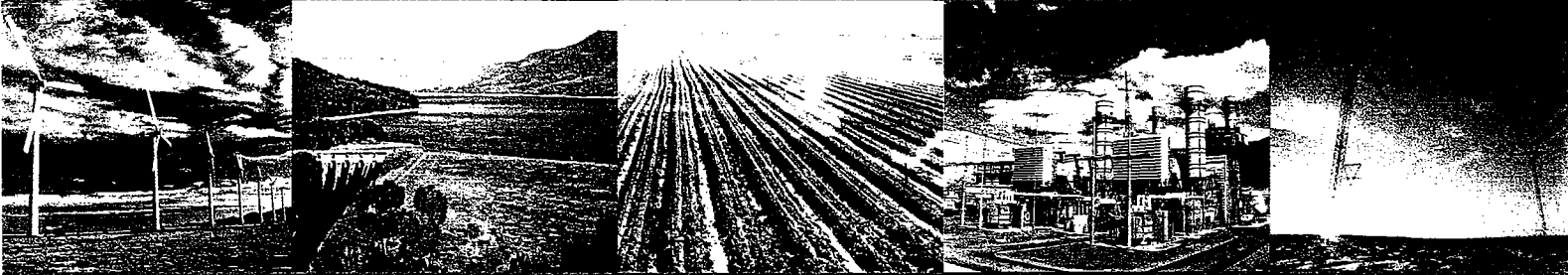


PAC-E-07-03

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2007

Integrated Resource Plan

Appendices



Pacific Power | Rocky Mountain Power | PacifiCorp Energy

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APPENDIX A – BASE ASSUMPTIONS

This appendix will cover the base assumptions used for both the Capacity Expansion Module and the Planning and Risk model used for portfolio analysis in the 2007 Integrated Resource Plan.

GENERAL ASSUMPTIONS

Study Period

PacifiCorp currently uses a calendar year that begins on January 1 and ends December 31. The study period covers a 20-year period beginning January 1, 2007 through December 31, 2026.

Inflation Curve

Where price forecasts and associated escalation rates were not established by external sources, IRP simulations and price forecasts were performed with PacifiCorp's inflation rate schedule (See Table A.1 below). Unless otherwise stated, prices or values in this appendix are expressed in nominal dollars.

Table A.1 – Inflation

Calendar Years	Average Annual Rate (%)
2007-2013	1.86
2014-2020	1.80
2021-2026	1.88

Planning Reserve Margin

PacifiCorp assumed both 12 and 15 percent planning margin for developing the load and resource balance. Capacity Expansion Module scenario analysis used 12 percent as the low case, 15 percent as the medium case and 18 percent as a high case during the initial phase of analyses. To preserve planning flexibility, the company adopted a reserve margin range of 12 to 15 percent in recognition of uncertainties concerning the cost and reliability impact of evolving state resource policies to foster renewable energy development and reduce utilities' carbon footprints.

LOAD FORECAST

This load forecast section provides state-level forecasted retail sales summaries, load forecasting methodologies, and the elasticity studies. Chapter 4 provides the forecast information for each state and the system as a whole by year for 2007 through 2016.

State Summaries

Oregon

Table A.2 summarizes Oregon state forecasted sales growth compared with historical growth by customer class.

Table A.2 – Historical and Forecasted Sales Growth in Oregon

	Residential	Commercial	Industrial	Irrigation	Other	Total
2005 GWh	5,374	4,614	2,957	211	50	13,207
2006 GWh	5,554	4,843	3,238	237	41	13,912
Average Annual Growth Rate						
1995-05	1.2%	2.0%	-3.5%	-3.1%	5.0%	0.1%
2007-16	0.7%	1.5%	-0.9%	0.0%	0.9%	0.6%

The forecast of residential sales is expected to have a slightly slower growth than has been experienced historically. Population growth is expected to continue in the service area, which is driving some of the growth, while usage per customer in the residential class is expected to decline slightly due to conservation.

Forecasted commercial class sales are projected to grow slightly more slowly over the forecast horizon compared to historical periods. Usage per customer is projected to remain flat due to increased equipment efficiency which offsets increased saturation of air conditioning.

