



# Assessment of European Carbon Border Adjustment Mechanism Regulation

For European Aluminium Association

By CRU Consulting:

Zaid Aljanabi, Head of Aluminium, Consulting

[zaid.aljanabi@crugroup.com](mailto:zaid.aljanabi@crugroup.com)

Aurélien Henry, Senior Consultant, Consulting

[aurelien.henry@crugroup.com](mailto:aurelien.henry@crugroup.com)

Lewis Pegrum, Consultant, Consulting

[lewis.pegrum@crugroup.com](mailto:lewis.pegrum@crugroup.com)

31<sup>st</sup> May 2022



## Legal notice

---

This presentation is private and confidential. It must not be disclosed in whole or in part, directly or indirectly or in any other format without the prior written permission of CRU International Limited.

CRU International Limited's responsibility is solely to its clients and its liability is limited to the amount of the fees actually paid for professional services.

Although reasonable care and diligence has been used in the preparation of this presentation, we do not guarantee the accuracy of any data, assumptions, forecasts or other forward-looking statements. We accept no liability to third parties, howsoever arising.

CRU takes information security seriously and currently holds the UK Government approved Cyber Essentials certification. This certifies that we have the appropriate security controls across our organisation and third party suppliers to protect our information assets. CRU also has a [privacy policy](#) in place which explains how we handle personal data on our customers.

# Contents

Section	Page
I. Executive summary	4
II. Introduction to CRU study	24
III. Baseline impact assessment	27
IV. Value chain and implementation risk	97
V. Appendices	129

# I. Executive Summary

## Introduction

## Introduction

- As part the European Green Deal emissions reduction goal, the **EU Commission published a proposal in July 2021 to introduce a Carbon Border Adjustment Mechanism (CBAM) by 2026** to level the playing field between importers and domestic producers already facing EU ETS costs for their scope 1 and 2 emissions.
- Under the proposed CBAM, **selected imports (e.g. aluminium, steel, cement and more) into Europe will be charged a duty based on their direct embedded emissions** and free allocation under EU ETS would be progressively phased between 2026 and 2035.
- CBAM and the associated emissions reduction goal poses **fundamental decarbonisation challenges for the aluminium industry** at both the direct and indirect emissions levels.
- **European aluminium producers agree with the decarbonisation goal but also think policy should incentivise cost reduction of the most sustainable source**, instead of increasing cost of carbon-intensive alternatives through CBAM.
- To tackle those issues, **CRU Consulting was engaged on behalf of the European Aluminium Association in an independent study to assess the impact of CBAM**. Interviews of alumina and aluminium producers along the value chain and a quantitative impact assessment of CBAM on primary aluminium and selected downstream products were conducted.
- The study conducted by CRU is segmented in two workstreams as follows:
  - **Workstream 1: Baseline impact assessment** – Quantitative impact assessment of draft CBAM reform proposals on price, cost and profitability in alumina, primary aluminium and downstream markets
  - **Workstream 2: Value chain and implementation risk** – Assess qualitatively key policy implementation and compliance risks related to CBAM

# I. Executive Summary

## Main findings

## Main findings WS 1: impact of CBAM on European primary aluminium industry

<p>1</p> <p>An increasing European carbon price puts pressure on the cost structure of European smelters, leading to a loss of competitiveness against importers</p>	<p>2</p> <p>All European producers, apart from the ones in Iceland, using decarbonised power bear indirect carbon costs as if they were using fossil-fuel power due to the marginal pricing of power in the European energy market</p>	<p>3</p> <p>The introduction of CBAM on indirect emissions does not fix the structural issue of the European energy market, and it also comes with the phasing out of both free allocation and indirect compensation for European producers, leading to further losses of competitiveness</p>
<p>4</p> <p>CRU's best estimates of the CBAM impact are first-round effects that will see a continuation of the loss of competitiveness for domestic smelters observed prior to CBAM, and an increase in primary aluminium prices in Europe</p>	<p>5</p> <p>As response to a higher price environment, a speculative second-round response from semi-finished producers could lower domestic aluminium prices by importing low carbon aluminium available from the rest of the world, and lead to a loss of competitiveness of existing European low carbon production</p>	<p>6</p> <p>Adding alumina emissions alongside Scope 1 emissions of importers significantly increases the average Scope 1+2 emissions intensity for European and EU27 domestic production as well as importers of primary aluminium.</p>

## Main findings WS 1: impact of CBAM on European semi-finished aluminium industry

<p>1</p> <p>CBAM will negatively impact raw materials costs and ETS costs of European semi-finished producers (rolling and extrusions mills)</p>	<p>2</p> <p>Mills with greater scrap consumption in their raw material mix are better placed to deal with cost pass through of increased primary aluminium prices from CBAM</p>	<p>3</p> <p>Exporters of semi-finished aluminium to Europe do not face cost pass through into their primary aluminium raw materials feed</p>
<p>4</p> <p>The introduction of CBAM does not seem to improve the competitiveness of European mills against hydropower- or nuclear-based, low-carbon aluminium imports</p>	<p>5</p> <p>Elevated prices of semi-finished aluminium due to CBAM brings substitution risks with alternative competing materials</p>	<p>6</p> <p>Increased semi-finished aluminium prices may encourage further rounds of impacts on semi-finished aluminium, such as circumvention, if all upstream emissions are not considered</p>



## Main findings WS 2: value chain & implementation risks

<p>1</p> <p>CRU's opinion is that the CBAM as proposed is a one-size-fits-all policy that has the potential to be harmful to the European aluminium industry.</p>	<p>2</p> <p>The potential inclusion of indirect emissions in CBAM applied will highlight the fact that the policy fails to take into account the specificities and complexities of the aluminium value chain in Europe.</p>	<p>3</p> <p>The policy has the potential to create an uneven playing field, contrary to the initial goal of the policy.</p>	<p>4</p> <p>The aluminium industry would be further hurt by the progressive loss of ETS carbon leakage measures.</p>
<p>5</p> <p>To decarbonise the aluminium industry, the sources of electric power have to be decarbonised.</p>	<p>6</p> <p>We agree to the CBAM concept as a decarbonisation tool but an implementation with indirect emissions risks could be ill-fitted for the aluminium industry.</p>	<p>7</p> <p>The only way to ensure full compliance by importers is for the EU Commission to be able to certify products at origin for import into the domestic market. There are issues of enforcement or execution as well.</p>	<p>8</p> <p>Illegal behaviour may occur through importers intentionally mislabeling higher value products as scrap or misrepresent the production process though false carbon content or smelter of origin.</p>

