NETL Life Cycle Inventory Data
Process Documentation File

Process Name:	Fischer-Tropsch Diesel (FTD) Energy Conversion Facility Commissioning/Decommissioning
Reference Flow:	1 pcs of Energy Conversion Facility per kg FTD
Brief Description:	Calculates the diesel use, water use and emissions associated with the commissioning and decommissioning of an FTD energy conversion facility. Decommissioning is presented as a percentage of the commissioning values.

Section I: Meta Data

Geographical Coverage:	US	**Region:**	California
Year Data Best Represents:	2001		
Process Type:	Installation Process (IP)		
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:

Decommissioning percent	*Percent of needed fuels (gasoline and diesel) and resulting combustion emissions from commissioning an FTD energy conversion facility*
Construction period	*Period of time during which the construction of the facility occurs, in years*
Diesel Production	*Quantity of diesel produced at the facility over the facility's lifetime, in kg*

Tracked Input Flows:

Diesel [Crude oil products]

Diesel (from crude oil) input for commissioning/decommissioning machinery operations

Water (ground water) [Water]

Water taken from a ground source used during the commissioning/decommissioning primarily for dust suppression

Tracked Output Flows:

Commissioning/Decommissioning

The pieces of commissioning/decommissioning associated with each kg of FT diesel produced over the lifetime of the plant

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Section II: Process Description

Associated Documentation

This unit process is composed of this document and the data sheet (DS), DS_Stage3__I_F-T_Diesel_ECF_CommissionDecommission_2010.01.xls, which provides additional details regarding calculations, data quality, and references as relevant.

Goal and Scope

The scope of this unit process covers the fuel combustion and emissions and water consumption for the construction (commissioning) and the end of life (decommissioning) of a liquid fuels energy conversion facility (ECF) for the creation of FTD in LC Stage #3. The process is appropriate for application to all FTD production pathways, including coal-to-liquids (CTL), coal and biomass-to-liquids (CBTL), and biomass-to-liquids (BTL). The unit process is based on the commissioning and decommissioning of a natural gas combined cycle (NGCC) power plant because data for the commissioning and decommissioning of CTL, CBTL and BTL plants were not readily available. The process is described below and in **Figure 1**. The following are considered within the commissioning and decommissioning unit process: consumption of diesel by construction/demolition machinery to perform the activities needed to commission and decommission the ECF and water needed for dust suppression. Construction of individual components within the ECF during the facility's operations, as well as the input flows and emissions associated with the flows such as raw materials acquisition and transportation, are addressed in separate unit processes.

Boundary and Description

The boundary for this unit process includes initial clearing and construction activities that take land in its natural state and turn it into a liquid ECF. These activities include

clearing of natural vegetation, excavation of soil and rock, grading, and construction of needed facilities. The boundary also includes decommissioning of the ECF. That is, after the useful life of the facility, decommissioning will result in the removal of infrastructure, recontouring the land around the mine to the extent warranted, and planting of vegetation to help return the land to its natural state.

As previously stated, the data used to model the liquid ECF is taken from an NGCC power plant commissioning. The Russel City Application for Certification is for a proposed new 600 MW NGCC plant (Russel City 2001). This is the closest data available for the construction of a liquid ECF. This unit process calculates the emissions and fuel consumption per acre for the Russel City facility and applies those factors to the acreage needed for a given liquid ECF. Water data for dust suppression were also based on the acreage for the facility and is assumed to occur over a 2 month period.

The diesel fuel use and emissions for commissioning and decommissioning of the facility were scaled from data for NGCC power plant commissioning to the ECF, based on the comparative land area that each facility would occupy. The footprint of the NGCC was 14.7 acres (Russel City 2001). Thus, diesel use and associated emissions were normalized to the area of the NGCC and then multiplied by the anticipated areal footprint of the EFC facility.

The assumed construction period for the facility is one year, with construction occurring between 6:00 am and 6:00 pm, Monday through Saturday. Another assumption is made that the site is unpaved prior to construction and that paving activities are required.

Figure 1 provides an overview of the boundary of this unit process. As shown, upstream emissions associated with the production and delivery of gasoline and diesel fuel are accounted for outside of the boundary of this unit process via profiles obtained elsewhere, such as proprietary profiles within the GaBi model. However, no machinery production is considered since it is assumed that machinery would be used for numerous construction or demolition jobs before being replaced.

Data were not readily available to model the decommissioning portion of the ECF life cycle. Therefore, it was assumed that decommissioning would result in 10 percent of the total fuel use and emissions that would result from commissioning. An adjustable parameter was also included in the unit process, to enable the user to update this assumption. Should the commissioning and decommissioning of the mine prove to be significant, further analysis on this data point is suggested, which may result in an increase or decrease in the value of this adjustable parameter, in comparison to the default value of 10 percent. This unit process does not include the disposal of materials which may be dismantled and disposed of during decommissioning.

Along with the adjustable parameter for decommissioning, there are adjustable parameters for the diesel output of the facility over its lifetime and the construction period. While the parameters are independently adjustable, some consideration should be taken in the variations of values entered. A larger facility will most likely result in a longer construction period. Should the alternative fuels in the ECF rival a petroleum refinery, they may end up producing roughly 500,000 barrels per day (roughly 180

million barrels per year). The facility size and therefore construction period would be expected to be larger and longer than the current outputs which might be around 50,000 barrels per day (18 million barrels per year).

