NETL Life Cycle Inventory Data
Process Documentation File

Process Name: Illinois No. 6 Coal Preparation Facility Assembly, Construction

Reference Flow: 1 kg of Illinois No. 6 Bituminous Coal

Brief Description: Calculates the number of each type of equipment required to prepare Illinois No. 6 bituminous coal for transport from an underground coal mine. Includes the following facilities: silo, stacker, crusher facility, cleaning facility, and WWTP.

Section I: Meta Data

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

Year Data Best Represents: 2008

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 Pollutants	☐ Other
Releases to Water:	☐ Inorganic Emissions	☐ Organic Emissions	☐ Other
Water Usage:	☐ Water Consumption	☐ Water Demand (throughput)	
Releases to Soil:	☐ Inorganic Releases	☐ Organic Releases	☐ Other

Adjustable Process Parameters:

Coal Feedrate — *Estimated required feedrate of coal to energy conversion facility (plant) in LC Stage #3, in metric tonnes per day. Default value is from Case #1 of NETL study (NETL 2009)*

Tracked Input Flows:

Steel Coal Loading Silo, 325 Tons [Installation] — *Total number of 325 short ton coal loading silos, needed over the lifetime of the energy conversion facility (plant), including replacements, to produce 1 kg of Illinois No. 6 bituminous coal*

Stockpile Stacker, 450 Tonne [Installation]	*Total number of stockpile stackers needed over the lifetime of the energy conversion facility (plant), including replacements, to produce 1 kg of Illinois No. 6 bituminous coal*
Coal Crusher Facility [Installation]	*Total number of crusher facilities needed over the lifetime of the energy conversion facility (plant), including replacements, to produce 1 kg of Illinois No. 6 bituminous coal*
Coal Cleaning Facility [Installation]	*Total number of cleaning facilities needed over the lifetime of the energy conversion facility (plant), including replacements, to produce 1 kg of Illinois No. 6 bituminous coal*
Wastewater Treatment Plant, Underground Coal Mine [Installation]	*Total number of wastewater treatment plants needed over the lifetime of the energy conversion facility (plant), including replacements, to produce 1 kg of Illinois No. 6 bituminous coal*

Tracked Output Flows:

Illinois No. 6 Bituminous Coal	*Amount of Illinois No. 6 bituminous coal output from the underground coal mine facilities (reference flow)*

Section II: Process Description

Associated Documentation

This unit process is composed of this document and the data sheet (DS) *DS_Stage1_C_Assembly_I6_Coal_Prep_2010.01.xls*, which provides additional details regarding relevant calculations, data quality, and references.

Goal and Scope

The scope of this unit process covers the elements required for the construction of a single coal preparation facility required to prepare Illinois No. 6 bituminous coal under Life Cycle (LC) Stage #1. After preparation, the coal will be loaded into railcars for transport (LC Stage #2) to the energy conversion facility (LC Stage #3) over the 30-year study period, as described below and in **Figure 1**. Input flows for this coal preparation facility assembly unit process include coal loading silos, stockpile stacker reclaimers, coal crusher facilities, coal cleaning facilities, and a wastewater treatment plant (WWTP). This unit process estimates the number of each type of equipment included in the coal preparation facility, evaluates the life expectancy and replacement rate for each input, and calculates the fraction of each type of equipment needed as inputs to prepare 1 kg of Illinois No. 6 bituminous coal, based on the parameters shown above and in the DS.

Construction data, including the mass of raw materials required to construct a single silo, stacker, crusher facility, cleaning facility, and WWTP, are calculated in separate unit processes. Therefore, the following unit processes are considered to be embedded in this assembly unit process:
DF_Stage1_C_Steel_Coal_Loading_Silo_325_Tons_2010.01.doc,
DF_Stage1_C_Coal_Stockpile_Stacker_2010.01.doc,
DF_Stage1_C_Coal_Crusher_Facility_2010.01.doc,
DF_Stage1_C_Coal_Cleaning_Facility_2010.01.doc, and
DF_Stage1_C_Wastewater_Treatment_Plant_Underground_Coal_Mine_2010.01.doc.
For a discussion of environmental emissions associated with the manufacture of raw materials used in the construction of unit train components, as well as other pertinent information, please refer to these separate unit processes.

