



NETL Life Cycle Inventory Data

Process Documentation File

Process Name: Electricity Distribution (Secondary)
Reference Flow: 1 MWh of Electricity delivered
Brief Description: Distribution losses for electricity to commercial or residential consumers

Section I: Meta Data

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

Section II: Process Description

Associated Documentation

This unit process is composed of this document and the data sheet (DS) *DS_Stage4_O_Electricity_Distribution_Secondary_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 commercial or residential 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 secondary distribution network. Secondary distribution transports electricity from transmission to commercial or residential consumers. There is a loss of electricity during distribution. The output of this unit process is electricity delivered to a commercial or residential 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 secondary distribution. Publicly available loss factors were converted to losses and used to develop a 25-75

confidence range for energy losses at secondary 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

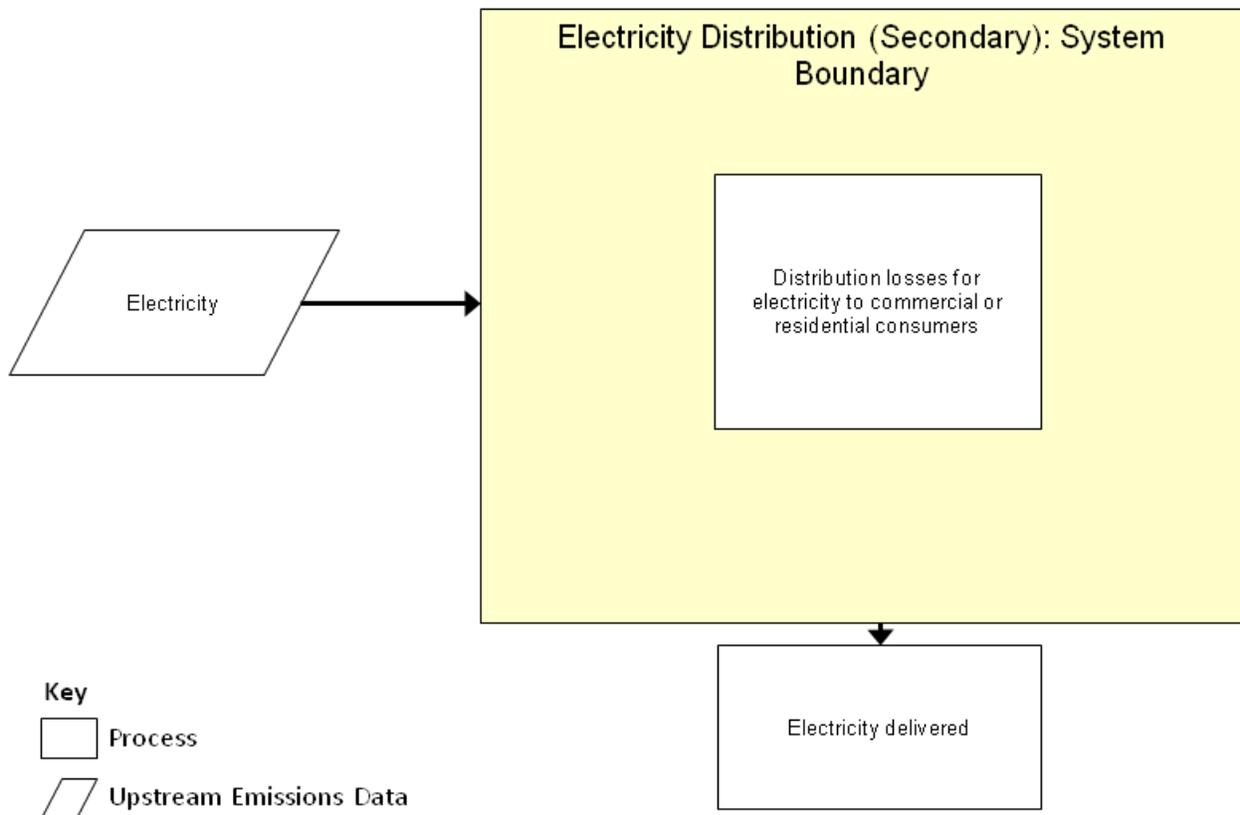


Table 1: Analysis of Electricity Distribution (Secondary) Losses

Property	Value
Average	5.56%
Maximum	8.55%
Third Quartile (Q3)	6.06%
First Quartile (Q1)	4.68%
Minimum	3.89%

Table 2: Unit Process Input and Output Flows

Flow Name	Value	Units (Per Reference Flow)
Inputs		
Electricity	1.0589	MWh
Outputs		
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 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

Date Created: April 17, 2013

Point of Contact: Timothy Skone (NETL), Timothy.Skone@NETL.DOE.GOV

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