Section 6. Electricity

This section describes the energy sources consumed by the electric power sector; electricity consumed by end users (i.e., electricity sold to end users); estimates of the electrical system energy losses incurred in the generation, transmission, and distribution of electricity; and estimates of net interstate sales of electricity.

The electric power sector consists of electric utilities and independent power producers (electricity-only and combined-heat-and-power (CHP) plants) classified under Sector 22 of the North American Industry Classification System whose primary business is to sell electricity, or electricity and heat, to the public. It does not include commercial or industrial electricity-only or CHP plants that produce electricity and/or heat primarily to support the activities of the commercial or industrial establishments.

Electrical Energy Sources

Physical units

Electricity is produced from a number of energy sources. In the State Energy Data System (SEDS), coal, natural gas, and petroleum are measured in physical units of thousand short tons, million cubic feet, and thousand barrels, respectively, as they are consumed by the electric power sector. Since wood and waste are measured in a variety of physical units, they are converted to the equivalent heat content and entered into SEDS measured in British thermal units (Btu). Because comparable measures in physical units for nuclear power, hydroelectric, wood, waste, geothermal, wind, photovoltaic, and solar thermal energy sources are not available, energy output in the form of electricity produced from these energy sources, in million kilowatthours, is used instead. The variable names for these data are as follows ("ZZ" in the variable name represents the two-letter state code that differs for each state):

CLEIPZZ   =   coal consumed by the electric power sector (described in Section 2 of this report), in thousand short tons;

ELEXPZZ   =   electricity exported from the United States, in million kilowatthours;

ELIMPZZ   =   electricity imported into the United States, in million kilowatthours;

GEEGPZZ   =   electricity produced from geothermal energy by the electric power sector (described in Section 5), in million kilowatthours;

HYEGPZZ   =   electricity produced from hydroelectric power in the electric power sector (described in Section 5), in million kilowatthours;

NGEIPZZ   =   natural gas consumed by the electric power sector (described in Section 3), in million cubic feet;

NUEGPZZ   =   electricity produced from nuclear power in the electric power sector, in million kilowatthours;

PAEIPZZ   =   petroleum consumed by the electric power sector (described in Section 4), in thousand barrels;

SOEGPZZ   =   electricity produced from photovoltaic and solar thermal energy sources in the electric power sector (described in Section 5), in million kilowatthours;

WDEIBZZ   =   wood energy sources consumed by the electric power sector (described in Section 5), in billion Btu;

WSEIBZZ   =   waste energy sources consumed by the electric power sector (described in Section 5), in billion Btu; and

WYEGPZZ   =   electricity produced from wind energy by the electric power sector (described in Section 5), in million kilowatthours.

The U.S. totals for these series are calculated as the sum of the state data.

British thermal units (Btu)

In order to total all the energy that is used to produce electricity, the energy sources are converted to the common unit of Btu. The methods for calculating the Btu content of coal, natural gas, petroleum, and renewable energy sources consumed for generating electric power are explained in their respective sections of this documentation. Nuclear electric power is described in the following section.

Total energy consumed by the electric power sector is the sum of all primary energy used to generate electricity, including net imports of electricity across U.S. borders (ELNIBZZ, see page 113). To eliminate the double counting of supplemental gaseous fuels, which are accounted for in the energy sources

(such as coal) from which they are derived, and in natural gas, they are removed from the total:

TEEIBZZ = CLEIBZZ + NGEIBZZ + PAEIBZZ + NUEGBZZ + GEEGBZZ + HYEGBZZ + SOEGBZZ + WWEIBZZ + WYEGBZZ + ELNIBZZ - SFEIBZZ

TEEIBUS = ΣTEEIBZZ

Nuclear Electric Power

Electricity generated from nuclear power, in million kilowatthours, by both regulated electric utilities and independent power producers are included in the State Energy Data System (SEDS) electric power sector. In the following formulas, "ZZ" in the variable name represents the two-letter state code that differs for each state:

NUEGPZZ = nuclear electricity net generation in the electric power sector, in million kilowatthours.