# I. Executive Summary

## Workstream 1

## Framework of CRU approach

- **CRU conducted a review and impact assessment of the CBAM proposal revealing uncertainties around the mechanism proposed by the EU commission.** CRU's established a framework for evaluating the impact of the CBAM proposal on the primary aluminium and semi-finished aluminium value chain segments (see graph below). **Key metrics are used to assess the impacts** on European producers vs non-European importers: **volumes, costs, price and domestic industry profitability (margin and value add<sup>1</sup>)**. At the core of CRU's framework is an European-centric primary aluminium behavioural model based on delivered costs of European producers and non-European importers (see high level illustration in slide 9).
- **Primary and semi-finished aluminium products are treated as complex goods as indicated by annex III of the draft Regulation.** Under this definition, the proposal provides that emissions embedded in input materials used for the production of those products should be included in the CBAM calculation by the EU Commission.
- The primary aluminium behavioural model is constructed on an P1020 ingot aluminium basis to simulate the ingot price with CBAM impacting the ingot duty paid premium. Slab and billet prices are then differentiated by a product-specific upcharge, estimated based on historical data. **The inclusion of Scope 2 emissions is closely examined in this study** because it is stated a next step for CBAM, which raises concerns for the electricity-intensive primary aluminium industry and further down the value chain due to the expected cost increase and circumvention risks.
- Ingot, slab and billet prices feed into the raw material costs of semi-finished aluminium production, also impacted by changing ETS costs. A **'static' cost pass-through** is assessed on a) the cost competitiveness of can body, end and foil stock producers against a major importer, and b) on the cost structure of a typical extruder<sup>2</sup>.

Illustration of CRU's framework for the CBAM impact assessment

Value chain segment	Pricing formula	Estimation Approach
Primary aluminium	A) Ingot price = LME + P1020 ingot premium + CBAM + B) Slab/Billet premium upcharge	A) European-centric behavioural primary aluminium model at ingot level B) Typical product-specific upcharge based on historical data <sup>3</sup>
Semi-finished aluminium	Rolled products prices	Static cost pass through assessment from primary aluminium to European producers vs major importer

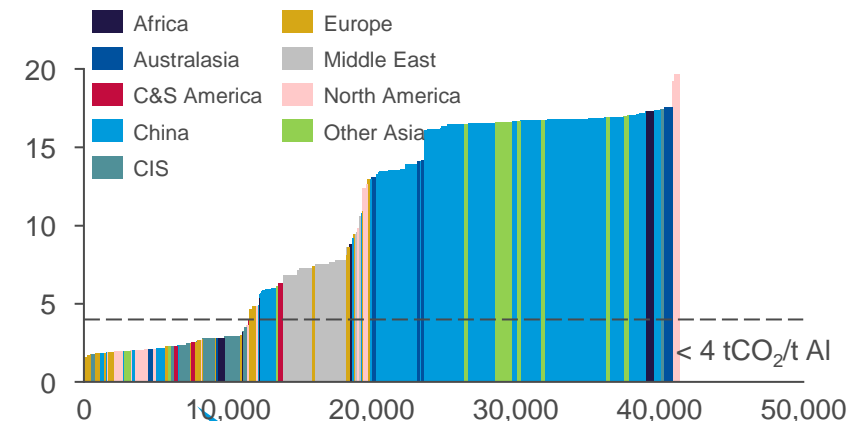
*Cost pass through of European primary aluminum prices*

1) Domestic value add is the average margin of domestic producers multiplied by those producers' sales in the domestic market 2) The extrusion markets is a highly fragmented with plants producing relatively small volumes. CRU only has views on costs for a typical 150ktpa extrusion plant but not plant by plant. 3) Ingot price does not have any upcharge

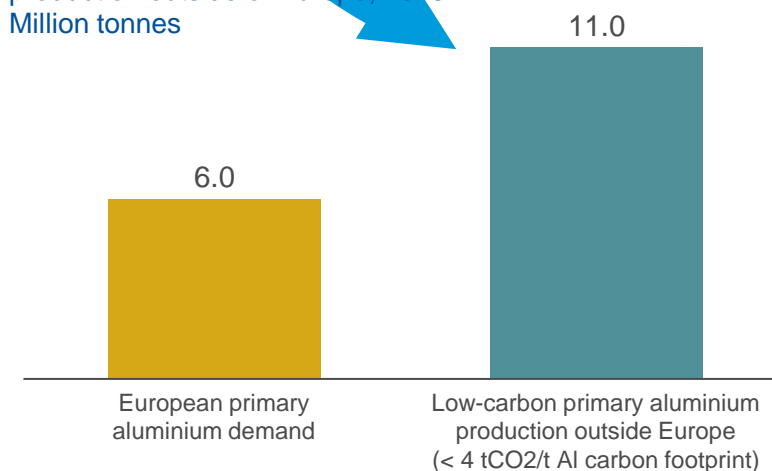
# Assessment of first- and second- round impacts of the CBAM proposal

- **CRU’s impact assessment of the CBAM proposal is a cost and benefits analysis.** The main tool used by CRU is behavioural modelling by product, which is illustrated in the following slide. CRU’s behavioural modelling is used to estimate first- and second-round impacts of the measures in the CBAM proposal. CRU believes the CBAM policy measures will bring multiple rounds of impact on the aluminium market:
  - **First-round impacts capture first-round distributional effects** (e.g. if the proposal disproportionately affects certain producers or the benefits accrue to a particular group) and/or **competition effects** (e.g. if the proposal will significantly reduce the imports in the market). **First-round impacts are CRU’s best estimate of how a scenario will play out in the market** because it is underpinned by **evidence-based modelling**, calibrated on historical market characteristics and the model allocates volumes dynamically to producers within these constraints.
  - **Second-round impacts are the changes in the estimated trajectory described by first-round impacts** (e.g. change in consumer preferences / behaviours, changes in trade flows, change in demand). **Second-round impacts are often difficult to estimate and are likely to be speculative in nature** as it can affect multiple aspects of the market as it assumes speculative new capacity replaces European production does not consider demand pull in other regions.
  - Further rounds of impacts may crystallise in the markets before reaching an eventual steady state.
- **However, when indirect emissions are included in CBAM and carbon leakage measures are fully phase out, second-round impacts have the potential to be significant, thereby potentially displacing European low carbon production and importers sourcing abundant foreign low carbon aluminium.**
- **Consequently:**
  - CRU examines second-round impacts on the premise that 1.5 Mt of European primary aluminium production is at risk of displacement by non-European low carbon aluminium.
  - The downstream / semi finished aluminium **cost pass through analysis is carried out under both first- and second- impacts scenarios** considered for primary aluminium.

