Renewable Electricity Purchases: History and Recent Developments

Introduction

Numerous proposals at both Federal and State levels to allow competition in the sale of electricity have sparked interest in the cost of renewable-based electricity.[1] Most of these proposals attempt to "set aside" a share of the electricity market for renewables,[2] recognizing that renewable electricity generation (except for hydropower) is more costly than conventionally generated electricity. Environmental concerns about emissions from fossil fuels have also stimulated increased interest in renewable energy. Thus, for a variety of reasons, there is a compelling need to know how much the United States is paying for renewable electricity, both in aggregate and on a cost per kilowatthour basis, compared to electricity from other sources. By analyzing the prices utilities have paid nonutilities to purchase renewable-based electricity, this chapter provides some basis for addressing that question.

This chapter presents an overview of renewable purchased power prices with an explanation of the role of the Public Utility Regulatory Policies Act of 1978 (PURPA). Beginning in the 1980s, PURPA stimulated renewable-based generation. It also created the "qualifying facility" status for renewables a designation that guarantees those facilities the right to sell electricity generated to a utility at favorable prices. Prices which utilities paid for power purchases from "nonutilities" are given by facility qualifying status, fuel type, State or region, and Standard Industrial Classification (SIC) Code. Although the analysis used to develop them made maximum use of available data, there are significant limitations on interpreting these prices. These limitations are discussed in Appendix A. It is also essential to point out that this chapter contains information on the price that utilities have paid to purchase renewable electricity not on the cost that nonutilities incurred to produce that electricity.

Overview

Nonutilities[3] provided 13 percent of total utility power purchases in 1995, almost 25 percent of which was renewable-based. Thus, renewable energy provided only a small fraction (3 percent) of U.S. utility power purchases.[4] However, this market is the major outlet for nonutility renewable power, as utilities purchased 53 percent of renewable electricity generated by nonutilities in 1995. Historically, this electricity was sold at much higher prices than the national average electricity price per kilowatthour.[5] In 1995, U.S. retail prices (i.e., the priced paid by the end-use customer) averaged 6.89 cents/kilowatt hour (Figure 1). By comparison, utility purchases from other utilities,[6] which are made on a competitive basis and may be regarded as reflecting "wholesale" prices, averaged 3.53 cents/kilowatthour. The average price utilities paid nonutilities was significantly higher, averaging 6.31 cents/kilowatthour nationwide. Higher still was the price utilities paid nonutilities for renewable-based electricity (Figure 2). The average purchase price of electricity from nonutility qualifying facilities[7] using renewable energy was 9.05

[1] For a broader understanding of electric power industry restructuring, see Energy Information Administration, *Challenges of Electric Power Industry Restructuring for Fuel Suppliers*, DOE/EIA-0623 (Washington, DC, September 1998).

[2] Broadly, renewable energy includes any source that is either regenerative or virtually inexhaustible. For the purposes of this report, sources meeting these criteria are: wind, solar thermal, photovoltaic, geothermal, conventional hydroelectric, and biomass.

[3] Essentially, a nonutility is an entity that owns generating capacity and is not an electric utility. Nonutility power producers include qualifying cogenerators, qualifying small power producers, and other nonutility generators (including independent power producers) without a designated franchised service area, and which do not file forms listed in the Code of Federal Regulations, Title 18, Part 141.

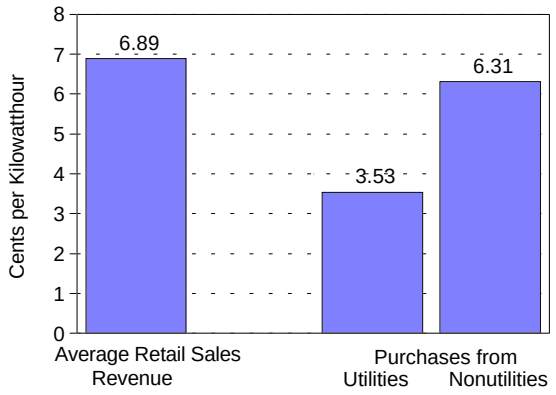
[4] Data on power purchased by one nonutility from another is not collected by the Department of Energy and is thus excluded.

[5] See Appendix A for detailed discussion of data sources and limitations.

[6] In this chapter, "Utilities" include power marketers, many of which sell large quantities of low-cost hydropower.

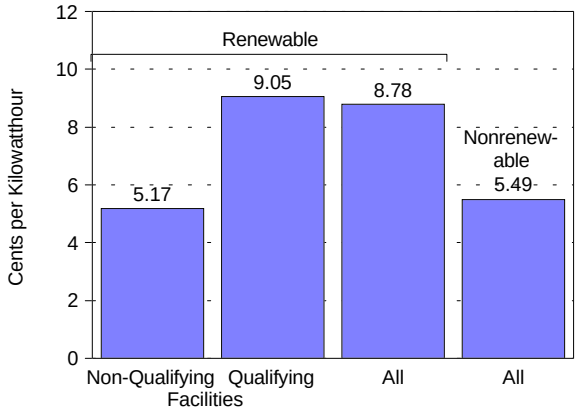
[7] See the following section on the history of PURPA for an explanation of "qualifying" and "nonqualifying" facilities.

Figure 1. U.S. Electric Utility Average Price per Kilowatthour for Purchased Power Compared to Average Retail Sales Revenue, 1995



Source: Table R9 and Energy Information Administration, *Electric Power Annual 1995,* Volume II, DOE/EIA-0348(95/2) (Washington, DC, December 1996), Table 7.

Figure 2. U.S. Electric Utility Average Price for Purchases from Nonutilities by Energy Source and QF Status, 1995



Source: Estimates documented in this chapter and related unpublished data.

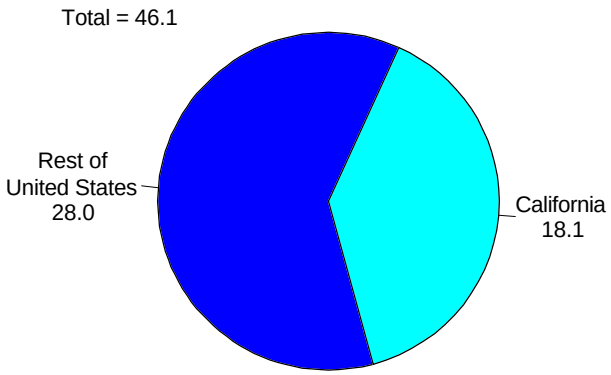
cents/kilowatthour some 31 percent higher than the average U.S. retail price.

California accounts for 39 percent of the purchases from renewable nonutility facilities (Figure 3). California's significant role is due to the availability of renewable resources and extensive support traditionally offered to renewable energy. Although utility purchases of non-utility renewable-based power represent just 15 percent of California's total (Figure 4), they are important because of the high "wholesale" price paid for them 8.04 cents/kilowatthour (Figure 5) compared with other purchases. This price, however, must be put into perspective. California has expensive electricity in general when compared with the rest of the Nation: 9.91 cents/kilowatthour in 1995, versus the U.S. average of 6.89 cents/kilowatthour.

A look at renewable nonutility purchases shows striking differences as well. California utilities paid an average of 12.79 cents/kilowatthour to nonutility qualifying facilities using renewable energy, but only 3.33 cents/kilowatthour to nonqualifying renewable non-utilities, which were entirely hydroelectric facilities (Figure 6).

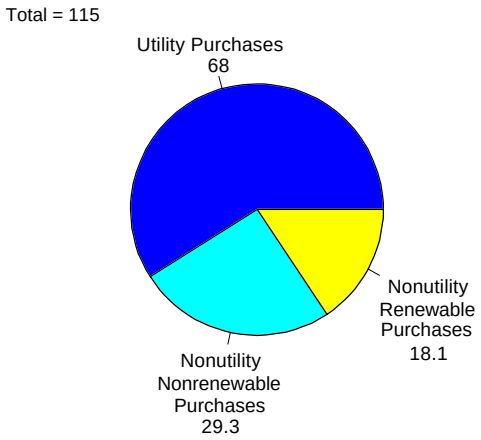
Although no precise measure of the incentives provided to renewable energy is available, analysis of price data in this chapter suggests one order of magnitude of the incentive subject to nontrivial data limitations. In some cases, such as California, the incentive seems large for electricity from particular renewables when prices utilities paid to those facilities were compared to those paid to non-renewable facilities. The reason high prices were paid to renewable-based nonutilities is that in the 1980s when many utilities signed long-term (10 year) PURPA-based contracts, it was presumed that natural gas prices would rise to much higher levels than they are today.This raised the utilities' estimatesof avoided costs.

Figure 3. California Electric Utility Purchases of Nonutility Renewable Power as a Share of U.S. Purchases, 1995
(Billion Kilowatthours)



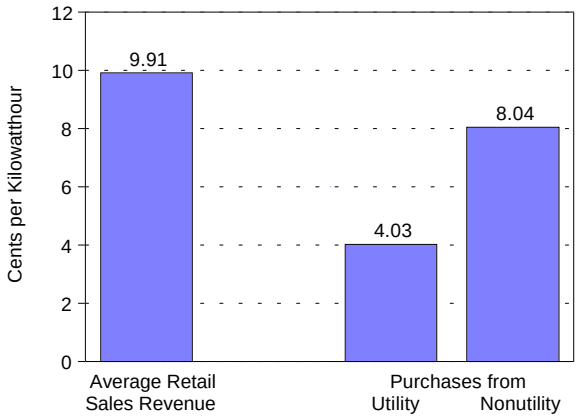
Source: Table R10.

Figure 4. California Electric Utility Purchases from Utilities and Nonutilities by Energy Source, 1995
(Billion Kilowatthours)



Source: Tables R9 and R10.

Figure 5. California Electric Utility Average Price per Kilowatthour for Purchased Power Compared to Average Retail Sales Revenue, 1995



Source: Table R9 and Energy Information Administration, *Electric Power Annual* 1995, Volume II, DOE/EIA-0348(95/2) (Washington, DC, December 1996), Table 7.

History of PURPA and Nonutilities

Interest in renewable energy rose during the 1970s when oil embargoes, rising energy prices, and concerns over air pollutants raised questions about the Nation's continued dependence on fossil fuels. As world energy prices tripled in 1974, the development of alternative energy sources became a national priority. In response to the Nation's "energy crisis," President Carter signed into law the National Energy Act of 1978, a compendium of five statutes that sought to decrease the Nation's dependence on foreign oil and increase domestic energy conservation and efficiency. PURPA was the most significant bill of the National Energy Act in that it fostered the development of facilities to generate electricity from renewable energy sources. A brief summary of PURPA's provisions and impact is presented below.

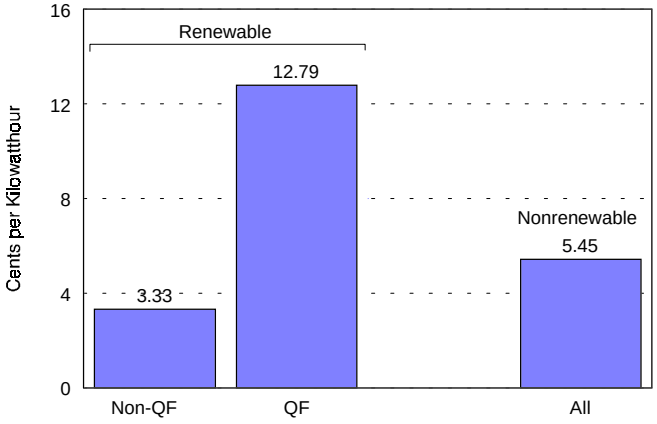
PURPA, among other things, required utilities to pay favorable power rates to two groups of nonutilities: (1) small power producers using renewable energy sources; and (2) cogenerators. PURPA permitted these operations to be designated as "qualifying facilities" (QFs) under certain conditions. To qualify for QF status under PURPA, both cogenerators and small power producers must have less than 50 percent ownership by electric utilities. QF cogenerators under PURPA must produce electricity and another form of useful thermal output through the sequential use of energy and meet certain operating and efficiency criteria. Small power producer QFs must generally be rated less than 80 megawatts, with at least 75 percent of the total energy input provided by renewable energy. Important to the analysis of purchased power prices is the fact that QF cogenerators do not have to use renewable fuels. Also worth noting is that renewable cogenerators are a mixture of QF and non-QF facilities.

PURPA required utilities to buy electricity from QFs at rates not to exceed a utility's "avoided cost," or the incremental cost to the electric utility of alternative electric energy which the utility would have generated or purchased from another source (an extensive discussion of avoided cost is provided later). The Federal Energy Regulatory Commission (FERC), responsible for certifying QFs and general implementation of PURPA, left the determination of the utility's avoided cost to the States and their utility commissions.

During the 1970s, the Federal renewable energy program grew rapidly, including funding for renewable energy research and development, residential and business tax credits for certain renewable technologies, and joint participation with the private sector in demonstration projects and commercialization of new technologies.