The U.S. total is calculated as the sum of the state data:

NUEGPUS = ΣNUEGPZZ

Nuclear power used for generating electricity is the total nuclear energy, NUETP, included in EIA consumption data:

NUETPZZ = NUEGPZZ
NUETPUS = NUEGPUS

The factor for converting electricity generated from nuclear energy (NUETKUS) from kilowatthours to British thermal units (Btu) is developed from data collected from nuclear steam-electric power plants. These U.S. average factors, which vary from year to year, can be found in Appendix B, Table B1, http://www.eia.gov/state/seds/seds-technical-notes-complete.cfm.

NUETKUS = factor for converting electricity generated from nuclear power from kilowatthours to Btu.

The formulas for applying the nuclear factor are:

NUEGBZZ = NUEGPZZ * NUETKUS
NUEGBUS = ΣNUEGBZZ
NUETBZZ = NUEGBZZ
NUETBUS = NUEGBUS

Data sources

NUEGPZZ — Nuclear electricity net generation in the electric power sector by state.

- 1960 through 1977: Federal Power Commission, News Release, "Power Production, Fuel Consumption, and Installed Capacity Data," table titled "Net Generation of Electric Utilities by State and Source."
- 1978 through 1980: U.S. Energy Information Administration (EIA),

Energy Data Reports, "Power Production, Fuel Consumption and Installed Capacity Data," table titled "Net Generation of Electric Utilities by State and Source" (1978) and Table 36 (1979 and 1980).

- 1981 through 1985: EIA, Form EIA-759, "Monthly Power Plant Report," and predecessor forms. Data are published in the EIA, *Electric Power Annual 1985*, Table 6.
- 1986 forward: EIA, Form EIA-923, "Power Plant Operations Report," and predecessor forms, http://www.eia.gov/electricity/data/eia923/index.html.

NUETKUS — Factor for converting electricity produced from nuclear power from physical units to Btu.

- 1960 through 1984: Calculated annually by the EIA by dividing the total heat content consumed in reactors at nuclear plants by the total (net) electricity generated by nuclear plants. The heat content and electricity generation are reported on FERC Form 1, "Annual Report of Major Electric Utilities, Licensees, and Others" and Form EIA-412, "Annual Report of Public Electric Utilities," and predecessor forms. The factors for 1982 through 1984 are published in the following:
  – 1982: EIA, *Historical Plant Cost and Annual Production Expenses for Selected Electric Plants 1982*, page 215.
  – 1983 and 1984: EIA, *Electric Plant Cost and Power Production Expenses 1991*, Table 13.
- 1985 forward: Calculated annually by EIA using the heat rate reported on Form EIA-860, "Annual Electric Generator Report" (and predecessor forms), and the generation reported on Form EIA-923, "Power Plant Operations Report" (and predecessor forms). Also available in Table A6 of the EIA, *Monthly Energy Review*, http://www.eia.gov/totalenergy/data/monthly/index.cfm.

Electricity Imports and Exports

Electricity transmitted across U.S. borders with Canada and Mexico are included in the State Energy Data System (SEDS) electric power sector.

ELEXPZZ = electricity exported from the United States by state, in million kilowatthours; and

ELIMPZZ = electricity imported into the United States by state, in million kilowatthours.

U.S. totals are calculated as the sum of the state data:

ELIMPUS = ΣELIMPZZ
ELEXPUS = ΣELEXPZZ

Net imports are derived by subtracting exports of electricity from imports:

ELNIPZZ = ELIMPZZ - ELEXPZZ
ELNIPUS = ΣELNIPZZ

Imports and exports of electricity in million kilowatthours are converted to billion Btu by multiplying the physical unit data by the conversion factor of 3.412 thousand Btu per kilowatthour.

ELIMBZZ = ELIMPZZ * 3.412
ELIMBUS = ΣELIMBZZ
ELEXBZZ = ELEXPZZ * 3.412
ELEXBUS = ΣELEXBZZ

ELNIBZZ = ELIMBZZ - ELEXBZZ
ELNIBUS = ΣELNIBZZ

Data sources

ELEXPZZ — Electricity exported from the United States (assumed to be produced by hydroelectric power through 1988) by state.

