SEATTLE CITY LIGHT ECONOMIC AND LOAD FORECASTING MODEL

FORECASTS AND METHODOLOGY

Prepared for

Seattle City Light

by

Dick Conway & Associates
2323 Eastlake Avenue East
Seattle, Washington 98102
(206) 324-0700

May 2011

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SEATTLE CITY LIGHT ECONOMIC AND LOAD FORECASTING MODEL

1. INTRODUCTION

This report documents the Seattle City Light Economic and Load Forecasting Model (SCLM), which produces economic and load forecasts for the Seattle City Light service area. The report begins with an overview of the current economic and load forecasts. The rest of the report describes in detail the Seattle City Light economic and load forecasting models. It is divided into four parts: (1) definition of terms; (2) model specification; (3) forecasting procedure; and (4) references and data sources. Historical data and forecasts are reported in Appendix A. The E-Views programs required to maintain and operate the model are found in Appendix B.

2. ECONOMIC AND LOAD FORECASTS

Economic Forecast

No one predicted the severity of the Great Recession. What did surprise analysts was how hard the Puget Sound region got hit. Prior to the downturn regional employment and population were growing at twice the national rate. It appeared that the momentum of the local economy would at least soften the blow.

As it turned out, the region had a rougher time of it than the rest of the nation. Because of its rapid growth just before the recession, the region had in effect put its housing market on a higher plane. Thus, when the housing and credit markets crashed, the Puget Sound economy had farther to fall. According to the latest count, the region lost 7.4 percent of its employment (132,800 jobs) compared to 6.0 percent for the nation.

The relative job loss was even greater in King County and the Seattle City Light Service Area. The county lost 7.7 percent of its employment (94,600 jobs), while the service area lost 8.6 percent (49,700 jobs). In the service area this meant that one out of every twelve jobs that existed in 2007 had disappeared by the end of 2009. The nature of the recession was reflected in the industries that suffered most. Approximately two-fifths of the total job loss occurred in construction and financial activities.

In the past when the region has had a deep recession, people packed up to search for work. But this downturn was a nationwide phenomenon, leaving the unemployed with nowhere to go. As a consequence, local population growth, spurred in part by the strong economic expansion in the middle of the last decade, remained at a high rate during the recession. In the service area, population climbed 1.6 percent per year between 2007 and 2010, leading to the creation of 19,900 new households.

U.S. real Gross Domestic Product turned up in the third quarter of 2009, marking the official end of the national recession. But the national economy has yet to provide much in the way of new employment opportunities. This is also true for King County and the service area. Only last December did we see the first signs of a local job recovery.

The recovery will likely continue to proceed at a slow pace. In the Seattle area, there are four reasons that support this point of view:

• Employers are extremely reluctant to hire because of uncertainty about the recovery.

• Construction employment is still falling due to lingering problems in the housing market.

• State and local governments are cutting jobs because of an unprecedented loss of tax revenue.

• Boeing and Microsoft, both of which did well during the recession, are not playing a significant role in the recovery.

The outlook for the service area calls for slow but accelerating economic growth. Following a two-year slide, employment will increase 0.4 percent in 2011 and 1.5 percent in 2012. Courtesy of Congress, personal income gets a bump up in 2011 due to a temporary reduction in social security contributions. Because of the lagged effect of the recession on migration, population growth is expected to continue to decelerate until it reaches its long-term rate, which is projected to be 0.5 percent per year.

Table 1

ECONOMIC GROWTH RATES
Annual Percent Change

	2009	2010	2011	2012	2010-20
Seattle City Light Service Area					
Employment	-5.4	-2.7	0.4	1.4	1.2
Personal income	-2.0	2.1	4.7	3.4	4.8
Population	2.2	1.2	0.7	0.6	0.5
King County					
Employment	-5.2	-1.9	1.2	2.1	1.8
Personal income	-2.2	2.2	4.6	3.5	5.1
Population	2.0	1.3	0.7	0.7	0.8
United States					
Employment	-4.4	-0.7	1.3	2.5	1.4
Personal income	-1.7	3.0	5.2	4.0	5.0
Population	0.9	0.9	0.9	0.9	0.8

Load Forecast

Between 2008 and 2010, Seattle City Light load fell 3.2 percent. The immediate causes were the Great Recession, a rate hike, and a relatively warm year in 2010. In a sense, it was surprising that the fall-off was not greater. In the last recession, load fell 7.3 percent in 2001. But, in that year, real electricity rates were raised almost 40 percent. The current version of the load forecasting model would suggest that the rate increase by itself would reduce the demand for electricity by about 4 percent (see page 16).

Across the board, load should rebound in 2011. Total load is expected to increase 2.0 percent due to several positive factors: on-going growth of households, expansion of industrial output, an upturn in commercial jobs, and a normal weather year (i.e., one colder than 2010).

Starting in 2012, load will grow at a slow rate of 0.2 percent per year for the rest of the decade. Commercial customers will be the only group experiencing a significant increase in load between 2010 and 2020. The impact of a 12.9 percent increase in service producing employment will be partially offset by a 4.5 percent reduction in electricity use per employee, giving rise to a 7.8 percent gain commercial and government load over the ten-year period. New employees occupying currently empty office space will contribute to the gain in the efficiency of commercial electricity use. Between 2010 and 2020, residential load will increase 1.6 percent—primarily due to the jump in 2011—while industrial load will decline 4.1 percent.

Table 2

SEATTLE CITY LIGHT LOAD GROWTH RATES
Annual Percent Change

	2009	2010	2011	2012	2010-20
Seattle City Light Load					
Total load	-0.9	-2.3	2.0	-0.1	0.4
Residential customers	0.0	-3.4	2.5	-0.3	0.1
Commercial and government customers	0.7	-3.7	1.7	0.1	0.8
Industrial customers	-11.6	8.9	2.4	-0.2	-0.4
Related variables					
Households	1.5	1.2	0.8	0.7	0.7
Service producing employment	-4.6	-1.8	0.4	1.5	1.2
Manufacturing employment	-7.9	-3.8	1.7	0.0	-0.2
Rates (all customers)	0.4	18.1	5.1	3.4	3.6
Seattle consumer price index	0.6	0.3	1.4	1.8	2.0
Heating-degree days	-3.3	-7.1	5.5	0.0	0.5

3. DEFINITIONS

Geographical Area

The Seattle City Light Economic and Load Forecasting Model covers two geographical areas: King County and the Seattle City Light service area, which includes the City of Seattle as well as areas north and south of the city.

Employment

Employment is the annual average number of full and part-time wage and salary employees working in King County and the Seattle City Light service area. This employment series is commonly called nonagricultural wage and salary employment, since it excludes workers in agriculture, fishing, and forestry. Employment is measured by place of work. Washington Employment Security Department (ESD) publishes monthly estimates of county employment by industry (see Section 6 for information on data sources). ESD also produces annual estimates for the City of Seattle and other cities in the service area. SCLM predicts King County and Seattle

City Light service area employment for 16 industrial and government groups. Table 3 shows their definitions according to the North American Industrial Classification System (NAICS). The monthly King County employment series are converted into quarterly series and seasonally adjusted for use in the forecasting model. Quarterly estimates for the service area (Seattle and the other service area) are based on the service area's annual share of county employment.

Unemployment Rate

ESD also reports the monthly unemployment rate for King County. The unemployment rate, which is measured by place of residence, is the percent of the civilian labor force without a job. The monthly unemployment estimates are converted into a quarterly series and seasonally adjusted. There is no reported unemployment rate for the Seattle City Light service area except for the census years (e.g., 1990 and 2000). For modeling purposes, however, the service area unemployment rate is assumed to be equal to the county unemployment rate, which is not an unreasonable assumption based on the ten-year census estimates.

Table 3

CLASSIFICATION OF INDUSTRIES AND GOVERNMENT

Industry	NAICS Code
Goods producing	11,21,23,31-33
Construction and natural resources and mining	11,21,23
Manufacturing	31-33
Food processing	311-312
Other nondurable goods	Other 31,322-326
Nonmetallic minerals products	327
Primary and fabricated metals	331-332
Aerospace	3364
Other transportation equipment	Other 336
Other durable goods	321,other 33
Service producing	22,42-81
Wholesale and retail trade	42,44-45
Transportation, warehousing, and utilities	22,48-49
Financial activities	52-53
Other services	51,54-56,61-62,71-72,81
Government	---

Personal Income

Personal income is income earned by people: wage and salary disbursements; proprietors' income; other labor income (e.g., medical benefits); property income (e.g., dividend payments); transfer payments (e.g., welfare payments); and personal contributions to social insurance (e.g., payments to Social Security), the last of which is deducted from the other components of personal income. Since personal income is measured by place of residence while labor income is measured by place of work, there is also a residence adjustment. Personal income is valued in both current and 2005 dollars. The 2005-dollar series, also called the constant-dollar series, is a measure of personal income's real purchasing power over time. Following standard conventions, estimates of real income are obtained by deflating current-dollar personal income by the U.S.

implicit price deflator for consumption expenditures. The U.S. Bureau of Economic Analysis (BEA) publishes annual estimates of personal income for King County. The annual series is converted into an annualized quarterly series using a multi-step interpolation procedure. There is no need to seasonally adjust the personal income series. Quarterly personal income estimates are made for the Seattle City Light service area by assuming that per capita incomes in King County and the service area are equal. This is also a reasonable assumption based on the ten-year census data.

Consumer Price Index

The Seattle consumer price index, which has an average value of one for 1982-84, is a measure of the local prices of consumer goods and services purchased by households in the greater Seattle metropolitan area. Changes in the index are a gauge of the local inflation rate. The index is published every other month by the U.S. Bureau of Labor Statistics (BLS). We do not seasonally adjust the reported series.

Housing Permits

Housing permits are the number of building permits issued for new residential construction. There are two types of housing units: single-family buildings (single units) and multi-family buildings (two or more units). Housing permits are a good but inexact measure of housing construction, since permits are issued in advance of actual building and not every permit leads to construction. The U.S. Bureau of the Census publishes monthly estimates of residential building permits for King County. The monthly series is converted into an annualized quarterly series and seasonally adjusted. No housing permits are estimated for the Seattle City Light service area.

Population

Resident population is defined as the number of people living in King County and the Seattle City Light service area on the first day of July. The U.S. Bureau of the Census reports annual July 1 population estimates for King County, Seattle, and other cities in the service area. The estimates for the years 1970, 1980, 1990, and 2000 differ slightly from the ten-year census figures, since the latter are measured as of April 1. The population series also differ somewhat from those reported by the Washington Office of Financial Management (OFM), which makes its own April 1 population estimates for counties and cities between census years. A simple interpolation procedure (the spline technique) is used to convert the annual population series into quarterly series.

Households

Households are the number of occupied single-family housing units (single detached homes) and occupied multi-family housing units (apartments and condominiums). Household size is the average number of persons living in households. The U.S. Bureau of the Census estimates the number of households and average household size for each census year. Estimates for the other years are made by interpolation. The fraction of people living in households, the fraction of household population living in single-family households, the average size of single-family households, and the average size of multi-family households are interpolated linearly between the corresponding census-year measurements. The number of single-family households is determined by dividing the estimate of single-family population by the average size of single-family households. The number of multi-family households is determined in a similar manner.

Load

Load is the consumption of electrical energy measured in gigawatt-hours. Seattle City Light has monthly estimates of load from 1980 to 2010 for each of the major customer groups: residential, commercial and government, and industrial. For modeling purposes, the monthly series are converted into quarterly series and then annualized. The quarterly estimates of load are <u>not</u> seasonally adjusted.

Retail Electricity Rates

For each customer group, an average rate is calculated by dividing the total amount billed to these customers by their total consumption of electricity. The rate is stated in dollars per megawatt-hour. Electricity rates are based on the cost of service and differ among Seattle City Light's three major customer groups. The historical annual consumption data for 1980 to 2010 come from Seattle City Light billing records. The annual series are converted into quarterly series and then divided by the Seattle consumer price index to obtain so-called real electricity rates.

Heating Degree-Days

Heating degree-days, which is an indicator of the demand for space heating, is measured as the difference between 65°F and the average daily temperature when this average is less than 65°F. There are zero heating degree-days on days when the average temperature is greater than 65°F. Heating degree-days are accumulated over each quarter and not seasonally adjusted. Seattle City Light obtains daily temperatures from the U.S. Weather Bureau's Sea-Tac weather station.

4. SEATTLE CITY LIGHT ECONOMIC AND LOAD FORECASTING MODEL

Economic Model

The economic and load forecasts are developed with an econometric model that in various forms has been around since 1987. The model was originally built to provide short-term economic forecasts for Seattle City Light. For the past eighteen years the model has produced predictions for *The Puget Sound Economic Forecaster*, a quarterly forecast and commentary on the regional economy published by Conway Pedersen Economics, Inc. The current version of the Seattle City Light Economic and Load Forecasting Model (SCLM) has two components: the economic model and the load model.

The economic model depicts the economic behavior of King County and the Seattle City Light service area within the context of their national economic environment (Figure 1). The model is a system of simultaneous equations specified to predict 65 endogenous variables (e.g., King County personal income and service area population) on a quarterly basis over a ten-year period (Table 4). The model is composed of 41 behavioral equations and 24 accounting identities. The parameters of the behavioral equations are estimated by regression analysis using quarterly data from 1970.1 to 2010.4. The model makes use of 18 exogenous variables (e.g., U.S. Gross Domestic Product, U.S. consumer price index, and Boeing employment), most of which portray conditions in the national economy. The ten-year economic forecasts can be found in Tables 1, 2, and 3 of Appendix A.

The economic model follows the conceptual framework of the economic base theory of regional growth. This theory distinguishes between the export (basic) and local (nonbasic) demands placed upon the county economy (and thus the service area economy). The theory postulates that

the economic growth of King County, whether measured in terms of output, employment, or income, is related to the growth of its basic sector. Thus, an expansion of exports (e.g., aircraft and software) is expected to trigger a responding (multiplier) process in the county economy that leads to increased employment and income in the nonbasic sector (e.g., trade, services, and local government).

As a practical matter, King County is the core of the economic model. There are three reasons for this: (1) there are better—more and higher quality—economic and demographic data for King County than the Seattle City Light service area; (2) the service area is a large and integral part of the county economy (47 percent of the employment and 41 percent of the population in 2010); and (3) because of the second reason and despite the fact that the service area tends to grow more slowly than the county, changes in the service area economy are highly correlated with changes in the county economy.

Thus, the service area forecasts are developed in two stages. First, the forecasting model predicts county employment, personal income, and population. Second, given these forecasts, the model in effect allocates a portion to the service area. More specifically, the service area forecasting

Figure 1

SEATTLE CITY LIGHT
ECONOMIC FORECASTING MODEL
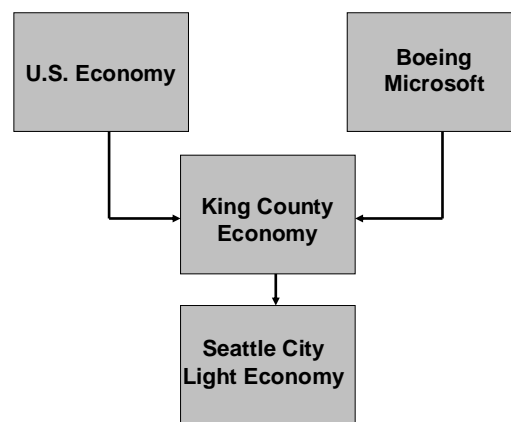
equations predict the service area's share of county economic and demographic activity over time. Refer to the representative equations described below to see how this is accomplished.

While SCLM has much in common with other types of regional econometric models, it has several noteworthy features:

1. Model specification. Each of the 41 behavioral equations is a fully integrated structural time-series model. Not only does each equation contain both explanatory variables and an ARMA model, but each dependent variable, in

Table 4

SEATTLE CITY LIGHT ECONOMIC FORECASTING MODEL*

Forecast period

    2011.1-2020.4

Estimation period

    1970.1-2010.4

Model size

    65 endogenous variables
    41 behavioral equations
    24 accounting identities
    18 exogenous variables

Selected endogenous variables

    Wage and salary employment
    Unemployment rate
    Personal income
    Consumer price index
    Housing permits
    Population
    Households

Selected exogenous variables

    U.S. Gross Domestic Product
    U.S. unemployment rate
    U.S. personal income
    U.S. personal consumption deflator
    U.S. housing starts
    U.S. population
    U.S. mortgage rate
    Boeing employment
    Microsoft employment
    Microsoft stock option income

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*The Seattle City Light Forecasting Model is comprised of King County and service area sub-models.

accordance with the Box-Jenkins approach to time-series modeling, is made stationary by taking the first difference of the natural logarithm of the variable. Thus, the model predicts, in effect, the growth rate of each variable rather than its level. Moreover, each equation's regression coefficients are the estimated elasticities of the dependent variable with respect to the independent variables. In general, combining structural equations with Box-Jenkins components is a strategy to improve both the short-term and long-term forecasting capabilities of the model.