Emissions intensity of primary aluminium (ingot, slab and billet) production, 2019, tCO<sub>2</sub>/t Al



European primary aluminium demand vs low-carbon production outside of Europe, 2019  
Million tonnes



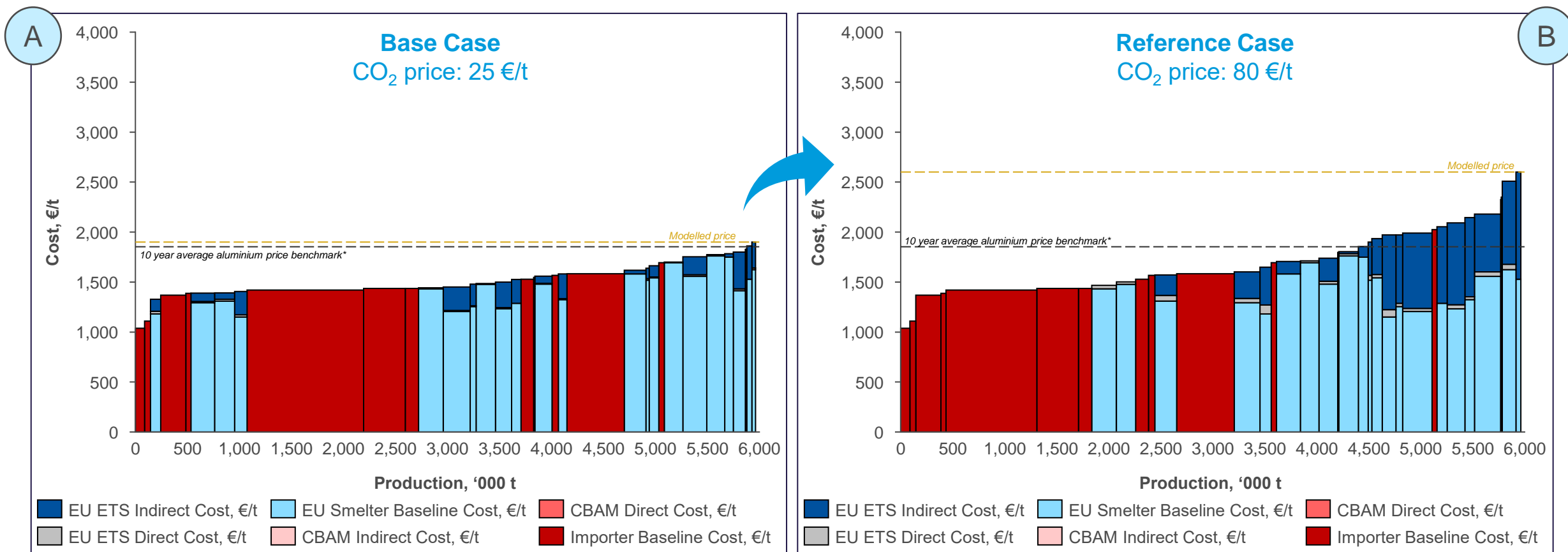
# CBAM impact assessment is conducted via scenario analysis

Input	Base Case	Reference Case	CBAM Scenarios			
			Scope 1 basis		Scope 1+2 basis	
Scenario	A	B	C	D	First-round: E Second-round: G	First-round: F Second-round: H
Market environment	2019	2019	2019	2019	2019	2019
ETS carbon price (€/t)	25 (yearly average)	80 (current price)	140	140	140	140
EU producers' ETS costs	Scope 1+2	Scope 1+2	Scope 1+2	Scope 1+2	Scope 1+2	Scope 1+2
EU ETS free allocation	2019	2019	-10% reduction vs 2026-30 level	× (Full auctioning)	-10% reduction vs 2026-30 level	× (Full auctioning)
EU ETS indirect compensation	2019	2019	As of 2026 and at chosen EU carbon price	As of 2030 and at chosen EU carbon price <sup>2</sup>	-10% reduction vs 2026 level at chosen CO2 price	×
CBAM design	×	×	Importer-specific direct embedded emissions intensity, capped by European 10% worst intensity	Importer-specific direct embedded emissions intensity, capped by European 10% worst intensity	Importer-specific emissions intensity, with only direct embedded emissions capped by European 10% worst intensity	Importer-specific emissions intensity, with only direct embedded emissions capped by European 10% worst intensity
CBAM embedded emissions basis <sup>3</sup>	-	-	Scope 1 + Alumina Scope 1	Scope 1 + Alumina Scope 1	Scope 1+2, with direct emissions as Scope 1 + Alumina Scope 1+2	Scope 1+2, with direct emissions as Scope 1 + Alumina Scope 1+2
CBAM adjustments	-	-	European average free allocation level	European average free allocation level	European average free allocation and indirect compensation levels	European average free allocation and indirect compensation levels

- CRU assessed the first- and second-impacts of CBAM on the European primary aluminium market through a comprehensive scenario analysis.
- Scenarios A to H listed to the left are a subset of the scenarios examined in the CRU report. They are discussed in the following slides.
- Scenarios A and B examine the impact of the ETS carbon price increase prior to the implementation of CBAM. Scenario A is the Base Case representative of the 2019 market at €25/t CO<sub>2</sub> carbon price, anchoring the analysis. Scenario B considers an increase in carbon price to €80/t CO<sub>2</sub>.
- Scenarios C and D consider the implementation of CBAM on Scope 1 emissions, including alumina Scope 1 emissions (primary aluminium is assumed a complex good) , under a high carbon price of €140/t CO<sub>2</sub>, CRU's medium-term carbon price forecast. Reduced levels of free allocation are looked at: -10% for Scenario C and no free allocation (i.e. full auctioning) for Scenario D.
- Scenarios E, F, G and H consider the inclusion of indirect emissions in CBAM. CBAM is applied on Scope 1+2 emissions, with Scope 1 including alumina Scope 1+2 emissions. Reduced levels of carbon leakage measures free allocation and indirect compensation) are looked at: -10% for Scenario E / G and no carbon leakage measures for Scenario F / H.

# Situation for the European primary aluminium market at current €80/tCO<sub>2</sub> price

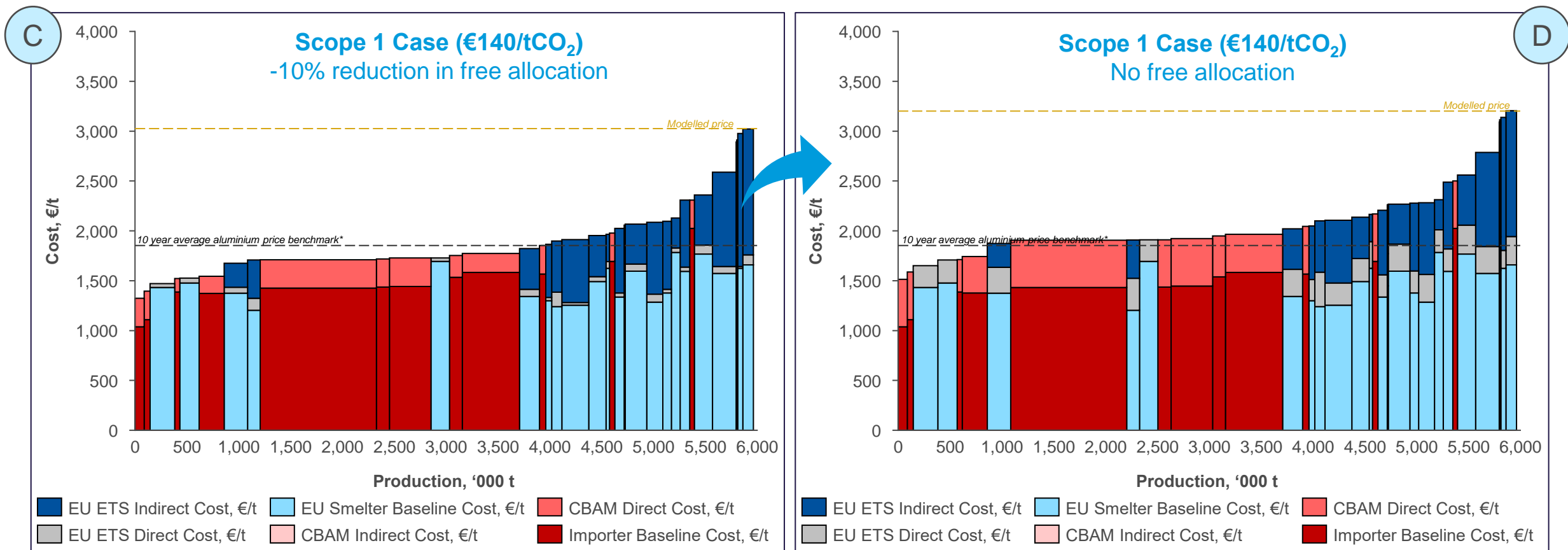
1. European smelters lose competitiveness (i.e. move up the cost curve) against low-cost importers as the carbon price increases in Europe, as shown below where it increases from 25 €/t in the Base Case to 80 €/t in the Reference Case
2. This situation will keep worsening at higher carbon prices, because of a higher passthrough of ETS indirect carbon costs