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 sheet.

Figure 1: Unit Process Scope and Boundary
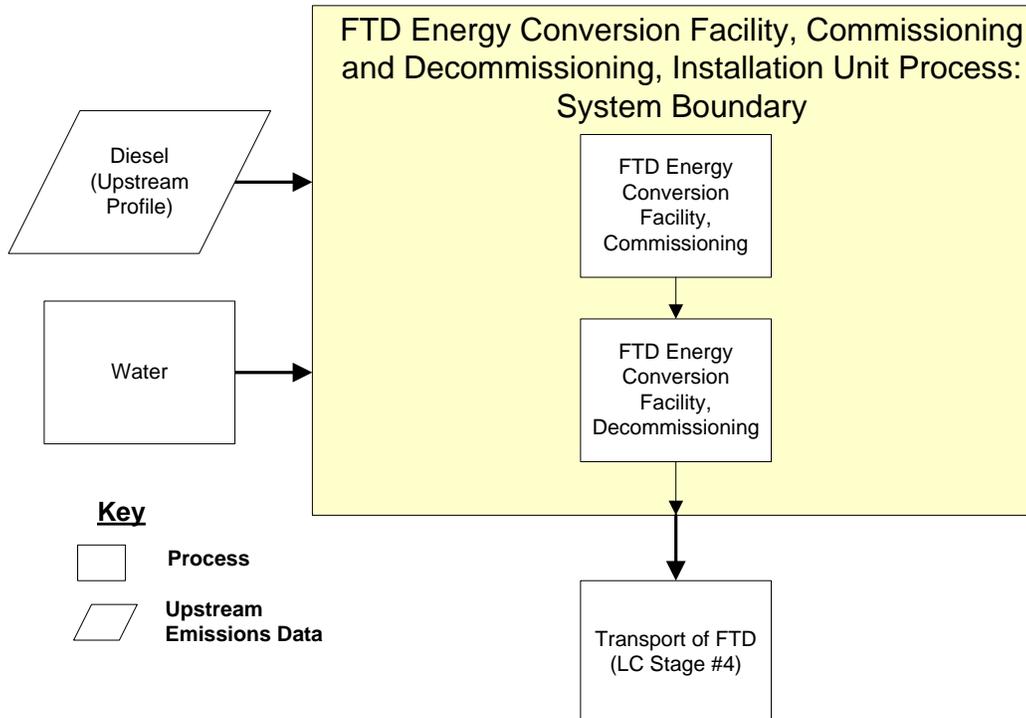
Table 1: Commissioning and Decommissioning Information

Data Point	Value	Unit	Reference
Construction Period	1	year	NETL Engineering Judgment
Lifetime Diesel Production	74,055,552,380	kg	NETL Calculation
Decommissioning Percent	10	%	NETL Engineering Judgment
Diesel Usage During Construction	1,405,199	kg/yr	URS 2004
Water Usage During Construction	21,303,377	L/yr	Russel City 2001

Table 2: Unit Process Input and Output Flows

Flow Name*	Value	Units (Per Reference Flow)
Inputs		
Diesel [Crude oil products]	**2.0872E-05**	**kg**
Water (ground water) [Water]	**3.1643E-04**	**kg**
Outputs		
Commissioned/Decommissioned FTD ECF	1.35E-11	pcs/kg
Carbon dioxide [Inorganic emissions to air]	6.5353E-05	kg
VOC (unspecified) [Organic emissions to air (group VOC)]	1.3748E-08	kg
Methane [Organic emissions to air (group VOC)]	1.0987E-06	kg
Nitrogen oxides [Inorganic emissions to air]	2.7766E-08	kg
Nitrous oxide (laughing gas) [Inorganic emissions to air]	5.0678E-06	kg
Sulphur oxide [Inorganic emissions to air]	6.5353E-05	kg
Particulate Matter, unspecified [Other emissions to air]	3.7590E-09	kg
Carbon monoxide [Inorganic emissions to air]	1.6851E-09	kg
Mercury (+II) [Heavy metals to air]	3.2641E-15	kg
Ammonia [Inorganic emissions to air]	2.6987E-09	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

Russel City 2001   Calpine Corporation and Bechtel Enterprises Holdings, Inc. 2001. Russell City Energy Center Application for Certification, Appendix 8.1-E. California Energy Commission. http://www.energy.ca.gov/sitingcases/russellcity/documents/applicant_files/afc/vol-2/8.1%20Air%20Quality%20Appendices.pdf (Accessed December 16, 2009).

URS 2004   URS Corporation. 2004. Compendium of Greenhouse Gas Emission Methodologies for the Oil and Gas Industry. Prepared for the American Petroleum Institute. http://www.api.org/ehs/climate/new/upload/2004_COMPENDIUM.pdf (Accessed December 16, 2009).

Section III: Document Control Information

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Point of Contact: Timothy Skone (NETL), Timothy.Skone@NETL.DOE.GOV

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