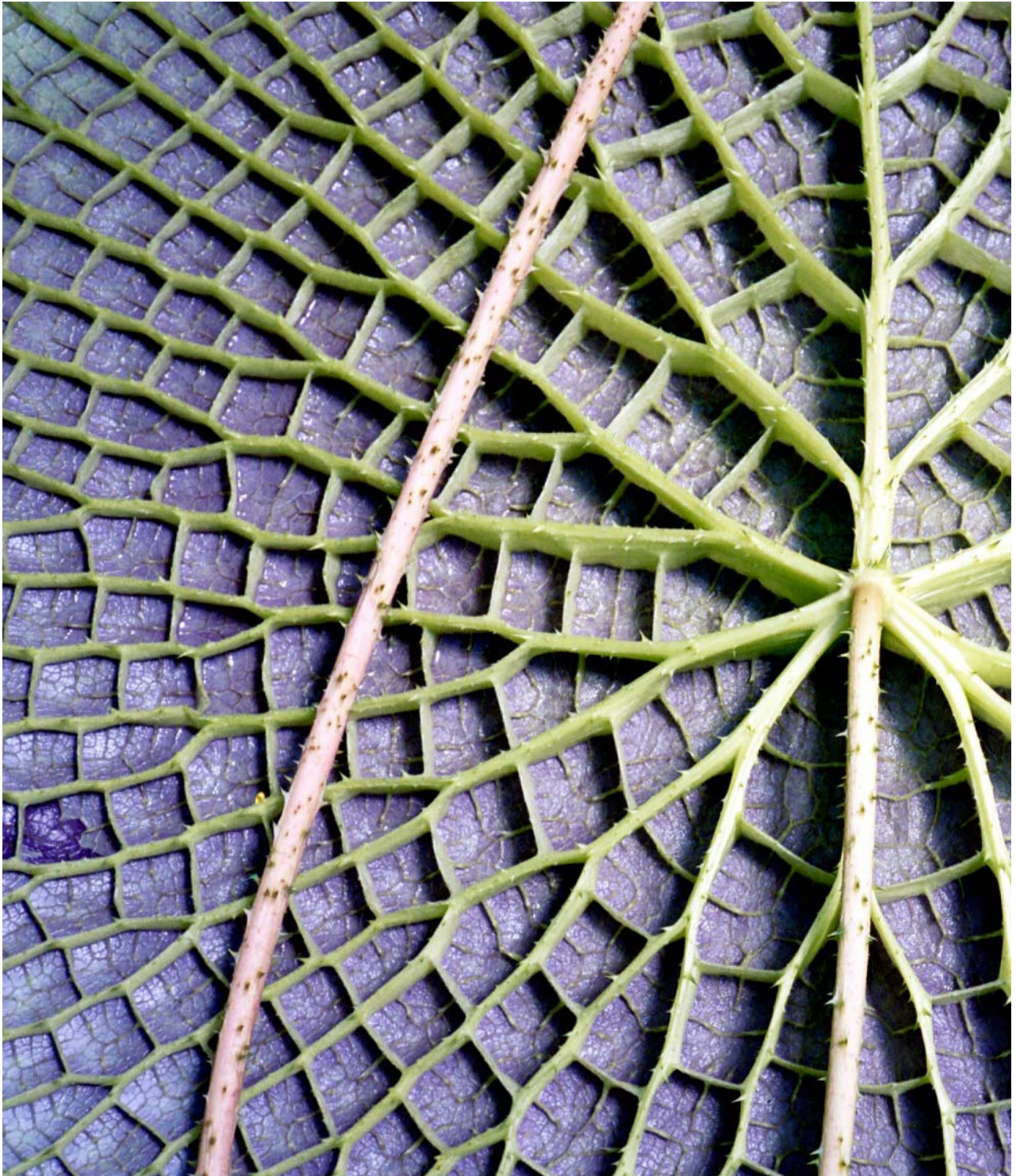


CO<sub>2</sub> EMISSIONS DATA COLLECTION  
User Guide, Version 7



## CO<sub>2</sub> Data Collection System User Guide

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Climate change is the biggest issue for the steel industry in the 21st century.

At the core of the steel industry approach is the collection and reporting of CO<sub>2</sub> emissions data by steel plants in all the major steel-producing countries.

The aim of this project is to collect and report CO<sub>2</sub> emissions data on a site-by-site basis to give an overall emission intensity for the production of steel at that site, irrespective of the final products that are being made.

