



NETL Life Cycle Inventory Data

Process Documentation File

Process Name: Fuel Fabrication Facility, Construction
Reference Flow: 1 piece (pcs) of Fuel Fabrication Facility/ kg UO₂
Brief Description: This process encompasses the material inputs required for the construction of a representative fuel assembly fabrication facility.

Section I: Meta Data

Geographical Coverage: US **Region:** N/A
Year Data Best Represents: 1983
Process Type: Manufacturing Process (MP)
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:

Tracked Input Flows:

Aluminum [Metals]	<i>Amount of aluminum required for construction</i>
Cast iron [Metals]	<i>Amount of cast iron required for construction</i>
Concrete, ready mix, R-5-0 [Concrete_Cement]	<i>Amount of ready mix concrete required for construction</i>
Copper [Non renewable elements]	<i>Amount of copper required for the construction</i>



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Process Documentation File

Steel cold rolled (St) [Metals]

Amount of steel required for the construction

Tracked Output Flows:

Fuel Fabrication Facility [construction processes]

Construction of a fuel fabrication facility

Section II: Process Description

Associated Documentation

This unit process is composed of this document and the data sheet (DS) *DS_Stage1_C_Fuel_Fabrication_Facility_2010.01.xls*, which provides additional details regarding relevant calculations, data quality, and references.

Goal and Scope

The scope of this unit process encompasses the materials and weights of those materials necessary to construct a fuel fabrication facility, used for fabricating and assembling fuel rods for use in nuclear power plants. The process is based on the reference flow of 1 pcs of fuel fabrication facility per kg of UO_2 , as described below and shown in **Figure 1**. The facility is constructed of concrete, copper, aluminum, cast iron, and steel. All other materials are considered negligible.

Boundary and Description

Figure 1 provides an overview of the boundary of this unit process, which quantifies the amount of raw materials needed for the construction of the fuel fabrication facility. The energy requirements and emissions (such as diesel combustion or fugitive dust emissions from construction equipment) for installation of facility components on site are not considered in this unit process. The upstream emission from the production of the raw materials used for the construction of the fuel fabrication facility (e.g., steel and concrete) are calculated outside the boundary of this unit process, based on proprietary profiles available within the GaBi model.

Construction of the fuel fabrication facility is based on material list provided in the "Energy Technology Characterizations Handbook" (ETCH 1983). Masses for a selection of materials were quantified for construction: concrete, copper, aluminum, cast iron, and steel. While it is known that other materials would likely be used in construction of the facility, the completeness of this data is considered sufficient, given that this unit process has a low level of significance

in the life cycle emissions of nuclear power (as determined by life cycle screening of relative greenhouse gas emissions, for all unit processes).

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 sheet. All materials are calculated based on the number of kilograms of UO_2 fuel assemblies produced during the lifetime of the facility.

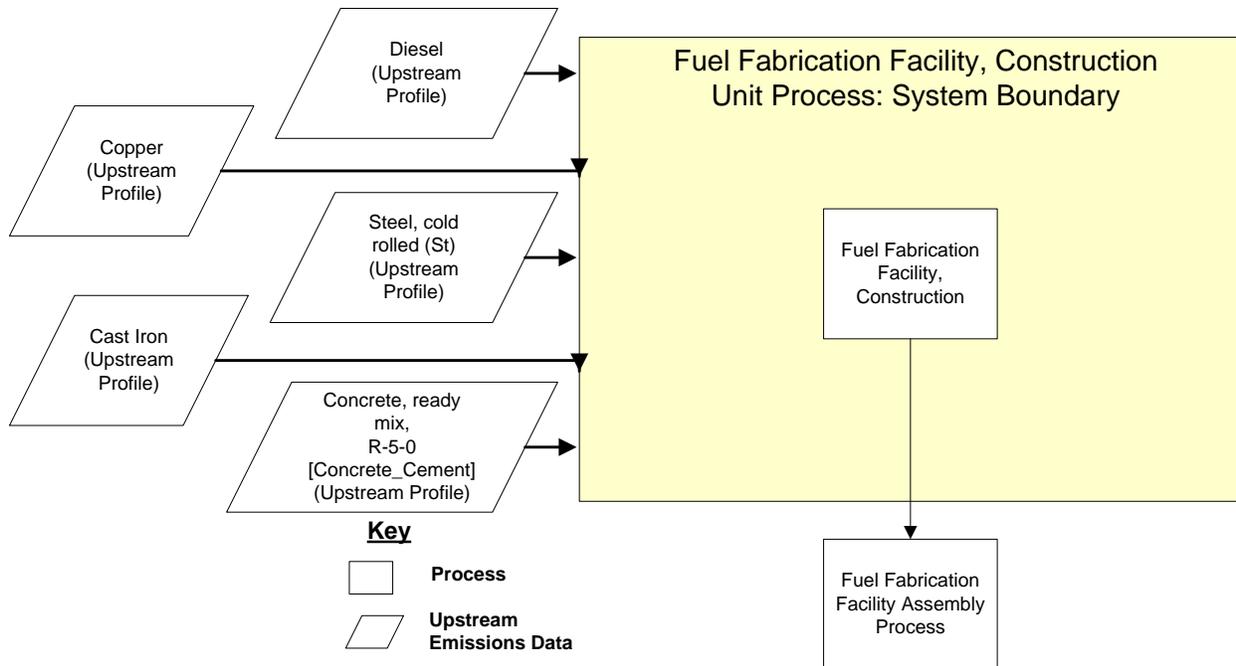


Figure 1. Unit Process Scope and Boundary

Table 1: Unit Process Input and Output Flows

Flow Name	Value	Units (Per Reference Flow)
Inputs		
Aluminum [Metals]	4.44E-02	kg/kg UO ₂
Cast iron [Metals]	2.83E-02	kg/kg UO ₂
Concrete, ready mix, R-5-0 [Concrete_Cement]	1.39E+01	kg/kg UO ₂
Copper [Non renewable elements]	1.62E-01	kg/kg UO ₂
Steel cold rolled (St) [Metals]	1.41E-03	kg/kg UO ₂
Outputs		
Fuel Assembly Facility/kg UO ₂ [Construction]	1	pcs/kg UO ₂

* **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

ETCH 1983 The Aerospace Corporation and Mueller Associates, Inc. 1983. Energy Technology Characterizations Handbook. Department of Energy. Washington, D.C.

Section III: Document Control Information

Date Created: October 28, 2010

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