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**ELECTRICITY USE IN THE PACIFIC NORTHWEST
UTILITY HISTORICAL SALES BY SECTOR
1989 & PRECEDING YEARS**

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SUMMARY

Electricity Use in the Pacific Northwest officially releases the compilation of regional 1989 retail customer sector sales data by the Bonneville Power Administration. This report is intended to enable detailed examination of annual regional electricity consumption. It gives statistics covering the time period 1970-1989, and also provides observations based on statistics covering the 1983-1989 time period.

The electricity use report is the only information source that provides data obtained from each utility in the region based on the amount of electricity they sell to consumers annually. Data is provided on each retail customer sector:

- residential • commercial • industrial
- direct-service industrial • irrigation

Other reports on electricity use typically examine electricity consumption trends by all utilities or by utility groups such as private and public utilities, and do not include sector breakdowns.

This report should be useful to utility practitioners who need to understand how much electricity is being used at the sector level or for what purposes. It lends dimension to the more highly aggregated descriptions of electricity use to help the reader begin to describe the underlying reasons for the more aggregated observations. For example, this document should enable the reader to describe why non temperature adjusted total electricity sales experienced 4.1 percent growth in

1988-1989 by observing how electricity was used by each retail customer sector.

The data in this report is compiled and presented annually by the End-Use Research Section in the Bonneville Power Administration to assist the agency in its various planning responsibilities ranging from conservation and generation planning to transmission planning. The data specifically supports forecasting activities, rate development, conservation and market assessments, and conservation and market program development and delivery. All of these activities require a detailed look at electricity use.

The electricity use report offers extensive graphic and tabular data on electricity consumption in all sectors for the years 1983-1989 and 1970-1989. Many views of the data are presented for users of the report, providing the opportunity to look at sector consumption from the perspectives of:

- the region
- utility groups
- states in the region
- Bonneville Area Offices

In addition, explanations are provided for the information illustrated in all the graphs, and observations are made about sector electricity use trends and reasons for those trends. Special graphs show annual heating degree days for 1983-1989, shares of commercial business type by floor area and number of buildings, and aluminum sales and prices for 1983-1989.

HIGHLIGHTS

- 1989 firm sales in the region totaled 17,183 aMW, a 4.1 percent increase from 1988 (4.0 percent when temperature adjusted).
- 1989 residential firm sales totaled 32.6 percent of the region's total firm sales; commercial firm sales totaled 21.6 percent; industrial firm sales totaled 41.4 percent; and irrigation firm sales totaled 3.3 percent.
- From 1983-1989 firm sales in the region averaged an annual increase of 493 megawatts, or 3.2 percent. For the same time period, the average annual increase when temperature adjusted was 484 megawatts, or 3.1 percent.

- From 1983-1989 firm sales average unadjusted growth in residential sales was 2.0 percent (adjusted growth, 1.9 percent); in commercial sales, 4.2 percent unadjusted growth (4.1 percent adjusted); in industrial sales (including DSIs) 3.8 percent; and in irrigation sales, 3.7 percent.
- Oregon saw the greatest percentage growth in electricity firm sales from 1988 to 1989 (4.5 percent), while Washington showed the highest annual average megawatt change in usage, 365 aMW.
- Snake River Area saw the greatest percentage growth in electricity firm sales from 1988 to 1989: 9.8 percent; Puget Sound Area had the largest energy use increase from 1988 to 1989: 110 aMW.

ACKNOWLEDGMENTS

This report was made possible by the efforts of many people in different offices within the Bonneville Power Administration. Special thanks go to the staff of the End-Use Research Section, Power Forecasting Branch, Area Economists and the Writer/Editor Pool.

ADDITIONAL COPIES

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Any requests for additional data summaries that would be useful, such as individual utility breakdown of electricity use by sector, also should be directed to Mary Lange.

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Bonneville Power Administration

SERVICE AREA BOUNDARIES

INTRODUCTION

This is the second formal document releasing the annual compilation by the Bonneville Power Administration (Bonneville, BPA) of electricity consumption statistics for the Pacific Northwest. The statistics have been coupled with observations and discussions of what appears to underlie the consumption trends found in the data. Also provided are descriptions of the regional pattern of consumption: where the growth is occurring and in which retail customer sectors.

Information about electricity use and especially observations about growth trends assist Bonneville in planning to meet its customers' power needs, plan and develop conservation programs, and provide customer service. Lately this information has grown even more important as the estimate of the level of the region's power surplus changed and planning procedures, such as transmission planning, have become more refined. For example, data about the levels of electricity consumption by sector and numbers of retail customers are important ingredients in helping Bonneville continue to satisfy diverse electricity needs in the future.

For purposes of this report, the Pacific Northwest (also referred to as the region) includes the states of Oregon, Washington and Idaho, the portion of Montana west of the Continental Divide, and the portions of Nevada, Utah and Wyoming that lie within the Columbia River drainage basin. The report emphasizes electricity use in Oregon, Washington, Idaho and western Montana. BPA divides the region into four service areas: Puget Sound, Lower Columbia, Upper Columbia and Snake River. (See service area boundary map on opposite page.) A discussion on BPA's Area Offices can be found on pp. 41-49.

Nearly 140 utilities supply electricity to consumers who use it in homes, businesses and industry, and on farms and ranches across the Pacific Northwest. For purposes of this report, the utilities are divided into three groups: private utilities (also called investor-owned utilities), public generating utilities public non-generating utilities. The generating utilities are typically distinguished by their capacity to generate electricity (even though

some non-generating utilities have small amounts of their own generation to serve customers). All utilities considered generating utilities by Bonneville are members of the Northwest Power Pool.

The sales history of all utilities is examined in this report, regardless of whether they receive power from their own generation, transfers from other utilities, or from the federal power system. This report also looks at sales to direct-service industries (DSIs), a group of industrial plants served directly by Bonneville and federal agencies that are also primarily served directly by Bonneville.

As of 1989, Bonneville and utilities in the region served more than 4 million retail electricity customers. Table 1 shows the number and type of utilities in the region, their energy sales, and the number of retail customers they serve as well as the number of Bonneville directly served industries and federal agencies.

TABLE 1

Pacific Northwest Region
By Utility Groups & BPA Direct-Service

1989			
Type	Number in Region	Firm mW*	Number of Retail Customers
<u>Utilities</u>			
Public			
Generating	9	3,580	815,518
Non-Generating	120	2,962	871,359
Private	8	7,935	2,477,689
Subtotal	137	14,477	4,142,866
<u>BPA Direct-Service</u>			
Direct-Service Industries	17	2,518	17
Federal Agencies, including the U.S. Bureau of Reclamation	21	188	50
Subtotal	38	2,706	67
TOTAL	175	17,183	4,142,933

* Numbers are not temperature adjusted
(See pp. 7-12 for temperature adjusted information)

WHAT'S IN THE REPORT

- ★ 1989: The Year in Review
- ★ 1988-1989 Changes
- ★ 1983-1989 Electricity Consumption Trends
- ★ Number of Retail Customers and Average Energy Use, 1989 & 1983-1989
- ★ Electricity Sales by State
- ★ An Area Office Look at Electricity Sales for Public Utilities
- ★ Glossary
- ★ Appendix: A Look at the Past, 1970-1989

This report is structured to provide a variety of different views of electricity consumption in the Pacific Northwest. Graphics summaries are provided on:

- sales in the region as a whole
- public and private utility sales
- sector sales
- Bonneville direct sales to industries and to federal agencies
- number of retail customers served and average kilowatt use per customer
- distribution of sales by PNW state and by BPA Area Office

1989: THE YEAR IN REVIEW

The 1989 sales data provides the opportunity to focus on sales activity in the past year. Graphics illustrate the region's growth in electricity usage and the utility group shares in that growth in all retail customer sectors for the time period January 1989 - December 1989.

1988-1989: CHANGES

The graphics and text enable the reader to see 1989 electricity use in light of 1988 use. The 1989 sales also establish guideposts for seeing how 1989 sales stack up against consumption trends over longer periods of time.

1983-1989 ELECTRICITY CONSUMPTION TRENDS

Detailed information for the period 1983-1989 provides an opportunity to look at longer term consumption trends. The period 1983-1989 was isolated because utility classification of industrial and commercial retail customers stabilized after 1982, allowing ready comparison of these sectors across utilities.

Information is provided on weather and its departure from what has been defined as normal weather to enable the reader to assess the relative impacts of weather-induced load fluctuations and other load growth more strictly economic-influenced (such as the purchase of new appliances). The weather information was also used to develop adjusted sales data--data that has had the weather effects netted out.

Finally, explanations are provided for what seems to underlie the observed consumption trends. Such things as commercial businesses and specific industries are reviewed. For those interested in seeing changes in usage prior to the 1983-1989 period, the appendix presents tables containing electricity sales spanning the time period 1970-1989.

NUMBER OF RETAIL CUSTOMERS AND AVERAGE ENERGY USE, 1989 & 1983-1989

The data on the number of retail customers within the region is given by region, by state and by Area Office. They are further broken down by public and private utility groups, and by sector (residential, commercial, industrial and irrigation). The average kilowatt usage per retail customer is also provided. The graphics compare the average kilowatt usage for each sector for the time period 1983-1989. Since boundary lines of the private utilities cross over Area Office boundaries, only data for the public utilities is provided when looking at the Area Offices.

ELECTRICITY SALES BY STATE, 1983-1989

A further perspective on usage is gained by looking at geographical distribution of electricity sales over a seven-year period. The graphics respond to frequent information requests. Usage is shown for Washington, Oregon, Idaho

and western Montana. The summaries are for each state as a whole and then for utility groups within each state.

AN AREA OFFICE LOOK AT ELECTRICITY SALES BY PUBLIC UTILITIES, 1983-1989

Bonneville Area Offices deliver electricity and related services to utility customers in the Puget Sound, Lower Columbia, Upper Columbia and Snake River areas. These offices serve as Bonneville's main contact with customers, government agencies and the general public in developing and implementing Bonneville policies and programs. A look at public utility electricity sales in each Area shows where loads are growing and the relative importance of each sector within each area.

Most private utility boundary lines cross over Bonneville's Area Office boundaries, making it difficult, if not impossible, to compare private utility sales within the Area Offices. However, most public utility boundary lines stay within Bonneville's Area Office boundaries. For those utilities that do cross over (e.g., Hood River Electric Cooperative) only a small percentage of the Area sales is affected.

GLOSSARY

The Glossary provides definitions of terms as they are used in this report.

APPENDIX: A LOOK AT THE PAST 1970-1989

Statistics are given for electricity use for the years 1970-1989. A quick look also is taken at growth rates for the years 1970-1989.

Diskettes are available upon request of all tables in the Appendix.

HOW TO USE THIS REPORT

This electricity use report allows tracking of past electricity sales in each sector by different utility groups and in the various geographic areas in the region (state, Area Office service area). Such tracking can reveal correlations between sales and customer groups in different

areas of the region that may have important policy and planning implications.

Knowledge of how segments of the population are using electricity can help in planning and designing programs to reach those segments. Knowledge of past sales to different electricity market segments can also help in the assessment of opportunities to conserve electricity and in the design of programs for conservation.

DATA SOURCES

The sector data in the electricity use report is compiled mostly from unaudited Financial and Operating reports prepared annually by each utility in the region. This data is based on the amount of electricity sold to each utility's customers.

Bonneville's Office of Energy Resources produces the Electricity Use Report (EUR) which focuses on the amount of electricity delivered or sold to the ultimate consumer (sales) and the Monthly Load Comparison (MLC) report which focuses on the amount of electricity generated or the amount delivered to the utility (load).

The MLC looks at current and historical rates of growth. The sales growth numbers in the electricity use report do not correspond exactly to the numbers reported in the MLC. Discrepancies between the two reports, including the difference in data sources, are described below.

First, as described above, the sources of data for the two reports differ. The electricity use report focuses on electricity use by sector based on data from electricity bills sent to retail customers by utilities. The MLC focus is on electricity use by utility grouping and is based largely on wholesale electricity bills sent to utilities and direct-service customers by Bonneville. These electricity bills are the best

source of quickly available data for immediately ascertaining electricity use trends. Sector level electricity use is not available for preparation of these bills and is not used in the MLC

Second, the two sources of information represent two distinctly different summaries of consumption. The electricity use report illustrates what has been delivered to the customer's door; the MLC represents what has been delivered to or in some cases generated by utilities to meet customer needs.

The differences between the two summaries represent distribution losses--losses that occur when electricity is delivered over utility distribution lines to the customer's door. These losses vary with weather, outages and intensity of use (line loading), and can result in the two data sets yielding different growth rates.

Third, each report is based on data summarized over different time periods. The electricity use report presents sales information based on a billing year for each individual

customer in the region. Since utilities generally stagger the reading of meters throughout each month, the reported billing year sales for each customer seldom corresponds to calendar year consumption. The MLC, on the other hand, is based on data that does not entail individual meter readings for each customer and therefore is more closely aligned to true calendar months and years.

The different data sources used in each report result in only small discrepancies between the growth rates derived from each. These discrepancies are not critical since the numbers in the electricity use report are not offered as absolute but rather as indicators. The numbers indicate relative sector shares; relative sales activity by different utility groups (private, generating public, non-generating public) in the region and by Bonneville in its direct-service sales; and perhaps most importantly, the distribution of sales within the region. These sector breakdowns make it easier to observe and explain trends in different electricity market segments.

REGIONAL ELECTRICITY SALES GROWTH AT A GLANCE

For quick reference, Table 2 below shows average annual firm sales growth in the Pacific Northwest, from 1986 to 1989 and from 1983 through 1989. Figure 1, on the next page, gives primary factors affecting sales growth.

TABLE 2
Region Average Annual Firm Sales Growth*

By Sector	1988-1989 (aMW)	1988-1989 (Percent Growth Rate)	1983-1989 (aMW)	1983-1989 (Percent Growth Rate)
Residential	264	4.8	108	2.0
Commercial	170	4.6	139	4.2
Industrial	156	4.3	112	3.1
DSI (Firm)	17	3.4	110	5.2
Irrigation	- 3	- 0.5	19	3.8
Total Sales	672	4.1	493	3.2

* Based on actual observed data (not temperature adjusted). For temperature-adjusted data see Table 4 (1988-1989) on page 7, and Table 5 and Figure 4 (1983-1989) on page 9.

FIGURE 1
Primary Factors Affecting Growth

▣ Residential	• growing regional economy• weather• population increase• energy conservation• relative fuel prices• electricity rate increases
▣ Commercial	• growing regional economy• weather• service sector growth• increased amenity levels• increased use of electronic equipment• energy conservation• electricity rate increases
▣ Industrial	• growing regional economy• energy conservation• electricity rate increases
▣ Direct-
Service
Industrial	• electricity rate/use of existing capacity• energy conservation/modernization• stronger economy/aluminum prices
▣ Irrigation	• growing regional economy• energy conservation• amount of rainfall• price of farm products• electricity rate increases

1989: THE YEAR IN REVIEW

1989 Highlights

- ▶ *Private utilities showed the largest share of sales in all sectors*
- ▶ *Industrial sector sales (including DSIs) were greater than sales to any other sector*

Electricity sales information is presented in Table 3 for those who wish to concentrate on electricity use for only 1989. The summary information shows the relative magnitude of electricity use for the whole region, each sector by utility group and directly served customers.