## A secure database for data collection

The database is hosted on dedicated servers at a company with ISO 27001 accreditation. Great care has been taken to ensure that data from your own company's steel plants will be known only to you and the worldsteel staff administering the project. Participating steel companies cannot view each others' data. At worldsteel, the Director, Climate Change and the CO<sub>2</sub> data collection project administrator are the only people who can see all the data submitted.



## Accessing the CO<sub>2</sub> DataCollection System

To access the CO<sub>2</sub> Data Collection System (DCS) you need a user name and password, available on application. You will receive your user name and password via e-mail.

### Superusers and Users

There are two levels of access to the DCS: Superusers and Users.

A Superuser oversees the data collection and approves data once it has been input by Users. Superuser accounts are created by the project administrator at worldsteel following the nomination of a Superuser by a company or federation. A Superuser creates the User accounts for those sites. A Superuser can edit user accounts

A User enters the data into the DCS. User accounts are created by the Superuser. A User can also edit the data they have entered and submit the data to the Superuser. After the Superuser has approved the submission, the User can view an Output summary of their own data.

### To log in

Go to URL: <https://co2.worldsteel.org>

Enter your user name (your e-mail address) and password into the boxes provided.

When you have successfully logged in, the CO<sub>2</sub> Data Collection System home page appears.

### Changing your password

Your user name appears in the top right corner on every screen. Underneath, click on Change password to enter a new password.

### To log out

Your user name appears in the top right corner on every screen. Click on Log out to go back to the login screen.

## Home page

The sections available to you appear in a menu along the top of the screen.

From the home page you can access up to four sections of the CO<sub>2</sub> DCS:

- Data Collection
- Output Averages
- Output Summary
- Graphs
- Administration

Click on the desired section to go to that page.

Note: access to the sections depends on your user status.

### Superuser

Sections available: Data Collection, Output Averages, Output Summary, Administration.

A Superuser can only see data for the sites under their responsibility.

Superuser responsibilities include:

- Creating authorised users
- Approving data submitted by a User
- Requesting data corrections
- Unapproving data submitted by a User

Superusers can also:

- View collection data
- View results on the Output Averages screen
- View results on the Output Summary screen

### User

Sections available: Data Collection, Output Summary.

User responsibilities include:

- Entering and editing data
- Submitting data for approval

Users can also view the CO<sub>2</sub> data for their site.

## Administration [Superusers]

Superusers have access to screen from the Administrator main page:

- Users

Click on a heading to access the screen.

### Adding and editing User details

On this screen you can add and edit information concerning new and existing users. Existing users are listed in the table. For each user the table displays first and last name, e-mail address (the User name) and site.

#### Adding users

Click on Create new. A new row will be added to the list containing several blank cells.

You can now edit the contents of this row as follows:

- In the first column of the row, click Edit
- Click inside the cell under FirstName and enter the user's first name
- Click inside the cell under LastName and enter the user's last name
- Click inside the cell under Email and enter the user's e-mail address
- Use the scroll-list in the Site column to select the site for which the user is responsible
- Finally, click inside the checkbox under Enable to activate the user details

Click Update in the first column to accept the new user. An e-mail is automatically sent to the new user containing their login details of User ID and password.

To cancel, click Cancel.

### Editing user details

In the first column of the row containing the site you want to edit, click Edit. Several cells become active.

You can now edit the contents of this row as follows:

- Edit the user's name under FirstName and LastName
- Edit the user's e-mail address
- Select the user's site
- Use the checkbox under Enable to activate / deactivate the user details

Click Update in the first column to accept the changes.

To cancel and revert to the previous details, click Cancel.

### Removing a user

In the first column of the row containing the user you want to remove, click Delete. A confirmation box appears.

Choose Yes to delete, No to cancel.

## Data collection [All users]

In this section you can manage your CO<sub>2</sub> data.

The first screen presents you with a table listing available sites. The four scroll boxes above the table allow you to modify the way sites are displayed, as follows:

- Organisation: choose a specific company or federation, or display all (default = all)
- Site: choose an individual site or display all (default = all)
- Year: select the year (default = previous year)
- Status: choose between:
  - Empty – data not yet collected or included in calculation
  - Draft – data collected and awaiting submission
  - Submitted – data submitted and awaiting corrections / approval by Superuser
  - In Calcs – data verified by Administrator and included in calculations
  - All – data either empty or included in calculations (default)

For each site you can perform several functions via the table. The number of functions displayed on the table depends on your user status.

