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STRATEGIC ANALYSIS REPORT

CBAM & ITS IMPACT ON VIETNAM'S MANUFACTURING ENTERPRISES

EU Carbon Border Adjustment Mechanism:
Quantitative Impact Analysis

April 2026

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EXECUTIVE SUMMARY

The EU's Carbon Border Adjustment Mechanism (CBAM) entered full enforcement on 01 January 2026. The Q1/2026 certificate price is €75.36/tonne CO_2 — the figure published by the EU Commission on 07/04/2026 under Regulation (EU) 2023/956 and IR 2025/2548. The CBAM factor rises from 2.5% (2026) to 100% (2034), creating an escalating financial obligation for enterprises exporting to the EU.

01 CBAM 2030: BF-BOF steel faces ~€133.8/t — exceeding operating EBITDA (€32–65/t) by 2–4× and gross profit (€82–130/t) in a weak cycle.

02 CBAM 2034: Primary aluminium from coal grid faces ~€2,100/t (~90% of selling price) — economically impossible to export to EU.

03 Vietnam's ETS pilot (2025–2028, Decree 119/2025/ND-CP) has not been recognised by the EU for CBAM deduction — effectively €0 offset at present.

04 Vietnam's grid emission factor: 0.66 $kgCO_2$/kWh (official 2023, DNRE) — 3× the EU average — amplifying CBAM burden for EAF steel and aluminium smelting.

05 The action window 2026–2028 (CBAM 2.5–10%) is the only period to build MRV/PCF infrastructure at still-manageable cost. After 2029, the window closes.

I. CBAM: CONTEXT AND MECHANISM

1.1 What is CBAM and Why Does it Matter for Vietnam?

CBAM (Carbon Border Adjustment Mechanism) is the EU mechanism placing a carbon price equivalent to the EU ETS on imports from countries lacking a comparable carbon pricing system — designed to prevent 'carbon leakage'. Legal basis: Regulation (EU) 2023/956 and related implementing regulations.

Vietnam exports approximately $50 billion USD/year to the EU, with 4 of the 6 CBAM sectors (steel, aluminium, cement, fertilisers) involving Vietnamese enterprises. Key structural disadvantages:

- Vietnam is in the ETS pilot phase (2025–2028, Decree 119/2025/ND-CP), however allowances are freely allocated and the EU recognition mechanism is still being developed — in practice there is currently no meaningful basis for CBAM deduction.
- Vietnam's grid emission factor: 0.66 $kgCO_2$/kWh (official 2023, DNRE); 2024 estimate is 0.681 $kgCO_2$/kWh (up due to 17.7% surge in coal power) — 3× the EU level (0.22 $kgCO_2$/kWh)
- No verified emission data → must use Default Values at the highest global emission levels per IR 2025/2621

1.2 Calculation Formula and Legal Basis

The CBAM obligation formula is interpolated from Articles 21–22, Regulation (EU) 2023/956 and related implementing regulations:

INTERPOLATED FORMULA: CBAM Cost = Embedded Emissions (tCO_2/t product) × [CBAM Certificate Price − Carbon Price Paid in Exporting Country (if EU-recognised)] × CBAM Factor (%)

Certificate Price 2026: Volume-weighted average of EU ETS primary auction clearing prices per quarter. Q1/2026 = €75.36/tCO_2 (EU Commission, 07/04/2026). From 2027: weekly average.

CBAM Factor: The share of embedded emissions requiring certificate surrender — rising from 2.5% (2026) to 100% (2034), mirroring the phase-out of EU ETS free allocation (Art. 10a, Directive EU 2023/959).

Deduction: Only applies where carbon price in the exporting country has been formally recognised as an "effective carbon price" by the EU. Recognition rules are still being developed (Call for Evidence, August 2025).

