



# NETL Life Cycle Inventory Data

## Process Documentation File

**Process Name:** Coal Handling Energy, Surface  
**Reference Flow:** 1 kg of Coal  
**Brief Description:** The amount of diesel required to power trucks and a bulldozer for a surface mine.

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### Section I: Meta Data

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**Geographical Coverage:** US **Region:** N/A  
**Year Data Best Represents:** 1998-2002  
**Process Type:** Extraction Process (EP)  
**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:**

diesel *[kg/kg] Amount of diesel fuel required per kg of coal*

**Tracked Input Flows:**

Coal, extracted [Intermediate product] *[Technosphere] Coal handled at a surface mine*

Thermal Energy from Diesel Fuel [Energy resources] *[Technosphere] Amount of diesel required to power trucks and a bulldozer.*

### Tracked Output Flows:

Coal, handled [Intermediate product] *Reference flow*

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## Section II: Process Description

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### Associated Documentation

This unit process is composed of this document and the data sheet (DS) *DS\_Stage1\_O\_Coal Handling\_Surface.xlsx*, which provides additional details regarding relevant calculations, data quality, and references.

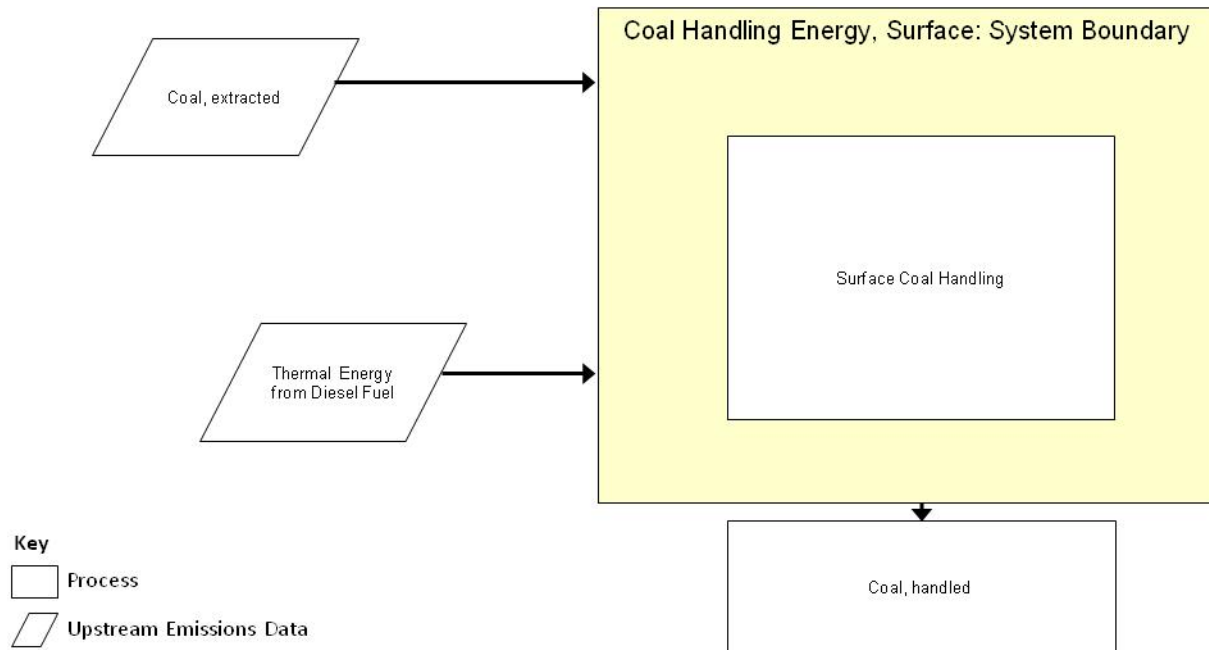
### Goal and Scope

This unit process provides a summary of relevant input and output flows associated with the amount of diesel required to power trucks and other handling equipment. All pieces of equipment are used to transport coal from a surface mine. The key inputs are thermal energy from diesel fuel and extracted coal. Diesel is also an adjustable parameter to measure uncertainties. Coal is the key output. The unit process is based on the reference flow of one kg of 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 diesel 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.

Bulk trucks, a bulldozer, pick-up trucks, rear dump trucks, and service trucks were the pieces of equipment used for coal handling at a surface mine; it was assumed all the equipment used diesel, input energy included vehicle efficiencies, and coal losses were accounted for in the coal cleaning unit process. To calculate the amount of diesel needed, based on the reference flow of one kg of coal, the sum of the equipments' energy requirements, in Btu per ton, was divided by the appropriate conversion to convert tons to kg and then divided by the high heating value of diesel (U.S. Energy Information Administration, 2011), in Btu per kg, to obtain the diesel requirement in kg of diesel per kg of coal. The diesel requirement was placed as a parameter in the DS file, so the item could be adjusted to measure uncertainties. Minimum and maximum

values for diesel were also included in the parameter section. The maximum value was calculated by dividing the sum of the energy requirements for an interior surface mine (U.S. Department of Energy and National Mining Association), in Btu/ton, by the appropriate conversion to convert tons to kg and then divided by the high heating value of diesel (U.S. Energy Information Administration, 2011), in Btu per kg, to obtain the diesel requirement in kg of diesel per kg of coal so the value is based on the reference flow of one kg of coal. The minimum value was the average of the western and interior mine data energy requirements, in Btu per ton, divided by the appropriate conversion and the high heating value of diesel (U.S. Energy Information Administration, 2011), in Btu per kg, to obtain the diesel requirement, based on the reference flow, in kg of diesel per kg of coal.

**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)
<b>Inputs</b>		
Coal, extracted [Intermediate product]	1.00	kg
Thermal Energy from Diesel Fuel [Energy resources]	1.43E-03	kg
<b>Outputs</b>		
Coal, handled [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>.

U.S. Energy Information Administration. 2011. *Appendix A British Thermal Unit Conversion Factors*. U.S. Energy Information Administration.

<http://www.eia.gov/totalenergy/data/annual/pdf/sec12.pdf>

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**Section III: Document Control Information**

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**Date Created:** July 31, 2013

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

**Revision History:**

Original/no revisions

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**Section IV: Disclaimer**

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