- 1960 through 1981: Economic Regulatory Administration, *Staff Reports*, "Report on Electric Energy Exchanges with Canada and Mexico." Source data are arranged by the Regional Reliability Council Areas and then by the electric utility. State data were tabulated by aggregating the data of all electric utilities within each state.
- 1982 and 1983: U.S. Energy Information Administration (EIA) state estimates are based on data from Economic Regulatory Administration Form ERA-781R, "Annual Report of Electrical Export/Import Data." State estimates are consistent with national and regional totals

published in the ERA, *Electricity Exchanges Across International Borders*.

- 1984 through 1987: EIA state estimates are based on data from Economic Regulatory Administration Form ERA-781R, "Annual Report of Electrical Export/Import Data," the Federal Energy Regulatory Commission Form 1, and the Bonneville Power Administration Annual Report. State estimates are consistent with national and regional totals published in the ERA, *Electricity Transactions Across International Borders*.
- 1988 forward: EIA state estimates are based on data from National Energy Board of Canada; FERC 714, "Annual Electric Balancing Authority Area and Planning Report;" California Energy Commission; and EIA retail sales data.

ELIMPZZ — Electricity imported into the United States (assumed to be produced by hydroelectric power through 1988) by state.

- 1960 through 1981: Economic Regulatory Administration, *Staff Reports*, "Report on Electric Energy Exchanges with Canada and Mexico." Source data are arranged by the Regional Reliability Council Areas and then by the electric utility. State data were tabulated by aggregating the data of all electric utilities within each state.
- 1982 and 1983: EIA state estimates are based on data from Economic Regulatory Administration Form ERA-781R, "Annual Report of Electrical Export/Import Data." State estimates are consistent with national and regional totals published in the ERA, *Electricity Exchanges Across International Borders*.
- 1984 through 1987: EIA state estimates are based on data from Economic Regulatory Administration Form ERA-781R, "Annual Report of Electrical Export/Import Data," the Federal Energy Regulatory Commission Form 1, and the Bonneville Power Administration Annual Report. State estimates are consistent with national and regional totals published in the ERA, *Electricity Transactions Across International Borders*.
- 1988 forward: EIA state estimates are based on data from National Energy Board of Canada; FERC 714, "Annual Electric Balancing Authority Area and Planning Report;" California Energy Commission; and EIA retail sales data.

Electricity Consumed by the End-Use Sectors

Physical units

The amount of electricity sold to end users is considered to be the amount of electricity consumed by the end-use sectors. Four electricity sales data series, in physical units of million kilowatthours, available in the U.S. Energy Information Administration (EIA) *Electric Power Annual* and electric power sales and revenues database, are used. The variable names for these data are as follows ("ZZ" in the variable name represents the two-letter state code that differs for each state):

ESRCPZZ	=	electricity sold to the residential sector;
ESCMPZZ	=	electricity sold to the commercial sector;
ESICPZZ	=	electricity sold to the industrial sector; and
ESACPZZ	=	electricity sold to the transportation sector (2003 forward);

Beginning in 2003, electricity consumed by the commercial sector is considered to be the electricity sold to the commercial sector:

ESCCPZZ   =   ESCMPZZ

Prior to 2003, there was no data series for the transportation sector, and the coverage of the commercial sector was smaller in scope. Another data series, electricity sold to the "Other" users, reported in the database, was used:

ESOTPZZ   =   electricity sold to "Other" users (including public street and highway lighting, other public authorities, railroads and railways, and interdepartmental sales).

To estimate electricity consumed by the transportation sector before 2003, electricity consumed by transit systems from the U.S. Department of Transportation, Federal Transit Administration, was used:

ESTRPZZ   =   electricity consumed by transit systems.

Consumption of electricity for the transportation and commercial sectors for 1960 through 2002 is defined as follows:

ESACPZZ   =   ESTRPZZ
ESCCPZZ   =   ESCMPZZ + (ESOTPZZ- ESTRPZZ)

For all years, total electricity consumed, represented by ESTCPZZ, is calculated by adding the four end-use sector estimates:

$$ESTCPZZ = ESRCPZZ + ESCCPZZ + ESICPZZ + ESACPZZ$$

U.S. totals are calculated as the sum of the state data.

British thermal units (Btu)

Electricity consumption estimates are converted into Btu by applying a constant factor of 3.412 thousand Btu per kilowatthour as illustrated in the formulas:

$$ESRCBZZ = ESRCPZZ * 3.412$$
$$ESTCBZZ = ESTCPZZ * 3.412$$

U.S. totals for the Btu series are calculated as the sum of the state data.

