Historical Data Sources

Data Sources

Historical data published in the *Electric Power Monthly (EPM)* and the *Electric Power Annual (EPA)* are compiled from data collection forms that are no longer in use by the Energy Information Administration, as well as those currently collected data sources reported in the publication. The forms no longer in use include: Form EIA-759, "Monthly Power Plant Report," Form EIA-860A, "Annual Electric Generator Report–Utility," Form EIA-860B, "Annual Electric Generator Report–Nonutility;" Form EIA-867, "Annual Nonutility Power Producer Report;" and the Form EIA-900, "Monthly Nonutility Power Report."

Form EIA-759

The Form EIA-759 was a cutoff model-based sample of approximately 240 electric utilities drawn from the frame of all operators of electric utility plants (approximately 700 electric utilities) that generated electric power for public use. Data were collected on an annual basis from the remaining operators of electric utility plants. The monthly data collection was from all utilities with at least one plant with a nameplate capacity of 50 megawatts or more. (Note: included all nuclear units). However, the few utilities that generated electricity using renewable fuel sources other than hydroelectric were all included in the sample. The Form EIA-759 was used to collect monthly data on net generation; consumption of coal, petroleum, and natural gas; and end-of-the-month stocks of coal and petroleum for each plant by fuel-type combination.

Formulas and methodologies. Data for the Form EIA-759 were collected at the plant level. Estimates were then provided for geographic levels. Consumption of fuel(s) was converted from quantities (in short tons, barrels, or thousand cubic feet) to Btu at the plant level.

A cutoff model sampling and estimation were employed, using a multiple regression model. Details of the estimation of totals and variances of totals are published on the Internet in a paper entitled "Weighted Multiple Regression Estimation for Survey Model Sampling (Knaub, 13)."

At the fuel and State level (i.e., lowest aggregate level), there were a number of cases where the minimal sample size of three was not met, when using a 25 MW cutoff. Imputation of historic values for the smallest plants was used to supplement actual values for the largest ones. However, at the NERC level, this was not necessary. Data element totals for each NERC region, by fuel type, were estimated using model sampling. These samples were composed solely of data reported for the plants actually in the sample. The national level estimate from this was then considered the best estimate, and all other estimates were apportioned accordingly.

As a final adjustment, based on EIA's most complete data, use was made of final Form EIA-759 annual census, when it became available. The annual census for Form EIA-759 data by State and energy source were compared to the corresponding monthly Form EIA-759 values. The ratio of these two values in each case was then used to adjust each corresponding monthly value.

Average heat content. Heat content values collected on the FERC Form 423 were used to convert the consumption data from the Form EIA-759 into Btu. Respondents to FERC Form 423 represent a subset of all generating plants (steam plants with a capacity of 50 megawatts or larger), while Form EIA-759 respondents generally represented generating plants with a combined capacity of 25 or more megawatts. The results, therefore, may not have been completely representative.

Form EIA-860A

The Form EIA-860A was a mandatory census of electric utilities in the United States that operated power plants or planned to operate a power plant within five years of the reporting year. The survey was used to collect data on electric utilities' existing power plants and their five-year plans for constructing new plants, generating unit additions, modifications, and retirements in existing plants. Data on the survey were collected at the generating unit level. These data were then aggregated to provide totals by energy source (coal, petroleum, gas, water, nuclear, other) and geographic area (State, NERC region, Federal region, Census division). Additionally, at the national level, data were aggregated to provide totals by prime mover. Data from the Form EIA-860A were also summarized in the *Inventory of Power Plants in the United States* and the *EPA*, and as input to publications and studies by other offices in the Department of Energy.

Formulas and methodologies. Data from the Form EIA-860A were submitted at the generating unit level and then aggregated to provide total capacity by energy source and geographic area. In addition, at the national level, data were aggregated by prime mover.