TABLE 3

Regional Sales
By Utility Groups & BPA Direct-Service
1989

Type	aMW*	Percent of Regional Total
<u>Public:</u>		
Residential	2,605	14.6
Commercial	1,588	8.9
Industrial —		
Industrial Firm	1,912	10.7
Industrial Non-firm	2	**
Industrial Colockum***	171	1.0
Irrigation	266	1.5
Subtotal	6,544	36.7
<u>Private:</u>		
Residential	3,201	18.0
Commercial	2,268	12.7
Industrial —		
Industrial Firm	2,150	12.1
Industrial Non-firm	146	0.8
Irrigation	316	1.8
Subtotal	8,081	45.4
<u>Directly Served Customers:</u>		
Direct-Service Industrial —		
Firm	2,518	14.1
Non-firm	486	2.7
Federal Agency/US Bureau of Reclamation	188	1.1
Subtotal	3,192	17.9
REGIONAL TOTAL	17,817	100.0

* Numbers are not temperature adjusted
(See pp. 7-12 for temperature adjusted information)

** Less than 1/10 of a percent

*** Colockum is a subsidiary company owned by ALCOA (See glossary for a more detailed definition)

A look at the sales by sector shows that in 1989 regional industries (including DSIs) consumed the most electricity: the 7,385 aMW sold to industrial users by BPA and the region's retail utilities made up 41.4 percent of all electricity sales in the region in 1989. Residential consumers used 5,806 aMW, or 32.3 percent of the electricity sold during 1989. The commercial sector used 4,044 aMW (22.7 percent of total sales), and irrigators consumed 582 aMW (3.3 percent of total sales).

1988-1989: CHANGES

1988-1989 Change Highlights

- ▶ *Regional electricity usage grew 4.1%, unadjusted; 4.0%, temperature adjusted*
- ▶ *Commercial and residential were the fastest growing sectors with residential the most important sector for public utilities, and commercial most important for private utilities.*

The 1988-1989 sales summary narrative and graphics are presented for those interested in a quick assessment of regional changes in electricity use from 1988 to 1989. Information is provided specifically for the the region as a whole, utility groups, and each sector.

From 1988 to 1989, the region's electricity use (not temperature adjusted) increased by 672 average megawatts, or 4.1 percent. The data collected shows the following sector growth rates: residential sector energy use grew by 4.8 percent; commercial sector use by 4.6 percent; industrial sector use by 4.3 percent; and irrigation sector use decreased 0.5 percent. After temperature adjustment, however, residential drops to 4.6 percent growth and commercial increases to 4.8 percent growth.

Temperature adjustment of sales can be important to avoid confusion of changes in use due to harsh weather and changes in use due to other factors, such as increased use by existing customers or the addition of new customers. No temperature adjustments were made for the industrial and irrigation sectors

since only a very small amount of their energy usage is affected by temperature. For a discussion on temperature adjustment see *Weather & Temperature Adjustment*, on page 10.

Table 4 shows the regional firm sales growth (both actual and temperature adjusted) in average megawatts and percentages from 1988 to 1989 and indicates that the residential and commercial sectors experienced the most significant growth.

TABLE 4

1988-1989 Regional Firm Sales				
Sector	Average Annual MW Increase		Average Growth Rate	
	Unadj	Adj*	Unadj	Adj*
Residential	264	255	4.8%	4.6%
Commercial**	170	172	4.6%	4.8%
Industrial	166	166	4.3%	4.3%
DSI	83	83	3.4%	3.4%
Irrigation	-3	-3	-0.5%	-0.5%
Total***	672	665	4.1%	4.0%

* Temperature adjusted
 ** Commercial includes street lighting and public facilities
 *** Total includes Colockum and federal agencies/USBR

Figure 2 shows growth (actual and temperature adjusted) in electricity use in the region, by public and by private utilities.

Figure 3 shows electricity use growth (actual) in the region, by generating and by non-generating public utilities.

FIGURE 2

FIGURE 3

1983-1989 ELECTRICITY CONSUMPTION TRENDS

Highlights

- ▶ *Regional average annual growth rate was 3.2% unadjusted (increase of 493 aMW) and 3.1% temperature adjusted (484 aMW increase)*
- ▶ *Residential was the slowest growing sector in percentage terms, both unadjusted and temperature adjusted, even though from 1988 to 1989 it was among the fastest growing*
- ▶ *Commercial saw the most growth in average megawatts, both unadjusted and temperature adjusted*
- ▶ *Direct-Service Industries saw the fastest percentage growth*

A detailed picture of trends in regional and utility group energy consumption for the period 1983-1989 places 1989 Pacific Northwest electricity use in context with several years of history. (For a look at total growth in energy consumption over a much wider range in time, 1970-1989, see the Appendix.)

The post-1982 period was chosen as the focus for observing trends since in 1983 Rural Electrification Administration utilities changed the way they classify commercial and industrial customers. A focus beginning with 1983 eliminates the difficulty of merging data from before and after the change in classifications.

Discussions included to give a complete picture of electricity use are:

- Distribution of consumption in the region and by utility group
- Weather and temperature adjustment
- Electricity use by sector
 - Residential
 - Commercial
 - Industrial
 - Industrial sales by retail utilities
 - BPA direct-service industrial sales
- Irrigation

The impacts of adjusting for departures from normal weather can be seen in the regional table (Table 5) and in the public and private utility group sales growth plot (Figure 4). In discussions of residential and commercial sales trends for 1983-1989, tables are presented showing both unadjusted and adjusted sales. See the sidebar entitled *Weather and Temperature Adjustment* and accompanying Figure 6, on page 10, for further information on how adjusted and unadjusted figures are derived.

By use of graphics and narrative, each sector discussion covers:

- Composition of the sector
- Observations on recent trends
- Geographical distribution of electricity use
- Factors affecting consumption

In the industrial sector discussion, the industries served directly by BPA are looked at separately from industries served by retail utilities. Because the aluminum company portion of direct-service industries (DSIs) uses a large amount of electricity, the seven-year sales summary for DSIs is split into aluminum and non-aluminum companies. Total DSIs are further broken down into firm and nonfirm sales. A graph tracks aluminum sales and prices for 1983 to 1989.

DISTRIBUTION OF ELECTRICITY CONSUMPTION IN THE REGION AND BY UTILITY GROUP

The region overall experienced a fairly moderate rate of growth over the 1983-1989 period, with growth accelerating from 1987 to 1989. After accounting for weather influenced fluctuations, the largest contributor to regional growth during the 1983-1989 period was increased use of existing capacity by direct-service industries.

From 1983-1989 the residential sector averaged the slowest percentage growth of all sectors (both unadjusted and temperature adjusted). However, in 1988 and 1989 residential use increased at a faster rate than the 1987-1988 and 1988-1989 regional average.

Table 5 shows the regional firm sales growth ► (both unadjusted and temperature adjusted) in average megawatts and by percentages by sector and for the region as a whole for the time period 1983-1989.

Figure 4 shows public and private utility sales growth rates (actual and temperature adjusted) by sector and makes it possible to determine relative changes over the time period, 1983-1989. Figure 5, which shows actual growth rates, makes possible a comparison for generating and non-generating public utilities.

FIGURE 4

TABLE 5

1983-1989 Regional Firm Sales				
Sector	Average Annual MW Increase		Average Growth Rate	
	Unadj	Adj*	Unadj	Adj*
Residential	108	105	2.0%	1.9%
Commercial**	139	133	4.2%	4.1%
Industrial	112	112	3.1%	3.1%
DSI	110	110	5.2%	5.2%
Irrigation	19	19	3.8%	3.8%
Total***	493	484	3.2%	3.1%

* Temperature adjusted
 ** Commercial includes street lighting and public facilities
 *** Total includes Colockum and federal agencies/USBR

FIGURE 5

Weather is a major factor affecting sales to the residential and commercial sectors. (See *Weather & Temperature Adjustment*, page 10). Comparison of temperature adjusted annual residential and commercial sales with non-temperature adjusted (actual observed) sales gives a picture of how much annual sales

Weather & Temperature Adjustment

Weather (used when referring to outdoor temperatures in this report) has significant impacts on electricity use, specifically in the residential and commercial sectors. Electricity use in these two sectors would typically be lower in a mild year than in a year that had harsher temperatures. If temperatures fluctuate from cold to mild year to year, observations about longer term electricity use trends are difficult if not impossible to develop. It is therefore important when looking at electricity use across several years to take weather into consideration. This is typically done by adjusting annual electricity use to remove the effects of temperature extremes and reflect common temperatures.* A normal, or "typical", weather year is often chosen for adjustment.

Over the 1983-1989 time period, the region experienced five years of warmer and two years of colder than normal weather (shown in Figure 6). These observations are based on heating degree days, a convenient way of summarizing annual temperatures.

The development of the temperature adjustment for the commercial sector differs somewhat from that of the residential sector. The difference arises because of the large influence that air conditioning has in the commercial sector. Temperature adjustment for commercial sales takes into account air conditioning use during two hotter than normal summers in 1984 and 1985.

* Note: The temperature adjustments in this document are based on methods, which can be reviewed upon request, that use approximations of the actual impacts of temperatures on electricity use and are subject to refinement as other data and methods are developed.

FIGURE 6

changes are due to fluctuations resulting from weather and how much changes are due to other factors that affect usage.

Figure 7 provides a picture of changes in electricity use by sector for the region. Rapid electricity rate increases during the early 1980s, energy conservation and a growing regional economy were important factors in

electricity sales to all sectors. Additional factors in sales were: population increase and relative fuel prices in the residential sector; service sector growth, increased amenity levels and increased use of electronic equipment in the commercial sector; increased use of existing capacity and aluminum prices in direct-service industries, and amount of rainfall and price of farm products in the irrigation sector.

FIGURE 7

(Avg MW)	1983	1984	1985	1986	1987	1988	1989
Residential:							
Temp Adj	5,211	5,369	5,369	5,442	5,407	5,586	5,841
Unadj	5,156	5,458	5,661	5,369	5,271	5,542	5,806
Commercial:							
Temp Adj	2,975	3,151	3,244	3,354	3,467	3,603	3,775
Unadj	3,020	3,020	3,407	3,425	3,537	3,686	3,856
Industrial	3,390	3,520	3,570	3,640	3,768	3,896	4,062
Irrigation	467	475	556	523	555	585	582

Table 6 shows electricity use statistical data (adjusted and unadjusted) for public and private utility groups by sector. Industrial sales are

broken down into retail utilities and direct-service industry sales by BPA.

TABLE 6

Public and Private Firm Sale Trends By Sector, 1983-1989

(Avg MW)

Residential

	Unadjusted	Temperature Adjusted
Public		
1983	2,237	2,266
1984	2,383	2,334
1985	2,514	2,354
1986	2,379	2,419
1987	2,327	2,398
1988	2,464	2,485
1989	2,605	2,626
Private		
1983	2,919	2,945
1984	3,075	3,035
1985	3,147	3,015
1986	2,990	3,023
1987	2,944	3,009
1988	3,078	3,101
1989	3,201	3,215

Commercial

	Unadjusted	Temperature Adjusted
Public		
1983	1,240	1,222
1984	1,344	1,311
1985	1,415	1,347
1986	1,410	1,381
1987	1,442	1,415
1988	1,521	1,488
1989	1,588	1,548
Private		
1983	1,780	1,754
1984	1,891	1,840
1985	1,992	1,897
1986	2,015	1,973
1987	2,095	2,053
1988	2,165	2,115
1989	2,268	2,227

Industrial

	Actual
Public	
1983	1,587
1984	1,662
1985	1,720
1986	1,767
1987	1,788
1988	1,840
1989	1,912
Private	
1983	1,803
1984	1,858
1985	1,850
1986	1,873
1987	1,980
1988	2,056
1989	2,150

Irrigation

	Actual
Public	
1983	215
1984	224
1985	259
1986	244
1987	256
1988	263
1989	266
Private	
1983	252
1984	251
1985	297
1986	279
1987	299
1988	322
1989	316

Direct-Service Industries

1983	1984	1985	1986	1987	1988	1989
1,860	2,458	2,068	1,885	2,065	2,435	2,518

RESIDENTIAL SECTOR

In the Pacific Northwest, the residential sector uses more electricity and has more retail customers than any other sector. In 1989, 32.6 percent of total regional firm sales were made to 3,611,336 residential customers. During the period 1983-1989, residential sector firm sales in the region grew at an average annual rate of only 2.0 percent compared to the region's firm sales average annual growth rate of 3.2 percent.

Residential retail customers are concentrated west of the Cascades. Urban areas accounted for 81.0 percent of regional residential sales and 80.6 percent of those sales were in the state of Washington in 1989. The residential sector encompasses all residential, farm, apartment and seasonal dwellings with such uses as space and water heating, cooking and lighting.

Nearly half of all energy used in homes is for space and water heating; most of the rest is used for refrigeration, freezing, cooking and lighting. Table 7 presents electricity use shares by equipment category.

The numbers in Table 7 are estimated shares rather than directly metered shares. The estimates are from the Joint 1989 Long Term Forecast.* These shares are intended as an illustration of how electricity is used in homes.

In addition to how electricity is used, residential sales are also categorized by one of three housing types: Single Family (1-4 units), Multifamily (more than 4 units) and Manufactured Housing. Table 8 shows the relative share of total residential firm sales for each housing type in 1988. (Statistics for 1989 are not available at this time.) The estimates in Table 8, as in Table 7, are from the Joint 1989 Long Term Forecast.*

* The 1989 Long Term Forecast was a joint effort of Bonneville Power Administration and the Northwest Power Planning Council.

TABLE 7

Shares of Residential Use
By Category of Equipment, 1988

Equipment Category	Percent Share
Space heat	25.2
Air conditioning	1.1
Water heat	25.6
Refrigeration	11.8
Freezers	3.6
Cooking	5.9
Lighting	4.6
Miscellaneous	22.2

TABLE 8

Shares of Total Residential Firm Sales
By Type of Home, 1988

Residence Type	Percent Share
Single Family	79.0
Multifamily	11.0
Manufactured	10.0

Recent Residential Sector Trends

While total regional firm sales (not adjusted for temperature) have continued to grow at a moderate rate over the last seven years--3.2 percent annually--the residential sector has shown a more modest growth rate of 2.0 percent annually for the same period. When the data is temperature adjusted, the six-year residential growth rate is 1.9 percent and the region's is 3.1 percent. On a percentage basis, residential sector electricity sales have been growing more slowly than sales to any of the other sectors.

Adjustment for Temperature Effects

Outdoor temperatures have a significant impact on residential sales, since 25.2 percent of residential electricity use is for space heating. In a mild year, residential sales will be noticeably lower than in a year with a harsh winter, all other use factors being equal. Because temperature effects vary from year to year without a systematic pattern and can mask other longer term trends that may affect residential electricity sales it is useful to adjust sales to reflect a "typical", or normal, weather

year in order to remove the effects of temperature extremes.

Over the 1983-1989 time period, the region experienced five years of warmer than normal and two years colder than normal weather, as measured by annual Heating Degree Days. (An explanation of weather and temperature adjustment can be found on page 10.)

Table 9 shows actual observed (non-temperature adjusted) residential and total regional firm electricity sales--percentage growth and average megawatt (aMW) gain--contrasted with temperature-adjusted sales for 1988-1989 and 1983-1989.

behavior, and the efficiency of the home, perhaps the largest single determinant of residential electricity consumption is the type of fuel used for space heating and water heating.

Fuel choice for space and water heating in new homes depends primarily on the relative prices of the various heating systems and fuels. Because the price of electricity relative to competing fuels (principally natural gas) has been increasing over the last six years, some utilities are experiencing a shift away from electric space and/or water heat in new single-family homes. This trend is more pronounced in areas served by private utilities, where the difference in price between electricity and natural gas is greatest.