Table 1: CBAM Factor Phase-in Roadmap 2026–2034

Year	2026	2027	2028	2029	2030	2031	2032	2033	2034
CBAM Factor * (official)	2,5%	5%	10%	22,5%	48,5%	61%	73,5%	86%	100%
EU ETS Free Allocation *	97,5%	95%	90%	77,5%	51,5%	39%	26,5%	14%	0%
ETS Price Forecast † (€/tCO_2)	€75	€80	€88	€95	€120	€130	€140	€145	€150

** CBAM Factor (%) is derived from the remaining ETS Free Allocation ratio. ETS Free Allocation factor governed by Article 10a, Directive (EU) 2023/959 (emissions-euets.com/cbam-factor). † ETS Price: market estimate compiled by HOUSELINK Research from Fastmarkets Carbon Analysis 02/2026 and BloombergNEF ECCO 2025 — not a legally prescribed figure.*

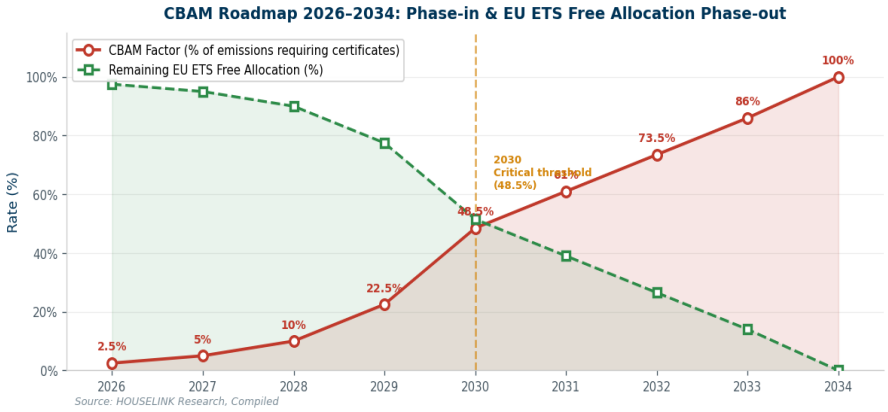

Figure 1 — CBAM Phase-in & EU ETS Free Allocation Phase-out Roadmap (2026–2034)

Source: EU Parliament/Council Reg. 2023/956; ICAP 2025. ETS price forecast: HOUSELINK Research, compiled from Fastmarkets & BloombergNEF

1.3 Global Carbon Pricing Context and Vietnam's Position

The impact of CBAM on each country depends on its domestic carbon pricing system. Domestic carbon prices formally recognised by the EU are deducted from the CBAM obligation, creating a significant competitive advantage. However, the formal recognition mechanism is still being developed (EU Commission Call for Evidence, August 2025).

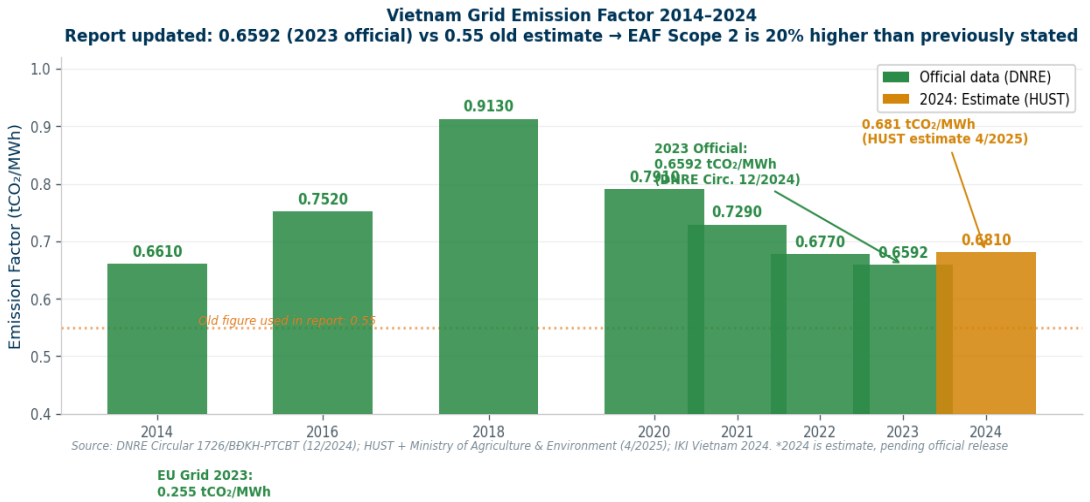

Figure 2 — Vietnam's Grid Emission Factor 2014–2024: updated per official sources

Source: Vietnam Dept. of Climate Change (MONRE), Circular 1726/BĐKH-PTCBT, 03/12/2024 (2023 figure). HUST & Ministry of Agriculture & Environment, April 2025 (2024 estimate). IKI Vietnam 2024

Important Note: Vietnam's official grid emission factor for 2023 is 0.66 $kgCO_2$/kWh (Dept. of Climate Change, Dec 2024) — 3× the EU level (0.22 $kgCO_2$/kWh). In 2024, this figure rose to 0.681 $kgCO_2$/kWh due to a 17.7% surge in coal-fired electricity output. This means EAF steel and primary aluminium producers in Vietnam face a larger CBAM disadvantage than previously forecast.