Note: The cost curves above refer to scenarios BC and RC respectively in: [First round impact scenarios](#)

# First-round impact of CBAM on Scope 1 emissions at €140/tCO<sub>2</sub> carbon price

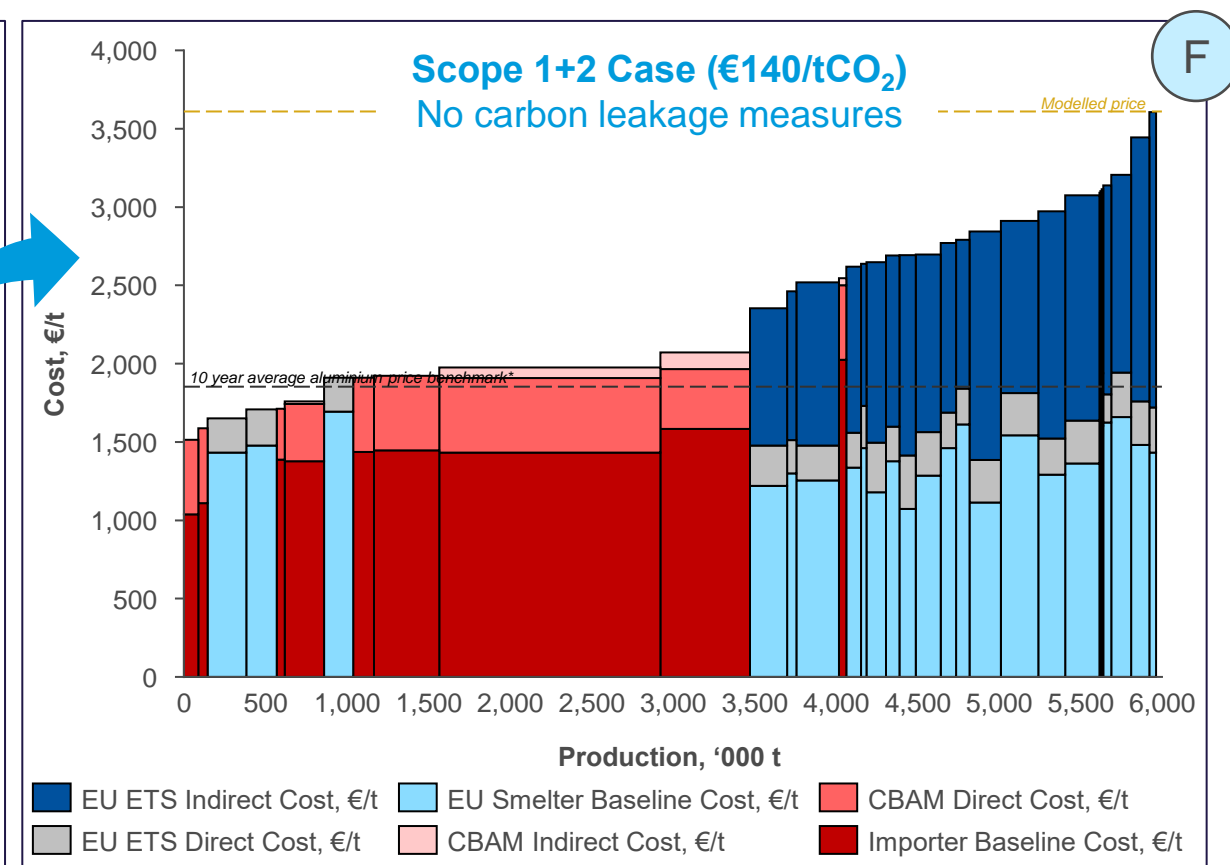
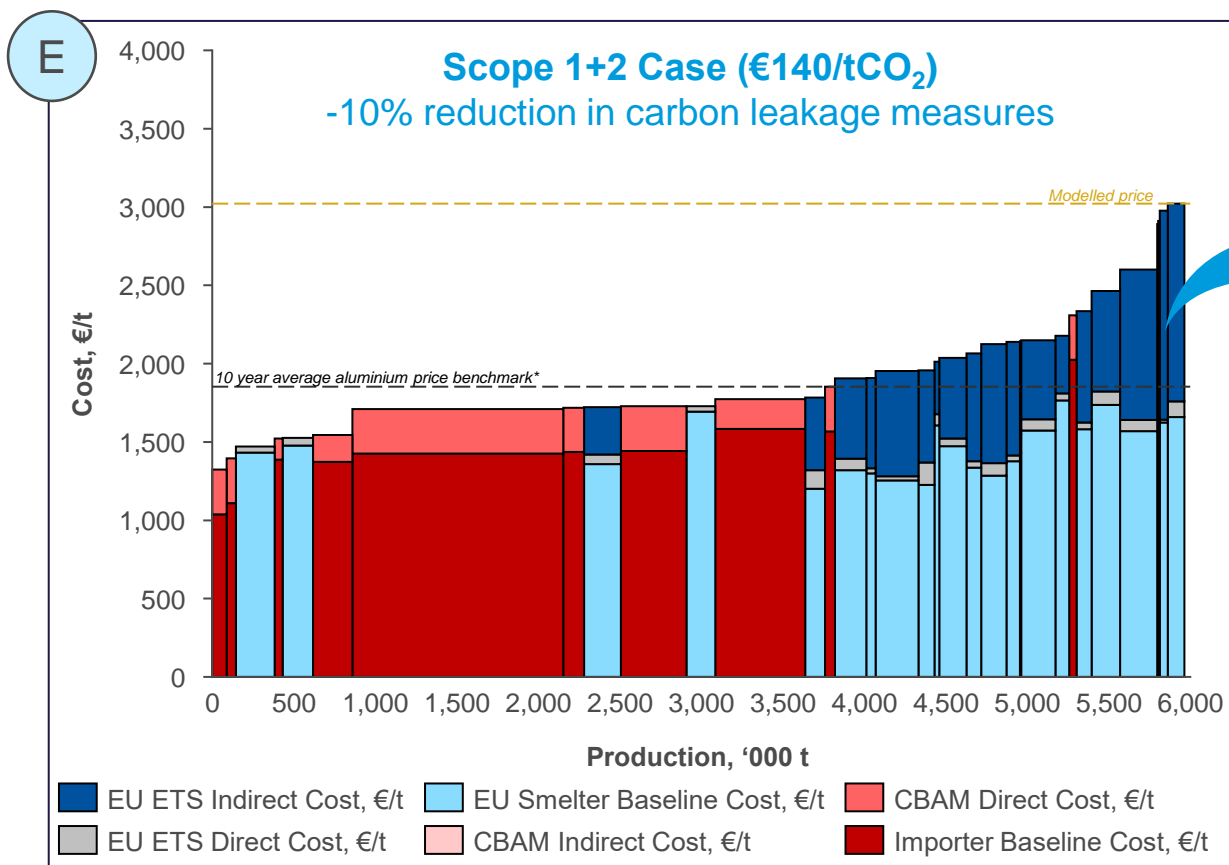
1. CBAM on Scope 1 means low CBAM duties for importers, even at high carbon price of €140/tCO<sub>2</sub>
2. No improvement of European industry competitiveness, further penalised by increased carbon price and progressive loss of free allocation (while ETS indirect compensation is retained)