States that had a progressive renewable energy policy, such as California's renewable tax credit, helped influence the development of renewable energy technologies. However, PURPA was the major catalyst behind the massive growth in the number of nonutility power

Figure 6. California Electric Utility Purchases from Nonutilities by Energy Source and QF Status, 1995



Source: Estimates documented in this report and related unpublished data.

producers.[8] After an initially rapid expansion, the number of new filings for QF status has decreased over the last several years as the cost of alternative energy sources, which formed the basis for avoided costs, turned out to be much lower than previously forecast.

A major point to bear in mind when analyzing the data in this chapter is that PURPA only affected entities wishing to sell power. Facilities which generated only for their own use were unaffected by PURPA, and most such facilities have a non-QF status.

Nonutility Renewable Capacity

By the end of 1996, the total installed capacity of nonutility power producers of 1 megawatt or more was 73,189 megawatts.[9, 10] Of this, 58,345 megawatts (80 percent) came from QFs. Total nonutility capacity using renewable energy was 17,172 megawatts from 908 facilities (Table R1). Of this amount, 12,583 megawatts was at qualified facilities. Between 1992 and 1996, QF capacity increased about 1,181 megawatts, while non-QF capacity increased by only 199 megawatts. In the South Atlantic region alone, renewable QF capacity increased by 398 megawatts. The importance of QFs varies by region. For example, in the Southern regions,[11] QFs composed 63 percent of renewable capacity in 1996, while in the Pacific region, QFs were 79 percent of the total. In the mid-Atlantic region, QF status accounted for 95 percent of renewable nonutility capacity.

Of the 17,172 megawatts of nonutility renewable electric capacity existing at the end of 1996, 7,053 megawatts were wood and wood waste facilities; 3,419 megawatts were conventional hydroelectric; and 3,063 megawatts were municipal solid waste (MSW facilities) and landfills (Figure 7). Between 1992 and 1996, conventional hydroelectric capacity increased 735 megawatts and MSW and landfill capacity rose 550 megawatts. Wind capacity declined from a peak of 1,822 megawatts in 1992 due to retirements exceeding additions[12] (Table R2). Due to State incentives and favorable climate conditions, nonutilities have developed more capacity using renewable sources (except for hydroelectric) in California than in any other State. California had 4,772 megawatts of renewable capacity in 1995, or nearly 30 percent of the U.S. total. The second-largest State, according to nonutility renewable capacity, was Florida, with 1,210 megawatts of biomass facilities (Table R3).

Manufacturing processes also affect the development of electric renewable energy facilities. Many nonutility power producers use steam or hot water to produce products other than electricity and then use the waste heat to produce electricity. In addition, these manufacturing processes can produce renewable waste (for example, sawdust) that can be combusted to produce energy. By industrial classification, electric, gas, and sanitary services (or SIC Code 49 facilities) had the largest renewable capacity of all industry groups: 10,026 megawatts in 1996 (Table R4), representing nearly 60 percent of the total for all groups. Paper and Allied products was second with 5,680 megawatts. Agriculture and other industry groups had the smallest amount of capacity.[13] Nearly half of SIC Code 49 capacity was in the Pacific region in 1996. Approximately 1,000 megawatts of this capacity have come on board since 1992.

[8] PURPA did, however, restrict nonutility power sales to the "host" utility; i.e., the utility whose service area included the nonutility facility.

[9] The one megawatt threshold is used by the Form EIA-867, "Annual Nonutility Power Producer Report." Significant wind and biomass capacity exists below one megawatt, but is not included here for lack of data.

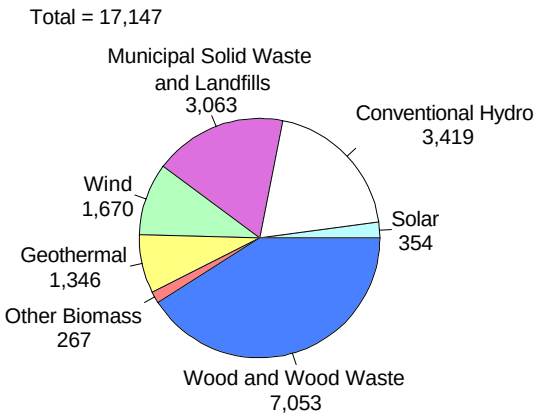
[10] Energy Information Administration, *Electric Power Annual, Volume II 1997*, DOE/EIA-0348(97/2) (Washington, DC, October 1998).

[11] Southern regions include South Atlantic, East South Central, and West South Central.

[12] This occurred because many of the PURPA "Standard Offer 4" contracts began expiring in the mid-1990s.

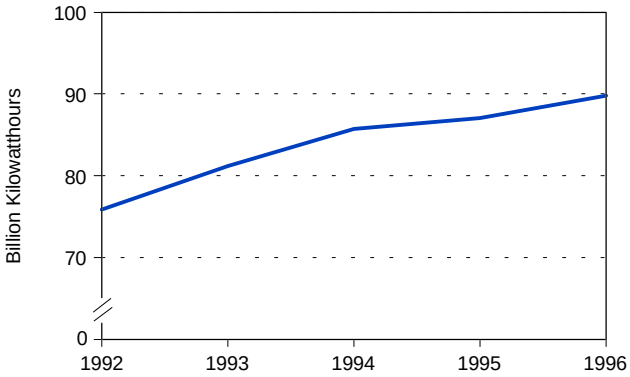
[13] The industry group for mining had no renewable nonutility facilities.

Figure 7. Installed Renewable Capacity at U.S. Nonutility Generating Facilities by Energy Source, 1996
(Megawatts)



Source: Table R2.

Figure 8. Gross Renewable Generation for U.S. Nonutility Generating Facilities, 1992 Through 1996



Source: Table R5.

Nonutility Renewable Generation

In 1996, nonutility power producers generated 382,423 million kilowatthours of electricity,[14] of which renewable sources generated 89,793 million kilowatthours (Table R5). Qualifying facilities produced 68,594 million kilowatthours from renewable sources, or about three-fourths of total renewable generation. QF renewable generation rose 18 percent between 1992 and 1996, and non-QF renewable generation in 1996 was 6 percent below its 1994 peak. A considerable amount of non-QF generation comes from entities generating electricity only for their own use.

Two-thirds of 1996 nonutility renewable generation was from biomass,[15] predominantly in the South (Table R6). Geothermal contributed 11 percent, wind nearly 4 percent, and solar almost 1 percent. Total renewable generation increased every year from 1992 through 1996 (Figure 8), showing an overall growth of 18 percent, a major portion of which was derived from conventional hydroelectric and municipal waste facilities.

Southern regions produced 38 percent of total nonutility renewable generation, while the Pacific region contributed 27 percent. For 1995, State-level data are shown, revealing that California had the most renewable generation at 20,801 million kilowatthours, or nearly 25 percent of the U.S. total (Table R7). Geothermal energy provided the largest share of California's renewable generation, with 8,011 million kilowatthours. California was followed by Florida and Maine, each at almost 6,000 million kilowatthours in 1995.

In terms of the major industry groups, electric / sanitary services (SIC Code 49) produced 58 percent of total generation in 1996, while Paper and Allied products produced 34 percent (Table R8). Since 1992, electric / sanitary services nonutility generation has grown nearly 27 percent.

Electric Utility Purchases of Nonutility Generation

The main focus of the remainder of this chapter is the price of power which electric utilities purchased from non-utility facilities using renewable energy. These include all the nonutilities that are QFs under PURPA and some non-qualified facilities (all hydroelectric).

Prior to PURPA, electric utilities purchased power almost exclusively from other utilities. Purchases from industrial producers did exist, but were very small. Not only did PURPA change the type of capacity built and the generation mix as discussed earlier, but it also changed the way sales of electricity were contracted and how rates were determined.

[14] Energy Information Administration, *Electric Power Annual, Volume II 1997*, DOE / EIA-0348(97 / 2) (Washington, DC, October 1998).
[15] Biomass includes the "Wood / Wood Waste," "Municipal Waste," and "Other Biomass" categories.

Details of PURPA contracts, under which utilities purchased power from nonutilities, and how they were implemented particularly in California are essential to interpreting the purchased power price data in this section. However, in order to emphasize the results of the price analysis and maintain continuity with the previous discussion, purchased power data will be provided first, followed by a discussion of PURPA contracts. Electricity purchases during 1995 (the most current year for which data was available at the time of this analysis) and the average price paid for these purchases are discussed below.

Total U.S. Power Purchases

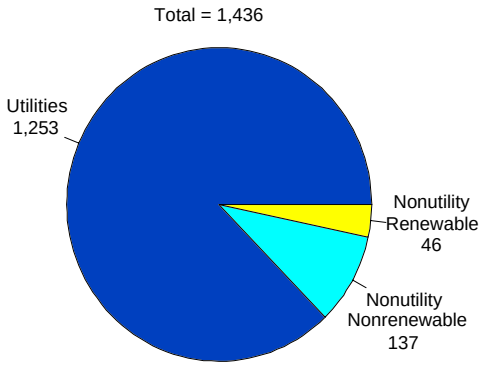
Purchases. U.S. electricity purchases by utilities totaled 1,436,072 million kilowatthours in 1995 (Table R9). Of this amount, 87 percent was purchased from utilities and other generators (Figure 9), with the remaining 13 percent purchased from nonutilities. One-fourth of the nonutility purchases was generated by renewable sources. Purchases from utilities tended to be evenly distributed across regions, whereas purchases from nonutilities (though much smaller) were concentrated in California, New York, and the Southern states.

Expenditures. The total cost of power purchases from all sources was $55.8 billion dollars. About 21 percent of this cost was for power from nonutilities. Among the States, California and New York utilities had the largest total expenditures for nonutility power, together accounting for half of total expenditures for power purchased from nonutilities.

Prices. The national average price for utility purchases from the group "Utility/Other,"[16] which includes large power marketers that sell large quantities of low-cost hydroelectric power, was 3.53 cents per kilowatthour. Regionally, prices ranged from a high of 5.11 cents in New England and 4.22 cents in the South Atlantic down to 3.0-3.5 cents per kilowatthour in most other regions.

In contrast, the average cost of power from nonutilities was 6.31 cents per kilowatthour, nearly double the cost of purchases from utilities and other sources. The most expensive regions were the Pacific, at 7.75 cents per kilowatthour, followed by New England, and the Mid-Atlantic and South Atlantic Regions. It should be noted that average retail (end use) electricity prices in these regions are also higher than the national average. Also, regional averages conceal individual States where nonutility purchased power prices may be competitive with utility prices.[17]

Figure 9. U.S. Electric Utility Purchases from Other Utilities and Nonutilities by Energy Source, 1995
(Billion Kilowatthours)



Source: Tables R9 and R10.

Renewable Purchased Power

All Sources

Purchases. Electric utility purchases of renewable electric power account for 25 percent of purchases from nonutilities in 1995, or 46,052 million kilowatthours (Table R10). Pacific region utilities, led by California, made 43 percent of U.S. renewable power purchases (19,821 million kilowatthours). Although nonutilities in the Southern regions produced 38 percent of nationwide nonutility renewable generation (Table R6), southern utility renewable purchases from nonutilities accounted for only 15 percent of U.S. nonutility renewable purchases (Table R10). This is because some industries in the south with major power requirements (e.g., the pulp and paper industry) produce electricity principally for their own use. Approximately 15,345 million kilowatthours, or one-third of total renewable purchases, were from municipal solid waste and landfills (Figure 10).

[16] Includes utilities, power marketers, power pools, and utilities in Canada and Mexico as defined for the Form EIA-861, "Annual Electric Utility Report."

[17] In Louisiana, the current nonutility generating market was developed in a competitive market and reportedly produced electricity at an average unit cost of less than 3.9 cents per kilowatthour in 1994. Electric utilities, operating under the traditional governmental utility regulation, are said to produce electricity at an average unit cost of more than 5.7 cents per kilowatthour. See http://ecep.usl.edu/lep/non-util/001.htm.

Major portions also came from wood and wood waste, geothermal, and conventional hydroelectric.

Although all non-QF renewable power purchases were from hydropower facilities, the reverse is not true. Over 55 percent of the 7 ,474 million kilowatthours of hydropower which utilities purchased from nonutilities was from QFs.[18]

Expenditures. Electric utility costs of purchased renewable electric power from nonutilities was $4.041 billion, or around 35 percent of the U.S. total nonutility power revenues from sales to utilities. More than half of these costs ($2.210 billion) were for electricity sold in California (Table R11). Nearly $1 billion each was for power from geothermal sources, wood and wood waste, and municipal solid waste and landfills.

