NETL Life Cycle Inventory Data
Process Documentation File

Process Name:	Pipeline Transport and Blending Energy Requirements for F-T Jet Fuel, Operation
Reference Flow:	1 kg of F-T Jet FuelTransported
Brief Description:	This unit process quantifies the energy requirements and fuel leakage emissions that are expected to result from the transport of F-T jet fuel transport by pipeline. This unit process also includes the electricity required for blending with conventional jet fuel.

Section I: Meta Data

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

Year Data Best Represents: 2006, 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 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:

CBTL Reference Distance	*Distance from CBTL facility to blending facility, assumes a uniform uncertainty distribution*
Pipeline Tortuosity	*Tortuosity coefficient of the transport pipeline*

Tracked Input Flows:

Electricity	*Amount of electricity required to pump fuel from the CBTL facility to refinery, in kWh*
F-T Jet Fuel [Intermediate Product]	*F-T jet fuel transported from CBTL plant by pipeline to refinery for blending, in kg*

Tracked Output Flows:

F-T Jet Fuel [Intermediate Product]	*F-T jet fuel delivered to the refinery*

Section II: Process Description

Associated Documentation

This unit process is composed of this document and the data sheet (DS) *DS_Stage4_O_F-T_JetFuel_Transport_2012.01.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 transport of F-T jet fuel under Life Cycle (LC) Stage #4, from the CBTL plant to the blending refinery over the 30-year study period, as described below and in **Figure 1.** Electricity and F-T jet fuel from the CBTL facility are the input flows for the operation of the transport process. The total amount of electricity required is based on the length of the pipeline, the electricity required to pump fuel through the pipeline per kilogram of fuel and kilometer traveled.

Boundary and Description

Figure 1 provides an overview of the boundary of this unit process. F-T Jet Fuel transport includes pipeline transport of F-T jet fuel from the CBTL facility to a petroleum refinery/blending station. At the refinery, the F-T jet fuel is blended with conventional, petroleum-based jet fuel (refer to next subsection). Here, transport of the F-T jet fuel to the refinery/blending station is considered.

The pipeline used for transporting the F-T jet fuel to the refinery/blending station is assumed to be a pre-existing pipeline used to transport petroleum products. However, it is assumed that an approximately 20 mile length of pipeline will need to be constructed to connect the CBTL facility to the existing portion of the petroleum pipeline. Construction related materials and emissions are included for this 20-mile pipeline segment. Total distance from the CBTL facility to the refinery/blending station was assumed to be 225 miles.

It is assumed that electrical powered pumps would be used to move the fuels through the pipeline, and energy intensity consistent with petroleum pipeline transport is assumed to be 260 Btu/ton-mile (1.72E-05 kWh/kg-km), as reported by NETL 2008. The energy intensity number will differ slightly due to the varying densities of the fuels as the energy consumption values are based on the mass of flow through the pipe. Jet fuel loss associated with fuel transport via pipeline is assumed to occur at a rate of 5.51E-05 kg/GJ fuel transported (Lewis 1997). Pipeline transport fuel loss rate data are thus estimated based on data that are approximately 15 years old. This is noted as a data limitation, and this data point should be updated when more recent information is identified. The emissions associated with the electricity used for pipeline transport is modeled using the regional power grid mix.

Relevant properties fuel transport properties 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

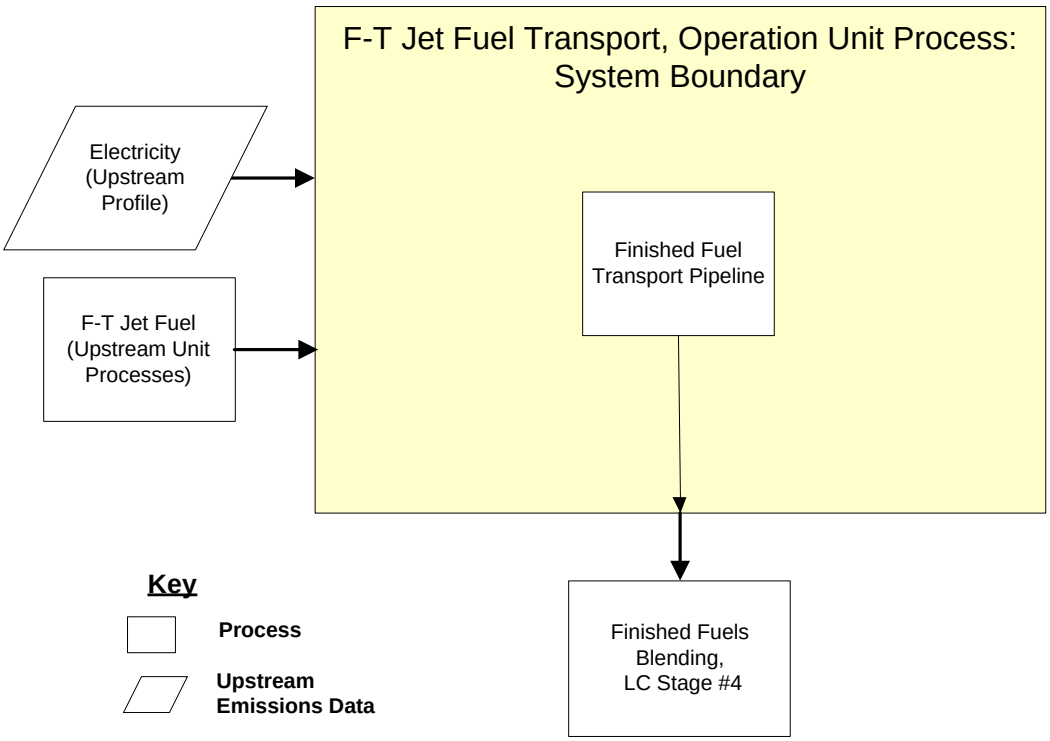

Table 1: Properties of Transport

Pipeline and Fuel Properties		
Property	**Value**	**Units**
Distance from CBTL facility to blending refinery, assuming a uniform uncertainty distribution	362	km
Electricity consumption to pump F-T jet fuel through pipeline	1.72E-05	kWh/kg-km
F-T jet fuel loss from pipeline and blending	2.33E-06	kg/kg

Table 2: Unit Process Input and Output Flows for Transport from CBTL facility to blending refinery

Flow Name*	Value	Units (Per Reference Flow)
Inputs		
Electricity [Electricity]	**6.93E-03**	**kWh**
F-T Jet Fuel transported via pipeline [Intermediate Product]	**1.0000023**	**kg**
Outputs		
F-T Jet Fuel [Intermediate Product]	1.00	kg
NMVOC (unspecified) [Group NMVOC to air]	2.33E-06	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

None.

References

Lewis 1997 — Lewis, C.A. 1997. Fuel and Energy Production Emission Factors. AEA Technology. http://web.inrets.fr/ur/lte/cost319/MEETdeliverable20.pdf (accessed December 16, 2009).

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.

Section III: Document Control Information

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Revision History:

Original/no revisions

How to Cite This Document: This document should be cited as:

NETL (2012). *NETL Life Cycle Inventory Data – Unit Process: Blended Jet Fuel Transport, Operation.* U.S. Department of Energy, National Energy Technology Laboratory. Last Updated: April 2012 (version 01). www.netl.doe.gov/energy-analyses (http://www.netl.doe.gov/energy-analyses)

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