Note: The cost curves above refer to scenarios Sc 2.1b and Sc 2.3b respectively in: [First round impact scenarios](#)

# First-round impact of including indirect emissions in CBAM

1. European and non-European smelters have different rules for pass through of indirect emissions to cost
2. Low-cost imports with renewables or gas power sources still face low CBAM duties relative to EU ETS costs borne by European producers
3. No improvement of European industry competitiveness as free allocation and indirect compensation are phased out

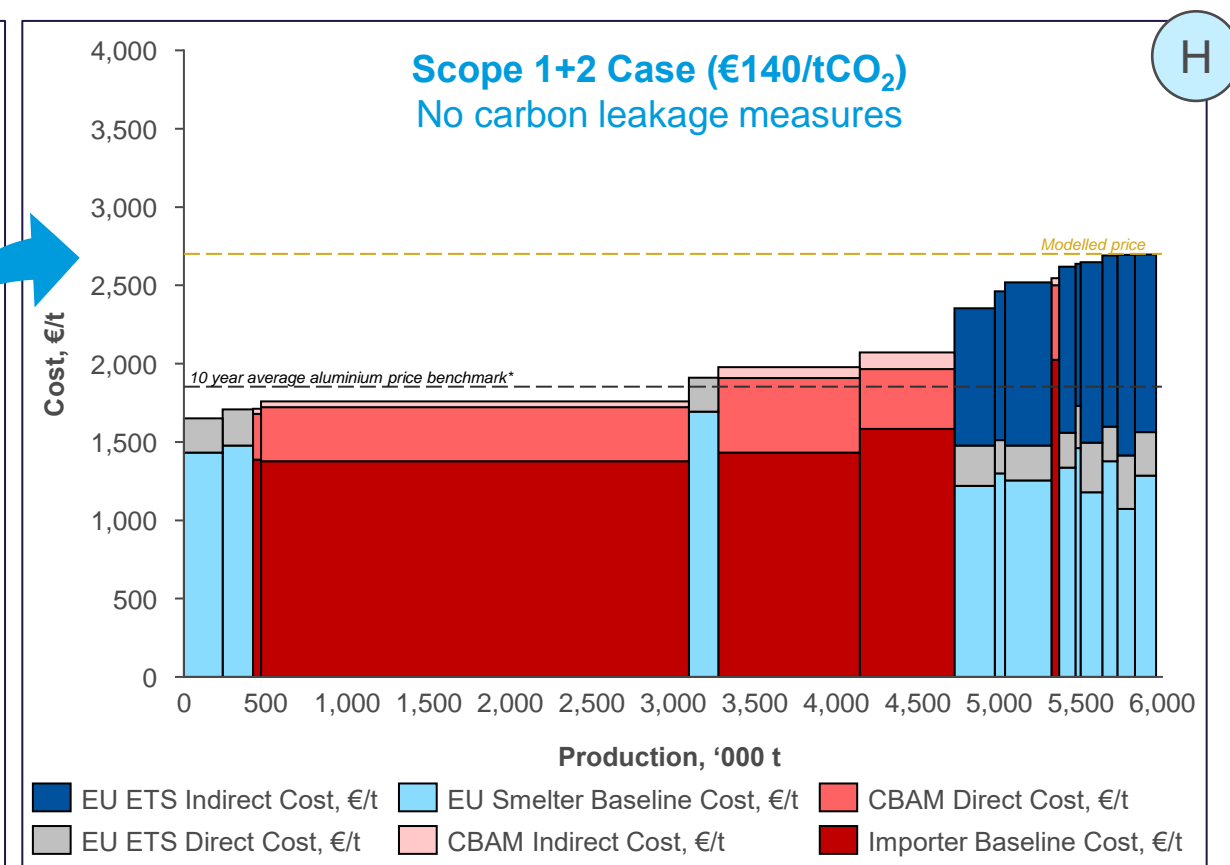
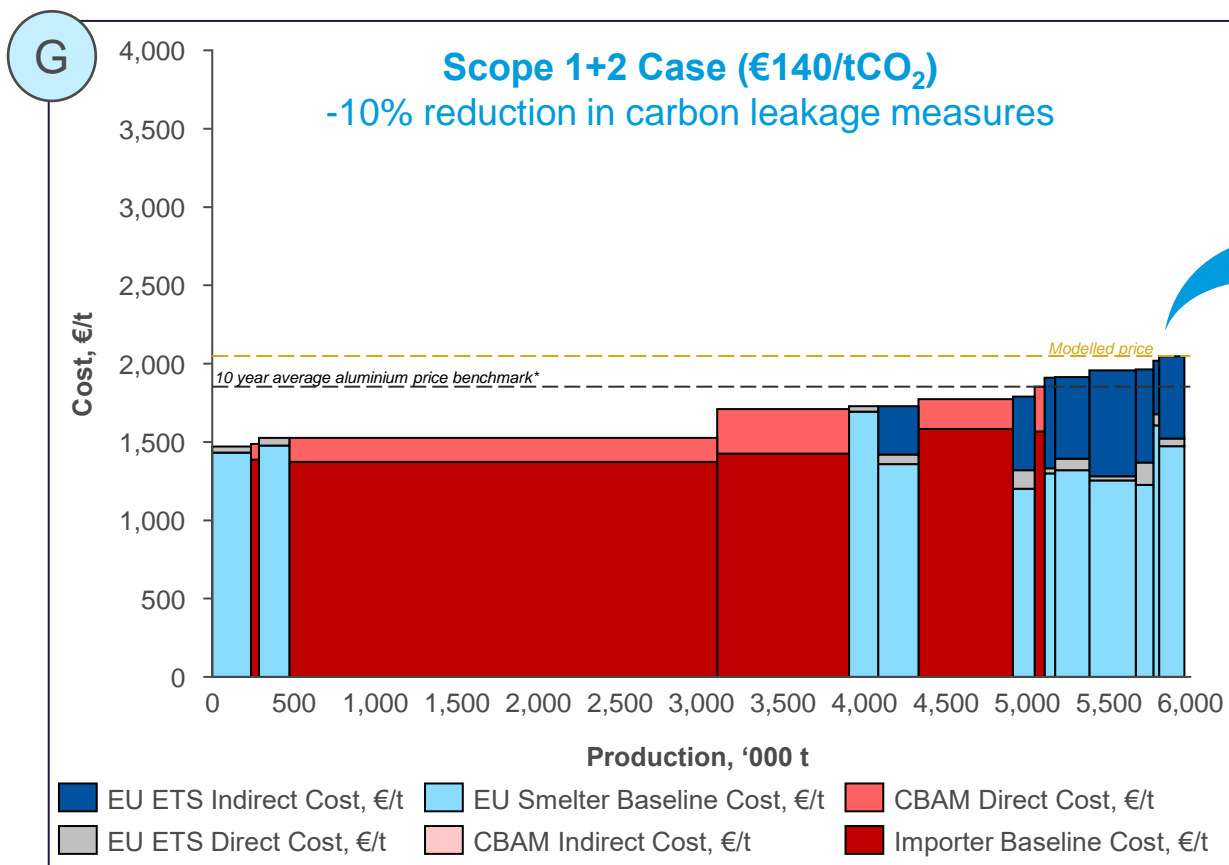