Forecasted industrial class sales are projected to decline more slowly over the forecast horizon compared to historical periods. In the later years of this historical period, two large industrial customers chose to leave PacifiCorp's system. This, coupled with declines over the decade in the lumber and wood products industries, resulted in an overall decline in sales to this class. Over the forecast horizon, continuing growth is expected in food processing industries, specialty metals manufacturing industries, and niche lumber and wood businesses, along with continued diversification in the manufacturing base in the state.

The factors influencing the forecasted sales growth rates are also influencing the forecasted peak demand growth rates.

Washington

Table A.3 summarizes Washington state forecasted sales growth compared with historical growth by customer class.

Table A.3 – Historical and Forecasted Sales Growth in Washington

	Residential	Commercial	Industrial	Irrigation	Other	Total
2005 GWh	1,587	1,417	1,054	175	11	4,244
2006 GWh	1,596	1,415	990	155	10	4,166
Average Annual Growth Rate						
1995-05	1.1%	2.1%	0.8%	3.1%	2.9%	1.4%
2007-16	1.1%	1.2%	2.0%	0.0%	0.1%	1.3%

The growth in residential class sales is due to continuing population growth and household formation in this part of PacifiCorp's service area. Usage per customer is expected to increase slightly due to increases in both real income and the residential square footage.

The continuing residential customer growth also affects the commercial sector through increasing numbers of commercial customers. Usage per commercial customer is decreasing during the forecast horizon due to increasing saturations in air-conditioning and office equipment that are being offset by efficiency gains in other end-uses, such as lighting.

The industrial class is projected to grow at rates above the historical rate. Industrial production is projected to continue to grow in the food, lumber, and paper industries in the state. There are indications that bio-diesel facilities will locate in the state during the forecast period.

California

Table A.4 summarizes California state forecasted sales growth compared with historical growth by customer class.

Table A.4 – Historical and Forecasted Sales Growth in California

	Residential	Commercial	Industrial	Irrigation	Other	Total
2005 GWh	391	290	64	89	2	837
2006 GWh	398	293	62	96	2	851
Average Annual Growth Rate						
1995-05	1.0%	2.4%	-2.0%	2.0%	0.4%	1.3%
2007-16	0.9%	1.8%	-0.4%	0.0%	0.1%	1.1%

The rate of growth in residential class sales is driven, in part, by the continuing growth in population in this part of PacifiCorp's service area. Usage per customer in the residential class is declining slightly. Home sizes continue to increase, resulting in more growth in use per customer but this is more than offset by the increasing adoption of efficient appliances. In addition, summer electrical usage increases from air conditioning additions are being somewhat offset by declining electric spacing heating saturations and appliance efficiency gains.

The continuing population growth also affects sales in the commercial sector through continued commercial customer growth. Additionally, commercial usage per customer is increasing due to greater square footage per building in new construction, increases in the number of offices, and the increasing use of office equipment in all commercial structures. However, some of this growth is being offset from increased equipment efficiency over the forecast horizon.

Declines over the decade in the lumber and wood product industries production resulted in an overall decline in the industrial sales; however, there are indications that this trend has ended and growth in other businesses are expected to continue.

Utah

Table A.5 summarizes Utah state forecasted sales growth compared with historical growth by customer class.

Table A.5 – Historical and Forecasted Sales Growth in Utah

	Residential	Commercial	Industrial	Irrigation	Other	Total
2005 GWh	5,707	6,776	6,944	151	547	20,124
2006 GWh	6,139	7,079	7,312	171	525	21,227

	Residential	Commercial	Industrial	Irrigation	Other	Total
Average Annual Growth Rate						
1995-05	4.2%	5.0%	0.9%	2.9%	0.3%	3.0%
2007-16	3.4%	3.3%	1.7%	0.7%	0.3%	2.7%

Utah continues to see natural population growth that is faster than many of the surrounding states. During the historical period, Utah experienced rapid population growth with a high rate of in-migration. However, the rate of population growth is expected to be lower in the coming decade as in-migration into the state slows. Use per customer in the residential class should continue at current levels for the forecast horizon. One of the reasons for the high usage per customer is that newer homes are assumed to be larger. In addition, it is assumed that air conditioning saturation rates for single family and manufactured houses will continue to grow.