TABLE 9
Residential Sector and Regional Firm Sales
Unadjusted and Temperature Adjusted Growth

	Residential Sector		Regional Total*	
	1988-1989	1983-1989	1988-1989	1983-1989
Growth Rate (%)				
Unadjusted	4.8	2.0	4.1	3.2
Adjusted	4.6	1.9	4.0	3.1
Average Annual Growth (aMW)				
Unadjusted	264	108	672	493
Adjusted	255	105	665	484

* Regional total = all sectors, including residential.

Residential sales over the 1983-1989 period, adjusted for temperature effects, grew at an average annual rate of 1.9 percent while the number of households grew at an average annual rate of 2.0 percent. Adjusted electricity sales to the residential sector grew at a much slower rate than total regional sales (1.9 percent vs. 3.1 percent). The slower growth of residential sales compared to number of households can be attributed to two primary factors:

- the effect of energy prices on fuel choice
- increased energy efficiency of homes and appliances

Effect of Energy Prices

While the factors affecting electricity consumption in a home include weather, the number and type of appliances, occupant

Rising relative electricity prices have also had an impact on fuel choice in *existing* homes, including more wood heat use and switching from electric to natural gas water heaters. The early 1980s saw both sharp increases in electricity prices and an economic recession in the region. During this time, use of wood heat rose sharply in single-family homes with electric space heating, as consumers attempted to lower their electricity bills.

More recently, growth in use of wood heat appears to have slowed due to stabilizing electricity prices and improved household incomes associated with economic recovery. Some other recent contributing factors may be environmental issues and safety, wood and wood stove cost, and personal effort issues associated with wood use.

In contrast to new single-family homes, the

percentage of new multifamily units using electric space heating equipment over the last six years has remained relatively constant, at 90 to 95 percent. One contributing factor to this constancy is that multifamily units are smaller than single-family homes and generally have common walls, thus annual heating bills are relatively lower. Also, natural gas heat generally costs more to install in multifamily units than does electric heat. Given lower multifamily heating requirements, this additional initial cost takes longer to recover in operating cost savings than in single-family homes. There is therefore less incentive to move toward other fuels for heating.

Another factor contributing to the relatively high percentage of new multifamily units with electric space heat is that owners of multifamily units who decide on equipment types are not the actual consumers of electricity. As a result they do not face the electric bills associated with heating but rather seek to minimize the initial capital cost of installing the heating equipment, and therefore install comparatively inexpensive electric baseboard heating systems.

Energy Efficiency of Homes and Appliances

Efficiency improvements have also contributed to the low rate of growth in residential electricity sales. Significant energy efficiency gains have occurred in both new and existing houses since the early 1980s.

Adoption of more stringent state building codes and promotion of the Model Conservation Standards (MCS) through the Super Good Cents and Northwest Energy codes (formerly Early Adopters) programs have improved new home efficiencies. Utility sponsored weatherization as well as labeling of major household appliances with their predicted annual energy consumption also have improved efficiency in existing homes. Rankings of appliances by their efficiencies has also helped to increase the efficiency of the region's appliance stock by assisting consumers to make better informed purchasing decisions.

Residential Firm Sales Trends By Utility Group

Figure 8 shows residential firm sales by

utility group over the past seven years in average megawatts (both unadjusted and adjusted for temperature). In the same figure, public utility sales are also broken down into sales by generating and non-generating utilities.

The relative shares of residential sector electricity sales by public and by private utilities have changed little over the past seven years. The six-year average annual sales growth rate differs slightly for the two groups: 1.6 percent for private and 2.6 percent for public utilities. However, public utility growth during the last year (as in 1987-1988) outpaced private utility sales growth. This is reflected in the growth rates from 1988 to 1989: 4.0 percent for private and 5.7 percent for public utilities.

FIGURE 8

COMMERCIAL SECTOR

In 1989, 21.6 percent of the region's total firm sales were made to the commercial sector, a share little changed since 1983. During the period 1983-1989, commercial sector sales in the Pacific Northwest grew at an average annual rate of 4.2 percent. However, when longer term changes in the commercial sector's share of sales are examined, beginning with 16.2 percent in 1970, the steady upward movement in this sector can be observed.

The distribution of the region's commercial consumers is similar to the distribution of the region's population. Commercial consumers are concentrated west of the Cascades, in the most populous areas of the region.

More commercial activity occurred in the state of Washington than in all other states in the region combined. More than half of the region's commercial sales, most of the commercial six-year growth, and almost two-thirds of the commercial floorspace were in Washington state in 1989.

The commercial sector includes a very diverse group of consumers, both in terms of the types of buildings occupied and the types of activities conducted. For example, auto repair shops, office buildings, fast food restaurants and bowling alleys are all included in the commercial sector. This sector also includes electricity used for street lighting and electricity used in churches and government buildings.

The primary driver of energy use in the commercial sector is business activity (primary economic activity) since it determines the type of electrical equipment installed in the building space. For example, the largest load in restaurants is for cooking and other food preparation equipment, while in groceries the largest loads are for refrigeration units.

Because business activity so strongly influences equipment use, building types, categorized according to business activity, are used to characterize the commercial sector.

Table 10 lists building types in the commercial sector, and gives an estimate of the share of total commercial firm sales for each business type for 1988. The office and dry goods retail business types account for the largest share of sales in the commercial sector, together making up about 50 percent of regional firm sales to commercial consumers. These shares are not directly measured but are estimates from the Joint 1989 Long Term Forecast prepared by Bonneville Power Administration and the Northwest Power Planning Council.

TABLE 10

Shares of Commercial Firm Sales
By Type of Building, 1988

Business Type	Percent Share
Office	29.8
Dry Goods Retail	18.7
Grocery	9.2
School	7.1
Restaurant	5.4
Warehouse	5.3
Health	4.9
Hotel/Motel	3.0
College	3.0
Miscellaneous	13.6

Recent Commercial Sector Trends

The commercial sector has grown significantly in recent years. During the period 1983-1989, sales grew at an average annual rate of 4.2 percent unadjusted for temperature effects and 4.1 percent when adjusted. During this period, the commercial sector averaged larger megawatt increases than any of the other sectors--139 aMW per year unadjusted; 133 aMW when adjusted.

Adjustment for Temperature Effects

Heating, ventilating and air conditioning (HVAC) account for one-third to one-half of typical electricity use in certain types of commercial buildings--most notably in offices and dry goods retail shops, which represent 50 percent of total commercial electricity use. In these buildings, outdoor temperature can have a significant effect on electricity use.

Temperature effects vary from year to year without a systematic pattern and can mask other long-term trends that may affect commercial electricity sales, such as acquisitions of energy intensive equipment or efficiency gains from new building codes. It is therefore useful to adjust actual sales to reflect a normal, or "typical", weather year to remove effects of unusually hot or cold temperatures.

Over the 1983-1989 period, the region experienced five years of warmer than normal weather and two years colder than normal, as measured by annual Heating Degree Days. (An explanation of weather and temperature adjustment can be found on page 10.)

Table 11 shows actual observed (unadjusted) commercial and total regional firm electricity sales--percentage growth and aMW gain--contrasted with temperature-adjusted sales growth for 1988-1989 and 1983-1989.

adjusted rate of 4.1 percent annually over the past seven years, exceeding the regional growth rate of 3.1 percent. Commercial sector growth after taking into account the influence of weather is primarily due to two factors:

- service sector growth
- increased amenity levels and use of electronic equipment

Service Sector Growth

The rapid growth in electricity sales in the commercial sector is primarily driven by an increase in the number of commercial buildings in the region. This growth reflects a national trend toward expansion in the service sector (rather than the manufacturing sector) of the economy. About half of the commercial buildings constructed in the region since 1980 have been office buildings, underscoring the dramatic growth in service sector activities.

TABLE 11

Commercial Sector and Regional Firm Sales
Unadjusted and Temperature Adjusted Growth

	Commercial Sector		Regional Total*	
	1988-1989	1983-1989	1988-1989	1983-1989
Growth Rate (%)				
Unadjusted	4.6	4.2	4.1	3.2
Adjusted	4.8	4.1	4.0	3.1
Average Annual Growth (aMW)				
Unadjusted	170	139	672	493
Adjusted	172	133	665	484

* Regional total = all sectors, including commercial.

During the unusually mild winters over the 1983-1989 time period, the commercial sector required less electricity for heating than normal. This decrease was partially offset by excessive cooling loads resulting from unusually warm summers. When commercial sales are temperature-adjusted so that both the dampening effect of the mild winters and the exaggerating effect of the hotter than normal summers are removed, the resulting adjusted growth is somewhat lower than actual growth.

Commercial sales grew at a temperature

Increased Amenity Levels and Use of Electronic Equipment

Electricity sales in the commercial sector have continued to grow despite energy efficiency improvements. These improvements in new and existing commercial buildings have largely focused on the heating, ventilating and air conditioning (HVAC) systems, overhead lighting, and refrigeration (in grocery stores). While consumption has been reduced, the reduction seems to be counterbalanced by two recent trends.

First, tenants in newer commercial buildings are showing preferences for increased amenity levels in their space. For example, many new (and, increasingly, older) buildings show high levels of comfort or service. Increased service can mean more hours of operating, greater temperature and humidity control, or more attractive display lighting. Services are most commonly seen in offices, schools, retail establishments, and various buildings in the other, or miscellaneous, category.

Second, electronic equipment (e.g., computers, printers, facsimile machines) is proliferating rapidly in all business types, and especially offices. For example, microcomputers were virtually nonexistent in 1983, but by 1995 it is expected that one in three office employees will have one on their desk. This rapid growth in electronic equipment is causing electricity use to increase significantly in virtually all business types, and especially in office buildings.

Commercial Firm Sales Trends By Utility Group

The relative shares of commercial sector electricity sales by public and by private utilities have changed very little in the past seven years. Private utilities made 59 percent of sales to the commercial sector each year. The average annual sales growth rate barely differs for the two groups, 4.1 and 4.2 percent, respectively.

The relative shares of commercial sector electricity sales by generating versus non-generating public utilities also have remained constant over the past seven years, about 42 percent for non-generating and 58 percent for generating public utilities.

Figure 9 shows commercial firm sales by utility group over the past seven years, in aMW (unadjusted and adjusted for temperature). Public utility sales are also broken down into sales by generating and non-generating utilities.

Commercial Sector Characteristics

In 1986 the region had 1.8 billion square feet of commercial floorspace distributed over 229,000 buildings. While many of the buildings are small--the average size in 1986 was about 8,000 square feet--a proportionately small number of large buildings contain a sizable

amount of floorspace.

FIGURE 9

Figure 10 on page 19 shows that three commercial business types (office, dry goods retail, and miscellaneous) make up more than half of the region's floorspace and more than 60 percent of the total number of buildings in the commercial sector.

Miscellaneous

The largest proportion of both buildings and floor area in the commercial sector falls into a category labeled "miscellaneous". A variety of business activities fall under this category,

activities such as post offices, gas stations, laundries and photo labs. Because this category is so diverse, a detailed description of it is not included in this report.

FIGURE 10

Office

The office is the second largest business type in the commercial sector, accounting for about 30.4 million square feet of commercial electricity sales in 1989. The office business type includes (but is not limited to) banks, insurance, legal and real estate offices, health care offices and government offices. About 60 percent of the region's office floor area is contained in the largest 20 percent of the region's office buildings, and these buildings are located mainly in urban areas.

About half of all commercial construction between 1980 and 1986 was office buildings. Typically, these new office buildings have been both larger and more efficient in terms of energy use for HVAC and lighting than buildings built before 1980.

However, rapidly growing computer and other miscellaneous loads have tended to offset

energy efficiency improvements to varying degrees. Despite the current construction trend toward larger office buildings, most are still small: 59 percent of the region's office buildings have less than 5,000 square feet of floorspace.

Based on metered data collected through Bonneville's End-Use Load and Consumer Assessment Program (ELCAP), it has been observed that HVAC is the largest end use of electricity in office buildings, accounting for about 50 percent of typical building consumption. Lighting uses another 41 percent, and miscellaneous loads use the remainder.

Dry Goods Retail

Dry goods retail businesses accounted for 285 million square feet of floorspace in 42,800 buildings in 1986, and 19 percent of commercial electricity sales in 1988 (15 percent in 1986). This business type includes department stores, hardware stores, clothing stores, car dealerships, and other retail trade.

Most dry goods retail establishments are small; two-thirds have less than 5,000 square feet of floorspace. Only 6 percent are larger than 20,000 square feet but account for 42 percent of the region's dry goods retail floorspace.

Based on ELCAP data it has been observed that in dry goods retail businesses half to two-thirds of the total electricity consumed annually goes for indoor lighting. Another 25 to 45 percent of annual consumption goes for HVAC equipment, and the remainder is used for various other end uses.

INDUSTRIAL SECTOR

A large and growing part of the Pacific Northwest's electricity sales are to the total industrial sector (including DSIs). In 1989, 41.4 percent of total regional firm sales were made to this sector. Total sector firm sales grew from 5,250 aMW in 1983 to 6,580 aMW in 1989, an average annual increase of 3.8 percent. The increase from 1988 to 1989 was 249 aMW, or 3.9 percent. This increase is higher than the regional average, but lower than the 8.5 percent increase from 1987 to 1988, mostly due to DSI loads reaching full capacity in 1988.

The industrial sector has two major groupings: retail customers served by all of the region's utilities and customers served directly by Bonneville (direct-service industries, or DSIs). Retail utility sales and DSI sales are discussed separately.

Industrial Sales By Retail Utilities

Sales to industries by the region's retail utilities (excluding DSIs) were 22.8 percent of the region's total firm sales in 1989. During 1983-1989, sales to the industries served by the region's utilities grew at an average annual rate of 3.1 percent.

Sales to industry by utilities grew the fastest in the state of Washington during the 1983-1989 period due to the opening of new mines. Industrial sales in Washington grew at an average annual rate of 3.6 percent, or an average of 63 aMW per year. The percentage of 1989 industrial sales attributable to Washington was large (49.2 percent) relative to electricity sales in the states of Oregon (30.4 percent), Idaho (15.5 percent), and western Montana (4.9 percent).

Electricity use in the industrial sector (excluding DSIs) is concentrated in five sub-sectors: pulp and paper, chemicals, lumber and wood products, primary metals (excluding aluminum), and food processing. These sub-sectors account for nearly 80 percent of utility sales to industries. Table 12, based on Bonneville's 1989 estimates, shows the types of industries and their relative shares of industrial firm sales.

TABLE 12

Shares of Industrial Firm Sales
By Type of Industry, 1989

Industry Type	Percent Share
Pulp and Paper	33
Chemicals	13
Lumber and Wood Products	14
Primary Metals	12
Food Processing	7
Other	21

* Excludes sales made directly by BPA to industries.

Recent Sales Trends

Regional utility industrial sales (excluding DSIs) grew at an average annual rate of 3.1 percent during the period 1983-1989. This growth largely reflects an expanding regional economy despite rising electricity sales. Electricity price increases during this period were estimated to have little effect on industrial electricity consumption basically because electricity prices increased only slightly faster than the inflation rate.

Table 13 on page 21 shows the growth in firm electricity sales to retail utility industrial customers (unadjusted) relative to regional total firm electricity sales (unadjusted) during the periods 1988-1989 and 1983-1989. Sales from 1988 to 1989 grew at a slightly faster rate than regional total sales grew. In contrast, industrial sector sales growth roughly paralleled growth in regional total sales in the period 1983-1989.

