

Section 6. Electricity

Electricity Consumed by End-Use Sectors

Electricity prices in the Energy Information Administration (EIA) State Energy Data System (SEDS) tables are retail prices for sales to ultimate users in nominal dollars per million Btu. Prices are developed for the residential, commercial, industrial, and transportation sectors. Taxes collected by a electricity retailer from an end user and turned over to a government authority are included in the revenues reported in the source data for the electricity prices—the EIA *Electric Sales and Revenue* and *Electric Power Annual*, or the Edison Electric Institute *Statistical Yearbook*—and, therefore, are included in the prices calculated from revenue.

Consumption is based on sales by the electric power sector to ultimate users. Electricity consumption data by State for the residential, commercial, industrial, and transportation sectors are obtained from SEDS. Consumption of electricity in the industrial sector is adjusted for estimated refinery use in each State. (See the discussion in Section 7, “Consumption Adjustments for Calculating Expenditures,” at http://www.eia.doe.gov/emeu/states/seds_tech_notes.html.)

Physical Unit Prices: 2003 Forward

Physical unit prices for electricity are calculated for the residential, commercial, industrial, and transportation sectors as the average revenue per kilowatt-hour of sales by all electric power retailers to a State, based on the EIA *Electric Sales and Revenue* database. For some States, there are transportation electricity consumption values in SEDS based on U.S. Department of Transportation data, but no comparable transportation sales and revenue in the *Electric Sales and Revenue*. Prices for each of these States are calculated by applying the percentage change in the

commercial sector prices between the previous year and the current year to the previous year's transportation sector price. In the years when Alabama, Arkansas, and Mississippi have no previous transportation sector price to use in the calculation, the commercial sector price is assigned to the transportation sector. States without transportation sector prices are shown in Table TN51.

Physical Unit Prices: 1990 Through 2002

For 1990 through 2002, physical unit prices for States are calculated for all four sectors as the average revenue per kilowatt-hour of sales by all electric power retailers reporting sales to a State. Revenue and sales data from the Form EIA-861 "Annual Electric Power Industry Report" database, as published in the EIA *Electric Sales and Revenue*, are used to calculate physical unit prices. The prices for the residential and industrial sectors are based directly on the database. Commercial sector prices are calculated as the commercial sector revenues plus the

Table TN51. Transportation Electricity Price Estimates, 2003 Forward

| State | Years | Price Estimates |
|-------|-----------|-------------------|
| AL | 2003–2007 | Commercial Sector |
| AR | 2004–2007 | Commercial Sector |
| IA | 2003–2005 | Percent Change |
| ME | 2003–2006 | Percent Change |
| MO | 2003 | Percent Change |
| MS | 2003–2007 | Commercial Sector |
| TN | 2003 | Percent Change |
| WI | 2003–2007 | Percent Change |

non-transportation portion of “Other” revenues divided by the commercial sales plus the non-transportation portion of “Other” sales. The non-transportation portions of “Other” sales and revenues are estimated using SEDS transportation electricity consumption and the *Electric Sales and Revenue* “Other” sales. The transportation sector prices are based on sales and revenues reported by a non-highway-street-lighting subsector of the “Other” category from the EIA-861 database for 1990 through 2000. Transportation electricity prices for 2001 and 2002 are calculated by applying the percentage change in the commercial sector prices between the previous year and the current year to the previous year’s transportation sector price.

Transportation electricity prices for Massachusetts and New Jersey in 2000 are out of range and are replaced with prices calculated by applying the percentage change in the commercial sector 1999 and 2000 prices to the 1999 transportation sector price.

Physical Unit Prices: 1987 Through 1989

For 1987 through 1989, State physical unit prices are calculated for all four sectors as the average revenue per kilowatthour of sales by all electric power retailers reporting sales to a State. Revenue and sales data are from the EIA *Electric Power Annual* data files.

The prices for the residential and industrial sectors are based on residential revenues and sales, and industrial revenues and sales, respectively. Commercial sector prices are calculated as the commercial sector revenues plus the non-transportation portion of “Other” revenues divided by the commercial sales plus the non-transportation portion of “Other” sales. The non-transportation portions of “Other” sales and revenues are estimated using SEDS transportation electricity consumption and the *Electric Sales and Revenue* “Other” sales. The transportation sector prices are calculated by dividing the “Other” category revenues by “Other” sales.