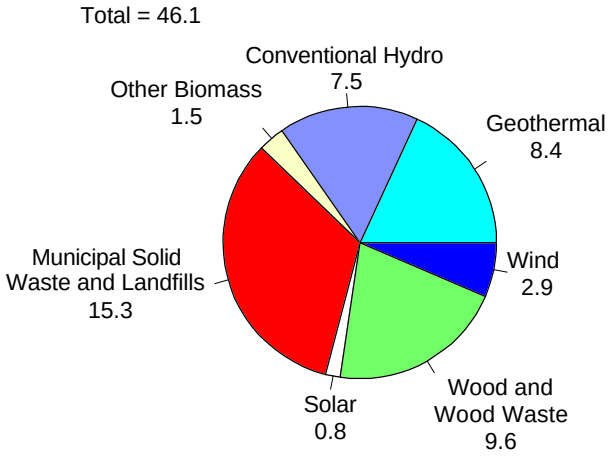
Prices. The nationwide average cost paid by electric utilities in 1995 for renewable power was 8.78 cents per kilowatthour, or 2.5 cents per kilowatthour above the 6.31 cent average for all nonutility purchases (Table R12). Qualifying facilities received an average of 9.05 cents per kilowatthour for renewable-based electricity, while nonqualifying facilities (hydropower only) received only an average of 5.17 cents per kilowatthour (Figure 2). By comparison, utilities paid nonutilities an average of 5.49 cents per kilowatthour for non-renewable electricity.

Excluding conventional hydroelectric power, California utilities paid prices considerably higher than the rest of the United States, ranging from 11 to 15 cents per kilowatthour. By comparison, utilities in other regions paid prices generally averaging 4 to 9 cents per kilowatthour. In addition, the cost varied by energy source. Solar (exclusively in California) was highest at 15.80 cents per kilowatthour, while municipal solid waste was lowest at 6.27 cents per kilowatthour (Figure 11).

Purchases by Industry Group

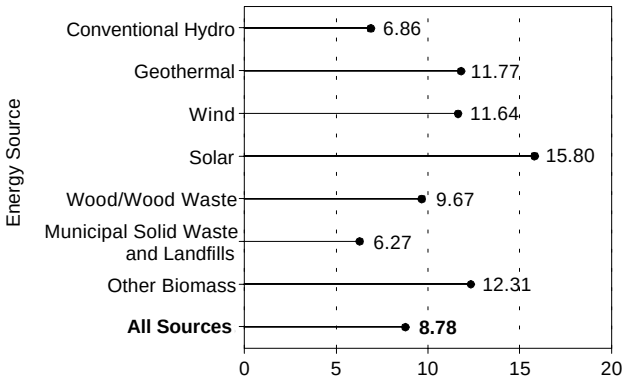
Expenditures. SIC Code 49 facilities (electric utilities, gas and sanitary services) sold 41,586 million kilowatthours, or 90 percent of renewable electric power sold to utilities by nonutilities (Table R13). Paper and Allied Products provided 2,865 million kilowatthours, while the mining group contributed nothing. SIC Code 49 received a comparable amount, 93 percent ($3.761 billion) of total utility expenditures on renewable electric power purchased from nonutilities (Table R14). Paper and Allied Products received $177 million.

Figure 10. U.S. Electric Utility Purchases of Renewable Electric Power from Nonutility Facilities by Energy Source, 1995
(Billion Kilowatthours)



Source: Table R10.

Figure 11. U.S. Electric Utility Average Price per Kilowatthour of Renewable Electric Power Purchased from Nonutility Facilities by Energy Source, 1995
(Cents per Kilowatthour)



Source: Table R10.

[18] This figure is derived from information in Tables R10 and R16.

Prices. The average price paid to SIC Code 49 facilities was highest at 9.05 cents per kilowatthour (Table R15). Paper and Allied Products received an average of 6.18 cents per kilowatthour. Facilities in the "Other Industry" group received the lowest price, 4.37 cents per kilowatthour. Some of the lowest average prices (about 2 cents per kilowatthour) were for very small sales by other industries. Among the States, California's SIC Code 49 facilities received one of the higher payments at 12.29 cents per kilowatthour.

Non-Qualified Facilities

Only 7 percent of renewable electricity purchased was from non-qualified nonutility facilities, all of which use conventional hydropower (Table R16). Across the country, most power from non-qualified facilities (non-QFs) was sold at lower prices than power from qualified facilities, with some exceptions in the Middle Atlantic and West South Central regions.

In 1995, 3,300 million kilowatthours of electricity were purchased from non-QFs by utilities at an average price of 5.17 cents per kilowatthour. This price is considerably lower than the 9.05 cents per kilowatthour paid to QFs. The New England region was highest at 8.41 cents per kilowatthour for non-QFs. Also higher than average were the Middle Atlantic and West South Central regions. The electric utilities in East North Central, West North Central, South Atlantic, Mountain, and Pacific regions paid less than the average price.

Significantly among the states, California accounted for 1,071 million kilowatthours, or nearly one-third, of the nation's total non-QF renewable purchases. This power was sold at an average cost of 3.33 cents per kilowatthour, a rate one-third lower that the national average received by non-QFs. Other low-priced states include Michigan, Wisconsin, Georgia, West Virginia and Vermont all less than 3 cents per kilowatthour.

Interpreting Purchased Power Prices

Appendix A provides a detailed discussion of data limitations which affect the prices shown above, while the next section explains how PURPA affected the contracts utilities were required to sign with nonutilities for purchasing renewable-based power. To summarize, two major points should be kept in mind when analyzing the prices presented above:

1. Because all nonhydroelectric renewable nonutility facilities which sold power to utilities are PURPA QFs, the prices utilities paid for power from those facilities reflect PURPA avoided costs, as implemented by State Public Utility Commissions. Thus, prices paid to these facilities are based on regulatory factors, not market prices. Further, these prices are not appropriate to use when conjecturing about the price to be paid for renewable-based electricity in scenarios of the future involving market-based electricity industry restructuring and/or incentives to support renewable energy (e.g., renewable portfolio standards).

2. By 1995, some of the long-term PURPA contracts signed in the mid-1980s had expired. Thus, the prices shown reflect an unknown mixture of original PURPA contracts with high avoided cost bases and new contracts with prices determined at much lower levels (see following section).

PURPA Contracts

Section 210(b) of PURPA mandates that the rates an electric utility pays a QF shall: (1) be just and reasonable to electric consumers and in the public interest, (2) not discriminate against qualifying cogenerators or qualifying small producers. It also prohibits FERC from prescribing a rule which provides for a rate for a purchase from a QF which exceeds the incremental cost to the electric utility of the purchase of alternative electric energy. Section 210(d) of PURPA defines the incremental cost of alternative electric energy as the cost to the utility of the electric energy which, but for the purchase from a cogenerator or small power producer, such utility would generate or purchase from another source.

In 1980, FERC promulgated regulations implementing Section 210 of PURPA defining avoided costs at the highest level allowed by the law, the full avoided costs. FERC regulations permit QFs to elect between being paid the utility's avoided cost calculated at the time power is delivered or at the time the obligation is incurred, regardless of when the power is delivered (lock-in rule). Avoided costs calculated at the time of the obligation, but above the purchasing utility's avoided costs at the time of delivery, do not violate FERC's regulations. Although challenged, FERC's ruling was ultimately upheld.[19]

[19] Soon after FERC promulgated its PURPA regulations, its full avoided cost rule was challenged. The Court of Appeals of the District of Columbia found the rule inconsistent with PURPA's mandate that rates be just and reasonable. However, the Supreme Court reversed the lower court's decision and upheld FERC's full avoided cost rule.

The FERC established general guidelines delegating responsibility for the determination of avoided costs to the States. At the time PURPA was enacted, oil prices were rising and predicted by some analysts to reach $100 a barrel by 1998. Today, in contrast, oil sells for under $12 a barrel.[20] This was the foundation many States used for setting the high avoided costs in utility power purchase contracts with QFs. In other cases, States may simply have been aggressive in implementing PURPA to encourage QF development (e.g., including capacity charges in determining avoided costs).

PURPA did not require public utilities to enter into long-term power sales agreements, though many States required utilities to offer long-term contracts of 10 to 20 years with QFs. These contracts included the Six-Cent Rule in New York[21] and Standard Offer contracts in California.[22] State government policies implementing PURPA favored QFs and produced an enormous growth in nonutility power producers and renewable electric generation during the 1980s. While PURPA was effective in the revitalization of nonutility power producers and renewable electric power, it was not necessarily the least-cost alternative to generating electricity.

In California, prices for Standard Offer contracts during the 1980s ranged from 10 to 20 cents per kilowatthour. A decade later, when the original Standard Offer contracts started to expire, owners of renewable energy facilities could not renew their contracts at the original rates. Sometimes original contracts were replaced by Interim and later, Final Standard Offer contracts. As Standard Offer contracts expired and wholesale prices declined to less than 3 cents per kilowatthour, there was a slowdown in the construction of new capacity and a gradual retirement of existing capacity.

In the mid 1980s, several States, considering the difficulty of estimating future avoided costs, concluded that avoided costs could be established through competitive bidding among QFs as opposed to setting them administratively. Maine was the first State to put competitive bidding into practice. However, during the early 1990s, with wholesale prices and avoided cost at less than 3 cents per kilowatthour, renewable electricity projects were not profitable. California introduced various programs that would require utilities to purchase QF capacity at prices in excess of their avoided costs. Utilities in California opposed these programs and initiated regulatory and legal actions. In 1995, FERC issued a decision clarifying the limits on States in setting rates that would exceed a utility's avoided cost. The FERC noted that States have other ways aside from PURPA to encourage the use of renewable resources, including imposing a tax on fossil-fueled generators or by giving a tax incentive to alternative generation. FERC also clarified that it would not entertain requests to invalidate existing QF contracts.

As a result of FERC's decision, California chose to include in its restructuring legislation, Assembly Bill 1890 (AB 1890), which placed a tax on electricity sold by investor-owned utilities, the funds from which would then be redistributed in support of renewable technologies. Enacted in 1996, AB 1890 directed the collection of $540 million from investor-owned utility ratepayers from 1998 through 2002 to support existing, new, and emerging renewable electric generation technologies. The program has a competitive bidding mechanism to reward the most cost-effective projects with a cents-per-kilowatthour amount (subject to a price cap). The benefits specified in AB 1890 are production credits rather than investment tax credits.

Between 1978 and 1987, in addition to Federal tax preferences,[23] California had a tax preference for renewable energy facilities. The combination of these tax credits and high marginal income tax rates[24] created an incentive for capital-intensive renewable energy projects (especially wind). One reason for the elimination of the investment tax credits is the perception that these programs had been abused to produce tax savings rather than to generate renewable energy.

[20] Energy Information Administration, *Monthly Energy Review*, DOE/EIA-0035(98/08) (Washington, DC, October 1998), p. 111.

[21] In 1981, New York State enacted legislation which established a minimum price of 6 cents per kilowatthour for utility purchases from QFs. This precipitated a large number of QF projects in New York and a challenge of the 6-cent law by utilities as it exceeded their avoided costs. New York repealed the law in 1992, but grandfathered many of the contracts executed prior to the effective date of the repeal.

[22] In California, QFs typically enter pre-approved contracts called Standard Offer Contracts with utility companies. These contracts reflect the difference between short- and long-term costs based on the utility costs they displace. Short-run avoided costs are generally calculated to reflect the costs they would displace for a short-term commitment to deliver energy. These costs are based on the utility's marginal operating costs, varying with the fuel in use and seasonal demand. Long-run avoided costs are designed, in addition to reflecting marginal costs, to include the costs of a resource (capital costs) that the utility would construct in lieu of the QF resource. In California this resulted in establishing relatively high avoided costs compared to other states. Additional information about renewable energy in California is available on the California Energy Commission's web site: www.energy.ca.gov/renewables/index.html

[23] Primarily a 15 percent Federal energy investment tax credit in addition to the standard 10 percent investment tax credit.

[24] Marginal income tax rates were reduced to a maximum of 28 percent in 1982, then increased slightly in 1986.

Concluding Comments

PURPA provided an opportunity to expand the use of renewable energy sources in electricity markets. As the electric industry restructures, proponents of repealing PURPA are challenging its provisions as being inconsistent with competitive wholesale markets. State commissions continue to modify their rules to mitigate the impact of PURPA. In 1996, for example, the Idaho Public Utilities Commission terminated its previous rule requiring 20 year terms for utility contracts to purchase QF power and replaced it with a rule requiring terms of only 5 years for facilities exceeding 1 megawatt. The New York Public Service Commission adopted procedures to allow electric utilities to curtail power purchases from QFs when their contracts allow curtailments. The Commission has also authorized utilities to collect data to determine whether or not QFs are complying with PURPA eligibility requirements. Other States have adopted or have pending initiatives, such as implementing market-based rates to determine avoided costs, that attempt to alleviate some of the financial impacts of PURPA.

Since 1997, more than a dozen proposed electric restructuring bills have been introduced in Congress, and the Administration's "Comprehensive Electricity Competition Plan" was also released in March 1998.[25] Most of these promote and preserve public benefits, proposing to secure the future of renewable electricity through a renewable portfolio standard (RPS) or a public benefit fund similar to the fund in California. The RPS would require electricity sellers to cover a percentage of their electricity sales with generation from non-hydroelectric renewable technologies. Most proposals repeal prospectively the "must buy" provision of PURPA.

The future prospect for renewable electricity will be dependent on the fate of PURPA, how aggressive Federal and State agencies are in setting incentives (such as an RPS, system benefit charge, or net metering, etc.) for electricity from renewables sources, and the willingness of the public to support green pricing programs.