### All users

- Edit data: allows you to enter new data or amend data not yet submitted or approved
- View data: allows you to view data that is included in calculations
- Submit: submit data for approval

### Superusers

- Corrections requested: ask for data to be amended by user
- Approve: approve submitted data
- Un-approve: revoke approval on data

## Data collection [Users]

### Entering site data

In the Data Collection table, choose Edit data on your site entry and you will go to the Data Collection Form. Here you can enter or edit data for your site. The Data Collection System uses this data to generate a report showing appropriate CO<sub>2</sub> values.

The data collection form consists of the following parts:

### General information

Your chosen site is shown here together with the company name, country and period for which the report will be created.

### Site type

The type of site, as defined by the Superuser, is indicated.

- Ore based – Integrated site, plant with scrap input below 30% (even with EAF on-site)
- Scrap – plant with scrap input over 70% scrap (EAF) or external DRI
- Unconventional – all other sites including smelting reduction and combined EAF + DRI production, plant with scrap input between 30% and 70%.

### Site structure

This section lists all the possible facilities that may be available at a site.

Enter the number of operational units for each facility at your site into the fields provided. The program recalculates every time a number is entered or changed, so there may be a slight delay before you can enter the next number. However, by moving between fields using your keyboard's tab button you can enter data without recalculating after each entry. When you have finished entering data, press enter or click on Calculate in the floating window. Only enter numerals. Do not use words. For example, write '6', not 'six'.

The CO<sub>2</sub> table will only show the relevant rows, depending on the values entered.

(I.E When you use 'Argon' item for input, you have the option of entering the amount in Oxygen plant in Site structure.)

# DATA COLLECTION (CONTINUED)

## Basic information

This section lists basic information about the site's production. This is used to calculate CO<sub>2</sub> intensity for the site. Enter the appropriate production quantities (in metric tonnes) from your site. All types of production from the site must be reported to ensure accurate analysis.

Tick the box next to 'Data verified by external body' if your data has been verified by an external body.

## CO<sub>2</sub> table

This section lists the specific information needed to calculate CO<sub>2</sub> data for the site. Enter your data for any appropriate fields into the table's active cells (light yellow). The structure of the table and the definition of the columns are explained in Appendix 3. When you have entered all values, click Calculate to calculate CO<sub>2</sub> values. Then click Save to save the report. After saving you will be returned to the Data Collection table. Confirm that you want to submit your data by clicking on Submit. An e-mail is automatically generated and sent to your Superuser, verifying the data submission.

Note: Once you have submitted data you can only view the submitted data. You cannot edit it any further, unless the Superuser requests a change.

You can exit from this screen by pressing the Exit button. This will take you back to the site list.

## Change requests from the Superuser

If you receive an e-mail notification from your Superuser requesting changes, repeat the above procedure to correct the data. After making any corrections, Save and Submit the report again.

## Viewing submitted site data

Choosing View data on the Data Collection table opens the Data Collection Form for your site, allowing you to view data.

## Exporting submitted site data

To export the submitted site data into Excel, click on the Export to Excel button. The data will be converted into text format. Select and copy all data, then paste it into an Excel sheet.

## Importing site data

In the Data Collection table, you can import site data from an Excel sheet. You must use the same spreadsheet format as an exported Excel sheet (see above: 'Exporting submitted site data'). Enter or edit data on the Excel sheet, select all data plus one additional column, then copy and paste it into the system. Click on Import.

## Data collection [Superusers]

Choosing View data on the Data Collection table opens the Data Collection Form for your chosen site. Here you can review data entered by the users.

Refer to the section 'Data collection [User]' on page 10 for a description of the Data Collection form content.

You can change any of the data. The calculated values will be updated to reflect these changes.

Note: any changes you make are NOT saved. This allows Superusers to check figures before requesting changes to be made by the user responsible for the site.

Click on Exit or on the Data Collection tab to return to the Data collection table.

Once the data is approved your administrator can include it in the overall calculations. You will then be able to view the results of your data on the Output Averages and Output Summary screens. (Until the administrator includes your data, they will not appear on these screens).

# OUTPUT



## Output averages [Superusers]

The Output Averages screen presents you with an overview of CO<sub>2</sub> averages by region. Superusers can view regional averages relating to their company / organisation.

The three scroll boxes above the table of averages allow you to define which results are displayed.

## Output Summary

The Output Summary screen presents you with an overview of final CO<sub>2</sub> calculation, The amount of information that can be viewed depend on your user status, as follows:

- Users can see a summary of CO<sub>2</sub> results from their site
- Superusers can view results from any site belonging to their company / organisation

The five scroll boxes above the summary table allow administrators and Superusers to define which results are displayed.

