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# **Greenhouse Gas Index for Products in 39 Industrial Sectors: Coal Mining**

NAICS CODES 212111, 212112, AND 212113

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## Important Note

This module is not a stand-alone document. Readers should refer to the introduction for a more detailed overview and discussion of the Framework and procedures to determine the GGI and, especially, to the ***Note on Common References, Default Values, Acronyms and Abbreviations used in the Modules***. Common information includes default values for CO<sub>2</sub> emissions from electricity and thermal energy derived from coal, oil and natural gas; a list of acronyms and abbreviations; guidance on using the sources cited for US exports, imports, and production by sector, and CO<sub>2</sub> emissions from electricity produced in nations that export to the United States.

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# 1. Introduction

These NAICS Codes comprise establishments primarily engaged in mining bituminous and lignite coal at the surface (212111); bituminous coal underground (212112); and anthracite coal (212113). Operations to produce coal use greenhouse gas (GHG)-intensive energy and emit methane and other GHGs as process emissions. During 2018, the exports of lignite, anthracite, and bituminous coal totaled \$11 million, \$36 million, and \$12.1 billion, respectively; their imports were \$9 million, \$22 million, and \$492 million, respectively.<sup>1</sup> In 2019, the total production of coal in the United States was 641 million tonnes and the value was about \$22 billion.<sup>2</sup> Under the Framework we've proposed, the export rebates and import charges would be based on an upstream US GHG tax and the greenhouse gas indices (GGIs) for the imported and exported products.<sup>3</sup>

In this module, we determine GGIs—which track GHG process emissions and the contribution of the carbon content of products derived from fossil resources along the production and supply chain in a manner analogous to that used in value-added taxes—for the coal products. When multiplied by the GHG tax, the result is the relevant export rebate or import charge. A minimum GGI of 0.50 tonnes CO<sub>2</sub>e/tonne product is required for an export rebate or the imposition of an import charge. We refer to products that meet this threshold as GHG-intensive products. Depending on the type of coal, the GGI for coal ranges from 1.71 to 2.98 tonnes CO<sub>2</sub>e/tonne coal.

As described in the introduction to the modules, there are two major steps involved in determining GGI values for the production of coal. The first is to evaluate the total input of taxed sources of GHG emissions—CO<sub>2</sub>e(TOT). The second is to allocate this total to the entire slate of covered products mined by the producer. Three sources contribute to CO<sub>2</sub>e(TOT) in this module: 1) the carbon content of products from the mined fossil resource; 2) GHG process emissions released during mining and processing (e.g., venting and flaring of natural gas); and 3) the use of GHG-intensive products purchased from suppliers, especially electricity and fuels.

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<sup>1</sup> Export and import data:

<https://usatrade.census.gov/data/Perspective60/View/dispview.aspx>.

<sup>2</sup> Production data: <https://www.eia.gov/coal/annual/pdf/tableES1.pdf> and [www.eia.gov/energyexplained/coal/prices-and-outlook.php](https://www.eia.gov/energyexplained/coal/prices-and-outlook.php).

<sup>3</sup> Flannery, Brian, Jennifer A. Hillman, Jan Mares, and Matthew C. Porterfield. 2020. Framework Proposal for a US Upstream GHG Tax with WTO-Compliant Border Adjustments: 2020 Update. Washington, DC: Resources for the Future.

<https://www.rff.org/publications/reports/framework-proposal-us-upstream-ghg-tax-wto-compliant-border-adjustments-2020-update/>

For mined fossil resources, allocation by carbon content is based on determining the average CO<sub>2</sub>e emissions per tonne of carbon (C) in all products:  $\langle \text{CO}_2\text{e}/\text{C} \rangle = \text{CO}_2\text{e}(\text{TOT})/\text{M}(\text{C})$ , where M(C) is the total mass of carbon in all covered products,<sup>4</sup> and then allocating taxed sources of GHG emissions to products based on *cf* (the fraction of carbon by weight in each product). The mining company will know the composition and amounts of covered products they produce, and under the proposed Framework, suppliers would communicate GGI values for their covered products to their customers (and the Regulator). So, producers will have the information they need to determine GGI values for their products. For each product,  $\text{GGI} = \langle \text{CO}_2\text{e}(\text{TOT})/\text{C} \rangle \text{ cf}$ . Note that in the event that the mining company produces only a single covered product, P,  $\text{GGI} = \text{CO}_2\text{e}(\text{TOT})/\text{M}(\text{P})$ , where M(P) is the weight of the covered product (tonnes P). Allocation only requires specific, product-by-product determination when the producer creates more than one covered product in the process being considered.

In this module, we focus solely on the produced coal without considering other products, such as associated gas and liquid condensate. The module illustrates how, using available public information, to determine a GGI for coal:  $\text{GGI}(\text{coal}) = \text{CO}_2\text{e}(\text{TOT})/\text{tonne of coal}$ . In practice, GGI values will vary from different production operations depending on the geology of the in-ground natural resource, the coal's chemical and physical properties, and the processes used to extract and initially process coal.

Primary contributions to the GGI for coal occur from its carbon content and GHG process emissions from methane (CH<sub>4</sub>)—both of which would be subject to the proposed upstream GHG tax. Underground mines liberate CH<sub>4</sub> from ventilation systems and from degasification systems. Surface coal mines liberate CH<sub>4</sub> as the overburden is removed and the coal is exposed to the atmosphere. In addition, CH<sub>4</sub> is released during post-mining activities as the coal is processed, transported, and stored for use.

This module provides a means for the Regulator to estimate, based on public information, initial export rebates for US exporters and import charges for US imports of coal if there were an upstream GHG tax of \$20 per tonne of CO<sub>2</sub>. This information would be useful to the Regulator in evaluating the information provided by exporters to indicate their requested export rebate and in establishing initial import charges.

