Process Name: Combustion of Gasoline

Reference Flow: 1 kg of Gasoline

Brief Description: This unit process includes the emissions associated with the combustion of gasoline

Section I: Meta Data

Geographical Coverage: United States **Region:** N/A

Year Data Best Represents: 2012

Process Type: Energy Conversion (EC)

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	☑ Other
Releases to Water:	☐ Inorganic	☐ Organic Emissions	☐ Other
Water Usage:	☐ Water Consumption		
	☐ Water Demand (throughput)		
Releases to Soil:	☐ Inorganic Releases	☐ Organic Releases	☐ Other

Adjustable Process Parameters:

SOX	*[kg/kg gasoline] Sulfur oxides emissions per kg of combusted gasoline*
SO2	*[kg/kg gasoline] Sulfur dioxide emissions per kg of combusted gasoline*

VOC	*[kg/kg gasoline] Volatile organic compound emissions per kg of combusted gasoline*
TOC	*[kg/kg gasoline] Total organic carbon emissions per kg of combusted gasoline*
NH3	*[kg/kg gasoline] Ammonia emissions per kg of combusted gasoline*
Aldehydes	*[kg/kg gasoline] Aldehyde emissions per kg of combusted gasoline*
CO	*[kg/kg gasoline] Carbon monoxide emissions per kg of combusted gasoline*
NOX	*[kg/kg gasoline] Nitrogen oxides emissions per kg of combusted gasoline*
NO2	*[kg/kg gasoline] Nitrogen dioxide emissions per kg of combusted gasoline*
NO	*[kg/kg gasoline] Nitrogen oxide emissions per kg of combusted gasoline*
HC	*[kg/kg gasoline] Hydrocarbon emissions per kg of combusted gasoline*
PM2.5_PM10	*[kg/kg gasoline] Particulate matter between 2.5 and 10 microns emissions per kg of combusted gasoline*
PM2.5	*[kg/kg gasoline] Particulate matter less than 2.5 microns emissions per kg of combusted gasoline*

BC	*[kg/kg gasoline] Black carbon particulate matter per kg of combusted gasoline*
OC	*[kg/kg gasoline] Organic carbon particulate matter per kg of combusted gasoline*
CO2	*[kg/kg gasoline] Carbon dioxide emissions per kg of combusted gasoline*
CH4	*[kg/kg gasoline] Methane emissions per kg of combusted gasoline*
N2O	*[kg/kg gasoline] Nitrous oxide emissions per kg of combusted gasoline*

Tracked Input Flows:

Gasoline	*[Technosphere] Gasoline for combustion*

Section II: Process Description

Associated Documentation

This unit process is composed of this document and the data sheet (DS) *Stage3_Gasoline_Combustion_2014.01.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 the combustion of gasoline in several different processes. The reference flow of this unit process is: 1 kg of Gasoline

Boundary and Description

This unit process provides a summary of relevant input and output flows associated with the combustion of gasoline. There are several grouping scenarios that represent the type of engine, sector, and control. The industrial sector includes the combustion of gasoline in a reciprocating engine for producing, processing, or assembling goods; i.e. manufacturing and mining (EPA, 2014). The commercial sector includes the combustion of gasoline for nonmanufacturing business, such as private and public organizations, government activities, social groups, or institutional living quarters (EPA, 2014). The mobile source scenario in this process consists of motor vehicles; specifically a car and truck type (EPA, 2014). Non-greenhouse gas (GHG) emissions for industrial and commercial scenarios were taken from the U.S.EPA's (United States Environmental Protection Agency) WebFIRE database (EPA, 2012), while GHG emissions for these scenarios were derived from EPA's 2011 GHG Emission Factors Hub (EPA, 2011). All mobile source scenario emissions were derived from NREL's (National Renewable Energy Lab) US LCI (U.S. Life Cycle Inventory) Database (NREL, 2011a; 2011b).