2. Estimation. A rule of thumb in economic modeling is that the estimation period should be at least as long as the forecast period. This condition is well satisfied in this case, as the observation period extends more than thirty years, while the forecast period extends only ten years. From a practical standpoint, it is especially important to have long historical data series because of the boom and bust nature of the King County economy. A smaller data set would make it more difficult to discern the short-term cyclical movements in the economy from the long-term trends. Since economic cycles tend to last about ten years, the historical data currently cover three complete cycles as well as part of a fourth cycle.

   The data required to estimate the model come from various government agencies: U.S. Bureau of Economic Analysis, U.S. Bureau of Labor Statistics, U.S. Bureau of the Census, Federal Reserve Board, Washington Employment Security Department, and Washington Office of Financial Management.

3. Exogenous variables. The United States is the largest market for King County and Seattle City Light service area exports and the principal driving force for the local economy. To ensure that the county and service area forecasts are consistent with economic developments at the national level, the model makes use of ten-year projections reported in the Blue Chip Economic Indicators. The Blue Chip outlook is a consensus forecast based on the predictions of 50 leading national economists.

   The local economy is particularly dependent upon Boeing and Microsoft, the county's two largest private employers. Thus, special consideration is given to Boeing aircraft production and employment and Microsoft employment and stock option income. While these forecasts are ultimately made on a judgmental basis, they are backed by considerable analysis (e.g., the Boeing and Microsoft impact studies).

4. Add factors. Add factors are employed to modify unreasonable projections made by one or more equations in the economic forecasting model. The goal of building a model that requires no add factors is rarely achieved, since models are imperfect representations of reality. In SCLM, add factoring is accomplished by raising or lowering the constants of certain equations. For a forecasting equation expressed in change-in-log form, the constant represents the quarterly growth rate of the dependent variable, all else being equal. Currently, there are two add factors used in the economic model and none used in the load model.

Load Model

The load forecasting model is an extension of the economic model, since the variables predicted by the economic model are used to predict the variables in the load model. The principal inputs to the load model are households, commercial and industrial employment, the unemployment rate, and the consumer price index. The other exogenous variables to the load model are Seattle City Light electricity rates and heating degree-days.

We are still experimenting with the specification of the load model. In this report, we have reformulated the aggregated model (called Model 1 in earlier reports), which forecasts load for three broad customer groups: residential customers, commercial and government customers, and industrial customers. Accordingly, the model consists of three behavioral equations and an accounting identity.

Table 5

SEATTLE CITY LIGHT LOAD FORECASTING MODEL

Forecast period

    2011.1-2020.4

Estimation period

    1970.1-2010.4

Model size

    4 endogenous variables
    3 behavioral equations
    1 accounting identity
    5 exogenous variables

Endogenous variables

    Residential customer load
    Commercial and government customer load
    Industrial customer load

Exogenous variables

    Households
    Service producing employment
    Manufacturing employment
    Unemployment rate
    Electricity rates
    Heating-degree days

Representative Equations

Following are six representative equations from the economic forecasting model and one representative equation from the load forecasting model. Along with the explanatory variables, the equations include time-series terms, specifically autoregressive moving-average (ARMA) terms. The regression equations are estimated in change-of-log form using the Ordinary Least Squares (OLS) method. Shown with the regression coefficient estimates are their respective t-values. Also given are the corrected coefficient of determination (adjusted R^2), the standard error of the estimate, and the Durbin-Watson statistic. Dummy variables, which depict one-time disturbances (e.g., labor strikes), are not shown.

King County Personal Income

Variable	Coefficient	T-Value
DLKYPE		
C	0.0000	---
DLYP	0.9781	39.3
DLKNR	0.7047	14.6
PDL(DLSCPIR)	0.0713	2.2
MA(1)	0.5402	7.9

R^2=0.872, SEE=0.005, DW=1.551

DLKYPE=log(KYP-KYSTK)-log(KYP(-1)-KYSTK(-1))
DLYP=log(USYP)-log(USYP(-1))
DLKNR=log(KN/USN)-log(KN(-1)/USN(-1))
DLSCPIR=log(SCPI/USCPI)-log(SCPI(-1)/USCPI(-1))

KYP	King County personal income
KYSTK	King County stock option income
KN	King County employment
SCPI	Seattle consumer price index
USYP	U.S. personal income
USN	U.S. employment
USCPI	U.S. consumer price index

Personal income is the single most important equation in the economic forecasting model, since it influences many other variables (e.g., wholesale and retail trade employment). Reflecting the county's dependency upon national markets, King County income is expected to follow national income, all else being equal. County income, however, will tend to grow faster than national income when county employment outpaces U.S. employment, as indicated by the relative employment growth rate term. County income is also affected by local inflation. During periods of high inflation, which are typically associated with rapid expansions, county wage rates will rise to offset the impact of higher living costs, particularly the higher cost of housing. Note that the relative inflation rate term enters the equation with a lag, as indicated by the PDL notation, which stands for polynomial distributed lag. In this case, personal income is being affected by the relative inflation rate in the current quarter as well as the three prior quarters, according to the estimated equation. The long-run elasticity is 0.416 (not shown), which means that a one percent increase in the general price level will ultimately lead to a 0.4 percent increase in personal income. The constant in the forecasting equation is predetermined to be zero. This represents a

small and statistically insignificant adjustment in the equation. Finally, the estimated elasticities in the personal income equation are reasonable in size. If the county economy is diversified and open to national markets, we would expect the U.S. income elasticity to display a value close to one. The current estimate is 0.978. Given that wages and salaries constitute nearly 70 percent of personal income in the county, we would expect the employment elasticity to be around 0.700, which it is.

As noted previously, King County and Seattle City Light service area per capita income are assumed to be equal. Given a forecast of King County personal income and the forecasts of King County and service area populations, which are discussed below, a forecast of service area personal income readily follows.

King County Other Nondurable Manufacturing Employment

Variable	Coefficient	T-Value
DLKNONDUR		
C	-0.0011	-0.6
DLX	0.2973	2.5
DLKUNRT	-0.1031	-3.9

R^2=0.221, SEE=0.020, DW=2.000

DLKNONDUR=log(KNONDUR)-log(KNONDUR(-1))
DLX=log(USX)-log(USX(-1))
DLKUNRT=log(KUNRT)-log(KUNRT(-1))

KNONDUR	King County other nondurable manufacturing employment
KUNRT	King County unemployment rate
USX	U.S. industrial production index

Goods produced in other nondurable manufacturing (e.g., textiles and apparel) are sold predominantly outside the county. Thus, a logical predictor of county other nondurable manufacturing employment is the U.S. industrial production index, which represents the national demand (basic demand) for King County's manufactured goods. The unemployment rate in this equation depicts the cyclical variation in demand.

Seattle City Light Service Area Other Nondurable Manufacturing Employment

Variable	Coefficient	T-Value
DLLNONDUR+0.0012		
DLKNONDUR	1.0012	76.2
AR(1)	0.7278	13.4

R^2=0.966, SEE=0.004, DW=1.727

DLLNONDUR=log(LNONDUR)-log(LNONDUR(-1))

LNONDUR	Seattle City Light service area other nondurable manufacturing employment

The high R^2 (0.966), high T-Value on DLKNONDUR (76.2), and an elasticity of one (1.001) indicate that, while the service area's share of King County other nondurable manufacturing employment has declined from 78 percent in 1970 to 54 percent in 2010, changes in the industry's employment in the service area and the county remain highly correlated. Note that the constant in this equation has a predetermined value of -0.0012.

King County Unemployment Rate

Variable	Coefficient	T-Value
DLKUNRT-0.0015		
DLUNRT	0.7370	9.2
DLKNR	-1.6977	-3.4
MA(1)	0.2909	3.6

R^2=0.617, SEE=0.044, DW=1.966

DLUNRT=log(USUNRT)-log(USUNRT(-1))

USUNRT   U.S. unemployment rate

The formulation of the unemployment rate equation is based on labor market equilibrium principles. The first explanatory variable of the equation implies that the supply of labor expands (contracts) in response to increases (decreases) in the number of persons employed such that the county's unemployment rate follows, but does not necessarily equal, the national unemployment rate in the long run. As indicated by the second explanatory variable, the county unemployment rate in the short run will tend to be low (high) relative to the national unemployment rate when county employment is growing faster (slower) than national employment.

There is no specific forecast of the unemployment rate for the Seattle City Light service area. It is presumed to be equal to the county rate.

King County Population

Variable	Coefficient	T-Value
DLKPOP+0.0008		
PDL(DLPOP)	0.2378	7.3
PDL(DLKNR)	0.0168	4.7
AR(1)	0.8699	20.8
MA(1)	0.2196	2.5

R^2=0.898, SEE=0.001, DW=1.914

DLKPOP=log(KPOP)-log(KPOP(-1))
DLPOP=log(USPOP)-log(USPOP(-1))

KPOP   King County population
USPOP   U.S. population

Rather than adopting the cohort-survival method of forecasting population, population growth is depicted as a response to the change in the demand for labor. A plot of population change against employment change shows that population growth tends to follow employment growth. This fact is also evident in the population forecasting equation, which reveals a strong relationship between the county and national employment-population ratios (the employment rates). In other words, when county employment grows, population will increase such that the county employment rate will tend to follow (though not necessarily equal) the national employment rate in the long run. Short-run deviations in the regional employment rate occur when King County employment is growing at a faster or slower rate than U.S. employment, as indicated by the relative employment growth rate term in the equation. As evident by the eight-quarter distributed lag on the employment term, population takes about two years to completely adjust to a new employment level. Note that the equation includes a first-order ARMA model.

Seattle City Light Service Area Population

Variable	Coefficient	T-Value
DLLPOP-0.0004		
DLKPOP	0.3959	6.7
AR(1)	0.8980	31.0

R^2=0.898, SEE=0.000, DW=1.520

DLLPOP=log(LPOP)-log(LPOP(-1))

LPOP   Seattle City Light service area population

The null hypothesis underlying the service area population equation is that, because the service area is an integral part of the county economy, the service area grows along with the county, albeit at a slower pace. This is borne out in the estimated population equation, as the elasticity of the service area's population growth rate with respect to the county population growth rate is significant but less than one. Specifically, the equation implies that the expected annual growth rate expressed in percentage terms for service area population is given by the following expression: 0.16+0.40[county population growth rate]. The first term 0.16 is the expected population change for the year predicted by the constant (i.e., 0.16=4[0.004]) in the regression equation. Thus, if King County population increases 1.00 percent, we would expect service area population to increase approximately 0.56 (=0.16+0.40[1.00]) percent (see the 2020 forecasts).

Seattle City Light Residential Load

Variable	Coefficient	T-Value
DLGWHRESPU		
C	0.3169	7.8
PDL(DLRATERESP)	-0.0157	-3.6
PDL(DLKUNRT)	-0.0097	-3.7
DLHDDU	0.0987	5.3
DUM1	-0.2644	-6.4
DUM2	-0.6500	-11.7
DUM3	-0.3632	-5.3
MA(1)	-0.9855	-146.1

$$R^2=0.990, \ SEE=0.036, \ DW=1.754$$

DLGWHRESPU=log(GWHRESU/LHSE)-log(GWHRESU(-1)/LHSE(-1))
DLRATERESP=log(RATERES/SCPI)-log(RATERES(-1)/SCPI(-1))
DLHDDU=log(HDDU)-log(HDDU(-1))

GWHRESU	Seattle City Light residential load
LHSE	Seattle City Light service area households
RATERES	Seattle City Light electric rate for residential customers
SCPI	Seattle consumer price index
KUNRT	King County unemployment rate
HDDU	Seattle heating degree-days
DUM1	Dummy variable, first-quarter
DUM2	Dummy variable, second quarter
DUM3	Dummy variable, third quarter

The load equations for all customer groups have similar specifications. In general, the electricity usage rate (e.g., gigawatt-hours per household or gigawatt-hours per employee) is presumed to depend upon the real cost of electricity, a cyclical variable, such as the unemployment rate, and heating degree-days. The above equation shows that residential electricity consumption per household is significantly related to all three of these variables. The polynomial distributed lag on the real electricity rate indicates that residential customers respond to rate changes but not all at once. The long-run rate elasticity (not shown), measured over four quarters, is estimated to be -0.092. We should point out four notable changes to the residential load demand model this time around: (1) load and heating-degree days are not seasonally adjusted prior to estimating the equation in order to predict seasonally-unadjusted load; (2) seasonally-unadjusted load is forecast assuming normal weather conditions; (3) the three new dummy variables (DUM1, DUM2, and DUM3) are picking up seasonal variations in residential load not related to weather; and (4) the current estimate of the long-run rate elasticity has a smaller value and a longer lag than the previous one.

5. FORECASTING PROCEDURE

Forecasting with the Seattle City Light Economic and Load Forecasting Model entails two tasks: (1) updating and revising the data series for the endogenous and exogenous variables; and (2) estimating the model and producing the forecast. This section describes these tasks in greater detail.

Data

The data series are organized into seven blocks. Some of the data series, such as the King County unemployment rate, are obtained directly from their primary source and placed into the file used to estimate the forecasting equations and produce the forecasts (scldata.xls). The other data series require some degree of processing. For example, because King County population is reported annually, it is necessary to convert the annual estimates to quarterly estimates using the so-called spline technique. The principal data processing files are SCL Employment.xls, SCL Population, Households, and Income.xls, and SCL Spline.xls. The primary sources of data are listed in Section 6.

1. <u>Employment and unemployment rate</u>. Along with the personal income and population equations, the employment and unemployment rate equations are important components of the Seattle City Light Economic and Load Forecasting Model. Updating the King County employment and unemployment rate series is straightforward, as all of the required data are reported by Washington Employment Security Department (ESD). ESD provides monthly seasonally unadjusted estimates of nonagricultural wage and salary employment and the unemployment rate on their web site (www.workforceexplorer.com). Note that the employment and unemployment rate data are periodically revised, sometimes as far back as three years. These data are converted into quarterly series and entered into scldata.xls. All variable names ending with the letter "U" signify that the variables are not seasonally adjusted. For example, KUNRTU stands for the seasonally unadjusted estimate of the King County unemployment rate. After the variable has been seasonally adjusted during the data processing procedure, the name changes to KUNRT.

   Estimating employment for Seattle and the rest of the service area requires additional work as well as some judgment. The process begins with the data base from the last version of the Seattle City Light Economic and Demographic Model, which extended from 1960 to 1998. After aggregating the wage and salary employment estimates for King County, Seattle, and the other service area in accordance to the current industrial classification scheme (Table 3), Seattle and other service area shares of county employment by industry are calculated. These shares are then extrapolated to 2010 by using March covered employment estimates for King County and Seattle as well as for the cities of Lake Forest Park, Shoreline, and Tukwila, which are a surrogate for the other service area. ESD provides county and city March covered employment estimates annually to the Puget Sound Regional Council, which puts the data on its web site (www.psrc.gov). The annual employment shares are then converted into quarterly shares using the spline technique. These shares are then multiplied by the corresponding nonagricultural wage and salary employment estimates for King County to give the desired employment estimates for Seattle and the other service area. Finally, the Seattle and other service area employment estimates, which are seasonally unadjusted, are entered into scldata.xls. See SCL Employment.xls for details about the data processing procedure.

2. <u>Housing permits</u>. The U.S. Bureau of the Census publishes monthly seasonally unadjusted housing permit estimates by county. The King County estimates are entered directly into scldata.xls.

3. <u>Personal income</u>. The personal income estimates present a different kind of problem. In part, this is due to the fact that BEA publishes only annual county estimates. Moreover, the agency reports the data two years after the fact. Currently, the published King County personal income series only goes to 2008. Thus, for modeling purposes, it is necessary to extend the annual estimates to 2010 and then to convert the entire series into quarterly estimates. The estimating procedure makes use of annual and quarterly estimates of U.S. personal income, wage and salary

disbursements, employment, and population. The county estimates of personal income can be obtained from *The Puget Sound Economic Forecaster* data base. The estimates of Seattle and other service area personal income are made by assuming that per capita income in these areas is equal to per capita income in the county. Because of the nature of the estimating procedure, the resulting estimates of personal income are in effect seasonally adjusted. See SCL Population, Households, and Personal Income.xls.

4. <u>Seattle consumer price index</u>. This series is reported bi-monthly by BLS. Converting the published figures into quarterly estimates is straightforward. For example, since the first published number of the year falls in February, the middle month of the first quarter, it is taken to be the estimate for the first quarter. The second quarter estimate is calculated as the average of the April and June figures reported by BLS.