Firm Sales Trends By Utility Group

Figure 11 on page 21 shows industrial electricity firm sales by utility group (excluding DSIs). Public utility sales are further broken down into two groups: sales by generating and by non-generating utilities.

Electricity sales by utility group show that the sales by public utilities to the industrial sector grew slightly faster than sales by private utilities during the 1983-1989 period. Industrial sector electricity sales by public utilities increased at 3.2 percent per year, while sales by private utilities increased 3.0 percent per year.

TABLE 13

Industrial Sector Firm Sales Growth
And Regional Firm Sales Growth

	Industrial Sector*		Regional Total**	
	1988-1989	1983-1989	1988-1989	1983-1989
Growth Rate (%)	4.3	3.1	4.1	3.2
Average Annual Growth (aMW)	166	112	672	493

* Excludes sales made directly by BPA to industry.

** Regional total = all sectors, including industrial.

FIGURE 11

Pulp and Paper

The major industry served by retail utilities in the region, pulp and paper, accounted for 33 percent of total industrial sales in 1989. Within the pulp and paper industry, electricity is mainly used in the preparation of wood chips or blocks prior to and during the pulping process, which involves cleaning, washing and sizing of the wood chips, and grinding and refining of the wood chips if mechanical processes are used. Electricity is also used in the "dewatering of pulp" as it is transformed into paper, and in the numerous motors that convey the wood pulp and paper through the various processing stages.

Actual electricity and fuel consumption statistics are compiled and reported annually for the Pacific Northwest Region by the American Paper Institute. These statistics show that electricity consumption by the pulp and paper industry in 1987 (data not available for 1988 or 1989) was only 3.6 percent above what the industry consumed in 1983. This stands in stark contrast to pulp and paper production tonnage, which increased by 16.8 percent during this period. It also contrasts with recent trends in the industry which include the increasing use of mechanical pulping processes as a replacement for more conventional chemical pulping processes and is several times more electrically intensive per ton of pulp.

Subsector Characteristics

Events in the five major industrial subsectors served by retail utilities in the Pacific Northwest help to explain the trends in industrial sales during the 1983-1989 period. These events are described under each subsector.

The foregoing facts suggest that electricity consumption should be increasing by more than just 3 or 4 percent. The relatively flat electricity consumption during 1983-1987 may be explained by the fact that the pulp and paper industry has great potential for generating its own electricity. Investigation of this trend is continuing.

Chemicals

The chemicals industry in the Pacific Northwest, which accounted for 13 percent of industrial electricity sales by retail utilities in 1988, showed slight growth during the 1983-1989 period. Electricity sales to this industry are largely affected by the production of chlorine, caustic soda (chloralkali) and sodium chlorate, and the production of elemental phosphorus.

Nationally, chloralkali production levels remained relatively flat during the 1983-1989 period. But because U.S. plant capacity decreased during this period, Pacific Northwest plants realized some growth.

Elemental phosphorus production levels in the U.S. during the 1983-1989 period gradually decreased from a high reached in 1984. The Northwest phosphorus plants followed suit. As a result, electricity sales to phosphorus plants slowly declined.

Lumber and Wood Products

The lumber and wood products industry, which accounted for about 14 percent of industrial sales by retail utilities in 1989, performed strongly during the 1983-1989 period. Electricity in lumber and wood product production is primarily used for cutting, trimming, milling and planing of raw timber into finished wood products such as lumber, and plywood and other structural panel board.

The lumber and wood products industry recovered tremendously from the lows it experienced during 1981-1982. Lumber production rose by 25 percent, and plywood and structural panel board production rose by 17 percent during the period 1983-1988 (data not available for 1989). These production levels came close to or surpassed levels achieved in 1977 when the industry achieved pre-recession highs.

Although the market for new housing is not as strong as it was in 1977, the industry continues to profit from the strong repair and remodeling market.

During 1989, the potential listing of the Northern Spotted Owl as a threatened species under the Endangered Species Act became a

heated issue, with suits filed by environmental groups halting sales of old-growth timber on U.S. Forest Service and Bureau of Land Management forest lands. Preliminary data indicates that in spite of the injunctions halting timber sales, lumber and panelboard production declined by only a small amount in 1989, due to the fact that mills still had access to timber inventory from previous sales.

Primary Metals

About 12 percent of all utility industry sales are made to firms producing raw steel or castings made of iron or steel. The region's steel production rose sharply over the last seven years, recovering fully from a 1983 recession induced low. It is estimated that raw steel production increased 70 to 90 percent between 1983 and 1989. The recovery in steel and other non-aluminum metals is calculated to have added between 100 aMW and 200 aMW to total utility electricity sales.

Food Processing

The food processing industry accounted for 7 percent of industrial sales in 1989. The industry includes a wide range of activities from milk processing to production of frozen french fries. Within food processing industries, electricity is used in four basic processes: refrigeration, cooking, drying, and heating liquids.

Electricity consumption by the food processing industry remained fairly stable during the 1983-1989 time period. This is because the demand for food products produced by the region depends on the level of national population, which was stable during this period.

Surplus Power (SP) Block Sales

As a response to concerns about the use of available surplus power for the benefit of regional customers, BPA made an offer in December 1986 to sell surplus firm power to its Pacific Northwest customers. The sale of surplus firm power was offered from January through September 1987 to utilities and non-aluminum direct-service industrial customers. The regional public utilities participated in this program, and passed along rate incentives to their qualifying residential, commercial and

industrial customers. The industrial firms receiving rate benefits included food processing, lumber and wood products, pulp and paper, chemicals, primary metals, and mining. Total sales through the SP Block Program to industrial customers served by regional utilities amounted to 11 aMW.

Direct-Service Industrial Sales By BPA

The direct-service industries (DSIs) account for a large share of BPA's power sales--34.2 percent of firm sales and 14.1 percent of the region's firm sales in 1989. Given the large size of the DSIs, any change in their loads can significantly affect BPA and the region. During the time period 1983-1989, total DSI sales in the region grew at an annual rate of 4.03 percent.

The DSIs are 17 industrial firms served directly by BPA rather than by retail utilities. Most of these firms use electric-intensive production processes. Eight of the firms produce aluminum. Table 14 lists all the DSI firms by what they produce.

Over the last seven years, sales to the DSIs have been volatile, their loads varying with economic events. As the economy improved and as BPA developed means to reduce their load fluctuations, DSI firm sales grew more, on a percentage basis, than sales to any other sector. Table 15 illustrates DSI percentage load growth and growth in average megawatts from 1988-1989 as well as the seven year period, 1983-1989.

TABLE 14

Direct-Service Industrial Customers

Aluminum	Chemicals	Primary Metal	Pulp & Paper
Reynolds Metals	Pennwalt	Oregon Metallurgical	Port Townsend
Kaiser Aluminum	Pacific Carbide*	ACPC	
& Chemicals	Georgia Pacific	Nickel Joint Venture**	
Columbia Falls	Carborundum*	Gilmore Steel*	
Intalco Aluminum			
ALCOA			
Columbia Aluminum			
VAHIALCO			
NW Aluminum			

* Companies under contract with BPA, but not presently operating.

** Reopened June 1989 (previously under the name of Hanna Nickel).

TABLE 15

Direct-Service Industrial Firm and Non-Firm Sales And Regional Firm Sales Growth

	Direct-Service Industrial		Regional Total*	
	1988-1989	1983-1989	1988-1989	1983-1989
Growth Rate (%)				
Total	1.1	4.0		
Firm	3.4	5.2	4.1	3.2
Non-Firm	-9.3	-0.8		
Average Annual				
Growth (aMW)				
Total	33	106		
Firm	83	110	677	493
Non-Firm	-50	-4		

* Regional total = all sectors, including direct-service industrial.

Recent DSI Trends

DSI load growth is due not to additional facilities, but to increased use of existing production facilities. As of December 1989, plants were operating at 97 percent of capacity.

During the past six years, DSI load growth on a percentage basis was the highest of all sectors. The significance of this change in DSI loads is illustrated by the fact that 110 aMW is more than three times what the city of Salem, Oregon, uses in a year.

Figure 12 shows firm and non-firm sales in average megawatts to direct-service industries during the period 1983-1989.

FIGURE 12

Aluminum Companies

The aluminum companies, the largest part of the DSI group, accounted for about 92 percent of DSI load in 1989. Table 16 lists the companies and shows their shares of the load.

TABLE 16

Aluminum Direct-Service Industry Companies' Share of Total and Firm DSI Load in 1989

Company	Percent Share of Total	aMW	Percent Share of Firm	aMW
Reynolds Metals	22	648	21	515
Kaiser Aluminum & Chemicals	20	592	21	519
Intalco Aluminum	15	444	14	352
Columbia Falls	11	330	11	274
ALCOA	8	241	9	218
Columbia Aluminum	9	270	9	220
VANALCO	6	188	7	174
NW Aluminum	5	156	5	129

Note: DSIs are not broken down by individual plant.

Between 1983 and 1989, aluminum total loads varied from 2,035 aMW in 1986 to 2,869 aMW in 1989. This period corresponds to the time during which the aluminum industry faced especially volatile prices for their product. During this period there were long periods when aluminum prices were below the operating costs of several plants, affecting their production levels and therefore their electricity use. Figure 13 shows the effect of aluminum prices on the DSI load.

FIGURE 13

Aluminum loads were relatively low at the start of 1983. Following 1983, demand for

aluminum increased to record levels and regional smelter loads rose, increasing to almost full capacity. Even though demand for aluminum was strong, high production levels resulted in a buildup of inventories. At the end of 1984 the industry again experienced sharply reduced demand for its product and consequently less need for electricity. The depression of prices lasted nearly three years, and caused three plants to close, with consequent large cutbacks in production and employment. BPA, the DSIs, and other interested groups worked together to restore the competitive position of the region's aluminum companies. This effort resulted in two programs:

- Variable power rate: This specially designed power rate, established in 1986, varies with the price of aluminum, resulting in lower electricity (production) costs during periods of poor market conditions and higher electricity costs during periods of good market conditions.
- ConMod: This incentive program for conservation/modernization encourages more efficient production processes in aluminum smelting.

The results of these efforts have been striking. Together the region's aluminum companies saved 54.5 MW in the Con/Mod program's first year. The Variable Rate has been credited with enabling the restart of three previously closed smelters.

By 1987, some of the high cost plants in other parts of the United States and in Europe had closed. Rising demand for aluminum, supply constraints, low inventories, and record high prices brought regional loads back up to near full capacity in 1988 and 1989.

Non-Aluminum DSIs

The non-aluminum companies, the smallest part of the DSI group, accounted for only 4.5 percent of the 1989 DSI load. Table 17 lists the direct-service non-aluminum companies and shows their shares of the DSI load in 1989.

Like their aluminum counterparts, the loads of the non-aluminum DSIs have fluctuated with economic conditions. During 1986-1988 weak

demand for their products and high costs of production led two plants to close, hurting regional employment. While the 100 aMW loss due to these closures did not greatly affect total DSI loads, BPA has worked with non-aluminum DSIs to help stabilize their loads.

Several industrial conservation programs sponsored by BPA offer financial incentives to firms proposing to install various electric energy conservation measures. Non-aluminum DSI companies have been eligible to take part in these programs. A few companies have taken advantage of them, with resulting energy savings and lower production costs, increasing their competitiveness with respect to producers in other regions of the United States and the world.

TABLE 17

Non-Aluminum Direct-Service Industry Companies' Share of Total and Firm DSI Load in 1989

Company	Percent Share of Total	aMW	Percent Share of Firm	aMW
Penwalt	2.00	66.0	2.00	57.0
Georgia Pacific	1.00	31.0	1.00	24.0
Port Townsend	0.40	10.0	0.40	10.0
Oregon Metallurgical	0.40	9.0	0.30	7.0
ACPC	0.03	1.0	0.04	1.0
Nickel Joint Venture	0.60	18.0	0.70	18.0
Gilmore Steel	0	0.1	0	0.1*
Pacific Carbide	0	0	0	0
Carborundum	0	0	0	0

* Majority of load served by private utility.

Hanna Nickel was the largest of the non-aluminum DSIs to shut down operations in the 1983-1988 time period. Low nickel metal prices in 1986 and 1987 caused the shutdown despite discounted electric rates and an attempt to install new technology to cut operating costs. By the end of 1988, nickel prices had rebounded to new highs and the smelter reopened under new management in June 1989 as Nickel Joint Venture.

IRRIGATION SECTOR

Utility sales in 1989 in the Pacific Northwest to the irrigation sector accounted for 3.3 percent of total regional firm sales. During the period 1983-1989 sales to the irrigation sector grew at an average annual rate of 3.7 percent, a temporary increase in a trend that has been flat to slowly decreasing since the late 1970s.

Of the 8.2 million irrigated acres in the region, 56 percent are sprinkler irrigated with underground water from aquifers or with surface water from canals and rivers.

Most of the region's irrigation takes place in the arid lands east of the Cascade Mountains in central and eastern Washington, in north central Oregon and in southern Idaho where the major irrigated crops are hay, grain, potatoes, vegetables and fruits. Most irrigation energy sales are made during the crop-growing season, from April to October, with peak sales in July or August.

The state of Idaho accounted for 47.9 percent of the 1989 irrigation sales. Washington followed with 32.6 percent. Oregon accounted for 17.8 percent and western Montana 1.5 percent. Over the years there has been very little fluctuation in the state shares of total regional irrigation electricity use.

Recent Irrigation Sector Trends

The 1983-1989 upward trend in irrigation sector sales is an anomaly in a flat to slightly decreasing trend. Sales in this sector in 1983 were the lowest since sales began to flatten in the mid-1970s, while sales in 1988 and 1989, respectively the third and fourth highest in history, reflect a drought.

Table 18 shows irrigation sector growth in firm electricity sales--percentage growth and average megawatt (aMW) gain--relative to regional total growth during the period 1988-1989 and for 1983 and 1989.

Several offsetting factors shape irrigation sales year to year and in the long run:

- planted sprinkled crop acreage
- weather
- prices of farm produce
- conservation

Acreage and Weather

The two major factors in yearly changes in irrigation sales are sprinkled crop acres and rainfall. Many crops grown in the arid eastern area of the Pacific Northwest require irrigation. An increase in sprinkled acres or drought conditions boost irrigation sales. Drought conditions in 1988 and 1989 increased irrigation sales.

TABLE 18

Irrigation Sector Firm Sales Growth
And Regional Firm Sales Growth

	Irrigation Sector		Regional Total*	
	1988-1989	1983-1989	1988-1989	1983-1989
Growth Rate (%)	-0.5	3.7	4.1	3.2
Average Annual Growth (aMW)	-3	19	672	493

* Regional total = all sectors, including irrigation.

Farm Prices

An economic slump in the farm economy during the late 1970s continuing through most of the 1980s had some long-term dampening effect on irrigation sales. This economic slump occurred as reduced exports of farm products and a slowing national economy resulted in lowered crop prices and in the build-up of surpluses of some crops. The farm economy slump has reversed in recent years.

Conservation

Nearly all irrigators now practice some kind of conservation. Several measures to conserve irrigation water and electricity have become available over the past few years. The most feasible and acceptable measure has been to reduce water pressure in center pivot irrigation systems.

Since 1982, incentives to increase the energy efficiency of their systems have been offered to irrigators in the Northwest through various programs, including several BPA programs. Conservation has significantly reduced the flat to slightly decreasing long-term trend in irrigation sales. Farmers are irrigating more prudently, responding to daily or weekly rainfall and temperature.