Note: The cost curves above refer to scenarios Sc 3.1d and Sc 3.3d respectively in: [First round impact scenarios](#)



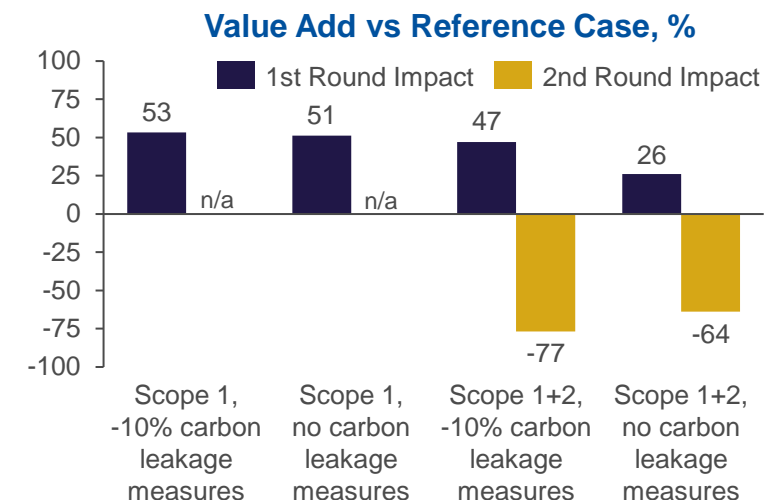
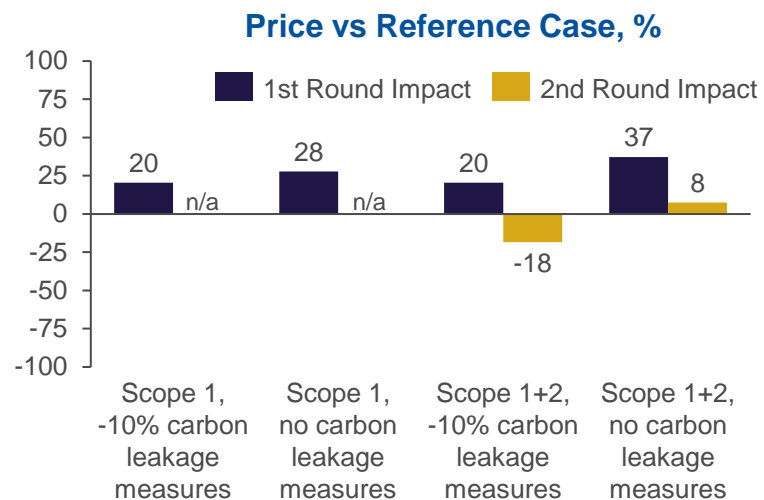
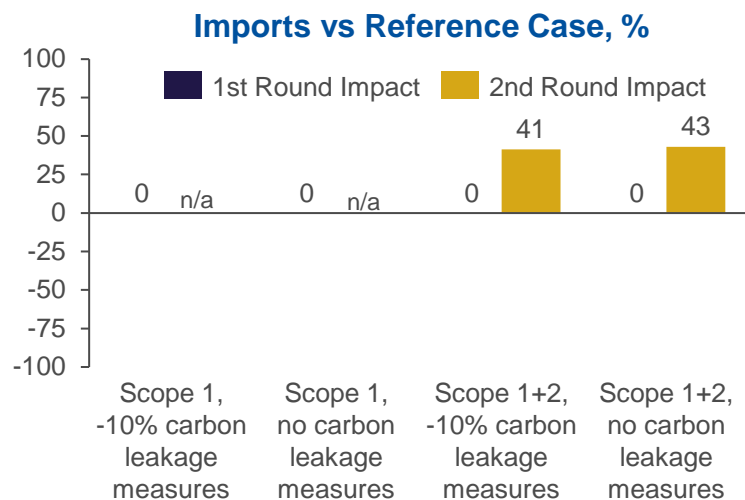
## Second-round impact of CBAM on primary aluminium

1. Speculative second-impacts could see semi-finished producers react to high first-round prices by importing abundant foreign low carbon aluminium, displacing a large share of European production, which will still face full direct & indirect ETS costs
2. This scenario assumes new capacity replaces curtailed European production that has been shutdown because of higher ETS costs compared to importers facing CBAM on indirect emissions and does not consider demand pull in other regions



Note: The cost curves above refer to scenarios Sc 4a and Sc 4c respectively in: [Second round impact scenarios](#)

# CBAM impact on primary aluminium in Europe (€140/tCO<sub>2</sub>)



## Impact on Imports

- Under the CBAM based on Scope 1 emissions only or are Scope 1+2 emissions considered, **first-round impacts** do not translate into a change in imports and domestic sales do not change compared to the reference case, as demand pull for low-carbon aluminium in other regions is considered.
- Under the **second-round impacts**, semi-finished producers maximise low-carbon primary aluminium in their raw materials mix. This could result in imports into Europe increasing by 41% - 43%, replacing a large share of European production, shutting it down.