Physical Unit Prices: 1970 Through 1986

For 1970 through 1986, preliminary physical unit prices for States are calculated for all four sectors as the average revenue per unit of sales by all electric power facilities reporting sales to a State. The calculation of

physical prices is based upon the revenues and sales data from the *Statistical Yearbook* for each year in the series. Data for the residential sector and industrial sector are drawn from their respective columns. The commercial sector is the sum of the columns titled “Commercial,” “Street and Highway Lighting,” “Other Public Authorities,” and “Interdepartmental.” The transportation sector is the column titled “Railroads and Railways.”

For 1980 through 1986, prices are based on preliminary revenues and sales data in the given year and are replaced with revised data in the following year. The only exception to this rule is the revenues data for AR in 1981; preliminary data are used in this case because of an apparent error in the revised data.

For 1970 through 1981, MD prices are assigned to DC. There are no other missing prices for the residential, commercial, and industrial sectors.

In the transportation sector, numerous price assignments are made due to the lack of sector-specific price data. Generally, electricity usage in the transportation sector is small; the sector’s electricity use ranged from 0.1 percent to 0.2 percent of total U.S. electricity consumption in 1970 through 1986. From 1970 through 1986, only 15 States used measurable amounts of electricity in the transportation sector (CA, DC, FL, GA, IL, LA, MA, MD, NJ, NY, OH, PA, TN, VA, and WA). A few individual State prices are unavailable and are assigned the commercial sector prices: LA for 1970 through 1986 and TN for 1970 through 1986. (Prices are available for LA in 1970, 1972, 1973, but those prices are replaced by commercial sector prices to maintain a consistent series for the State.) In addition, MA transportation prices for 1985 and 1986 are estimated by multiplying the MA 1985 and 1986 commercial prices by the average of the ratios of the commercial-to-transportation sector prices for 1980 through 1984. Similarly, the VA 1977 transportation price is estimated by multiplying the VA commercial price in 1977 by the average of the ratios of the commercial-to-transportation sectors prices for 1978 through 1982.

In order to reconcile national-level electricity prices based on the *Statistical Yearbook* with the EIA national-level electricity prices published in the *Annual Energy Review (AER)*, yearly adjustment factors are calculated for the residential, commercial, and industrial sectors as follows: a preliminary U.S. price for each sector is calculated as the average of the

State prices, weighted by SEDS consumption. These preliminary U.S. prices are divided by the national-level electricity prices published in the *AER*, and the quotient is used as an adjustment factor. The preliminary State prices are multiplied by the adjustment factor to produce the final physical unit State prices in those sectors. Since no transportation sector prices are published in the *AER*, no adjustments are made to that sector and the final physical unit prices are derived solely from the *Statistical Yearbook* sales and revenue data. The annual adjustment factors for the residential, commercial, and industrial sectors are shown in Table TN52.

Btu Prices: All Years

Btu prices for States are calculated by dividing the physical unit prices by the conversion factor 3,412 Btu per kilowatthour. U.S. Btu prices are calculated as the average of the State Btu prices, weighted by consumption data from SEDS, adjusted for process fuel consumption in the industrial sector.

Data Sources

Prices

1990 forward: Sales and revenue data from EIA, Form EIA-861 "Annual Electric Power Industry Report" database as shown in the historical spreadsheets of the *Electric Power Annual* (January 26, 2009), http://www.eia.doe.gov/cneaf/electricity/epa/sales_state.xls, and http://www.eia.doe.gov/cneaf/electricity/epa/revenue_state.xls, sector category "Total Electric Industry."

Transportation sector variations:

- 2003 forward: Column labeled "Transportation".
- 2001 and 2002: Prices calculated by EIA.
- 1990–2000: Data for non-highway lighting portion of "Other" from the Form EIA-861 database files at <http://www.eia.doe.gov/cneaf/electricity/page/eia861.html>

1987–1989: EIA, *Electric Power Annual 1988*, Tables 19 and 21 (1987 data); *Electric Power Annual*, Tables 27 and 29 (1988 and 1989).

Table TN52. Annual Electricity Price Adjustment Factors, 1970 Through 1986

| Year | Residential | Commercial | Industrial |
|------|-------------|------------|------------|
| 1970 | 1.05121 | 1.05712 | 1.06832 |
| 1971 | 1.05632 | 1.05926 | 1.05504 |
| 1972 | 1.05271 | 1.05514 | 1.05765 |
| 1973 | 1.06626 | 1.06188 | 1.05991 |
| 1974 | 1.09572 | 1.08098 | 1.08732 |
| 1975 | 1.09257 | 1.08098 | 1.08732 |
| 1976 | 1.07753 | 1.07755 | 1.06891 |
| 1977 | 1.06746 | 1.07675 | 1.06820 |
| 1978 | 1.06654 | 1.08273 | 1.06861 |
| 1979 | 1.06986 | 1.08349 | 1.06441 |
| 1980 | 1.04457 | 1.06109 | 1.06781 |
| 1981 | 1.05821 | 1.06943 | 1.06523 |
| 1982 | 1.06654 | 1.06351 | 1.05597 |
| 1983 | 1.05421 | 1.05301 | 1.05537 |
| 1984 | 0.99693 | 1.01924 | 0.99015 |
| 1985 | 1.00010 | 1.02008 | 0.98355 |
| 1986 | 0.99854 | 1.01518 | 0.98618 |