5. <u>Population and households</u>. The Census Bureau reports annual July 1 population estimates for counties and cities. These estimates are converted into quarterly series using the spline method. But the Census Bureau only estimates households in the census years (e.g., 1990 and 2000). As a consequence, a linear interpolation procedure is used to make annual estimates between the census years. The spline method then converts the annual estimates into quarterly series. The derivation of the population and household estimates is found in SCL Population, Households, and Personal Income.xls.

   A seven-step estimating procedure is required to make household estimates after 2000. The procedure is the same for all areas: (1) Given population reported by the Census Bureau, estimate group-quarter population using the ratio of group-quarter population to total population from the 2000 census. (2) Subtract group-quarter population from total population to get household population. (3) Based on past trends, estimate the fraction of household population living in single-family households. (4) From the above, calculate single-family population and multi-family population. (5) Based on past trends, estimate average household size for single-family households and multi-family households. (6) From the above, calculate the number of single-family and multi-family households. (7) Check the household estimates against the corresponding estimates of single-family and multi-family housing units as reported by OFM.

6. <u>Load</u>. Seattle City Light is the source of data on power consumption by customer group, average rate by customer group, and heating degree-days.

7. <u>U.S. and miscellaneous variables</u>. The U.S. variables are reported by various government agencies, such as BEA, BLS, the Census Bureau, and the Federal Reserve. Historical data and forecasts can be obtained from *The Puget Sound Economic Forecaster*. The miscellaneous variables include a small set of variables, such as aerospace employment and Microsoft stock option income, which need to be forecast judgmentally. As noted previously, the judgment in this case is based in part on independent studies (e.g., "The Microsoft Economic Impact Study").

Model Estimation and Forecasting

The Seattle City Light Economic and Load Model is maintained and operated using econometric modeling software called EViews. In addition to the software, the forecasting system includes an Excel spreadsheet (scldata.xls), three EViews workfiles (quarterly.wf1, sclmodel.wf1, and year.wf1), an E-Views database (scldata.edb), two E-Views programs (scleconmodel.prg and sclloadmodel.prg), and two models (scleconmodel and sclloadmodel), which are contained in sclmodel.wf1.

Following is a general description of the model estimation and forecasting procedures from the perspective of the two EViews programs. The discussion centers on scleconmodel.prg, the program used to build the economic model and produce the economic forecasts. The modelbuilding and forecasting procedures for the load model, which are embodied in sclloadmodel.prg, are virtually the same. The two programs can be found in Appendix B.

The entire process of model estimation and forecasting involves only three steps: (1) enter the updated economic and load data into scldata.xls; (2) run scleconmodel.prg to build the economic model and produce the economic forecasts in sclmodel.wf1; and (3) run sclloadmodel.prg to build the load model and produce the load forecasts in sclmodel.wf1.

1. <u>Enter updated data</u>. The historical economic and load data are entered onto four sheets in scldata.xls: Employment, Population and Income, United States, and SCL Load. The historical economic series extend quarterly from 1970.1 to 2010.4, while the load data run from 1980.1 to 2010.4. The United States sheet must also have forecasts of the national variables as well as the miscellaneous variables (e.g., King County aerospace employment) to 2020.4. There is a fifth sheet that contains dummy variables for each historical quarter.

2. <u>Run scleconmodel.prg</u>. Once the data are entered into the spreadsheet, scleconmodel.prg is run in EViews using the following command:

   run scleconmodel 2010.4 2011.1 2020.4 2020

   Note that the parameters (so-called wildcards) are specific to the current economic data set. For example, 2010.4 is currently the last historical observation for the quarterly series, while 2011.1 and 2020.4 are the first and last quarters for the forecast period and 2020 is the last forecast year.

   The program scleconmodel.prg performs three tasks: (1) it reads and processes the data series; (2) it estimates the forecasting equations and updates the model; and (3) it produces a forecast, writing it out on a scratch sheet.

   The program reads quarterly data for King County and the Seattle City Light service area (1970.1-2010.4) and quarterly data for the United States and miscellaneous variables (1970.1-2020.4) from scldata.xls and places them in sclmodel.wf1, an E-Views workfile, and in scldata.edb, an E-Views database.

Certain variables, such as the quarterly employment series, are then seasonally adjusted using the x11(m) command in sclmodel.wf1. As previously noted, the seasonally unadjusted variables are designated in scldata.xls with a "U" at the end of the variable name. The "U" is dropped from the name during the seasonal adjustment process. It is also necessary at this point to perform some "adding-up" tasks, such as creating a seasonally adjusted manufacturing employment series by summing the previously seasonally adjusted employment series for food processing, other nondurable goods, nonmetallic minerals products, primary and fabricated metals, aerospace products, other transportation equipment, and other durable goods.

The next step prepares the variables for model estimation. Most variables in the model are expressed in change-in-log form. As shown in the program, the change-in-log transformation for King County employment (kn) is

$$dlkn = \log(kn) - \log(kn(-1))$$

where log represents the natural logarithm.

Once the data are processed, the forecasting equations are estimated using the equation command. The regression equations are estimated with the Ordinary Least Squares method. The equations are stored in sclmodel.wf1 under the name specified in the equation command (e.g., kunrteq, which is the name for the King County unemployment rate regression equation). The equations and their regression statistics can be viewed using the show command (e.g., show kunrteq).

The program replaces the existing equations in scleconmodel with the updated equations. Scleconmodel is the name of the economic forecasting model and it is stored in sclmodel.wf1. To see scleconmodel, open sclmodel.wf1 and use the show command (show scleconmodel). Note that the regression equations are not shown explicitly in scleconmodel. In their place are the equation names preceded by a colon (e.g., :kunrteq).

In the final step, the model is run over the projection period (2011.1-2020.4) to produce a forecast. The solve command (e.g., solve scleconmodel) is used for this purpose. The program solves scleconmodel, which is a simultaneous equation model, using an iterative solution procedure. The solution to the system of equations constitutes the forecast for the endogenous variables over the projection period. After the forecast is saved in sclmodel.wf1 and stored in scldata.edb, the program opens year.wf1, which is an annual workfile, and fetches the forecast from scldata.edb. The quarterly forecast is automatically transformed into an annual forecast when it enters year.wf1. Lastly, the program calculates annual percentage changes for each forecast variable and produces a scratch forecast table (abc.xls). This table is used to analyze the forecast for its reasonableness.

3. Run sclloadmodel.prg. Given the historical data and forecasts for the economic variables, which constitute the exogenous variables for the load model, the third step is to build the load model and produce the load forecasts. This is accomplished with sclloadmodel.prg using the following command:

run sclloadmodel 2010.4 2011.1 2020.4 2020

Since historical load data currently extend to 2010.4, the first two parameters in the run command for sclloadmodel.prg are the same as those used to run scleconmodel.prg. In general, the data processing, model building, and forecasting steps in sclloadmodel.prg are similar to those in scleconmodel.prg.

The current version of SCLM uses just two add-factors. Add-factors come in handy when forecasts of individual variables look unreasonable. Suppose we want to raise the forecast of residential load by 1.0 percent over the four quarters of 2011. First, we create a dummy variable (DUMGWHRES) in sclmodel.wf1 with a value of 0.0025 in each of the four quarters of 2011 and zero for all other quarters between 1980.1 (the first quarter of history) and 2020.4 (the last quarter of the forecast period). The load model predicts the change-in-log of residential load per customer (DLGWHRESPU). Thus, adding 0.0025 to the forecast in 2011.1 raises it by approximately 0.25 percent. Repeating the adjustment for the other three quarters of 2011 gives the desired result. As a final step, it is necessary to append the dummy variable to the residential load forecasting equation in sclloadmodel. The equation with the add-factor would look like this:

```
:gwhreseq
@ADD(V) DLGWHRESPU DUMGWHRES
```

6. REFERENCES AND DATA SOURCES

Aspen Publishers, Inc., "Blue Chip Economic Indicators," monthly.

Conway Pedersen Economics, Inc., "Boeing and Microsoft," *The Puget Sound Economic Forecaster*, November 1997.

Conway Pedersen Economics, Inc., *The Puget Sound Economic Forecaster*, quarterly issues.

Conway, Richard S., Jr., "Seattle City Light Economic and Demographic Model: Economic and Demographic Data Base," Seattle City Light, December 2000.

Conway, Richard S., Jr., "Seattle City Light Economic and Load Forecasting Model: Detailed Forecasts and Methodology," Seattle City Light, December 2009.

Conway, Richard S., Jr., "The Microsoft Economic Impact Study," Microsoft Corporation, 1996, 2003, and 2006.

Conway, Richard S., Jr., Glenn Pascall, and Douglas H. Pedersen, "The Boeing Company Economic Impact Study," The Boeing Company, 1989.

Federal Reserve Board, "Statistics," various issues, www.federalreserve.gov.

U.S. Bureau of Economic Analysis, "National Economic Accounts," various issues, www.bea.doc.gov.

U.S. Bureau of Economic Analysis, "Personal Income by Major Source and Earnings by Industry (North American Industrial Classification System), King County, 2001-08," April 2010, www.bea.doc.gov.

U.S. Bureau of Economic Analysis, "Personal Income by Major Source and Earnings by Industry (Standard Industrial Classification), King County, 1969-2000," April 2010, www.bea.doc.gov.

U.S. Bureau of Economic Analysis, "Total Full-Time and Part-Time Employment by Industry (North American Industrial Classification System), King County, 2001-08," April 2010, www.bea.doc.gov.

U.S. Bureau of Economic Analysis, "Total Full-Time and Part-Time Employment by Industry (Standard Industrial Classification), King County, 1969-2000," April 2010, www.bea.doc.gov.

U.S. Bureau of Economic Analysis, *Survey of Current Business*, monthly issues.

U.S. Bureau of Labor Statistics, "Employment and Unemployment," monthly issues, www.bls.gov.

U.S. Bureau of Labor Statistics, "Inflation and Consumer Spending," monthly issues, www.bls.gov.

U.S. Bureau of the Census, "Annual Population Estimates for Cities and Towns," annual issues, www.census.gov.

U.S. Bureau of the Census, "Annual Population Estimates by County," annual issues, www.census.gov.

U.S. Bureau of the Census, "Census 2000," various issues, www.census.gov.

U.S. Bureau of the Census, *Census of Population*, various issues, www.census.gov.

U.S. Bureau of the Census, "Housing Data," monthly issues, www.census.gov.

U.S. Bureau of the Census, "Housing Units Authorized by Building Permits and Public Contracts," Series C-40, various issues.

Washington State Employment Security Department, "Covered Employment Estimates (March estimates for Puget Sound cities)," annual issues, www.psrc.org.

Washington State Employment Security Department, "Employment and Payrolls in Washington State," quarterly issues.

Washington State Employment Security Department, "Nonagricultural Wage and Salary Workers Employed in Washington State (Historical Series)," monthly issues, www.workforceexplorer.com.

Washington State Employment Security Department, "Resident Labor Force and Employment in Washington State (Historical Series)," monthly issues, www.workforceexplorer.com.

Washington State Employment Security Department, "State of Washington Covered Employment Classified by Industry," quarterly issues, www.workforceexplorer.com.

Washington State Employment Security Department, "Washington State Labor Area Summaries," monthly issues, www.workforceexplorer.com.

Washington State Office of Financial Management, "Population Trends for Washington State," annual issues, www.ofm.wa.gov.

APPENDIX A

SEATTLE CITY LIGHT ECONOMIC AND LOAD FORECASTS

Seattle City Light Forecasts, 1970-2020

Table 1. King County

	1970	1971	1972	1973	1974	1975
Wage and salary employment (thous.)	445.4	427.5	445.1	473.1	492.6	501.5
Goods producing	117.9	100.5	106.0	118.4	124.8	120.9
Construction and resources	21.0	18.8	18.7	19.5	19.6	20.0
Manufacturing	97.0	81.6	87.3	98.9	105.2	100.9
Food processing	9.3	8.8	8.4	8.3	8.1	8.1
Other nondurable goods	10.8	10.8	11.4	11.8	12.3	11.7
Nometallic minerals products	2.4	2.2	2.2	2.2	2.3	2.5
Primary and fabricated metals	8.7	7.9	8.1	9.1	9.9	10.0
Aerospace products	43.6	31.4	35.2	43.8	46.6	43.0
Other transportation equipment	8.5	6.9	7.0	6.8	7.9	7.5
Other durable goods	13.7	13.5	15.0	16.8	18.0	18.0
Service producing	327.4	327.0	339.1	354.7	367.8	380.7
Wholesale and retail trade	79.4	76.8	78.7	82.0	83.6	87.0
Transportation, warehousing, and utilities	26.1	25.4	25.6	26.5	26.5	26.5
Financial activities	32.5	31.7	32.8	34.3	35.3	36.3
Other services	108.6	109.2	114.0	122.9	131.5	138.5
Government	80.8	83.9	88.1	89.1	90.9	92.3
Unemployment rate (%)	9.6	12.2	10.7	7.5	6.4	9.2
Personal income (mils. $05)	23734.0	23171.4	23947.8	25254.0	25791.1	26939.4
Personal income (mils. $)	5614.1	5714.5	6108.6	6790.9	7659.5	8664.3
Per capita personal income ($)	4853	4971	5364	5962	6642	7464
Seattle consumer price index (1982-84=1.000)	0.374	0.381	0.393	0.418	0.464	0.511
Housing permits (thous.)	6.9	4.9	5.1	5.8	6.4	10.2
Population (thous.)	1156.8	1149.6	1138.9	1138.9	1153.0	1160.8
Group-quarter population	25.5	25.6	25.7	26.0	26.6	27.0
Household population	1131.3	1124.0	1113.2	1113.0	1126.4	1133.8
Single-family	946.8	935.4	921.1	915.6	921.4	922.0
Multi-family	184.5	188.6	192.1	197.3	205.1	211.8
Households (thous.)	392.7	395.8	397.7	403.4	414.3	423.0
Single-family	288.9	289.3	288.8	291.1	297.0	301.5
Multi-family	103.8	106.5	108.9	112.4	117.2	121.6
Household size (number)	2.881	2.840	2.799	2.759	2.719	2.680
Single-family	3.277	3.233	3.190	3.146	3.102	3.058
Multi-family	1.777	1.770	1.763	1.756	1.749	1.742
Annual growth (% change)						
Employment	na	-4.0	4.1	6.3	4.1	1.8
Personal income (cur. $)	na	1.8	6.9	11.2	12.8	13.1
Consumer price index	na	1.8	3.2	6.4	11.1	10.1
Housing permits	na	-29.5	4.7	12.7	11.2	59.1
Population	na	-0.6	-0.9	0.0	1.2	0.7

Seattle City Light Forecasts, 1970-2020

Table 1. King County

	1976	1977	1978	1979	1980	1981
Wage and salary employment (thous.)	517.2	553.1	610.7	659.3	679.0	680.8
Goods producing	118.5	128.1	151.1	169.6	169.9	165.8
Construction and resources	21.8	25.8	31.4	35.7	33.3	31.4
Manufacturing	96.7	102.3	119.6	133.9	136.6	134.4
Food processing	8.5	9.2	9.6	10.0	9.6	9.6
Other nondurable goods	12.7	13.5	14.8	15.5	14.7	14.8
Nometallic minerals products	2.6	2.6	2.6	2.7	2.6	2.5
Primary and fabricated metals	9.1	9.4	10.3	11.7	11.4	10.3
Aerospace products	38.0	39.1	49.7	56.3	60.9	61.2
Other transportation equipment	7.6	9.3	10.9	12.2	11.3	10.8
Other durable goods	18.2	19.2	21.8	25.5	26.2	25.3
Service producing	398.8	425.0	459.6	489.7	509.1	514.9
Wholesale and retail trade	92.0	97.2	104.9	111.6	111.8	113.7
Transportation, warehousing, and utilities	28.4	29.4	30.9	32.7	33.5	32.3
Financial activities	37.4	40.8	45.2	48.6	51.7	52.7
Other services	148.1	163.0	180.7	197.1	208.4	213.7
Government	92.8	94.5	97.9	99.7	103.8	102.6
Unemployment rate (%)	8.6	8.2	5.8	5.2	6.1	7.5
Personal income (mils. $05)	28447.1	29860.1	32677.0	34800.8	35947.0	37150.2
Personal income (mils. $)	9652.9	10792.2	12639.9	14654.1	16762.7	18848.5
Per capita personal income ($)	8265	9124	10478	11857	13131	14493
Seattle consumer price index (1982-84=1.000)	0.539	0.582	0.640	0.709	0.827	0.916
Housing permits (thous.)	14.2	19.7	20.4	17.2	13.1	9.6
Population (thous.)	1167.9	1182.7	1206.1	1235.6	1276.3	1300.4
Group-quarter population	27.5	28.1	29.0	30.0	31.3	31.3
Household population	1140.4	1154.6	1177.1	1205.6	1245.0	1269.1
Single-family	921.9	927.9	940.5	957.5	982.9	995.5
Multi-family	218.4	226.6	236.6	248.1	262.1	273.5
Households (thous.)	431.7	443.5	458.8	476.8	499.7	511.5
Single-family	305.9	312.4	321.3	332.1	346.2	352.0
Multi-family	125.9	131.1	137.5	144.7	153.5	159.5
Household size (number)	2.642	2.603	2.566	2.528	2.492	2.481
Single-family	3.014	2.971	2.927	2.883	2.839	2.828
Multi-family	1.735	1.728	1.721	1.714	1.707	1.715
Annual growth (% change)						
Employment	3.1	6.9	10.4	8.0	3.0	0.3
Personal income (cur. $)	11.4	11.8	17.1	15.9	14.4	12.4
Consumer price index	5.6	8.0	9.9	10.7	16.8	10.7
Housing permits	38.5	39.4	3.6	-15.7	-23.9	-26.7
Population	0.6	1.3	2.0	2.4	3.3	1.9