The relatively high population growth also affects sales in the commercial sector by continued commercial customer growth. Usage per customer is projected to increase with new construction having greater square footage per building and increasing usage of office equipment. However, some of this growth is being offset from equipment efficiency gains over the forecast horizon.

The industrial class has been experiencing significant industrial diversification in the state and will continue to cause sales growth in the sector. Utah has a strategic location in the western half of the United States, which provides easy access into many regional markets. The industrial base has become more linked to the region and is less dependent on the natural resource base within the state. This provides a strong foundation for continued growth into the future.

The peak demand for the state of Utah is expected to have a high growth rate during the forecast period. This is due to several factors: first, newer residential structures are assumed to be larger; second, the air conditioning saturation rates in the state continue to increase in the residential and commercial sectors; and third, newly constructed commercial structures are assumed to be larger than during historical periods.

Idaho

Table A.6 summarizes Idaho state forecasted sales growth compared with historical growth by customer class.

Table A.6 – Historical and Forecasted Sales Growth in Idaho

	Residential	Commercial	Industrial	Irrigation	Other	Total
2005 GWh	652	382	1,650	534	2	3,221
2006 GWh	678	401	1,659	592	2	3,332
Average Annual Growth Rate						
1995-05	1.7%	5.6%	-0.0%	2.5%	3.2%	1.3%
2007-16	2.2%	3.1%	0.0%	0.6%	1.2%	1.0%

The growth of sales in the residential sales class continues to be strong in the forecast horizon due to customer growth and increased usage per customer. The customer growth is driven by strong net in-migration and household formation. The increased usage per customer is driven by

larger home size and a relatively large number of people per household. It is also assumed that air conditioning saturation rates will continue to be increasing during the forecast horizon.

The growth rate for commercial class sales is expected to be less than historic levels but will continue to be strong due to customer growth in response to the increasing residential customer growth and due to an increase in the number of offices. Usage per customer is projected to increase, which has been influenced in part by new construction at the Brigham Young University Idaho campus, increased air conditioning saturation, office equipment, and exterior lighting. However, this growth is somewhat offset by equipment efficiency gains over the forecast horizon.

Industrial sales are assumed to be near maximum levels of production and remain there during the forecast horizon.

Wyoming

Table A.7 summarizes Wyoming state forecasted sales growth compared with historical growth by customer class.

Table A.7 – Historical and Forecasted Sales Growth in Wyoming

	Residential	Commercial	Industrial	Irrigation	Other	Total
2005 GWh	939	1,290	5,756	16	13	8,013
2006 GWh	970	1,367	5,939	21	13	8,309
Average Annual Growth Rate						
1995-05	1.4%	2.5%	1.2%	4.1%	0.1%	1.4%
2007-16	1.6%	2.6%	6.7%	-0.5%	0.2%	5.6%

The residential sales forecast is expected to continue to grow at nearly historical rates. Population growth is expected to continue in the service area, which causes some of the growth. Home sizes continue to increase, resulting in increased general use per customer. Increasing air conditioning saturations are resulting in more use per customer during the summer months.

Commercial sales are projected to grow at a similar rate over the forecast horizon compared to historical periods due to customer growth and increasing usage per customer. Customer growth occurs in response to residential customer growth and the growth of the office sector. Usage per customer is projected to increase for the forecast period due to increases of office and miscellaneous equipment.

A major change in the Wyoming sales forecast occurs in the industrial sales sector. Large gas extraction customers are expected to locate in the PacifiCorp service area. The location of these industrial customers in the service area also contributes to the growth in the residential and commercial customer sectors.

Class 2 DSM

Identified and budgeted Class 2 DSM programs have been included in the load forecast as a decrement to the load. By 2016, there are 143 MWa of Class 2 programs in the forecast. This savings includes 10 MWa to be implemented by the Energy Trust of Oregon within PacifiCorp's service territory. Table A.8 shows average program savings and peak obligation hour savings by

year. In 2016, these Class 2 programs reduce peak system load from what it otherwise would have been by 2.2%.