II. SECTOR-BY-SECTOR IMPACT ANALYSIS

Table 2: CBAM Impact Overview by Sector

Sector / Technology	Emissions (tCO_2/t product)	CBAM 2026 (€/t)	CBAM 2030 (€/t)	CBAM 2034 (€/t)	Risk Level
BF-BOF Steel (Formosa type)	2,30	€4,33	€133,8	€345	Critical
EAF Steel – Coal Grid VN (HPG type) †	~1,25–1,35	€2,4–2,6	€73–83	€187–215	High (↑ due to grid EF)
EAF Steel + Renewable Energy	~0,45–0,55	€0,9–1,0	€26–32	€67–83	Low
Cement (Vicem type)	0,75	€1,41	€43,7	€112,5	Critical
Urea – Natural Gas Fertiliser	1,80	€3,39	€104,6	€270	Critical
Primary Aluminium – Coal Grid †	~12–15	€22,6–28,3	€703–880	~€1.800–2.250	Fatal / Market Exit
Secondary Aluminium (recycled)	~1,5	€2,83	€87,3	€225	Medium

† Calculated using grid emission factor 0.66 $kgCO_2$/kWh (Vietnam DNRE 2024) instead of 0.55 $kgCO_2$/kWh. Source: World Steel Assoc. 2022; IEA 2024; ICAP 2025; EU Commission Q1/2026. Calculations: HOUSELINK Research

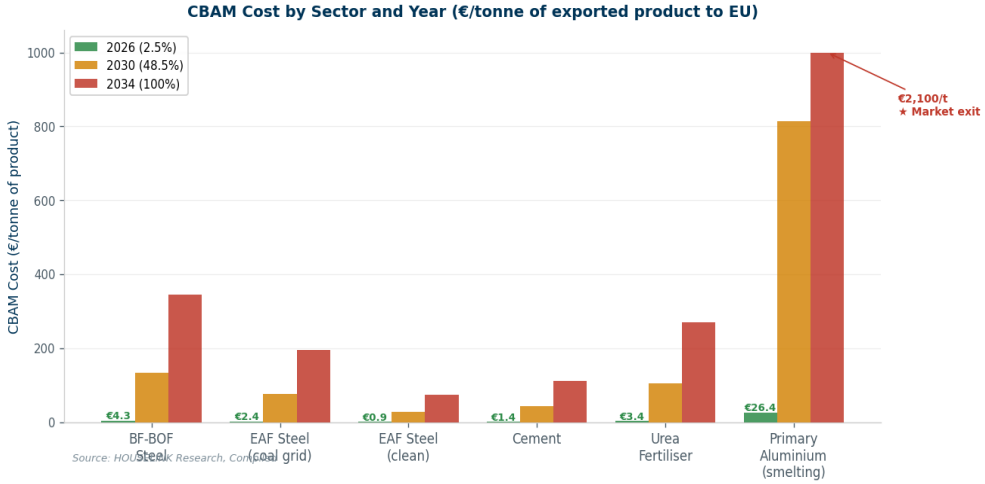

Figure 3 — CBAM Cost by Sector and Year (€/tonne of product)

Source: HOUSELINK Research, Compiled. CBAM factor: EU 2023/956. ETS price: Fastmarkets 02/2026. Emission intensities: WorldSteel 2022, IEA 2024, Vietnam DNRE 2024

2.1 Iron & Steel — Differentiated Impact by Technology

2.1.1 BF-BOF Blast Furnace Steel

BF-BOF steel has an emission intensity of ~2.3 tCO_2/tonne (World Steel Assoc. 2022: global BF-BOF average is 2.33 tCO_2/t). This is the technology operating at Formosa Ha Tinh (~7.5 million tonnes/year). Profit margin benchmarks from actual industry financial data:

Financial Indicator	Current Cycle (2024–2026)	Normal Cycle	Source
HRC Export Price	$600–750/t (~€545–682/t)	$700–1.050/t	GMK Center; Fastmarkets 2025
Gross Profit (Revenue – COGS)	€80–130/t (15–20%)	€100–200/t (15–25%)	IMARC Group HRC Report 2025
Operating EBITDA	€32–65/t (5–9%)	€45–90/t (7–12%)	Nucor FY2024; ArcelorMittal AR2024
CBAM 2030 (~€133.8/t)	Exceeds EBITDA by 2–4×	Exceeds EBITDA by 1,5–3x	HOUSELINK Research calculation
CBAM 2034 (~€345/t)	50–63% of HRC selling price	→ Excluded from the EU market	HOUSELINK Research calculation

Source: IMARC Group Hot-Rolled Coils Manufacturing Plant Project Report 2025; Nucor Corporation Annual Report 2024; ArcelorMittal Annual Report 2024; WorldSteel Sustainability Indicators 2025

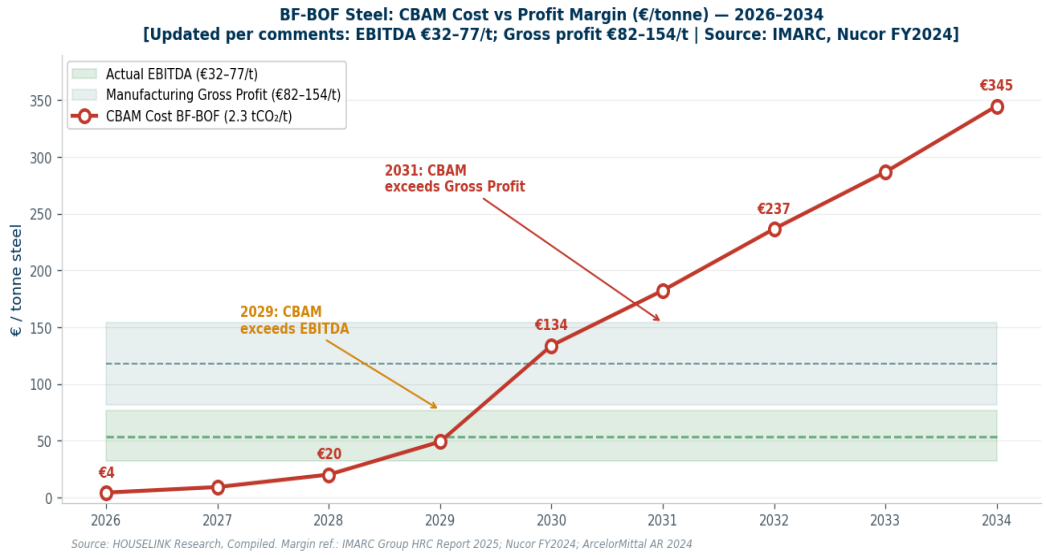

Figure 4 — BF-BOF Steel: CBAM Cost vs EBITDA and Gross Profit (€/tonne, 2026–2034)

Source: HOUSELINK Research. Margin refs: IMARC Group 2025; Nucor FY2024; ArcelorMittal AR2024. ETS price: Fastmarkets 02/2026

2.1.2 EAF Electric Arc Furnace Steel — Vietnam Coal Grid

EAF steel is generally considered 'greener' than BF-BOF. However, due to Vietnam's high grid emission factor (0.66 $kgCO_2$/kWh — official 2023; 0.681 $kgCO_2$/kWh — 2024 estimate), Vietnamese EAF steel carries a relatively high Scope 2 footprint:

- Scope 2 (electricity ~450 kWh/t steel): 450 × 0.66 ÷ 1,000 = ~0.30 tCO_2/t — 3× higher than EU EAF
- Scope 1 (electrodes, lime, carbon additives): ~0.3–0.4 tCO_2/t (depending on HBI/scrap ratio)
- Total EAF coal grid intensity in Vietnam: ~1.25–1.35 tCO_2/t (higher than previous estimate of 1.2 tCO_2/t due to more accurate grid EF)
- CBAM cost 2030: €73–83/t — still exceeds typical operating EBITDA

Key Solution: Signing a DPPA (Direct Power Purchase Agreement) with a renewable energy plant reduces Scope 2 from ~0.30 to ~0.04 tCO_2/t, cutting total intensity to ~0.45 tCO_2/t → CBAM 2030 falls from ~€78/t to ~€26/t. Incremental cost: near €0 vs standard grid tariff.