Source: EIA calculations based on data from the *Annual Energy Review* and the *Statistical Yearbook of the Electric Utility Industry*.

1970–1986: Edison Electric Institute (EEI), *Statistical Yearbook of the Electric Utility Industry*, tables titled "Revenues: Total Electric Utility Industry" and "Energy Sales: Total Electric Utility Industry," based on EEI surveys.

1970–1986: EIA, *Annual Energy Review 1989*, Table 95, "Retail Prices of Electricity Sold by Electric Utilities, 1960–1989."

Consumption

1970 forward: EIA, State Energy Data System, electricity consumption by end-use sector.

Conversion Factor: All Years

3,412 Btu per kilowatthour.

Nuclear Fuel for Generation of Electricity

Nuclear fuel prices are developed by EIA for the electric power sector. State-level data on the amount of electricity generated from nuclear power are taken from the State Energy Data System (SEDS). Regulated nuclear power plants report fuel costs per kilowatthour to the Federal Energy Regulatory Commission (FERC) annually. These data include all taxes, transportation, and handling costs.

Physical Unit and Btu Prices: All Years

State-level nuclear fuel prices are estimated by EIA in two steps: (1) the total cost of fuels consumed at all nuclear power plants in a State is divided by their total generation of electricity, and (2) the cost per kilowatthour created in step 1 is divided by an annual U.S. average thermal conversion factor to create the price in dollars per million Btu. Occasionally, the fuel costs at nuclear power plants include small amounts of non-nuclear fuels that are necessary to continue essential plant operations during refueling or maintenance of the reactor. When there are not enough data available to calculate average nuclear fuel prices for a State, various methods, described below, are used to estimate prices.

Physical Unit Prices: 2007

For 2007, a complete set of nuclear fuel cost estimates is provided by EIA, Office of Coal, Nuclear, Electric, and Alternate Fuels (CNEAF), extracted from Ventyx Velocity Suite.

Physical Unit Prices: 2001 Through 2006

For 2001 through 2006, when a State has nuclear electricity generation in SEDS, but no fuel cost data are available, a State average physical unit price is estimated by CNEAF, generally based on the average physical unit prices paid by the same type(s) of reactors in other States. For 2001-2004, in States where there are nuclear electricity generation and fuel cost data available for only some plants, only those plants with available data are used to calculate the State average price. Occasionally, a plant is excluded from the State price calculation because the cost

data are significantly out of range with other plants in the State. The specific States and years with price assignments different than what is outlined above are shown with their price source in Table TN53.

Physical Unit Prices: 1992 Through 2000

For 1992 through 2000, in States where there are nuclear electricity generation and fuel cost data for some plants, but not all, available data are used to calculate the State average price. In States where nuclear electricity generation for a specific plant is not available, the plant's fuel cost data also are excluded from the State price calculation. In addition, plants that have no fuel cost data available are excluded from the State price calculation because the cost data are significantly out of range with other plants in the State.

Table TN53. Nuclear Electricity Fuel Price Estimates, 2001 Through 2006

| State | Years | Price Source |
|-------|---------------------------|---|
| IA | 2006 | EIA estimate based on 2001-2005 trend of cost decline |
| IL | 2003 2005, 2006 | Average of 2002 & 2004 Quad Cities costs Quad Cities costs assigned to all plants |
| MD | 2005, 2006 | St. Lucie costs assigned |
| MI | 2005 | Calvert Cliffs costs assigned |
| NJ | 2002-2004 2005 2006 | National year-to-year change Oyster Creek assigned St. Lucie costs Oyster Creek and Hope Creek assigned St. Lucie costs; Salem assigned Callaway costs |
| NY | 2001 2002, 2003 | Average of Ginna & Nine Mile Point Ginna costs assigned |
| OH | 2006 | Davis-Besse assigned Perry costs |
| PA | 2005 2006 | Susquehanna and Limerick assigned Beaver Valley costs; Three Mile Island assigned Oconee costs Susquehanna, Limerick, and Peach Bottom assigned Beaver Valley costs; Three Mile Island assigned average of Oconee, Crystal River, and Arkansas Nuclear One |
| TX | 2005, 2006 | Commanche assigned South Texas costs |
| WI | 2006 | Kewaunee assigned average price increase of Point Beach and Prairie Island |

Remaining States with missing cost data were assigned prices using one of the following methods: directly assigning a nearby State or the U.S. price; applying the ratio of the previous year to the current year physical unit nuclear fuel prices for a nearby State to the State's physical unit nuclear fuel price for the previous year; or, assigning the State's average price of the preceding and subsequent year.