[25] For a discussion of restructuring proposals and issues, see Energy Information Administration, *Challenges of Electric Power Industry Restructuring for Fuel Suppliers,* DOE/EIA-0623 (Washington, DC, September 1998).

Table 1. Installed Renewable Capacity at U.S. Nonutility Generating Facilities by Qualifying Facility Status and Census Division, 1992 Through 1996 (Megawatts)

Census Division	QF Capacity[a]		Non-QF Capacity		Total Capacity	
	Number of Facilities	Capacity (megawatts)	Number of Facilities	Capacity (megawatts)	Number of Facilities	Capacity (megawatts)
			1992			
New England	85	1,644	47	382	132	2,026
Middle Atlantic	93	1,111	28	90	121	1,201
East North Central	47	383	22	310	69	692
West North Centra	10	120	7	75	17	195
South Atlantic	64	1,986	38	1,092	102	3,078
East South Central	17	535	6	330	23	865
West South Central	16	680	11	568	27	1,248
Mountain	47	506	19	175	66	680
Pacific	227	4,438	101	1,367	328	5,805
U.S. Total	**606**	**11,402**	**279**	**4,389**	**885**	**15,791**
			1993			
New England	87	1,617	47	382	134	1,999
Middle Atlantic	97	1,138	26	87	123	1,225
East North Central	50	469	22	278	72	747
West North Central	12	125	7	102	19	227
South Atlantic	68	2,099	38	1,068	106	3,168
East South Central	16	541	9	524	25	1,066
West South Central	18	707	12	569	30	1,276
Mountain	52	531	19	168	71	699
Pacific	221	4,465	101	1,371	322	5,836
U.S. Total	**621**	**11,692**	**281**	**4,550**	**902**	**16,242**
			1994			
New England	87	1,601	47	373	134	1,974
Middle Atlantic	103	1,259	25	78	128	1,336
East North Central	50	438	25	296	75	733
West North Central	13	148	7	112	20	260
South Atlantic	74	2,357	43	1,414	117	3,771
East South Central	16	555	14	849	30	1,404
West South Central	18	757	12	538	30	1,295
Mountain	53	542	17	156	70	698
Pacific	217	4,373	99	1,363	316	5,736
U.S. Total	**632**	**12,030**	**288**	**5,178**	**920**	**17,208**
			1995			
New England	84	1,563	45	394	129	1,957
Middle Atlantic	106	1,346	24	75	130	1,421
East North Central	60	527	18	267	78	794
West North Central	15	156	7	112	22	269
South Atlantic	75	2,318	42	1,202	117	3,521
East South Central	20	779	12	631	32	1,410
West South Central	21	867	10	463	31	1,330
Mountain	52	550	18	167	70	717
Pacific	209	4,283	91	1,268	300	5,551
U.S. Total	**642**	**12,390**	**267**	**4,580**	**909**	**16,970**
			1996			
New England	82	1,512	47	411	129	1,924
Middle Atlantic	106	1,329	24	75	130	1,404
East North Central	65	553	20	278	85	832
West North Central	15	157	8	121	23	278
South Atlantic	75	2,384	43	1,260	118	3,644
East South Central	17	848	13	636	30	1,484
West South Central	23	957	11	466	34	1,423
Mountain	51	548	19	169	70	717
Pacific	207	4,294	82	1,173	289	5,467
U.S. Total	**641**	**12,583**	**267**	**4,588**	**908**	**17,172**

[a]Nonutility generating facilities that have obtained status as qualifying facilities under the Public Utility Regulatory Policies Act of 1978.

Notes: Renewable data presented in this table differs slightly from that found in the Energy Information Administration's *Electric Power Annual 1997 Volume II* (Washington, DC, October 1998) due to slight differences in the definition of renewable energy sources. See Appendix A, Table A1 of this report for details. Totals may not equal sum of components because of independent rounding.

Source: Energy Information Administration, Form EIA-867, "Annual Nonutility Power Producer Report."

Table 2. Installed Renewable Capacity at U.S. Nonutility Generating Facilities by Energy Source and Census Division, 1992 Through 1996

(Megawatts)

Census Division	Conventional Hydroelectric	Geothermal	Wind	Solar	Wood/Wood Waste[a]	Municipal Waste[b]	Other Biomass[c]	Total
				1992				
New England	579	--	--	--	909	W	W	2,026
Middle Atlantic	418	--	--	--	121	662	--	1,201
East North Central	100	--	--	--	417	175	--	692
West North Central	73	--	--	--	77	46	--	195
South Atlantic	205	--	--	--	2,079	747	46	3,078
East South Central	--	--	--	--	850	W	W	865
West South Central	193	--	--	--	1,033	5	18	1,248
Mountain	290	224	--	--	159	7	--	680
Pacific	825	1,030	1,822	360	1,088	355	325	5,805
U.S. Total	**2,684**	**1,254**	**1,822**	**360**	**6,733**	**2,513**	**425**	**15,791**
				1993				
New England	587	--	--	--	846	W	W	1,999
Middle Atlantic	421	--	--	--	141	663	--	1,225
East North Central	101	--	--	--	458	188	--	747
West North Central	73	--	--	--	105	49	--	227
South Atlantic	209	--	--	--	2,158	755	46	3,168
East South Central	--	--	--	--	1,056	10	--	1,066
West South Central	193	--	--	--	1,054	W	W	1,276
Mountain	317	224	--	--	150	7	--	699
Pacific	832	1,094	R1,796	360	1,016	379	358	5,836
U.S. Total	**R2,734**	**1,318**	**R1,796**	**360**	**6,984**	**2,591**	**459**	**16,242**
				1994				
New England	586	--	--	--	818	W	W	1,974
Middle Atlantic	441	--	--	--	145	750	--	1,336
East North Central	115	--	--	--	417	200	--	733
West North Central	73	--	W	--	105	50	W	260
South Atlantic	568	--	--	--	2,358	799	46	3,771
East South Central	172	--	--	--	1,217	W	W	1,404
West South Central	193	--	--	--	1,071	7	23	1,295
Mountain	317	234	--	--	140	7	--	698
Pacific	898	1,102	W	354	1,077	382	W	5,736
U.S. Total	**3,364**	**1,335**	**1,737**	**354**	**7,350**	**2,744**	**325**	**17,208**
				1995				
New England	584	--	--	--	W	634	W	1,957
Middle Atlantic	485	--	--	--	W	823	W	1,421
East North Central	103	--	--	--	477	215	--	794
West North Central	73	--	W	--	105	59	W	269
South Atlantic	568	--	--	--	2,045	862	46	3,521
East South Central	172	--	--	--	1,224	W	W	1,410
West South Central	193	--	--	--	1,087	25	26	1,330
Mountain	323	237	--	--	150	7	--	717
Pacific	899	1,057	W	354	866	W	268	5,551
U.S. Total	**3,399**	**1,295**	**1,723**	**354**	**6,766**	**3,038**	**396**	**16,970**

See notes at end of table.

Table 2. Installed Renewable Capacity at U.S. Nonutility Generating Facilities by Energy Source and Census Division, 1992 Through 1996 (Continued)

Census Division	Conventional Hydroelectric	Geothermal	Wind	Solar	Wood/Wood Waste[a]	Municipal Waste[b]	Other Biomass[c]	Total
				1996				
New England	589	--	--	--	663	W	W	1,924
Middle Atlantic	485	--	--	--	164	754	--	1,404
East North Central	105	--	--	--	486	241	--	832
West North Central	81	--	W	--	105	59	W	278
South Atlantic	568	--	--	--	2,103	927	46	3,644
East South Central	172	--	--	--	1,297	W	W	1,484
West South Central	195	--	W	--	1,141	27	W	1,423
Mountain	322	237	--	--	150	7	--	717
Pacific	902	1,108	1,515	354	944	397	148	5,467
U.S. Total	**3,419**	**1,346**	**1,670**	**354**	**7,053**	**3,063**	**267**	**17,172**

[a]Includes wood, wood waste, wood liquors, peat, railroad ties, utility poles, and wood sludge.

[b]Includes municipal solid waste, landfill gas, digester gas, and methane.

[c]Other biomass includes agricultural by products/waste, solid byproducts, liquid acetonitrile waste, medical waste, straw, tires, fish oil, tall oil, sludge waste, closed loop biomass, and waste alcohol.

W = Withheld to avoid disclosure of individual company data.

Notes: Renewable data presented in this table differs slightly from that found in the Energy Information Administration's *Electric Power Annual 1997 Volume II* (Washington, DC, October 1998) due to slight differences in the definition of renewable energy sources. See Appendix A, Table A1 of this report for details. Totals may not equal sum of components because of independent rounding.

Source: Energy Information Administration, Form EIA-867, "Annual Nonutility Power Producer Report."

Table 3. Installed Renewable Capacity at U.S. Nonutility Generating Facilities by Energy Source and State, 1995
(Megawatts)

State	Conventional Hydroelectric	Geothermal	Wind	Solar	Wood/ Wood Waste[a]	Municipal Waste[b]	Other Biomass[c]	Total
Alabama	--	--	--	--	W	--	W	781
Alaska	--	--	--	--	W	--	--	W
Arizona	--	--	--	--	--	--	--	--
Arkansas	W	--	--	--	367	W	--	370
California	658	1,022	1,680	354	606	293	160	4,772
Colorado	32	--	--	--	--	5	--	36
Connecticut	W	--	--	--	--	214	W	267
Delaware	--	--	--	--	--	--	--	--
District of Columbia	--	--	--	--	--	--	--	--
Florida	--	--	--	--	637	527	46	1,210
Georgia	W	--	--	--	501	W	--	518
Hawaii	26	35	W	--	--	W	108	257
Idaho	265	--	--	--	140	--	--	404
Illinois	18	--	--	--	--	35	--	53
Indiana	--	--	--	--	--	14	--	14
Iowa	5	--	--	--	--	7	--	12
Kansas.	2	--	--	--	--	--	--	2
Kentucky	--	--	--	--	W	--	--	W
Louisiana	192	--	--	--	476	--	17	685
Maine	359	--	--	--	541	66	--	966
Maryland	--	--	--	--	W	W	--	138
Massachusetts	W	--	--	--	W	318	--	396
Michigan	29	--	--	--	327	137	--	492
Minnesota	65	--	W	--	105	W	--	244
Mississippi	--	--	--	--	345	--	--	345
Missouri	--	--	--	--	--	--	--	--
Montana	W	--	--	--	W	--	--	23
Nebraska	--	--	--	--	--	--	--	--
Nevada	W	237	--	--	--	--	--	W
New Hampshire	91	--	--	--	123	23	--	237
New Jersey	W	--	--	--	--	182	W	204
New Mexico	--	--	--	--	--	W	--	W
New York	383	--	--	--	74	366	--	823
North Carolina	368	--	--	--	W	W	--	589
North Dakota	--	--	--	--	--	--	W	W
Ohio	3	--	--	--	W	W	--	32
Oklahoma	--	--	--	--	W	W	--	80
Oregon	W	--	--	--	129	W	--	257
Pennsylvania	W	--	--	--	W	275	--	394
Rhode Island	3	--	--	--	--	14	--	16
South Carolina	W	--	--	--	282	W	--	315
South Dakota	--	--	--	--	--	--	--	--
Tennessee	172	--	--	--	99	10	--	280
Texas	--	--	--	--	181	W	W	196
Utah	10	--	--	--	--	--	--	10
Vermont.	W	--	--	--	W	--	--	75
Virginia	22	--	--	--	410	175	--	607
Washington	101	--	--	--	92	32	--	226
West Virginia	144	--	--	--	--	--	--	144
Wisconsin	52	--	--	--	130	20	--	202
Wyoming	W	--	--	--	--	--	--	W
U.S. Total	**3,399**	**1,295**	**1,723**	**354**	**6,766**	**3,038**	**396**	**16,970**

[a]Includes wood, wood waste, wood liquors, peat, railroad ties, utility poles, and wood sludge.

[b]Includes municipal solid waste, landfill gas, digester gas, and methane.

[c]Other biomass includes agricultural by products/waste, solid byproducts, liquid acetonitrile waste, medical waste, straw, tires, fish oil, tall oil, sludge waste, closed-loop biomass, and waste alcohol.

W = Withheld to avoid disclosure of individual company data.

Notes: Renewable data presented in this table differs slightly from that found in the Energy Information Administration's *Electric Power Annual 1997 Volume II* (Washington, DC, October 1998) due to slight differences in the definition of renewable energy sources. See Appendix A, Table A1 of this report for details. Totals may not equal sum of components because of independent rounding.

Source: Energy Information Administration, Form EIA-867, "Annual Nonutility Power Producer Report."

