



# THE STEEL CLIMATE STANDARD

Framework for Steel Product  
Certification and Corporate  
Science-Based Emissions Targets



Global Steel  
Climate Council

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# Acknowledgements

The Global Steel Climate Council (GSCC) is a non-profit association organized to advance climate strategy by establishing standards and advocating for carbon emissions reductions by members of the steel industry. The GSCC includes more than 30 international producing members and supporters who are steel manufacturers, trade associations, end users, scrap metal suppliers, and non-governmental organizations.

The founding members of the GSCC are the CELSA Group, Commercial Metals Company, Institute of Scrap Recycling Industries (ISRI), Nucor Corporation, Steel Dynamics, Inc., and Steel Manufacturers Association (SMA).

This standard was developed by Trinity Consultants in collaboration with members of the Global Steel Climate Council (GSCC).

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# 1 | Our Mission

**The Steel Climate Standard developed by the GSCC has three important objectives:**

1. Provide a single, technology-agnostic framework for steel product certification and company science-based emissions target-setting that applies to all steel producers equally on a global basis;
2. Allow all steel customers to know the carbon emissions associated with the steel products they are purchasing; and
3. Create an industry standard for achieving the emissions reduction goals in the Paris Climate Agreement by 2050.

**The world needs steel.** Steel is an essential engineering material for the global economy. It is a critical material used to manufacture our vehicles and machinery, construct our buildings and factories, produce our energy, and much more. Steel is also playing a central role in the transition to a greener economy with the production of electric vehicles, wind turbines, solar arrays, and other clean tech products. Steel is fundamental for advancing a circular economy because its many different applications and components can efficiently be recycled, reused and remanufactured.

**The world needs to lower carbon emissions.** The GSCC is leading the charge to reduce carbon emissions and encourage investments in lower emissions technology as part of the global effort to decarbonize economies and societies. An October 2022 report by the United Nations shows that countries are not on track to limit carbon emissions to 1.5°C by the end of the century. Steel producers around the world are at different stages in their efforts to reduce emissions and achieve sustainable production.

**We already have the technology.** Steelmakers have become more efficient and producing a tonne of steel today requires only 40% of the energy it did in 1960. Many steelmakers around the world have successfully converted steel production processes to maximize steel's circularity, resulting in lower carbon intensity products. This means that the technologies already exist to cut global steelmaking emissions by over 70%. And new technologies are on the horizon that will reduce emissions even further.

**We need a global standard.** Customers need to know the embodied carbon content of the steel they are purchasing to meet their company's ambitions related to decarbonization. Numerous groups and companies – including the GSCC – are advocating for a global standard to measure and report carbon emissions from steel. Today, some steelmakers and organizations are advocating for a common standard that features a “ferrous scrap sliding scale” relative to use of scrap steel for setting carbon reduction trajectories. This approach sets two disparate standards for emissions from steel producers; one standard for steel made from iron ore extractive production processes, and another for steel made from

circular electric arc furnace (EAF) processes. This method is unacceptable when a common sector goal for the steel industry is sought to achieve the 1.5-degree Celsius (°C) objective by 2050.

Having a dual standard that allows higher-emission steelmakers to postpone changing their production process to readily available, less carbon intensive methods conflicts with the basic objective of 2050 goal setting. Higher-emitting steel producers use the dual standard to claim their steel products are “green” even if they are produced with significantly higher carbon emissions than those using the electric arc furnace (EAF) process. The GSCC’s mission is to lead the way toward a truly effective low-emission steel standard for all producers that accurately counts carbon emissions – regardless of the production methods.

The GSCC Steel Climate Standard is designed to incentivize true decarbonization of the steel sector by providing carbon intensity standards for global trade purposes as well as a science-based emissions target setting process that ensures companies are managing emissions on a trajectory to attain the 1.5°C scenario by 2050.

**We must avoid a standard that enables greenwashing.** Creating a standard based on a ferrous scrap sliding scale could result in higher emissions steel products being labeled as “green” and prioritized at the expense of lower emissions steel products. This will discourage innovation and allow higher emissions steelmakers to postpone making changes in their production process. Even worse, it will lead to higher greenhouse gas emissions overall from the steel sector. A truly effective lower-carbon steel standard must be one in which actual, attained carbon emissions are measured, and the standard must apply equally to all producers on a global basis.

**We can accomplish this.** The standard must lead to the global steel industry significantly reducing carbon emissions. This can be achieved by creating a science-based emissions standard based on actual emissions that would apply to all producers equally on a global basis. Establishing a standard should incentivize actions that will generate decreases in carbon emissions to achieve the 1.5°C science-based emissions target for the global steel sector.

In summary, the GSCC standard will:

- Establish a single set of process-agnostic product standards and require steel manufacturers to establish science-based emission targets. This approach will promote the global use of advanced technologies in steel production on a more expeditious timeline to achieve the 1.5°C science-based emissions target for the global steel sector.
- Allow global steel producers and consumers to benchmark against a single common standard, provide transparency for consumers when making lower-carbon emissions steel product purchasing decisions, and provide a known and replicable method to track, plan, and implement carbon emissions reduction activities.

For more information, please see <https://globalsteelclimatecouncil.org/>

## 2 | Overview of Standard

The Global Steel Climate Council (GSCC) is an international coalition of steel producers and stakeholders who support a global standard aimed at accelerating the transition to climate-sustaining steel products by incentivizing steelmakers around the world to use available lower-emitting steel production processes and technologies.

The GSCC seeks to provide a set of technology-agnostic standards which accelerate the transition to lower-carbon steel and incentivize the industry to achieve lower carbon emissions by 2050 in alignment with the 1.5°C scenario for the steel sector. In doing so, the GSCC's protocol is comprised of two main components:

1. Product certification criteria for lower-carbon emission steel; and
2. Science-based emissions target setting criteria for steel producers.

Setting science-based emissions targets as outlined by the GSCC standard is a requirement. However, certifying steel products is optional.

The GSCC's established boundary includes critical auxiliary activities that are excluded from other standards, such as scrap collection and sorting as well as hot rolling. Finally, the GSCC's program considers all relevant GHG pollutants (not just CO<sub>2</sub>) and requires independent third-party verification of emissions calculations and reduction targets. In proposing this standard, the GSCC has set out to establish a simple and straightforward, yet comprehensive, science-based steel climate program.

### 2.1 Guiding Principles

The primary objective of the GSCC is to establish a Steel Climate Standard, focusing on the following guiding principles:

- Reducing GHG emissions from the global steel industry;
- Establishing a standard that is technology/production method agnostic;
- Establishing a standard with a system boundary that includes all relevant GHG pollutants from Scope 1, Scope 2 and Scope 3 emissions;
- Establishing a standard that aligns with a science-based glidepath to achieve a 1.5°C scenario by the year 2050;
- Requiring third-party verification of emissions data and science-based emissions targets; and
- Providing relevant information on sustainable steelmaking to appropriate decision makers.

The GSCC has used these guiding principles to build a framework for a proposed standard with five key pillars as its foundation (see Figure 2-1).

Figure 2-1. GSCC Guiding Principles



**SCIENTIFIC**

Aligns with IEA projections, the latest climate science, and Paris Agreement goals to achieve sector-wide targeted reductions by 2050



**QUANTITATIVE**

Specifies numeric product intensity targets, based on clearly defined boundaries, that reduce over time



**COMPREHENSIVE**

Establishes a holistic decarbonization program that includes product-based standards as well as a framework for setting science-based emissions targets for steel producers



**PRINCIPILED**

Outlines a clear vision for the future of steel in a decarbonizing economy based on a process-agnostic approach



**TRANSPARENT**

Provides a straightforward process for certification of products, verification of science-based emissions targets, and labeling for consumer/end-market use



These pillars represent the key characteristics of the GSCC proposed standard, and are further described as follows:

**Scientific.** In developing the proposed standard, the GSCC has relied upon extensive research and information compiled from the latest climate science, steel-industry data, and market projections from credible sources such as the Intergovernmental Panel on Climate Change (IPCC), International Energy Agency (IEA), and World Steel Association (WSA). Our objective is to ensure that the proposed standard aligns with the latest climate science and Paris Agreement goals to achieve sector-wide targeted reductions by 2050.

**Quantitative.** The GSCC standard specifies numeric steel product carbon emissions intensity standards, based on clearly defined boundaries that include all relevant carbon-intensive processes in the steelmaking value chain. These intensity standards reduce over time to achieve the decarbonization goal for the global steel industry by 2050.

**Comprehensive.** The proposed standard establishes a holistic decarbonization program that includes product-based standards as well as a framework for setting science-based emissions targets for steel producers, both of which rely on the reduction of carbon emissions intensity on a carbon dioxide equivalent (CO<sub>2</sub>e) basis, inclusive of all relevant GHGs. This product-focused approach allows for decarbonization to be practically achieved on a mill-by-mill basis, as technology evolves over the next few decades.

**Principled.** The GSCC standard is founded on a clear vision for the future of steel in a decarbonizing economy based on a process-agnostic approach. By eliminating the “sliding scale” concept for ferrous scrap, the GSCC standard holds all steel manufacturers to the same Steel Climate Standard. This approach recognizes the steel manufacturers that have already made significant investments in lower carbon technology and provides market drivers for near-term reductions from the highest emitting sources as well as long-term investment in emerging technology needed to meet the ultimate decarbonization goal in 2050.

**Transparent.** The framework proposed by the GSCC seeks to simplify and provide a straightforward process for certification of products, verification of science-based emissions targets, and labeling for consumer/end-market use. The GSCC standard establishes a clearly defined and comprehensive set of criteria by which progress in decarbonizing the steel sector can be measured. It relies on global standards to quality assure and verify product intensity claims.

## 2.2 Key Concepts

The GSCC's overarching vision for the proposed standard is a comprehensive process-agnostic decarbonization framework that is focused on global participation in the steel sector to lower overall GHG emissions by 2050. This approach encourages all steel producers to converge toward a common goal. The GSCC framework is built on four key concepts as summarized in Figure 2-2.

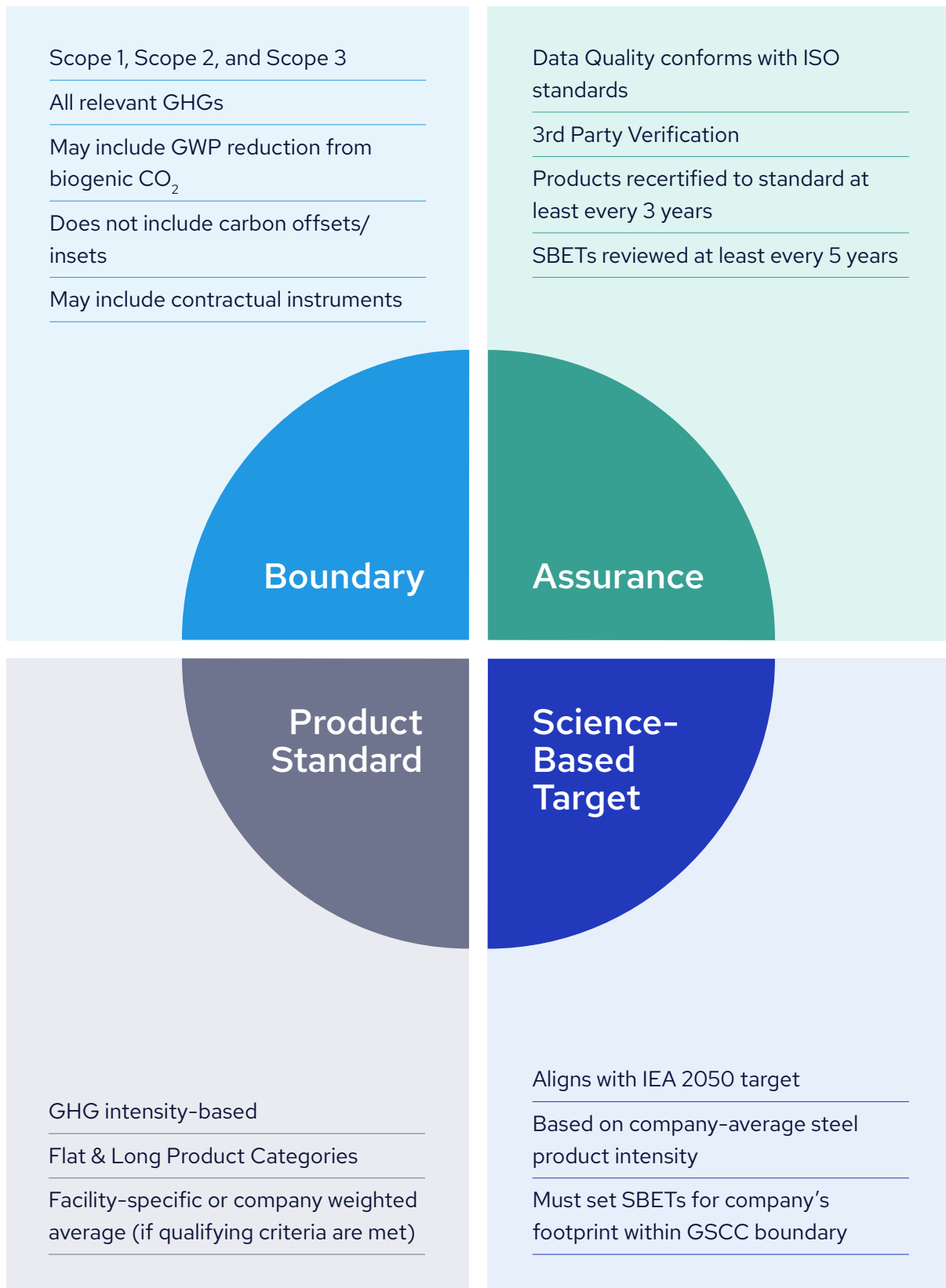
**Boundary.** The GSCC standard defines a clear boundary for Scope 1, Scope 2, and Scope 3 sources and includes applicable GHG pollutants. The GSCC boundary will cover activities from mining to hot rolling and may include contractual instruments for renewable energy and Renewable Thermal Certificates (RTCs) as well as reductions from biogenic CO<sub>2</sub>. Carbon offsets and insets must be excluded.

