NETL Life Cycle Inventory Data
Process Documentation File

Process Name: Grinding Energy, Surface

Reference Flow: 1 kg of Crushed Coal

Brief Description: The amount of electricity required to power a grinding mill at a surface mine.

Section I: Meta Data

Geographical Coverage: US **Region:** N/A

Year Data Best Represents: 1998-2002

Process Type: Basic Process (BP)

Process Scope: Gate-to-Gate Process (GG)

Allocation Applied: No

Completeness: Individual Relevant Flows Captured

Flows Aggregated in Data Set:

☐ Process ☑ Energy Use ☐ Energy P&D ☐ Material P&D

Relevant Output Flows Included in Data Set:

Releases to Air:	☐ Greenhouse Gases	☐ Criteria Air	☐ Other
Releases to Water:	☐ Inorganic	☐ Organic Emissions	☐ Other
Water Usage:	☐ Water Consumption	☐ Water Demand (throughput)	
Releases to Soil:	☐ Inorganic Releases	☐ Organic Releases	☐ Other

Adjustable Process Parameters:

electricity	*[kWh/kg] Amount of electricity required per kg of coal*

Tracked Input Flows:

Coal, cleaned [Intermediate Product]	*[Technosphere] Coal extracted from a surface mine*
Electricity [Electric Power]	*[Technosphere] Amount of electricity required to power grinding mill.*

Tracked Output Flows:

Coal, ground [Intermediate Product]	*Reference flow*

Section II: Process Description

Associated Documentation

This unit process is composed of this document and the data sheet (DS) *DS_Stage1_O_Grinding_Surface.xlsx*, which provides additional details regarding relevant calculations, data quality, and references.

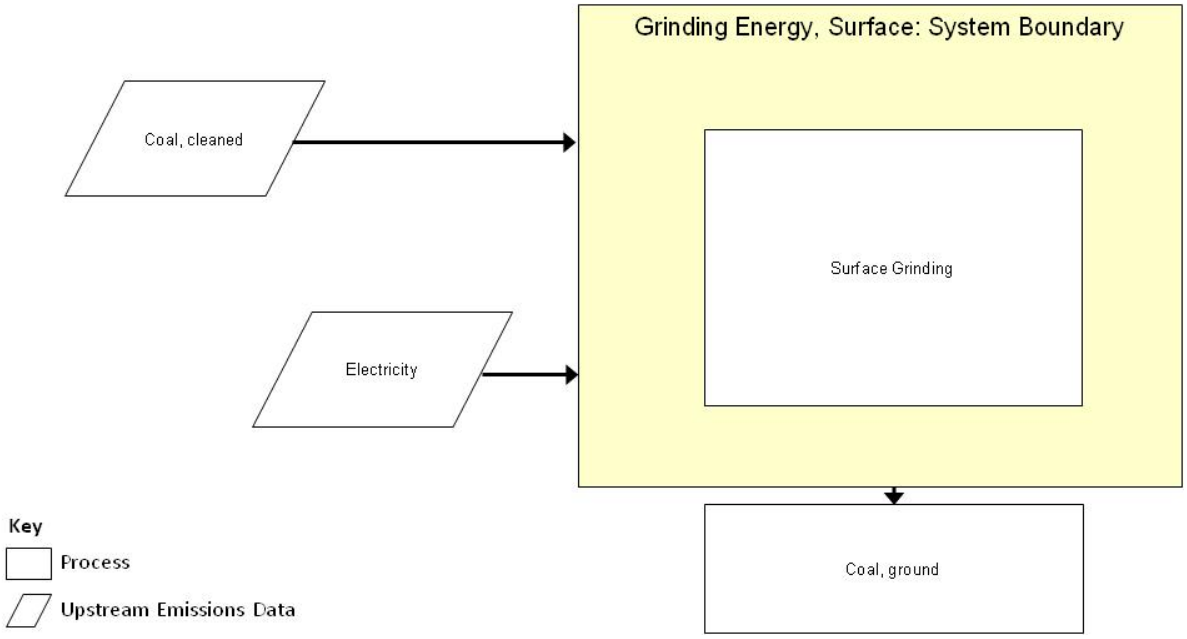
Goal and Scope

This unit process provides a summary of relevant input and output flows associated with the amount of electricity required to power a grinding mill at a surface mine. The key inputs are electricity and cleaned coal. Electricity is also an adjustable parameter to measure uncertainties. Coal from the ground is the key output. PM emissions are accounted for separately in the surface mine extraction unit process. The unit process is based on the reference flow of one kg of crushed coal. The relevant flows of this unit process are described below and shown in **Figure 1**.