Additional calculations

Beginning in 2003, electricity sold for transportation use is available from the EIA electric power sales and revenues database. For years prior to 2003, additional calculations are performed in the State Energy Data System (SEDS) to provide data for the EIA *Monthly Energy Review* and *Annual Energy Review* to use in estimating transportation electricity use. The share of electricity sold to the "Other" category of consumers that is used for transportation is calculated:

$$ESTRSUS = ESTRPUS / ESOTPUS$$

Additional notes on electricity sales

1. Beginning in 2003, the source for electricity consumed by the transportation sector is the EIA Form EIA-861, "Annual Electric Power Industry Report." This is the first year that electricity sales data are collected separately for the transportation sector (previously these volumes were included in Commercial and "Other"). In 2003, information from the U.S. Department of Transportation, National Transit Database, http://www.ntdprogram.gov/ntdprogram/data.htm, is used to supplement the EIA data for three states with missing or incomplete volumes: Missouri, Ohio, and Tennessee.

2. The source for the electricity sales data for 1960 through 1983 is the EIA Form EIA-826, "Electric Utility Company Monthly Statement," and predecessor forms. Electricity sales data for 1984 forward are from Form EIA-861, "Annual Electric Utility Report." At the national level, data from both forms correspond closely (within 3%) for all end-use sectors. However, differences in the number of survey respondents and the reporting of commercial and industrial sales caused inconsistencies

between 1983 and 1984 data in those end-use sectors for some states. See EIA *Electric Power Annual, 1991,* DOE/EIA-0348(91), p. 130, and *An Assessment of the Quality of Selected EIA Data Series, Electric Power Data,* DOE/EIA-0292(87), pp. 17-28, for detailed discussions of the reporting differences.

3. For 1960 through 1983, electricity sales data for the District of Columbia and Maryland are combined on the survey forms. Estimates of separate sales for the District of Columbia and Maryland were created by using electricity sales data by end-use sector by communities from the FERC Form 1, "Annual Report of Major Electric Utilities, Licensees, and Others," filed by the Potomac Electric Power Company (PEPCO). PEPCO sales to the District of Columbia were assumed to be total electricity sales in the District of Columbia. Electricity sales to the District of Columbia reported by PEPCO on the FERC Form 1 were subtracted from the EIA-826 District of Columbia and Maryland aggregate figures to obtain estimates of Maryland electricity sales by sector. Beginning with 1981 data, electric utilities were no longer required to report sales to specific communities. Sales data for the District of Columbia for 1981 through 1983 were obtained directly from PEPCO's accounting department.

Data sources

ESACPZZ — Electricity sold to (consumed by) the transportation sector by state.

- 1960 through 2002: Equal to ESTRPZZ.
- 2003 forward: EIA, "Retail Sales of Electricity by State by Sector by Provider (EIA-861)" spreadsheet at http://www.eia.gov/electricity/data/state/, sector name "Total Electric Industry," column "Transportation Sales."

ESCMPZZ — Electricity sold to (consumed by) the commercial sector by state.

Note: Data for Maryland and the District of Columbia were combined for 1960 through 1983. The method for disaggregating the data is explained in Additional Note 3 on this page.

- 1960 through 1975: Federal Power Commission, *Electric Power Statistics*, "Sales of Electric Energy to Ultimate Consumers."
- 1976 through 1980: EIA, *Electric Power Annual* (November 1982), Table 125.
- 1981 through 1983: EIA, Form EIA-826, "Electric Utility Company Monthly Statement," and predecessor forms. Published data rounded

to gigawatthours in EIA, *Electric Power Annual 1983*, Table 51.

- 1984 through 1986: EIA, Form EIA-861, "Annual Electric Utility Report." Unpublished data.
- 1987: EIA, Form EIA-861, "Annual Electric Utility Report." Published in the EIA, *Electric Power Annual 1988,* Table 19.
- 1988 and 1989: EIA, Form EIA-861, "Annual Electric Utility Report." Published in the EIA, *Electric Power Annual,* Table 27.
- 1990 forward: EIA, "Retail Sales of Electricity by State by Sector by Provider (EIA-861)" spreadsheet at http://www.eia.gov/electricity/data/state/, sector name "Total Electric Industry," column "Commercial Sales."