Table 4. Installed Renewable Capacity at U.S. Nonutility Generating Facilities Attributed to Major Industry Groups by Census Division, 1992 Through 1996
(Megawatts)

Census Division	Agriculture/ Forestry	Mining	Paper and Allied Products[a]	All Other Manufacturing	Electric/ Sanitary Services[b]	Other Industry Groups	Total
			1992				
New England	--	--	772	38	1,216	--	2,026
Middle Atlantic	--	--	111	W	1,034	W	1,201
East North Central	--	--	345	W	241	W	692
West North Centra	--	--	98	W	63	W	195
South Atlantic	46	--	1,965	158	896	13	3,078
East South Central	--	--	844	6	15	--	865
West South Central	--	--	1,008	31	209	--	1,248
Mountain	--	--	124	W	433	W	680
Pacific	64	--	310	537	4,876	18	5,805
U.S. Total	**111**	**--**	**5,577**	**909**	**8,982**	**211**	**15,791**
			1993				
New England	--	--	670	33	1,295	--	1,999
Middle Atlantic	--	--	113	54	1,058	--	1,225
East North Central	--	--	346	W	294	W	747
West North Central	--	--	126	W	66	W	227
South Atlantic	46	--	2,044	162	909	7	3,168
East South Central	--	--	1,043	8	15	--	1,066
West South Central	--	--	1,009	57	210	--	1,276
Mountain	--	--	124	W	460	W	699
Pacific	55	--	305	509	4,950	18	5,836
U.S. Total	**102**	**--**	**5,780**	**900**	**9,257**	**204**	**16,242**
			1994				
New England	--	--	663	36	1,275	--	1,974
Middle Atlantic	--	--	W	W	1,220	--	1,336
East North Central	--	--	323	W	302	W	733
West North Central	--	--	W	41	89	W	260
South Atlantic	46	--	2,110	509	1,099	7	3,771
East South Central	--	--	1,209	180	15	--	1,404
West South Central	--	--	1,046	37	212	--	1,295
Mountain	--	--	113	W	469	W	698
Pacific	33	--	267	394	5,025	18	5,736
U.S. Total	**79**	**--**	**5,972**	**1,245**	**9,705**	**207**	**17,208**
			1995				
New England	--	--	656	11	1,290	--	1,957
Middle Atlantic	--	--	W	W	1,359	--	1,421
East North Central	--	--	324	33	361	77	794
West North Central	--	--	W	41	98	W	269
South Atlantic	46	--	1,723	508	1,237	7	3,521
East South Central	--	--	1,118	186	106	--	1,410
West South Central	--	--	1,042	76	212	--	1,330
Mountain	--	--	124	W	478	W	717
Pacific	56	--	236	302	4,937	19	5,551
U.S. Total	**102**	**--**	**5,401**	**1,181**	**10,079**	**208**	**16,970**

See notes at end of table.

Table 4. Installed Renewable Capacity at U.S. Nonutility Generating Facilities Attributed to Major Industry Groups by Census Division, 1992 Through 1996 (Continued)

Census Division	Agriculture/ Forestry	Mining	Paper and Allied Products[a]	All Other Manufacturing	Electric/ Sanitary Services[b]	Other Industry Groups	Total
				1996			
New England	--	--	667	11	1,245	--	1,924
Middle Atlantic	--	--	113	W	1,289	W	1,404
East North Central	--	--	344	W	410	W	832
West North Central	--	--	126	41	111	--	278
South Atlantic	46	--	1,731	513	1,286	68	3,644
East South Central	--	--	1,192	185	107	--	1,484
West South Central	--	--	1,096	59	268	--	1,423
Mountain	--	--	124	W	478	W	717
Pacific	49	--	288	280	4,833	18	5,467
U.S. Total	**95**	**--**	**5,680**	**1,109**	**10,026**	**262**	**17,172**

[a] Includes SIC codes 2621 (paper mills) and 2631 (paperboard mills).

[b] SIC code 49 (electric, gas, and sanitary services).

W = Withheld to avoid disclosure of individual company data.

Notes: Renewable data presented in this table differs slightly from that found in the Energy Information Administration's *Electric Power Annual 1997 Volume II* (Washington, DC, October 1998) due to slight differences in the definition of renewable energy sources. See Appendix A, Table A1 of this report for details. For definitions of major industry groups, see Executive Office of the President, Office of Management and Budget, *Standard Industrial Classification Manual, 1987* (Washington, DC, 1987). Totals may not equal sum of components because of independent rounding.

Source: Energy Information Administration, Form EIA-867, "Annual Nonutility Power Producer Report."

Table 5. Gross Renewable Generation at U.S. Nonutility Generating Facilities by Qualifying Facility Status and Census Division, 1992 Through 1996

(Million Kilowatthours)

Census Division	QF Generation[a]		Non-QF Generation		Total Generation	
	Number of Facilities	Generation (Million Kilowatthours)	Number of Facilities	Generation (Million Kilowatthours)	Number of Facilities	Generation (Million Kilowatthours)
			1992			
New England	85	9,246	47	1,867	132	11,112
Middle Atlantic	93	6,801	28	400	121	7,201
East North Central	47	2,360	22	1,278	69	3,637
West North Centra	10	633	7	374	17	1,006
South Atlantic	64	11,436	38	4,712	102	16,148
East South Central	17	3,048	6	2,109	23	5,156
West South Central	16	4,104	11	2,491	27	6,594
Mountain	47	2,103	19	528	66	2,631
Pacific	227	18,501	101	3,891	328	22,392
U.S. Total	**606**	**58,229**	**279**	**17,648**	**885**	**75,878**
			1993			
New England	87	9,802	47	1,786	134	11,588
Middle Atlantic	97	6,933	26	363	123	7,296
East North Central	50	2,759	22	1,311	72	4,071
West North Central	12	681	7	391	19	1,072
South Atlantic	68	11,174	38	4,703	106	15,877
East South Central	16	3,012	9	3,002	25	6,014
West South Central	18	4,262	12	3,076	30	7,338
Mountain	52	2,597	19	705	71	3,303
Pacific	221	19,811	101	4,849	322	24,660
U.S. Total	**621**	**61,032**	**281**	**20,187**	**902**	**81,219**
			1994			
New England	87	9,569	47	1,928	134	11,496
Middle Atlantic	103	7,477	25	337	128	7,814
East North Central	50	3,035	25	1,412	75	4,447
West North Central	13	743	7	424	20	1,167
South Atlantic	74	11,988	43	6,415	117	18,403
East South Central	16	3,185	14	4,735	30	7,920
West South Central	18	4,300	12	2,867	30	7,166
Mountain	53	2,664	17	577	70	3,242
Pacific	217	20,364	99	3,742	316	24,106
U.S. Total	**632**	**63,325**	**288**	**22,436**	**920**	**85,761**
			1995			
New England	84	9,696	45	1,964	129	11,660
Middle Atlantic	106	7,665	24	288	130	7,953
East North Central	60	3,500	18	1,222	78	4,723
West North Central	15	818	7	450	22	1,268
South Atlantic	75	12,815	42	5,721	117	18,536
East South Central	20	4,567	12	3,300	32	7,866
West South Central	21	4,685	10	2,470	31	7,155
Mountain	52	2,829	18	779	70	3,608
Pacific	209	19,498	91	4,817	300	24,316
U.S. Total	**642**	**66,074**	**267**	**21,011**	**909**	**87,085**

See notes at end of table.

Table 5. Gross Renewable Generation at U.S. Nonutility Generating Facilities by Qualifying Facility Status and Census Division, 1992 Through 1996 (Continued)

Census Division	QF Generation[a]		Non-QF Generation		Total Generation	
	Number of Facilities	Generation (Million Kilowatthours)	Number of Facilities	Generation (Million Kilowatthours)	Number of Facilities	Generation (Million Kilowatthours)
			1996			
New England	82	9,981	47	2,290	129	12,271
Middle Atlantic	106	8,411	24	353	130	8,764
East North Central	65	3,917	20	1,291	85	5,209
West North Central	15	815	8	440	23	1,255
South Atlantic	75	13,169	43	5,908	118	19,078
East South Central	17	4,514	13	3,414	30	7,928
West South Central	23	4,829	11	2,351	34	7,180
Mountain	51	2,820	19	835	70	3,655
Pacific	206	20,137	82	4,317	288	24,454
U.S. Total	**640**	**68,594**	**267**	**21,199**	**907**	**89,793**

[a] Nonutility generating facilities that have obtained status as qualifying facilities under the Public Utility Regulatory Policies Act of 1978.

Notes: Renewable data presented in this table differs slightly from that found in the Energy Information Administration's *Electric Power Annual 1997 Volume II* (Washington, DC, October 1998) due to slight differences in the definition of renewable energy sources. See Appendix A, Table A1 of this report for details. Totals may not equal sum of components because of independent rounding.

Source: Energy Information Administration, Form EIA-867, "Annual Nonutility Power Producer Report."

Table 6. Gross Renewable Generation for U.S. Nonutility Generating Facilities by Energy Source and Census Division, 1992 Through 1996

(Million Kilowatthours)

Census Division	Conventional Hydroelectric	Geothermal	Wind	Solar	Wood/Wood Waste[a]	Municipal Waste[b]	Other Biomass[c]	Total
				1992				
New England	W	--	--	--	4,943	3,235	W	11,112
Middle Atlantic	1,916	--	--	--	1,168	4,116	--	7,201
East North Central	515	--	--	--	2,351	715	56	3,637
West North Centra	W	--	--	--	382	W	--	1,006
South Atlantic	1,095	--	--	--	10,642	4,179	231	16,148
East South Central	--	--	--	--	5,070	W	W	5,156
West South Central	663	--	--	--	5,780	43	109	6,594
Mountain	600	1,214	--	--	764	W	W	2,631
Pacific	1,626	7,363	2,916	746	5,710	2,333	1,697	22,392
U.S. Total	**9,446**	**8,578**	**2,916**	**746**	**36,810**	**15,006**	**2,375**	**75,878**
				1993				
New England	2,526	--	--	--	5,260	3,499	303	11,588
Middle Atlantic	1,724	--	--	--	1,238	4,334	--	7,296
East North Central	520	--	--	--	2,569	904	77	4,071
West North Central	336	--	--	--	457	W	W	1,072
South Atlantic	963	--	--	--	10,656	3,994	263	15,877
East South Central	--	--	--	--	5,949	W	W	6,014
West South Central	1,246	--	--	--	5,922	41	128	7,338
Mountain	948	1,588	--	--	709	W	W	3,303
Pacific	3,249	8,161	R3,036	897	5,163	2,402	1,752	24,660
U.S. Total	**11,511**	**9,749**	**R3,036**	**897**	**37,925**	**15,555**	**2,546**	**81,219**
				1994				
New England	2,709	--	--	--	4,822	3,657	308	11,496
Middle Atlantic	1,877	--	--	--	1,405	4,531	--	7,814
East North Central	533	--	--	--	2,812	1,022	79	4,447
West North Central	339	--	W	--	471	303	W	1,167
South Atlantic	2,983	--	--	--	10,862	4,347	210	18,403
East South Central	1,047	--	--	--	6,798	W	W	7,920
West South Central	983	--	--	--	5,984	40	160	7,166
Mountain	837	1,637	--	--	712	W	W	3,242
Pacific	1,918	8,486	W	824	5,495	2,605	W	24,106
U.S. Total	**13,227**	**10,122**	**3,482**	**824**	**39,361**	**16,606**	**2,139**	**85,761**
				1995				
New England	2,561	--	--	--	4,620	4,113	365	11,660
Middle Atlantic	1,584	--	--	--	W	4,960	W	7,953
East North Central	488	--	--	--	2,966	1,193	75	4,723
West North Central	303	--	W	--	W	376	W	1,268
South Atlantic	2,799	--	--	--	10,737	4,705	296	18,536
East South Central	835	--	--	--	6,964	W	W	7,866
West South Central	962	--	--	--	5,993	40	160	7,155
Mountain	1,171	1,659	--	--	719	W	W	3,608
Pacific	4,070	8,253	W	824	4,092	2,695	W	24,316
U.S. Total	**14,774**	**9,912**	**3,185**	**824**	**37,986**	**18,182**	**2,222**	**87,085**

See notes at end of table.

Table 6. Gross Renewable Generation for U.S. Nonutility Generating Facilities by Energy Source and Census Division, 1992 Through 1996 (Continued)

Census Division	Conventional Hydroelectric	Geothermal	Wind	Solar	Wood/Wood Waste[a]	Municipal Waste[b]	Other Biomass[c]	Total
				1996				
New England	3,235	--	--	--	4,350	4,321	366	12,271
Middle Atlantic	2,337	--	--	--	1,310	5,075	42	8,764
East North Central	525	--	--	--	3,121	1,468	95	5,209
West North Central	382	--	W	--	441	372	W	1,255
South Atlantic	3,042	--	--	--	10,642	5,051	343	19,078
East South Central	897	--	--	--	6,959	W	W	7,928
West South Central	980	--	W	--	5,912	W	157	7,180
Mountain	1,280	1,663	--	--	662	W	W	3,655
Pacific	3,878	8,535	3,266	903	4,497	2,530	845	24,454
U.S. Total	**16,555**	**10,198**	**3,400**	**903**	**37,895**	**18,966**	**1,877**	**89,793**

[a] Includes wood, wood waste, wood liquors, peat, railroad ties, utility poles, and wood sludge.