## Impact on Prices

- First round impacts** of CBAM will translate into the primary aluminium price in Europe will significantly increase..
- As free allocations are phased out, the price increases by up to 28% under Scope 1 CBAM and 37% under Scope 1+2 CBAM.
- Second-round impacts could see lower prices than the reference (-18%) when some carbon leakage measures are retained (-10% carbon leakage measures case) by domestic smelters. When carbon leakage measures are fully phased out, primary aluminium prices would only increase 8% and European smelters will lose competitiveness as they will continue to face higher indirect carbon costs than importers due to the EU ETS.

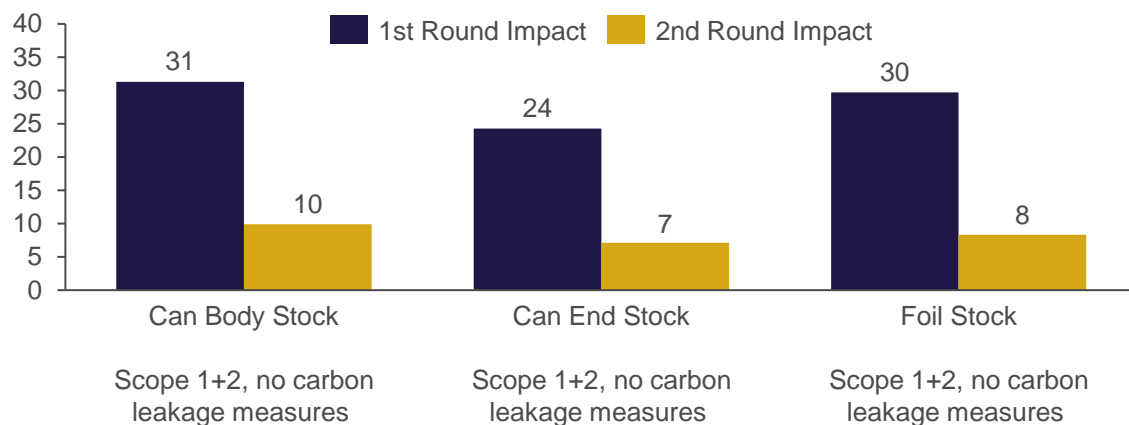
## Impact on Value add

- Value add increases in **first-round impacts** of CBAM, and is higher than in the reference case when carbon leakage measures are retained.
- As carbon leakage measures are phased out, the value add increment over the reference case diminishes. Value add under Scope 1 CBAM is higher than under Scope 1+2 CBAM as the cost pressure is greater in the latter case for domestic producers due to the phasing out of both free allocation and indirect compensation..
- The second-round impacts** would be destructive to European value add, decreasing it by -64% to 77%.

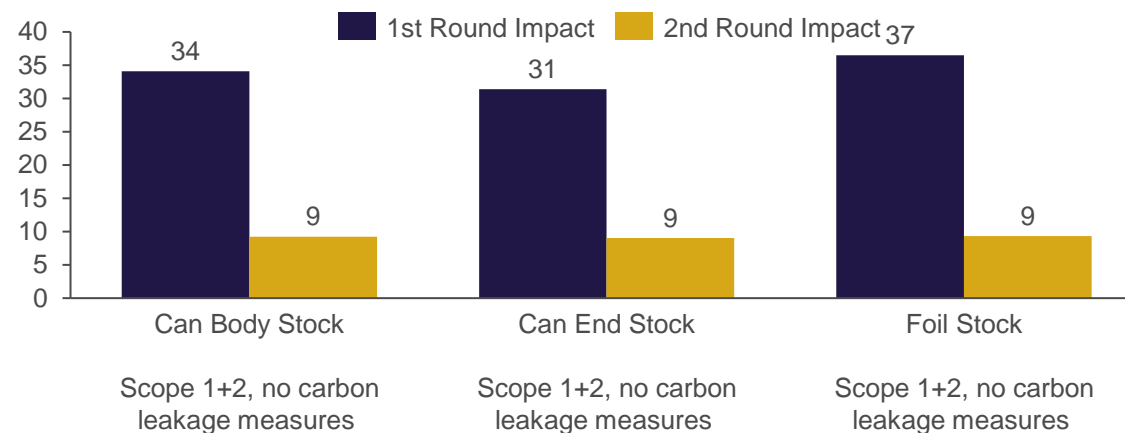
# CBAM impact on semi-finished aluminium in Europe

- The impact of CBAM on the semi-finished aluminium segment is considered for major semi-finished products in Europe: can body stock, can end stock and foil stock.
- The cost pass through of the primary aluminium price on to the raw materials and total costs of domestic semi finished aluminium producers is examined under the first- and second-round impacts scenarios discussed in the primary aluminium analysis.
- Prices are assessed through a product-specific cost competitiveness analysis of European producers against a major semi-finished importer.

**Total costs increase vs Reference Case, %**



**Price increase vs Reference Case, %**



**Total costs increase**

- The **first-round impacts** experienced by the primary aluminium sector will translate into an 24% - 31% increase in the cost of producing semi-finished products.
- This is because high primary aluminium prices will be passed through to the raw material costs of semi-finished producers (i.e purchases of ingot and slab to produce the above products). Raw materials' cost will increase between 31% - 34%.
- If **second-round impacts** materialise, the cost increase for semi-finished producers would be limited to 7%-10%, as prices for primary ingot and slab are lower in this scenario.

