NETL Life Cycle Inventory Data
Process Documentation File

Process Name: Coal Handling Energy, Underground

Reference Flow: 1 kg of Coal

Brief Description: The amount of electricity and diesel required to power a coal conveyor, service truck, and load haul dumper for an underground 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] Adjustable parameter - Electrical energy required to operate handling equipment*
diesel	*[kg/kg] kg of diesel for handling per kg of coal*

Tracked Input Flows:

Electricity [Electric power]	*[Technosphere] Amount of electricity required to power a coal conveyor and load haul dumper for an underground mine.*
Thermal Energy from Diesel Fuel [Energy resources]	*[Technosphere] Amount of diesel required to power a service truck.*
Coal, underground, extracted [Intermediate Product]	*[Technosphere] Coal handled at an underground mine.*

Tracked Output Flows:

Coal, underground, handled [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_Coal Handling_Underground.xlsx*, which provides additional details regarding relevant calculations, data quality, and references.

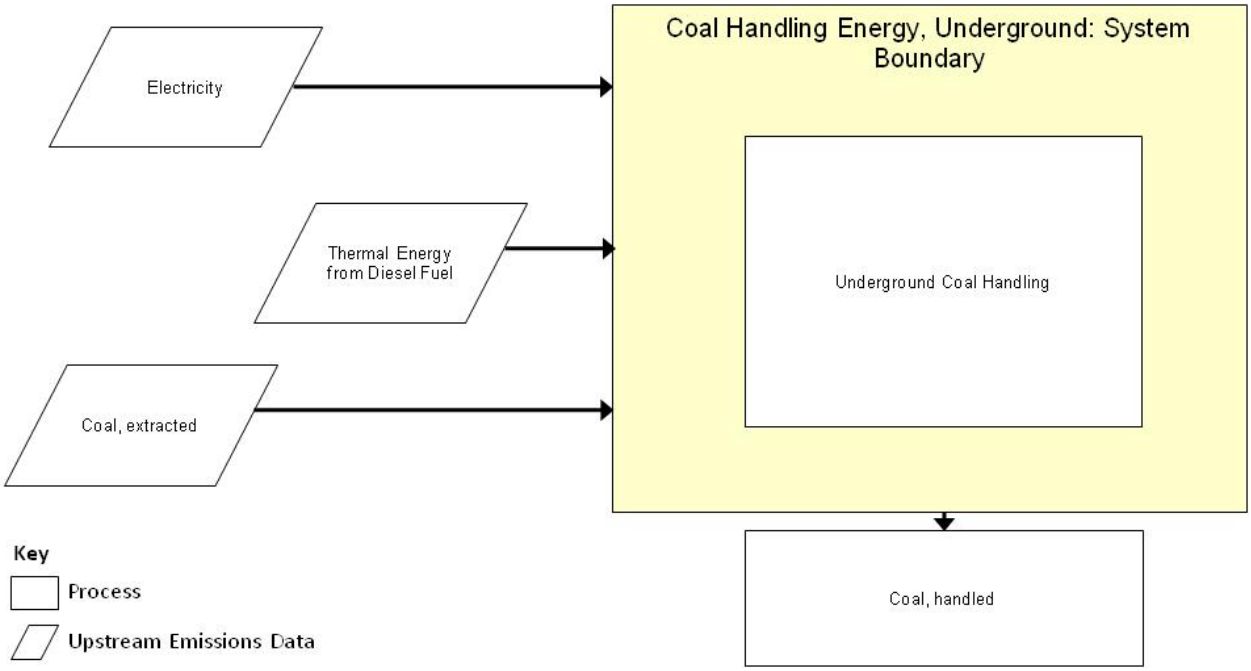
Goal and Scope

This unit process provides a summary of relevant input and output flows associated with the amount of electricity and diesel required to power a coal conveyor, service trucks, and load haul dumper. All pieces of equipment are used to transport coal from an underground mine. The key inputs are electricity, diesel, and extracted coal, while 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 electricity and diesel requirements were 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). 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 conveyor, load haul dumper, and service trucks were the pieces of equipment used for coal handling at an underground mine; the conveyor and load haul dumper are powered by electricity, while the service trucks use diesel. To calculate the electricity requirement (in kWh per kg of coal), the sum of the conveyor and load haul dumper energy requirements, in Btu per ton, was divided by the appropriate conversions to determine the electricity needed on the basis of one kg of coal, which is the reference flow. No coal losses were assumed. To obtain the diesel requirement, on the basis of the reference flow, the energy requirement for the service trucks 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. It was assumed that vehicle efficiency was included in the diesel energy requirements. The electricity and diesel requirements were placed as parameters in the DS file, so the items 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		
Electricity [Electric power]	1.97E-02	kWh/kg
Thermal Energy from Diesel Fuel [Energy resources]	1.46E-03	kg/kg
Coal, underground, extracted [Intermediate Product]	1.00	kg
Outputs		
Coal, underground, 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

Section III: Document Control Information

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