Seattle City Light Forecasts, 1970-2020

Table 1. King County

	1982	1983	1984	1985	1986	1987
Wage and salary employment (thous.)	668.0	672.1	710.5	739.5	772.1	808.8
Goods producing	157.6	149.5	157.2	164.8	173.9	182.4
Construction and resources	28.6	29.1	32.2	34.1	37.4	39.3
Manufacturing	129.0	120.5	125.0	130.7	136.5	143.1
Food processing	9.3	9.1	8.6	9.0	8.9	9.2
Other nondurable goods	14.2	14.4	16.0	16.2	16.5	16.6
Nometallic minerals products	2.4	2.4	2.5	2.5	2.4	2.5
Primary and fabricated metals	9.1	8.2	8.6	8.0	8.0	8.1
Aerospace products	59.6	53.3	55.1	62.8	69.1	74.7
Other transportation equipment	10.1	8.6	8.5	6.8	6.3	6.1
Other durable goods	24.3	24.4	25.8	25.4	25.2	25.7
Service producing	510.5	522.6	553.3	574.7	598.1	626.4
Wholesale and retail trade	113.6	114.8	121.8	125.2	130.1	135.6
Transportation, warehousing, and utilities	32.1	32.6	34.9	36.0	37.8	39.0
Financial activities	52.3	53.0	55.4	57.5	60.6	61.6
Other services	212.4	221.8	237.1	249.1	260.3	278.3
Government	100.1	100.4	104.1	107.1	109.3	111.9
Unemployment rate (%)	9.9	9.6	7.5	6.3	6.2	5.8
Personal income (mils. $05)	37653.0	37845.8	39524.2	41406.1	43564.0	45091.8
Personal income (mils. $)	20155.8	21130.9	22906.0	24784.2	26709.4	28675.0
Per capita personal income ($)	15370	16052	17247	18321	19389	20387
Seattle consumer price index (1982-84=1.000)	0.978	0.993	1.030	1.055	1.066	1.092
Housing permits (thous.)	6.5	10.7	13.3	14.1	15.0	17.0
Population (thous.)	1311.4	1316.3	1328.0	1352.7	1377.5	1406.4
Group-quarter population	31.0	30.6	30.3	30.3	30.2	30.3
Household population	1280.3	1285.7	1297.8	1322.4	1347.2	1376.1
Single-family	998.0	995.8	998.6	1010.9	1023.1	1038.2
Multi-family	282.4	290.0	299.2	311.5	324.1	337.9
Households (thous.)	518.1	522.4	529.4	541.5	553.8	567.7
Single-family	354.3	354.9	357.3	363.1	369.0	375.9
Multi-family	163.9	167.6	172.1	178.4	184.8	191.8
Household size (number)	2.471	2.461	2.451	2.442	2.433	2.424
Single-family	2.817	2.806	2.795	2.784	2.773	2.762
Multi-family	1.723	1.731	1.738	1.746	1.754	1.761
Annual growth (% change)						
Employment	-1.9	0.6	5.7	4.1	4.4	4.8
Personal income (cur. $)	6.9	4.8	8.4	8.2	7.8	7.4
Consumer price index	6.7	1.5	3.7	2.5	1.0	2.4
Housing permits	-32.3	64.2	24.4	6.3	6.4	12.7
Population	0.8	0.4	0.9	1.9	1.8	2.1

Seattle City Light Forecasts, 1970-2020

Table 1. King County

	1988	1989	1990	1991	1992	1993
Wage and salary employment (thous.)	849.4	898.7	937.4	941.8	950.7	948.0
Goods producing	192.6	208.0	213.3	208.9	205.8	188.2
Construction and resources	42.5	46.1	48.5	47.9	48.7	45.8
Manufacturing	150.1	161.9	164.9	161.1	157.1	142.4
Food processing	9.2	11.0	12.0	12.5	12.7	12.7
Other nondurable goods	18.7	18.4	18.4	18.3	18.9	19.1
Nometallic minerals products	2.9	2.9	3.0	2.6	2.9	2.8
Primary and fabricated metals	8.5	9.1	9.2	7.8	7.5	7.4
Aerospace products	77.7	83.8	85.7	86.2	82.1	67.6
Other transportation equipment	7.0	7.5	7.2	5.7	4.6	6.3
Other durable goods	26.1	29.4	29.4	28.1	28.4	26.4
Service producing	656.8	690.7	724.1	732.9	744.9	759.8
Wholesale and retail trade	142.2	147.9	152.3	150.3	150.2	150.7
Transportation, warehousing, and utilities	40.8	43.2	45.8	46.5	45.3	44.3
Financial activities	61.1	62.7	63.1	62.4	63.1	65.3
Other services	297.1	317.9	337.4	343.6	352.1	363.3
Government	115.5	119.1	125.4	130.1	134.2	136.2
Unemployment rate (%)	4.7	4.5	3.9	4.8	5.8	5.9
Personal income (mils. $05)	47674.6	50462.5	52856.3	54367.5	56517.0	56978.3
Personal income (mils. $)	31525.7	34818.0	38137.1	40646.0	43489.5	44811.6
Per capita personal income ($)	21885	23582	25134	26365	27673	28075
Seattle consumer price index (1982-84=1.000)	1.129	1.182	1.268	1.341	1.390	1.429
Housing permits (thous.)	18.4	18.8	15.8	7.4	9.3	7.8
Population (thous.)	1440.3	1476.3	1517.2	1541.5	1571.5	1596.0
Group-quarter population	30.4	30.5	30.7	31.4	32.3	33.0
Household population	1409.9	1445.8	1486.5	1510.1	1539.2	1563.0
Single-family	1056.6	1076.3	1099.1	1114.4	1133.7	1148.9
Multi-family	353.3	369.5	387.3	395.7	405.6	414.1
Households (thous.)	583.8	600.8	619.8	629.9	642.3	652.4
Single-family	384.1	392.8	402.8	408.4	415.6	421.2
Multi-family	199.7	207.9	217.0	221.4	226.7	231.2
Household size (number)	2.415	2.407	2.398	2.397	2.397	2.396
Single-family	2.751	2.740	2.729	2.728	2.728	2.727
Multi-family	1.769	1.777	1.785	1.787	1.789	1.792
Annual growth (% change)						
Employment	5.0	5.8	4.3	0.5	0.9	-0.3
Personal income (cur. $)	9.9	10.4	9.5	6.6	7.0	3.0
Consumer price index	3.4	4.7	7.3	5.8	3.7	2.8
Housing permits	8.8	1.7	-15.7	-53.0	25.1	-15.8
Population	2.4	2.5	2.8	1.6	1.9	1.6

Seattle City Light Forecasts, 1970-2020

Table 1. King County

	1994	1995	1996	1997	1998	1999
Wage and salary employment (thous.)	960.4	980.0	1018.0	1072.6	1119.6	1155.2
Goods producing	178.9	176.8	182.4	200.3	211.3	208.3
Construction and resources	45.5	45.9	47.5	52.1	56.4	62.2
Manufacturing	133.3	130.9	134.9	148.2	154.9	146.0
Food processing	11.9	13.6	14.1	13.5	13.0	12.3
Other nondurable goods	20.3	21.8	21.6	21.9	22.1	21.4
Nometallic minerals products	3.0	3.1	3.1	3.2	3.5	3.3
Primary and fabricated metals	7.4	7.7	8.0	8.6	8.8	8.0
Aerospace products	58.2	51.0	53.3	63.4	67.1	59.5
Other transportation equipment	5.5	6.1	5.4	5.2	6.0	6.5
Other durable goods	27.1	27.6	29.3	32.4	34.5	35.0
Service producing	781.5	803.2	835.6	872.3	908.3	947.0
Wholesale and retail trade	151.4	156.8	163.9	169.9	175.5	183.4
Transportation, warehousing, and utilities	45.5	45.9	48.0	49.6	52.2	53.1
Financial activities	66.5	64.9	67.0	69.3	73.2	77.3
Other services	380.2	395.6	414.6	439.0	459.2	481.8
Government	137.8	140.0	142.2	144.5	148.2	151.4
Unemployment rate (%)	5.3	5.3	4.9	4.1	4.0	3.8
Personal income (mils. $05)	58948.2	61046.7	64878.6	68528.8	77390.1	84789.8
Personal income (mils. $)	47315.5	50083.0	54388.2	58520.6	66720.1	74271.2
Per capita personal income ($)	29352	30689	32862	34732	38957	42952
Seattle consumer price index (1982-84=1.000)	1.478	1.522	1.575	1.630	1.678	1.728
Housing permits (thous.)	8.5	8.2	10.2	11.7	13.6	11.8
Population (thous.)	1611.9	1631.9	1654.9	1684.8	1712.4	1729.1
Group-quarter population	33.5	34.2	34.9	35.8	36.6	37.2
Household population	1578.4	1597.7	1620.0	1649.0	1675.8	1691.9
Single-family	1157.8	1169.7	1183.6	1202.4	1219.5	1228.8
Multi-family	420.5	428.0	436.4	446.6	456.3	463.1
Households (thous.)	659.0	667.3	676.9	689.2	700.6	707.6
Single-family	424.6	429.0	434.2	441.2	447.6	451.0
Multi-family	234.4	238.3	242.6	248.0	253.0	256.5
Household size (number)	2.395	2.394	2.393	2.393	2.392	2.391
Single-family	2.727	2.726	2.726	2.725	2.725	2.724
Multi-family	1.794	1.796	1.799	1.801	1.803	1.806
Annual growth (% change)						
Employment	1.3	2.0	3.9	5.4	4.4	3.2
Personal income (cur. $)	5.6	5.8	8.6	7.6	14.0	11.3
Consumer price index	3.4	3.0	3.4	3.5	2.9	3.0
Housing permits	8.6	-3.4	24.0	14.3	16.5	-13.4
Population	1.0	1.2	1.4	1.8	1.6	1.0

Seattle City Light Forecasts, 1970-2020

Table 1. King County

	2000	2001	2002	2003	2004	2005
Wage and salary employment (thous.)	1187.6	1169.5	1126.1	1109.4	1117.5	1142.7
Goods producing	205.2	197.9	178.9	164.4	163.7	170.8
Construction and resources	67.7	66.0	60.5	58.5	60.1	63.8
Manufacturing	137.5	131.9	118.4	105.9	103.6	107.1
Food processing	12.1	11.3	10.3	10.4	10.6	10.7
Other nondurable goods	21.0	18.9	17.8	16.4	16.2	15.9
Nometallic minerals products	3.4	3.0	2.9	3.0	3.1	3.2
Primary and fabricated metals	7.7	7.4	7.1	6.7	6.9	6.7
Aerospace products	53.0	54.0	47.2	39.8	37.4	39.1
Other transportation equipment	5.3	3.9	3.8	3.7	3.9	4.6
Other durable goods	35.0	33.3	29.4	26.0	25.5	26.9
Service producing	982.4	971.6	947.2	945.0	953.8	971.9
Wholesale and retail trade	188.7	185.4	177.6	175.0	174.7	175.8
Transportation, warehousing, and utilities	52.4	50.9	47.4	46.3	46.3	46.1
Financial activities	77.4	78.5	76.7	78.2	76.8	76.9
Other services	510.2	498.8	484.4	483.1	493.7	511.8
Government	153.7	158.0	161.1	162.4	162.2	161.3
Unemployment rate (%)	4.0	5.1	6.2	6.2	5.2	4.6
Personal income (mils. $05)	88035.1	85240.7	84575.9	84686.5	91987.8	89429.2
Personal income (mils. $)	79030.6	77982.2	78430.9	80127.4	89382.3	89431.4
Per capita personal income ($)	45438	44380	44459	45244	50100	49565
Seattle consumer price index (1982-84=1.000)	1.792	1.858	1.894	1.925	1.947	2.001
Housing permits (thous.)	11.8	10.0	10.6	9.9	11.4	12.4
Population (thous.)	1739.3	1757.2	1764.1	1771.0	1783.6	1804.2
Group-quarter population	37.7	38.0	38.2	38.3	38.6	39.1
Household population	1701.6	1719.2	1725.9	1732.7	1745.0	1765.1
Single-family	1233.1	1243.5	1245.9	1248.2	1254.5	1266.4
Multi-family	468.6	475.6	480.0	484.4	490.4	498.7
Households (thous.)	711.9	718.7	725.8	733.8	742.7	754.6
Single-family	452.7	455.0	458.4	463.2	468.1	475.0
Multi-family	259.2	263.7	267.4	270.6	274.6	279.5
Household size (number)	2.390	2.392	2.378	2.361	2.349	2.339
Single-family	2.724	2.733	2.718	2.695	2.680	2.666
Multi-family	1.808	1.804	1.795	1.790	1.786	1.784
Annual growth (% change)						
Employment	2.8	-1.5	-3.7	-1.5	0.7	2.3
Personal income (cur. $)	6.4	-1.3	0.6	2.2	11.6	0.1
Consumer price index	3.7	3.7	1.9	1.7	1.1	2.8
Housing permits	0.3	-15.1	5.6	-6.9	15.6	9.0
Population	0.6	1.0	0.4	0.4	0.7	1.2

Seattle City Light Forecasts, 1970-2020

Table 1. King County

	2006	2007	2008	2009	2010	2011
Wage and salary employment (thous.)	1175.2	1199.8	1216.8	1153.3	1131.7	1145.5
Goods producing	182.5	188.3	186.5	161.4	149.0	151.8
Construction and resources	70.1	75.2	74.5	58.3	50.3	50.9
Manufacturing	112.4	113.1	112.0	103.1	98.7	100.9
Food processing	11.1	11.2	11.2	10.9	10.9	11.3
Other nondurable goods	16.1	15.4	14.6	13.2	12.3	12.2
Nometallic minerals products	3.7	3.5	3.5	2.9	2.7	2.7
Primary and fabricated metals	7.1	7.6	7.7	6.3	5.9	6.0
Aerospace products	43.0	44.8	44.8	44.0	42.0	42.5
Other transportation equipment	4.4	4.0	3.7	3.1	3.2	3.3
Other durable goods	27.0	26.6	26.5	22.7	21.6	22.8
Service producing	992.7	1011.5	1030.3	991.9	982.7	993.7
Wholesale and retail trade	176.2	176.9	177.8	166.3	165.4	167.0
Transportation, warehousing, and utilities	46.7	47.4	47.0	43.9	43.3	43.6
Financial activities	78.0	77.3	75.9	69.7	65.7	65.1
Other services	529.7	546.4	563.2	545.2	542.5	553.5
Government	162.2	163.5	166.4	166.9	165.8	164.6
Unemployment rate (%)	4.0	3.8	4.7	8.5	8.8	8.6
Personal income (mils. $05)	96936.4	101022.9	100452.3	98048.4	98550.4	101624.6
Personal income (mils. $)	99608.5	106637.6	109551.3	107120.5	109512.1	114592.9
Per capita personal income ($)	54356	57396	58107	55717	56205	58427
Seattle consumer price index (1982-84=1.000)	2.076	2.155	2.248	2.261	2.268	2.300
Housing permits (thous.)	13.8	16.4	10.0	3.3	5.8	5.5
Population (thous.)	1832.3	1857.9	1885.4	1922.6	1948.4	1961.3
Group-quarter population	39.7	40.2	40.8	41.6	42.2	42.5
Household population	1792.6	1817.7	1844.6	1881.0	1906.2	1918.8
Single-family	1283.5	1298.8	1315.3	1338.5	1353.7	1363.1
Multi-family	509.1	518.9	529.2	542.4	552.5	555.7
Households (thous.)	768.2	777.9	786.5	795.3	804.5	809.9
Single-family	482.5	486.4	490.8	493.9	495.9	498.9
Multi-family	285.7	291.5	295.7	301.3	308.7	310.9
Household size (number)	2.333	2.337	2.345	2.365	2.369	2.369
Single-family	2.660	2.670	2.680	2.710	2.730	2.732
Multi-family	1.782	1.780	1.790	1.800	1.790	1.787
Annual growth (% change)						
Employment	2.8	2.1	1.4	-5.2	-1.9	1.2
Personal income (cur. $)	11.4	7.1	2.7	-2.2	2.2	4.6
Consumer price index	3.8	3.8	4.3	0.6	0.3	1.4
Housing permits	11.3	18.9	-39.0	-67.1	76.1	-5.7
Population	1.6	1.4	1.5	2.0	1.3	0.7

