



# NETL Life Cycle Inventory Data

## Process Documentation File

**Process Name:** LNG Regasification  
**Reference Flow:** 1 kg of regasified LNG  
**Brief Description:** This unit process covers the energy requirements, emissions, and losses associated with regasifying LNG at an import terminal

### Section I: Meta Data

**Geographical Coverage:** Asian/European Regasification      **Region:** n/a  
**Year Data Best Represents:** 2016  
**Process Type:** Basic Process (BP)  
**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:

##### Energy\_Source\_Switch

*This is a parameter switch to choose the source of the supplemental energy used for regasification. A value of 0 entered here indicates that the supplemental energy is from the electricity grid mix. A value of 1 here indicates that the supplemental energy is parasitic LNG.*

##### Energy\_Regasification

*Energy requirement for regasifying the LNG*

**Electricity\_Consumption**

*Energy requirement for onsite electricity consumption for ancillary activities*

**Storage\_Time**

*Time spent in temporary storage*

**Fugitive\_emission\_rate\_regas**

*Fugitive emission rate*

**NG\_turbine\_efficiency**

*Adjustable parameter, efficiency of turbine for parasitic load*

**LNG\_comp\_CH4**

*Adjustable parameter, mass fraction of methane in the LNG*

**Tracked Input Flows:****Natural gas, combusted**

*[Technosphere] mass requirement, fuel combusted using GTSC*

**Electricity**

*[Technosphere]*

**LNG unloaded for regasification**

*[Technosphere] mass requirement of LNG unloaded from the ocean tanker*

**Tracked Output Flows:****Regasified LNG**

*Reference flow*

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**Section II: Process Description**

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**Associated Documentation**

This unit process is composed of this document and the data sheet (DS) *DS\_O\_LNG\_Regasification\_2018.01.xlsx*, which provides additional details regarding relevant calculations, data quality, and references.

