NETL Life Cycle Inventory Data
Process Documentation File

Process Name: Bulk Storage Facility, Gasoline, Operation

Reference Flow: 1 kg Gasoline

Brief Description: This unit process includes the emissions from operation of a bulk storage facility for gasoline. Emissions from fuel evaporation during storage and truck loading and unloading operations are included.

Section I: Meta Data

Geographical Coverage: US **Region:** Not Applicable

Year Data Best Represents: 2006

Process Type: Basic Process (BP)

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

Allocation Applied: No

Completeness: Individual Relevant Flows Recorded

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:

Evaporative Loss (Evap_Loss)	*Amount of gasoline to evaporate during terminal operations*

Tracked Input Flows:

Gasoline [Crude Oil Products]	*Petroleum-derived gasoline*
Power [Electric Power]	*U.S. national average electricity profile*

Tracked Output Flows:

Gasoline [Crude Oil Products] *Reference Flow*

Section II: Process Description

Associated Documentation

This unit process is composed of this document and the data sheet (DS) *DS_Stage4_O_Bulk_Storage_Facility_Gasoline_2010.01.xls*, which provides additional details regarding relevant, calculations, data quality, and references.

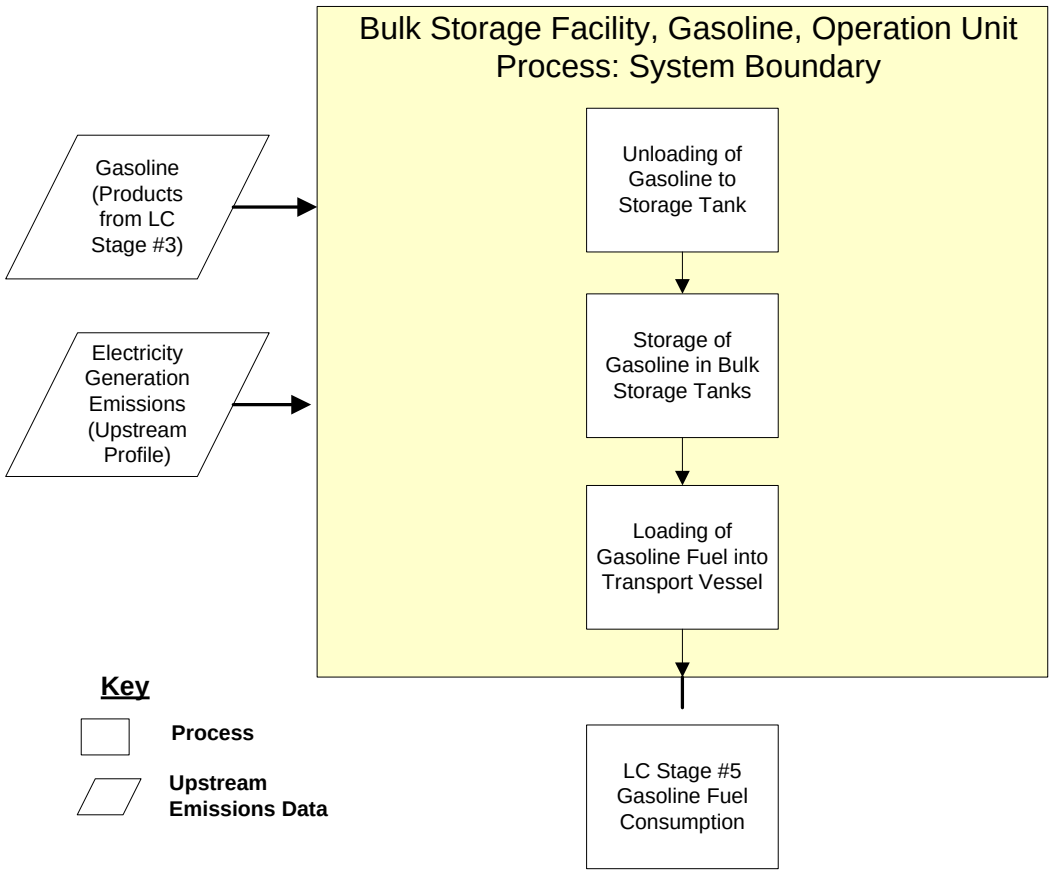
Goal and Scope

This unit process describes the operation of a bulk storage terminal during the transport (Life Cycle [LC] Stage #4) of finished gasoline to a refueling station. Gasoline is refined in LC Stage #3 and then transported to the bulk storage facility by pipeline, truck, or rail in separate unit processes, before distribution and eventual use under LC Stage #5.