Seattle City Light Forecasts, 1970-2020

Table 1. King County

	2012	2013	2014	2015	2016	2017
Wage and salary employment (thous.)	1169.7	1195.2	1220.1	1243.8	1268.1	1290.3
Goods producing	154.7	157.8	162.1	166.2	170.2	173.2
Construction and resources	53.1	56.6	60.6	64.0	67.7	70.6
Manufacturing	101.6	101.2	101.4	102.1	102.5	102.6
Food processing	11.2	11.1	11.1	11.1	11.0	11.0
Other nondurable goods	12.3	12.5	12.6	12.8	12.9	13.0
Nometallic minerals products	2.7	2.8	2.8	2.8	2.9	2.9
Primary and fabricated metals	6.1	6.1	6.2	6.2	6.3	6.3
Aerospace products	42.2	40.9	40.1	39.9	39.3	38.7
Other transportation equipment	3.2	3.2	3.1	3.1	3.0	2.9
Other durable goods	23.7	24.6	25.4	26.3	27.1	27.9
Service producing	1015.0	1037.4	1058.0	1077.6	1098.0	1117.1
Wholesale and retail trade	167.7	170.1	172.6	173.9	175.5	176.3
Transportation, warehousing, and utilities	43.6	43.9	44.4	44.8	45.2	45.5
Financial activities	64.8	64.9	65.4	65.8	66.1	66.2
Other services	574.1	593.5	610.3	627.1	644.4	661.5
Government	164.8	165.1	165.4	166.1	166.8	167.5
Unemployment rate (%)	8.2	7.7	7.2	6.8	6.5	6.4
Personal income (mils. $05)	103373.8	106297.8	109633.3	113090.6	116680.8	120208.9
Personal income (mils. $)	118607.2	124403.3	131004.5	138110.9	145632.4	153338.8
Per capita personal income ($)	60081	62620	65495	68502	71624	74792
Seattle consumer price index (1982-84=1.000)	2.343	2.389	2.437	2.487	2.538	2.594
Housing permits (thous.)	6.2	8.2	9.1	10.1	10.9	10.9
Population (thous.)	1974.1	1986.6	2000.2	2016.1	2033.2	2050.1
Group-quarter population	42.7	43.0	43.3	43.6	44.0	44.4
Household population	1931.3	1943.6	1956.9	1972.5	1989.2	2005.8
Single-family	1372.7	1381.8	1391.3	1402.3	1413.8	1425.0
Multi-family	558.7	561.8	565.5	570.2	575.4	580.8
Households (thous.)	815.8	822.0	828.8	836.9	845.6	854.5
Single-family	502.9	506.9	511.2	516.2	521.5	526.7
Multi-family	312.9	315.1	317.6	320.7	324.2	327.8
Household size (number)	2.367	2.365	2.361	2.357	2.352	2.347
Single-family	2.730	2.726	2.722	2.717	2.711	2.705
Multi-family	1.785	1.783	1.780	1.778	1.775	1.772
Annual growth (% change)						
Employment	2.1	2.2	2.1	1.9	2.0	1.7
Personal income (cur. $)	3.5	4.9	5.3	5.4	5.4	5.3
Consumer price index	1.8	2.0	2.0	2.0	2.1	2.2
Housing permits	14.1	31.0	11.5	11.2	7.0	0.6
Population	0.7	0.6	0.7	0.8	0.8	0.8

Seattle City Light Forecasts, 1970-2020

Table 1. King County

	2018	2019	2020
Wage and salary employment (thous.)	1312.0	1334.4	1357.7
Goods producing	176.1	179.3	182.7
Construction and resources	73.4	76.3	79.5
Manufacturing	102.7	102.9	103.3
Food processing	10.9	10.9	10.8
Other nondurable goods	13.1	13.1	13.2
Nometallic minerals products	2.9	2.9	3.0
Primary and fabricated metals	6.3	6.3	6.3
Aerospace products	38.1	37.6	37.2
Other transportation equipment	2.8	2.8	2.7
Other durable goods	28.6	29.3	30.0
Service producing	1135.9	1155.1	1175.0
Wholesale and retail trade	176.9	177.5	178.2
Transportation, warehousing, and utilities	45.8	46.1	46.5
Financial activities	66.1	66.0	65.8
Other services	678.9	696.7	715.1
Government	168.2	168.8	169.5
Unemployment rate (%)	6.2	6.1	6.0
Personal income (mils. $05)	123880.4	127760.9	131806.0
Personal income (mils. $)	161501.5	170227.6	179483.8
Per capita personal income ($)	78145	81715	85465
Seattle consumer price index (1982-84=1.000)	2.652	2.710	2.770
Housing permits (thous.)	10.9	10.9	10.9
Population (thous.)	2066.6	2083.1	2100.0
Group-quarter population	44.7	45.1	45.5
Household population	2021.9	2038.0	2054.6
Single-family	1435.6	1446.0	1456.5
Multi-family	586.3	592.0	598.1
Households (thous.)	863.3	872.2	881.5
Single-family	531.8	537.0	542.2
Multi-family	331.4	335.3	339.3
Household size (number)	2.342	2.337	2.331
Single-family	2.699	2.693	2.686
Multi-family	1.769	1.766	1.763

Annual growth (% change)

	2018	2019	2020
Employment	1.7	1.7	1.8
Personal income (cur. $)	5.3	5.4	5.4
Consumer price index	2.2	2.2	2.2
Housing permits	-0.6	-0.1	0.6
Population	0.8	0.8	0.8

Seattle City Light Forecasts, 1970-2020

Table 2. Seattle City Light Service Area

	1970	1971	1972	1973	1974	1975
Wage and salary employment (thous.)	302.0	289.6	297.3	308.1	315.9	318.2
Goods producing	64.9	56.9	59.4	63.6	65.9	62.7
Construction and resources	13.7	11.8	11.3	11.3	11.0	10.9
Manufacturing	51.2	45.1	48.0	52.3	54.9	51.8
Food processing	8.3	7.9	7.5	7.2	6.9	6.8
Other nondurable goods	8.4	8.5	9.0	9.1	9.3	8.7
Nometallic minerals products	1.3	1.2	1.3	1.2	1.2	1.3
Primary and fabricated metals	7.1	6.3	6.3	7.0	7.6	7.2
Aerospace products	14.3	11.3	13.8	16.9	17.6	16.0
Other transportation equipment	4.9	3.5	3.4	2.9	4.0	3.8
Other durable goods	6.9	6.4	6.9	7.8	8.2	8.1
Service producing	237.1	232.7	237.9	244.5	250.0	255.5
Wholesale and retail trade	54.2	50.3	49.0	49.7	49.7	50.3
Transportation, warehousing, and utilities	15.5	15.2	15.2	15.7	15.7	15.6
Financial activities	28.1	27.0	27.5	28.3	28.8	29.6
Other services	78.0	77.2	80.5	85.1	89.0	92.5
Government	61.3	63.1	65.6	65.7	66.8	67.5
Personal income (mils. $05)	14019.7	13599.0	13942.5	14636.3	14597.0	15054.1
Personal income (mils. $)	3316.1	3353.7	3556.4	3935.4	4334.3	4841.5
Per capita personal income ($)	4853	4971	5364	5962	6642	7464
Seattle consumer price index (1982-84=1.000)	0.374	0.381	0.393	0.418	0.464	0.511
Population (thous.)	683.3	674.7	663.1	660.1	652.6	648.7
Group-quarter population	21.8	22.1	22.3	22.8	23.1	23.5
Household population	661.5	652.6	640.8	637.3	629.5	625.2
Single-family	515.9	505.6	492.9	486.7	477.6	470.9
Multi-family	145.6	147.0	147.9	150.6	152.0	154.3
Households (thous.)	252.8	253.3	252.8	255.5	256.3	258.7
Single-family	168.3	167.4	165.7	166.3	165.7	166.0
Multi-family	84.5	85.9	87.0	89.2	90.7	92.7
Household size (number)	2.617	2.577	2.535	2.495	2.456	2.416
Single-family	3.065	3.020	2.974	2.928	2.883	2.837
Multi-family	1.723	1.712	1.700	1.688	1.676	1.664

Annual growth (% change)

Employment	na	-4.1	2.6	3.6	2.5	0.7
Personal income (cur. $)	na	1.1	6.0	10.7	10.1	11.7
Consumer price index	na	1.8	3.2	6.4	11.1	10.1
Population	na	-1.3	-1.7	-0.5	-1.1	-0.6

Seattle City Light Forecasts, 1970-2020

Table 2. Seattle City Light Service Area

	1976	1977	1978	1979	1980	1981
Wage and salary employment (thous.)	324.1	340.3	371.4	396.6	406.5	404.8
Goods producing	60.9	64.5	75.9	84.1	82.3	79.4
Construction and resources	11.3	12.7	14.9	16.6	15.2	14.1
Manufacturing	49.5	51.8	61.0	67.5	67.1	65.3
Food processing	6.9	7.4	7.7	8.1	7.8	7.7
Other nondurable goods	9.2	9.6	10.3	10.6	9.9	10.2
Nometallic minerals products	1.3	1.2	1.3	1.4	1.4	1.3
Primary and fabricated metals	6.3	6.5	7.2	8.3	8.2	7.0
Aerospace products	13.8	14.1	19.8	22.2	23.9	23.4
Other transportation equipment	3.9	4.6	6.0	7.0	6.3	6.7
Other durable goods	8.1	8.4	8.9	10.0	9.6	9.0
Service producing	263.2	275.8	295.5	312.4	324.2	325.4
Wholesale and retail trade	52.4	53.9	58.1	61.5	61.3	61.4
Transportation, warehousing, and utilities	16.7	17.4	18.3	19.7	20.4	20.1
Financial activities	30.0	32.1	34.9	37.0	38.7	38.9
Other services	96.6	103.8	113.2	122.4	129.0	131.4
Government	67.6	68.6	70.9	71.9	74.8	73.6
Personal income (mils. $05)	15751.7	16253.2	17362.0	17968.8	17887.4	18135.0
Personal income (mils. $)	5344.7	5873.7	6714.8	7564.4	8339.4	9200.4
Per capita personal income ($)	8265	9124	10478	11857	13131	14493
Seattle consumer price index (1982-84=1.000)	0.539	0.582	0.640	0.709	0.827	0.916
Population (thous.)	646.7	643.8	640.9	638.0	635.1	634.8
Group-quarter population	24.0	24.4	24.8	25.3	25.7	25.4
Household population	622.7	619.4	616.1	612.7	609.4	609.4
Single-family	465.6	459.9	454.1	448.5	442.8	440.2
Multi-family	157.1	159.5	161.9	164.3	166.6	169.2
Households (thous.)	262.0	264.8	267.8	270.8	273.8	274.6
Single-family	166.9	167.5	168.3	169.0	169.8	169.3
Multi-family	95.1	97.3	99.5	101.7	104.0	105.3
Household size (number)	2.377	2.339	2.301	2.263	2.226	2.220
Single-family	2.791	2.745	2.699	2.654	2.608	2.600
Multi-family	1.652	1.639	1.627	1.615	1.602	1.607

Annual growth (% change)

	1976	1977	1978	1979	1980	1981
Employment	1.8	5.0	9.1	6.8	2.5	-0.4
Personal income (cur. $)	10.4	9.9	14.3	12.7	10.2	10.3
Consumer price index	5.6	8.0	9.9	10.7	16.8	10.7
Population	-0.3	-0.4	-0.5	-0.5	-0.5	0.0

Seattle City Light Forecasts, 1970-2020

Table 2. Seattle City Light Service Area

	1982	1983	1984	1985	1986	1987
Wage and salary employment (thous.)	396.1	389.7	404.3	409.0	422.5	432.1
Goods producing	75.6	68.3	70.9	71.3	72.3	74.2
Construction and resources	13.1	12.4	12.6	12.8	13.6	14.4
Manufacturing	62.5	55.9	58.3	58.6	58.7	59.8
Food processing	7.4	7.2	6.5	6.8	6.6	6.6
Other nondurable goods	9.7	9.9	10.8	10.7	10.8	10.9
Nometallic minerals products	1.3	1.3	1.3	1.2	1.3	1.5
Primary and fabricated metals	5.9	5.0	5.2	4.8	4.5	4.5
Aerospace products	23.0	18.5	20.9	23.4	24.4	26.2
Other transportation equipment	6.8	5.8	5.1	3.5	3.1	2.7
Other durable goods	8.3	8.1	8.5	8.1	7.9	7.4
Service producing	320.5	321.4	333.4	337.7	350.3	357.9
Wholesale and retail trade	60.9	59.7	60.9	61.2	62.9	62.6
Transportation, warehousing, and utilities	20.0	19.1	18.7	19.5	20.3	21.1
Financial activities	39.5	39.1	39.7	39.6	41.1	41.5
Other services	128.2	131.2	139.3	142.3	150.0	155.9
Government	71.9	72.3	74.8	75.0	75.9	76.8
Personal income (mils. $05)	18229.7	18285.5	19005.2	19648.2	20408.3	20830.3
Personal income (mils. $)	9758.3	10209.5	11014.1	11760.3	12512.2	13245.9
Per capita personal income ($)	15370	16052	17247	18321	19389	20387
Seattle consumer price index (1982-84=1.000)	0.978	0.993	1.030	1.055	1.066	1.092
Population (thous.)	634.9	636.0	638.6	641.9	645.3	649.7
Group-quarter population	25.1	24.8	24.6	24.4	24.2	24.0
Household population	609.8	611.2	614.0	617.5	621.1	625.7
Single-family	437.9	436.2	435.6	435.4	435.3	435.9
Multi-family	172.0	175.0	178.4	182.1	185.8	189.8
Households (thous.)	275.5	276.9	278.9	281.2	283.5	286.3
Single-family	168.9	168.7	169.0	169.4	169.9	170.6
Multi-family	106.6	108.1	109.9	111.7	113.6	115.7
Household size (number)	2.214	2.208	2.202	2.196	2.191	2.186
Single-family	2.593	2.585	2.578	2.570	2.563	2.555
Multi-family	1.613	1.618	1.624	1.630	1.635	1.641
Annual growth (% change)						
Employment	-2.1	-1.6	3.8	1.2	3.3	2.3
Personal income (cur. $)	6.1	4.6	7.9	6.8	6.4	5.9
Consumer price index	6.7	1.5	3.7	2.5	1.0	2.4
Population	0.0	0.2	0.4	0.5	0.5	0.7