2.2 Aluminium — Most Extreme CBAM Exposure

Primary aluminium smelting is the most severely CBAM-affected sector due to its extremely high electricity intensity (~13,000 kWh/tonne aluminium). Using the official grid emission factor of 0.66 $kgCO_2$/kWh:

- Scope 2 from electricity: 13,000 × 0.66 ÷ 1,000 = ~8.6 tCO_2/t aluminium
- Scope 1 (carbon anode / Hall-Héroult reaction): ~4–6 tCO_2/t
- Total primary aluminium intensity with coal grid in Vietnam: ~12–15 tCO_2/t (IEA global average: 14.8 tCO_2/t with coal grid)

CBAM cost for primary aluminium (coal grid):

- 2026: €22.6–28.3/t → not yet severe (factor 2.5%)
- 2030: €703–880/t → 5–10× operating EBITDA
- 2034: ~€1,800–2,250/t → equivalent to ~80–100% of aluminium ingot selling price (~€2,100–2,300/t)

→ Exporting coal-grid primary aluminium to the EU after 2030 is NOT ECONOMICALLY VIABLE.

Exit strategy: Secondary (recycled) aluminium: ~1.5 tCO_2/t → CBAM 2034 only ~€225/t — challenging but manageable. Transition to secondary aluminium must begin now to develop scrap sourcing and processing capabilities..

2.3 Cement — Medium-Term Export Risk

Vietnam is ASEAN's largest cement producer and exporter. Emission intensity ~0.75 tCO_2/tonne (of which ~60% from calcination chemical reactions — cannot be eliminated by fuel switching). CBAM cost 2034 (~€112.5/t) is nearly double the export price (~€50–60/t). Impact is primarily indirect via EU supply chains and the risk of CBAM scope expansion.

2.4 Fertilisers — Clear Pressure with a Transition Pathway

Urea fertiliser (Haber-Bosch process from natural gas): ~1.8 tCO_2/tonne urea, including Scope 2 under CBAM rules. CBAM cost 2030 (~€104.6/t) exceeds typical margins of $30–50/t. Exit strategy: Blue ammonia (CCS) or Green ammonia (electrolysis + RE) reduces intensity to 0.1–0.3 tCO_2/t.

III. PROFIT RISK MATRIX

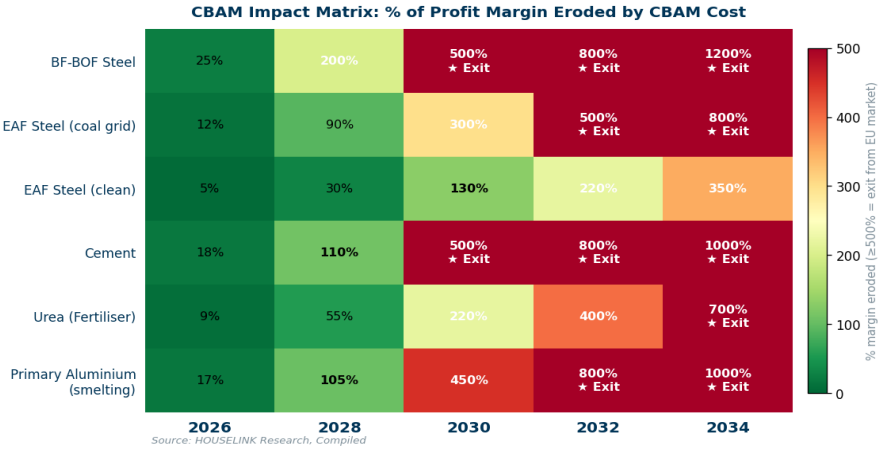

Figure 5 — CBAM Impact Matrix: % of Profit Margin Eroded by Sector and Year

Source: HOUSELINK Research. Margin refs: IMARC Group 2025; Nucor FY2024; ArcelorMittal AR2024. Emission intensities: WorldSteel 2022, IEA 2024, Vietnam DNRE 2024