Table A.8 – Class 2 DSM Included in the System Load Forecast

MW _a	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
PacifiCorp	19	38	54	62	75	87	100	112	124	135
Energy Trust of Oregon (ETO)	11	20	27	36	45	54	63	73	82	92
TOTAL	30	58	81	98	120	141	163	185	206	227
Peak Reduction (MW)	40	77	108	131	160	188	217	247	275	303

Near Term Customer Class Sales Forecast Methods

Residential, Commercial, Public Street and Highway Lighting, and Irrigation Customers

Sales to residential, commercial, public street and highway lighting, and irrigation customers are developed by forecasting both the number of customers and the use per customer in each class. The forecast of kWh sales for each customer class is the product of two separate forecasts: number of customers and use per customer.

The forecast of the number of customers relies on weighted exponential smoothing statistical techniques formulated on a twelve-month moving average of the historical number of customers. For each customer class the dependent variable is the twelve-month moving average of customers. The exponential smoothing equation for each case is in the following form:

$$S_t = w * x_t + (1-w) * S_{t-1}$$

$$S_t^{(2)} = S_t * x_t + (1-w) * S_{t-1}^{(2)}$$

$$S_t^{(3)} = S_t^{(2)} * x_t + (1-w) * S_{t-1}^{(3)}$$

where x_t is the twelve-month moving average of customers. The form of this forecasting equation is known as a triple-exponential smoothing forecast model and, as derived from these equations, most of the weight is applied to the more recent historical observations. By applying additional weight to more current data and utilizing exponential smoothing, the transition from actual data to forecast periods is as smooth as possible. This technique also ensures that the December to January change from year to year is reflective of the same linear pattern. These forecasts are produced at the class level for each of the states in which PacifiCorp has retail service territory. PacifiCorp believes that the recent past is most reflective of the near future. Using weights applies greater importance to the recent historical periods than the more distant historical periods and improves the reliability of the final forecast.

The average use per customer for these classes is calculated using regression analysis on the historical average use per customer, which determines if there is any material change in the trend over time. The regression equation is of the form,

$$KPC_t = a + b*t$$

where KPC is the annual kilowatt-hours per customer and “t” is a time trend variable having a value of zero in 1992 with increasing increments of one thereafter. “a” and “b” are the estimated intercept and slope coefficients, respectively, for the particular customer class. As in the forecast of number of customers, the forecasts of kilowatt-hours per customer are reviewed for reasonableness and adjusted if needed. The forecast of the number of customers is multiplied by the forecast of the average use per customer to produce annual forecasts of energy sales for each of the four classes of service.

Industrial Sales and Other Sales to Public Authorities

These classes are diverse. In the industrial class, there is no typical customer. Large customers have differing usage patterns and sizes. It is not unusual for the entire class to be strongly influenced by the behavior of one customer or a small group of customers. In order to forecast customer loads for industrial and other sales to public authorities, these customers are first classified based on their Standard Industrial Classification (SIC) codes, which are numerical codes that represent different types of businesses. Customers are further separated into large electricity users and smaller electricity users. PacifiCorp’s forecasting staff, which consults with each PacifiCorp customer account manager assigned to each of the large electricity users, makes estimates of that customer’s projected energy consumption. The account managers maintain direct contact with the large customers and are therefore in the best position to know whether any plans or changes in their business processes may impact their energy consumption. In addition, the forecasting staff reviews industry trends and monitors the activities of the customers in SIC code groupings that account for the bulk of the industry sales. The forecasting staff then develops sales forecasts for each SIC code group and aggregates them to produce a forecast for each class.

Long Term Customer Class Sales Forecast Methods

Economic and demographic assumptions are key factors influencing the forecasts of electricity sales. Absent other changes, demand for electricity will parallel other regional and national economic activities. However, several influences can change that parallel relationship; for example, changes in the price of electricity, the price and availability of competing fuels, changes in the composition of economic activity, the level of conservation, and the replacement rates for buildings and energy-using appliances. The long-term forecast considers all of these as variables. The following is a generalized discussion of the methodology implemented for the long-term forecast. The forecast is derived from a consistent set of economic, demographic and price projections specific to each of the six states served by PacifiCorp. Forecasts of employment, population and income with a consistent view of the western half of the United States are used as inputs to the forecasting models.

Economic and Demographic Sector

Employment serves as the major determinant of future trends among the economic and demographic variables used to “drive” the long-term sales forecasting equations. PacifiCorp’s meth-