Irrigation Firm Sales Trends By Utility Group

Figure 14 shows irrigation firm sales by utility group over the past seven years, including public generating and non-generating utility sales. Irrigation sector sales by private utilities in the region grew more on both a percentage basis and in number of aMW than have irrigation sales by public utilities.

Private utility irrigation sales experienced a minus 1.9 percent growth rate from 1988 to 1989; however, private utility sales had an average annual growth rate of 3.8 percent during the period 1983-1989. Public utility irrigation sales growth was 1.1 percent from 1988 to 1989 and an average annual of 3.6 percent during 1983-1989. Public utility megawatt increases for irrigation were very small, 3 aMW from 1988 to 1989 and 9 aMW during 1983-1989; private utility changes were 6 aMW less from 1988 to 1989 and an average of 11 aMW gain during 1983-1989.

FIGURE 14

NUMBER OF RETAIL CUSTOMERS AND AVERAGE ENERGY USE 1989 & 1983-1989

Highlights

- ▶ In 1989, the region had 4,142,866 public and private utility retail customers
- ▶ In 1989, the average residential customer in the region used 1.6 average kilowatts of electricity
- ▶ In 1989, 52.6% of all retail customers were in the state of Washington
- ▶ Average kilowatt usage for residential customers dropped in 1986 and 1987 due to warmer than usual winters and an increase in wood burning; 1984 and 1985 were colder than normal years

Looking at trends in the numbers of retail customers and the average kilowatt use per customer by sector can be important in helping Bonneville satisfy diverse electricity needs in the future. Tracking average kilowatt use trends in the residential sector is relatively easy because the major factor of change is weather. The average kilowatt use per customer figures in the commercial and industrial sectors are less simple. The greatest factor in average use change in these two sectors is the number of small companies starting business: although a small business uses far less electricity than a large business, the small and the large business are each counted as one customer. The effect of increased numbers of small businesses on average kilowatt use in a sector is evident in the Puget Sound Area. Average kilowatt use for the industrial sector in this Area dropped from 378.0 average kilowatts in 1988 to 353.8 in 1989. Change in average use for irrigation customers is due primarily to the amount of rainfall and the size of the farm.

Table 19 gives the number of retail customers for public and private utilities by sector and the average kilowatt use per customer for 1989. Street lighting has been removed from the commercial sector since the small amount of electricity each street light

uses would distort the commercial sector picture. In 1989 the 7,562 street lights reported used only 53 average megawatts of electricity.

TABLE 19

Number of Retail Customers and Average Use 1989		
Sector	Retail Customers	Avg kW Use Per Customer
Residential		
Total	3,611,336	1.6
Public	1,478,565	1.8
Private	2,132,771	1.5
Commercial*		
Total	458,543	8.3
Public	173,279	9.9
Private	285,264	7.8
Industrial		
Total	11,480	353.8
Public	3,700	516.9
Private	7,780	276.3
Irrigation		
Total	53,945	10.8
Public	27,780	9.6
Private	26,165	12.1
Total	4,135,304	3.5

* Commercial excludes street lighting

Figure 15 on page 29 presents graphically the 1983-1989 trend of average kilowatt use per customer. The Pacific Northwest experienced colder than normal weather in 1984 and 1985, and warmer than normal weather in 1983 and 1986-1989. This weather fluctuation can be seen in average use in both the residential and commercial sectors. The data has not been temperature adjusted. (For information on adjustment see the sidebar *Weather and Temperature Adjustment* on page 10.)

The decline in industrial usage in 1989 was in part due to a large number of small industries opening in the Puget Sound Area. Drought conditions in 1988 and 1989 increased irrigation sales, while greater than average rainfall lowered irrigation sales in 1986.

Table 20 on page 30 provides statistics for the 1983-1989 period by utility groups: public and private. The number of retail customers and average kilowatt use per customer are given for each sector.

FIGURE 15

Average Kilowatt Use Per Retail Customer
By Sector, 1983-1989

Total Region

Residential

Commercial*

* Commercial excludes street lighting

Industrial

Irrigation

	1983	1984	1985	1986	1987	1988	1989
Residential	1.57	1.64	1.68	1.57	1.51	1.56	1.61
Commercial	7.43	7.76	8.02	7.78	7.93	8.08	8.28
Industrial	346.31	365.67	380.91	382.73	379.66	378.01	357.84
Irrigation	8.86	8.90	10.20	9.87	10.35	10.98	10.79

TABLE 20

Number of Retail Customers
and Average Use
By State (1989)

Washington

Sector	Retail Customers	Avg KW Use Per Customer
Residential Total	1,915,019	1.7
Public	1,065,692	1.8
Private	849,327	1.5
Commercial Total	213,841	8.9
Public	114,424	9.2
Private	99,417	8.5
Industrial Total	5,906	334.2
Public	2,771	525.6
Private	3,135	165.1
Irrigation Total	17,777	10.7
Public	14,241	11.6
Private	3,536	7.2

Oregon

Sector	Retail Customers	Avg KW Use Per Customer
Residential Total	1,157,918	1.5
Public	297,076	1.7
Private	860,842	1.4
Commercial Total	159,464	7.6
Public	37,489	7.6
Private	121,975	7.6
Industrial Total	2,398	511.3
Public	587	641.0
Private	1,811	469.3
Irrigation Total	17,675	5.9
Public	7,954	7.5
Private	9,721	4.6

Oregon includes sales for Surprise Valley Electric in CA.

Idaho

Sector	Retail Customers	Avg KW Use Per Customer
Residential Total	407,659	1.5
Public	84,756	1.6
Private	322,903	1.6
Commercial Total	59,929	6.1
Public	11,831	1.6
Private	48,098	6.0
Industrial Total	1,470	402.6
Public	318	229.9
Private	1,152	450.2
Irrigation Total	15,789	18.1
Public	3,549	9.7
Private	12,240	20.5

Idaho includes sales from Wells Rural Electric in NV and Lower Valley P&L in WY.

Western Montana

Sector	Retail Customers	Avg KW Use Per Customer
Residential Total	112,282	1.2
Public	31,041	1.5
Private	81,241	1.0
Commercial Total	17,047	5.6
Public	3,387	4
Private	13,660	
Industrial Total	603	302.3
Public	24	273.9
Private	579	303.5
Irrigation Total	2,981	3.0
Public	2,036	3.2
Private	945	2.7

Commercial excludes street lighting.

Table 21 on page 32 reports the 1989 data by state. The state of Washington served 52.6 percent of the region's retail customers. Oregon followed with 30.7 percent, Idaho served 13.7 percent, and western Montana served 3.0 percent. Oregon data includes customers of Surprise Valley Electric, whose headquarters is in California; Idaho data includes customers of Wells Rural Electric whose headquarters are in Nevada and of Lower Valley P&L whose headquarters are in Wyoming.

Table 22 on page 33 reports 1989 public utility data by Area Office. Private utility data is not included because it cannot be broken out by BPA's Area Office boundary lines. Puget Sound Area served 49.1 percent of the region's 1989 retail customers, the Lower Columbia Area served 23.4 percent, Upper Columbia served 13.2 percent, and Snake River served 14.3 percent.

TABLE 21

Number of Public Retail Customers
and Average Use
By Area Office (1989)

Puget Sound		
Sector	Retail Customers	Avg KW Use Per Customer
Residential Public	742,523	1.6
Commercial Public	81,893	9.3
Industrial Public	2,491	334.8
Irrigation Public	578	.8
TOTAL	827,485	3.3

Lower Columbia		
Sector	Retail Customers	Avg KW Use Per Customer
Residential Public	351,441	1.9
Commercial Public	39,424	9.0
Industrial Public	541	1,402.4
Irrigation Public	2,145	1.2
TOTAL	393,551	4.5

Upper Columbia		
Sector	Retail Customers	Avg KW Use Per Customer
Residential Public	187,512	2.0
Commercial Public	22,758	9.6
Industrial Public	148	1,146.9
Irrigation Public	11,814	8.8
TOTAL	222,232	3.9

Snake River		
Sector	Retail Customers	Avg KW Use Per Customer
Residential Public	197,089	1.8
Commercial Public	29,204	7.7
Industrial Public	520	288.2
Irrigation Public	13,243	11.9
TOTAL	240,056	3.7

Commercial excludes street lighting

TABLE 22

Number of Retail Customers and Average Use
By Sector, 1983-1989

Residential

	Retail Customers	Avg KWH Use Per Customer
Public		
1983	1,313,773	1.7
1984	1,336,212	1.8
1985	1,353,802	1.9
1986	1,377,210	1.7
1987	1,402,146	1.7
1988	1,429,712	1.7
1989	1,478,565	1.8
Private		
1983	1,965,948	1.5
1984	1,989,275	1.6
1985	2,014,034	1.6
1986	2,044,874	1.5
1987	2,078,670	1.4
1988	2,114,313	1.5
1989	2,132,771	1.5

Commercial

	Retail Customers	Avg KWH Use Per Customer
Public		
1983	150,270	8.1
1984	152,902	8.5
1985	155,968	8.9
1986	159,153	8.7
1987	161,723	8.7
1988	165,402	9.0
1989	173,279	9.0
Private		
1983	248,230	7.0
1984	254,919	7.3
1985	261,384	7.5
1986	273,514	7.3
1987	276,697	7.5
1988	283,150	7.5
1989	285,264	7.8

Commercial excludes street lighting

Industrial

	Retail Customers	Avg KWH Use Per Customer
Public		
1983	4,065	390.5
1984	3,794	438.0
1985	3,732	460.9
1986	3,803	464.4
1987	3,912	457.1
1988	3,629	506.9
1989	3,700	516.8
Private		
1983	5,725	314.9
1984	5,832	318.6
1985	5,641	328.0
1986	5,706	328.3
1987	6,013	329.3
1988	6,677	308.0
1989	7,750	271.3

Irrigation

	Retail Customers	Avg KWH Use Per Customer
Public		
1983	27,149	7.9
1984	27,808	8.1
1985	27,668	9.4
1986	27,587	8.8
1987	27,110	9.4
1988	26,869	9.8
1989	27,780	9.6
Private		
1983	25,575	9.8
1984	25,558	9.8
1985	26,648	11.1
1986	25,458	11.0
1987	26,477	11.3
1988	26,442	12.2
1989	26,165	12.1

ELECTRICITY SALES BY STATE

Highlights

- ▶ *Washington accounted for 55.8% of the region's 1989 firm sales*
- ▶ *At 4.5%, Oregon saw the greatest percentage growth in electricity sales from 1988 to 1989*
- ▶ *Washington showed the highest annual average megawatt change in usage, 365 aMW, from 1988 to 1989*
- ▶ *In 1989, Idaho farmers used almost half of the electricity sold for irrigation in the region*
- ▶ *A comparison of 1983-1989 growth trends by the three primary PNW states shows Washington with the highest average yearly growth rate (3.8%); and the highest average yearly growth in energy sales (313 aMW)*

Electricity use graphics and tables presented here give a picture of each state's electricity use growth in recent years, its growth in relation to growth in other states, and also sector contributions to the overall state picture. State summaries give a picture of major factors contributing to 1983-1989 consumption trends.

When using the data in this chapter, it is useful to keep in mind two things:

- Sales made by a public utility are included in the state where its headquarters is located even though areas served by some public utilities cross state boundaries. For example, the headquarters of Clearwater Power Company is in Idaho but the utility serves customers in Washington as well as Idaho. These sales in other states are typically a small percentage of the total sales made by public utilities within any given state.
- All average megawatts in this section are from actual observed sales (sales not adjusted for temperature).

Figure 16 on page 35 shows the percentage of total 1989 firm sales in each state. Electricity sales in the state of Washington accounted for 55.8 percent of the region's firm sales. Customers in Oregon consumed 28.2 percent of the total, in Idaho 11.7 percent, and in western Montana 4.3 percent.

Table 23 on page 35 shows the 1989 firm energy sales for each state by sector and the average megawatt consumption by utility groups: public and private.

Following Table 23 is a summary for each state which includes narrative, a table, and a figure. Each narrative gives the state's population ranking in the region and a sketch of its economic base. The table for each state (Tables 24-27) shows firm sales in each sector and total state firm sales for the years 1983-1989. The figure for each state (Figures 17-20) compares total firm sales for each sector for each year, 1983-1989.

Table 28 on page 40 compares each state's average yearly growth for the years 1983-1989 with the region's, both in percentage and average megawatts.

FIGURE 16

TABLE 23

**Firm Sales By State
1989**

Avg MW

	Residential	Commercial*	Industrial	DSI	Irrigation	Total
Washington:						
Total	3,262	2,101	1,997	1,843	190	9,393
Public	1,912	1,194	1,456	—	165	4,727
Private	1,350	907	541	—	25	2,823
Oregon:						
Total	1,727	1,269	1,236	401	104	4,737
Public	506	298	376	—	60	1,240
Private	1,221	971	860	—	44	3,096
Idaho:						
Total	681	386	629	0	279	1,975
Pub. :	139	79	73	—	34	325
Private	542	307	556	—	245	1,650
Montana:						
Total	135	100	200	274	9	718
Public	47	17	7	—	7	78
Private	88	83	193	—	2	366
Region:						
Total	5,805	3,856	4,062	2,518	582	16,823
Public	2,604	1,588	1,912	—	266	6,370
Private	3,201	2,268	2,150	—	316	7,935

* Commercial includes street lighting and public facilities

WASHINGTON SUMMARY

1983-1989

Of the four states in the Pacific Northwest, Washington is the most populous, 4,761,000 in 1989, with a large part of the population concentrated around Puget Sound.

Washington state's economy depends upon diverse activities: commerce, numerous industries, including aerospace, lumber and wood products, manufacturing, mining, fishing, and tourism. Washington has more industries than any other state in the region. The aerospace industry, in the Puget Sound service area, is a major factor in the state's economy.

	1983	1984	1985	1986	1987	1988	1989
Res.	2,878	3,035	3,175	3,028	2,953	3,111	3,262
Com.	1,621	1,736	1,850	1,857	1,922	2,003	2,101
Ind.	1,620	1,702	1,755	1,820	1,863	1,938	1,997
DSI	1,235	1,588	1,591	1,440	1,475	1,787	1,843
Irrig.	159	164	188	179	188	189	190
TOTAL	7,513	8,225	8,659	8,324	8,401	9,028	9,393

TABLE 24

Commercial includes street lighting & public facilities

FIGURE 17

OREGON SUMMARY

1983-1989

Oregon is the second most populous state in the region, 2,820,000 in 1989. Oregon's largest industry--logging/lumber/plywood--grew gradually during the 1982-1989 period. Diversified manufacturing, especially inland, is strong, along with transportation equipment (shipyards, truck factories), primary metals, electrical equipment, fabricated metals, and construction. The economy along the Oregon coast is heavily influenced by fishing, tourism, and recreation.

Oregon's direct-service industries were hit hard at the end of 1984 when the demand for aluminum fell sharply. Oregon's Northwest Aluminum plant was hit the hardest. The depression of prices lasted nearly three years.

