NETL Life Cycle Inventory Data
Process Documentation File

Process Name: Tug and barge transport

Reference Flow: 1 kg of cargo, tug and barge

Brief Description: Transport of an unspecified cargo via tug and barge

Section I: Meta Data

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

Year Data Best Represents: 2009

Process Type: Transport Process (TP)

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_frac	*[dimensionless] Fraction of fuel use that is diesel*
fueloil_frac	*[dimensionless] Fraction of fuel that is fuel oil*
distance	*[km] Distance of crude transport*
energy_inten	*[MJ/kg-km] Energy required to move 1 kg of crude 1 km*

Tracked Input Flows:

diesel combusted in large marine engine	*[Technosphere] diesel fuel for transport*
fuel oil combusted in large marine engine	*[Technosphere] fuel oil for transport*
petroleum product, into storage tanks	*[Technosphere] cargo transported by tug and barge*
construction, tug and barge	*[Technosphere] construction of tug and barge*

Tracked Output Flows:

cargo, tug and barge	*Reference flow*

Section II: Process Description

Associated Documentation

This unit process is composed of this document and the data sheet (DS) DS_*Stage24_O_tug_and_barge_transport_2013.01.xlsx*, which provides additional details regarding relevant calculations, data quality, and references.

Goal and Scope

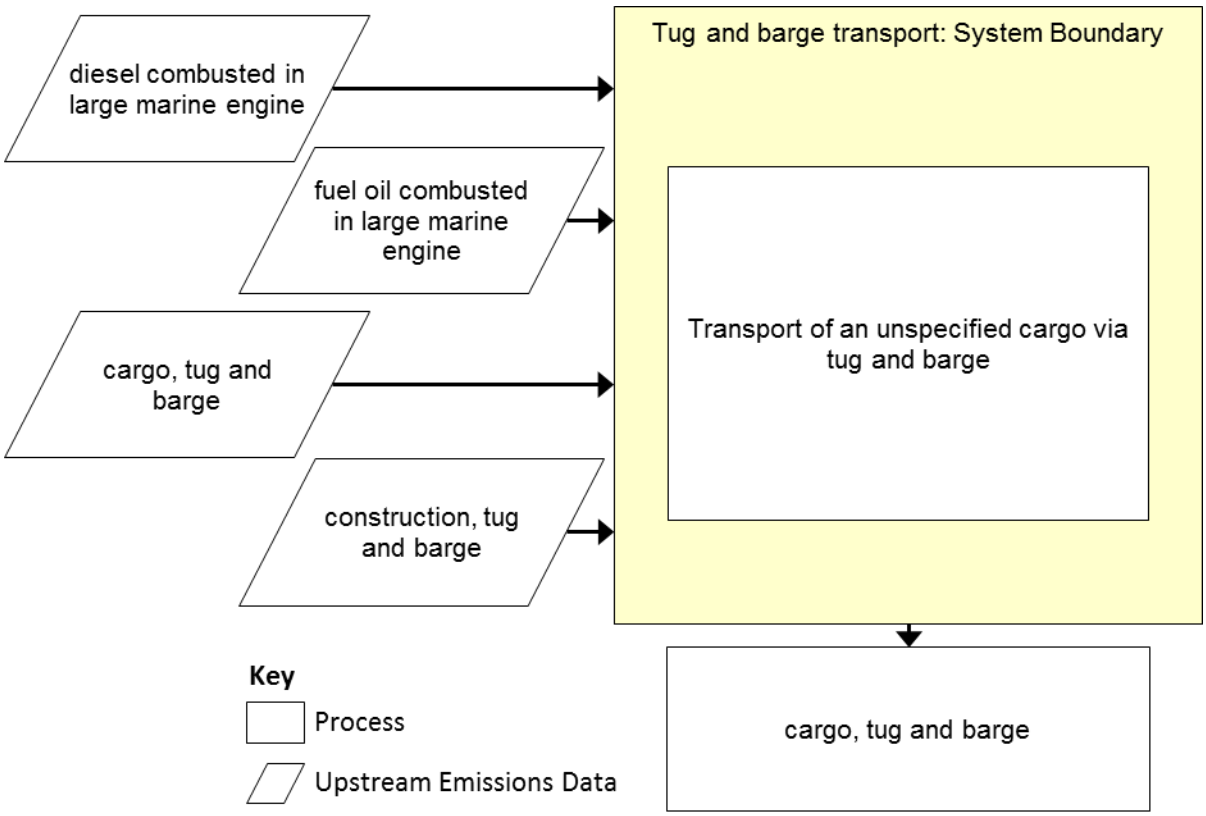
This unit process provides a summary of relevant input and output flows associated with the transport of an unspecified type of cargo by tug and barge. Flows include diesel and fuel input for combustion and an input for the cargo. This process can be used regardless of the type of cargo being transported or the location where the transport is taking place. The reference flow of this unit process is: 1 kg of cargo.

Boundary and Description

The unit process is designed such that the type of cargo being transported and location of transport are irrelevant. This unit process assumes that the unspecified type of cargo is loaded into the barge during a previous unit process. This unit process transports the unspecified cargo from one location to another.

Figure 1 provides an overview of the boundary of this unit process. As shown, upstream emissions associated with the production and combustion of fuel and processed cargo are accounted for outside of the boundary of this unit process. So, if the freighter is transporting cargo that will have emissions (e.g., crude transport with tank losses), then a process that accounts for those emissions will need to be connected upstream of this transport process.

Figure 1: Unit Process Scope and Boundary



The lower heating values are used for fuel energy content and are taken from the Greenhouse Gases, Regulated Emissions, and Energy Use in Transportation (GREET) Model and converted to mass basis using density data from the same source (ANL, 2013). The default values for the share of diesel oil and fuel used in freighter transportation are based on domestic consumption of transportation energy (ORNL, 2013). The energy intensity of tug and barge transport is based on domestic waterborne transportation (ORNL, 2013).

Table 1: Unit Process Input and Output Flows

Flow Name	Value	Units (Per Reference Flow)
Inputs		
diesel combusted in large marine engine	**1.24E-06**	**kg**
fuel oil combusted in large marine engine	**2.88E-06**	**kg**
petroleum product, into storage tanks	**1.00E+00**	**kg**
construction, tug and barge	**1.00E+00**	**pieces**
Outputs		
cargo, tug and barge	**1.00E+00**	**kg**

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

Embedded Unit Processes

None.

References

ANL 2013 Argonne National Laboratory. 2013. GREET.net 2013 v.1.10.9210. Argonne, IL: Argonne National Laboratory. Retrieved December 2, 2013 from http://greet.es.anl.gov/main

ORNL 2013 Oak Ridge National Laboratory. 2013. Transportation Energy Data Book: Edition 32. Oak Ridge, TN: Oak Ridge National Laboratory. Retrived December 2, 2013 from http://cta.ornl.gov/data/download32.shtml

Section III: Document Control Information

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