[b] Includes municipal solid waste, landfill gas, digester gas, and methane.

[c] Other biomass includes agricultural byproducts/waste, solid by-products, liquid acetonitrile waste, medical waste, straw, tires, fish oil, tall oil, sludge waste, closed-loop biomass, and waste alcohol.

Notes: Renewable data presented in this table differs slightly from that found in the Energy Information Administration's *Electric Power Annual 1997 Volume II* (Washington, DC, October 1998) due to slight differences in the definition of renewable energy sources. See Appendix A, Table A1 of this report for details. Totals may not equal sum of components because of independent rounding.

Source: Energy Information Administration, Form EIA-867, "Annual Nonutility Power Producer Report."

Table 7. Gross Renewable Generation for U.S. Nonutility Generating Facilities by Energy Source and State, 1995 (Million Kilowatthours)

State	Conventional Hydroelectric	Geothermal	Wind	Solar	Wood/ Wood Waste[a]	Municipal Waste[b]	Other Biomass[c]	Total
Alabama	--	--	--	--	4,313	--	W	W
Alaska	--	--	--	--	W	--	W	134
Arizona	--	--	--	--	W	--	--	W
Arkansas	--	--	--	--	1,653	W	W	1,678
California	3,155	8,011	3,107	824	2,739	2,023	942	20,801
Colorado	125	--	--	--	--	W	W	161
Connecticut	W	--	--	--	--	1,392	W	1,667
Delaware	--	--	--	--	--	--	--	--
District of Columbia	--	--	--	--	--	--	--	--
Florida	--	--	--	--	2,404	3,312	192	5,908
Georgia	W	--	--	--	3,222	W	76	3,369
Hawaii	83	242	W	--	W	W	280	1,021
Idaho	936	--	--	--	W	--	W	1,507
Illinois	77	--	--	--	W	244	W	362
Indiana	--	--	--	--	--	86	--	86
Iowa	12	--	--	--	W	W	--	61
Kansas.	11	--	--	--	--	--	--	11
Kentucky	--	--	--	--	W	--	--	W
Louisiana	W	--	--	--	2,787	--	W	3,852
Maine	1,727	--	--	--	3,393	444	148	5,711
Maryland	--	--	--	--	W	526	W	708
Massachusetts	221	--	--	--	W	2,015	W	2,376
Michigan	W	--	--	--	1,926	697	W	2,766
Minnesota	W	--	W	--	508	327	--	1,173
Mississippi	--	--	--	--	2,047	--	W	W
Missouri	--	--	--	--	--	--	W	W
Montana	W	--	--	--	W	--	--	105
Nebraska	--	--	--	--	--	--	--	--
Nevada	W	1,659	--	--	--	--	--	W
New Hampshire	406	--	--	--	881	181	--	1,468
New Jersey	W	--	--	--	--	1,298	W	1,331
New Mexico	--	--	--	--	--	W	--	W
New York	1,223	--	--	--	580	1,901	--	3,705
North Carolina	1,796	--	--	--	1,730	W	W	3,583
North Dakota	--	--	--	--	--	--	W	W
Ohio	W	--	--	--	380	W	--	408
Oklahoma	--	--	--	--	W	W	--	301
Oregon	W	--	--	--	571	W	--	1,009
Pennsylvania	350	--	--	--	806	1,761	--	2,917
Rhode Island	W	--	--	--	--	W	--	91
South Carolina	65	--	--	--	1,663	W	W	1,798
South Dakota	--	--	--	--	--	--	--	--
Tennessee	835	--	--	--	600	W	W	1,493
Texas	--	--	--	--	1,256	W	W	1,324
Utah	43	--	--	--	--	--	--	43
Vermont.	W	--	--	--	W	--	--	347
Virginia	78	--	--	--	1,536	739	9	2,361
Washington	477	--	--	--	662	W	W	1,350
West Virginia	808	--	--	--	--	--	--	808
Wisconsin	276	--	--	--	658	W	W	1,101
Wyoming	--	--	--	--	--	--	--	--
U.S. Total	**14,774**	**9,912**	**3,185**	**824**	**37,986**	**18,182**	**2,222**	**87,085**

[a] Includes wood, wood waste, wood liquors, peat, railroad ties, utility poles, and wood sludge.

[b] Includes municipal solid waste, landfill gas, digester gas, and methane.

[c] Other biomass includes agricultural by products/waste, solid byproducts, liquid acetonitrile waste, medical waste, straw, tires, fish oil, tall oil, sludge waste, and waste alcohol.

W = Withheld to avoid disclosure of individual company data.

Notes: Renewable data presented in this table differs slightly from that found in the Energy Information Administration's *Electric Power Annual 1997 Volume II* (Washington, DC, October 1998) due to slight differences in the definition of renewable energy sources. See Appendix A, Table A1 of this report for details. Totals may not equal sum of components because of independent rounding.

Source: Energy Information Administration, Form EIA-867, "Annual Nonutility Power Producer Report."

Table 8. Gross Renewable Generation for U.S. Nonutility Generating Facilities Attributed to Major Industry

Table 8. Gross Renewable Generation for U.S. Nonutility Generating Facilities Attributed to Major Industry Groups by Census Division, 1992 Through 1996 (Continued)

Groups by Census Division, 1992 Through 1996

(Million Kilowatthours)

Census Division	Agriculture/ Forestry	Mining	Paper and Allied Products[a]	All Other Manufacturing	Electric/ Sanitary Services[b]	Other Industry Groups	Total
				1992			
New England	--	--	4,135	170	6,807	--	11,112
Middle Atlantic	--	--	851	W	6,007	W	7,201
East North Central	--	--	1,978	W	1,352	W	3,637
West North Centra	--	--	509	109	W	W	1,006
South Atlantic	W	--	10,100	759	5,130	W	16,148
East South Central	--	--	5,054	W	W	--	5,156
West South Central	--	--	5,654	163	778	--	6,594
Mountain	--	--	607	W	1,799	W	2,631
Pacific	W	--	1,394	2,546	18,114	W	22,392
U.S. Total	**382**		**30,283**	**4,378**	**40,436**	**399**	**75,878**
				1993			
New England	--	--	4,094	176	7,317	--	11,588
Middle Atlantic	--	--	992	162	6,142	--	7,296
East North Central	--	--	1,951	W	1,710	W	4,071
West North Central	--	--	555	W	335	W	1,072
South Atlantic	W	--	10,155	706	4,869	W	15,877
East South Central	--	--	5,926	25	63	--	6,014
West South Central	--	--	5,700	274	1,363	--	7,338
Mountain	--	--	559	W	2,361	W	3,303
Pacific	W	--	1,022	2,396	20,947	W	24,660
U.S. Total	**349**	**--**	**30,955**	**4,191**	**45,107**	**615**	**81,219**
				1994			
New England	--	--	3,883	169	7,444	--	11,496
Middle Atlantic	--	--	W	W	6,675	--	7,814
East North Central	--	--	2,132	208	1,888	219	4,447
West North Central	--	--	W	169	415	W	1,167
South Atlantic	W	--	10,145	2,641	5,484	W	18,403
East South Central	--	--	6,774	1,077	69	--	7,920
West South Central	--	--	5,861	205	1,100	--	7,166
Mountain	--	--	550	W	2,383	W	3,242
Pacific	W	--	1,138	1,738	20,975	W	24,106
U.S. Total	**275**	**--**	**32,172**	**6,317**	**46,432**	**565**	**85,761**
				1995			
New England	--	--	3,796	32	7,832	--	11,660
Middle Atlantic	--	--	W	W	7,023	--	7,953
East North Central	--	--	2,096	214	2,126	287	4,723
West North Central	--	--	W	174	489	W	1,268
South Atlantic	W	--	9,950	2,458	5,976	W	18,536
East South Central	--	--	6,156	873	837	--	7,866
West South Central	--	--	5,782	286	1,087	--	7,155
Mountain	--	--	575	W	2,571	W	3,608
Pacific	W	--	1,190	1,231	21,558	W	24,316
U.S. Total	**313**	**--**	**31,036**	**5,370**	**49,500**	**866**	**87,085**

See notes at end of table.

Table 8. Gross Renewable Generation for U.S. Nonutility Generating Facilities Attributed to Major Industry Groups by Census Division, 1992 Through 1996 (Continued)

Census Division	Agriculture/ Forestry	Mining	Paper and Allied Products[a]	All Other Manufacturing	Electric/ Sanitary Services[b]	Other Industry Groups	Total
				1996			
New England	--	--	3,820	36	8,415	--	12,271
Middle Atlantic	--	--	896	W	7,846	W	8,764
East North Central	--	--	2,163	W	2,596	W	5,209
West North Central	--	--	526	W	548	W	1,255
South Atlantic	W	--	9,782	2,695	6,274	W	19,078
East South Central	--	--	6,163	936	830	--	7,928
West South Central	--	--	5,740	256	1,184	--	7,180
Mountain	--	--	509	W	2,611	W	3,655
Pacific	W	--	1,280	1,080	21,762	W	24,454
U.S. Total	**311**	**--**	**30,880**	**5,376**	**52,065**	**1,162**	**89,793**

[a] Includes SIC codes 2621 (paper mills) and 2631 (paperboard mills).

[b] SIC code 49 (electric, gas, and sanitary services).

W = Withheld to avoid disclosure of individual company data.

Notes: Renewable data presented in this table differs slightly from that found in the Energy Information Administration's *Electric Power Annual 1997 Volume II* (Washington, DC, October 1998) due to slight differences in the definition of renewable energy sources. See Appendix A, Table A1 of this report for details. For definitions of major industry groups, see Executive Office of the President, Office of Management and Budget, *Standard Industrial Classification Manual, 1987* (Washington, DC, 1987). Totals may not equal sum of components because of independent rounding.

Source: Energy Information Administration, Form EIA-867, "Annual Nonutility Power Producer Report."

Table 9. U.S. Electric Utility Purchases, Costs, and Average Price per Kilowatthour for Electricity Purchased from Nonutility Facilities and Utilities by Census Division and State, 1995

Census Division and State	Purchases (Million Kilowatthours)		Total Cost (Million Dollars)		Average Price (Cents/ Kilowatthour)	
	Nonutilities[a]	Utilities[b]	Nonutilities[a]	Utilities[b]	Nonutilities[a]	Utilities[b]
New England	**17,147**	**93,353**	**1,313**	**4,772**	**7.65**	**5.11**
Connecticut	3,507	15,308	285	539	8.13	3.52
Maine	3,466	9,121	320	356	9.23	3.91
Massachusetts	9,132	45,346	580	2,639	6.35	5.82
New Hampshire	1,033	9,086	128	509	12.35	5.60
Rhode Island	3	6,825	(*)	427	4.18	6.26
Vermont	7	7,667	(*)	303	6.11	3.95
Middle Atlantic	**48,386**	**113,805**	**3,023**	**3,329**	**6.25**	**2.93**
New Jersey	9,310	25,906	680	958	7.31	3.70
New York	31,176	52,445	1,904	1,307	6.11	2.49
Pennsylvania	7,900	35,454	439	1,064	5.55	3.00
East North Central	**10,114**	**139,439**	**538**	**3,947**	**5.32**	**2.83**
Illinois	258	23,944	4	748	1.6	3.12
Indiana	60	25,772	1	762	2.13	2.96
Michigan	9,592	20,986	527	615	5.49	2.93
Ohio	47	44,734	1	1,156	1.68	2.58
Wisconsin	157	24,003	5	666	3.16	2.78
West North Central	**483**	**134,418**	**17**	**3,889**	**3.54**	**2.89**
Iowa	45	14,459	3	459	5.73	3.18
Kansas	11	8,323	(*)	306	2.41	3.68
Minnesota	287	31,593	11	931	3.81	2.95
Missouri	17	41,946	1	1,087	5.05	2.59
Nebraska	45	22,783	1	647	1.92	2.84
North Dakota	39	8,242	1	245	2.42	2.97
South Dakota	39	7,073	1	214	1.61	3.02
South Atlantic	**24,568**	**238,694**	**1,519**	**10,078**	**6.18**	**4.22**
Delaware	69	5,538	5	179	7.97	3.23
District of Columbia	147	9,679	5	315	3.27	3.25
Florida	9,084	41,708	444	1,868	4.89	4.48
Georgia	313	46,937	33	2,003	10.50	4.27
Maryland	1,031	17,357	28	611	2.70	3.52
North Carolina	3,550	45,244	223	2,443	6.28	5.40
South Carolina	44	27,555	1	1,135	2.42	4.12
Virginia	9,737	37,987	742	1,311	7.62	3.45
West Virginia	593	6,690	37	213	6.29	3.18
East South Central	**366**	**180,041**	**5**	**6,831**	**1.45**	**3.79**
Alabama	238	32,565	2	1,216	0.99	3.73
Kentucky	(*)	39,763	(*)	1,253	2.00	3.15
Mississippi	50	24,965	1	996	1.74	3.99
Tennessee	79	82,748	2	3,366	2.66	4.07
West South Central	**20,678**	**120,563**	**647**	**4,228**	**3.13**	**3.51**
Arkansas	51	27,638	1	866	1.85	3.13
Louisiana	1,016	27,221	58	872	5.74	3.20
Oklahoma	3,595	14,502	222	486	6.18	3.35
Texas	16,017	51,201	365	2,005	2.28	3.92
Mountain	**8,481**	**75,661**	**407**	**2,428**	**4.80**	**3.21**
Arizona	29	15,022	1	493	1.81	3.28
Colorado	3,152	29,071	145	984	4.61	3.38
Idaho	496	3,392	28	79	5.61	2.33
Montana	570	5,476	24	148	4.19	2.70
Nevada	2,903	9,252	160	242	5.52	2.62
New Mexico	967	7,248	41	265	4.24	3.66
Utah	364	3,522	8	117	2.24	3.32
Wyoming	--	2,677	--	99	--	3.69

See notes at end of table.

