EPD OPTIMIZATION REPORT

LEED v4.1 MRc2 — Environmental Product Declarations, Option 2: Embodied Carbon/LCA Optimization

Product:	Manufacturer:
Reinforcing Steel Bar	Jeddah Steel Factory
Issue Date:	**Expiry Date:**
09-Jul-2026	08-Jul-2031

EPD Reference and Optimization Basis

Product: Reinforcing Steel Bar
Declared Unit: 1 metric ton
System Boundary: Cradle-to-gate with options (A1-A4, C1-D)
Manufacturer: Jeddah Steel Factory Company for Metal Products, Saudi Arabia
Program Operator: International Climate Intelligence System (ICIS)
EPD Number: ICIS-202607-145
Issue Date: 09-Jul-2026
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Basis of Assessment

- Baseline EPD: Reinforcing Steel bar EPD (ICIS-202607-145).
- 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 10-12% 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) Global Warming Potential (GWP) reduction opportunities for Jeddah Steel Factory's Reinforcing Steel Bar through a modeled optimization scenario, in accordance with LEED v4.1 MRc2 — Environmental Product Declarations, Option 2: Embodied Carbon/LCA Optimization.

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 Reinforcing Steel Bar EPD (ICIS-202607-145) 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 improvement levers within A1 and A3, including steel billet efficiency, furnace oil reduction, furnace optimization, rolling electricity efficiency, and loss reduction. 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 scenario is modeled for the same product and manufacturer using identical declared unit, system boundary, and impact assessment method, the baseline and optimization results are directly comparable.