ESICPZZ — Electricity sold to (consumed by) the industrial sector by state. Note: Data for Maryland and the District of Columbia were combined for 1960 through 1983. The method for disaggregating the data is explained in Additional Note 3 on page 115.

- 1960 through 1975: Federal Power Commission, Electric Power Statistics, "Sales of Electric Energy to Ultimate Consumers."
- 1976 through 1980: EIA, *Electric Power Annual* (November 1982), Table 126.
- 1981 through 1983: EIA, Form EIA-826, "Electric Utility Company Monthly Statement," and predecessor forms. Published data rounded to gigawatthours in EIA, *Electric Power Annual 1983*, Table 51.
- 1984 through 1986: EIA, Form EIA-861, "Annual Electric Utility Report." Unpublished data.
- 1987: EIA, Form EIA-861, "Annual Electric Utility Report." Published in the EIA, *Electric Power Annual 1988*, Table 19.
- 1988 and 1989: EIA, Form EIA-861, "Annual Electric Utility Report." Published in the EIA, *Electric Power Annual,* Table 27.
- 1990 forward: EIA, "Retail Sales of Electricity by State by Sector by Provider (EIA-861)" spreadsheet at http://www.eia.gov/electricity/data/state/, sector name "Total Electric Industry," column "Industrial Sales."

ESOTPZZ — Electricity sold to (consumed by) the "Other" sector (i.e., public street and highway lighting, sales to other public authorities, railroads and railways, and interdepartmental sales) by state.

Note: Data for Maryland and the District of Columbia were combined for 1960 through 1983. The method for disaggregating the data is explained in

Additional Note 3 on page 115.

- 1960 through 1975: Federal Power Commission, *Electric Power Statistics*, "Sales of Electric Energy to Ultimate Consumers."
- 1976 through 1980: EIA, *Electric Power Annual* (November 1982), Table 127.
- 1981 through 1983: EIA, Form EIA-826, "Electric Utility Company Monthly Statement," and predecessor forms. Published data rounded to gigawatthours in EIA, *Electric Power Annual 1983*, Table 51.
- 1984 through 1986: EIA, Form EIA-861, "Annual Electric Utility Report." Unpublished data.
- 1987: EIA, Form EIA-861, "Annual Electric Utility Report." Published in the EIA, *Electric Power Annual 1988*, Table 19.
- 1988 and 1989: EIA, Form EIA-861, "Annual Electric Utility Report." Published in the EIA, *Electric Power Annual,* Table 27.
- 1990 through 2002: EIA, "Retail Sales of Electricity by State by Sector by Provider (EIA-861)" spreadsheet at http://www.eia.gov/electricity/data/state/, sector name "Total Electric Industry," column "Other Sales."
- 2003 forward: Series discontinued. Values are zero.

ESRCPZZ — Electricity sold to (consumed by) the residential sector by state.

Note: Data for Maryland and the District of Columbia were combined for 1960 through 1983. The method for disaggregating the data is explained in Additional Note 3 on page 115.

- 1960 through 1975: Federal Power Commission, *Electric Power Statistics*, "Sales of Electric Energy to Ultimate Consumers."
- 1976 through 1980: EIA, *Electric Power Annual* (November 1982), Table 124.
- 1981 through 1983: EIA, Form EIA-826, "Electric Utility Company Monthly Statement," and predecessor forms. Published data rounded to gigawatthours in EIA, *Electric Power Annual 1983*, Table 51.
- 1984 through 1986: EIA, Form EIA-861, "Annual Electric Utility Report." Unpublished data.
- 1987: EIA, Form EIA-861, "Annual Electric Utility Report." Published in the EIA, *Electric Power Annual 1988*, Table 19.
- 1988 and 1989: EIA, Form EIA-861, "Annual Electric Utility Report." Published in the EIA, *Electric Power Annual,* Table 27.
- 1990 forward: EIA, "Retail Sales of Electricity by State by Sector by Provider (EIA-861)" spreadsheet at http://www.eia.gov/electricity/

data/state/, sector name "Total Electric Industry," column "Residential Sales."

ESTRPZZ — Electricity consumed by transit systems by state.