## Output descriptions

Note: all values are expressed in metric tons (tonnes).

### CO<sub>2</sub> emission

Total CO<sub>2</sub> emissions = sum of Scope 1 + Scope1.1  
+ Scope 2 + Scope 3

### Crude steel

Total carbon crude steel production

### Scope 1, Scope1.1

Direct emissions

### Scope 2

Energy-related upstream emissions

### Scope 3

Other upstream emissions and credits

### Intensity

CO<sub>2</sub> intensity = total CO<sub>2</sub> emissions / total  
carbon crude steel production



# APPENDICES



Appendix 1: Data collection

Appendix 2: Methodology

Appendix 3: Key definitions

Appendix 4: Calculation of emissions

Appendix 5: Useful conversion factors

Appendix 6: Estimating total carbon content from proximate analysis

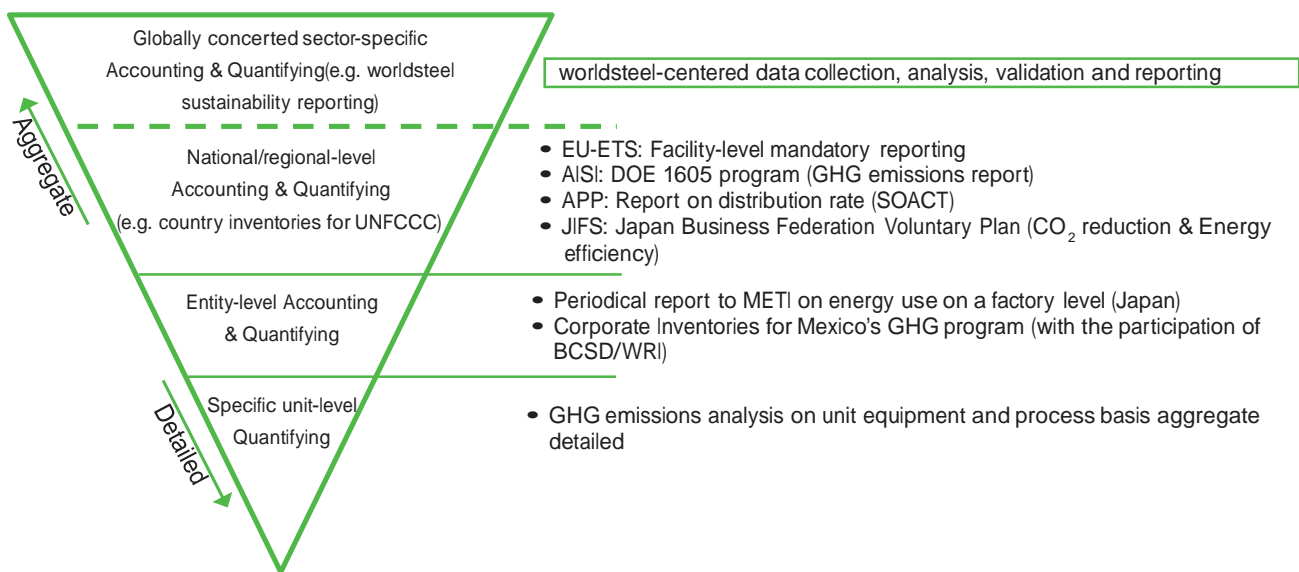
Appendix 7: Naming convention for sites

## Data collection

Individual sites, companies and federations already capture a lot of detailed information relating to CO<sub>2</sub> emissions. But, being gathered separately, an overview of regional or worldwide data cannot be calculated. By using the CO<sub>2</sub> Data Collection System to collect and compile all CO<sub>2</sub> emission data, worldsteel can provide a complete overview of emissions for the entire steel industry.

The diagram below gives a detailed structural analysis of data collection practices.