Estimated values for net summer and net winter capacity for electric generating units were developed by use of a regression formula. The formula was used to estimate values for existing units where data were missing and for projected units. It was found that a zero-intercept linear regression worked very well for estimating net summer and net winter capacity based on nameplate capacity. The only parameter then was the slope ($\hat{h}$) that was used to relate nameplate capacity to net summer and net winter capacity as follows: $\hat{y} = \hat{h}x$, where $\hat{y}$ was the estimated net summer/winter capacity, and x was the known nameplate capacity. There was a different value for $\hat{h}$ for different prime movers and for summer and winter capacities, dependent upon the age of the generator. For more details see the *Inventory of Power Plants*.

Form EIA-860B

The Form EIA-860B was a mandatory survey of all existing and planned nonutility electric generating facilities in the United States with a total generator nameplate capacity of 1 or more megawatts. In 1992, the reporting threshold of the Form EIA-860B was lowered to include all facilities with a combined nameplate capacity of 1 or more megawatts. Previously, data were collected every three years from facilities with a nameplate capacity between 1 and 5 megawatts. Planned generators were defined as a proposal by a company to install electric generating equipment at an existing or planned facility. The proposal was based on the owner having obtained (1) all environmental and regulatory approvals, (2) a contract for the electric energy, or (3) financial closure on the facility. The Form consisted of Schedules I, "Identification and Certification;" Schedule II, "Facility Information"; Schedule III, "Standard Industrial Classification Code Designation"; Schedule IVA, "Facility Fuel Information"; Schedule IVB, "Facility Thermal and Generation Information"; Schedule V, "Facility Environmental Information"; and Schedule VI, "Electric Generator Information."

Submission of the Form EIA-860B was required from all facilities that had a combined facility nameplate capacity of 1 megawatt or more. Schedule V, "Facility Environmental Information" was only required of those facilities of 25 megawatts or more.

The form was used to collect data on the installed capacity, energy consumption, generation, and electric energy sales to electric utilities and other nonutilities by facility. Additionally, the form was used to collect data on the quality of fuels burned and the types of environmental equipment used by the respondent. These data were aggregated to provide geographic totals for selected States and at the Census division and national levels. Since the Form EIA-860B data are considered confidential, suppression of some data was necessary to protect the confidentiality of the individual respondent data.

Formulas and methodologies. Gross electricity generation data from the Form EIA-860B, reported by generator, were aggregated to provide totals by energy source and geographic area. Nonutility power producers reported gross electricity generated on the Form EIA-860B, unlike electric utilities that reported net generation on various EIA and FERC forms. Nonutilities generally do not measure and record electrical consumption used solely for the production of electricity. Nonutility generators and associated auxiliary equipment are often an integral part of a manufacturing or other industrial process and individual watthour meters are not generally installed on auxiliary equipment.

Estimated values for net generation from nonutility power producers were developed by EIA using gross generation, prime mover, fuels, and type of air pollution control data reported on the Form EIA-860B. The difference between gross and net generation is the electricity consumed by auxiliary equipment and environmental control devices such as pumps, fans, coal pulverizers, particulate collectors, and flue gas desulfurization (FGD) units. The difference between gross and net generation is sometimes called parasitic load. In smaller power plants rotating auxiliaries are almost always electric motors. In large power plants that produce steam, rotating auxiliaries can be powered by either steam turbines or electric motors and sometimes both because of cold startup requirements.

This methodology for estimating net generation from gross generation was based on determining typical energy consumption for auxiliary electrical equipment associated with electrical generators. For instance, wind turbines have none of the auxiliaries common to a coal-burning power plant such as a coal pulverizers, fans, and emission controls. On the other hand, wind farms do consume electricity since automatic computer-based control systems are used to control blade pitch and speed thereby affecting generator electricity output.

Shown below are the conversion factors used to estimate net generation by nonutility generators. The factors are typical of a modern electric power plant, but could vary significantly between individual plants. Net generation was calculated by multiplying the appropriate conversion factor by the reported gross electrical generation.