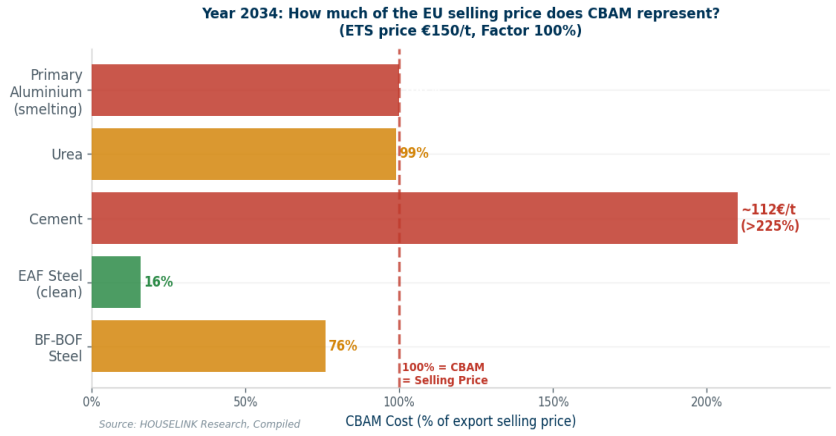

Figure 6 — Year 2034: CBAM Cost as % of EU Export Selling Price

Source: HOUSELINK Research, Compiled. ETS price forecast: Fastmarkets & BloombergNEF ECCO 2025

IV. INTERNATIONAL COMPETITIVENESS ANALYSIS

Net CBAM burden depends on: (1) emission intensity and (2) domestic carbon price recognised by the EU for deduction. The formal recognition mechanism is being developed by the EU Commission (Call for Evidence 08/2025) — no final decision has been issued.

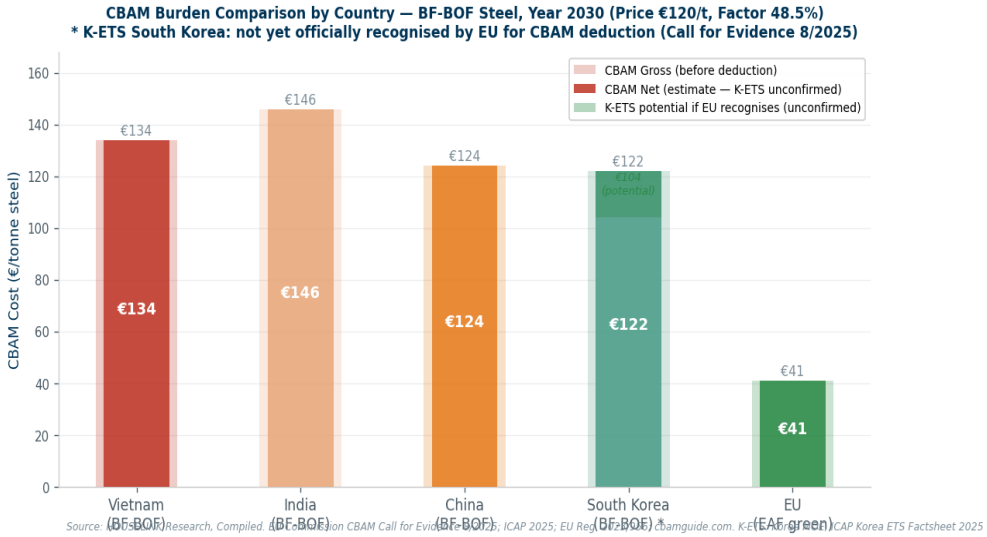

Figure 7 — Net CBAM Burden by Country, BF-BOF Steel, Year 2030 (K-ETS South Korea: potential if EU recognises — not officially confirmed as of April 2026)*

Source: HOUSELINK Research. K-ETS: secondary market ~KRW 9,393/tCO₂ ≈ USD 6.60 ≈ €5.8/tCO₂ (ICAP 2025). CN-ETS: ~CNY 70.78 ≈ USD 9.85 ≈ €8.7/tCO₂ (ICAP 2025). Note: secondary market prices — not the EU-determined deduction amount (final rules pending). EU Commission Call for Evidence on CBAM third-country carbon price deduction 08/2025

Table 3: Net CBAM by Country — BF-BOF Steel, Year 2030

Country	Intensity (tCO₂/t)	Domestic Carbon (~€/tCO₂)	CBAM Gross (€/t)	Potential Deduction	Estimated Net CBAM	Note
Vietnam	2,30	€0 (ETS pilot not recognised)	€133,8	€0	€133,8	Most Disadvantaged
India	2,50	€0 (not mandatory)	€145,5	€0	€145,5	Similar to VN
China	2,30	~€8 CN-ETS	€133,8	~€8,9 (if recognised)	~€124,9	Uncertain
South Korea *	2,10	~€6 K-ETS (2025)	€122,2	~€6,1 (if recognised)	~€127,7	* Unconfirmed
EU (EAF green)	0,70	€70 EU ETS	-	—	€0	Home Market Advantage

** K-ETS South Korea: May qualify but has NOT been formally recognised by the EU (EU Commission Call for Evidence 08/2025). Competitive advantage is potential, not certain. Source: ICAP; HOUSELINK Research*

Competitive Conclusion: Without recognised domestic carbon pricing, Vietnam bears the highest net CBAM burden among major steel exporters. To close the gap: (1) Accelerate Vietnam ETS towards EU recognition; (2) Reduce actual emissions to lower CBAM gross; (3) Sign DPPA renewable energy contracts to cut Scope 2 — no policy approval required.

