduction potential reflects realistic operational improvements aligned with current cement manufacturing practices rather than fundamental process transformation.
- The optimization approach maintains full comparability with the baseline EPD through consistent system boundaries, declared unit, and impact assessment methodology.
- Overall, the results potentially demonstrate a credible and technically achievable pathway for 12–14% reduction in cradle-to-gate GWP through incremental, performance-aligned optimization measures.

Limitations & Assumptions

This optimization assessment is based on a modeled scenario and represents indicative reduction potential rather than verified or achieved performance. The assessment is limited to cradle-to-gate (A1–A3) life cycle stages and Global Warming Potential (GWP) only; other impact categories and downstream life cycle stages are not evaluated. The modeled optimization assumes implementation of the identified improvement measures, primarily related to clinker factor and kiln energy performance, without changes to product classification, functional performance, or declared unit. Results are intended solely for LEED v4.1 MRc2 Option 2 documentation purposes.

Alan Beski Christopher
Sustainability Manager
GCAS Quality Certifications

Office no. 110, National Insurance Building
Sheikh Zayed Road
P.O. Box 65561
Dubai, UAE
www.gcasquality.com | info.dubai@gcasquality.com

GCAS Quality Certifications - ECO Platform member