**Assurance.** The GSCC protocol requires minimum data quality criteria in accordance with ISO standards for developing the carbon footprint. Within the established boundary, companies will calculate an intensity metric in units of tonnes of CO<sub>2</sub>e per tonne of hot rolled steel (t CO<sub>2</sub>e/t hot rolled steel). Independent third-party verification of all data in accordance with established ISO standards is required.

**Product Certifications.** The GSCC proposed standard provides a concise set of criteria for evaluating and certifying flat and long steel products as lower-carbon emissions steel based on their carbon intensity as determined above. Companies can certify as many or as few products as desired and can seek certification at the facility level or at the product level (as a weighted average across the facilities where the product is manufactured, when qualifying criteria are met). The product standard defines and promotes best practices for labeling of certified lower-carbon emissions steel products to provide transparency for consumers/end-market use. Labels should adhere to a standard format that identifies the GSCC standard.

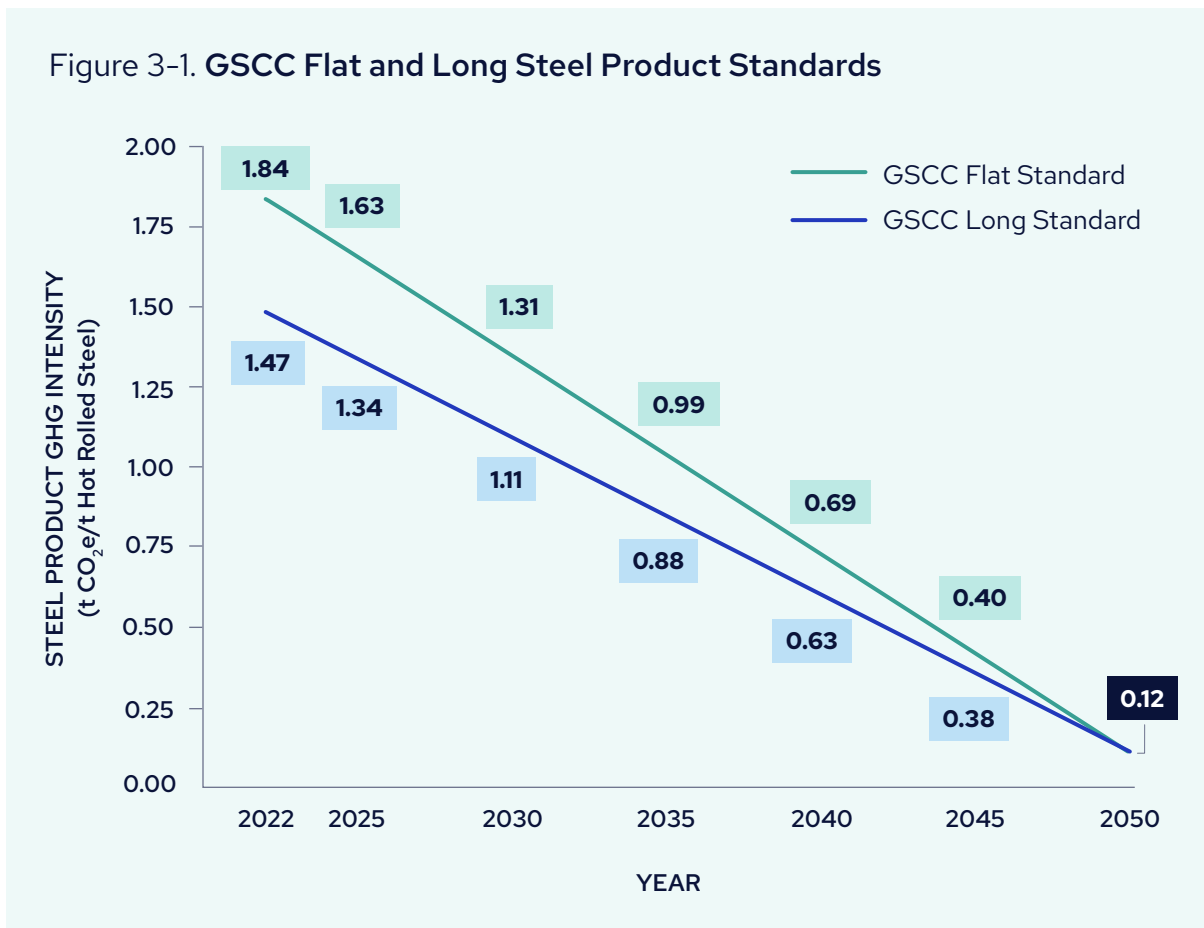
**Science-Based Emissions Targets.** The GSCC approach champions science-based emissions targets as a key pillar of a company's transition to a lower-carbon economy. Participating companies are required to establish and assure climate targets that are based on sound science, in alignment with the 1.5°C scenario and IEA projections for 2050, and that are then reevaluated at least every 5 years.

Figure 2-2. **GSCC Standard Key Concepts**



### 3 | GSCC Steel Product Certification

The GSCC standards for long and flat products from 2022 through 2050 are provided in Figure 3-1. The GSCC is establishing steel product-based intensity standards (t CO<sub>2</sub>e/t hot rolled steel) which distinguish between long products and flat products, recognizing that at this time, it is technically infeasible to manufacture flat products and long products that have equivalent carbon intensities. This is because the raw materials used for sheet products generally have higher embodied carbon, resulting in different product intensity values on a t CO<sub>2</sub>e/t hot rolled steel basis. High alloy specialty steel and stainless steel are not covered by these standards currently.



These standards have been developed in alignment with the GSCC Steel Sector Decarbonization Glidepath described in Appendix C. The GSCC will reevaluate this glidepath at least every five years to ensure that it reflects the latest climate science, at which point the product standards may be adjusted if needed to remain aligned with a revised glidepath.

### 3.1 Demonstrating Conformance

A company's conformance with the long and flat product certification criteria shall be demonstrated by calculating a steel product's GHG emissions intensity, in t CO<sub>2</sub>e/t hot rolled steel, as outlined in Appendix E. The GHG emissions intensity shall be calculated for a given product based on facility-specific product value chain data from the most recent full year. If a company wishes to certify a given product across all of its facilities where that product is manufactured, the weighted average of the GHG emissions intensity across all facilities may be calculated and provided to demonstrate conformance with the GSCC standards, as long as the product emissions intensity at each individual facility also meets the standard.

In addition, since conformance with the standard follows a product life cycle accounting approach, a subset of a given product produced at a single facility may be certified to the GSCC product standards. For example, a company may produce two "grades" of a steel product at a single mill – one of which is manufactured specifically to achieve a lower product intensity (e.g., through the procurement of renewable energy contractual instruments). As long as the company can demonstrate that it meets all requirements for product emissions accounting for the particular grade of product produced at the mill, it can be certified to the GSCC standards.

Companies who wish to adopt the GSCC product standards shall establish and publicly disclose SBETs as outlined in Section 4 within two years of joining the GSCC's Steel Climate Standard as a condition of their participation in the program.

### 3.2 Certification & Labeling of Products

To initially certify products under the GSCC standards, companies shall:

- Provide the steel product's GHG intensity value and documentation of third-party verification of the steel product intensity emissions calculations (t CO<sub>2</sub>e/t hot rolled steel) as outlined in Appendix E; and
- Establish SBETs in accordance with Section 4 within two years of joining the GSCC's Steel Climate Standard.

Since the GSCC product standards decrease annually and the data required to calculate the steel product GHG intensity is collected for the most recent complete year, the intensity value shall be compared to the GSCC standard for the year corresponding to the data collected. That is, if a company wishes to obtain GSCC certification for a certain product in 2024, the data collected relative to the value chain for that product shall be for the year 2023, and the resulting product GHG intensity value shall be compared to the 2023 GSCC product standard value.

The steel product GHG intensity value provided to the GSCC shall be facility-specific. If a company wants to certify a product across multiple facilities where it is produced, the product GHG intensity value provided shall be the weighted average of the GHG emissions intensity across all of the company's facilities that produce it. In addition, the facility-specific emissions intensity values shall be provided to demonstrate that each facility's product meets the standard.

Once the GSCC has determined that a product meets the standard, a product certification will be issued and will be valid for up to three years. To maintain this certification, the company shall calculate, self-verify and disclose annual product intensity values for the most recent year to the GSCC. The annual product intensity values shall be compared to the GSCC standard value for the corresponding year to demonstrate that the product continues to meet the standard. The product intensity values shall be third-party verified every three years during revalidation.