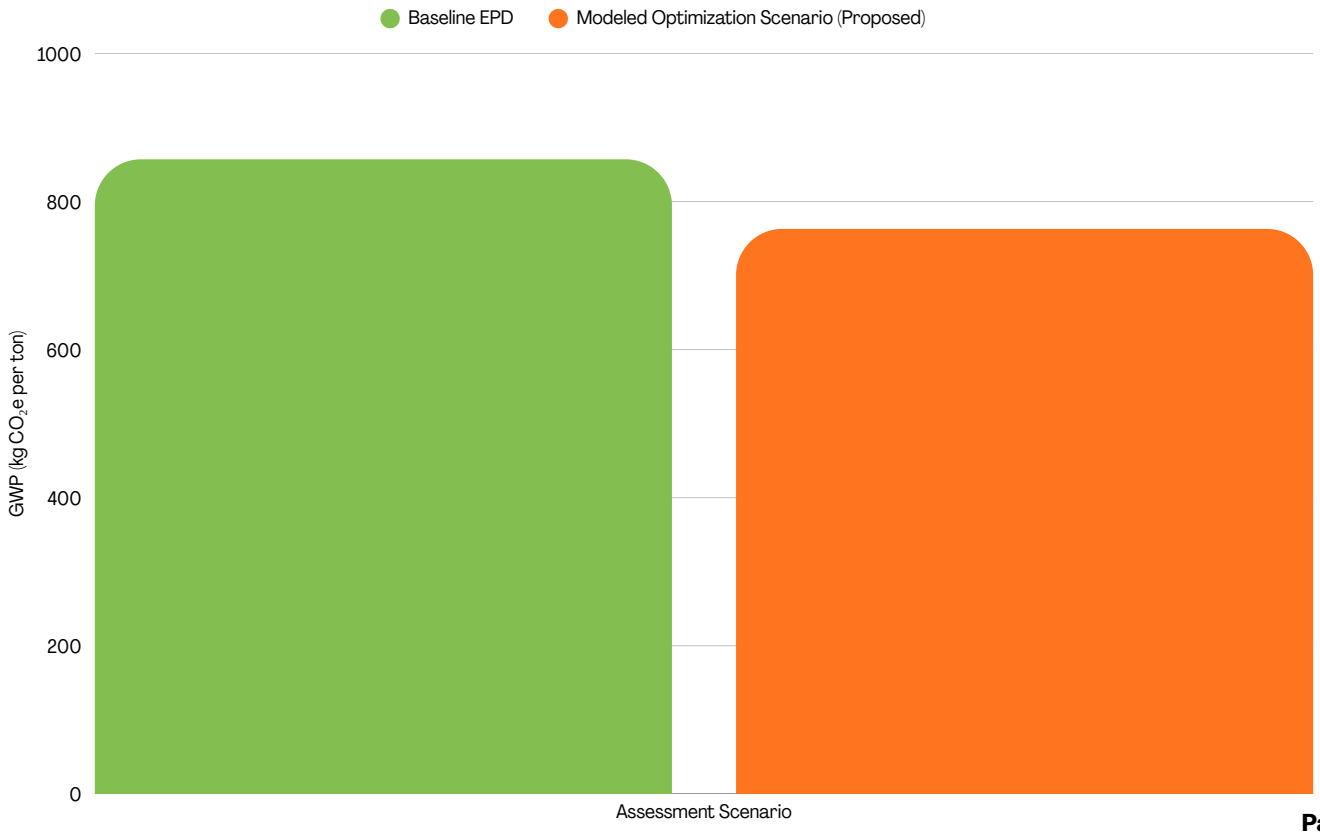
Results

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	857
Modeled Optimization Scenario (proposed)	~754-771

The modeled optimization scenario represents a proposed potential reduction of approximately 10-12% in A1–A3 GWP relative to the baseline EPD, subject to implementation of the identified optimization measures.

Indicative A1-A3 GWP Comparison: Baseline EPD and Proposed Optimization Scenario



Key Optimization Opportunities (A1 & A3)

A1 – Raw Material Supply (Internal Scrap, Billet Production & Inputs)

- Optimize internal scrap use through improved segregation, charging control, and material consistency before melting and billet casting.
- Improve billet production efficiency by reducing yield losses during melting, casting, billet handling, and transfer to rolling operations.
- Strengthen closed-loop material recovery by returning process scrap from rebar production efficiently into the billet production route.
- Maintain Grade 60 / Grade 420 performance through controlled billet chemistry, stable steel quality, and reduced material variability.
- Optimize steel bundling wire and minor upstream inputs to reduce embodied impacts within the A1 boundary.

A3 – Manufacturing (Reheating Furnace & Rolling Operations)

- Improve reheating furnace efficiency through burner tuning, combustion control, insulation improvement, and furnace oil reduction.
- Optimize billet charging practice, furnace residence time, and heat distribution to reduce fuel-related emissions.
- Improve rolling mill electricity efficiency through motor, pump, compressor, and process control optimization.
- Optimize TMT quenching, cooling bed operation, and cutting efficiency to reduce auxiliary energy demand.
- Improve process stability and minimize losses across reheating, rolling, quenching, cutting, internal handling, and packing operations.

Interpretation

The results of the optimization assessment indicate that meaningful reductions in cradle-to-gate (A1–A3) Global Warming Potential (GWP) are potentially achievable for Jeddah Steel Factory's Reinforcing Steel Bar through targeted improvements within manufacturer-controlled processes. The modeled scenario demonstrates that A1 and A3 life cycle stages are the primary levers for reducing embodied carbon, consistent with JSF's billet-to-rebar production route using billets produced from pre-consumer scrap feedstock and energy-intensive reheating, rolling, and TMT processing operations.

The identified optimization opportunities show that further reductions are mainly driven by improved scrap control, billet production efficiency, closed-loop recovery of process scrap, furnace oil reduction, reheating furnace optimization, and rolling mill electricity efficiency. These measures do not require changes to the product classification, Grade 60 / Grade 420 performance, declared unit, manufacturing route, or downstream life cycle stages. The reduction potential is therefore linked to practical operational, material-efficiency, and energy-efficiency improvements within the defined A1–A3 system boundary.

Overall, the interpretation supports the suitability of Jeddah Steel Factory's Reinforcing Steel Bar for LEED v4.1 MRc2 Option 2: Embodied Carbon/LCA Optimization, demonstrating a clear and credible pathway for proposed cradle-to-gate impact reduction, subject to implementation of the identified 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 scrap control, billet production efficiency, reheating furnace performance, furnace oil reduction, and rolling electricity efficiency, without changes to product classification, Grade 60 / Grade 420 performance, or declared unit. Results are intended solely for LEED v4.1 MRc2 Option 2 documentation purposes.

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