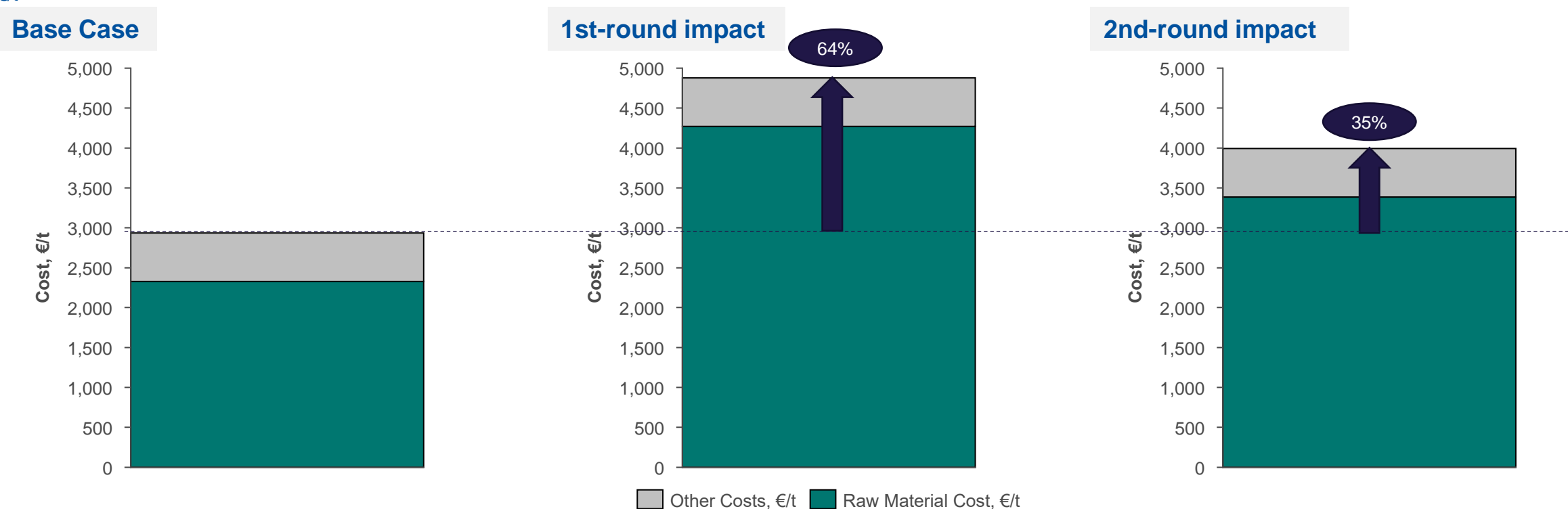
**Price increase**

- **Prices will rise between 31-37%** across the major semi-finished aluminium markets examined under the **first-round impacts of CBAM**.
- Under the **second-round impacts** of CBAM, semi-finished prices would **only increase ~9%**.

# Pass through analysis of first- and second-impacts to European typical extruder

- In the Base Case, raw materials represent ~76% of total costs at €2,327/t for a typical extruder in Europe with 150 ktpy capacity. Total delivered costs (excluding ETS costs) are €3,044/t.
- First-round impacts of CBAM result in raw material costs increasing by 84% to €4,270/t (which represent 86% of total costs). This translates into total delivered costs increasing by 64% to €4,987/t.
- Second-round impacts result in raw material costs increasing by 45% to €3,385/t (which represents 83% of total costs). This translates into total delivered costs increasing by 35% to €4,103/t.

Typical European extruder delivered costs (excluding ETS costs)  
€/t



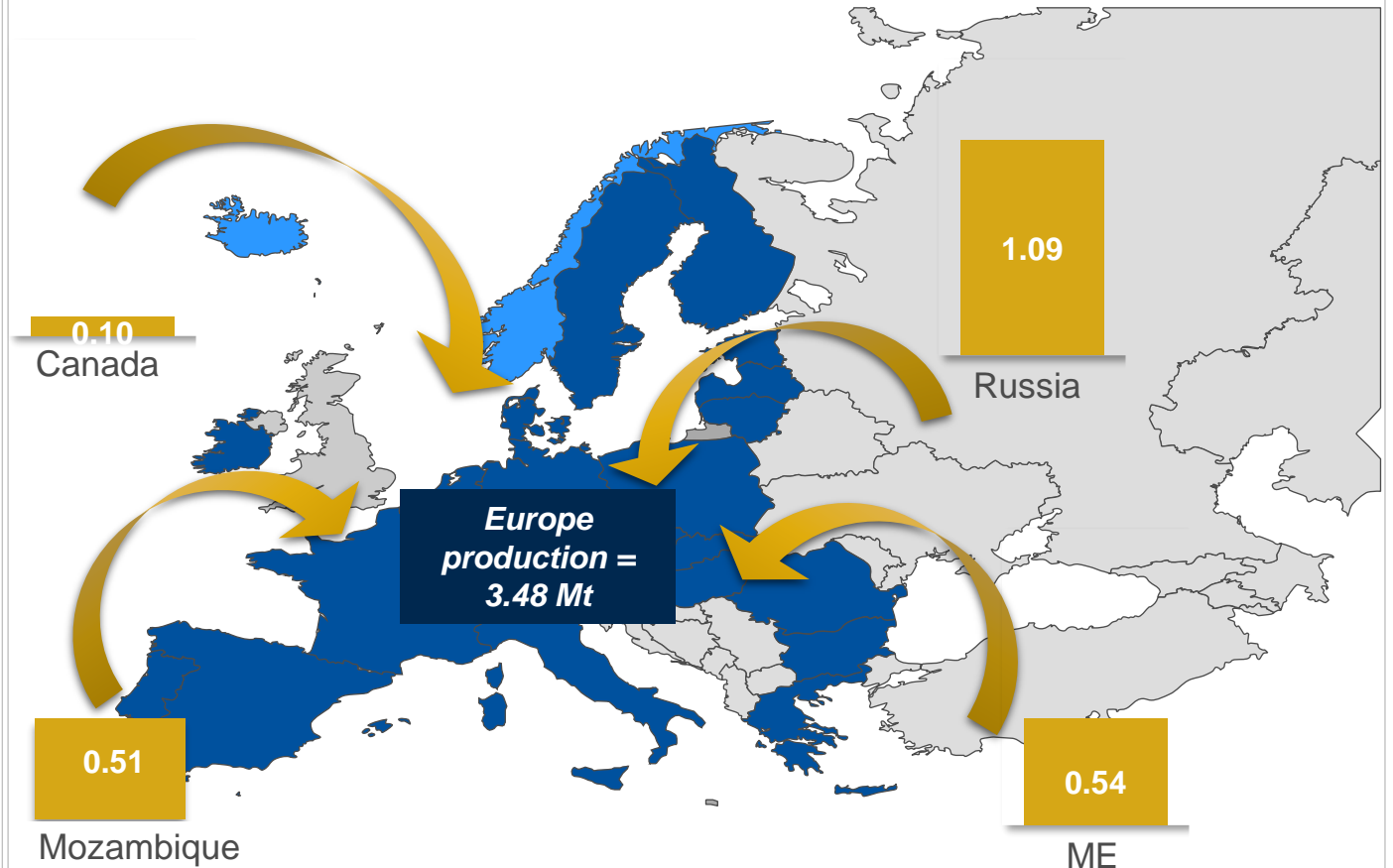
# I. Executive Summary

## Workstream 2

## Summary of workstream 2: value chain & implementation risks

- CRU Consulting conducted 13 primary research interviews in Europe, Africa, Middle East and China across various parts of the aluminium value chain. These typically involved a 30-90 minutes video call. A standard set of question was used in all interviews, and the interviewees were briefed about the background to the study.
- CBAM will lead to **higher cost for high-carbon aluminium entering Europe**. CBAM is targeting the following products: HS 7601, 7603-7608, 76090000. Some products are exempt, thereby creating risks of circumvention, while implementation risks will also exist. All this may incentivise some fraudulent behaviour from some importers.
- CBAM is a **first of kind trade policy** and there are no similar cases to compare it to like for like.
- Other economic risks that are associated with the implementation of CBAM is the potential of blocking imports from certain regions and increasing reliance on fewer regions in the world, which could lead to **resource risk mitigation. These risks are supply chain risk and geopolitical risks.**

Import volumes of ingot, billet and slab to Europe in 2019 Mt



## Summary of workstream 2: value chain & implementation risks

Unlike other industries with simpler value chains, the aluminium value chain is highly complex with various CBAM circumvention possibilities. Circumvention avenues would typically be concentrated in the downstream semi-finished aluminium segment of the value chain.