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<sup>4</sup> See the discussion in the introduction concerning the use of angle brackets “ $\langle \rangle$ ” to denote an average over the entire operation, e.g., a facility or entire sector.

In the United States, most producers of coal are already obligated annually to determine and report to the US Environmental Protection Agency (EPA) GHG emissions from their operations that emit over 25,000 tonnes CO<sub>2</sub>e per year. This information is publicly available in a yearly EPA report.<sup>5</sup> They will also know the amounts and types of coal (and other products) they produce—and, under the Framework in the United States, suppliers would be obligated to inform customers (and the Regulator) of the GGI values of GHG-intensive products that they sell. Therefore, manufacturers have the information needed to determine the GGI values for GHG-intensive products they create in specific facilities.

More accurate and timely information to determine rebates and import charges than used here could undoubtedly be obtained by the Regulator from either the industry associations or firms (like S&P Global, which has a business of obtaining and marketing information about the GHG aspects of various products and corporate actions).

**An important note:** We emphasize that the estimates in this module are meant to provide only indicative, representative values for the GGIs of US coal products. Some of the public data that the calculations rely on probably are not representative of industry performance today. Actual values will depend on determination of the GGI for each specific product created at a specific facility. Since companies, associations, and commercial firms that collect and market information about products' energy and emissions profiles can provide more accurate information than was used here, the Regulator should seek such information when determining potential import charges or evaluating requests for export rebates. The estimates here do not account for all GHG-intensive chemicals or other raw materials that may contribute to the GGI. Subject to the administrative costs to evaluate all such inputs and be consistent for both export rebates and import charges, the Regulator should strive to accept all verifiable raw material inputs to the GGI for coal from specific mines.

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<sup>5</sup> See: US EPA. 2021. Inventory of US Greenhouse Gas Emissions and Sinks: 1990–2019. Washington, DC: EPA. <https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2019>.

## 2. Coal

Table 3-30 of the EPA report noted above (see footnote 5) reports that total CH<sub>4</sub> emissions from US coal mining in 2018 were 52.7 million tonnes CO<sub>2</sub>e—of which 38.9 million tonnes CO<sub>2</sub>e were from underground mining and 7.0 million tonnes CO<sub>2</sub>e were from surface mining. Only 6.8 million tonnes CO<sub>2</sub>e were from post-mining activities.

For the purposes of this analysis, we allocate the mining emissions as follows. Underground and post-mining underground emissions are considered to come from bituminous coal and anthracite coal, whereas surface and post-mining surface emissions are considered to come from sub-bituminous coal and lignite. In that same year (according to the same EPA report), 685 million tonnes of coal were produced—while a report by the US Energy Information Administration (EIA) for 2019 indicates total coal production was 706 million tons (641 million tonnes).<sup>6</sup> The EIA report gives amounts of coal by type that have been pro-rata increased to equal 685 million. The values for GGI below are based on EPA values and a table from the Climate Accountability Institute.<sup>7</sup> These values represent US national averages. They range from 1 to 5 percent larger than would be estimated only from the carbon content of the coal. In practice, the Framework recommends that US GGI values should be determined on a site-specific basis to reflect actual circumstances, e.g., with regard to methane emissions and other factors.

**Table 1. Coal production, carbon content, emissions, and GGI (US national average)**

<b>Coal Rank</b>	<b>Production</b> (million tonnes/yr)	<b>Carbon Content</b> (tonnes C/tonne coal)	<b>GHG Process Emissions</b> (tonnes CO <sub>2</sub> e/tonne)	<b>GGI</b> (tonnes CO <sub>2</sub> e/tonne)
<b>Bituminous</b>	328	0.70	0.117	2.68
<b>Sub-bituminous</b>	303	0.50	0.020	1.85
<b>Lignite</b>	51.6	0.41	0.020	1.52
<b>Anthracite</b>	2.6	0.78	0.117	2.98

<sup>6</sup> See: Table ES-1 of EIA's *Annual Coal Report*; <https://www.eia.gov/coal/annual/>.

<sup>7</sup> See:

<https://climateaccountability.org/pdf/Sums/Coal%20Sums/Coal%20CarbonCoefficient%208p.pdf>.

### 3. Export Rebates

If there were an upstream GHG tax of \$20 per tonne of CO<sub>2</sub>, the export rebates for coal based on the forgoing GGIs would be as follows.

**Table 2. Export rebates for coal by type**

<b>Coal Rank</b>	<b>GGI tonnes CO<sub>2</sub>e/tonne</b>	<b>Export Rebate \$/tonne</b>
Bituminous	2.68	53.60
Sub-bituminous	1.85	37.00
Lignite	1.52	30.40
Anthracite	2.98	59.60

## 4. Import Charges

The United States imports coal from Columbia, Canada, and Indonesia (see footnote 1). Until importers provide the Regulator with credible, verifiable information to support and claim a lower GGI value for their coal, the Regulator could assume such coal had the same GGI as US domestically produced coal—and thus should use the GGIs for the average US coal (of the various types) to establish import charges.

Based on what's above, if the GHG tax were \$20 per tonne of CO<sub>2</sub>, the initial import charges for imports of coal by type would be as follows.

**Table 3. Initial import charges for coal by type**

<b>Coal Rank</b>	<b>GGI</b> tonnes CO <sub>2</sub> e/tonne	<b>Import Charge</b> \$/tonne
Bituminous	2.68	53.60
Sub-bituminous	1.85	37.00
Lignite	1.52	30.40
Anthracite	2.98	59.60