V. ACTION WINDOW AND ROADMAP

Source: HOUSELINK Research, Compiled

Figure 8 — Action Window for Vietnamese Manufacturing Enterprises (2026–2034)

Source: HOUSELINK Research, Compiled from EU Reg. 2023/956 and Fastmarkets Carbon Analysis

Table 4: Decarbonisation Strategy Matrix — Cost, Impact and Timeline

Strategy	Emission Reduction	Investment Cost	Timeline	Priority
PCF Measurement + ISO 14067 Verification	Avoids Default Values (30–50% higher)	$15K–50K	3–6 months	★★★★★ #1 NOW
DPPA Renewable Energy (Scope 2)	30–60% Scope 2 (critical given 0.66 grid EF)	~$0 incremental	6–18 months	★★★★★ #2 NOW
Process Optimisation (energy efficiency)	10–20%	$500K–5M	12–24 months	★★★★
Fuel Switch (coal → gas/biomass)	20–40%	$2M–20M	24–48 months	★★★
Technology Shift BF-BOF → EAF	50–70%	$100M–500M	5–10 years	★★★
CCUS (Carbon Capture & Storage)	70–90%	$50M–200M	7–15 years	★★
Green H_2 + DRI (Green Steel)	85–95%	$200M–1B+	10–15 years	★★

Source: HOUSELINK Research, Compiled from IEA Energy Technology Perspectives 2024; BloombergNEF LCOE Outlook 2025; World Steel Assoc.

Why DPPA is Priority #2: With Vietnam's official grid EF at 0.66 $kgCO_2/kWh$ (2023) and trending upward to 0.681 (2024), DPPA renewable energy contracts reduce CBAM exposure and satisfy OEM Scope 2 requirements (Apple, Samsung, BMW, Porsche) simultaneously — at near-zero incremental cost

VI. BUSINESS MODEL IMPACT

6.1 Large State-Owned Enterprises

- CBAM financial risk 2030: $5–50 million USD/year depending on scale and sector
- Advantage: large capital base, access to green financing from IFC/ADB for technology transition investment
- Required action: approve technology transition CAPEX and establish MRV systems immediately in 2026

6.2 Large FDI Enterprises

- Strategic decision required — maintain BF-BOF (reduce EU market exposure) or invest in DRI-EAF technology transition

6.3 SMEs Exporting Directly to the EU

- Affected immediately from 2026 — CBAM declarations required for every import consignment
- Default Value risk: without verified data → liable at the highest global emission intensities (IR 2025/2621)
- MRV system investment ($15K–50K) is far smaller than annual CBAM liability ($100K–$500K+)

6.4 Indirect Exporters (Tier-1/Tier-2 Suppliers for OEMs)

- Samsung, Apple, BMW, Porsche require all suppliers to provide PCF data (Scope 3) — independent of CBAM
- 2025–2026: already receiving data requests from customers → lack of preparation = lost contracts, no need to wait until 2030

VII. CONCLUSIONS AND STRATEGIC RECOMMENDATIONS

1. CBAM is a binding legal obligation effective 01 January 2026 — not a projection. The certificate price of €75.36/tCO_2 (Q1/2026) is an official figure. The phase-in schedule (2.5% → 100%) is a statutory roadmap under EU law.

2. Vietnam's grid emission factor of 0.66 $kgCO_2/kWh$ (official 2023, DNRE) — 3× the EU average — is a disadvantage that can be SOLVED immediately via DPPA renewable energy contracts at near-zero incremental cost.

3. Vietnam's ETS pilot (2025–2028) has not generated any recognised deduction for CBAM. Accelerating Vietnam ETS towards EU recognition is a national policy priority.

4. K-ETS (South Korea) and other national ETS systems have NOT been formally recognised by the EU for CBAM deduction. Competitive advantages of other countries remain potential — contingent on EU legislative decisions in 2026–2027.

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