TABLE 25

Total Oregon Firm Sales

oMW	1983	1984	1985	1986	1987	1988	1989
Res.	1,559	1,619	1,664	1,570	1,571	1,653	1,727
Com.	1,014	1,086	1,123	1,142	1,180	1,216	1,269
Ind.	1,048	1,079	1,109	1,116	1,116	1,191	1,236
DSI	477	619	216	130	314	373	401
Irrig.	87	94	106	101	104	100	104
TOTAL	4,165	4,497	4,218	4,109	4,285	4,533	4,737

Commercial includes street lighting & public facilities

FIGURE 18

IDAHO SUMMARY

1983-1989

Idaho is the third most populous state in the Northwest, 1,014,000 in 1989. Idaho's economy began to turn around in 1988 after two years of decline. Employment was spurred by a sharp rise in manufacturing, primarily in electronics. Mining is a small component of Idaho's work force, but is a basic industry that supports many other activities. Mining made a comeback in 1988 after a three-year slide. Idaho's two largest manufacturing sectors--lumber/plywood and food processing--also helped improve Idaho's economy since 1988. Rich in farm land, Idaho represented 47.9 percent of the region's irrigation sales of electricity in 1989.

TABLE 26

Total Idaho Firm Sales

αMW	1983	1984	1985	1986	1987	1988	1989
Res.	621	676	688	646	621	650	681
Com.	306	326	342	340	342	370	386
Ind.	569	591	566	541	556	586	629
DSI	0	0	0	0	0	0	0
Irrig.	213	208	250	235	253	285	279
TOTAL	1,709	1,801	1,846	1,762	1,772	1,891	1,975

Commercial includes street lighting & public facilities

FIGURE 19

WESTERN MONTANA SUMMARY

1983-1989 Annual Average

Only Montana west of the Continental Divide is included in the region. This small portion of Montana is primarily rural. Employment rose in 1988 after a four-year slide, largely due to an increase in mining production. Firm load at Columbia Falls Aluminum (a DSI) increased from 148 aMW in 1983 to 274 aMW in 1989.

Western Montana prospers from its outdoor recreation. Many tourists visit western Montana's forests and lakes each year.

aMW	1983	1984	1985	1986	1987	1988	1989
Res.	117	128	134	126	124	127	135
Com.	79	87	92	91	92	96	100
Ind.	153	147	141	162	188	181	200
DSI	148	251	261	264	274	273	274
Irrig.	8	9	11	9	8	11	9
TOTAL	505	622	639	652	686	688	718

TABLE 27

Commercial includes street lighting & public facilities

FIGURE 20

TABLE 28

Firm Sales Growth by State
And Regional Firm Sales Growth
(1983-1989)

	Washington		Oregon	
	Growth Rate(%)	Average Annual Growth (aMW)	Growth Rate(%)	Average Annual Growth (aMW)
Residential	2.1	64	1.9	31
Commercial*	4.4	80	3.8	43
Industrial	3.6	63	2.8	31
DSI	6.9	101	-2.9	-13
Irrigation	3.0	5	3.0	3
TOTAL	3.8	313	2.2	95

	Idaho		Western Montana		Regional	
	Growth Rate(%)	Average Annual Growth (aMW)	Growth Rate(%)	Average Annual Growth (aMW)	Growth Rate(%)	Average Annual Growth (aMW)
Residential	1.6	10	2.4	3	2.0	108
Commercial*	4.0	13	4.0	4	4.2	139
Industrial	1.7	10	4.6	8	3.1	112
DSI	—	—	10.8	21	5.2	110
Irrigation	4.6	11	2.0	(less than .5)	3.7	19
TOTAL	2.4	44	6.0	36	3.2	493

* Commercial includes street lighting & public facilities

AN AREA OFFICE LOOK AT ELECTRICITY SALES BY PUBLIC UTILITIES*

* This Area Office perspective on Pacific Northwest electricity consumption includes only data for public utilities. Most private utilities cross over BPA Area Office boundary lines and their data is available by state only.

Highlights

- ▶ Puget Sound Area: 44.5% of region's 1989 public utility firm sales
- ▶ Snake River Area: greatest Area annual percentage growth in 1989, 9.8%
- ▶ Puget Sound Area: largest increase in energy sales, 1988 to 1989, 110 aMW
- ▶ Snake River Area: continued to lead Areas in irrigation sales in 1989 at almost 60% of region's total public utility sales
- ▶ 1983-1989 largest annual percentage growth trend: Snake River Area, 4.3%
- ▶ 1983-1989 energy sales increases: Puget Sound Area, 70 aMW; Lower Columbia Area, 49 aMW; Snake River Area, 33 aMW; and Upper Columbia, 31 aMW (a major part of the growth came from Upper Columbia's larger utilities)

Figures and tables give a picture of comparative growth among the Areas, each Area's growth in recent years (1983-1989), and sector contributions to overall Area electricity sales. Area summaries give a picture of the major factors contributing to recent trends.

- Sales made by a public utility are included in the Area where the utility's headquarters are located even though some consumers the utility serves may be located within the boundaries of other Area Offices. For example, the headquarters of Hood River Electric Cooperative is in the Snake River Area but the utility also serves consumers in the Lower Columbia Area. However, sales outside this utility's home Area represent a small percentage of the utility's total sales, as is typically the case for the other public utilities crossing over the boundary lines.
- All average megawatts (aMW) in this section are from actual observed sales (sales that have not been adjusted for temperature).

THE FOUR AREA OFFICES

BPA's four Areas are: Puget Sound, which serves northwestern Washington; Lower Columbia, serving western Oregon; Upper Columbia, serving western Montana, northern Idaho and eastern Washington; and Snake River, serving eastern Oregon, most of Idaho and south central Washington. (See map opposite page 1 for a pictorial representation of Area boundaries.)

The Area Offices provide a variety of services to BPA utility customers. These offices serve as BPA's main contact with customers, government agencies and the general public in each Area to develop and implement policies and programs.

Figure 21 on page 42 shows the percentage of 1989 public utility firm sales to each sector within each Area. The Puget Sound Area accounted for 44.5% of the region's public utility firm sales; Lower Columbia Area accounted for 27.9%; Snake River Area, 14.0%; and Upper Columbia Area, 13.6%.

FIGURE 21

Table 29 shows the 1989 public utility firm sales for each Area Office by sector.

Each Area Office summary gives a picture of the major factors contributing to recent use trends in that Area. A figure and a table appear in each summary that look at recent trends in public utility firm sales for that sector.

Table 34 on page 49 shows each Area's average yearly growth compared to the region's public utilities' average yearly growth both in percentage and average megawatts.

TABLE 29

Public Utility Firm Sales By Area 1989					
Avg MW	Residential	Commercial	Industrial	Irrigation	Total
Puget Sound: Public	1,219	777	834	0	2,830
Lower Columbia: Public	659	360	758	3	1,780
Upper Columbia: Public	371	220	170	105	866
SNAKE RIVER: Public	355	226	150	158	889
Total: Public	2,604	1,583	1,912	266	6,365

• Commercial includes street lighting & public facilities

PUGET SOUND AREA SUMMARY

Of the four BPA Area Offices, Puget Sound serves the smallest geographic area but the largest population base. In 1989, 44.5 percent of the region's public utility firm sales were in the Puget Sound Area.

Of the 27 public utilities located in the Puget Sound Area, 11 are municipalities, 8 are public utility districts, and 8 are cooperatives. The Puget Sound Area includes the state of Washington west of the Cascade Mountains, less Clark, Cowlitz, Skamania and Wahkiakum counties in southwestern Washington which are in the Lower Columbia Area.

It is not surprising that the Puget Sound Area saw the most growth in energy sales in the residential, commercial and industrial sectors. Puget Sound has a large share of the region's big commercial office buildings, is home to more industries than any other Area, and fishing and tourism are strong. Aerospace projects contribute greatly to the Area's economy, with Boeing employment in the Seattle area rising by nearly 40,000 (70%) in the past five years.

Table 30 shows the Puget Sound Office average megawatt sales to each sector and total public utility sales for all sectors for each year from 1983-1989.

TABLE 30

Puget Sound Public Utility Firm Sales							
aMW	1983	1984	1985	1986	1987	1988	1989
Res	1,054	1,110	1,164	1,126	1,093	1,163	1,219
Com*	625	673	704	709	722	752	782
Ind	735	766	777	793	789	810	834
Irrig**	0	0	0	0	0	0	0
TOTAL	2,414	2,549	2,645	2,628	2,604	2,725	2,725

* Commercial includes street lighting & public facilities
 ** Less than .5 aMW

Figure 22 shows Puget Sound Area public utility sales growth from 1983-1989 in average megawatts and sector shares of Puget Sound's annual public utility sales.

FIGURE 22

LOWER COLUMBIA AREA SUMMARY

The Lower Columbia Area Office serves the third largest geographical area in the region, covering the entire state of Oregon west of the Cascade Mountain Range, as well as Clark, Cowlitz, Skamania and Wahkiakum counties located in southwestern Washington. Lower Columbia has the second largest population base of the four BPA Areas. Of Lower Columbia's 26 public utility customers, 10 are municipalities, 9 are public utility districts, and 7 are cooperatives.

The Lower Columbia Area service area topography ranges from the rugged peaks of the Cascades (Mount Hood, 11,235 feet) to sea level, with the fertile Willamette Valley in between. With 40 to 60+ inches of precipitation annually, the irrigation load in this area is small compared to that in eastern Oregon and Washington.

Of the 36 counties in Oregon, Lower Columbia serves in 17. Of the 17, agriculture is the principle industry in 8; lumber and wood products are the principle industries in 4. However, lumber and wood products are close in importance to agriculture in 5 counties.

The coastal counties' economy is heavily influenced by fishing, tourism and recreation. With major plants such as Weyerhaeuser and Longview Fibre at Longview, James River at Camas, and Co-ply at North Bonneville, lumber and wood products are paramount to the economy of southwest Washington. Significant capacity expansions have been announced or are in process by Weyerhaeuser (60 MW) and Longview Fibre (8 MW).

Retired populations moving into the region

have accelerated residential and commercial growth. This is particularly true in southern Oregon and coastal counties. This influx of retirees is expected to continue as long as there is a considerable disparity between the price of residential real estate in California and the price in Oregon and Washington. The potential impact of the spotted owl issue on the region's economy is a major concern, an issue which state and federal agencies are continuing to assess.

Table 31 shows Lower Columbia Area's energy sales to each sector and total public utility sales for all sectors for each year from 1983-1989.

TABLE 31

Lower Columbia Public Utility Firm Sales							
oMW	1983	1984	1985	1986	1987	1988	1989
Res	560	596	637	589	592	628	659
Comm*	280	304	318	318	330	344	360
Ind	647	662	681	702	723	735	758
Irrig	1	2	5	3	3	3	3
TOTAL	1,488	1,564	1,639	1,612	1,648	1,710	1,780

* Commercial includes street lighting & public facilities

Figure 23 on page 45 shows Lower Columbia public utility sales growth from 1983-1989 in average megawatts and sector shares of Lower Columbia's yearly public utility sales.

FIGURE 23

UPPER COLUMBIA AREA SUMMARY

The Upper Columbia Area Office serves the third most populous area in the Pacific Northwest and the second largest geographic area. Of the 28 public utilities Upper Columbia serves, 5 are municipalities, 7 are public utility districts, 15 are cooperatives and 1 is a power and irrigation district. The largest share of Upper Columbia's population is in eastern Washington and northern Idaho, which form the western side of the Area. The rest of the Upper Columbia Area is primarily rural.

Manufacturing and agriculture continue to be the economic foundation for the Upper Columbia Area. Other major industries are lumber and wood products, mining, recreation and tourism. Mining made a comeback in 1988 with most of the recent activity centered in northeastern Washington. Tourism is rapidly becoming a major industry, particularly in the Idaho panhandle.

Although average yearly growth rates from 1983-1989 looked strong for Upper Columbia, the growth in energy sales was the smallest of

all the Areas. Most of the growth came from Upper Columbia's larger utilities.

Table 32 shows Upper Columbia Area's average megawatt sales to each sector and total public utility sales for all sectors for each year from 1983-1989.

TABLE 32

Upper Columbia Public Utility Firm Sales							
aMW	1983	1984	1985	1986	1987	1988	1989
Res	316	350	372	349	336	350	371
Com*	167	189	204	197	203	214	220
Ind	110	126	144	156	164	168	170
Irrig	88	89	106	101	105	108	105
TOTAL	681	754	826	803	808	840	866

* Commercial includes street lighting & public facilities

Figure 24 shows Upper Columbia sales growth from 1983-1989 in average megawatts and sector shares of Upper Columbia's yearly public utility sales.

FIGURE 24

SNAKE RIVER AREA SUMMARY

Although the Snake River Area encompasses the largest geographic area within the region, it serves the smallest population base of the four Area Offices. Of the 40 public utilities Snake River serves, 11 are municipalities, 4 are public utility districts and 25 are cooperatives. The three largest population centers are Tri-Cities in Washington, Idaho Falls in Idaho and The Dalles in Oregon.

The Snake River Area is physically characterized by rugged terrain. Mountain ranges are broken by wide, open plains. Where water is available, agriculture flourishes through modern irrigation systems. Many Corps of Engineers and Bureau of Reclamation on the Columbia and Snake rivers are located within Snake River Area boundaries.

Agriculture and its associated food processing industry form the major portion of the economic foundation for the Snake River Area. The primary crops are wheat, potatoes, alfalfa and apples. In addition to food processing, the major industries include mining, tourism, and lumber and wood products.

The Snake River Area is served by the Walla Walla headquarters office and two district offices, Idaho Falls and Boise. Since 1984, the load in the Idaho Falls District has been affected by a number of factors. Probably the most important is the addition of two major mining loads.

The Cypress molybdenum mine near Challis, Idaho, had its first full scale year of production in 1984. Production has fluctuated at times because of molybdenum market uncertainty. For the time being, the market seems to have stabilized, and the mine should have a lifetime of about another 10 years.

Energy consumption at Newmont Gold Mine near Carlin, Nevada, has grown from around 27,633 kWh in 1985 to about 240,000 MWh in 1989. It appears the gold market can support the Newmont Mine for some time to come.

Irrigation sales in the Snake River Area are the highest in the region, totaling more than the other three Areas combined. In the past two, very dry years, southern Idaho used a substantial amount of electricity for irrigation.

Tourism was the primary growth area for the office in Walla Walla in 1989. Windsurfing on the Columbia River enhanced residential and commercial loads. The other key growth area is in central Oregon, where recreation activities around Mt. Bachelor and Sunriver resulted in increased sales in 1989.

As a result of an improved agricultural economy and an AMAX gold mine, the Snake River district office in Boise has recovered sales recently.

Table 33 shows Snake River Area's average megawatt sales to each sector and total public utility sales for all sectors for each year, 1983-1989.

TABLE 33

Snake River Public Utility Firm Sales							
oMW	1983	1984	1985	1986	1987	1988	1989
Res	306	327	341	315	305	322	355
Com*	167	179	189	185	188	210	226
Ind	94	108	118	115	111	126	150
Irrig	125	133	150	140	147	152	158
TOTAL	692	747	798	755	751	810	889

* Commercial includes street lighting & public facilities

Figure 25 shows Snake River Area sales growth in average megawatts and sector shares of Snake River's yearly public utility sales for the 1983-1989 period.