When a State has nuclear electricity generation in SEDS, but no fuel cost data are available, the national physical unit nuclear fuel price is used to estimate the State price. The ratio of the current year to the previous year national nuclear fuel price is applied to the State's physical unit nuclear fuel price for the previous year. The national prices used in the estimation are the national averages before missing State prices are assigned.

The States and years estimated using these methodologies are shown in Table TN54.

Physical Unit Prices: 1970 Through 1991

For 1970 through 1991, when a State has nuclear electricity generation in SEDS, but no fuel cost data are available, the national physical unit nuclear fuel price is used to estimate the State price. The ratio of the current year to the previous year national nuclear fuel price is applied to the State's physical unit nuclear fuel price for the previous year. The national prices used in the estimation are the national averages before missing State prices are assigned. The States and years with specific price assignments are shown in Table TN54.

Additional Notes for Nuclear

- Nuclear electricity generation levels are negative for Colorado in 1985, Tennessee in 1986 and 1987, Oregon in 1993 and Connecticut and Maine in 1997, indicating that the nuclear power plants used more energy than they supplied. In these cases, the fuel prices and expenditures are set to zero.
- For Missouri in 1985, a large credit resulting from litigation is assigned to fuel costs, creating an artificially low price. The 1986 Missouri price, which is in the range of the prices of other nuclear

Table TN54. Nuclear Electricity Fuel Price Estimates, 1970 Through 2000

| State | Years | Price Source |
|-------|-------------------------------------|---|
| AL | 1973, 1974, 1976 | National Year-to-Year Change |
| AR | 1980 | National Year-to-Year Change |
| AZ | 1985 | National Year-to-Year Change |
| CO | 1977, 1978, 1982–1984, 1986–1989 | National Year-to-Year Change |
| | 1985 | Assigned zero |
| CT | 1997 | Assigned zero |
| | 1998 | NH |
| FL | 1997 | Excludes Crystal River |
| GA | 1974, 1978 | National Year-to-Year Change |
| | 2000 | Average of 1999 & 2001 |
| IL | 1997 | Excludes LaSalle, Zion, & Clinton |
| | 1998 | Excludes LaSalle & Clinton |
| | 2000 | Excludes Clinton |
| ME | 1972 | National Year-to-Year Change |
| | 1997 | Assigned zero |
| MA | 1999–2000 | VT |
| MI | 1997 | Excludes Big Rock Point |
| | 1998, 1999 | Excludes Cook |
| | 2000 | Excludes Palisades |
| MS | 1984 | National Year-to-Year Change |
| MO | 1984, 1985 | National Year-to-Year Change |
| NC | 1982 | National Year-to-Year Change |
| NE | 1999, 2000 | IA |
| NJ | 2000 | Excludes Oyster Creek |
| NY | 1998 | Excludes Indian Point 2 |
| OH | 1986 | National Year-to-Year Change |
| OR | 1975, 1993 | Assigned zero |
| PA | 1999 | Excludes Three-Mile Island |
| | 2000 | Average of Beaver Valley & Peach Bottom |
| SC | 1970 | National Year-to-Year Change |
| | 1985 | Adjusted for Catawba expenses |
| TN | 1980, 1986, 1987 | Assigned zero |
| WA | 1970–1987 | U.S. |
| WI | 1970 | National Year-to-Year Change |

fuel plants, is used to estimate the 1985 price by applying the ratio of the 1985-to-1986 national prices.

- The 1985 Energy Information Administration (EIA) *Historical Plant Costs and Annual Production Expenses for Selected Electric Plants* has a footnote for the Duke Power Catawba plant in South Carolina stating that the reported production expenses represent only 12.5 percent of the actual production expenses. The production expenses used in the calculation for the Catawba plant are adjusted accordingly.