Boundary and Description

Figure 1 provides an overview of the boundary of this unit process.

Figure 1: Unit Process Scope and Boundary



The electricity requirement was calculated using the Energy and Environmental Profile of the U.S. Mining Industry developed by the U.S. Department of Energy's Energy Efficiency and Renewable Energy division and the National Mining Association (U.S. Department of Energy and National Mining Association 2002). Chapter Two of the source focused on coal; description of coal types, overview of coal mining, energy requirements for underground and surface mines, and emissions from coal mining. The data source provides energy data for specific mining activities such as coal handling, extraction, and grinding. BCS, Incorporated (BCS) developed the data by integrating the U.S. Department of Energy's Energy Information Administration's 1997 Coal Industry data into the Western Mining Engineering, Inc.'s SHERPA Mine Cost Software to create 2002 estimates. BCS also used Mine and Mill Equipment Cost, An Estimator's Guide to develop the data. Newer data for specific coal mining processes are not available. This unit process parameterizes key variables, which allow for evaluation of data uncertainty when used in a life cycle model.

A grinding mill was the piece of equipment used to grind coal at a surface mine. It was assumed that the values in the data source were also valid for surface mines since the data was specific to underground mines. The energy requirement for a grinding mill, in Btu per ton, was divided by the appropriate conversions to obtain the electricity requirement in kWh per kg; the reference flow is one kg of coal. Electricity was placed as a parameter in the DS file, so the item could be adjusted to measure uncertainties.

Table 1 shows the input and output flows of this unit process. Additional details regarding input and output flows, including calculation methods, are contained in the associated DS sheet.

Table 1: Unit Process Input and Output Flows

Flow Name	Value	Units (Per Reference Flow)
Inputs		
Coal, cleaned [Intermediate Product]	1.00	kg
Electricity [Electric Power]	3.01E-02	kWh/kg
Outputs		
Coal, ground [Intermediate Product]	1.00	kg

* **Bold face** clarifies that the value shown *does not* include upstream environmental flows.

Embedded Unit Processes

None.

References

U.S. Department of Energy and National Mining Association. (2002). *Energy and Environmental Profile of the U.S. Mining Industry : Chapter 2 Coal*. U.S. Department of Energy. http://www1.eere.energy.gov/manufacturing/resources/mining/pdfs/coal.pdf.

Section III: Document Control Information

Date Created: July 31, 2013

Point of Contact: Timothy Skone (NETL), Timothy.Skone@NETL.DOE.GOV

Revision History:

Original/no revisions

How to Cite This Document: This document should be cited as:

NETL (2013). NETL Life Cycle Inventory Data – Unit Process: Grinding Energy, Surface. U.S. Department of Energy, National Energy Technology Laboratory. Last Updated: July 2013 (version 01). www.netl.doe.gov/LCA (http://www.netl.doe.gov/LCA)

Section IV: Disclaimer

Neither the U.S. Department of Energy (DOE) National Energy Technology Laboratory (NETL) nor any person acting on behalf of these organizations:

A. Makes any warranty or representation, express or implied, with respect to the accuracy, completeness, or usefulness of the information contained in this document, or that the use of any information, apparatus, method, or process disclosed in this document may not infringe on privately owned rights; or

B. Assumes any liability with this report as to its use, or damages resulting from the use of any information, apparatus, method, or process disclosed in this document.

Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by NETL. The views and opinions of the authors expressed herein do not necessarily state or reflect those of NETL.