These conversion factors were estimated by the staff of the Office of Coal, Nuclear, Electric and Alternate Fuels, Energy Information Administration. The primary reference used in developing the conversion factors was *Steam, Its Generation and Use,* 40th Edition, Babcock & Wilcox, Barberton, Ohio.

Prime Mover Type	Gross-to-Net Generation Conversion Factor
Gas (Combustion Turbine)	.98
Steam Turbine	.97[a]
Internal Combustion	.98
Wind Turbine	.99
Solar-Photovoltaic	.99
Hydraulic Turbine	.99
Fuel Cell	.99
Other	.97

[a] Factor reduced by .01 if the facility has flue gas particulate collectors and another .03 if the facility has flue gas desulfurization (FGD) equipment. Facilities under 25 megawatts and burning coal in traditional boilers (e.g., not fluidized bed boilers) are assumed to have particulate and FGD equipment.

Form EIA-867

The Form EIA-867 was a mandatory survey of all existing and planned nonutility electric generating facilities in the United States with a total generator nameplate capacity of 1 or more megawatts. Planned generators are defined as a company's proposal to install electric generating equipment at an existing or planned facility. The proposal is based on the owner having obtained (1) all environmental and regulatory approvals, (2) a contract for the electric energy, or (3) financial closure on the facility.

The Form EIA-867 consisted of Schedules I, "Identification and Certification;" Schedule II, "Facility Information"; Schedule III, "Standard Industrial Classification Code Designation"; Schedule IVA, "Facility Fuel Information"; Schedule IVB, "Facility Thermal and Generation Information"; Schedule V, "Facility Environmental Information"; and Schedule VI, "Electric Generator Information." Schedule V, "Facility Environmental Information" was only required of those facilities of 25 megawatts or more. The form was used to collect data on the installed capacity, energy consumption, generation, and electric energy sales to electric utilities and other nonutilities by facility. Additionally, the form was used to collect data on the quality of fuels burned and the types of environmental equipment used by the respondent.

Instrument and Design History. The Form EIA-867 was implemented in December 1989 to collect data as of year-end 1989. In 1992, the reporting threshold of the Form EIA-867 was lowered to include all facilities with a combined nameplate capacity of 1 or more megawatts. Previous to 1992, data were collected every 3 years from facilities with a nameplate capacity between 1 and 5 megawatts. The Federal Energy Administration Act of 1984 (Public Law 93-275) defines the legislative authority to collect these data.

Data Processing. The Form EIA-867 was mailed to the respondents each January to collect data as of the end of the preceding calendar year. Static data for each respondent were preprinted from the previous year, and the respondents were instructed to verify all preprinted information and to supply the missing data. The completed forms were to be returned to the EIA by April 30. The response rate for all facilities with confirmed addresses was 100 percent. The data were manually edited before being keyed for automatic data processing. Computer programs containing additional edit checks were run. Respondents were telephoned to obtain corrections or clarifications of reported data and to obtain missing data as a result of the manual and automated editing.

Data Quality. The Manufacturing Energy Consumption Survey (MECS) produces detailed estimates of manufacturing electricity generation by industry and Census Division on a triennial basis. The data are published in the Manufacturing Energy Consumption Survey, Consumption of Energy. Gross generation by nonutility power producers by major industry groups, and Census division, for 1990 through 1994 are reasonable given the growth in manufacturing on site generation that occurred between 1985 and 1988 as reported in MECS. As an historical reference, the tables are Table 9 in the 1985 MECS Consumption publication and Tables 14 through 17 and Tables 20 through 24 in the 1988 publication. Data for the Form EIA-867 were collected from all existing and planned nonutility generating facilities in the United States with a total generator nameplate capacity of 1 or more megawatts. These data were aggregated to provide geographic totals for selected States and at the Census division and national levels. Since the Form EIA-867 data were considered confidential, suppression of some data was necessary to protect the confidentiality of the individual respondent data. See "Confidentiality of the Data" in this section for further information on the nondisclosure of data.