Data Sources

Prices

2007: EIA, Office of Coal, Nuclear, Electric, and Alternate Fuels (CNEAF), from data compiled by Ventyx Velocity Suite, February 2009, <http://www1.ventyx.com/velocity/vs-overview.asp>, based on data collected on FERC Form 1, “Annual Report of Major Electric Utilities, Licensees, and Others.”

2004–2006: EIA, CNEAF, from data published in *NuclearFuel*, <http://www.platts.com/Nuclear/Newsletters%20&%20Reports/Nuclear%20Fuel/>, (a division of Platts, a McGraw-Hill Company). The data are collected on FERC Form 1, “Annual Report of Major Electric Utilities, Licensees, and Others.”

2000–2003: EIA, CNEAF, from data published in *Nucleonics Week*, <http://www.platts.com/Nuclear/Newsletters%20&%20Reports/Nucleonics%20Week/>, (a division of Platts, a McGraw-Hill Company). The data are collected on FERC Form 1, “Annual Report of Major Electric Utilities, Licensees, and Others.”

1997–1999: EIA, CNEAF, from data published in *Nucleonics Week*, <http://www.platts.com/Nuclear/Newsletters%20&%20Reports/Nucleonics%20Week/>, (a division of Platts, a McGraw-Hill Company). The data are collected on FERC Form 1, “Annual Report of Major Electric Utilities, Licensees, and Others,” and Form EIA-412, “Annual Report of Public Electric Utilities,” <http://www.eia.doe.gov/cneaf/electricity/page/data.html>.

1992–1996: EIA, CNEAF, from data compiled by the Utility Data Institute, (a McGraw-Hill Company). The data are collected on FERC Form 1, “Annual Report of Major Electric Utilities, Licensees, and Others,” and Form EIA-412, “Annual Report of Public Electric Utilities,” <http://www.eia.doe.gov/cneaf/electricity/page/data.html>.

1988–1991: EIA, *Electric Plant Cost and Power Production Expenses*, Table 16 (1988–1990) and Table 14 (1991).

1982–1987: EIA, *Historical Plant Costs and Annual Production Expenses for Selected Electric Plants*, Table 18 (1982-1984) and Table 20 (1985–1987).

1979–1981: EIA, *Thermal Electric Plant Construction Cost and Annual Production Expenses*, pages 267–279 (1979), Table 11 (1980 and 1981).

1975–1978: EIA, *Steam Electric Plant Construction Cost and Annual Production Expenses*, “Section II-Nuclear Plants.”

1970–1974: Federal Power Commission, *Steam Electric Plant Construction Costs and Annual Production Expenses*, data sheets for Nuclear Plants (1970–1973), and “Section II-Nuclear Plants” (1974).

Consumption

1970 forward: EIA, State Energy Data System, electricity generated by nuclear power.

Conversion Factors

1985 forward: EIA, annual U.S. average factors calculated using the heat rate reported on Form EIA-860, “Annual Electric Generator Report” (and predecessor forms), and the generation reported on Form EIA-906, “Power Plant Report” (and predecessor forms). The factors are published in the State Energy Data Consumption Technical Notes, Appendix Table B1, http://www.eia.doe.gov/emeu/states/seds_tech_notes.html.

1970 through 1984: EIA, annual U.S. average factors calculated by dividing the total heat content consumed in nuclear generating units by the total (net) electricity generated by those nuclear generating units.

The heat content and electricity generation are reported on Form FERC-1 and Form EIA-412, and predecessor forms.

Electricity Imports and Exports

Electricity transmitted across U.S. borders with Canada and Mexico are included in the State Energy Data System electric power sector. Quantities and value of U.S. electricity imports and exports are available in the foreign trade statistics published by the U.S. Department of Commerce, Bureau of the Census. The annual U.S. total imports and exports quantities and revenues are used to calculate U.S. annual average prices that are assigned to each of the States with electricity trade. The prices in dollars per megawatthour are converted to dollars per million Btu using the factor of 3,412 Btu per kilowatthour for 1989 forward. Imports and exports quantity and revenue data are not available for calculating prices for 1970 through 1988; prices for those years are estimated by applying annual percentage changes in industrial sector electricity prices to the 1989 U.S. average electricity imports and exports prices.

Data Sources

Prices

1989 forward: U.S. Department of Commerce, Bureau of the Census taken from the U.S. International Trade Commission's Interactive Tariff and Trade DataWeb database, <http://dataweb.usitc.gov>.

1970–1988: EIA, State Energy Data System, industrial sector electricity prices.

Consumption

1970 forward: EIA, State Energy Data System, electricity imports and electricity exports.

Conversion Factor, All Years

3,412 Btu per kilowatthour.