Boundary and Description

Figure 1 represents the sub-processes contained within the bulk storage facility operations. Upon arrival to the bulk storage facility, gasoline is pumped from the transport vessel to a storage tank at the facility. Gasoline evaporation occurs during both unloading and storage in the tank. The gasoline is later moved from the storage tank to a truck for distribution to refueling stations. This process ends when the gasoline is loaded into the truck and is ready for transport.

Figure 1: Unit Process Boundary and Scope



Inputs to the unit process, as shown in **Figure 1**, include electricity, and gasoline produced under LC Stage #3. Electricity consumption data for a bulk storage terminal were not available, so the electricity consumption of a refueling facility was used and assumed to be equivalent. This substitution is noted as a data limitation; however, the electricity used in pumping fuel from a transport vessel to a storage tank is expected to be very similar for both types of fuel storage facilities. Approximately 0.00125 kWh of electricity is consumed to transport one gallon of fuel throughout the unloading operation (NETL 2008).

Evaporative emissions of fuel during truck loading and unloading of gasoline are taken from a Colorado Department of Public Health and Environment – Permit Report (STC 2006). These emissions include non-methane volatile organic compound (VOC), carbon monoxide, and oxide. To provide additional flexibility to the unit process, an adjustable parameter is included that indicates the amount of gasoline lost to evaporative emissions during terminal operations. The default value included in the DS is 1.08E-03 kg/kg gasoline. However, in the event that updated or more relevant evaporative emissions rates for gasoline are identified, an updated value may be substituted. The bulk storage facility may contribute to water and soil emissions; however, sufficient

data were not available to quantify these potential environmental releases. This is noted as a data limitation.

Table 1 shows gasoline properties used for calculation of evaporation of fuel in this unit process. **Table 2** provides a summary of modeled input and output flows. Additional details regarding input and output flows, including calculation methods, are contained in the associated DS.

Table 1: Properties Diesel Stored in the Facility

Property of Petroleum Gasoline (U.S. National Average Sold or Distributed in 2005)	Value	Reference
Density kg/m^3 (lb/gal)	737.04 (6.151)	NETL 2008
Lower Heating Value (LHV) MJ/m^3 (Btu/gal)	32,356 (116,090)	NETL 2008

Table 2: Unit Process Input and Output Flows

Flow Name*	Value	Units (Per Reference Flow)
Inputs		
Gasoline [Crude Oil Products]	**1.00E+00**	**kg**
Power [Electric Power]	**4.49E-04**	**kWh**
Outputs		
Gasoline [Crude Oil Products]	1	kg
NMVOC (unspecified) [Group NMVOC to air]	1.08E-03	kg
Nitrogen oxide [Inorganic emissions to air]	1.28E-11	kg
Carbon monoxide (biotic) [Inorganic emissions to air]	3.20E-11	kg
VOC (unspecified) [Organic emissions to air (group VOC)]	1.12E-10	kg

* **Bold face** clarifies that the value shown *does not* include upstream environmental flows. Upstream environmental flows were added during the modeling process using GaBi modeling software, as shown in Figure 1.

Embedded Unit Processes

None.

References

NETL 2008 — NETL. 2008. *Development of Baseline Data and Analysis of Life Cycle Greenhouse Gas Emissions of Petroleum-Based Fuels*. DOE/NETL-2009/1346. U.S. Department of Energy, National Energy Technology Laboratory, Pittsburgh, PA. November 26, 2008.

CDPHE 2006. — Colorado Department of Public Health and Environment. 2006. *Operating Permit: Sinclair Transportation Company,*

Denver Products Terminal. Colorado Department of Public Health and Environment. September 28, 2006.

Section III: Document Control Information

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