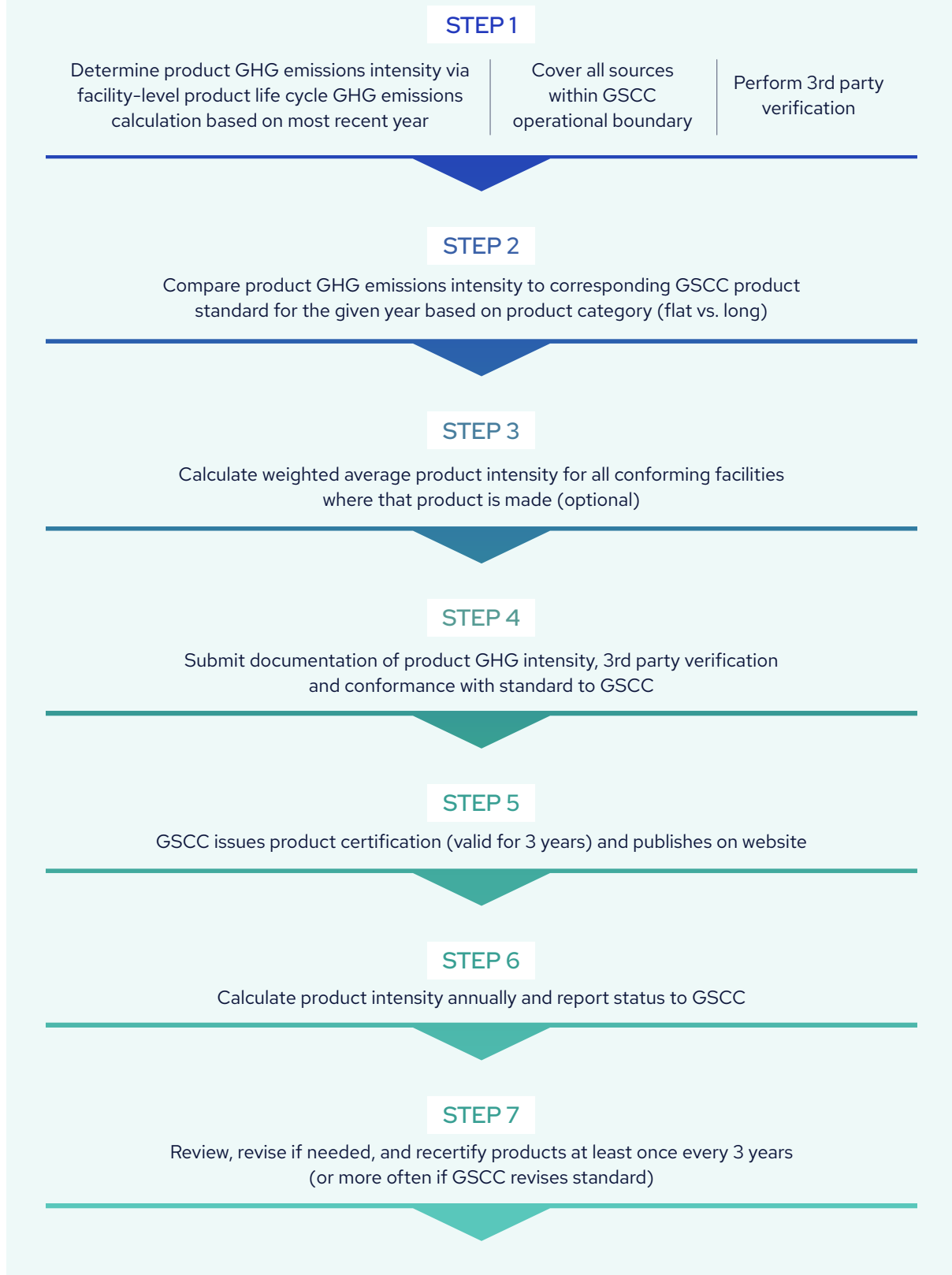
If the GSCC revises the standard during its periodic review cycle, the company will need to recertify against the revised standard in order to continue use of the GSCC Steel Climate Standard certification for the product.

The GSCC will provide product labeling templates to participating companies for optional use in marketing/labeling certified products at the company's discretion. Additionally, the GSCC will maintain a list of certified products on its website.

### 3.3 GSCC Process for Certifying to Product Standards

The overall process for certifying products to the GSCC standards is presented in Figure 3-2 on the next page.

Figure 3-2. Product Standard Process Overview



## 4 | GSCC Science-Based Emissions Target Setting

Steel companies participating in the GSCC program are required to establish science-based emissions targets (SBETs) that reflect an ambition of achieving the 1.5°C scenario by the year 2050, which is one of the GSCC guiding principles. This includes establishing both interim targets (5 to 10 years from the year of commitment) as well as a long-term goal aligned with this ambition. This is accomplished by setting targets as outlined in this section that are at or below the GSCC Steel Sector Decarbonization Glidepath. See Appendix C for information on the GSCC Steel Decarbonization Glidepath.

### 4.1 Guidelines for Setting Science-Based Emissions Targets (SBETs)

To establish SBETs, a participating company shall follow the steps outlined below.

#### **Step 1. Calculate Base Year CASEI**

As a first step in the target setting process, a company will calculate the base year Company-Average Steel Emissions Intensity (CASEI) for its steelmaking operations expressed as t CO<sub>2</sub>e/t hot rolled steel. The CASEI is calculated as outlined in the accounting procedures prescribed in Appendix F. The base year is comprised of a full year of representative operations and shall be no earlier than 2015.

#### **Step 2. Compare the Base Year CASEI to the GSCC Decarbonization Glidepath**

Once the base year CASEI is calculated, the company shall compare it to the GSCC Decarbonization Glidepath value in Appendix Table C-3 for the year that corresponds to the base year selected by the company. For companies electing to use a base year that is prior to 2020, the GSCC Decarbonization Glidepath is extrapolated back to 2015 in Appendix Table C-4 for reference in this step of target-setting.

The company shall develop a company specific GHG reduction trajectory that results in the reduction of its CASEI to align with the GSCC Decarbonization Glidepath. If the base year CASEI is above the GSCC Decarbonization Glidepath, the company shall develop its company specific GHG reduction trajectory as indicated in Step 3A. If the base year CASEI is below the GSCC Decarbonization Glidepath, the company shall develop its company specific GHG reduction trajectory as indicated in Step 3B.



**Step 3A. If the Base Year CASEI is ABOVE the GSCC Decarbonization Glidepath**

If the comparison in Step 2 shows that the base year CASEI value is above the GSCC Decarbonization Glidepath value for the corresponding year, then the company will draw a line from its base year CASEI value to the point of convergence with the GSCC Decarbonization Glidepath at the year 2040. The trajectory of that line, from the base year CASEI value to the point of intersection and then continuing along the GSCC Decarbonization Glidepath to 2050, represents the minimum intensity reduction progress that must be achieved to meet the GSCC’s science-based target criteria. Refer to Appendix Figure F-1 for an illustrative example (Example 1) of this scenario.

**Step 3B. If the Base Year CASEI is BELOW the GSCC Decarbonization Glidepath**

If the comparison in Step 2 shows that the base year CASEI value is below the GSCC Decarbonization Glidepath value for the corresponding year, then the company will draw a horizontal line from its base year CASEI value to the point of convergence with the GSCC Decarbonization Glidepath. The company will then determine the year represented by that point of convergence and draw a second line from its base year CASEI value to the point on the GSCC Decarbonization Glidepath that is 1-5 years ahead of the point of convergence, depending on the company’s base year CASEI, as indicated in Table 4-1 below. This approach recognizes companies that have already made progress in decarbonizing their operations while still challenging them to continue to lower their emissions.

Table 4-1. **Company Trajectory Adjustment**

Base Year CASEI	Adjustment From Intersection w/ Glidepath
1.49 – 1.74	5 Years
1.24 – 1.49	4 Years
0.91 – 1.24	3 Years
0.57 – 0.91	2 Years
0 – 0.57	1 Year

The resulting trajectory, from the base year to the intensity corresponding to that 1-5 year point and then continuing along the GSCC Decarbonization Glidepath to 2050, represents the minimum intensity reduction progress that must be achieved to meet the GSCC science-based target criteria. Refer to Appendix Figure F-2 for an illustrative example (Example 2) of this scenario.

#### **Step 4. Set Interim SBETs**

The company shall establish an interim SBET, or series of interim SBETs, to be met within 5-10 years from the date of commitment (i.e., the date that they are made public). The interim SBETs shall be set at or below the company specific trajectory determined as outlined above. Once the company specific trajectory intersects with the GSCC Decarbonization Glidepath in a given year, the company's SBETs shall continue to align with (i.e., be at or below) the GSCC Decarbonization Glidepath to 2050. The SBETs shall be supported by a credible, documented company-level strategy for reducing GHG emissions from steelmaking operations and the expected timeline for implementing changes to operations within the GSCC boundary to achieve real reductions in its CASEI.

#### **Step 5. Set Long-Term SBET**

Each company shall set a long-term SBET, for a year from 2040 to 2050 which is at or below its company-specific trajectory.

## **4.2 Certification Requirements for Targets**

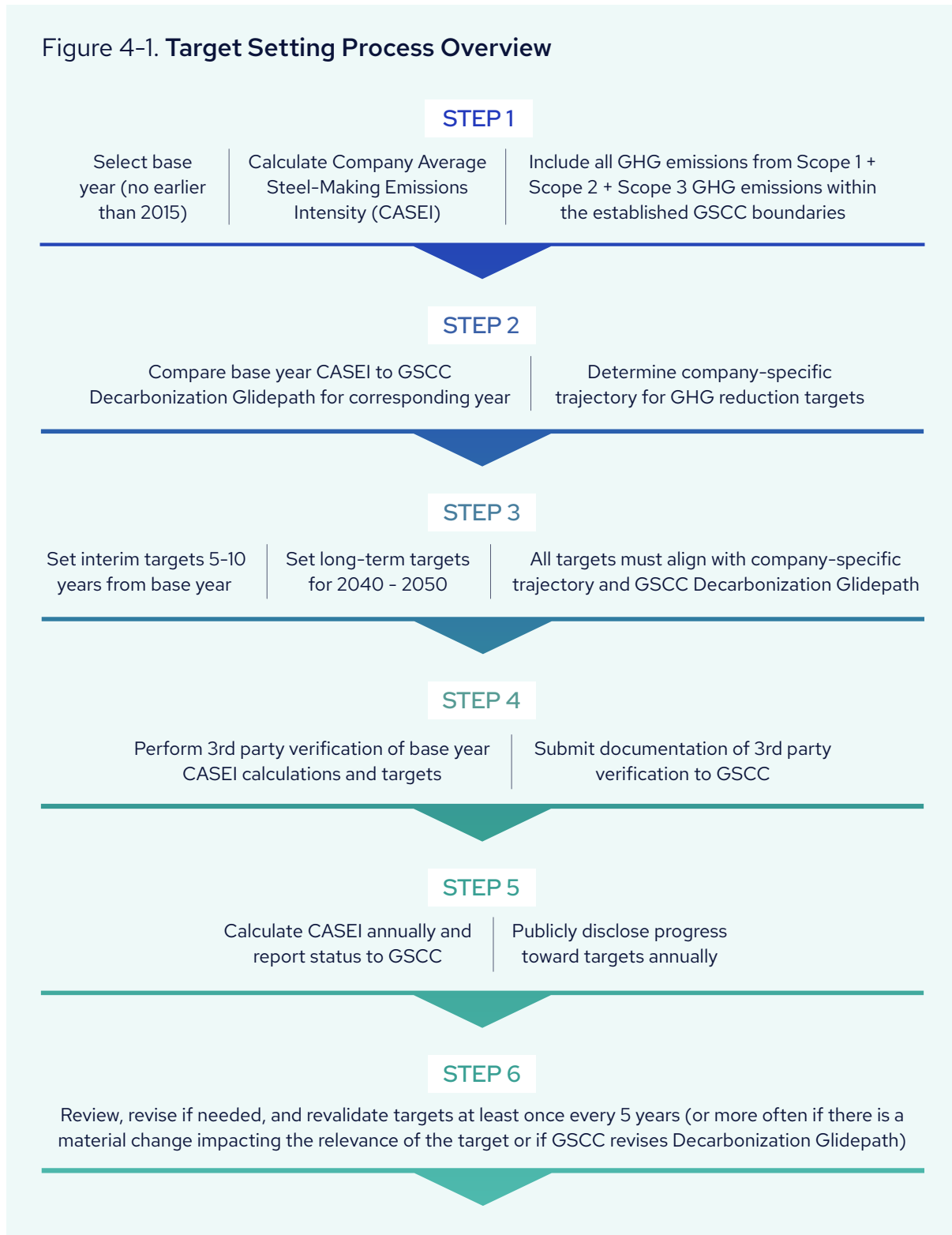
A company's base year CASEI calculation and its interim and long-term SBETs shall be independently verified by a third party. The verifier shall also ensure that target setting conforms with the steps outlined above prior to the commitment date. Once its SBETs are made public, the company shall track its performance by calculating and self-certifying its CASEI annually.

A company's strategy for achievement of its SBETs and its progress toward meeting those targets shall be disclosed publicly, for example, as part of the Corporate Sustainability Report (CSR) or via reporting through a carbon disclosure framework. Progress shall be determined based on the general trend in the company's CASEI as well as overall activities aimed at reducing emissions. That is, progress shall not be strictly based on the CASEI decreasing measurably each year, recognizing that there may be extenuating circumstances in certain years that result in no decrease from the previous year. For example, projects involving implementation of abatement or other decarbonization strategies may span over multiple years before measurable reductions are fully realized. The company's CASEI shall be third-party verified at least every five years.