FIGURE 25

TABLE 34

Public Utility Firm Sales Growth by Area
And Regional Public Utility Firm Sales Growth
(1983-1989)

	Puget Sound		Lower Columbia	
	Growth Rate(%)	Average Annual Growth (aMW)	Growth Rate(%)	Average Annual Growth (aMW)
Residential	2.5	28	2.8	17
Commercial	3.8	26	4.3	13
Industrial	2.1	17	2.7	19
Irrigation	—	—	—	0
TOTAL	2.7	70	3.0	49

	Upper Columbia		Snake River		Regional	
	Growth Rate(%)	Average Annual Growth (aMW)	Growth Rate(%)	Average Annual Growth (aMW)	Growth Rate(%)	Average Annual Growth (aMW)
Residential	2.7	7	2.5	8	2.6	61
Commercial	4.7	9	5.2	10	4.2	58
Industrial	7.5	10	8.1	9	3.2	54
Irrigation	3.0	3	4.0	6	3.6	9
TOTAL	4.1	31	4.3	33	3.1	184

• Commercial includes street lighting & public facilities

GLOSSARY

- Ampere** - Unit of measurement of electric current.
- Average Annual Growth Rate** - Measure of growth that takes into account the compounding of growth that takes place over time. Similar to compound interest paid on a savings account.
- The formula is:
- $$\left(\frac{PV}{HV} \right)^{1/n} - 1$$
- where PV = present value
HV = historical value
n = term (number of years)
- Average Megawatt** - One average megawatt (aMW) equals one million average watts and is a measure of energy. On an annual basis, the total megawatt hours measured in one year is divided by the number of hours in a year--8,784 hours in a leap year; 8,760 hours in all other years.
- To put this measure in context, one medium size coal-fired plant producing 2,190,000 megawatthours per year would produce 250 average megawatts.
- BPA Customer** - Utilities that buy electric power from BPA and industries BPA serves directly. See also Directly Served Customers.
- Colockum** - A subsidiary company owned by Aluminum Company of America (ALCOA). Colockum generates its own hydro electricity and buys additional electricity from Chelan County Public Utility District. All electricity bought or produced by Colockum goes to ALCOA's potlines #4 and #5.
- Commercial Sector** - Consists generally of trade and service activities. The commercial sector includes business activities which do not involve manufacturing or extraction. This sector has a variety of building types, such as offices, schools, retail stores, warehouses, hotels, and hospitals. Street lighting accounts are classified as commercial.
- Housing projects normally consist mainly of residential accounts with some small commercial support services. However, a utility might sell power on a single meter to the entire project at a commercial rate.
- Cooperative** - Private, normally nonprofit corporations operating within state laws, but essentially self-regulating. Each cooperative is a preference customer of BPA and is controlled by a board of directors, elected from its membership.
- Demand** - In a public utility context, the rate at which electricity is delivered to or by a system over any designated period, expressed in kilowatts or megawatts, or in kilovoltamperes or megavoltamperes.
- Direct Service Industry** - Industrial firm that buys electricity directly from BPA. These firms operate electric-intensive plants in the Pacific Northwest producing aluminum, other primary metals, chemicals, or pulp and paper products.
- Directly Served Customers** - Includes the direct service industries and also federal agencies that buy electricity directly from BPA for their own use.
- Dry Goods** - Firms that sell merchandise to individuals and households. Dry goods retail firms include all retail trade establishments except those engaged mainly in selling food and drink, such as grocery stores and restaurants.

End Use	- Electricity use categories such as heating, cooling, ventilation, hot water, and lights and conveniences.
Federal Agencies	- In the Pacific Northwest, includes the U.S. Bureau of Reclamation (USBR); Bureau of Mines in Oregon; Fairchild Air Force Base; U.S. Navy Bases (Puget Sound Naval Yard, Jim Creek, and Bangor); and Department of Energy, Richland - Midway. Federal agencies buy most of their electricity directly from BPA; they generate electricity for their remaining load.
Firm Electricity	- Electricity whose availability is assured to the customer to meet all or any agreed upon part of the customer's load requirement over a defined period.
Generating Utility	- A utility that owns generating facilities that meet all or most of their customers' demand for electricity. Even so, some generating utilities buy electricity for a greater percentage of their total loads than do some non-generating utilities. Generating utilities are members of the Northwest Power Pool. Pacific Northwest generating utilities include these public utilities: Eugene Water & Electric, Seattle City Light, Tacoma City Light, Chelan County Public Utility District (PUD), Cowlitz County PUD, Douglas County PUD, Grant County PUD, Pend Oreille County PUD, and Snohomish County PUD.
Heating Degree Days	- The average degrees per year it takes to bring the daily temperature to an interior temperature of 65 degrees.
Industrial Sector	- Includes manufacturing operations that process a product, including lumbering and wood products, or assemble units into a complete article, as well as extractive activities such as mining and quarrying. Large commercial accounts such as single-metered shopping centers sometimes are included in industrial accounts such as Large Power, Large Commercial, or Small Industrial, even though they are not related to manufacturing a product. Quite often, utilities distinguish between the industrial and commercial sectors by the size of the load. For example, in 1983 the Rural Electrification Authority utilities changed the way they define commercial and industrial customers. Before 1983, customers who used 50 kilovoltamperes (KVA) or more were classified as industrial. Starting in 1983, the commercial group was enlarged to include customers who use up to 1,000 KVA.
Investor-Owned Utility	- See Private Utility
Irrigation Sector	- Includes customers who require electricity for such uses as pumping, spraying crops, and stock pumps used for pasturage. Domestic water pumping is often included as irrigation if no distinction is made on utility rate schedules between residential and irrigation pumping or if the reported data are mixed.
Kilovolt (kv)	- One kilovolt equals 1,000 volts.
Kilowatt (kW)	- One kilowatt equals 1,000 watts.
Kilowatt Hour (kWh)	- One kilowatt hour equals one kilowatt (= 1,000 watts) of electricity supplied to or taken from an electric circuit for one hour.

Load	- The amount of electric power or energy delivered or required at any specified point or points on a system. Load originates mainly at the energy-consuming equipment of customers, such as heaters, air conditioners, lights, and motors.
Load Factor	- The ratio of average load to peak load during a specified period of time. For example, if the load factor of a customer is low, the customer's average use of electricity is low relative to the same customer's peak use.
Megawatt (MW)	- One megawatt equals one million watts.
Nonfirm Electricity	- Electricity supplied or available under an arrangement that does not guarantee and continuous availability of that electricity.
Non-Generating Utility	- A public utility that has little or no generating facilities. Most Pacific Northwest non-generating public utilities rely on BPA to meet all or most of their load. A few have the capability to generate electricity or purchase electricity from sources other than BPA.
Northwest Power Pool	- Formed in 1941 to achieve maximum electrical production through coordination of river flows and to help coordinate electrical operations. In 1964 the Pacific Northwest Coordination Agreement was signed, a binding contract for planned operation among 18 U.S. utilities and agencies controlling power generating facilities in Washington and Oregon, and parts of Idaho, Montana and California. These utilities and agencies constitute the Northwest Power Pool.
Preference Customer	- Public bodies, including public utility districts, and cooperatives with priority access to federal firm electricity.
Private Utility	- A utility that sells electricity, is owned by stockholders, and is regulated by state commission. Also known as an investor-owned utility.
Public Facility/ Public Authority	- Commercial buildings owned by the public. Examples are schools, churches, public libraries and government buildings.
Public Utility	- A utility that sells electricity to and is owned and regulated by its consumers.
Public Utility District (WA)/ Peoples' Utility District (OR)	- A separate unit of government established by voters. The Washington Public Districts and Oregon People's Utility Districts hold preference customer status in buying BPA power.
Residential Sector	- All residential, farm, apartment, and seasonal dwellings with such electricity uses as space and water heating, cooking, and lighting. Electricity uses can include security lighting and swimming pool heating. The residential sector has some overlap with the commercial sector because some businesses are housed in homes.
Retail Customer	- In this report, an entity that buys electricity from a Pacific Northwest utility.
Sales	- The amount of electricity sold to retail or directly served customers. See also Directly Served Customers, Retail Customers
Sector	- A large group of energy users whose members have similar types of uses for electricity. Sectors include residential, commercial, industrial, and irrigation.

- Temperature Adjustment** - A way of taking into account changes in electricity use due to weather. The adjustment of electricity sales for temperature effects on electricity use for heating is based on heating degree days determined by the National Weather Service.
- Utility Group** - Utilities served by BPA are grouped according to whether they are publicly or privately owned, and publics are further grouped according to whether they are generating or non-generating utilities.
- Volt** - A unit of electromotive force as applied steadily to a circuit.
- Voltampere** - An electrical unit of power equivalent to electromotive force (volts) times amount of electric current (amperes).
- Washington Public Power Supply System (WPPSS)** - Municipal corporation and joint operation agency in Washington state composed of representatives of public utility districts and municipal utilities. Based on power purchase contracts of its members or other utilities, WPPSS can acquire, construct and operate plants and facilities for the generation or transmission of electric power.
- Watt** - An electrical unit of power or rate of doing work. A watt is analogous to horsepower or footpounds per minute of mechanical power. One horsepower is equivalent to about 746 watts.

APPENDIX: A LOOK AT THE PAST, 1970-1989 SALES BY SECTOR AND BY UTILITY GROUP

This appendix provides a table showing regional sales by sector and utility group for the time period 1970-1989. A growth rate table takes a quick look at the region's total average yearly growth for the time periods 1970-1989, 1975-1989, 1980-1989, 1985-1989, 1988-1989, and five-year spans beginning with 1970-1975 and ending with 1985-1989.

Several things to keep in mind when reviewing the data:

- Sales are as observed. For example, when CP National's retail customers were transferred to Oregon Trail in October 1988, a shift occurred in sales from private utility to public utility.
- No data is adjusted for temperature.
- The decline in non-firm electricity sales to the direct-service industries after 1981 partly reflect contractual changes brought about by the Pacific Northwest Power Act of 1980.
- In 1983, the Rural Electrification Authority cooperative utilities changed the way they define commercial and industrial customers. Before 1983, customers who used 50 kilovoltamperes or more were classified as industrial. Starting in 1983, the commercial group was enlarged to include customers who use up to 1,000 kilovoltamperes.
- The difference between loads and sales is discussed in the segment "EUR vs. MLC" on page 3 of this report.

The statistics contained in this appendix are available on diskette by calling Mary Lange at Bonneville Power Administration, (503) 230-5858.

Growth Rate Table
(Average Yearly Growth)

Percent					
Firm Sales	1970-1989	1975-1989	1980-1989	1985-1989	1988-1989
Total	2.7	2.3	1.4	2.4	4.1
Public	3.4	3.0	1.6	1.9	4.5
Private	3.1	2.5	1.7	2.2	4.1
DSI	0.7	0.4	0.2	5.0	3.4
Fed Ag/USBR	0.6	2.3	1.4	-0.9	-3.1

Firm Sales	1970-1975	1975-1980	1980-1985	1985-1989
Total	4.0	3.9	0.7	2.4
Public	4.7	5.4	1.4	1.9
Private	4.9	3.9	1.4	2.2
DSI	1.4	0.9	-3.6	5.0
Fed Ag/USBR	-4.3	4.1	2.5	-0.9

PACIFIC NORTHWEST REGION
SUMMARY HISTORICAL SALES AND LOAD DATA

Table 1

Total Sales in Pacific Northwest Region, 1970 - 1989

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
	(Average Megawatts)									
Residential	3328	3643	3848	3970	4070	4429	4636	4809	5090	5524
Commercial (A)	1662	1815	1962	2049	2024	2242	2356	2441	2606	2809
Street lighting										
Industrial non-DSI	2479	2490	2712	2773	2857	2712	3052	3159	3243	3455
Industrial Colockum	154	158	161	156	170	174	174	177	180	183
Industrial DSI	2217	2071	2019	2226	2434	2371	2375	2421	2440	2469
Irrigation	263	268	303	361	417	424	467	576	495	603
USBR irrigation	55	55	55	55	55	55	55	59	55	64
BPA-Served Fed.Agencies	114	84	80	76	75	81	84	92	95	108
TOTAL FIRM SALES	10272	10584	11140	11666	12102	12488	13199	13734	14204	15215
Firm losses (B)	673	693	730	764	793	818	865	900	930	997
TOTAL FIRM LOAD (C)	10945	11277	11870	12430	12895	13306	14064	14634	15134	16212
Ind. non-DSI nonfirm	68	67	71	99	73	105	87	94	99	110
Ind. DSI nonfirm	616	740	719	490	726	471	688	379	731	347
TOTAL NONFIRM SALES	684	807	790	589	799	576	775	473	830	457
Nonfirm losses (B)	16	19	19	14	19	14	19	11	20	11
TOTAL NONFIRM LOAD	700	826	809	603	818	590	794	484	850	468
TOTAL REGION SALES	10956	11391	11930	12255	12901	13064	13974	14207	15034	15672
TOTAL REGION LOAD	11646	12104	12679	13033	13713	13896	14857	15118	15984	16680

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Residential	5461	5311	5533	5156	5458	5661	5369	5271	5542	5806
Commercial (A)	2774	2839	2925	2966	3182	3357	3374	3485	3634	3803
Street lighting	62	67	58	54	53	50	51	52	52	53
Industrial non-DSI	3462	3664	3469	3390	3520	3570	3640	3768	3896	4062
Industrial Colockum	181	178	173	160	167	159	143	164	173	171
Industrial DSI	2484	2448	1993	1860	2458	2068	1885	2065	2435	2518
Irrigation	522	589	541	467	475	556	523	555	585	582
USBR irrigation	60	61	51	54	56	58	60	64	64	58
BPA-Served Fed.Agencies	106	108	115	119	128	137	127	127	130	130
TOTAL FIRM SALES	15112	15265	14858	14226	15497	15616	15172	15551	16511	17183
Firm losses (B)	1063	1061	1045	1123	1043	1176	950	1093	1071	1177
TOTAL FIRM LOAD (C)	16175	16326	15903	15349	16540	16792	16122	16644	17582	18360
Ind. non-DSI nonfirm	113	112	97	134	142	120	134	148	142	148
Ind. DSI nonfirm	340	663	257	510	487	386	325	412	536	486
TOTAL NONFIRM SALES	453	775	354	644	629	506	459	560	678	634
Nonfirm losses (B)	11	19	8	15	15	12	11	13	16	15
TOTAL NONFIRM LOAD	464	794	362	659	644	518	470	573	694	649
TOTAL REGION SALES	15565	16040	15212	14870	16126	16122	15631	16111	17189	17817
TOTAL REGION LOAD	16639	17120	16265	16008	17184	17310	16592	17217	18276	19009

FOOTNOTES: Periods (.) represent missing values.

(A) Includes street lighting from 1970 thru 1979.

(B) Distribution losses, excluding federal transmission losses

(6.55 percent firm from 1970 to 1979, difference between loads and sales from 1980 to 1989; 2.40 percent nonfirm from 1970 to 1989).

(C) Includes such loads as surplus power purchases under BPA's partnership program.

