



# NETL Life Cycle Inventory Data

## Process Documentation File

**Process Name:** Electricity Distribution (Primary)  
**Reference Flow:** 1 MWh of Electricity delivered  
**Brief Description:** Distribution losses for electricity to industrial users

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### Section I: Meta Data

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**Geographical Coverage:** United States      **Region:** National  
**Year Data Best Represents:** 2013  
**Process Type:** Transport Process (TP)  
**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:**

Loss      *[dimensionless] Loss rate during electricity distribution*

**Tracked Input Flows:**

Electricity      *[Technosphere] Electricity from transmission*

**Tracked Output Flows:**

Electricity delivered

*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\_Stage4\_O\_Electricity\_Distribution\_Primary\_2013.01.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 distribution of electricity to industrial consumers. The reference flow of this unit process is 1 MWh of electricity delivered.

**Boundary and Description**

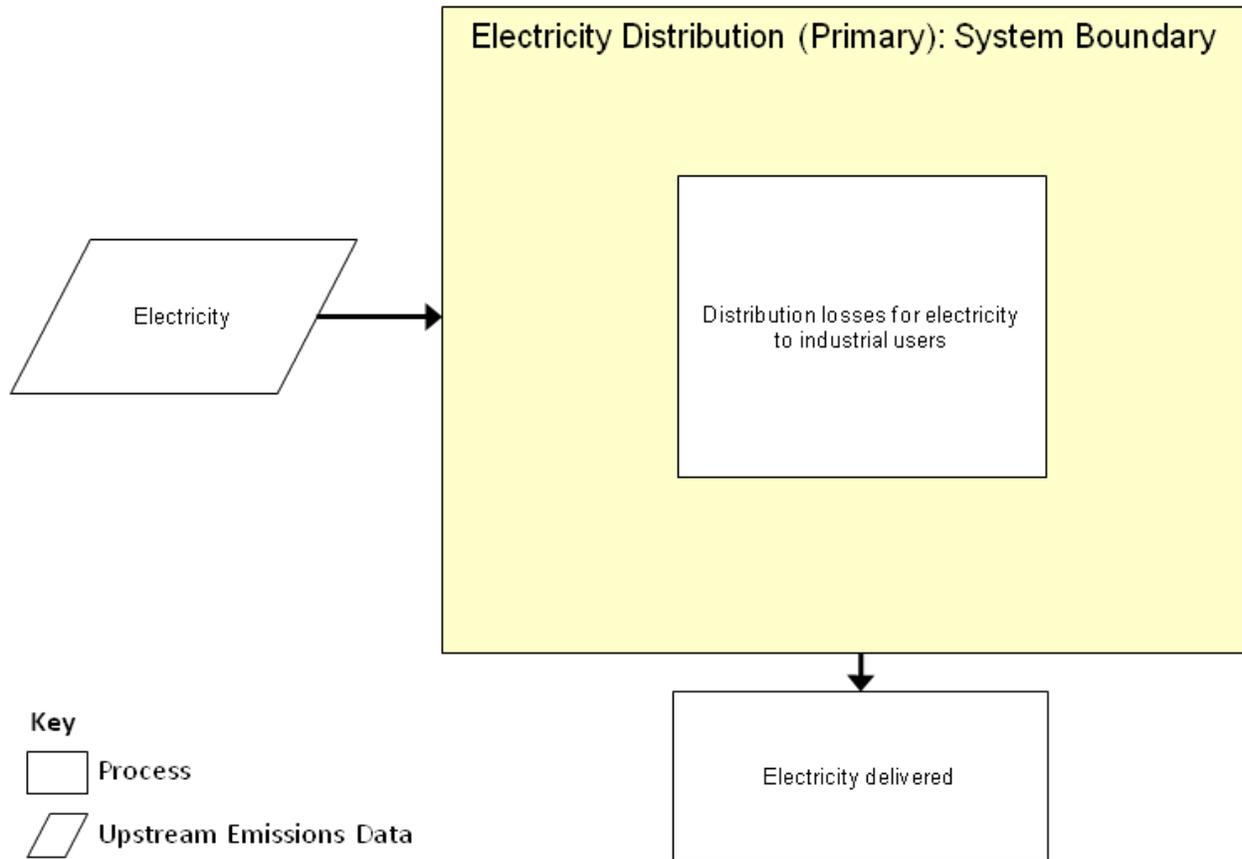
The input to this unit process is electricity from a transmission network, and the output from this process is electricity that has been through a primary distribution network. Primary distribution transports electricity from transmission to industrial users. There is a loss of electricity during distribution. The output of this unit process is electricity delivered to an industrial consumer.

The main characteristics that distinguish transmission lines from distribution lines are that they are operated at high (115 kV, 138 kV, 161 kV and 230 kV) and extra-high (345 kV, 500 kV and 765 kV) voltages (AEP, 2012a), they have a network configuration with more than one electrical path between any two points in the system and they transmit large quantities of power (the capacity of transmission line can be between 50 MVA and 2,000 MVA) over longer distances. Distribution lines are operated at medium (1.1 kV up to 69 kV) and low voltages (120 V up to 480 V), they mostly have a radial configuration with a single electrical path between any two points in the system and they transmit smaller quantities of power (from 5 kVA to 30 MVA) over shorter distances. For a given amount of power, a higher voltage reduces the load current and thus the energy lost since the energy lost is proportional to the square of the load current.

This unit process accounts only for electricity losses during primary distribution. Publicly available loss factors were converted to losses and used to develop a 25-75 confidence range for energy losses at primary distribution levels. There are limited sources for the distribution loss factors data because the utilities are not obligated to make the

distribution loss factor data publicly available. The distribution systems are used to serve demand inside the states and are not under FERC jurisdiction. Data sources for the primary and secondary distribution losses are the actual hourly distribution loss factors used in the Electric Reliability Council of Texas (ERCOT) settlement process and the actual hourly distribution loss factors calculated by San Diego Gas and Electric (San Diego Gas and Electric, 2012). ERCOT data include AEP Texas Central Company, AEP Texas North Company, and Texas-New Mexico Power Company (ERCOT, 2013)

Figure 1: Unit Process Scope and Boundary



**Table 1: Analysis of Electricity Distribution (Primary) Losses**

| <b>Property</b>     | <b>Value</b> |
|---------------------|--------------|
| Average             | 1.70%        |
| Maximum             | 3.38%        |
| Third Quartile (Q3) | 2.62%        |
| First Quartile (Q1) | 1.09%        |
| Minimum             | 1.06%        |

**Table 2: Unit Process Input and Output Flows**

| Flow Name             | Value  | Units (Per Reference Flow) |
|-----------------------|--------|----------------------------|
| <b>Inputs</b>         |        |                            |
| Electricity           | 1.0173 | MWh                        |
| <b>Outputs</b>        |        |                            |
| Electricity delivered | 1.00   | MWh                        |

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

**Embedded Unit Processes**

None.

**References**

ERCOT, 2013.

Hourly actual distribution loss factor: January–February, 2013. Accessed at [http://ercot.com/mktinfo/data\\_agg/index](http://ercot.com/mktinfo/data_agg/index) on March 11, 2013.

San Diego Gas and Electric, 2012. Hourly distribution loss factor: January 2012–March 2013. Accessed at <http://www.sdge.com/customer-choice/customer-choice/distribution-loss-factors> on March 15, 2013.



**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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