A company shall recalculate the base year CASEI and re-establish targets if there is a significant change that would materially impact relevance of the target to the company's operations (e.g., changes in company structure due to acquisitions/divestments, discovery of a material error in underlying calculations, etc.). The GSCC suggests that such a change be considered significant if it results in a 10% or greater change in the company's CASEI. Finally, should the GSCC's periodic review of the decarbonization glidepath result in an adjustment to the glidepath, SBETs shall be reviewed and revised/revalidated, as necessary.

### 4.3 GSCC Process for Setting Science-Based Emissions Targets

The overall process for establishing company SBETs is presented in Figure 4-1 below.



# Appendix A. Glossary of Terms

**Base Year:** The year selected as the reference for comparing changes in GHG emissions over time. For the GSCC's Steel Climate Standard, a company's base year can be no earlier than 2015.

**Carbon Dioxide Equivalent (CO<sub>2</sub>e):** Unit for comparing the radiative forcing of a GHG to carbon dioxide using its pollutant-specific global warming potential (GWP). For the purposes of this standard, CO<sub>2</sub>e shall be calculated as outlined in Appendix B.

**Carbon Inset:** An action or activity, which a company implements internally, that indirectly reduces a company's carbon footprint outside of its direct operations but within its own supply chain (e.g., planting trees as nature-based carbon sink onsite).

**Carbon Intensity:** The amount of carbon emissions per unit of product. For the purposes of this standard, carbon intensity is defined as the tonnes of CO<sub>2</sub>e emitted per tonne of hot rolled steel produced (t CO<sub>2</sub>e/t hot rolled steel).

**Carbon Offset:** An action or activity, which is implemented external to a company's value chain, that compensates for the company's own GHG emissions (e.g., purchasing offsets generated by nature-based carbon sink located off site).

**Company-Average Steel Emissions Intensity (CASEI):** GHG emissions intensity (in units of tonnes of CO<sub>2</sub>e emitted per tonne of hot rolled steel produced) calculated as a weighted average across all steel products and all steel making operations within the GSCC defined boundary.

**Contractual Instruments for Renewable Energy:** Any type of contract between two parties for the sale and purchase of energy bundled with attributes about the energy generation, or for unbundled attribute claims. Markets differ as to what contractual instruments are commonly available or used by companies to purchase energy or claim specific attributes about it, but they can include energy attribute certificates (RECs, GOs, etc.), direct contracts (for both low-carbon, renewable, or fossil fuel generation), supplier-specific emission rates, and other default emission factors representing the untracked or unclaimed energy and emissions (termed the residual mix) if a company does not have other contractual information that meets the GHG Protocol Scope 2 Quality Criteria.

**Cradle-to-Gate:** Life cycle of emissions and removals attributable to a product from material acquisition through the point at which the product leaves the reporting company's gate (e.g., immediately following the product's production).

**Crude Steel:** Steel in the first solid state after melting, suitable for further processing or for sale (also referred to as raw steel). This is typically measured at the point at which continuous casting or ingot casting has been completed, and prior to any further processing such as roughing or hot rolling.

**Embodied Carbon:** GHG emissions associated with a product's life cycle, including raw material extraction, transportation, processing, and manufacturing.

**Energy Attribute Certificate:** A category of contractual instrument that represents certain information (or attributes) about the energy generated but does not represent the energy itself. This category includes a variety of instruments with different names, including certificates, tags, credits, or generator declarations (for example, Renewable Energy Certificates or RECs in the U.S.).

**Flat steel products:** Category of steel products characterized by their wide and thin shape produced by passing steel ingots or slabs through rollers. Flat products include sheet, strip, coil, welded tube and plate products.

**Greenhouse Gas (GHG):** Gaseous constituent of the atmosphere, both natural and anthropogenic, that absorbs and emits radiation at specific wavelengths within the spectrum of infrared radiation emitted by the Earth's surface, the atmosphere and clouds. For the purposes of the GSCC standard, GHGs include carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulfur hexafluoride (SF<sub>6</sub>) and nitrogen trifluoride (NF<sub>3</sub>).

**Hot Rolled Steel:** Steel product that has been heated above the recrystallization temperature to plastically deform it in the working or rolling operation. This process is used to create shapes with the desired geometrical dimensions and material properties while maintaining the same volume of metal.

**Life Cycle Assessment:** Compilation and evaluation of inputs, outputs, and potential environmental impacts of a product system throughout its lifecycle.

**Location-Based Method:** A method to quantify Scope 2 GHG emissions based on average energy generation emission factors for defined locations, including local, subnational, or national boundaries.

**Long steel products:** Category of steel products characterized by their length and relatively small cross-sectional area, typically produced from blooms or billets into straight lengths. Long products include bars, rods, structural steel beams and shapes, rail, wires, and specialty steel sections.

**Market-Based Method:** A method to quantify Scope 2 GHG emissions based on GHG emissions emitted by the generators from which the reporter purchases electricity through contractual instruments (including bundled and unbundled attributes) on their own.

**Operational Boundary:** Defines the scope of direct and indirect emissions for processes/operations that fall within the established organizational boundary. For the GSCC program, this is a fixed boundary that begins with upstream production and transportation of alloys/feedstocks (including scrap collection and processing) and ending with hot rolling of steel product as identified in Appendix Table B-1.

**Primary Data:** Primary data are the data collected from specific processes and activities in a product's life cycle. Primary data can be process activity data (physical measures of a process that results in GHG emissions or removals), direct emissions data (determined through direct monitoring, stoichiometry, mass balance, or similar methods) from a specific site, or data that is averaged across all sites that contain the specific process. Primary data can be measured or modeled, as long as the result is specific to the process in the product's life cycle. Primary data may also include data provided by suppliers or other value chain partners related to specific activities in a product's value chain.

**Product Category:** A group of steel products that can fulfill equivalent functions. For the purposes of the GSCC product standards, this is defined as flat products and long products. See Appendix D for detailed categorization of steel products.

**Reheat Furnace:** Steelmaking process in which steel stock is heated above the recrystallization temperature for the purpose of hot rolling.

**Renewable Natural Gas:** A mixture of methane and carbon dioxide (and other hydrocarbons) produced from the biological decomposition of organic materials which has been upgraded to meet pipeline quality standards so that it may blend with, or substitute for, geologic natural gas.

**Renewable Thermal Certificate (RTC):** a unique representation of the environmental attributes associated with the production of renewable natural gas. One certificate is created in association with the generation of one dekatherm of renewable natural gas.

**Science-Based Emissions Target (SBET):** Under the GSCC program, SBETs are GHG emissions reduction targets that are in line with the goals of the Paris Agreement to limit global warming to 1.5°C above pre-industrial levels. By definition, SBETs are based on sound science and a credible feasibility estimate of what the company can achieve by a specified target date.

**Scope 1 Emissions:** Direct GHG emissions resulting from the activities performed by a company within its operational boundary, including emissions from on-site fuel consumption. For the GSCC program, the processes/operations included within the operational boundary are defined in Appendix B.

**Scope 2 Emissions:** Indirect GHG emissions occurring outside the company's operational boundary, which result from the generation of electricity, heating, cooling, and/or steam that is consumed (i.e., purchased or otherwise imported). For the GSCC program, the processes/operations included within the operational boundary are defined in Appendix B.

**Scope 3 Emissions:** Indirect GHG emissions associated with the activities that occur outside of the operational boundaries of the company and its steel-making activities. For the GSCC program, the processes/operations included within the operational boundary are defined in Appendix B.

**Scrap:** Iron, steel and other metal material in metallic form that is recovered in multiple life cycle stages, including steel production processes, the manufacturing processes of final products and the end of life of final products, and is recycled as a raw material for steel production.

**Secondary Data:** Process data that are not from specific processes in the studied product's life cycle and do not qualify as primary data. Secondary data can come from external sources or other internal sources that serve as proxy for the studied process. Examples of sources of secondary data include: financial data, average usage factors or emission factors from life cycle databases, industry average emission factors, company process activity data, etc.

**Steel Product:** A product designed and manufactured from steel that is marketed and sold to customers.

**Third Party:** A fully independent and approved or accredited certification body that has provided assurance that specific criteria as defined by the standard have been met.

**Toll Manufacturing:** Outsourcing all or part of the manufacturing of a product to a third party where a steel company provides the raw materials or semi-finished products as well as the final product specifications.

**Tonne:** Metric tonne (t), equivalent to 1,000 kilograms or 2,204.6 pounds (lbs) or 1.1023 short tons.

## Appendix B. GSCC Boundaries

The GSCC is establishing a system boundary for determining steel's carbon intensity that captures the key sources of direct and indirect GHG emissions in the steel manufacturing value chain. It is important to establish a comprehensive and consistent boundary to ensure that:

- Reduction targets cover all relevant, carbon-intensive processes (ironmaking and steelmaking processes, as well as critical upstream raw material processes), and
- Comparisons between product carbon intensities are on a like-for-like basis.

The GSCC boundary is fixed, meaning that reporting companies shall include all sources identified as "in boundary" in the calculation of steel product carbon intensity, regardless of whether they are Scope 1, Scope 2 or Scope 3. For example, if a company purchases billet or slab to make its hot rolled steel product, the upstream Scope 3 emissions associated with the processes in the GSCC boundary involved in making that billet or slab are counted. This ensures that the billet or slab is sourced responsibly and prevents artificial reductions in intensity. Similarly, if a company transfers billet or slab to a third party for hot rolling of their product under a toll manufacturing agreement, the downstream Scope 3 emissions associated with that hot rolling activity are counted. This ensures that a company does not outsource hot rolling activities to artificially reduce their intensity.

The following sections provide more detailed information regarding the key boundary definitions established under the GSCC program.

### B.1 GSCC GHG Boundary Definition

The calculation of emissions for purposes of the GSCC program shall account for the GHGs required by the Kyoto Protocol and The GHG Protocol Corporate Accounting and Reporting Standard (revised edition, 2015).<sup>1</sup> These GHGs are currently: carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) sulfur hexafluoride (SF<sub>6</sub>) and nitrogen trifluoride (NF<sub>3</sub>). An individual GHG shall be considered insignificant if it represents less than 0.5% of total Scope 1 GHG emissions, and less than 5% of total Scope 3 emissions within the GSCC boundary, on a CO<sub>2</sub>e basis.

Total GHG emissions shall be calculated in terms of carbon dioxide equivalents (CO<sub>2</sub>e) using the 100-year global warming potential (GWP) published by the Intergovernmental Panel on Climate Change (IPCC). GSCC encourages use of GWP values available from the latest IPCC assessment report (AR) so that the GHG emissions estimates reflect the latest climate science. Per ISO 14064-1:2018, if the GWP values are not taken from the latest IPCC report, the emissions factors or the database reference used in the calculation, as well as their source, shall be provided for purposes of 3rd party verification.



## B.2 GSCC Operational Boundary Definition

The GSCC operational boundary is shown in Figure B-1. It is identical to the boundary identified by the International Energy Agency (IEA) in its analytical boundary for defining near zero emission steel production, with several key exceptions:<sup>2</sup>

- It extends beyond the steel casting step to include reheat furnaces and hot rolling processes, which can be energy-intensive;<sup>3</sup>
- It includes upstream processes for collecting and sorting ferrous scrap; and
- It includes upstream production of metal alloys and metal additives (e.g., de-oxidizing agents) that may be significant for certain products.

Since the operational boundary ends with hot rolling, the denominator for steel product carbon intensity is tonne hot rolled steel production. Table B-1 provides a more detailed description of the processes considered within the GSCC operational boundary and also compares it to the analytical boundaries used by IEA in developing their iron and steel sector decarbonization pathway discussed in Appendix C.