### Multi-level accounting & quantifying



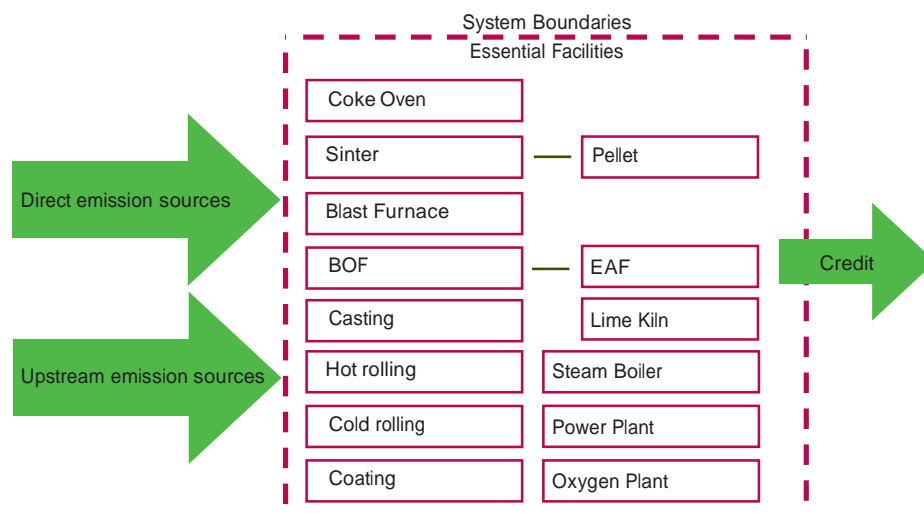
## Methodology

The basic methodology for calculating emissions is illustrated below. Calculations incorporate Scope 1 (Scope 1.1), Scope 2 and Scope 3 emissions, according to the GHG (greenhouse gas) protocol.

- Basic definition of calculation (direct/indirect/credit)
- Agreed (default/measured) common conversion factors

$$\text{CO}_2 \text{ emissions} = \text{Direct} + \text{Indirect} - \text{Credit}$$

$$\text{CO}_2 \text{ intensity} = \text{CO}_2 \text{ emissions (tonne)} / \text{crude steel (tonne)}$$



Upstream value of mining and transport is excluded from the system boundary.

Upstream value of petroleum products for oil refining is included.

Upstream CO<sub>2</sub> value: sum of CO<sub>2</sub> emitted during the production of each item

Upstream energy value: sum of energy consumed during the production of each item.

## Site structure

HDG lines: Hot Dip Galvanizing lines

EG: Electro-Galvanized lines

Smelting Red: Smelting Reduction

## Basic information

Total coke production

Total dry coke delivered by the batteries after quenching  
(including BF coke and fines, excluding wet quenching sludge)

Sinter production

Merchant sinter delivered to BF bunkers before screening

Hot metal production

Total hot metal at main runner

DRI production

Total DRI at plant outlet

BOF crude steel production

Total crude steel production using BOF

Open hearth crude steel production

Total crude steel production using Open hearth

EAF crude steel production

Total crude steel production using EAF

Carbon crude steel production

Sum of BOF, Open hearth and EAF crude steel production

Granulated slag production

Total production of dry granulated blast furnace slag

Purchased carbon steel scrap

Total external procurement of scrap (pre- and post-consumer scrap, excluding home scrap). It means "net of inventory" regarding purchased scrap, not on the use of scrap or the environmental burden of scrap or scrap recycling models.

## CO<sub>2</sub> table definitions

Procured / purchased

Amounts entering site from external sources, net of inventory change ahead of home production (for example: net electricity purchased from the grids)

Delivered / sold

Amounts delivered from the site, excluding internal use (for example: net coke sold)

Carbon content

Total carbon content on dry basis. If unknown, it can be estimated by proximate analysis (see appendix 6). If no data is provided, a default value will be used

Net calorific value

Heating value of fuel on dry basis with reference to water vapour. If no data is provided a default value will be used.

Scope 1 emissions (according to greenhouse gas protocol)

Direct emissions from site chimneys determined from straight carbon balance

Scope 1.1 emissions (worldsteel panel of experts)

Direct emissions of exported by-product gas.

= Direct emission factor of by-product gas × (Purchased-Sold)

Scope 2 emissions (according to greenhouse gas protocol)

Upstream emissions or credits related to procurement/delivery of electricity and steam from site.

Upstream emissions of exported by-product gas considering the potential savings in electricity generation.

= Upstream emission factor of by-product gas × (Purchased-Sold)

Scope 3 emissions (according to greenhouse gas protocol)

Other upstream emissions or credits related to procurement / delivery of pre-processed materials / by-products from site.