Table 9. U.S. Electric Utility Purchases, Costs, and Average Price per Kilowatthour for Electricity Purchased from Nonutility Facilities and Utilities by Census Division and State, 1995 (Continued)

Census Division and State	Purchases (Million Kilowatthours)		Total Cost (Million Dollars)		Average Price (Cents/ Kilowatthour)	
	Nonutilities[a]	Utilities[b]	Nonutilities[a]	Utilities[b]	Nonutilities[a]	Utilities[b]
Pacific	**55,942**	**159,853**	**4,337**	**4,830**	**7.75**	**3.02**
Alaska	1	2,682	(*)	101	0.41	3.78
California	47,333	68,017	3,806	2,739	8.04	4.03
Hawaii	3,231	6	254	(*)	7.86	6.15
Oregon	964	41,323	62	909	6.41	2.20
Washington	4,413	47,825	216	1,079	4.89	2.26
U.S. Total	**182,934**	**1,253,138**	**11,551**	**44,230**	**6.31**	**3.53**

[a]Includes qualifying cogenerators, qualifying small power producers and other nonutility generators as defined for the Form EIA-867, "Annual Nonutility Power Producer Report."

[b] While the FERC Form 1 classifies power marketers as nonutilities, for purposes of this analysis, the "Utilities" category includes purchases from conventional utilities (investor-owned, cooperative, municipally-owned, Federal/State and other public utilities), power pools, power marketers, and utilities in Canada and Mexico as defined for the Form EIA-861, "Annual Electric Utility Report."

(*) Denotes less than one-half unit of measure.

Notes: Totals may not equal sum of components because of independent rounding.

Source: Federal Energy Regulatory Commission, FERC Form 1, "Annual Report of Major Electric Utilities, Licensees and Others," Energy Information Administration, Form EIA-412, "Annual Report of Public Electric Utilities," and Rural Utilities Service, RUS Form 7, "Financial and Statistical Report," RUS Form 12a through 12i, "Electric Power Supply Borrowers," and RUS Form 12c through 12g, "Electric Distribution Borrowers with Generating Facilities."

Table 10. U.S. Electric Utility Purchases of Renewable Electric Power from Nonutility Facilities by Energy Source, Census Division, and State, 1995

(Million Kilowatthours)

Census Division and State	Conventional Hydroelectric	Geothermal	Wind	Solar	Wood/Wood Waste[a]	Municipal Waste[b]	Other Biomass[c]	Total
New England	**995.50**	**--**	**--**	**--**	**3,024.25**	**3,482.47**	**307.11**	**7,809.33**
Connecticut	31.97	--	--	--	--	1,219.96	193.69	1,445.62
Maine	590.04	--	--	--	2,156.53	397.27	112.70	3,256.54
Massachusetts	184.95	--	--	--	126.16	1,698.71	0.71	2,010.53
New Hampshire	187.42	--	--	--	740.19	166.53	--	1,094.13
Rhode Island	--	--	--	--	--	--	--	--
Vermont	1.13	--	--	--	1.37	--		2.50
Middle Atlantic	**1,492.88**	**--**	**--**	**--**	**746.81**	**4,430.10**	**--**	**6,669.79**
New Jersey	10.92	--	--	--	--	1,118.31	--	1,129.24
New York	1,136.96	--	--	--	366.07	2,181.80	--	3,684.83
Pennsylvania	345.00	--	--	--	380.73	1,129.99	--	1,855.72
East North Central	**83.63**	**--**	**--**	**--**	**936.23**	**880.74**	**9.43**	**1,910.04**
Illinois	12.05	--	--	--	--	210.03	--	222.08
Indiana	--	--	--	--	--	43.86	--	43.86
Michigan	54.28	--	--	--	933.60	486.48	9.34	1,483.70
Ohio	4.73	--	--	--	2.46	20.60	--	27.79
Wisconsin	12.57	--	--	--	0.17	119.77	0.09	132.60
West North Central	**77.24**	**--**	**54.59**	**--**	**33.94**	**274.24**	**0.77**	**440.78**
Iowa	12.30	--	--	--	0.02	0.02	--	12.34
Kansas	10.35	--	--	--	--	--	--	10.35
Minnesota	54.59	--	54.59	--	33.92	274.22	--	417.32
Missouri	--	--	--	--	--	--	(*)	(*)
Nebraska	--	--	--	--	--	--	--	--
North Dakota	--	--	--	--	--	--	0.77	0.77
South Dakota	--	--	--	--	--	--	--	--
South Atlantic	**373.38**	**--**	**--**	**--**	**1,596.78**	**4,003.74**	**87.84**	**6,061.75**
Delaware	--	--	--	--	--	--	--	--
District of Columbia	--	--	--	--	--	--	--	--
Florida	--	--	--	--	228.88	2,796.64	83.35	3,108.86
Georgia	9.18	--	--	--	0.98	--	(*)	10.16
Maryland	--	--	--	--	--	436.75	--	436.75
North Carolina	30.27	--	--	--	347.91	35.51	--	413.70
South Carolina	54.95	--	--	--	390.79	48.85	--	494.59
Virginia	29.87	--	--	--	628.22	685.99	4.49	1,348.58
West Virginia	249.11	--	--	--	--	--	--	249.11
East South Central	**--**	**--**	**--**	**--**	**1.09**	**--**	**2.57**	**3.66**
Alabama	--	--	--	--	0.45	--	2.57	3.01
Kentucky	--	--	--	--	--	--	--	--
Mississippi	--	--	--	--	0.64	--	--	0.64
Tennessee	--	--	--	--	--	--	--	--
West South Central	**869.53**	**--**	**--**	**--**	**55.00**	**3.26**	**75.99**	**1,003.78**
Arkansas	--	--	--	--	49.66	0.23	--	49.89
Louisiana	869.53	--	--	--	--	--	75.89	945.42
Oklahoma	--	--	--	--	0.01	3.03	--	3.04
Texas	--	--	--	--	5.33	--	0.10	5.43
Mountain	**977.20**	**798.67**	**--**	**--**	**502.02**	**42.87**	**11.88**	**2,332.65**
Arizona	--	--	--	--	--	--	--	--
Colorado	84.99	--	--	--	--	42.87	--	127.87
Idaho	808.40	--	--	--	502.02	--	11.88	1,322.30
Montana	49.29	--	--	--	--	--	--	49.29
Nevada	19.13	798.67	--	--	--	--	--	817.81
New Mexico	--	--	--	--	--	--	--	--
Utah	15.38	--	--	--	--	--	--	15.38
Wyoming	--	--	--	--	--	--	--	--

See notes at end of table.

Table 10. U.S. Electric Utility Purchases of Renewable Electric Power from Nonutility Facilities by Energy Source, Census Division, and State, 1995 (Continued)

Census Division and State	Conventional Hydroelectric	Geothermal	Wind	Solar	Wood/Wood Waste[a]	Municipal Waste[b]	Other Biomass[c]	Total
Pacific	**2,604.22**	**7,647.72**	**2,862.46**	**784.72**	**2,738.18**	**2,227.95**	**955.52**	**19,820.76**
Alaska	--	--	--	--	0.47	--	0.06	0.53
California	1,954.67	7,647.72	2,856.67	784.72	2,328.84	1,659.44	843.89	18,075.95
Hawaii	31.51	--	5.78	--	0.57	344.05	110.54	492.45
Oregon	351.78	--	--	--	220.15	67.83	--	639.76
Washington	266.26	--	--	--	188.15	156.63	1.03	612.07
US Total	**7,473.59**	**8,446.39**	**2,917.04**	**784.72**	**9,634.31**	**15,345.38**	**1,451.10**	**46,052.54**

[a] Includes wood, wood waste, wood liquors, peat, railroad ties, utility poles, and wood sludge.

[b] Includes municipal solid waste, landfill gas, digester gas, and methane.

[c] Other biomass includes agricultural byproducts/waste, solid byproducts, liquid acetonitrile waste, medical waste, straw, tires, fish oil, tall oil, sludge waste, closed-loop biomass, and waste alcohol.

(*) Denotes less than one-half unit of measure.

Notes: Renewable data presented in this table differs slightly from that found in the Energy Information Administration's *Electric Power Annual 1997 Volume II* (Washington, DC, October 1998) due to slight differences in the definition of renewable energy sources. See Appendix A, Table A1 of this report for details. Totals may not equal sum of components because of independent rounding.

Source: Federal Energy Regulatory Commission, FERC Form 1, "Annual Report of Major Electric Utilities, Licensees and Others," Energy Information Administration, Form EIA-412, "Annual Report of Public Electric Utilities," and Rural Utilities Service, RUS Form 7, "Financial and Statistical Report," RUS Form 12a through 12i, "Electric Power Supply Borrowers," and RUS Form 12c through 12g, "Electric Distribution Borrowers with Generating Facilities."

Table 11. U.S. Electric Utility Costs of Renewable Electric Power Purchased from Nonutility Facilities by Energy Source, Census Division, and State, 1995
(Million Dollars)

Census Division and State	Conventional Hydroelectric	Geothermal	Wind	Solar	Wood/Wood Waste[a]	Municipal Waste[b]	Other Biomass[c]	Total
New England	**93.34**	**--**	**--**	**--**	**290.02**	**296.27**	**24.10**	**703.73**
Connecticut	2.62	--	--	--	--	102.44	15.46	120.53
Maine	57.86	--	--	--	192.50	45.71	8.56	304.64
Massachusetts	14.93	--	--	--	10.44	127.54	0.07	152.98
New Hampshire	17.90	--	--	--	87.05	20.58	--	125.53
Rhode Island	--	--	--	--	--	--	--	--
Vermont	0.02	--	--	--	0.03	--	--	0.05
Middle Atlantic	**129.09**	**--**	**--**	**--**	**53.19**	**215.63**	**--**	**397.91**
New Jersey	0.68	--	--	--	--	46.97	--	47.65
New York	105.10	--	--	--	22.94	105.33	--	233.37
Pennsylvania	23.31	--	--	--	30.25	63.33	--	116.89
East North Central	**2.91**	**--**	**--**	**--**	**61.42**	**38.10**	**0.52**	**102.95**
Illinois	0.19	--	--	--	--	3.21		3.40
Indiana	--	--	--	--	--	1.18	--	1.18
Michigan	2.19	--	--	--	61.36	29.13	0.52	93.19
Ohio	0.18	--	--	--	0.05	1.07	--	1.30
Wisconsin	0.36	--	--	--	0.01	3.52	0.01	3.88
West North Central	**2.59**	**--**	**3.06**	**--**	**0.94**	**12.20**	**0.01**	**18.82**
Iowa	0.61	--	--	--	(*)	(*)	--	0.61
Kansas	0.25	--	--	--	--	--	--	0.25
Minnesota	1.73	--	3.06	--	0.94	12.20	--	17.94
Missouri	--	--	--	--	--	--	(*)	(*)
Nebraska	--	--	--	--	--	--	--	--
North Dakota	--	--	--	--	--	--	0.01	0.01
South Dakota	--	--	--	--	--	--	--	--
South Atlantic	**24.37**	**--**	**--**	**--**	**104.88**	**175.70**	**6.97**	**311.91**
Delaware	--	--	--	--	--	--	--	--
District of Columbia	--	--	--	--	--	--	--	--
Florida	--	--	--	--	13.14	125.99	4.31	143.44
Georgia	0.43	--	--	--	0.02	--	(*)	0.45
Maryland	--	--	--	--	--	14.36	--	14.36
North Carolina	1.36	--	--	--	23.23	1.29	--	25.88
South Carolina	2.80	--	--	--	27.12	1.81	--	31.73
Virginia	1.47	--	--	--	41.37	32.24	2.65	77.72
West Virginia	18.32	--	--	--	--	--	--	18.32
East South Central	**--**	**--**	**--**	**--**	**0.08**	**--**	**0.40**	**0.48**
Alabama	--	--	--	--	0.07	--	0.40	0.46
Kentucky	--	--	--	--	--	--	--	--
Mississippi	--	--	--	--	0.01	--	--	0.01
Tennessee	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**
West South Central	**55.70**	**--**	**--**	**--**	**1.01**	**0.05**	**2.69**	**59.45**
Arkansas	--	--	--	--	0.92	(*)	--	0.92
Louisiana	55.70	--	--	--	--	--	2.69	58.39
Oklahoma	--	--	--	--	(*)	0.04	--	0.04
Texas	--	--	--	--	0.09	--	(*)	0.10
Mountain	**48.58**	**42.39**	**--**	**--**	**25.26**	**1.07**	**0.49**	**117.78**
Arizona	--	--	--	--	--	--	--	--
Colorado	3.75	--	--	--	--	1.07	--	4.82
Idaho	39.65	--	--	--	25.26	--	0.49	65.40
Montana	2.74	--	--	--	--	--	--	2.74
Nevada	1.46	42.39	--	--	--	--	--	43.85
New Mexico	--	--	--	--	--	--	--	--
Utah	0.98	--	--	--	--	--	--	0.98
Wyoming	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**

See notes at end of table.

