NETL Life Cycle Inventory Data
Process Documentation File

Process Name: Water Carrier, 125,000 m^3 LNG Tanker, Construction

Reference Flow: 1 piece (pcs) of Water Carrier, 125,000 m^3 LNG Tanker

Brief Description: This process constructs an LNG tanker water carrier with 125,000 m^3 load capacity (before heel). The material requirements and weights are determined for construction of a single tanker.

Section I: Meta Data

Geographical Coverage: Japan **Region:** Not Applicable

Year Data Best Represents: 1997

Process Type: Manufacturing Process (MP)

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

Allocation Applied: No

Completeness: All 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:

None.

Tracked Input Flows:

Steel Plate, BF (85% Recovery Rate) [Metals]	*Steel plate from blast furnace (BF), assumes 85% recovered/recycled steel*
304 Stainless Steel Cold Rolled [Metals]	*304 cold-rolled stainless steel*
Aluminum sheet [Metals]	*Aluminum sheet*

Tracked Output Flows:

Water Carrier, 125000 m3 LNG Tanker	*Reference flow, single water carrier construction*

Section II: Process Description

Associated Documentation

This unit process is composed of this document and the data sheet (DS) *DS_Stage2_C_LNG_Water_Tanker_125000m3_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 materials used in the construction of a Liquid Natural Gas (LNG) ocean going tanker, or water carrier. The water carrier is used under an operations unit process in Life Cycle (LC) Stage #2 to haul LNG extracted from wells in foreign locales, processed in a foreign facility, and loaded at a foreign port (LC Stage #1). This unit process is combined with other LC Stage #2 transport unit processes in order to deliver LNG to a domestic energy conversion facility in LC Stage #3. Carbon steel (steel plate), stainless steel, and aluminum are considered to be the sole input flows for the construction of the indicated vessel.

Boundary and Description

Figure 1 provides an overview of the boundary of this unit process. The boundary of this unit process is a single tanker such that all material flows are expressed on the basis of one LNG Tanker constructed. The construction profile assumes the tanker is solely assigned to the transport route for which it is used, with no co-product transport. Emissions related to the physical assembly of the water carrier (e.g., emitted while putting together the components of a tanker, including transport of those components) are not considered in this study. Upstream emissions from the production of raw materials used for the construction of the water carrier (e.g., carbon steel and stainless steel) are calculated outside the boundary of this unit process, based on profiles determined from other sources, such as the GaBi model. As shown in Figure 1 and discussed above, the water carrier constructed in this unit process is incorporated into the water carrier assembly process for LC Stage #2.

The data set obtained for this unit process is cited in a paper dated 1997 (Hashimoto 1997), reflecting construction materials for the year 1991. While LNG tankers built around this time would be anticipated to be in service during the study period, the data is nevertheless old, and is considered a data limitation. This LNG tanker has a capacity of 125,000 cubic meters, is constructed for the sole use of LNG transport, and is assumed to have a usable life of 30 years for this unit process.

Table 1 provides a summary of modeled input and output flows. Additional detail regarding input and output flows, including calculation methods, is contained in the associated DS.

Figure 1: Unit Process Inputs, Outputs, and Boundaries

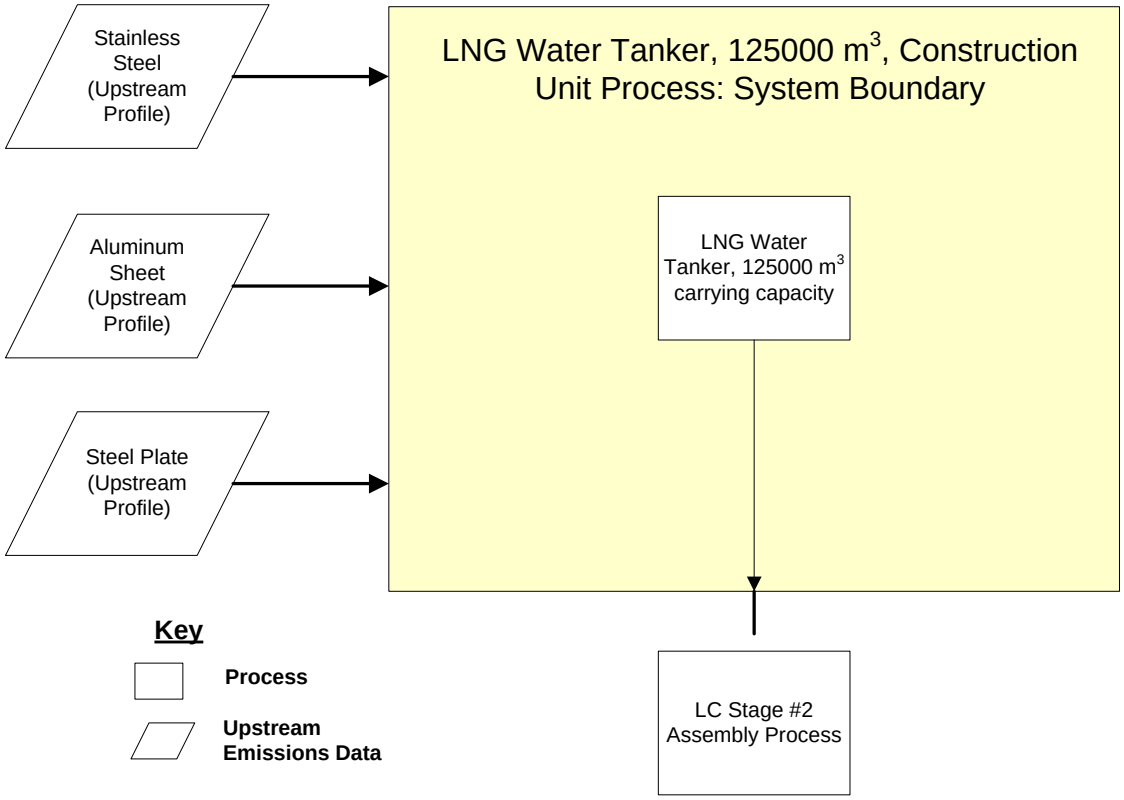

Table 1: Unit Process Input and Output Flows

Flow Name*	Value	Units (Per Reference Flow)
Inputs		
Steel plate, BF (85% Recovery Rate) [Metals]	**19,413,753**	**kg**
304 Stainless Steel Cold Rolled [Metals]	**544,311**	**kg**
Aluminum sheet [Metals]	**2,721,554**	**kg**
Outputs		
Water Carrier, 125000 m3 LNG Tanker [Construction]	1.00	pcs

* **Bold face** clarifies that the value shown *does not* include upstream environmental flows. Upstream environmental flows must be added during the modeling process from other source, such as from GaBi modeling software, as shown in Figure 1.

Embedded Unit Processes

None.

References

DOE 2005	DOE. 2005. Liquefied Natural Gas: Understanding the Basic Facts. U.S. Department of Energy. http://www.fossil.energy.gov/programs/oilgas/publications/lng/LNG_primerupd.pdf (Accessed December 18, 2009).
Hashimoto et al 1997	Hashimoto, K et al. 1997. "Energy Balance of Global CO2 Recycling and Amounts of Reduction of CO2 Emission." Science Reports RITU 2:153-160. http://ir.library.tohoku.ac.jp/re/bitstream/10097/28667/1/KJ00004200800.pdf (Accessed December 18, 2009).

Section III: Document Control Information

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