Seattle City Light Forecasts, 1970-2020

Table 2. Seattle City Light Service Area

	1988	1989	1990	1991	1992	1993
Wage and salary employment (thous.)	447.3	473.0	489.7	491.2	495.0	489.1
Goods producing	76.6	84.0	82.7	83.6	82.7	75.1
Construction and resources	15.9	16.7	16.3	17.4	18.3	16.6
Manufacturing	60.7	67.3	66.4	66.2	64.4	58.5
Food processing	6.7	8.5	8.6	9.0	9.3	8.2
Other nondurable goods	12.2	11.9	12.0	11.3	11.3	10.9
Nometallic minerals products	1.8	1.7	1.6	1.5	1.7	1.5
Primary and fabricated metals	4.5	4.6	4.5	3.7	3.8	3.7
Aerospace products	25.8	29.0	29.0	30.3	28.8	24.1
Other transportation equipment	2.9	3.4	3.6	3.5	2.3	3.3
Other durable goods	6.8	8.3	7.1	6.9	7.1	6.7
Service producing	370.7	388.9	407.1	407.5	412.3	414.0
Wholesale and retail trade	63.4	65.7	67.6	64.0	62.5	60.3
Transportation, warehousing, and utilities	21.8	23.4	24.1	23.6	22.5	22.0
Financial activities	40.5	41.8	41.6	39.2	39.2	39.4
Other services	165.6	176.9	188.4	189.6	195.2	197.9
Government	79.4	81.2	85.4	91.1	92.9	94.3
Personal income (mils. $05)	21676.7	22623.9	23261.3	23817.0	24631.6	24693.6
Personal income (mils. $)	14333.4	15609.3	16782.8	17805.8	18953.7	19420.5
Per capita personal income ($)	21885	23582	25134	26365	27673	28075
Seattle consumer price index (1982-84=1.000)	1.129	1.182	1.268	1.341	1.390	1.429
Population (thous.)	654.9	661.9	667.7	675.3	684.9	691.7
Group-quarter population	23.9	23.8	23.7	24.3	24.9	25.4
Household population	631.0	638.1	644.0	651.0	660.0	666.3
Single-family	436.9	439.1	440.5	443.6	448.0	450.5
Multi-family	194.1	199.0	203.5	207.4	212.0	215.8
Households (thous.)	289.4	293.3	296.7	300.0	304.2	307.2
Single-family	171.5	172.9	173.9	175.1	176.7	177.6
Multi-family	117.9	120.5	122.8	125.0	127.5	129.5
Household size (number)	2.180	2.175	2.171	2.170	2.170	2.169
Single-family	2.548	2.540	2.533	2.534	2.535	2.536
Multi-family	1.646	1.652	1.657	1.660	1.663	1.666
Annual growth (% change)						
Employment	3.5	5.7	3.5	0.3	0.8	-1.2
Personal income (cur. $)	8.2	8.9	7.5	6.1	6.4	2.5
Consumer price index	3.4	4.7	7.3	5.8	3.7	2.8
Population	0.8	1.1	0.9	1.1	1.4	1.0

Seattle City Light Forecasts, 1970-2020

Table 2. Seattle City Light Service Area

	1994	1995	1996	1997	1998	1999
Wage and salary employment (thous.)	493.1	499.5	513.1	531.0	543.3	567.2
Goods producing	71.2	70.0	70.8	73.7	75.6	74.7
Construction and resources	16.4	16.6	17.1	18.8	20.3	22.7
Manufacturing	54.8	53.4	53.6	54.9	55.3	52.0
Food processing	8.7	10.3	10.7	10.2	9.8	9.3
Other nondurable goods	11.6	11.7	11.6	12.0	11.8	11.4
Nometallic minerals products	1.6	1.7	1.6	1.6	1.7	1.6
Primary and fabricated metals	3.8	3.9	4.0	4.1	4.0	3.7
Aerospace products	19.0	15.5	15.5	16.9	17.7	15.5
Other transportation equipment	3.0	3.7	3.5	2.9	3.0	3.3
Other durable goods	7.1	6.6	6.8	7.2	7.3	7.3
Service producing	421.8	429.5	442.3	457.4	467.7	492.4
Wholesale and retail trade	59.7	62.1	63.6	64.7	65.6	71.5
Transportation, warehousing, and utilities	22.7	23.0	23.0	22.6	23.6	24.9
Financial activities	39.2	37.9	39.6	41.8	42.8	45.2
Other services	205.9	211.7	220.2	231.4	237.0	251.0
Government	94.3	94.9	96.0	97.0	98.6	99.8
Personal income (mils. $05)	25409.0	26167.0	27653.8	29000.5	32506.1	35468.0
Personal income (mils. $)	20394.6	21467.4	23182.1	24764.9	28024.2	31067.8
Per capita personal income ($)	29352	30689	32862	34732	38957	42952
Seattle consumer price index (1982-84=1.000)	1.478	1.522	1.575	1.630	1.678	1.728
Population (thous.)	694.8	699.5	705.4	713.0	719.3	723.3
Group-quarter population	25.8	26.3	26.8	27.4	28.0	28.4
Household population	669.0	673.2	678.6	685.6	691.3	694.9
Single-family	450.6	451.7	453.5	456.4	458.4	458.9
Multi-family	218.4	221.5	225.1	229.2	232.9	235.9
Households (thous.)	308.5	310.5	313.0	316.3	319.0	320.6
Single-family	177.6	178.0	178.6	179.7	180.4	180.5
Multi-family	130.9	132.5	134.4	136.6	138.6	140.1
Household size (number)	2.169	2.168	2.168	2.168	2.167	2.167
Single-family	2.537	2.538	2.539	2.540	2.541	2.542
Multi-family	1.669	1.672	1.675	1.678	1.681	1.684

Annual growth (% change)

Employment	0.8	1.3	2.7	3.5	2.3	4.4
Personal income (cur. $)	5.0	5.3	8.0	6.8	13.2	10.9
Consumer price index	3.4	3.0	3.4	3.5	2.9	3.0
Population	0.4	0.7	0.8	1.1	0.9	0.6

Seattle City Light Forecasts, 1970-2020

Table 2. Seattle City Light Service Area

	2000	2001	2002	2003	2004	2005
Wage and salary employment (thous.)	585.0	566.4	544.0	535.6	533.7	546.4
Goods producing	74.5	70.1	64.4	59.5	59.3	60.9
Construction and resources	25.3	23.7	22.2	20.8	21.0	21.6
Manufacturing	49.2	46.5	42.2	38.7	38.3	39.3
Food processing	9.1	8.5	7.8	7.8	8.0	8.1
Other nondurable goods	11.2	10.1	9.5	8.7	8.7	8.5
Nometallic minerals products	1.6	1.5	1.4	1.4	1.5	1.6
Primary and fabricated metals	3.5	3.4	3.2	3.0	3.2	3.0
Aerospace products	13.8	14.0	12.3	10.4	9.7	10.2
Other transportation equipment	2.7	2.0	1.9	1.9	2.0	2.3
Other durable goods	7.3	6.9	6.1	5.4	5.3	5.6
Service producing	510.5	496.2	479.6	476.2	474.4	485.6
Wholesale and retail trade	76.5	74.4	70.6	68.3	67.0	66.9
Transportation, warehousing, and utilities	24.2	22.2	19.9	22.5	20.3	20.0
Financial activities	45.3	44.7	43.3	43.6	42.1	41.2
Other services	264.1	252.9	242.6	239.4	244.2	254.3
Government	100.3	102.1	103.2	102.3	100.8	103.1
Personal income (mils. $05)	36696.1	35523.6	35137.2	34998.5	37762.3	36555.6
Personal income (mils. $)	32942.6	32498.7	32584.0	33114.0	36692.2	36556.2
Per capita personal income ($)	45438	44380	44459	45244	50100	49565
Seattle consumer price index (1982-84=1.000)	1.792	1.858	1.894	1.925	1.947	2.001
Population (thous.)	725.0	732.3	732.9	731.9	732.3	737.5
Group-quarter population	28.8	29.1	29.2	29.1	29.1	29.3
Household population	696.2	703.2	703.7	702.8	703.2	708.2
Single-family	458.0	460.6	459.1	456.7	455.1	456.6
Multi-family	238.2	242.5	244.6	246.1	248.0	251.6
Households (thous.)	321.3	324.8	327.2	328.7	330.4	334.3
Single-family	180.1	180.3	180.5	180.5	180.5	181.7
Multi-family	141.2	144.5	146.7	148.2	150.0	152.6
Household size (number)	2.167	2.165	2.151	2.138	2.128	2.118
Single-family	2.543	2.555	2.544	2.530	2.522	2.512
Multi-family	1.687	1.678	1.667	1.661	1.654	1.649

Annual growth (% change)

	2000	2001	2002	2003	2004	2005
Employment	3.1	-3.2	-4.0	-1.5	-0.4	2.4
Personal income (cur. $)	6.0	-1.3	0.3	1.6	10.8	-0.4
Consumer price index	3.7	3.7	1.9	1.7	1.1	2.8
Population	0.2	1.0	0.1	-0.1	0.1	0.7

Seattle City Light Forecasts, 1970-2020

Table 2. Seattle City Light Service Area

	2006	2007	2008	2009	2010	2011
Wage and salary employment (thous.)	553.6	560.7	575.7	544.6	530.1	532.0
Goods producing	64.4	66.4	68.2	60.4	54.8	54.7
Construction and resources	23.3	25.3	27.7	23.0	18.9	18.2
Manufacturing	41.0	41.1	40.5	37.3	35.9	36.5
Food processing	8.4	8.5	8.4	8.2	8.2	8.5
Other nondurable goods	8.6	8.2	7.8	7.0	6.6	6.5
Nometallic minerals products	1.8	1.7	1.7	1.4	1.3	1.3
Primary and fabricated metals	3.2	3.5	3.5	2.9	2.7	2.7
Aerospace products	11.2	11.7	11.7	11.5	10.9	11.0
Other transportation equipment	2.2	2.0	1.9	1.6	1.6	1.7
Other durable goods	5.6	5.5	5.5	4.7	4.5	4.7
Service producing	489.2	494.3	507.5	484.2	475.3	477.3
Wholesale and retail trade	65.9	67.2	68.2	62.5	61.2	60.6
Transportation, warehousing, and utilities	18.3	19.0	19.0	17.8	17.6	17.6
Financial activities	41.9	41.5	41.9	37.0	34.3	33.6
Other services	262.4	265.7	274.0	263.7	260.4	265.0
Government	100.7	101.0	104.4	103.2	101.8	100.6
Personal income (mils. $05)	39508.7	41199.7	40982.0	40099.5	40251.7	41517.4
Personal income (mils. $)	40597.6	43489.6	44694.2	43809.8	44728.8	46815.5
Per capita personal income ($)	54356	57396	58107	55717	56205	58427
Seattle consumer price index (1982-84=1.000)	2.076	2.155	2.248	2.261	2.268	2.300
Population (thous.)	746.8	757.7	769.2	786.3	795.8	801.3
Group-quarter population	29.7	30.2	30.7	31.5	31.9	32.1
Household population	717.1	727.5	738.5	754.8	763.9	769.1
Single-family	460.3	465.0	469.9	477.9	481.5	483.6
Multi-family	256.7	262.5	268.6	276.9	282.4	285.5
Households (thous.)	339.9	344.0	346.5	351.7	355.9	358.7
Single-family	183.7	184.0	183.8	184.8	184.6	185.3
Multi-family	156.2	160.0	162.7	166.9	171.3	173.5
Household size (number)	2.109	2.115	2.131	2.146	2.146	2.144
Single-family	2.506	2.527	2.557	2.586	2.608	2.611
Multi-family	1.643	1.641	1.651	1.659	1.649	1.646
Annual growth (% change)						
Employment	1.3	1.3	2.7	-5.4	-2.7	0.4
Personal income (cur. $)	11.1	7.1	2.8	-2.0	2.1	4.7
Consumer price index	3.8	3.8	4.3	0.6	0.3	1.4
Population	1.3	1.5	1.5	2.2	1.2	0.7

Seattle City Light Forecasts, 1970-2020

Table 2. Seattle City Light Service Area

	2012	2013	2014	2015	2016	2017
Wage and salary employment (thous.)	539.4	547.5	555.1	562.3	569.7	576.2
Goods producing	54.8	55.2	56.0	56.8	57.4	57.8
Construction and resources	18.3	19.0	20.0	20.8	21.6	22.2
Manufacturing	36.5	36.2	36.0	36.0	35.8	35.6
Food processing	8.4	8.3	8.3	8.2	8.1	8.0
Other nondurable goods	6.6	6.6	6.7	6.7	6.7	6.7
Nometallic minerals products	1.3	1.3	1.3	1.4	1.4	1.4
Primary and fabricated metals	2.8	2.8	2.8	2.8	2.8	2.9
Aerospace products	10.9	10.5	10.2	10.0	9.8	9.6
Other transportation equipment	1.6	1.6	1.6	1.5	1.5	1.4
Other durable goods	4.9	5.1	5.2	5.3	5.5	5.6
Service producing	484.6	492.3	499.1	505.5	512.2	518.4
Wholesale and retail trade	60.0	60.2	60.5	60.5	60.7	60.6
Transportation, warehousing, and utilities	17.5	17.4	17.5	17.5	17.5	17.4
Financial activities	33.2	33.1	33.3	33.5	33.6	33.6
Other services	273.6	281.2	287.5	293.6	299.9	306.0
Government	100.4	100.3	100.3	100.4	100.6	100.8
Personal income (mils. $05)	42205.7	43351.6	44631.6	45913.8	47220.0	48491.9
Personal income (mils. $)	48425.2	50735.5	53331.6	56071.5	58936.2	61856.1
Per capita personal income ($)	60081	62620	65495	68502	71624	74792
Seattle consumer price index (1982-84=1.000)	2.343	2.389	2.437	2.487	2.538	2.594
Population (thous.)	806.0	810.2	814.3	818.5	822.8	827.0
Group-quarter population	32.3	32.5	32.7	32.8	33.0	33.2
Household population	773.7	777.7	781.6	785.7	789.8	793.9
Single-family	485.4	486.7	487.9	489.1	490.2	491.2
Multi-family	288.3	291.0	293.7	296.6	299.6	302.6
Households (thous.)	361.3	363.8	366.2	368.7	371.3	373.9
Single-family	186.0	186.7	187.4	188.1	188.9	189.6
Multi-family	175.3	177.0	178.8	180.6	182.4	184.3
Household size (number)	2.141	2.138	2.134	2.131	2.127	2.123
Single-family	2.609	2.606	2.603	2.599	2.595	2.591
Multi-family	1.645	1.644	1.643	1.643	1.642	1.642
Annual growth (% change)						
Employment	1.4	1.5	1.4	1.3	1.3	1.2
Personal income (cur. $)	3.4	4.8	5.1	5.1	5.1	5.0
Consumer price index	1.8	2.0	2.0	2.0	2.1	2.2
Population	0.6	0.5	0.5	0.5	0.5	0.5

Seattle City Light Forecasts, 1970-2020

Table 2. Seattle City Light Service Area

	2018	2019	2020
Wage and salary employment (thous.)	582.5	588.9	595.6
Goods producing	58.1	58.5	58.9
Construction and resources	22.7	23.2	23.8
Manufacturing	35.4	35.3	35.1
Food processing	8.0	7.9	7.8
Other nondurable goods	6.7	6.8	6.8
Nometallic minerals products	1.4	1.4	1.4
Primary and fabricated metals	2.9	2.9	2.9
Aerospace products	9.4	9.2	9.0
Other transportation equipment	1.4	1.4	1.3
Other durable goods	5.7	5.8	5.9
Service producing	524.4	530.4	536.7
Wholesale and retail trade	60.5	60.3	60.3
Transportation, warehousing, and utilities	17.4	17.3	17.3
Financial activities	33.5	33.3	33.2
Other services	312.1	318.4	324.8
Government	101.0	101.1	101.3
Personal income (mils. $05)	49817.8	51218.5	52669.8
Personal income (mils. $)	64946.6	68242.8	71721.5
Per capita personal income ($)	78145	81715	85465
Seattle consumer price index (1982-84=1.000)	2.652	2.710	2.770
Population (thous.)	831.1	835.1	839.2
Group-quarter population	33.3	33.5	33.7
Household population	797.8	801.6	805.5
Single-family	492.1	492.9	493.6
Multi-family	305.6	308.7	311.9
Households (thous.)	376.4	379.0	381.5
Single-family	190.3	191.0	191.6
Multi-family	186.1	188.0	189.9
Household size (number)	2.119	2.115	2.111
Single-family	2.586	2.581	2.576
Multi-family	1.642	1.642	1.642

Annual growth (% change)

	2018	2019	2020
Employment	1.1	1.1	1.1
Personal income (cur. $)	5.0	5.1	5.1
Consumer price index	2.2	2.2	2.2
Population	0.5	0.5	0.5

Seattle City Light Forecasts, 1970-2020

Table 3. United States

	1970	1971	1972	1973	1974	1975
Gross Domestic Product (bils. $05)	4270.0	4413.3	4647.7	4917.1	4889.9	4879.5
Industrial production index (07=1.000)	0.373	0.378	0.414	0.448	0.447	0.407
Employment (mils.)	71.0	71.3	73.8	76.9	78.4	77.1
Unemployment rate (%)	5.0	5.9	5.6	4.9	5.6	8.5
Personal income (bils. $)	838.8	903.5	992.7	1110.8	1222.7	1335.1
Wages and salary disbursements	551.6	584.0	638.8	708.8	772.8	814.8
Other income	287.2	319.6	353.9	401.9	449.9	520.3
Consumer price index (82-84=1.000)	0.388	0.405	0.418	0.444	0.493	0.538
Consumer expenditures deflator (05=1.000)	0.237	0.247	0.255	0.269	0.297	0.322
Housing starts (mils.)	1.435	2.036	2.361	2.044	1.332	1.160
Population (mils.)	205.4	207.9	210.1	212.1	214.1	216.2
Population, 20-64 years of age (mils.)	108.3	110.1	111.9	113.7	115.6	117.5
Three-month treasury bill rate (%)	6.39	4.33	4.07	7.03	7.83	5.78
Conventional mortgage rate (%)	8.41	7.58	7.38	8.04	9.19	9.04
Annual growth (% change)						
Gross Domestic Product ($05)	na	3.4	5.3	5.8	-0.6	-0.2
Employment	na	0.5	3.4	4.2	1.9	-1.7
Personal income (cur. $)	na	7.7	9.9	11.9	10.1	9.2
Consumer price index	na	4.2	3.3	6.3	11.0	9.1
Housing starts	na	41.9	16.0	-13.4	-34.8	-12.9