Notes: The transit system data include electricity used to operate commuter rail, rapid rail, streetcars or light rail, cable cars, trolley-buses, motorbuses, automated guideways, inclined plane railways, and aerial tramways. These data do not include electricity used by Amtrak. These data are available on a fiscal year basis (July 1 through June 30) for 1979 through 1982 and for calendar years 1983 forward. Some data for 1979 through 1983 were adjusted by EIA on the basis of an analysis of historical trends. Electricity consumption for the District of Columbia for 1976 through 2002 is partially apportioned to Maryland and Virginia on the basis of electricity consumption data from the Washington Metropolitan Area Transit Authority.

- 1960 through 1978: EIA estimates are based on data from:
  – The American Public Transit Association (formerly the American Transit Association) annual operating reports.
  – Pushkarev, Boris S. and others, Urban Rail in America. (Bloomington, IN: Indiana University Press, 1982.)
  – U.S. Department of Transportation, *A Directory of Regularly Scheduled, Fixed Route, Local Public Transportation Service in Urbanized Areas Over 50,000 Population*, 1980 and 1981.
- 1979 through 1989: U.S. Department of Transportation, Urban Mass Transportation Administration, *National Urban Mass Transportation Statistics, Section 15 Annual Report*, table titled "Energy Consumption: Details by Transit System."
  – 1979 and 1980: Table 2.13.1.
  – 1981 and 1982: Table 3.13.1.
  – 1983 through 1989: Table 3.12.
- 1990 through 2002: U.S. Department of Transportation, Federal Transit Administration, *Data Tables for the Section 15 Report Year*, http://www.ntdprogram.gov/ntdprogram/data.htm:
  – 1990: Table 2.12.
  – 1991: Table 13.
  – 1992 through 1997: Table 15.
  – 1998: Table 16.
  – 1999 through 2002: Table 17.
- 2003 forward: Series replaced by ESACPZZ. Values are zero.

Electrical System Energy Losses and Net Interstate Flow of Electricity

Electrical system energy losses, identified by "LO" in SEDS, include all losses incurred in the generation, transmission, and distribution of electricity, including plant use and unaccounted-for quantities. At the national level, total losses, LOTCBUS, is defined as the difference between the heat content of all energy consumed by the electric power sector (TEEIBUS) and the heat content of retail electricity sold to the end-use sectors (ESTCBUS). Total losses for the United States are calculated in billion Btu as follows:

$$\text{LOTCBUS} = \text{TEEIBUS} - \text{ESTCBUS}$$

At the state level, however, this calculation does not yield losses because electricity can flow from one state to another. If information on bilateral flow of electricity across state lines is available, a detailed account of the electricity flowing between states and the corresponding energy losses can be compiled. However, EIA's surveys do not capture such information, and some assumptions have to be made in the estimation of energy losses and interstate electricity flow.

In the late 2000s, EIA's State Electricity Profiles introduced a new table on the supply and disposition of electricity in kilowatthours for each state. Net interstate trade is computed as the state's total electricity supply less all within-state electricity disposition (i.e., retail sales, direct use, international exports, and estimated losses). Estimates are available for 1990 forward.

This new series of net interstate trade was incorporated into SEDS in the 2010 data cycle. As a result, the method of estimating state-level electrical system energy losses from 1990 forward was revised. Prior to 1990, the old method of first estimating electrical system energy losses and then deriving net interstate electricity flow continues to be used (see "1960 through 1989" below).

1990 forward

Net interstate trade of electricity for each state is available in EIA's State Electricity Profiles. The series is multiplied by -1 to convert to SEDS net interstate flow electricity:

$$\text{ELISPZZ} = \text{net interstate flow of electricity for each state, ZZ, in million kilowatthours.}$$

A positive value indicates net inflow of electricity, and a negative value indicates net outflow. The sum of net interstate flow for all states, ELISPUS,

is zero.