Allocating Capacity. The installed capacity for non-utility generating units was allocated to one energy source using the following algorithms:

- For generating units using a single fossil energy source, the capacity was allocated totally to that energy source.
- For generating units that use hydraulic, geothermal, solar, biomass, or wind energy, the capacity was allocated to that energy source (even if a secondary fuel was burned).
- For generating units using a combination of fossil energy and renewable energy sources, capacity was classified as fossil or renewable based on the

greatest percentage of Btu consumed when summed.

To allocate capacity by fuel within the fossil energy and renewable energy sources, the single fuel within that energy source with the greatest percentage of Btu consumed was used.

Allocating Generation. The generation for nonutility facilities was allocated to one energy source using the following algorithms:

- For generating units that use energy sources that are not burned (hydraulic, geothermal, nuclear, solar, or wind energy), the generation was allocated to that energy source (even if a secondary fuel is burned).
- For facilities having generating units using energy sources that are burned, the generation was allocated based on the percentage of Btu consumed. This algorithm assumes that unit efficiency was the same for all energy sources.

A comparison of installed capacity for facilities of 1 megawatt or more of EIA's data with data published by Edison Electric Institute (EEI) in Capacity and Generation of Non-Utility Sources of Energy shows a difference of approximately 1 percent.

Gross-to-Net Generation Conversion Methodology. Gross electricity generation data from the Form EIA-867, reported by generator, were aggregated to provide totals by energy source and geographic area. Nonutility power producers reported gross electricity generated on the Form EIA-867, unlike electric utilities that reported net generation on various EIA and FERC forms. Nonutilities generally do not measure and record electrical consumption used solely for the production of electricity. Nonutility generators and associated auxiliary equipment are often an integral part of a manufacturing or other industrial process and individual watthour meters are not generally installed on auxiliary equipment. Estimated values for net generation from nonutility power producers were developed by EIA using gross generation, prime mover, fuels, and type of air pollution control data reported on the Form EIA-867. The difference between gross and net generation is the electricity consumed by auxiliary equipment and environmental control devices such as pumps, fans, coal pulverizers, particulate collectors, and flue gas desulfurization (FGD) units. The difference between gross and net generation is sometimes called parasitic load. In smaller power plants rotating auxiliaries are almost always electric motors. In large power plants that produce steam, rotating auxiliaries can be powered by either steam turbines or electric motors and sometimes both because of cold startup requirements. This methodology for estimating net generation from gross generation was based on determining typical energy consumption for auxiliary electrical equipment associated with electrical generators. For instance, wind turbines have none of the auxiliaries common to a coal-burning power plant such as coal pulverizers, fans, and emission controls. On the other hand, wind farms do consume electricity since automatic, computer-based control systems are used to control blade pitch and speed thereby affecting generator electricity output.

Shown below are the conversion factors used to estimate net generation by nonutility generators. The factors are typical of a modern electric power plant but could vary significantly between individual plants.

Prime Mover Type	Gross-to-Net Generation Conversion Factor
Gas (Combustion) Turbine)	.98
Steam Turbine	.97[a]
Internal Combustion	.98
Wind Turbine	.99
Solar-Photovoltaic	.99
Hydraulic Turbine	.99
Fuel Cell	.99
Other	.97

a Factor reduced by .01 if the facility has flue gas particulate collectors and another .03 if the facility has flue gas desulfurization (FGD) equipment. Facilities under 25 megawatts and burning coal in traditional boilers (e.g., not fluidized bed boilers) are assumed to have particulate and FGD equipment.

Net generation was calculated by multiplying the appropriate conversion factor by the reported gross electrical generation.