Coking coal

Coal for making coke, including anthracite

BF injection coal

PCI (Pulverized Coal Injection) coal, including anthracite

## APPENDIX 3 (CONTINUED)

### Sinter/BOF coal

Coal for sinter/BOF, including anthracite

### Steam coal

Boiler coal for producing electricity and steam, including anthracite

### EAF coal

Coal for EAF, including EAF injected carbon, EAF charge carbon and anthracite

### SR/DRI coal

Coal for SR/DRI, including anthracite (SR: Smelting Reduction, DRI: Direct Reduced Iron)

### Coke

A solid carbonaceous material

### Charcoal

Devolatilised or coked carbon neutral materials (trees, plants)

### Heavy oil

Bunker-C oil

### Light oil

Diesel oil (not including bio-diesel oil)

### Kerosene

Paraffin (oil)

### LPG

Liquefied petroleum gas

### Limestone

Calcium carbonate ( $\text{CaCO}_3$ )

### Burnt lime

$\text{CaO}$

### Crude dolomite

Calcium and magnesium carbonate ( $\text{CaCO}_3$ ,  $\text{MgCO}_3$ )

### Burnt dolomite

$\text{CaO}$ ,  $\text{MgO}$

### Sinter

bulk iron ore sintered by baking mixture of fine iron ore, coke breeze and pulverized lime

### EAF/BOF electrodes

Net use of EAF/BOF electrodes or attrition loss

### Pig Iron

Hot metal, intermediate liquid iron products produced by smelting iron ore with equipment such as blast furnace

### Cold Iron

solidified hot metal as an intermediate solid iron products

### Gas based DRI

DRI (Direct Reduced Iron)

### Electricity

World average value based on IEA 2006

### Coal based DRI

DRI (Direct Reduced Iron)

### Oxygen

$\text{O}_2$

### Nitrogen

$\text{N}_2$

### Argon

Ar

### Coke Oven gas

COG

### Blast Furnace gas

BFG

### BOF gas

LDG (Linze Donawitz Gas)

### BF slag to cement

BF granulated slag sold to cement industry for credits

### BOF slag to cement

BOF slag sold to cement industry for credits

### $\text{CO}_2$ to external use

$\text{CO}_2$  sold to carbonated drink manufacturers for credits



## Calculation of emissions

The following tables show the values used by the application to calculate the total emissions for a site. The listed CO<sub>2</sub> emission factors were defined and agreed by a worldsteel panel of experts.

### Direct emission factors (Scope 1, Scope 1.1)

Item	Unit	Default ncv (GJ/unit)	Conversion factor (tCO <sub>2</sub> /GJ)	Direct Emission factor (tCO <sub>2</sub> /unit)	Reference
Coking coal	dry t	32.200	0.0950	3.059	IEA
BF injection coal	dry t	31.100	0.0950	2.955	IEA
Sinter/BOF coal	dry t	29.300	0.0950	2.784	IEA
Steam coal	dry t	25.900	0.0950	2.461	IEA
EAF coal	dry t	30.100	0.1082	3.257	IEA
SR/DRI coal	dry t	31.100	0.0950	2.955	worldsteel
Coke	dry t	30.100	0.1082	3.257	worldsteel
Charcoal	dry t	18.800	0.000	0.000	worldsteel
Heavy oil	m <sup>3</sup>	37.700	0.0771	2.907	IEA
Light oil	m <sup>3</sup>	35.100	0.0741	2.601	IEA
Kerosene	m <sup>3</sup>	34.700	0.0715	2.481	IEA
LPG	t	47.300	0.0631	2.985	IEA
LNG	k.m3N	35.900	0.056	2.014	worldsteel
Natural gas	k.m3N	35.900	0.056	2.014	IEA
Limestone	dry t	0.000	0.000	0.440	IPCC
Crude dolomite	dry t	0.000	0.000	0.471	worldsteel
EAF/BOF electrodes	t	0.000	0.000	3.663	IPCC
Pig Iron	t	0.000	0.000	0.172	worldsteel
Cold Iron	t	0.000	0.000	0.172	ISO14404
Gas based DRI	t	0.000	0.000	0.073	IPCC
Coal based DRI	t	0.000	0.000	0.073	IPCC
Ferro-Nickel	t	0.000	0.000	0.037	ISSF
Ferro-Chromium	t	0.000	0.000	0.275	ISSF
Ferro-Molybdenum	t	0.000	0.000	0.018	ISSF
Coke oven gas	k.m <sup>3</sup> N	19.000	0.044	0.836	worldsteel
Blast furnace gas	k.m <sup>3</sup> N	3.300	0.270	0.891	worldsteel
BOF gas	k.m <sup>3</sup> N	8.400	0.180	1.512	worldsteel
Coal tar	t	37.000	0.092	3.389	WRI
Benzol	t	40.570	0.083	3.382	worldsteel

\* The yellow boxes are modifiable. If the data is not measured or available, default values will be used. Measurement of carbon content and net caloric value is highly recommended to obtain more accurate CO<sub>2</sub> emissions.