Boundary and Description

Figure 1 provides an overview of the boundary of this unit process. The total number of coal loading silos at the coal preparation facility was calculated based on coal production at the coal mine where the representative silo is located. This mine, the Wolverine mine in British Columbia, Canada, has a single silo. Wolverine mine had permits to extract up to 3 million tonnes of coal per year, as of 2008 (Western Coal 2010). To determine the number of silos, the required amount of coal at the Study mine was determined by ratioing to the coal feedrate required by the energy conversion facility in LC Stage #3, in metric tonnes per day. This coal feedrate is an adjustable parameter, which can be adjusted as needed to reflect assumptions regarding the amount of coal required. The default value for this parameter is 21,719 tonnes/day. Multiplied by 365 days/year, the total amount of coal required is 7,927,435 tonnes/year. This value was divided by 3,000,000 tonnes/year (the capacity of a single silo) and rounded up for a total of 3 silos.

The lifetime of the plant was assumed to be 30 years. Each type of equipment or facility was assumed to have a life expectancy of 30 years, which means that the replacement rate for each is 1. To determine the fraction of a single piece of each

type of equipment required over the lifetime of the plant, to produce 1 kg of Illinois No. 6 bituminous coal, the coal feedrate (tonnes/day) was converted to kg/year, and then multiplied by the plant lifetime (30 years) to get the total amount of coal produced over the Study period. Finally, the number of each type of equipment was multiplied by the relevant replacement rate, and then divided by the total amount coal required over the Study period.

Relevant properties of a single Illinois No. 6 coal preparation facility used for the calculation of input and output flows for this unit process are shown in **Table 1**. **Table 2** provides a summary of modeled input and output flows. Additional details showing calculation methods for input and output flows, and other relevant information, are contained in the associated DS.