Figure B-1. GSCC Operational Boundary

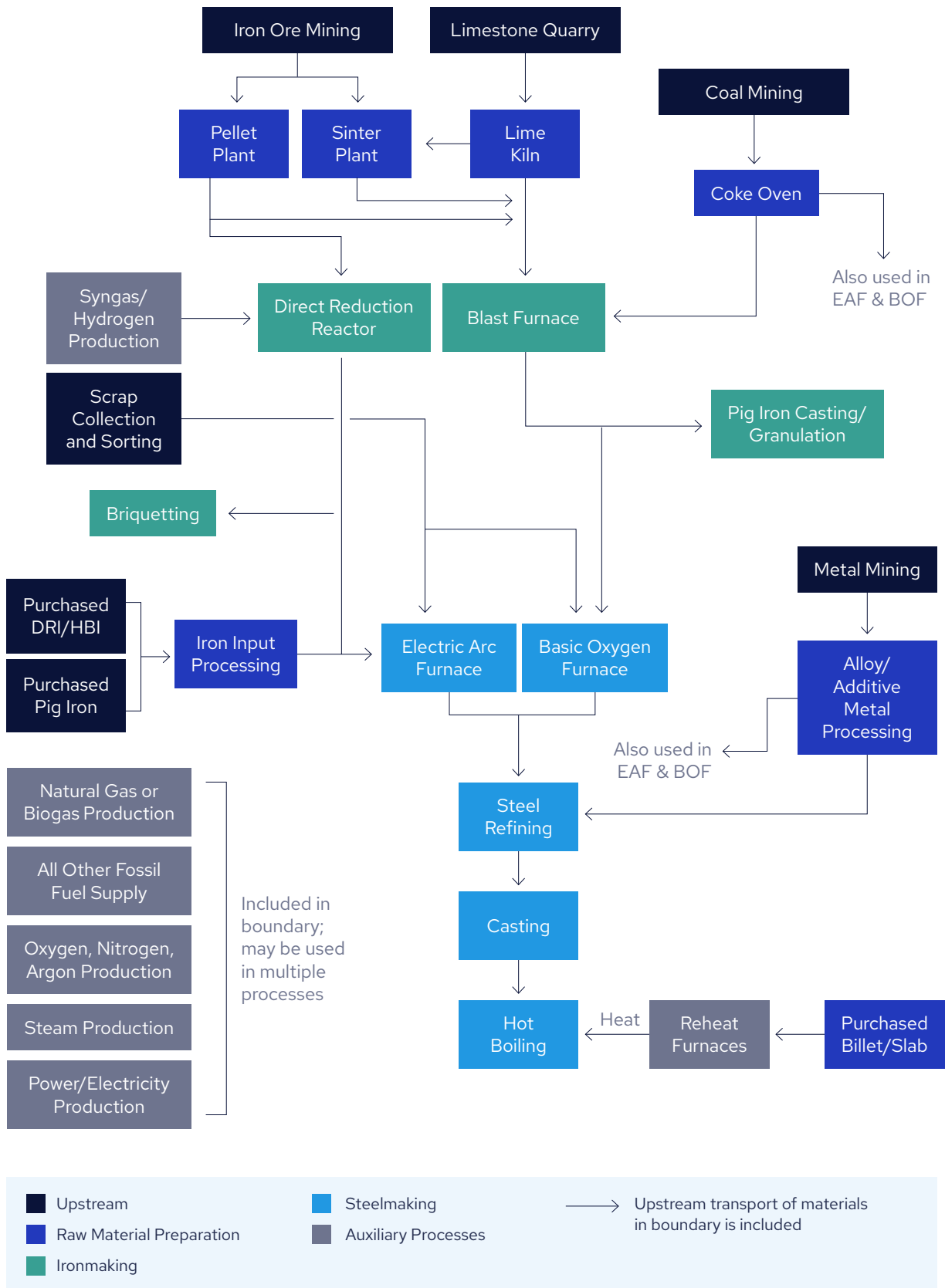


Table B-1. **Boundary Matrix**

Process Block	Description	In GSCC Boundary	In IEA Boundary
<b>UPSTREAM RAW MATERIALS</b>			
Iron Ore Mining	Upstream extraction of iron ore	Y	Y
Limestone Quarry	Upstream extraction of limestone	Y	Y
Coal Mining	Upstream extraction of coal	Y	Y
Metal Mining	Upstream extraction of metals	Y	N
Scrap Collection/Sorting	Upstream collection, sorting and shredding of scrap metal	Y	N
Purchased DRI/HBI	Upstream production of DRI/HBI that is purchased from others	Y	Y
Purchased Pig Iron	Upstream production of pig iron that is purchased from others	Y	Y
Purchased Billet/Slab	Upstream production of steel billets/slabs that are purchased from others	Y	Y
<b>RAW MATERIAL PREPARATION</b>			
Pellet Plant	Iron ore processing into uniform-sized iron ore pellets	Y	Y
Sinter Plant	Iron ore fines processing into sinter	Y	Y
Lime Kiln	Limestone processing into lime	Y	Y
Coke Oven	Coal processing into coke	Y	Y
Alloy/Additive Metal Processing	Metal processing into metal used for alloys and additives	Y	N
Purchased Iron Inputs	Iron input processing/on-site transfer into EAF	Y	Y
<b>AUXILIARY PROCESSES</b>			
Syngas/Hydrogen Production	Upstream production of hydrogen and syngas	Y	Partial <sup>a</sup>
Natural Gas/Biogas Production	Upstream production of natural gas and biogas	Y	Partial <sup>a</sup>
All other Fossil Fuel Supply	Upstream production of all other fossil-based fuels	Y	Y
Oxygen Production	Upstream production of Oxygen	Y	Y
Nitrogen and Argon Production	Upstream of other industrial gases - Nitrogen and Argon	Y	N
Steam Production	Upstream production of steam	Y	N
Power/Electricity Production	Upstream production of electricity	Y	[Note b]
Other Fossil Fuels Production	Upstream production of fossil fuels other than natural gas	Y	Y
Upstream Materials Transport	Transportation of raw materials included in boundary to iron and steel making sites	Y	Y

Process Block	Description	In GSCC Boundary	In IEA Boundary
<b>IRONMAKING PROCESSES</b>			
Direct Reduction Reactor	Ironmaking process via direct reduction of iron using CO and H <sub>2</sub> coming from reformed natural gas, syngas or coal	Y	Y
Blast Furnace	Ironmaking process via reduction of iron ore using CO and carbon coming from solid lime and coke	Y	Y
Briquetting	Ironmaking process in which hot direct reduced iron from reduction kiln is formed into briquettes	Y	Y
Pig Iron Casting/Granulation	Ironmaking process in which hot pig iron from blast furnace is formed into iron droplets or cast into forms	Y	Y
<b>STEELMAKING PROCESSES</b>			
Electric Arc Furnace	Steelmaking process in which iron sources (mainly scrap metal) are melted using an electric arc between graphite/carbon electrodes	Y	Y
Basic Oxygen Furnace	Steelmaking process in which oxygen is blown into molten iron from blast furnace	Y	Y
Steel Refining Processes	Steelmaking processes for refining steel (e.g., AOD, LMF, degassing)	Y	Y
Casting	Steelmaking process in which molten steel is cast into forms	Y	Y
Hot Rolling	Steelmaking process in which steel is rolled at temperatures above its recrystallization temperature	Y	N
Reheat Furnaces	Steelmaking process in which steel stock is heated to above the recrystallization temperature for hot rolling	Y	N
Waste Water Treatment	Onsite waste water treatment processes	N	N
Waste Treatment	Onsite waste handling processes	N	N
Functional Unit (intensity denominator)	Functional Unit (intensity denominator)	tonne hot rolled steel production	tonne crude steel production

<sup>a</sup> IEA boundary only includes fossil fuel supply, does not appear to include biogas or syngas.

<sup>b</sup> The iron and steel sector carbon budget provided in IEA Net Zero by 2050 Study (2021) accounts for industrial process emissions only, they do not include indirect emissions from purchased electricity. However, the analytical boundary used in IEA Achieving Net Zero Heavy Industry Sectors in G7 Members Study (2022) include imported electricity.

## Appendix C. GSCC Steel Decarbonization Glidepath

The GSCC product intensity standards and company science-based target setting goals are based on *Net Zero by 2050: A Roadmap for the Global Energy System* (IEA NZE), published by the International Energy Agency (IEA), which provides a global pathway to achieve net zero CO<sub>2</sub> emissions by 2050.<sup>4</sup> The IEA NZE allocates a carbon budget for the iron and steel industry that is used as the basis for GSCC's Steel Decarbonization Glidepath. The IEA NZE pathway projects global CO<sub>2</sub> emissions from the iron & steel industry decreasing from 2,349 million tonnes in 2020 to 220 million tonnes in 2050. According to the IEA NZE, steel demand is projected to increase by 12% by 2050. Based on these values, the IEA's projected steel product direct emissions intensity (in t CO<sub>2</sub>/t crude steel) is calculated for 2020 and 2050 as shown in Table C-1.

**Table C-1. IEA NZE Iron and Steel Sector Carbon Budget and Steel Demand Projections**

PARAMETER	2020	2050
IEA NZE Iron and Steel Sector Process Emissions (Mt CO <sub>2</sub> )	2,349	220
IEA NZE Global Steel Production (Mt Steel)	1,781	1,987
<b>IEA NZE Iron and Steel Carbon Intensity (t CO<sub>2</sub>/t steel)</b>	<b>1.32</b>	<b>0.11</b>

The values shown in Table C-1 account for industrial process emissions only. They do not account for indirect emissions from electricity use by the iron and steel industry sector because IEA NZE attributes all such emissions to the power sector. In order to add indirect emissions from electricity use by the iron and steel sector to the IEA NZE projections shown in Table C-1, the GSCC adopted the adjustment made by the Science-Based Target Initiative (SBTi) and Rocky Mountain Institute (RMI) to estimate indirect emissions from electricity use by the iron and steel industry for 2020 and 2050.<sup>5,6</sup> The estimated Scope 2 emissions intensity values for the iron and steel sector in 2020 and 2050, as well as the total intensity are provided in Table C-2.

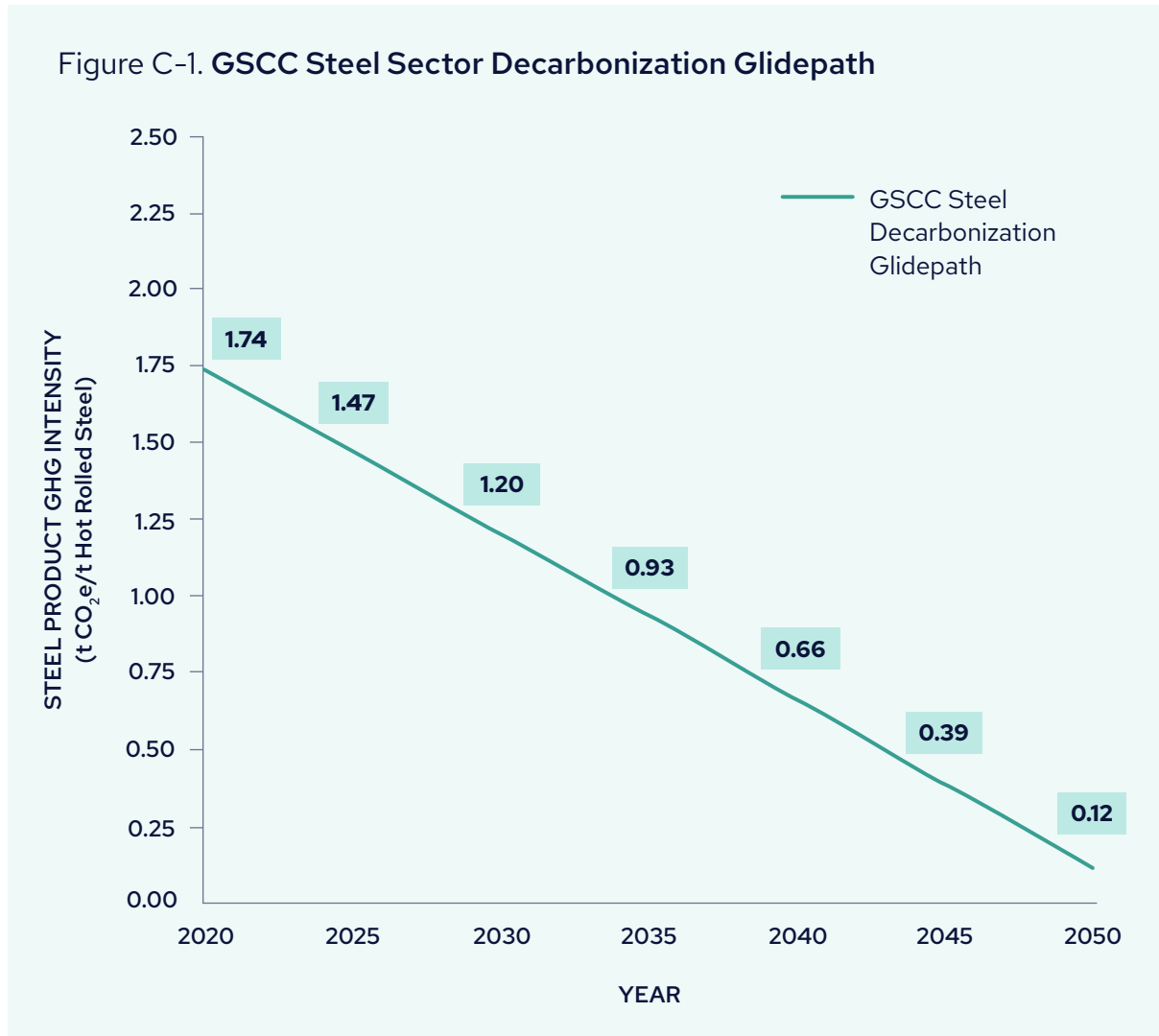
Table C-2. ICA NZE Iron and Steel Sector Carbon Intensity Adjusted for Scope 2