\* EAF/BOF electrodes

If the data of electrodes is available, enter the number of consumed electrodes in your site. Entering the data is highly recommended for EAF makers. If the data is not available or empty (in the case of scrap based sites), a default emission factor is considered as 0.005 tCO<sub>2</sub>/total crude steel.

## APPENDIX 4 (CONTINUED)

### Upstream emission factors (Scope 2, Scope 3)

Item	Unit	Energy Equiv. value (GJ/unit)	Upstream Emission factor (tCO <sub>2</sub> /unit)		Reference
			Scope 2	Scope 3	
Coke	dry t	4.000		0.224	worldsteel
Heavy oil	m <sup>3</sup>	0.000		0.275	IEA
Light oil	m <sup>3</sup>	0.000		0.247	IEA
Kerosene	m <sup>3</sup>	0.000		0.247	IEA
LNG	k.m <sup>3</sup> N	0.000		0.665	worldsteel
Burnt lime	t	4.500		0.950	worldsteel
Burnt dolomite	t	4.500		1.100	worldsteel
Sinter	t	2.450		0.262	worldsteel
Pellets	t	2.100		0.137	worldsteel
EA/BOF electrodes	t	0.000		0.650	worldsteel
Pig Iron	t	20.900		1.855	worldsteel
Cold Iron	t	20.900		1.855	worldsteel
Ferro-Nickel	t	0.000		8.676	ISSF
Ferro-Chromium	t	0.000		5.987	ISSF
Ferro-Molybdenum	t	0.000		8.500	ISSF
Gas based DRI	t	14.100		0.780	worldsteel
Coal based DRI	t	17.900		1.210	worldsteel
Electricity	MWh	9.800	0.504		IEA
Steam	t	3.800	0.195		IEA
Oxygen	k.m <sup>3</sup> N	6.900		0.355	IEA
Nitrogen	k.m <sup>3</sup> N	2.000		0.103	IEA
Argon	k.m <sup>3</sup> N	2.000		0.103	worldsteel
Coke oven gas	k.m <sup>3</sup> N	19.000	0.977		worldsteel
Blast furnace gas	k.m <sup>3</sup> N	3.300	0.170		worldsteel
BOF gas	k.m <sup>3</sup> N	8.400	0.432		worldsteel

\* worldsteel: worldsteel panel of Experts, ISSF: ISSF panel of Experts

\* Both energy equiv. value and emission factor of electricity are world average values based on IEA CO<sub>2</sub> emissions from fuel combustion 2006. These values will be updated on an annual basis.

eg. CO<sub>2</sub> Emission factor of Electricity = Energy equiv. value \* conversion factor

$$= 9.8 \text{ GJ/MWh} * 0.0514 \text{ TCO}_2/\text{GJ} = 0.504 \text{ TCO}_2/\text{MWh}$$

\* Energy equiv. value: 9.8 GJ/MWh, conversion factor: 0.0514 TCO<sub>2</sub>/GJ (ref. IEA)

## APPENDIX 4 (CONTINUED)

### Note for by-product gases

Item	Emission factor (tCO <sub>2</sub> /k.m <sup>3</sup> N)	
	Direct	Upstream
Coke Oven gas	0.836	0.977
Blast furnace gas	0.891	0.170
BOF gas	1.512	0.432

### Calculation CO<sub>2</sub> emissions of by-product gases

As agreed by a worldsteel panel of experts, instead of using scope 3, by product gas is calculated in scope 1 when used in own power plant or calculated in scope 1.1 when used in external power plant as it is generated directly by processes and used internally and excess can be sold externally for power generation in order to identify the sites with external and internal power plants.

Hence, total emission of exported by-product gases is calculated in Scope 2 as the upstream emission factor which is an electricity-equivalent value will be used for calculating CO<sub>2</sub> emissions of by-product gases.

	Previous Version	Current Version (New 2015)
Scope 1	Direct EF * (Purchased – Sold)	Direct EF * (Purchased – Sold)
Scope 1.1	-	- Direct EF * (Purchased – Sold)
Scope 2	Purchased Power	<b>Purchased Power – power from exported waste gas</b> = Purchased Power – {Upstream EF * (Sold – Purchased)} = Purchased Power + Upstream EF * (Purchased – Sold)
Scope 3	(Upstream EF – Direct EF) * (Purchased – Sold)	-
Total	Purchased Power + Upstream EF * (Purchased – Sold)	Purchased Power + Upstream EF * (Purchased – Sold)

\* There is no changes in total CO<sub>2</sub> emission amount.