Table II

Total Public Sales in Pacific Northwest Region, 1970 - 1989										
	(Average Megawatts)									
	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Residential	1509	1653	1738	1776	1812	1979	2084	2163	2297	2480
Commercial (A	695	759	818	836	828	910	977	994	1066	1146
Street lighting	.	.	.	.	.	.	.	.	.	.
Industrial non-DSI (B	998	971	1036	1079	1118	1111	1305	1397	1447	1568
Industrial Colockum	154	158	161	156	170	174	174	177	180	183
Irrigation	99	99	112	146	163	178	216	259	227	268
TOTAL FIRM SALES	3455	3640	3865	3993	4091	4352	4756	4990	5217	5645
Industrial nonfirm	.	.	.	.	.	.	.	.	.	.
TOTAL PUBLIC SALES	3455	3640	3865	3993	4091	4352	4756	4990	5217	5645
	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Residential	2474	2390	2449	2237	2383	2514	2379	2327	2464	2605
Commercial (A	1138	1139	1174	1217	1321	1394	1388	1419	1498	1565
Street lighting	28	30	27	23	23	21	22	23	23	23
Industrial non-DSI (B	1602	1748	1698	1587	1662	1720	1767	1788	1840	1912
Industrial Colockum	181	178	173	160	167	159	143	164	173	171
Irrigation	239	264	251	215	224	259	244	256	263	266
TOTAL FIRM SALES	5662	5749	5772	5439	5780	6067	5943	5977	6261	6542
Industrial nonfirm	3	2	0	48	48	31	21	3	1	2
TOTAL PUBLIC SALES	5665	5751	5772	5487	5828	6098	5964	5980	6262	6544

Table III

Total Private Sales in Pacific Northwest Region, 1970 - 1989										
	(Average Megawatts)									
	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Residential	1819	1990	2110	2194	2258	2450	2552	2646	2793	3044
Commercial (A	967	1056	1144	1213	1196	1332	1379	1447	1540	1663
Street lighting	.	.	.	.	.	.	.	.	.	.
Industrial non-DSI	1481	1519	1676	1694	1739	1601	1747	1762	1796	1887
Irrigation	164	169	191	215	254	246	251	317	268	335
TOTAL FIRM SALES	4431	4734	5121	5316	5447	5629	5929	6172	6397	6929
Industrial nonfirm	68	67	71	99	73	105	87	94	99	110
TOTAL IOU SALES	4499	4801	5192	5415	5520	5734	6016	6266	6496	7039
	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Residential	2987	2921	3084	2919	3075	3147	2990	2944	3078	3201
Commercial (A	1636	1700	1751	1749	1861	1963	1986	2066	2136	2238
Street lighting	34	37	31	31	30	29	29	29	29	30
Industrial non-DSI	1860	1916	1771	1803	1858	1850	1873	1980	2056	2150
Irrigation	283	325	290	252	251	297	279	299	322	316
TOTAL FIRM SALES	6800	6899	6927	6754	7075	7286	7157	7318	7621	7935
Industrial nonfirm	110	110	97	86	94	89	113	145	141	146
TOTAL IOU SALES	6910	7009	7024	6840	7169	7375	7270	7463	7762	8081

FOOTNOTES: Periods represent missing values.

(A) Includes street lighting from 1970 thru 1979.

(B) Includes Industrial nonfirm form 1970 thru 1982.

Table IV

BPA Sales to Directly Served Customers, 1970 - 1989

	1970	1971	1972	1973	1974	1975	1976	(Average Megawatts)		
								1977	1978	1979
Industrial DSI's	2217	2071	2019	2226	2434	2371	2375	2421	2440	2469
USBR irrigation	55	55	55	55	55	55	55	59	55	64
BPA-Served Fed. Agencies	114	84	80	76	75	81	84	92	95	108
TOTAL FIRM SALES	2386	2210	2154	2357	2564	2507	2514	2572	2590	2641
Industrial DSI Nonfirm	616	740	719	490	726	471	688	379	731	347
TOTAL BPA DIRECT SALES	3002	2950	2873	2847	3290	2978	3202	2951	3321	2988
	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Industrial DSI's	2484	2448	1993	1860	2458	2068	1885	2065	2435	2518
USBR irrigation	60	61	51	54	56	58	60	64	64	58
BPA-Served Fed. Agencies	106	108	115	119	128	137	127	127	130	130
TOTAL FIRM SALES	2650	2617	2159	2033	2634	2263	2072	2256	2629	2706
Industrial DSI Nonfirm	340	663	257	510	487	386	325	412	536	486
TOTAL BPA DIRECT SALES	2990	3280	2416	2543	3121	2649	2397	2668	3165	3192

Table V

Nongenerating Public Sales in Pacific Northwest Region, 1970 - 1989

	(Average Megawatts)									
	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Residential	665	746	808	844	879	976	1040	1110	1197	1300
Commercial (A)	233	256	281	285	290	331	384	401	434	470
Street lighting	.	.	.	.	.	.	.	.	.	.
Industrial non-DSI (B)	361	373	403	429	439	446	477	554	561	638
Irrigation	79	79	91	118	133	146	177	214	186	219
TOTAL FIRM SALES	1338	1454	1583	1676	1741	1899	2078	2279	2378	2627
Industrial nonfirm	.	.	.	.	.	.	.	.	.	.
TOTAL NON-GENERATING SALES	1338	1454	1583	1676	1741	1899	2078	2279	2378	2627

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Residential	1281	1237	1262	1148	1230	1296	1211	1195	1268	1355
Commercial (A)	470	449	458	511	568	593	584	596	638	670
Street lighting	10	12	9	7	6	6	6	6	6	6
Industrial non-DSI (B)	629	652	655	586	611	637	640	649	671	720
Irrigation	197	217	204	172	181	207	194	203	207	211
TOTAL FIRM SALES	2587	2567	2588	2424	2596	2739	2635	2649	2790	2962
Industrial nonfirm	.	.	.	18	21	11	5	0	0	0
TOTAL NON-GENERATING SALES	2587	2567	2588	2442	2617	2750	2640	2649	2790	2962

Table VI

Generating Public Sales in Pacific Northwest Region, 1970 - 1989

	(Average Megawatts)									
	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Residential	844	907	930	932	933	1003	1044	1053	1100	1180
Commercial (A)	462	503	537	551	538	579	593	593	632	676
Street lighting	.	.	.	.	.	.	.	.	.	.
Industrial non-DSI (B)	637	598	633	650	679	665	828	843	886	930
Industrial Colockum	154	158	161	156	170	174	174	177	180	183
Irrigation	20	20	21	28	30	32	39	45	41	49
TOTAL FIRM SALES	2117	2186	2282	2317	2350	2453	2678	2711	2839	3018
Industrial nonfirm	.	.	.	.	.	.	.	.	.	.
TOTAL GENERATING SALES	2117	2186	2282	2317	2350	2453	2678	2711	2839	3018

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Residential	1193	1153	1187	1089	1153	1218	1168	1132	1196	1250
Commercial (A)	668	690	716	706	753	801	804	823	860	895
Street lighting	18	18	18	16	17	15	16	17	17	17
Industrial non-DSI (B)	973	1096	1043	1001	1051	1083	1127	1139	1169	1192
Industrial Colockum	181	178	173	160	167	159	143	164	173	171
Irrigation	42	47	47	43	43	52	50	53	56	55
TOTAL FIRM SALES	3075	3182	3184	3015	3184	3328	3308	3328	3471	3580
Industrial nonfirm	.	.	.	30	27	20	16	3	1	2
TOTAL GENERATING SALES	3075	3182	3184	3045	3211	3348	3324	3331	3472	3582

FOOTNOTES: Periods represent missing values.

(A) Includes street lighting from 1970 thru 1979.

(B) Includes industrial nonfirm from 1970 thru 1982.

HISTORICAL SALES DATA IN PACIFIC NORTHWEST REGION

A. RESIDENTIAL SECTOR

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
	(Average Megawatts)									
PUBLICS	1509	1653	1738	1776	1812	1979	2084	2163	2297	2480
PRIVATES	1819	1990	2110	2194	2258	2450	2552	2646	2793	3044
SUBTOTAL	3328	3643	3848	3970	4070	4429	4636	4809	5090	5524
USBIA	.	.	.	9	9	10	11	11	17	13
TOTAL REGION	3328	3643	3848	3979	4079	4439	4647	4820	5102	5537

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
PUBLICS	2474	2390	2449	2237	2383	2514	2379	2327	2464	2605
PRIVATES	2987	2921	3084	2919	3075	3147	2990	2944	3078	3201
SUBTOTAL	5461	5311	5533	5156	5458	5661	5369	5271	5542	5806
USBIA	14	14	15	14	15	16	15	15	16	17
TOTAL REGION	5475	5325	5548	5170	5473	5677	5384	5286	5558	5823

B. COMMERCIAL SECTOR

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
	(Average Megawatts)									
PUBLICS STREET LTG	.	.	.	.	.	.	.	.	.	.
PRIVATES STREET LTG	.	.	.	.	.	.	.	.	.	.
SUBTOTAL	.	.	.	.	.	.	.	.	.	.
PUBLICS	695	759	818	836	828	910	977	994	1066	1146
PRIVATES	967	1056	1144	1213	1196	1332	1379	1447	1540	1663
SUBTOTAL	1662	1815	1962	2049	2024	2242	2356	2441	2606	2809
USBIA	.	.	.	5	5	6	5	6	6	9
TOTAL REGION	1662	1815	1962	2054	2029	2248	2361	2447	2612	2818

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
PUBLICS STREET LTG	28	30	27	23	23	21	22	23	23	23
PRIVATES STREET LTG	34	37	31	31	30	29	29	29	29	30
SUBTOTAL	62	67	58	54	53	50	51	52	52	53
PUBLICS	1138	1139	1174	1217	1321	1394	1388	1419	1498	1565
PRIVATES	1636	1700	1751	1749	1861	1963	1986	2066	2136	2238
SUBTOTAL	2774	2839	2925	2966	3182	3357	3374	3485	3634	3803
USBIA	7	8	6	6	6	7	6	6	6	7
TOTAL REGION	2781	2847	2931	2972	3188	3364	3380	3491	3640	3810

C. INDUSTRIAL SECTOR

	1970	1971	1972	1973	1974	1975	(Average Megawatts)			
	1976	1977	1978	1979						
PUBLICS	998	971	1036	1079	1118	1111	1305	1397	1447	1568
PRIVATES	1481	1519	1676	1694	1739	1601	1747	1762	1796	1887
SUBTOTAL	2479	2490	2712	2773	2857	2712	3052	3159	3243	3455
COLOCKUM	154	158	161	156	170	174	174	177	180	183
DSI FIRM	2217	2071	2019	2226	2434	2371	2375	2421	2440	2469
DSI NON-FIRM	616	740	719	490	726	471	688	379	731	347
PUB. NON-FIRM	.	.	.	.	.	.	.	.	.	.
PRI. NON-FIRM	68	67	71	99	73	105	87	94	99	110
TOTAL REGION	5534	5526	5682	5744	6260	5833	6376	6230	6693	6564

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
PUBLICS	1602	1748	1698	1587	1662	1720	1767	1788	1840	1912
PRIVATES	1860	1916	1771	1803	1858	1850	1873	1980	2056	2150
SUBTOTAL	3462	3664	3469	3390	3520	3570	3640	3768	3896	4062
COLOCKUM	181	178	173	160	167	159	143	164	173	171
DSI FIRM	2484	2448	1993	1860	2458	2068	1885	2065	2435	2518
DSI NON-FIRM	340	663	257	510	487	386	325	412	536	486
PUB. NON-FIRM	3	2	0	48	48	31	21	3	1	2
PRI. NON-FIRM	110	110	97	86	94	89	113	145	141	146
TOTAL REGION	6580	7065	5989	6054	6774	6303	6127	6557	7182	7385

D. IRRIGATION SECTOR

	1970	1971	1972	1973	1974	1975	(Average Megawatts)			
	1976	1977	1978	1979						
PUBLICS	99	99	112	146	163	178	216	259	227	268
PRIVATES	164	169	191	215	254	246	251	317	268	335
SUBTOTAL	263	268	303	361	417	424	467	576	495	603
US BUREAU OF RECLAMATION	55	55	55	55	55	55	55	59	55	64
USBR RESERVOIR PUMPING	.	.	.	109	98	97	110	106	91	135
USBIA	.	.	.	4	4	4	4	8	4	6
TOTAL REGION	318	323	358	529	574	580	636	749	645	808

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
PUBLICS	239	264	251	215	224	259	244	256	263	266
PRIVATES	283	325	290	252	251	297	279	299	322	316
SUBTOTAL	522	589	541	467	475	556	523	555	585	582
US BUREAU OF RECLAMATION	60	61	51	54	56	58	60	64	64	58
USBR RESERVOIR PUMPING	57	115	98	84	96	115	121	127	129	128
USBIA	4	3	4	4	5	7	6	4	6	5
TOTAL REGION	643	768	694	609	632	736	710	750	784	773

Break Down of BPA-Served Fed. Agencies

	1970	1971	1972	1973	1974	1975	1976	(Average Megawatts)		
								1977	1978	1979
USBIA res.	.	.	.	9	9	10	11	11	12	13
USBIA com.	.	.	.	5	5	6	5	6	6	9
USBIA irrg.	.	.	.	4	4	4	4	8	4	6
Total USBIA	.	.	.	18	18	20	20	25	22	28
Federal Agencies	.	.	.	58	57	61	64	67	73	80
BPA-Served Fed. Agencies	114	84	80	76	75	81	84	92	95	108

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
USBIA res.	14	14	15	14	15	16	15	15	16	17
USBIA com.	7	8	6	6	6	7	6	6	6	7
USBIA irrg.	4	3	4	4	5	7	6	4	6	5
Total USBIA	25	25	25	24	26	30	27	25	28	29
Federal Agencies	81	83	90	95	102	107	100	102	102	101
BPA-Served Fed. Agencies	106	108	115	119	128	137	127	127	130	130

Break Down of Non-Generating Public Commercial

	1970	1971	1972	1973	1974	1975	1976	(Average Megawatts)		
								1977	1978	1979
Commercial	232	255	280	284	289	329	381	398	428	411
Public Facilities	.	.	.	.	.	.	.	.	.	50
WPPSS Construction (A)	1	1	1	1	1	2	3	3	6	9
Total Commercial	233	256	281	285	290	331	384	401	434	470

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Commercial	411	388	399	461	500	527	520	533	579	613
Public Facilities	50	50	51	44	51	58	55	54	51	52
WPPSS Construction (A)	9	11	8	6	17	8	9	9	8	5
Total Commercial	470	449	458	511	568	593	584	596	638	670

Break Down of Generating Public Commercial

	1970	1971	1972	1973	1974	1975	1976	(Average Megawatts)		
								1977	1978	1979
Commercial	462	503	537	551	538	579	593	593	632	601
Public Facilities	.	.	.	.	.	.	.	.	.	75
Total Commercial	462	503	537	551	538	579	593	593	632	676

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Commercial	593	615	643	633	675	720	721	740	774	809
Public Facilities	75	75	73	73	78	81	83	83	86	86
Total Commercial	668	690	716	706	753	801	804	823	860	895

(A) Washington Public Power Supply System (WPPSS) - See glossary for defination

E. OTHER SECTOR

	(Average Megawatts)									
	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
BPA-SERV FEDS (LESS USBIA)	.	.	.	58	57	61	64	67	73	80
OTHER RESV. PUMPING	.	.	.	0	8	9	9	13	15	20
TOTAL REGION	.	.	.	58	65	70	73	80	88	100

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
BPA-SERV FEDS (LESS USBIA)	81	83	90	95	102	107	100	102	102	101
OTHER RESV. PUMPING	19	21	15	20	15	17	14	14	14	14
TOTAL REGION	100	104	105	115	117	124	114	116	116	115

Break Down of Private Commercial

	1970	1971	1972	1973	1974	1975	1976	(Average Megawatts)		
								1977	1978	1979
Commercial	967	1056	1144	1213	1196	1332	1379	1447	1540	1661
Public Facilities	.	.	.	.	.	.	.	.	.	2
Total Commercial	967	1056	1144	1213	1196	1332	1379	1447	1540	1663
	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Commercial	1635	1695	1747	1746	1858	1960	1983	2062	2133	2235
Public Facilities	1	5	4	3	3	3	3	4	3	3
Total Commercial	1636	1700	1751	1749	1861	1963	1986	2066	2136	2238

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