Figure 1: Unit Process Scope and Boundary

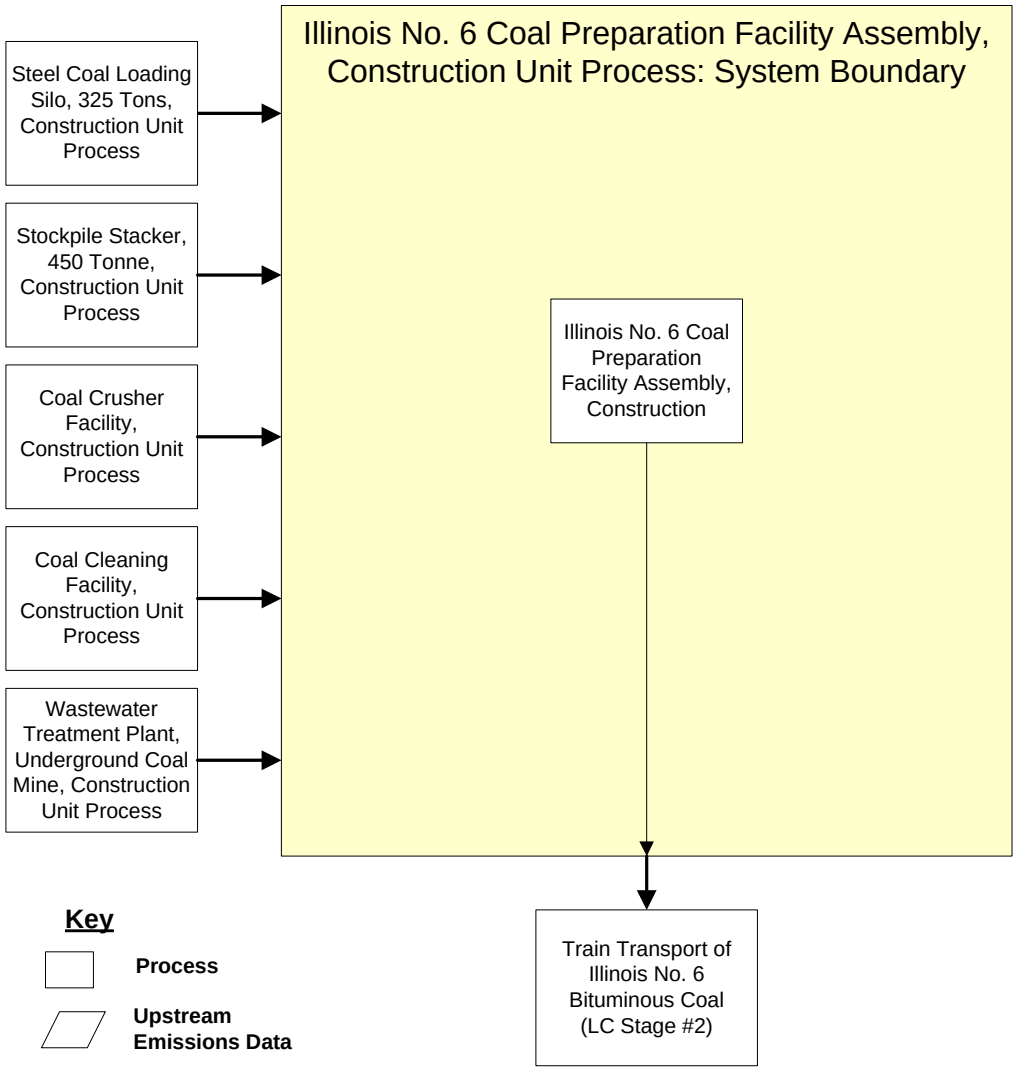

Table 1: Properties of a Single Illinois No. 6 Coal Preparation Facility

Construction and Replacement Properties		
Property	**Value**	**Units**
Capacity of Single Silo	3,000,000 (3,306,933)	tonne/year (tons/day)
Daily Coal Feedrate	21,719 (23,941)	tonne/day (tons/day)
Yearly Coal Feedrate	7,927,435 (8,738,501)	tonne/year (tons/year)
Total Coal Over Plant Lifetime	237,823,050,000 (524,310,076,000)	kg (lbs)
Number of Silos	3	silos
Number of Stackers	1	stacker
Number of Crusher Facilities	1	crusher facility
Number of Cleaning Facilities	1	cleaning facility
Number of WWTPs	1	WWTP
Silo Replacement Rate	1	silo
Stacker Replacement Rate	1	stacker
Crusher Facility Replacement Rate	1	crusher facility
Cleaning Facility Replacement Rate	1	cleaning facility
WWTP Replacement Rate	1	WWTP

Table 2: Unit Process Input and Output Flows

Flow Name*	Value	Units (Per Reference Flow)
Inputs		
Steel Coal Loading Silo, 325 Tons [Installation]	**1.11E-11**	**pcs**
Stacker Reclaimer [Installation]	**4.20E-12**	**pcs**
Coal Crusher Facility [Installation]	**4.20E-12**	**pcs**
Coal Cleaning Facilities [Installation]	**4.20E-12**	**pcs**
Wastewater Treatment Plant, Underground Coal Mine [Installation]	**4.20E-12**	**pcs**
Outputs		
Hard Coal (Illinois No.6) [Hard Coal Products]	1	kg

* **Bold face** clarifies that the value shown *does not* include upstream environmental flows. See also the documentation for embedded unit processes, as shown below.

Embedded Unit Processes

DF_Stage1_C_Steel_Coal_Loading_Silo_325_Tons_2010.01.doc;
DF_Stage1_C_Coal_Stockpile_Stacker_2010.01.doc;
DF_Stage1_C_Coal_Crusher_Facility_2010.01.doc;
DF_Stage1_C_Coal_Cleaning_Facility_2010.01.doc;
DF_Stage1_C_Wastewater_Treatment_Plant_Underground_Coal_Mine_2010.01.doc

References

NETL 2009	NETL. 2009. *Affordable, Low-Cost Diesel Fuel from Domestic Coal and Biomass*. DOE/NETL-2009/1349. U.S. Department of Energy, National Energy Technology Laboratory. Pittsburgh, PA.
Western Coal 2010	Western Coal. 2010. *Operations: Wolverine Group*. Western Coal Corp. http://www.westerncoal.com/properties/wolverine_group_perry_creek/ (Accessed February 3, 2010).

Section III: Document Control Information

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Section IV: Disclaimer