### Credits

BF slag to cement	t	0.550
BOF slag to cement	t	0.300
CO <sub>2</sub> to external	t	1.000

\* BF and BOF slag to cement are potential credits. Their emission factors are not finalised yet. They need to be determined after discussion among member companies and cement industries.

## Useful Conversion factors

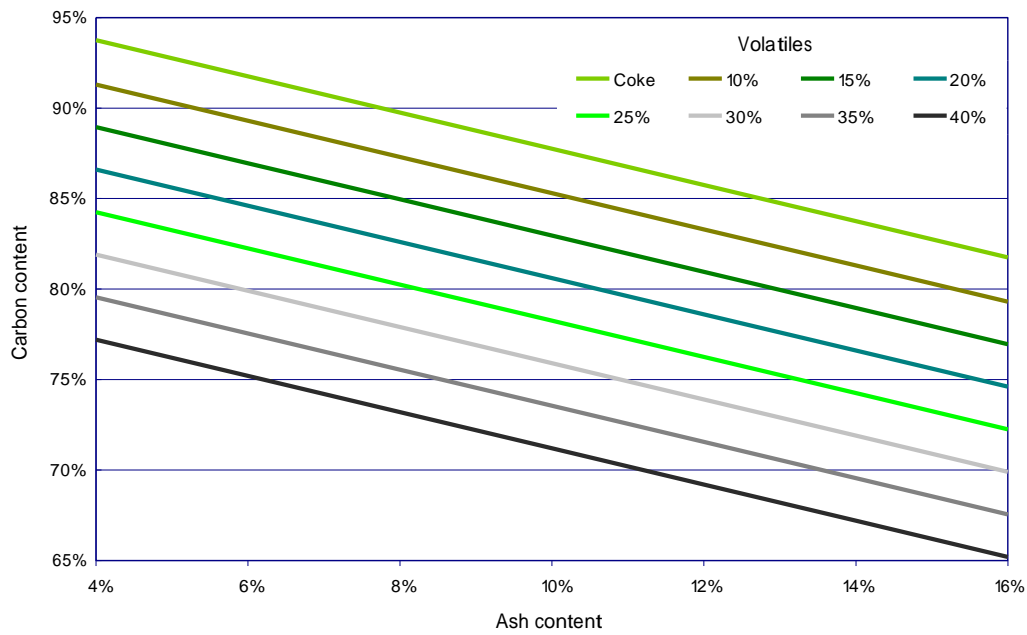
1 scf	Volume	0.026862 m <sup>3</sup> N
1 gal	Volume	0.003785 m <sup>3</sup>
1 lb	Weight	0.453592 kg
1 nt	Weight	0.907184 mt
1 mmBTU	Energy	1.054349 GJ
1 mBTU/scf	Energy	39.251136 MJ/m <sup>3</sup> N
1 mBTU/nt	Energy	1.162222 MJ/mt
1 BTU/gal	Energy	0.278530 MJ/m <sup>3</sup>

### Conditions

1 m <sup>3</sup> N	1 atm (1.013 x 10 <sup>5</sup> Pa) , 0 °C
1 scf	30 Hg – 60 °F

## Estimating total carbon content from proximate analysis

The following table shows the carbon content in coals and cokes.



Use the following calculation to estimate the total carbon content:

Coals

$$\text{Total carbon content, } C = 100 - \text{Ash} - 0.47 \times \text{Volatiles}$$

Volatiles are considered as coke oven gas (53% carbon by weight)

Coke

$$\text{Total carbon content, } C = 97.75 - \text{Ash}$$



## Naming rules for sites

The following naming convention must be used for all site names.

Company	Sites		Full name
Four-letter code	001	Site name 1	AAAA001
	002	Site name 2	AAAA002

World Steel Association

Rue Colonel Bourg 120  
B-1140 Brussels  
Belgium

T: +32 2 702 8900  
F: +32 2 702 8899  
E: [steel@worldsteel.org](mailto:steel@worldsteel.org)

C413 Office Building  
Beijing Lufthansa Center  
50 Liangmaqiao Road  
Chaoyang District  
Beijing 100125  
China

T: +86 10 6464 6733  
F: +86 10 6464 6744  
E: [china@worldsteel.org](mailto:china@worldsteel.org)

[worldsteel.org](http://worldsteel.org)