Seattle City Light Forecasts, 1970-2020

Table 3. United States

	1976	1977	1978	1979	1980	1981
Gross Domestic Product (bils. $05)	5141.3	5377.7	5677.6	5855.0	5839.0	5987.2
Industrial production index (07=1.000)	0.439	0.473	0.499	0.514	0.501	0.507
Employment (mils.)	79.5	82.6	86.8	89.9	90.5	91.3
Unemployment rate (%)	7.7	7.1	6.1	5.9	7.2	7.6
Personal income (bils. $)	1474.8	1633.2	1837.7	2062.2	2307.9	2591.3
Wages and salary disbursements	899.7	994.1	1121.0	1256.0	1377.7	1517.5
Other income	575.1	639.2	716.8	806.2	930.2	1073.8
Consumer price index (82-84=1.000)	0.569	0.606	0.652	0.726	0.824	0.909
Consumer expenditures deflator (05=1.000)	0.339	0.361	0.387	0.421	0.466	0.507
Housing starts (mils.)	1.535	1.962	2.001	1.717	1.300	1.096
Population (mils.)	218.3	220.5	222.9	225.4	228.0	230.2
Population, 20-64 years of age (mils.)	119.6	121.8	124.1	126.5	128.9	131.1
Three-month treasury bill rate (%)	4.97	5.27	7.19	10.07	11.43	14.03
Conventional mortgage rate (%)	8.86	8.84	9.64	11.19	13.77	16.63
Annual growth (% change)						
Gross Domestic Product ($05)	5.4	4.6	5.6	3.1	-0.3	2.5
Employment	3.2	3.9	5.1	3.6	0.7	0.8
Personal income (cur. $)	10.5	10.7	12.5	12.2	11.9	12.3
Consumer price index	5.8	6.5	7.6	11.3	13.5	10.4
Housing starts	32.4	27.8	2.0	-14.2	-24.3	-15.7

Seattle City Light Forecasts, 1970-2020

Table 3. United States

	1982	1983	1984	1985	1986	1987
Gross Domestic Product (bils. $05)	5871.0	6136.2	6577.1	6849.3	7086.6	7313.3
Industrial production index (07=1.000)	0.481	0.494	0.539	0.545	0.550	0.579
Employment (mils.)	89.7	90.3	94.5	97.5	99.5	102.1
Unemployment rate (%)	9.7	9.6	7.5	7.2	7.0	6.2
Personal income (bils. $)	2775.3	2960.7	3289.5	3526.7	3722.4	3947.4
Wages and salary disbursements	1593.7	1685.0	1854.9	1995.7	2114.8	2270.7
Other income	1181.6	1275.7	1434.6	1531.0	1607.6	1676.7
Consumer price index (82-84=1.000)	0.965	0.996	1.039	1.076	1.097	1.136
Consumer expenditures deflator (05=1.000)	0.535	0.558	0.579	0.598	0.613	0.636
Housing starts (mils.)	1.057	1.705	1.766	1.741	1.812	1.631
Population (mils.)	232.4	234.6	236.6	238.7	240.9	243.1
Population, 20-64 years of age (mils.)	133.2	135.3	137.3	139.2	141.0	142.6
Three-month treasury bill rate (%)	10.61	8.61	9.52	7.48	5.98	5.78
Conventional mortgage rate (%)	16.08	13.23	13.87	12.42	10.18	10.20
Annual growth (% change)						
Gross Domestic Product ($05)	-1.9	4.5	7.2	4.1	3.5	3.2
Employment	-1.8	0.7	4.7	3.2	2.0	2.6
Personal income (cur. $)	7.1	6.7	11.1	7.2	5.5	6.0
Consumer price index	6.2	3.2	4.4	3.5	1.9	3.6
Housing starts	-3.6	61.3	3.6	-1.4	4.0	-10.0

Seattle City Light Forecasts, 1970-2020

Table 3. United States

	1988	1989	1990	1991	1992	1993
Gross Domestic Product (bils. $05)	7613.9	7885.9	8033.9	8015.1	8287.1	8523.5
Industrial production index (07=1.000)	0.609	0.614	0.620	0.611	0.628	0.649
Employment (mils.)	105.3	108.0	109.5	108.4	108.7	110.8
Unemployment rate (%)	5.5	5.3	5.6	6.9	7.5	6.9
Personal income (bils. $)	4253.7	4587.8	4878.6	5051.0	5362.0	5558.6
Wages and salary disbursements	2453.0	2596.4	2754.0	2823.1	2980.3	3082.7
Other income	1800.8	1991.5	2124.6	2227.9	2381.7	2475.9
Consumer price index (82-84=1.000)	1.183	1.239	1.307	1.362	1.403	1.445
Consumer expenditures deflator (05=1.000)	0.661	0.690	0.721	0.748	0.769	0.786
Housing starts (mils.)	1.488	1.382	1.203	1.009	1.201	1.292
Population (mils.)	245.3	247.7	250.6	253.9	257.4	260.7
Population, 20-64 years of age (mils.)	144.1	145.5	147.1	149.3	151.2	153.0
Three-month treasury bill rate (%)	6.67	8.11	7.49	5.38	3.43	3.00
Conventional mortgage rate (%)	10.34	10.32	10.13	9.25	8.40	7.33
Annual growth (% change)						
Gross Domestic Product ($05)	4.1	3.6	1.9	-0.2	3.4	2.9
Employment	3.2	2.5	1.4	-1.0	0.3	2.0
Personal income (cur. $)	7.8	7.9	6.3	3.5	6.2	3.7
Consumer price index	4.1	4.8	5.4	4.2	3.0	3.0
Housing starts	-8.7	-7.1	-12.9	-16.2	19.1	7.5

Seattle City Light Forecasts, 1970-2020

Table 3. United States

	1994	1995	1996	1997	1998	1999
Gross Domestic Product (bils. $05)	8870.7	9093.8	9433.9	9854.4	10283.5	10779.9
Industrial production index (07=1.000)	0.683	0.715	0.747	0.801	0.848	0.884
Employment (mils.)	114.3	117.3	119.7	122.8	125.9	129.0
Unemployment rate (%)	6.1	5.6	5.4	4.9	4.5	4.2
Personal income (bils. $)	5842.5	6200.9	6591.6	7000.8	7525.4	7910.9
Wages and salary disbursements	3232.1	3418.0	3616.3	3876.6	4181.6	4460.0
Other income	2610.4	2782.9	2975.3	3124.2	3343.8	3450.8
Consumer price index (82-84=1.000)	1.482	1.524	1.569	1.605	1.630	1.666
Consumer expenditures deflator (05=1.000)	0.803	0.820	0.838	0.854	0.862	0.876
Housing starts (mils.)	1.446	1.361	1.469	1.475	1.621	1.647
Population (mils.)	263.9	267.0	270.1	273.4	276.6	279.7
Population, 20-64 years of age (mils.)	154.6	156.4	158.1	160.3	162.4	164.7
Three-month treasury bill rate (%)	4.25	5.49	5.01	5.06	4.78	4.64
Conventional mortgage rate (%)	8.36	7.95	7.81	7.60	6.94	7.43
Annual growth (% change)						
Gross Domestic Product ($05)	4.1	2.5	3.7	4.5	4.4	4.8
Employment	3.1	2.6	2.0	2.6	2.6	2.4
Personal income (cur. $)	5.1	6.1	6.3	6.2	7.5	5.1
Consumer price index	2.6	2.8	2.9	2.3	1.5	2.2
Housing starts	12.0	-5.9	7.9	0.4	9.9	1.6

Seattle City Light Forecasts, 1970-2020

Table 3. United States

	2000	2001	2002	2003	2004	2005
Gross Domestic Product (bils. $05)	11226.0	11347.2	11553.0	11840.7	12263.8	12638.4
Industrial production index (07=1.000)	0.920	0.889	0.891	0.902	0.923	0.953
Employment (mils.)	131.8	131.8	130.3	130.0	131.4	133.7
Unemployment rate (%)	4.0	4.8	5.8	6.0	5.5	5.1
Personal income (bils. $)	8559.4	8883.3	9060.1	9378.2	9937.3	10485.9
Wages and salary disbursements	4827.7	4952.2	4997.3	5139.6	5425.7	5701.0
Other income	3731.7	3931.1	4062.8	4238.5	4511.6	4784.9
Consumer price index (82-84=1.000)	1.722	1.770	1.799	1.840	1.889	1.953
Consumer expenditures deflator (05=1.000)	0.898	0.915	0.927	0.946	0.971	1.000
Housing starts (mils.)	1.573	1.601	1.710	1.854	1.949	2.073
Population (mils.)	282.8	285.7	288.6	291.4	294.1	296.8
Population, 20-64 years of age (mils.)	166.9	169.3	171.6	173.8	175.9	177.8
Three-month treasury bill rate (%)	5.82	3.39	1.60	1.01	1.38	3.15
Conventional mortgage rate (%)	8.06	6.97	6.54	5.82	5.84	5.87
Annual growth (% change)						
Gross Domestic Product ($05)	4.1	1.1	1.8	2.5	3.6	3.1
Employment	2.2	0.0	-1.1	-0.3	1.1	1.7
Personal income (cur. $)	8.2	3.8	2.0	3.5	6.0	5.5
Consumer price index	3.4	2.8	1.6	2.3	2.7	3.4
Housing starts	-4.5	1.8	6.8	8.4	5.1	6.3

Seattle City Light Forecasts, 1970-2020

Table 3. United States

	2006	2007	2008	2009	2010	2011
Gross Domestic Product (bils. $05)	12976.3	13228.9	13228.9	12880.6	13248.7	13672.4
Industrial production index (07=1.000)	0.974	1.000	0.967	0.877	0.927	0.968
Employment (mils.)	136.1	137.6	136.8	130.8	129.8	131.5
Unemployment rate (%)	4.6	4.6	5.8	9.3	9.7	9.3
Personal income (bils. $)	11268.1	11912.3	12391.2	12174.9	12545.3	13201.3
Wages and salary disbursements	6068.9	6421.7	6559.1	6274.1	6404.7	6691.2
Other income	5199.2	5490.6	5832.1	5900.8	6140.6	6510.1
Consumer price index (82-84=1.000)	2.016	2.074	2.152	2.146	2.181	2.222
Consumer expenditures deflator (05=1.000)	1.027	1.056	1.091	1.093	1.111	1.128
Housing starts (mils.)	1.812	1.342	0.900	0.555	0.586	0.670
Population (mils.)	299.5	302.1	304.8	307.5	310.1	312.8
Population, 20-64 years of age (mils.)	179.7	181.4	182.9	184.6	186.3	187.9
Three-month treasury bill rate (%)	4.73	4.35	1.37	0.15	0.13	0.28
Conventional mortgage rate (%)	6.41	6.34	6.04	5.04	4.74	5.13
Annual growth (% change)						
Gross Domestic Product ($05)	2.7	1.9	0.0	-2.6	2.9	3.2
Employment	1.8	1.1	-0.6	-4.4	-0.7	1.3
Personal income (cur. $)	7.5	5.7	4.0	-1.7	3.0	5.2
Consumer price index	3.2	2.9	3.8	-0.3	1.6	1.9
Housing starts	-12.6	-25.9	-32.9	-38.4	5.7	14.3

Seattle City Light Forecasts, 1970-2020

Table 3. United States

	2012	2013	2014	2015	2016	2017
Gross Domestic Product (bils. $05)	14123.2	14546.8	14954.2	15357.9	15772.6	16182.7
Industrial production index (07=1.000)	1.007	1.041	1.075	1.107	1.140	1.173
Employment (mils.)	134.8	137.8	139.9	141.5	143.2	144.8
Unemployment rate (%)	8.6	7.8	7.2	6.7	6.3	6.2
Personal income (bils. $)	13728.3	14428.4	15164.2	15937.6	16750.4	17588.0
Wages and salary disbursements	7068.6	7407.9	7763.5	8136.1	8526.7	8927.4
Other income	6659.6	7020.5	7400.8	7801.5	8223.8	8660.5
Consumer price index (82-84=1.000)	2.267	2.317	2.368	2.420	2.473	2.530
Consumer expenditures deflator (05=1.000)	1.147	1.170	1.195	1.221	1.248	1.276
Housing starts (mils.)	0.890	1.200	1.330	1.430	1.500	1.510
Population (mils.)	315.5	318.2	320.9	323.5	326.2	328.9
Population, 20-64 years of age (mils.)	188.8	189.7	190.5	191.2	191.8	192.3
Three-month treasury bill rate (%)	1.18	2.23	2.65	2.95	3.40	3.50
Conventional mortgage rate (%)	5.88	6.35	6.60	6.65	6.75	6.80
Annual growth (% change)						
Gross Domestic Product ($05)	3.3	3.0	2.8	2.7	2.7	2.6
Employment	2.5	2.2	1.5	1.2	1.2	1.1
Personal income (cur. $)	4.0	5.1	5.1	5.1	5.1	5.0
Consumer price index	2.0	2.2	2.2	2.2	2.2	2.3
Housing starts	32.8	34.8	10.8	7.5	4.9	0.7

Seattle City Light Forecasts, 1970-2020

Table 3. United States

	2018	2019	2020
Gross Domestic Product (bils. $05)	16603.4	17018.5	17444.0
Industrial production index (07=1.000)	1.207	1.241	1.276
Employment (mils.)	146.3	147.6	148.9
Unemployment rate (%)	6.1	6.0	5.9
Personal income (bils. $)	18467.4	19390.7	20360.3
Wages and salary disbursements	9347.0	9786.3	10246.3
Other income	9120.4	9604.4	10114.0
Consumer price index (82-84=1.000)	2.588	2.647	2.708
Consumer expenditures deflator (05=1.000)	1.304	1.332	1.362
Housing starts (mils.)	1.510	1.510	1.510
Population (mils.)	331.6	334.3	337.0
Population, 20-64 years of age (mils.)	192.6	192.9	193.1
Three-month treasury bill rate (%)	3.50	3.50	3.50
Conventional mortgage rate (%)	6.80	6.80	6.80
Annual growth (% change)			
Gross Domestic Product ($05)	2.6	2.5	2.5
Employment	1.0	0.9	0.9
Personal income (cur. $)	5.0	5.0	5.0
Consumer price index	2.3	2.3	2.3
Housing starts	0.0	0.0	0.0

Seattle City Light Forecasts, 1970-2020

Table 4a. Seattle City Light Load, 1970-2020

	1970	1971	1972	1973	1974	1975
Load (GWH)	na	na	na	na	na	na
Residential customers	na	na	na	na	na	na
Commercial and government customers	na	na	na	na	na	na
Industrial customers	na	na	na	na	na	na
Rates ($/MWh)	na	na	na	na	na	na
Residential customers	na	na	na	na	na	na
Commerical customers	na	na	na	na	na	na
Government customers	na	na	na	na	na	na
Industrial customers	na	na	na	na	na	na
Heating degree-days (degrees)	na	na	na	na	na	na
Annual growth (% change)						
Load	na	na	na	na	na	na
Residential customers	na	na	na	na	na	na
Commercial and government customers	na	na	na	na	na	na
Industrial customers	na	na	na	na	na	na

Table 4b. Seattle City Light Load, 2008.1-2020.4

	2008.1	2008.2	2008.3	2008.4	2009.1	2009.2
Load (seasonally unadjusted GWH)	10754.8	9278.7	8688.5	10138.6	10608.6	8835.9
Residential customers	4098.3	2832.5	2246.6	3712.2	4193.1	2663.6
Commercial and government customers	5476.6	5212.2	5298.1	5466.6	5493.8	5188.5
Industrial customers	1179.8	1234.0	1143.8	959.7	921.7	983.9
Rates ($/MWh)	56.35	56.54	56.44	56.17	54.92	55.28
Residential customers	63.07	63.23	63.11	62.87	61.66	62.04
Commerical customers	53.64	53.82	53.71	53.42	52.16	52.51
Government customers	56.42	56.50	56.05	55.33	53.17	53.20
Industrial customers	47.74	47.95	47.98	47.91	47.11	47.58
Heating degree-days (degrees)	2068	1039	218	1737	2160	808