The staff of the Office of Coal, Nuclear, Electric and Alternate Fuels, Energy Information Administration estimated these conversion factors. The primary reference used in developing the conversion factors was *Steam, Its Generation and Use*, 40th Edition, Babcock & Wilcox, Barberton, Ohio.

Emissions for the Production of Electricity Methodology. Emissions for nonutility power producers include emissions from cogeneration facilities that produce electric power as an integral part of a manufacturing or other thermal consuming process. Emissions are directly proportional to the quantities of fuels consumed. To calculate emissions for the production of electricity, a methodology was developed to estimate the consumption of fuel associated for the production of electricity by cogeneration facilities. The methodology was based on net generation heat rates by primary fuel and prime mover. The primary fuel is the predominant energy source for the generator based on fuel consumption at the facility expressed in total Btu by fuel type. The heat rates

were estimated by the staff of the Office of Coal, Nuclear, Electric and Alternate Fuels; Energy Information Administration. The primary reference used in developing the conversion factors was *TAG--Technical Assessment Guide, Volume 1: Electricity Supply--1986*, Electric Power Research Institute, Palo Alto, California, December 1986. The procedure to estimate the fuel consumed for the production of electricity was to calculate net generation by primary fuel and prime-mover (see gross-to-net generation methodology), multiply the net generation by the appropriate heat rate to obtain total Btu consumed for the production of electricity, and apportion by the total Btu weighted by energy source.

Nameplate Capacity to Summer Capability Conversion Methodology. Form EIA-867, "Annual Nonutility Power Producer Report," collected nameplate capacity for electric generating units. Estimated values for net summer capability from nameplate capacity are aggregated to provide a U.S. total. The methodology used for estimating summer capability from nameplate capacity is the same methodology shown in the Electric Power Annual or Electric Power Monthly Appendix for the Form EIA-860.

Business Classification. The nonutility industry consists of all manufacturing, agricultural, forestry, transportation, finance, service, and administrative industries, based on the Office of Management and Budget's Standard Industrial Classification (SIC) Manual.1 The following is a list from the Form EIA-867 of the main classifications and the category of primary business activity within each classification.

Agriculture, Forestry, and Fishing
01 Agriculture production-crops
02 Agriculture production, livestock and animal specialties
07 Agricultural services
08 Forestry
09 Fishing, hunting, and trapping
Mining
10 Metal mining
12 Coal mining
13 Oil and gas extraction
14 Mining and quarrying of nonmetallic minerals except fuels
Construction
15 to 17
Manufacturing
20 Food and kindred products
21 Tobacco products
22 Textile and mill products
23 Apparel and other finished products made from fabrics and similar materials
24 Lumber and wood products, except furniture
25 Furniture and fixtures
26 Paper and allied products (other than 2621 or 2631)
2621 Paper mills, except building paper
2631 Paperboard mills
27 Printing and publishing
28 Chemicals and allied products (other than 2819, 2821, 2869, or 2873)
2819 Industrial Inorganic Chemicals
2821 Plastics materials and resins
2869 Industrial organic chemicals
2873 Nitrogenous fertilizers
29 Petroleum refining and related industries (other than 2911)
2911 Petroleum refining
30 Rubber and miscellaneous plastic products
31 Leather and leather products
32 Stone, clay, glass, and concrete products (other than 3241)
3241 Cement, hydraulic
33 Primary metal industries (other than 3312 or 3334)
3312 Blast furnaces and steel mills
3334 Primary aluminum
34 Fabricated metal products, except machinery and transportation equipment
35 Industrial and commercial equipment and components except computer equipment
36 Electronic and other electrical equipment and components except computer equipment
37 Transportation equipment
38 Measuring, analyzing, and controlling instruments, photographic, medical, and optical goods, watches and clocks
39 Miscellaneous manufacturing industries
Transportation and Public Utilities
40 Railroad transportation
41 Local and suburban transit and interurban highway passenger transport
42 Motor freight transportation and warehousing
43 United States Postal Service
44 Water transportation
45 Transportation by air
46 Pipelines, except natural gas
47 Transportation services
48 Communications
49 Electric, gas, and sanitary services
Wholesale Trade
50 to 51
Retail Trade
52 to 59
Finance, Insurance, and Real Estate
60 Depository Institutions

[1] The SIC Manual has since been replaced by the North American Industry Classification System (NAICS) codes. For more information about NAICS codes, see the Bureau of the Census Internet site http://www.census.gov/epcd/www/naics.html.