PARAMETER	2020	2050
IEA NZE Steel Scope 1 + Scope 3 Intensity (t CO <sub>2</sub> /t crude steel)	1.32	0.11
Steel Scope 2 Intensity (t CO <sub>2</sub> /t steel)	0.43	0.01
<b>IEA NZE Total GHG Intensity (t CO<sub>2</sub>e/t crude steel)</b>	<b>1.74</b>	<b>0.12</b>
<b>GSCC Total GHG Intensity (t CO<sub>2</sub>e/t hot rolled steel)</b>	<b>1.74</b>	<b>0.12</b>

The IEA NZE iron and steel sector carbon budget was derived based on various assumptions and projections regarding the expected evolution and adoption of low carbon technologies and mitigation strategies over the next three decades across the sector globally, as outlined in their 2020 study.<sup>7</sup> Given the many complex variables and inherent uncertainty in such an analysis, it is practically impossible to predict the timing and effectiveness of the emerging technological innovations for this sector over the next 30 years. Furthermore, as stated previously, the GSCC believes that sector decarbonization should be pursued on a process-agnostic basis where progress is not dependent on specific steel-making technologies. Therefore, the GSCC Decarbonization Glidepath begins at the IEA's sector-specific carbon budget in 2020 and ends at the IEA's sector-specific carbon budget in 2050 to achieve net zero, and assumes a constant rate of decline (i.e., a straight line) between 2020 and 2050.

It should be noted that the IEA's emissions scope only considered carbon dioxide emissions for the iron and steel sector processes included in its analytical boundary (IEA, 2022), with the exception of fossil fuel supply, for which methane emissions were also considered. In order to fully account for the sector's footprint, the GSCC is considering all relevant GHGs on a CO<sub>2</sub>e basis within its operational boundary as defined in Appendix B Section B.1. Furthermore, as indicated in Appendix B Section B.2, the analytical boundary as outlined by IEA (2022) excludes a number of iron and steel value chain processes that are included in the GSCC operational boundary. Hence, while the numeric values adopted by the GSCC are based on IEA's chosen emissions and operational boundaries, the units of measure are revised from t CO<sub>2</sub>/t crude steel to t CO<sub>2</sub>e/t hot rolled steel for the GSCC Decarbonization Glidepath. This approach adds a level of conservatism, resulting in more ambitious steel sector intensity targets. The values in Table C-3 are based on a constant rate of decline from 2020 to 2050 to create the GSCC Decarbonization Glidepath shown in Figure C-1.

Figure C-1. GSCC Steel Sector Decarbonization Glidepath



The GSCC will review this glidepath at least every five years and may revise it in future years to align with the latest climate science, advancements in low carbon technology and its deployment within the sector, and updated steel industry production.

Table C-3. **GSCC Steel Decarbonization Glidepath by Year**

GSCC STEEL DECARBONIZATION GLIDEPATH (t CO <sub>2</sub> e/t hot-rolled steel)							
2020	1.74	2030	1.20	2040	0.66	2050	0.12
2021	1.69	2031	1.15	2041	0.60		
2022	1.64	2032	1.09	2042	0.55		
2023	1.58	2033	1.04	2043	0.50		
2024	1.53	2034	0.98	2044	0.44		
2025	1.47	2035	0.93	2045	0.39		
2026	1.42	2036	0.88	2046	0.33		
2027	1.36	2037	0.82	2047	0.28		
2028	1.31	2038	0.77	2048	0.22		
2029	1.26	2039	0.71	2049	0.17		

In order to allow for establishing a company-specific trajectory starting from a base year as far back as 2015, the GSCC Decarbonization Glidepath values are extrapolated back to 2015 in Table C-4 below.

Table C-4. **GSCC Glidepath Values Extrapolated to 2015 for Target-Setting Purposes**

EXTRAPOLATED GLIDEPATH VALUES (t CO <sub>2</sub> e/t hot-rolled steel)	
2015	2.02
2016	1.96
2017	1.91
2018	1.85
2019	1.80



## Appendix D. Basis for GSCC Product Standards

The proposed GSCC flat product and long product standards are based on projected GHG intensity glidepaths developed for each product type. To develop these product-specific glidepaths, the GSCC allocated global steel demand by product category in 2020, 2030, 2040 and 2050 as shown in Table D-1. These projections were based on global consumption predictions for flat and long products by industry sector and by global region.

Table D-1. **Global Steel Demand Projections by Product Category**<sup>13</sup>

PRODUCT CATEGORY	GLOBAL STEEL DEMAND (Mt)			
	2020	2030	2040	2050
Long Products	988	1,039	1,072	1,101
Flat Products	797	950	1,020	1,079

It should be noted that these predictions did not include high alloy specialty steel or stainless steel products. Therefore, these categories of steel products are not covered by the GSCC product standards at this time. Also, the total global steel demand in these projections do not match the total global steel demand by decade from IEA. This discrepancy is addressed by scaling the weighted average of the product mix for each year to the GSCC Steel Decarbonization Glidepath as detailed below.

Worldsteel released its *Life Cycle Inventory (LCI) Study: 2020 Data Release* in May 2021.<sup>9</sup> This study followed the data quality standards and LCA development standards outlined in ISO 14040: 2006 and 14044: 2006 with the report also receiving critical review. Individual LCAs were created for 15 product categories that cover greater than 95% of global production. A summary of the product GHG intensity (based on total emitted CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O) from this study for each product category is shown in Table D-2.

The global steel demand values shown in Table D-1 were also broken down by the product categories shown in Table D-2. Using this information, the weighted average product intensity for each product category (flat and long) was calculated. It was assumed that the steel product intensities developed by worldsteel in 2020 would decrease annually at the same rate as the GSCC Steel Decarbonization Glidepath. A weighted average was then calculated for each year using the projected steel product intensities. The results of this analysis are shown for 2020, 2030, 2040 and 2050 in Table D-3.

Table D-2. Worldsteel LCA Product GHG Intensity by Product

PRODUCT CATEGORY	PRODUCT	kg CO <sub>2</sub> <sub>e</sub> /kg Steel <sup>10</sup> (AR5)
Long Products	Sections	1.61
	Rebar	1.99
	Wire rod	2.19
	Engineering steels	1.59
Flat Products	Plate	2.46
	Hot rolled coil	2.35
	Cold rolled coil	2.53
	Pickled hot rolled coil	2.34
	Finished cold rolled coil	2.65
	Electrogalvanized steel	2.57
	Hot-dip galvanized steel	2.69
	Tinplated products	2.73
	Organic coated steel	2.92
	Welded pipes	2.52
	Seamless Pipe	2.05

Table D-3. Intensity of Product by Category Based on worldsteel LCA Intensities and MineSpans Model Demand Projections for Long and Flat Steel

PRODUCT CATEGORY	GLOBAL STEEL INTENSITY (t CO <sub>2</sub> <sub>e</sub> /t steel)			
	2020	2030	2040	2050
Long Products	1.92	1.31	0.72	0.13
Flat Products	2.52	1.74	0.95	0.17
World-Average Product	2.19	1.51	0.83	0.15

Due to the discrepancy in global steel demand projections noted above, it was necessary to scale the long and flat product intensities to the GSCC Steel Decarbonization Glidepath to ensure that the weighted average of flat and long product intensity values in a given year is equal to the GSCC Steel Decarbonization Glidepath intensity in that year. This resulted in the values provided in Tables D-4 and D-5.

Table D-4. GSCC Steel Long Product Intensity Standard by Year

GSCC STEEL LONG PRODUCT STANDARD BY YEAR (t CO <sub>2</sub> e/t hot-rolled steel)							
		2030	1.11	2040	0.63	2050	0.12
		2031	1.07	2041	0.58		
2022	1.47	2032	1.02	2042	0.53		
2023	1.43	2033	0.97	2043	0.48		
2024	1.38	2034	0.93	2044	0.43		
2025	1.34	2035	0.88	2045	0.38		
2026	1.29	2036	0.83	2046	0.33		
2027	1.25	2037	0.78	2047	0.28		
2028	1.20	2038	0.73	2048	0.22		
2029	1.16	2039	0.68	2049	0.17		

Table D-5. GSCC Steel Flat Product Intensity Standard by Year

GSCC STEEL FLAT PRODUCT STANDARD BY YEAR (t CO <sub>2</sub> e/t hot-rolled steel)							
		2030	1.31	2040	0.69	2050	0.12
		2031	1.24	2041	0.63		
2022	1.84	2032	1.18	2042	0.57		
2023	1.77	2033	1.12	2043	0.51		
2024	1.70	2034	1.05	2044	0.45		
2025	1.63	2035	0.99	2045	0.40		
2026	1.57	2036	0.93	2046	0.34		
2027	1.50	2037	0.87	2047	0.28		
2028	1.44	2038	0.81	2048	0.23		
2029	1.37	2039	0.75	2049	0.17		

# Appendix E. Emissions Accounting for Products

This section outlines the emissions accounting procedures that should be followed when evaluating conformance with the GSCC product certification criteria for flat and long steel product categories.

## E.1 Product GHG Boundaries

To certify a steel product to the GSCC product standards, cradle-to-gate product life cycle emissions that consider all processes identified within the GSCC fixed operational boundary (see Figure B-1), shall be determined on a facility basis and expressed as the product's hot rolled steel emissions intensity (t CO<sub>2</sub>e/t hot rolled steel). The calculation of the product's GHG intensity shall be based on global standards and guidance related to product life cycle GHG accounting and reporting as outlined in the following sections.

## E.2 Product Life Cycle Emissions

In determining a steel product's cradle-to-gate life cycle emissions to determine conformance with the GSCC product standards, the embodied carbon values shall be developed in conformance with the following global standards and guidance:

- GHG *Protocol Product Life Cycle Accounting and Reporting Standard*
- ISO 14040:2006, *Environmental management – Life cycle assessment – Principles and framework*
- ISO 14044:2006, *Environmental management – Life cycle assessment – Requirements and guidelines*
- ISO 14067:2018, *Greenhouse gases – Carbon footprint of products – Requirements and guidelines for quantification*

The following elements of the GHG Protocol *Corporate Accounting and Reporting Standard* requirements also apply to the calculation of a steel product's GHG emissions intensity:

- Carbon offsets and insets shall not be included.
- Biogenic carbon uptake and emissions from the use of sustainably sourced materials (See Appendix F Section F.2) shall be accounted for separately from fossil-based carbon in conformance with ISO 14067:2018.
- Emissions reductions due to the procurement of RTCs meeting the quality criteria in Appendix F Section F.2 may be accounted for in determining the direct emissions due to the steel product's manufacture. Emissions associated with RTCs shall be reported separately.

- Avoided emissions (e.g., due to use of slag in production of cement) shall not be included as an emissions reduction.
- Emissions reductions due to the procurement of contractual instruments such as RECs, PPAs, VPPA and green tariffs meeting the quality criteria in Appendix F Section F.3 may be accounted for in determining the indirect emissions due to electricity used for the steel product's manufacture. Emissions associated with these contractual instruments shall be reported separately.
- Primary data which conforms with the requirements in Appendix F Section F.4 shall be used if available.
- Use of primary data for purchased billets and slabs used to manufacture the steel product is required.
- In the absence of primary data, industry average data may be used, and its sources shall be referenced.