Figure 1: Unit Process Scope and Boundary

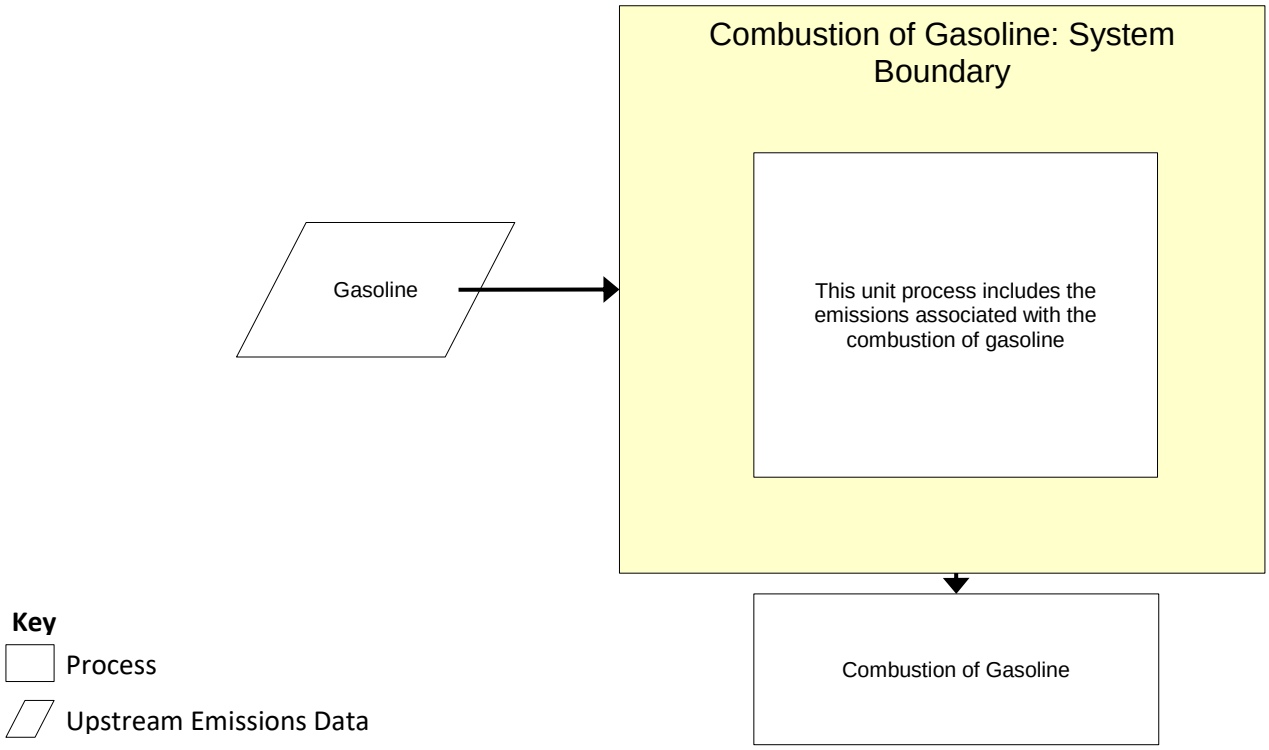

Table 1: Unit Process Input and Output Flows – Passenger Car

Flow Name	Value	Units (Per Reference Flow)
Inputs		
US: Gasoline, combusted in equipment [Flows]	**1.00**	**kg**
Outputs		
Mobile Source, Passenger Car [Refinery products]	1.00E+00	kg
Sulphur oxide [Inorganic emissions to air]	0.00E+00	kg
Sulphur dioxide [Inorganic emissions to air]	5.90E-05	kg
NMVOC (unspecified) [Group NMVOC to air]	4.78E-03	kg
TOC, Total Organic Carbon [unspecified]	0.00E+00	kg
Ammonia [Inorganic emissions to air]	3.34E-04	kg
Aldehyde (unspecified) [Group NMVOC to air]	0.00E+00	kg
Carbon monoxide [Inorganic emissions to air]	5.42E-02	kg
Nitrogen oxides [Inorganic emissions to air]	0.00E+00	kg
Nitrogen dioxide [Inorganic emissions to air]	6.87E-04	kg
Nitrogen monoxide [Inorganic emissions to air]	5.92E-03	kg
Hydrocarbons (other than methane) [Organic emissions to air]	4.65E-03	kg
Dust (PM2,5 - PM10) [Particles to air]	9.69E-06	kg
Dust (PM2.5) [Other emissions to air]	1.15E-04	kg
Black carbon [Particles to air]	2.18E-05	kg
Organic carbon [Other emissions to air]	1.87E-04	kg
Carbon dioxide [Inorganic emissions to air]	3.16E+00	kg
Methane [Organic emissions to air]	1.80E-04	kg
Nitrous oxide (laughing gas) [Inorganic emissions to air]	1.17E-04	kg

* **Bold face** clarifies that the value shown *does not* include upstream environmental flows.

Embedded Unit Processes

None.

References

EPA (2014) U.S. Energy Information Administration (2014). Definitions of EIA Distillate Categories and Fuels Contained in the Distillate Grouping. EIA. Washington, DC. http://www.eia.gov/dnav/pet/tbldefs/pet_cons_821dsta_tbldef2.asp. Last Accessed: March 25, 2014

EPA (2012) U.S. Environmental Protection Agency (2012). WebFIRE. EPA. Washington, DC. http://cfpub.epa.gov/webfire/ Last Accessed: March 23, 2014

EPA (2011)	U.S. Environmental Protection Agency (2011). Emission factors for greenhouse gas inventories. EPA. Washington, DC. http://www.epa.gov/climateleadership/inventory/ghg-emissions.html. Last Accessed: March 24, 2014
NREL (2011a)	National Renewable Energy Laboratory (2011). Transport, passenger car, gasoline powered. NREL. https://www.lcacommons.gov/nrel/process/show/859be9cd-66ab-4374-ab49-d89bc9cfdb14?qlookup=gasoline&max=35&hfacet=&hfacetCat=&loc=&year=&dtype=&crop=&index=23&numfound=51&offset=. Last Accessed: March 26, 2014
NREL (2011b)	National Renewable Energy Laboratory (2011). Transport, passenger truck, gasoline powered. NREL. https://www.lcacommons.gov/nrel/process/show/796604f8-2494-4a2a-852f-6fa717f876f4?qlookup=gasoline+passenger+truck%2C+gasoline+powered&max=35&hfacet=&hfacetCat=&loc=&year=&dtype=&crop=&index=1&numfound=46&offset=. Last Accessed: March 26, 2014

Section III: Document Control Information

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