61 Nondepository credit institutions
62 Security and commodity brokers, dealers, exchanges, and services
63 Insurance carriers
64 Insurance agents, brokers, and services
65 Real estate
67 Holding and other investment offices
Services
70 Hotels
72 Personal services
73 Business services
75 Automotive repair, services, and parking
76 Miscellaneous repair services
78 Motion pictures
79 Amusement and recreation services
80 Health services
81 Legal services
82 Education services
83 Social services
84 Museums, art galleries, and botanical and zoological gardens
86 Membership organizations
87 Engineering, accounting, research, management, and related services
88 Private households
89 Miscellaneous services
Public Administration
91 to 97
Other (explain)

Form EIA-900

The Form EIA-900, "Monthly Nonutility Power Report," was a cutoff model-based sample drawn from the frame for the Form EIA-860B, "Annual Electric Generator Report – Nonutility." Members of the Form EIA-860B frame with nameplate capacity greater than or equal to 50 megawatts constituted the sample for the Form EIA-900. The Form EIA-900 was used to collect monthly data on net generation; consumption of coal, petroleum, and natural gas; and end-of-the month stocks of coal and petroleum.

Formulas and Methodologies. The Form EIA-900 data were collected at the facility level, which was roughly the nonutility equivalent of plant level. The cutoff sample used generation to determine the estimated total nonutility monthly generation based on the annual Form EIA-860B, "Annual Generator Report – Nonutility," data available. Fuel consumption estimates were based on relating the estimated monthly generation to the consumption data for the Form EIA-860B.

Quality of Data

The CNEAF office is responsible for routine quality assurance activities. All operations in this office are done in accordance with formal standards established by the Energy Information Administration. These standards are the measuring rod necessary for quality statistics. Data improvement efforts for the data collected on the above forms included verification of data-keyed input by automatic computerized methods, editing by subject matter specialists, and follow-up on nonrespondents.

Data Editing System

Data from the form surveys were edited on a monthly basis using automated systems. The edit included both deterministic checks, in which records were checked for the presence of required fields and their validity; and statistical checks, in which estimation techniques were used to validate data according to their behavior in the past and in comparison to other current fields. When all data passed the edit process, the system built monthly master files, which were used as input to the *EPM*.

Confidentiality of the Data

In general, the data collected on the forms used for input to the *Electric Power Monthly* report were not confidential. However, data collected on the Form EIA-900, "Monthly Nonutility Power Report," and from the Form EIA-860B, "Annual Electric Generator Report – Nonutility," are considered confidential and must adhere to EIA's "Policy on the Disclosure of Individually Identifiable Energy Information in the Possession of the EIA" (45Federal Register 59812 (1980)).

Rounding Rules for Data

Given a number with r digits to the left of the decimal and d+t digits in the fraction part, with d being the place to which the number is to be rounded and t being the remaining digits which will be truncated, this number is rounded to r+d digits by adding 5 to the (r+d+1)th digit when the number is positive or by subtracting 5 when the number is negative. The t digits are then truncated at the (r+d+1)th digit. The symbol for a rounded number truncated to zero is (*).

Percent Differences

The following formula was used to calculate percent differences.

$$\text{Percent Difference} = \left(\frac{x\ (t_2) - x\ (t_1)}{x\ (t_1)} \right) x\ 100,$$

where $x\ (t_1)$ and $x\ (t_2)$ denote the quantity at year t_1 and subsequent year t_2.