### E.3 Product Emissions Certification Criteria

The data used for the determination of the product-level GHG emissions intensity based on the GSCC boundary for hot rolled steel production shall be independently verified in conformance with the requirements of recognized international verification standards such as ISO 14064-3:2019, *Greenhouse gases – Part 3: Specification with guidance for the verification and validation of greenhouse gas statements* as it applies to product GHG statements. This verification may be to either the 'reasonable level of assurance' or the 'limited level of assurance'. Alternatively, third party verification requirements may be met through the issuance of an environmental product declaration (EPD) in accordance with ISO 14025:2006, *Environmental labels and declarations – Type III environmental declarations – Principles and procedures*, provided the underlying life cycle assessment for the EPD meets all criteria in this section.

The GSCC will develop a separate guidance document to establish criteria for qualifying third party verifiers. The purpose of that guidance will be to ensure that the companies and individuals providing third-party verification have demonstrated a specified level of technical proficiency necessary to assess the accuracy of steel product GHG emission intensity calculations as outlined in this standard. A list of approved verifiers will be provided on the GSCC website.

# Appendix F. Emissions Accounting for Targets

This section outlines the emissions accounting procedures that should be followed when setting company science-based emissions targets (SBETs).

## F.1 Target Boundaries

For the purposes of establishing SBETs, the GSCC's fixed operational boundary requires steel manufacturers to include all in-boundary processes and GHGs as prescribed in Appendix B, regardless of whether they fall within the company's Scope 1, Scope 2 or Scope 3 GHG emissions, as defined by the GHG Protocol *Corporate Reporting and Accounting Standard*. The calculations of these emissions shall be based on global standards and guidance related to corporate-level GHG accounting and reporting as outlined in the following sections.

## F.2 Scope 1 Emissions

Scope 1 (direct) GHG emissions from all steel-making processes that are under operational control of the company and are within the GSCC operational boundary (see Figure B-1) shall be counted in calculating hot rolled steel GHG emissions intensity. In determining Scope 1 GHG emissions, calculations shall be developed in conformance with the following global standards and guidance:

- GHG Protocol *Corporate Accounting and Reporting Standard*
- ISO 14064-1:2018, *Greenhouse Gases – Part 1: Specification With Guidance At The Organization Level For Quantification And Reporting Of Greenhouse Gas Emissions And Removals*
- ISO 14404-4:2020, *Calculation Method of CO<sub>2</sub> Emissions Intensity from Iron and Steel Production*

The GSCC standard seeks to incentivize the reduction of direct process emissions from the iron and steel sector, hence companies shall not account for purchased carbon offsets in calculating Scope 1 emissions. Carbon insets, which typically involve the implementation of nature-based carbon sinks onsite, shall also be excluded when calculating Scope 1 emissions. Similarly, carbon sequestration associated with land-use, whether on- or off-site, shall be excluded.

The GSCC considers the use of bio-based materials as a viable decarbonization strategy for steelmaking. Biocarbon derived from biomass produced from the following materials shall be considered sustainably sourced:

1. Materials complying with third-party controlled sourcing certifications (e.g., Forest Stewardship Council (FSC) Controlled Wood, Sustainable Forest Initiative (SFI) Certified Sourcing or Fiber Sourcing, Programme for the Endorsement of Forest Certification (PEFC) Controlled Sources);
2. Materials considered eligible sources of supply according to the Green-e Framework for Renewable Energy Certification, Version 1.0 (2017) or Green-e regional standards; and/or
3. Other biomass-based sustainably sourced materials that meet sustainable or renewable metrics.

If the bio-based materials meet the above quality criteria, then the biogenic CO<sub>2</sub> emissions from the use of those materials may be excluded from the calculation of Scope 1 emissions and shall be reported as a separate line item in the steel company's GHG accounting.

Natural gas use can be a significant source of Scope 1 emissions in steel making. The GSCC recognizes the developing market for renewable thermal certificates (RTCs) as a way to incentivize the replacement of fossil-based natural gas with renewable natural gas (RNG), similar to how such contractual instruments incentivized the development of renewable energy. Therefore, RTCs may be used in accounting for Scope 1 emissions. Specifically, RTCs are a means of accounting for the environmental attributes and GHG reductions associated with renewable natural gas, which for Scope 1 purposes is the emission of biogenic CO<sub>2</sub> from the combustion of RNG. Hence, RTCs may only be used as a credit against CO<sub>2</sub> emissions from natural gas combustion.

The RTCs shall meet the following criteria adapted based on the ISO 14064-1:2018 criteria for contractual instruments until specific criteria is published to validate the environmental attributes (specifically, validate carbon values to support carbon reduction claims) of RTCs via an internationally recognized standard or guidance.

- RTC shall convey the information associated with the unit of biomethane (one dekatherm) delivered together with the characteristics of its production;
- RTC is ensured with a unique claim;
- RTC is tracked and redeemed, retired, or cancelled by or on behalf of the reporting entity;
- RTC is as close as possible to the period to which the contractual instrument is applied and comprises a corresponding timespan;
- RTC is produced within the country, or within the market boundaries where consumption occurs.

Emission reductions associated with the procurement of RTCs shall be reported as a separate line item in the steel company's GHG accounting.

Embodied carbon that remains in final steel products or co-products/by-products (e.g., slag) is not counted in the company's GHG inventory or intensity calculation as long as that carbon is not emitted to the atmosphere during downstream handling, processing, or use.



However, 100 percent of the direct emissions that occur due to the production of steel intermediates or final products, co-products, by-products, and/or wastes shall be counted in the company's Scope 1 GHG inventory and emissions intensity calculation, regardless of whether those materials are exported from the site or further processed onsite. Further, any emissions reduction or avoidance occurring outside of the steel production boundary that may result from the use of by-products (e.g., use of slag as a material for the production of cement) cannot be considered as an emissions credit for the purposes of the GSCC emissions accounting procedures.

### F.3 Scope 2 Emissions

Scope 2 (indirect) emissions from the generation of electricity, steam, heat, or cooling acquired and consumed by the steel company shall be counted in calculating hot rolled steel GHG emissions intensity. In determining Scope 2 GHG emissions, calculations shall be developed in conformance with the following global standards and guidance:

- GHG Protocol *Corporate Accounting and Reporting Standard*
- ISO 14064-1:2018, *Greenhouse Gases - Part 1: Specification With Guidance At The Organization Level For Quantification And Reporting Of Greenhouse Gas Emissions And Removals*
- ISO 14404-4:2020, *Calculation Method of CO<sub>2</sub> Emissions Intensity from Iron and Steel Production*

Scope 2 GHG emissions from purchased electricity shall be determined in conformance with the requirements of ISO 14064-1:2018 Annex E.2 *Treatment of Imported Electricity*.

When a company is using contractual instruments for the procurement of renewable electricity such as: renewable energy certificates, or RECs (both bundled and unbundled), power purchase agreements (PPAs), virtual power purchase agreements (VPPs), or green tariffs, the contractual instruments shall meet the following quality criteria of ISO 14064-1:2018, E.2.2 *Additional Information*:

- Conveys the information associated with the unit of electricity delivered together with the characteristics of the generator;
- Is ensured with a unique claim;
- Is tracked and redeemed, retired, or cancelled by or on behalf of the reporting entity;
- Is as close as possible to the period to which the contractual instrument is applied and comprises a corresponding timespan;
- Is produced within the country, or within the market boundaries where consumption occurs if the grid is interconnected.

Emission reductions associated with the procurement of contractual instruments shall be reported as a separate line item in the steel company's GHG accounting.

If a company is not using contractual instruments and market-based information is not available, the location-based approach may be used. Grid average emission factors shall be used for the year being reported, if available. If not available, the most recent grid average emission factor shall be used.

## F.4 Scope 3 Emissions

Scope 3 (indirect) GHG emissions from all supply chain processes and activities that are considered within the GSCC operational boundary (see Figure B-1) but are not covered under Scope 1 and Scope 2 shall be counted as Scope 3 in calculating hot rolled steel GHG emission intensity.

In determining Scope 3 GHG emissions, the embodied carbon values shall be developed in conformance with the following global standards and guidance:

- GHG Protocol *Corporate Accounting and Reporting Standard*
- GHG Protocol *Corporate Value Chain (Scope 3) Accounting and Reporting Standard*<sup>11</sup>
- GHG Protocol *Technical Guidance for Calculating Scope 3 Emissions (Version 1.0)*<sup>12</sup>

The steel company shall use primary data provided by the supplier, if available, provided it conforms to the following requirements:

- The declared embodied GHG value has been determined by the supplier for the material in conformance with the requirements outlined by GSCC herein for determining product-life cycle emissions (See Appendix E);
- The declared embodied GHG value is cradle-to-gate;
- The declared embodied GHG value has been third party verified in conformance with the international standards referenced in Appendix E, as applicable.

If primary data is not available for the determination of Scope 3 emissions, the steel company shall use industry average data (secondary data) and reference its source. If a steel company is purchasing billets and slabs to produce certain products, then the use of primary supplier data is required for those materials. Note that these requirements do not apply to scrap and post-consumer reclaimed material, as the default embodied GHG value for these materials is zero.

## F.5 Company-Average Steel Emissions Intensity (CASEI)

For target-setting purposes, the GSCC recommends that a company's GHG emissions be consolidated using the operational/financial control approach (i.e., the company accounts for emissions from operations that are included in the GSCC boundary and over which the company has operational and/or financial control). The basis for target setting will be a company-average steel emissions intensity (CASEI) calculated as follows:

- Calculate the Scope 1, Scope 2 and Scope 3 emissions as tonnes CO<sub>2</sub>e in a given year based on the GSCC GHG and operational boundaries for hot rolled steel production as outlined above for each facility owned and operated by the company.
- Calculate the weighted average across all facilities on a per tonne hot rolled steel basis to determine the CASEI.

Alternatively, if a steel company has centralized data collection across all facilities, the CASEI can be calculated at a company-wide level by summing all Scope 1, Scope 2 and Scope 3 emissions within the GSCC boundary and dividing by the total production of hot rolled steel.

The determination of the CASEI for the target base year (and subsequent verification years as required) shall be independently verified in conformance with the requirements of recognized international verification standards such as ISO 14064-3:2019, *Greenhouse gases – Part 3: Specification with guidance for the verification and validation of greenhouse gas statements* as it applies to organization GHG statements. This verification may be to either the ‘reasonable level of assurance’ or the ‘limited level of assurance’.

The GSCC will develop a separate guidance document to establish criteria for qualifying third party verifiers. The purpose of this guidance will be to ensure that the companies and individuals providing third-party verification have demonstrated a specified level of technical proficiency necessary to assess the accuracy of steel product GHG emissions intensity calculations as outlined in this standard. A list of approved verifiers will be provided on the GSCC website.

## F.6 Target Setting Boundary Examples

The following examples are provided to illustrate how target boundaries shall be applied.

**Example #1:** Company A purchases billets from Company B, which is an independent third party (i.e., Company A has no operational or financial control over Company B). Company A manufactures hot rolled product from the billets it purchases, which are then marketed and sold under Company A’s product portfolio. In this example, the upstream Scope 3 emissions associated with Company B’s production of the billets purchased by Company A shall be included in the boundary for Company A’s SBET. Company A shall use primary data for the Scope 3 emissions associated with the purchased billet.

**Example #2:** Company A produces pig iron, which is used in its steel-making facilities across the company. A portion of the pig iron that Company A produces is sold to Company C, which is an independent third-party steel manufacturer (neither company has operational or financial control over the other). In this example, the downstream Scope 3 emissions and the resulting amount of hot rolled product associated with Company C’s production of hot rolled steel from the pig iron supplied by Company A is still considered within the boundary and shall be included in the calculation for Company C’s SBET. Company C should use primary

data for the Scope 3 emissions associated with the pig iron purchased from Company A if available. Otherwise, secondary data (e.g., industry average factors) may be used.