To estimate the Btu value of net interstate flow (including attributed energy losses), ELISBZZ, states with net electricity outflow (i.e. negative ELISPZZ) and states with net electricity inflow (i.e. positive ELISPZZ) are identified. For states with net electricity outflow, the average heat content of the outflow is assumed to be the same as the average heat content of the energy used to produce electricity for in-state use. That is, total energy consumed by the electric power sector, TEEIBZZ, is allocated to in-state retail sales and outflow according to their physical unit shares:

ELISBZZ   =   - (TEEIBZZ * (|ELISPZZ| / (|ELISPZZ| + ESTCPZZ)))
for states with net electricity outflow

An annual average outflow Btu-to-kilowatthour ratio is derived by dividing the sum of ELISBZZ for all states with net electricity outflow by the sum of their ELISPZZ. This ratio is used to estimate the Btu value of net inflow of electricity:

ELISBZZ   =   ELISPZZ * (Average outflow Btu-to-kilowatthour ratio)
for states with net electricity inflow

Total energy used to generate the electricity consumed in the state, TEESBZZ, is computed by removing the outflow energy (for the states with net outflow) or adding the inflow energy (for the states with net inflow) from/to the total energy consumed by the electric power sector in the state. Since ELISBZZ is negative for the net outflow states, there is only one formula:

TEESBZZ   =   TEEIBZZ + ELISBZZ

Since the sum of net interstate flow is zero, TEESBUS, the sum of TEESBZZ, equals TEEIBUS.

Electrical system energy losses, LOTCBZZ, are defined as the total energy used to generate the electricity consumed in the state less the heat content of the retail sales of electricity:

LOTCBZZ   =   TEESBZZ - ESTCBZZ

By definition, the sum of LOTCBZZ equals LOTCBUS.

Electrical system energy losses are then allocated to the four end-use sectors according to the sales shares:

LORCBZZ   =   LOTCBZZ * (ESRCBZZ / ESTCBZZ)
LOCCBZZ   =   LOTCBZZ * (ESCCBZZ / ESTCBZZ)
LOICBZZ   =   LOTCBZZ * (ESICBZZ / ESTCBZZ)
LOACBZZ   =   LOTCBZZ * (ESACBZZ / ESTCBZZ)

Losses for the United States are the sums of all the states' losses.

1960 through 1989

Because of insufficient data, efforts to estimate net interstate trade prior to 1990 were not successful. The earlier methodology created by SEDS continues to be used for data years 1960 through 1989. This methodology first estimates the electrical system energy losses for the states, and then calculates net interstate flow.

Because Alaska and Hawaii have no exchanges of electricity with other states, their electrical system energy losses are simply the difference between all energy consumed by the electric power sector and the heat content of the retail sales of electricity:

LOTCBAK   =   TEEIBAK - ESTCBAK
LOTCBHI   =   TEEIBHI - ESTCBHI

An annual losses-to-sales ratio is created for the aggregate of the contiguous 48 states plus the District of Columbia by dividing the aggregate electrical system energy losses with the aggregated retail sales of electricity:

LOTCB48   =   LOTCBUS - (LOTCBAK + LOTCBHI)
ESTCB48   =   ESTCBUS - (ESTCBAK + ESTCBHI)
ELLSS48   =   LOTCB48 / ESTCB48

This ratio is fairly constant over time, ranging from a minimum of 2.3 in 1987 to a maximum of 2.5 in 1960. The ratio is applied to total retail sales and to retail sales by end-use sector in each of the 48 contiguous states and the District of Columbia:

LOTCBZZ   =   ESTCBZZ * ELLSS48

Electrical system energy losses are allocated to the four end-use sectors according to the sales shares:

LORCBZZ   =   LOTCBZZ * (ESRCBZZ / ESTCBZZ)
LOCCBZZ   =   LOTCBZZ * (ESCCBZZ / ESTCBZZ)
LOICBZZ   =   LOTCBZZ * (ESICBZZ / ESTCBZZ)
LOACBZZ   =   LOTCBZZ * (ESACBZZ / ESTCBZZ)

Losses for the United States are the sums of all the states' losses.

Net interstate flow of electricity is then calculated as the difference between total electricity sales plus attributed losses and the total energy consumption by the electric power sector within each state.

ELISBZZ   =   (ESTCBZZ + LOTCBZZ) - TEEIBZZ

The sum of ELISBZZ is zero.

Data sources

ELISPZZ — Net interstate flow of electricity for each state.

- 1960 through 1989: Not available.
- 1990 forward: EIA, Office of Electricity, Renewables, and Uranium Statistics, State Electricity Profiles, http://www.eia.gov/electricity/state/, Table 10.