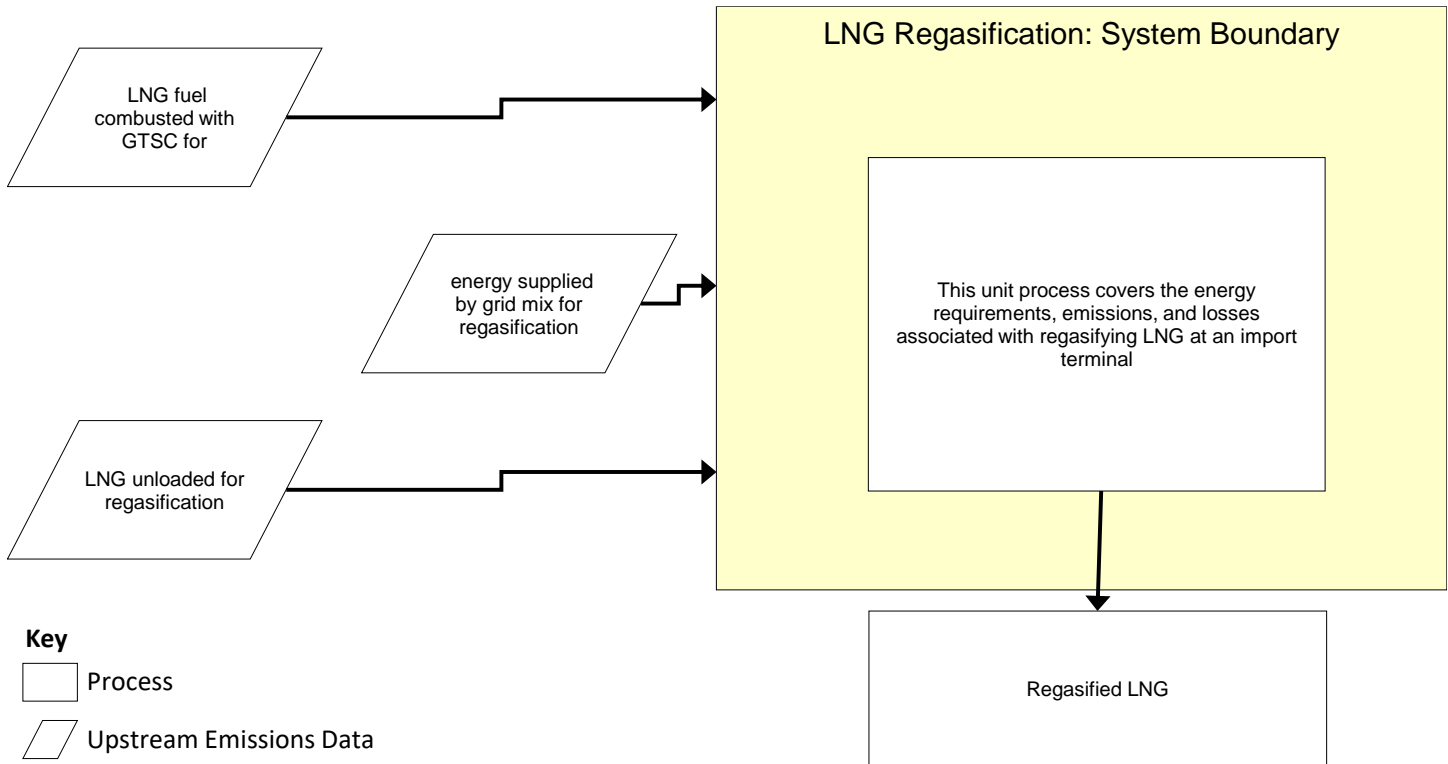
## **Goal and Scope**

This unit process provides a summary of relevant input and output flows associated with regasifying imported LNG at an import terminal located onshore in Europe or Asia. Open rack vaporizers (ORV) are the technology used. Boil-off gas (BOG) from temporary onsite storage is assumed to be re-liquefied. The reference flow of this unit process is: 1 kg of regasified LNG

## **Boundary and Description**

The regasification UP accounts for the operation of a regasification terminal located in either Europe or Asia. The UP is based on Open Rack Vaporization (ORV) technology, which is utilized in ~100% of Asian and ~60% of European regasification terminals (Agarwal et al., 2017). After unloading from the ship, the LNG is placed in temporary storage for between 1.33 and 1.60 days (EIA, 2017; IGU, 2017). The BOG generated during temporary storage is assumed to be captured and re-liquefied before being sent through the ORV. The boil-off rate (BOR) is assumed to be 0.02% of storage volume/day (Dobrota, Lalic, & Komar, 2013). The required energy for regasification can be provided by either grid mix electricity or parasitic natural gas (NG). Upon selection of parasitic NG as the energy source, the UP uses a NG turbine efficiency of ~34% for estimating the total mass of NG to be combusted for meeting the energy requirements for regasification. In ORV, the LNG is passed through a heat exchanger with sea water. Emissions results account for emissions from fugitives. Combustion emissions are accounted for in a separate combustion UP. The functional unit of this unit process is the mass of LNG that is regasified.

Figure 1: Unit Process Scope and Boundary



### Embedded Unit Processes

None.

### References

- Agarwal, R., Rainey, T., Rahman, S., Steinberg, T., Perrons, R., & Brown, R. (2017). LNG Regasification Terminals: The Role of Geography and Meteorology on Technology Choices. *Energies*, 10(12), 2152.
- Dobrota, D., Lalic, B., & Komar, I. (2013). Problem of Boil-off in LNG Supply Chain *Transactions in Maritime Science*, 2, 91-100. doi: 10.7225/toms.v02.n02.001
- EIA. (2017). U.S. liquefied natural gas exports have increased as new facilities come online. EIA Retrieved November 20, 2018, from <https://www.eia.gov/todayinenergy/detail.php?id=34032>
- IGU. (2017). *2017 World LNG Report*. IGU Website: Retrieved November 20, 2018, from [https://www.igu.org/sites/default/files/103419-World IGU Report no%20crops.pdf](https://www.igu.org/sites/default/files/103419-World%20IGU%20Report%20no%20crops.pdf)



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**Section III: Document Control Information**

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**Revision History:**

Original/no revisions

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**Section IV: Disclaimer**

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