**Example #3:** Company A produces hot rolled steel products from billets that it makes internally at its steel-making operations. However, Company A makes more billets than it has the capacity to roll into product. Therefore, Company A has a financial arrangement with Company D, which is a toll manufacturing agreement. Under this agreement, Company D agrees to hot roll a portion of the billets that Company A makes into products per Company A's specification. The final products are sold to customers under Company A's product portfolio. In this example, the downstream Scope 3 emissions associated with Company D's production of hot rolled steel from the billets supplied by Company A is considered within the boundary and shall be included in the calculation for Company A's SBET. Company A should use primary data for the Scope 3 emissions associated with the hot rolling performed by Company D if available. Otherwise, secondary data (e.g., industry average factors) may be used.

## F.7 Company-Specific Trajectory Examples

Examples illustrating how companies shall develop company-specific trajectories to support SBET-setting are provided in this section.

### **Example 1: Base year CASEI value is ABOVE the GSCC Decarbonization Glidepath:**

In this example, the company has chosen a base year of 2022, and its CASEI in that year is 2.5 t CO<sub>2</sub>e/t hot rolled steel. Therefore, it is above the 2022 GSCC Decarbonization Glidepath value of 1.64 t CO<sub>2</sub>e/t hot rolled steel. To determine the company-specific GHG decarbonization trajectory, a line is drawn from the base year CASEI value to the GSCC Decarbonization Glidepath value in 2040, as depicted by the green line in Figure F-1. This green line represents the minimum linear GHG intensity reduction progress required by the GSCC standard.

### **Example 2: Base year CASEI value is BELOW the GSCC Decarbonization Glidepath:**

In this example, the company has chosen a base year of 2022, and its CASEI in 2022 is 1.4 t CO<sub>2</sub>e/t hot rolled steel. Therefore, it is below the 2022 GSCC Decarbonization Glidepath value of 1.64 t CO<sub>2</sub>e/t hot rolled steel. To determine the company-specific GHG decarbonization trajectory, a horizontal line is drawn from the base year CASEI value to the point of convergence with the GSCC Decarbonization Glidepath (in this case, in the year 2027, as depicted by Point A in Figure F-2). According to Table 4-1, if the base year CASEI is between 1.24 and 1.49, then the target should be adjusted by four years (as depicted by Point B in Figure F-2). Then a line is drawn from the base year CASEI to Point B, where it converges with the GSCC Decarbonization Glidepath. This green line represents the minimum linear GHG intensity reduction progress required by the GSCC standard for the company specific GHG reduction trajectory.

Figure F-1. Base Year CASEI Above GSCC Glidepath

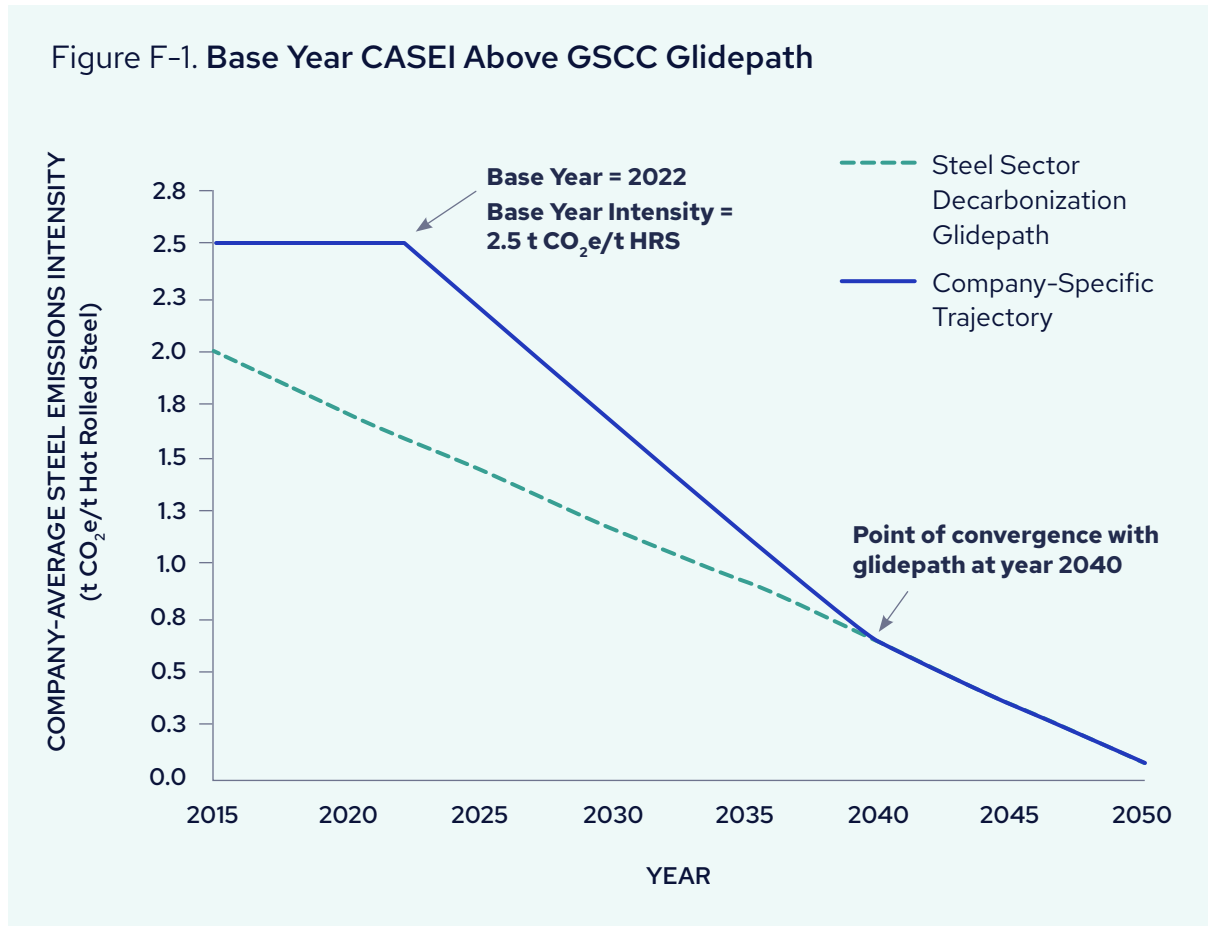
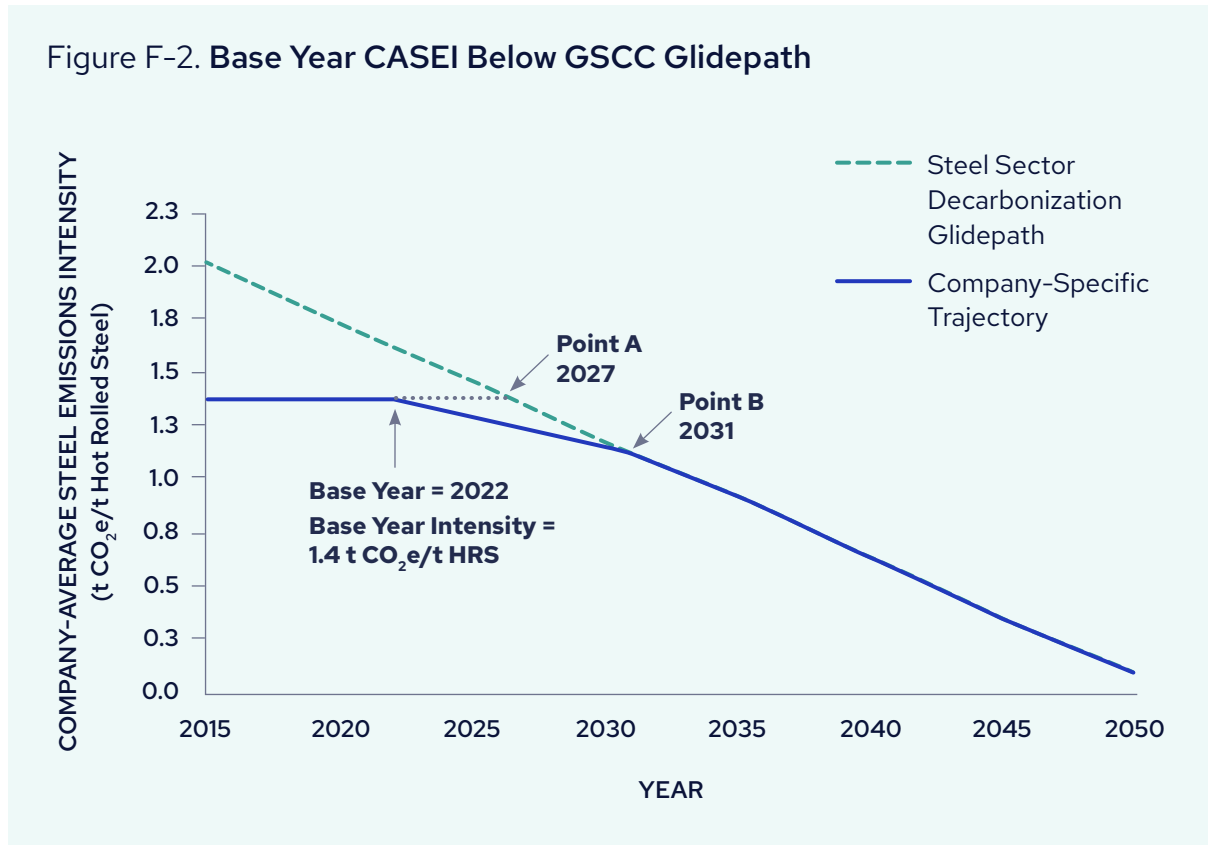


Figure F-2. Base Year CASEI Below GSCC Glidepath



# Appendix G. References

- <sup>1</sup> The GHG Protocol, revised 2015, *“A Corporate Accounting and Reporting Standard – Revised Edition.”* Available here: <https://ghgprotocol.org/corporate-standard>
- <sup>2</sup> IEA, 2022, *“Achieving Net Zero Heavy Industry Sectors in G7 Members.”* Available at: <https://www.iea.org/reports/achieving-net-zero-heavy-industry-sectors-in-g7-members>
- <sup>3</sup> Reheat furnace is defined in Appendix B as a *“steelmaking process in which steel stock is heated to above the recrystallization temperature for hot rolling”* thereby tying it specifically to hot rolling. Reheat furnaces and hot rolling are energy intensive processes that are part of manufacturing process for most steel products.
- <sup>4</sup> IEA, 2021, *“Net Zero by 2050: A Roadmap for the Global Energy Sector.”* Available at: <https://www.iea.org/reports/net-zero-by-2050>
- <sup>5</sup> SBTi, November 2022, *“Steel Science-Based Target Setting Guidance.”* Available at: <https://sciencebasedtargets.org/resources/files/SBTi-Steel-Guidance-draft.pdf>
- <sup>6</sup> Replication of the SBTi methodology for S2 intensity estimates showed an error in the intensity value derived for 2020 by SBTi and RMI. The corrected value was used for the purposes of this standard.
- <sup>7</sup> IEA, 2020, *“Iron and Steel Technology Roadmap.”* Available at: <https://www.iea.org/reports/iron-and-steel-technology-roadmap>
- <sup>8</sup> Projections of future demand for long and flat steel products developed via MetalSpans Demand modeling, January 2023, <https://www.mckinsey.com/industries/metals-and-mining/how-we-help-clients/minespans/overview>.
- <sup>9</sup> Worldsteel, 2021, *“Life cycle inventory (LCI) study – 2020 data release.”* Available here: <https://worldsteel.org/wp-content/uploads/Life-cycle-inventory-LCI-study-2020-data-release.pdf>
- <sup>10</sup> Intensity values are based on emissions to air totals for CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O with AR5 global warming potentials.
- <sup>11</sup> GHG Protocol, 2011, *“Corporate Value Chain (Scope 3) Accounting and Reporting Standard, Supplement to the GHG Protocol Corporate Accounting and Reporting Standard.”* Available here: <https://ghgprotocol.org/standards/scope-3-standard>
- <sup>12</sup> GHG Protocol, 2011, *“Technical Guidance for Calculating Scope 3 Emissions (Version 1.0), Supplement to the Corporate Value Chain (Scope 3) Accounting and Reporting Standard.”* Available here: <https://ghgprotocol.org/scope-3-technical-calculation-guidance>



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