Table 11. U.S. Electric Utility Costs of Renewable Electric Power Purchased from Nonutility Facilities by Energy Source, Census Division, and State, 1995 (Continued)

Census Division and State	Conventional Hydroelectric	Geothermal	Wind	Solar	Wood/Wood Waste[a]	Municipal Waste[b]	Other Biomass[c]	Total
Pacific	**155.96**	**951.36**	**336.38**	**124.02**	**394.64**	**223.05**	**143.40**	**2,328.81**
Alaska	--	--	--	--	--	--	--	--
California	111.84	951.36	336.03	124.02	367.18	185.34	134.67	2,210.43
Hawaii	1.77	--	0.36	--	0.03	29.39	8.69	40.24
Oregon	26.80	--	--	--	19.51	3.51	--	49.81
Washington	15.56	--	--	--	7.91	4.82	0.05	28.34
US Total	**512.55**	**993.74**	**339.45**	**124.02**	**931.45**	**962.06**	**178.58**	**4,041.84**

[a] Includes wood, wood waste, wood liquors, peat, railroad ties, utility poles, and wood sludge.

[b] Includes municipal solid waste, landfill gas, digester gas, and methane.

[c] Other biomass includes agricultural byproducts/waste, solid byproducts, liquid acetonitrile waste, medical waste, straw, tires, fish oil, tall oil, sludge waste, closed-loop biomass, and waste alcohol.

(*) Denotes less than one-half unit of measure.

Notes: Totals may not equal sum of components because of independent rounding.

Source: Federal Energy Regulatory Commission, FERC Form 1, "Annual Report of Major Electric Utilities, Licensees and Others," Energy Information Administration, Form EIA-412, "Annual Report of Public Electric Utilities," and Rural Utilities Service, RUS Form 7, "Financial and Statistical Report," RUS Form 12a through 12i, "Electric Power Supply Borrowers," and RUS Form 12c through 12g, "Electric Distribution Borrowers with Generating Facilities."

Appendix A

Renewable Electricity Purchased Power Prices Methodology

Renewable Energy Sources

Broadly, renewable energy includes any source that is regenerative or virtually inexhaustible. Thus, sources the Energy Information Administration (EIA) classifies as renewable are: wind, solar, photovoltaic, geothermal, hydropower, and biomass (See Table A1 for details.) Although the EIA collects no data specifically on the cost of producing renewable-based electricity, it and the Federal Energy Regulatory Commission (FERC) do collect some information on the prices utilities pay for the power they purchase.

The EIA collects a wide variety of information about the U.S. electric power industry. This includes detailed data on capability and generation for utilities (Forms EIA 759 and 860)[26] and nonutilities (Form EIA 867).[27] Though these annual surveys have no information on electricity prices, various Federal electric power industry financial surveys have this data. These include FERC Form 1, Form EIA-412, and the U.S. Department of Agriculture's Rural Utilities Service (RUS) forms. Each has information on electric utility power purchase quantities and prices paid.[28]

The main focus of this study is on renewable power sold by nonutilities reporting on the EIA-867 survey. The EIA-867 survey collects information, including power sales, from all nonutility generating facilities with a rated capacity of 1 megawatt or greater. Conventional hydroelectric facilities and a small number of other renewable facilities, all operated by electric utilities, are excluded from the study because of limitations on the data. By merging information from the EIA-867 survey with EIA's Financial Surveys Bulk Power Database,[29] data about capability, generation and the purchase price of renewable power could be assembled by certain characteristics, (e.g. renewable fuel type, industry grouping or SIC Code, geographic division, and QF status).

Methodology

The EIA does not explicitly collect price data for renewable electricity. Instead, prices were calculated by merging data sources and making certain assumptions to be explained here. In short, the Financial Surveys Bulk Power Database has information on the utilities' quantity of purchases and the total amount paid, but it does not identify the energy source. However, this information in the Financial Surveys Bulk Power Database can be linked to the EIA-867 nonutility survey, which does report data for energy source, sales to utilities, and the quantity of power sold.

To facilitate making the link between the two databases and to improve accuracy, certain procedures were adopted. First, renewable facilities reporting that they used renewable energy sources to generate power were identified from the EIA-867 survey. The names of the utilities sold to and the amount sold were identified. This information was then matched with the Financial Surveys Bulk Power Database, from which the utilities' reported purchases and amounts paid were taken. In cases where more than one energy source had been consumed in generation, the purchased quantity was allocated to type of energy source by using the appropriate proportion to the type of energy consumed for generation, according to Form EIA-867 survey data.

Some care was taken to match names of facilities in both databases using a dictionary of aliases and information

[26] Refers to Form EIA-759, "Monthly Power Plant Report," and Form EIA-860, "Annual Electric Generator Report."

[27] For facilities 1 megawatt or greater capacity reporting on Form EIA-867, "Annual Nonutility Power Producer Report."

[28] Refers to Federal Energy Regulatory Commission, FERC Form 1, "Annual Report of Major Electric Utilities, Licensees and Others," Form EIA-412, "Annual Report of Public Electric Utilities," and Rural Utilities Service, RUS Form 7, "Financial and Statistical Report," RUS Form 12a through 12i, "Electric Power Supply Borrowers," and RUS Form 12c through 12g, "Electric Distribution Borrowers with Generating Facilities."

[29] The Financial Bulk Power Database assimilates information from all Federal electric power industry surveys mentioned.

Table A1. Renewable Energy Sources

Water
Geothermal
Wind
Solar
Biomass
Wood/Wood Waste
Black Liquor
Peat
Railroad Ties
Red Liquor
Sludge Wood
Spent Sulfite Liquor
Utility Poles[a]
Wood/Wood Waste
Municipal Waste[b]
Digester Gas
Landfill Gas
Methane
Municipal Solid Waste
Other Biomass
Agricultural Byproducts/Waste
Closed Loop Biomass
Fish Oil
Liquid Acetonitrile Waste
Medical Waste
Sludge Waste
Solid Byproducts
Straw
Tall Oil
Tires
Waste Alcohol
Excluded
Paper Pellets
Pitch[c]

[a]In previous EIA reports, utility poles were included as an "other" nonrenewable source. Since the poles used in electricity generation are wood, they are included here as a renewable source.

[b]In previous EIA reports, digester gas and methane were included as "other" nonrenewable sources. Since these fuels are reported primariliy by waste treatment facilities, they are included here as renewables.

[c]In previous EIA reports, pitch was included as a wood source. However, since it is reported primarily by chemical companies, it is excluded here.

found in the National Renewable Energy Laboratory's Renewable Energy Plant Information System (REPIS), thus minimizing nonmatches.

Data Sources and Limitations

Surveys/Databases

"EIA 867 Nonutility Survey" refers to the Energy Information Administration, Form EIA-867, "Annual Nonutility Power Producer Report." "Financial Surveys Bulk Power Database" includes the merged Federal Energy Regulatory Commission (FERC), Form 1, "Annual Report of Major Electric Utilities, Licensees and Others," Energy Information Administration, Form EIA-412, "Annual Report of Public Electric Utilities," and Rural Utilities Service (RUS), Form 7, "Financial and Statistical Report," RUS Form 12a through 12i, "Electric Power Supply Borrowers," and RUS Form 12c through 12g, "Electric Distribution Borrowers with Generating Facilities." "REPIS" refers to U.S. Department of Energy, National Renewable Energy Laboratory, Energy Efficiency and Renewable Energy Network, Renewable Electric Plant Information System. "QF Filings" refers to the publicly available applications to FERC to obtain status as a "Qualified Facility."

Data Element Sources

Renewable Fuel Type, Installed Capacity, State: EIA 867 Nonutility Survey, REPIS, and QF Filings. Note: Facilities with more than half their generation from renewable energy were classified as renewable.

Qualified Facility Status: EIA 867 Nonutility Survey and QF Filings.

SIC Code and Generation: EIA 867 Nonutility Survey. Note: generation is allocated to fuel type according to the mix of reported energy units of fuel input to generation.

Electric utility sold to and quantity: EIA 867 Nonutility Survey

Electric utility purchases, amount, price, and generator purchased from: Financial Surveys Bulk Power Database. Note anomalies occurred in the price data when the utilities had some abnormality such as a high demand charge (take or pay contract) and a small amount purchased. Oddities also occurred when the price was low presumably waste disposal options with revenue from electricity sales a secondary objective.

Confidentiality Issues

Information found on the Form EIA 867 Nonutility Survey, Schedules III through VII, is held confidential

under the provisions of the Freedom of Information Act (FOIA). Hence, in tables R1-R8 information is withheld when there are three or fewer respondents in a table cell, or one respondent has more than 90 percent of the value in a cell.

Information on fuel type, though reported on Schedule II of the Form EIA-867, was obtained from two public sources, REPIS and FERC QF filings. Purchase price information was obtained from the EIA's Financial Surveys Bulk Power Database, which is nonconfidential. Thus, no data in tables R9-R16 were suppressed.

Limitations

Although EIA made every effort to include all nonutility purchased power data in this analysis, there are some gaps. The largest one is structural: the power one industrial firm sells to another. The Federal government does not collect data on power transactions between industrial firms. The amount of these purchases is unknown. Not having information on this sector is particularly unfortunate here, because such transactions are only made if both parties perceive there is a benefit to selling/purchasing power. Thus, they would represent a true look at nonutility power purchases made under the type of competitive conditions which some restructuring proposals hope to foster.

In addition, transactions involving nonutilities with hydropower and biomass-based generating facilities with capacity rated at less than 1 megawatt were excluded. This arises largely because the EIA-867 survey does not collect information from facilities under this threshold. REPIS does contain all facilities, including those with a rated capacity less than 1 megawatt, but it was judged too difficult to use, given the perceived benefit.

Another major limitation involves prices ascribed to power purchases from facilities with both renewable and non-renewable fuels. The EIA-867 fuel inputs are for total generation and not power sold, yet the utility costs used are for total power purchased. There is thus an unknown bias in the prices shown for multifuel facilities.

As indicated above, this analysis included all EIA-867 facilities which sold any renewable power to utilities. This has the effect of assigning to renewables purchased power costs which could be from principally nonrenewable facilities. Since renewable energy is perceived to be more expensive than nonrenewable energy, this process should cause renewable purchased power prices shown to be lower than what they might be in fact. The opposite approach was considered excluding all but "pure" renewable facilities. This approach would eliminate the price bias but would, in some cases, severely limit the amount of generation data available and call into question whether the average prices shown were truly representative. Finally, a small number of transactions could not be matched between the Bulk Power Database and the EIA-867/REPIS and were not useable for this analysis.

Regarding prices, EIA has insufficient data to examine prices in the level of detail desirable. For example, EIA data does not give any indication of the position on the load curve for electricity sold; thus, there is some inherent inaccuracy in some of the price comparisons made in this chapter. Ideally, one would match prices for an electricity purchase taking into account the power's position on the load curve as it was dispatched. For example, the price of renewable electricity meeting peak load would be compared with the price on non-renewable electricity meeting peaking load. Undoubtedly, the difference between these two statistics would be less than the comparisons made in this chapter in Figure 2. However, no data exists to make this comparison.

Also, it must be recognized that the prices presented here for 1995 represent a mixture of prices based on contracts signed in the mid-1980s and some that were renewed in the early 1990s. EIA has no data to permit separating "old" and "new" contracts. Finally, in cases where there were two or more energy sources consumed in generation, an average price common to all was assigned. To the extent fossil fuels were used in greater proportion compared to non-hydroelectric renewables, this may have understated renewable prices.

The above material relates to limitations on the availability and quality of data. In addition, the data need to be qualified in terms of what they represent. The financial data presented in this chapter represent *prices paid*, most often under the umbrella of avoided cost. These data should not be interpreted as representing the cost of generation, or the cost of generation plus a regulated mark-up. While (as indicated previously) PURPA's avoided cost philosophy was supposed to relate to the concept of cost, it was a cost projected up to 10 years in advance. The projections of conventional generating fuel prices, as mentioned earlier, were much higher than those which were realized. It is therefore not surprising that considerable anecdotal evidence in the biomass area strongly suggests that current actual generating costs, plus a reasonable return on investment, are much lower than comparable prices paid shown in this chapter.