Seattle City Light Forecasts, 1970-2020

Table 4a. Seattle City Light Load, 1970-2020

	1976	1977	1978	1979	1980	1981
Load (GWH)	na	na	na	na	7844.3	7850.6
Residential customers	na	na	na	na	3346.4	3263.5
Commercial and government customers	na	na	na	na	2918.5	2976.0
Industrial customers	na	na	na	na	1579.5	1611.0
Rates ($/MWh)	na	na	na	na	12.57	15.51
Residential customers	na	na	na	na	12.88	15.97
Commerical customers	na	na	na	na	14.32	16.72
Government customers	na	na	na	na	13.96	18.00
Industrial customers	na	na	na	na	8.86	11.82
Heating degree-days (degrees)	na	na	na	na	4968	4616
Annual growth (% change)						
Load	na	na	na	na	na	0.1
Residential customers	na	na	na	na	na	-2.5
Commercial and government customers	na	na	na	na	na	2.0
Industrial customers	na	na	na	na	na	2.0

Table 4b. Seattle City Light Load, 2008.1-2020.4

	2009.3	2009.4	2010.1	2010.2	2010.3	2010.4
Load (seasonally unadjusted GWH)	8640.6	10409.8	9847.0	8905.9	8591.1	10258.9
Residential customers	2263.2	3774.5	3647.8	2756.2	2260.2	3789.1
Commercial and government customers	5342.8	5584.2	5195.3	5047.4	5178.1	5383.7
Industrial customers	1034.6	1051.2	1003.9	1102.3	1152.8	1086.1
Rates ($/MWh)	56.81	59.30	63.85	66.48	68.21	68.80
Residential customers	63.60	66.13	70.73	73.40	75.15	75.75
Commerical customers	54.03	56.50	61.00	63.67	65.49	66.24
Government customers	54.79	57.71	63.38	66.58	68.65	69.27
Industrial customers	48.98	51.13	54.91	57.16	58.69	59.30
Heating degree-days (degrees)	164	1765	1606	1011	261	1671

Seattle City Light Forecasts, 1970-2020

Table 4a. Seattle City Light Load, 1970-2020

	1982	1983	1984	1985	1986	1987
Load (GWH)	7934.7	7579.5	7912.4	8284.6	8137.1	8028.5
Residential customers	3366.0	3084.0	3228.2	3331.1	3183.8	3036.4
Commercial and government customers	3090.2	3166.6	3321.0	3543.8	3524.7	3600.6
Industrial customers	1478.5	1328.9	1363.3	1409.6	1428.6	1391.4
Rates ($/MWh)	17.38	21.34	25.16	27.10	29.58	30.12
Residential customers	18.39	24.21	27.70	29.83	31.73	32.24
Commerical customers	17.87	19.83	24.24	26.30	29.47	29.86
Government customers	19.55	22.26	26.51	28.61	31.35	31.47
Industrial customers	13.27	17.04	20.22	21.47	24.04	25.31
Heating degree-days (degrees)	5043	4503	4985	5607	4539	4267

Annual growth (% change)

	1982	1983	1984	1985	1986	1987
Load	1.1	-4.5	4.4	4.7	-1.8	-1.3
Residential customers	3.1	-8.4	4.7	3.2	-4.4	-4.6
Commercial and government customers	3.8	2.5	4.9	6.7	-0.5	2.2
Industrial customers	-8.2	-10.1	2.6	3.4	1.3	-2.6

Table 4b. Seattle City Light Load, 2008.1-2020.4

	2011.1	2011.2	2011.3	2011.4	2012.1	2012.2
Load (seasonally unadjusted GWH)	10485.4	9110.4	8551.3	10224.5	10430.5	9092.6
Residential customers	4048.9	2688.1	2257.2	3775.8	4033.7	2681.7
Commercial and government customers	5377.9	5290.1	5164.2	5320.6	5333.7	5278.6
Industrial customers	1058.6	1132.2	1130.0	1128.0	1063.2	1132.4
Rates ($/MWh)	69.38	69.96	70.55	71.14	71.74	72.34
Residential customers	76.39	77.03	77.67	78.33	78.99	79.65
Commerical customers	66.80	67.36	67.92	68.49	69.07	69.65
Government customers	69.85	70.44	71.03	71.63	72.23	72.84
Industrial customers	59.80	60.30	60.81	61.32	61.83	62.35
Heating degree-days (degrees)	1942	888	238	1729	1942	888

Seattle City Light Forecasts, 1970-2020

Table 4a. Seattle City Light Load, 1970-2020

	1988	1989	1990	1991	1992	1993
Load (GWH)	8473.7	8719.4	8986.1	8861.7	8691.6	8932.7
Residential customers	3236.1	3283.7	3340.8	3259.0	3095.9	3256.3
Commercial and government customers	3776.3	3968.4	4143.5	4146.2	4172.4	4237.8
Industrial customers	1461.3	1467.3	1501.8	1456.5	1423.3	1438.6
Rates ($/MWh)	30.44	32.12	31.68	31.60	33.67	35.83
Residential customers	33.11	34.10	33.75	33.21	35.48	37.20
Commerical customers	30.48	31.95	31.06	31.44	33.52	35.81
Government customers	32.45	34.07	33.46	33.50	35.96	37.89
Industrial customers	23.28	26.92	27.38	27.24	28.70	31.49
Heating degree-days (degrees)	4708	4627	4773	4556	4090	4691
Annual growth (% change)						
Load	5.5	2.9	3.1	-1.4	-1.9	2.8
Residential customers	6.6	1.5	1.7	-2.4	-5.0	5.2
Commercial and government customers	4.9	5.1	4.4	0.1	0.6	1.6
Industrial customers	5.0	0.4	2.4	-3.0	-2.3	1.1

Table 4b. Seattle City Light Load, 2008.1-2020.4

	2012.3	2012.4	2013.1	2013.2	2013.3	2013.4
Load (seasonally unadjusted GWH)	8560.7	10255.7	10463.7	9119.9	8578.6	10264.9
Residential customers	2253.1	3769.1	4026.4	2677.1	2249.6	3764.1
Commercial and government customers	5182.5	5369.4	5387.4	5327.2	5222.5	5402.2
Industrial customers	1125.1	1117.2	1049.9	1115.6	1106.5	1098.6
Rates ($/MWh)	72.95	73.56	74.18	74.80	75.43	76.06
Residential customers	80.32	80.99	81.67	82.36	83.05	83.75
Commerical customers	70.23	70.82	71.42	72.02	72.62	73.23
Government customers	73.45	74.06	74.69	75.31	75.95	76.58
Industrial customers	62.88	63.40	63.94	64.47	65.02	65.56
Heating degree-days (degrees)	238	1729	1942	888	238	1729

Seattle City Light Forecasts, 1970-2020

Table 4a. Seattle City Light Load, 1970-2020

	1994	1995	1996	1997	1998	1999
Load (GWH)	8887.1	8814.3	9180.4	9167.9	9205.9	9383.7
Residential customers	3183.0	3088.8	3315.8	3181.1	3178.9	3301.8
Commercial and government customers	4332.6	4353.9	4450.9	4517.4	4554.7	4723.9
Industrial customers	1371.4	1371.6	1413.7	1469.4	1472.2	1358.0
Rates ($/MWh)	37.20	37.42	38.96	39.34	38.87	38.96
Residential customers	38.35	38.93	41.12	42.25	42.90	43.02
Commerical customers	37.21	37.23	38.24	38.45	37.39	37.25
Government customers	39.22	38.52	39.69	39.01	38.83	38.20
Industrial customers	33.14	33.77	35.21	35.36	33.79	34.40
Heating degree-days (degrees)	4373	3994	4953	4599	4499	4975

Annual growth (% change)

	1994	1995	1996	1997	1998	1999
Load	-0.5	-0.8	4.2	-0.1	0.4	1.9
Residential customers	-2.3	-3.0	7.3	-4.1	-0.1	3.9
Commercial and government customers	2.2	0.5	2.2	1.5	0.8	3.7
Industrial customers	-4.7	0.0	3.1	3.9	0.2	-7.8

Table 4b. Seattle City Light Load, 2008.1-2020.4

	2014.1	2014.2	2014.3	2014.4	2015.1	2015.2
Load (seasonally unadjusted GWH)	10476.3	9135.9	8596.5	10280.1	10490.3	9147.2
Residential customers	4021.3	2673.7	2246.7	3759.5	4017.7	2672.1
Commercial and government customers	5421.6	5362.1	5256.7	5434.6	5450.3	5387.2
Industrial customers	1033.3	1100.1	1093.1	1086.0	1022.3	1087.9
Rates ($/MWh)	76.70	77.35	78.00	78.65	79.31	79.98
Residential customers	84.45	85.16	85.88	86.60	87.33	88.06
Commerical customers	73.85	74.47	75.10	75.73	76.36	77.00
Government customers	77.23	77.88	78.53	79.19	79.86	80.53
Industrial customers	66.11	66.67	67.23	67.79	68.36	68.94
Heating degree-days (degrees)	1942	888	238	1729	1942	888

Seattle City Light Forecasts, 1970-2020

Table 4a. Seattle City Light Load, 1970-2020

	2000	2001	2002	2003	2004	2005
Load (GWH)	9453.0	8765.5	8888.1	8989.8	9026.0	9057.0
Residential customers	3283.8	3061.9	3059.1	2988.5	2964.6	2967.7
Commercial and government customers	4835.6	4508.7	4629.2	4801.0	4861.0	4900.3
Industrial customers	1333.5	1194.9	1199.8	1200.2	1200.4	1188.9
Rates ($/MWh)	40.67	56.51	62.89	62.57	63.48	61.94
Residential customers	45.88	62.57	68.77	67.86	67.41	66.67
Commerical customers	38.92	54.44	61.95	62.29	61.77	61.04
Government customers	37.28	52.30	59.60	59.37	60.32	60.22
Industrial customers	35.20	50.09	52.99	52.56	61.87	54.52
Heating degree-days (degrees)	4964	4990	4945	4527	4422	4489

Annual growth (% change)

	2000	2001	2002	2003	2004	2005
Load	0.7	-7.3	1.4	1.1	0.4	0.3
Residential customers	-0.5	-6.8	-0.1	-2.3	-0.8	0.1
Commercial and government customers	2.4	-6.8	2.7	3.7	1.2	0.8
Industrial customers	-1.8	-10.4	0.4	0.0	0.0	-1.0

Table 4b. Seattle City Light Load, 2008.1-2020.4

	2015.3	2015.4	2016.1	2016.2	2016.3	2016.4
Load (seasonally unadjusted GWH)	8605.8	10290.6	10503.1	9162.7	8623.5	10309.6
Residential customers	2245.8	3757.9	4015.2	2669.7	2243.1	3752.4
Commercial and government customers	5280.2	5460.9	5480.2	5420.4	5314.9	5497.9
Industrial customers	1079.8	1071.8	1007.6	1072.6	1065.5	1059.3
Rates ($/MWh)	80.65	81.33	82.01	82.70	83.40	84.10
Residential customers	88.80	89.54	90.30	91.06	91.82	92.59
Commerical customers	77.65	78.30	78.96	79.62	80.29	80.97
Government customers	81.20	81.88	82.57	83.27	83.97	84.67
Industrial customers	69.52	70.10	70.69	71.28	71.88	72.48
Heating degree-days (degrees)	238	1729	1942	888	238	1729

Seattle City Light Forecasts, 1970-2020

Table 4a. Seattle City Light Load, 1970-2020

	2006	2007	2008	2009	2010	2011
Load (GWH)	9366.4	9618.4	9715.2	9623.7	9400.7	9592.9
Residential customers	3067.0	3137.1	3222.4	3223.6	3113.3	3192.5
Commercial and government customers	5058.4	5278.9	5363.4	5402.3	5201.1	5288.2
Industrial customers	1241.1	1202.4	1129.3	997.8	1086.3	1112.2
Rates ($/MWh)	60.85	56.22	56.38	56.58	66.84	70.26
Residential customers	65.90	62.83	63.07	63.36	73.76	77.35
Commerical customers	59.89	53.74	53.65	53.80	64.10	67.64
Government customers	59.09	55.98	56.08	54.72	66.97	70.74
Industrial customers	52.97	47.81	47.90	48.70	57.52	60.56
Heating degree-days (degrees)	4476	4823	5062	4897	4549	4797

Annual growth (% change)

	2006	2007	2008	2009	2010	2011
Load	3.4	2.7	1.0	-0.9	-2.3	2.0
Residential customers	3.3	2.3	2.7	0.0	-3.4	2.5
Commercial and government customers	3.2	4.4	1.6	0.7	-3.7	1.7
Industrial customers	4.4	-3.1	-6.1	-11.6	8.9	2.4

Table 4b. Seattle City Light Load, 2008.1-2020.4

	2017.1	2017.2	2017.3	2017.4	2018.1	2018.2
Load (seasonally unadjusted GWH)	10523.1	9185.7	8649.9	10336.3	10553.4	9222.0
Residential customers	4008.0	2663.8	2237.2	3740.9	3994.4	2654.4
Commercial and government customers	5517.9	5458.9	5354.7	5541.8	5564.9	5506.2
Industrial customers	997.3	1063.0	1058.0	1053.7	994.2	1061.3
Rates ($/MWh)	84.80	85.51	86.23	86.96	87.69	88.42
Residential customers	93.37	94.15	94.94	95.74	96.55	97.36
Commerical customers	81.65	82.33	83.02	83.72	84.43	85.13
Government customers	85.38	86.10	86.82	87.55	88.29	89.03
Industrial customers	73.09	73.71	74.33	74.95	75.58	76.21
Heating degree-days (degrees)	1942	888	238	1729	1942	888

Seattle City Light Forecasts, 1970-2020

Table 4a. Seattle City Light Load, 1970-2020

	2012	2013	2014	2015	2016	2017
Load (GWH)	9584.9	9606.8	9622.2	9633.5	9649.7	9673.8
Residential customers	3184.4	3179.3	3175.3	3173.4	3170.1	3162.4
Commercial and government customers	5291.0	5334.8	5368.8	5394.6	5428.4	5468.3
Industrial customers	1109.5	1092.6	1078.1	1065.4	1051.2	1043.0
Rates ($/MWh)	72.65	75.12	77.68	80.32	83.05	85.88
Residential customers	79.99	82.71	85.52	88.43	91.44	94.55
Commerical customers	69.94	72.32	74.79	77.33	79.96	82.68
Government customers	73.14	75.63	78.21	80.87	83.62	86.46
Industrial customers	62.62	64.75	66.95	69.23	71.58	74.02
Heating degree-days (degrees)	4797	4797	4797	4797	4797	4797

Annual growth (% change)

	2012	2013	2014	2015	2016	2017
Load	-0.1	0.2	0.2	0.1	0.2	0.2
Residential customers	-0.3	-0.2	-0.1	-0.1	-0.1	-0.2
Commercial and government customers	0.1	0.8	0.6	0.5	0.6	0.7
Industrial customers	-0.2	-1.5	-1.3	-1.2	-1.3	-0.8

Table 4b. Seattle City Light Load, 2008.1-2020.4

	2018.3	2018.4	2019.1	2019.2	2019.3	2019.4
Load (seasonally unadjusted GWH)	8687.7	10370.4	10586.3	9258.7	8724.8	10404.3
Residential customers	2229.3	3727.9	3980.8	2645.5	2221.8	3715.6
Commercial and government customers	5401.0	5589.1	5611.3	5551.9	5445.6	5635.2
Industrial customers	1057.4	1053.5	994.2	1061.3	1057.3	1053.5
Rates ($/MWh)	89.17	89.92	90.67	91.43	92.20	92.98
Residential customers	98.17	99.00	99.83	100.67	101.52	102.37
Commerical customers	85.85	86.57	87.30	88.03	88.77	89.52
Government customers	89.78	90.53	91.29	92.06	92.83	93.61
Industrial customers	76.86	77.50	78.15	78.81	79.47	80.14
Heating degree-days (degrees)	238	1729	1942	888	238	1729

Seattle City Light Forecasts, 1970-2020

Table 4a. Seattle City Light Load, 1970-2020

	2018	2019	2020
Load (GWH)	9708.4	9743.5	9780.2
Residential customers	3151.5	3140.9	3131.0
Commercial and government customers	5515.3	5561.0	5607.8
Industrial customers	1041.6	1041.6	1041.4
Rates ($/MWh)	88.80	91.82	94.94
Residential customers	97.77	101.10	104.54
Commerical customers	85.50	88.40	91.41
Government customers	89.41	92.45	95.59
Industrial customers	76.54	79.14	81.83
Heating degree-days (degrees)	4797	4797	4797

Annual growth (% change)

	2018	2019	2020
Load	0.4	0.4	0.4
Residential customers	-0.3	-0.3	-0.3
Commercial and government customers	0.9	0.8	0.8
Industrial customers	-0.1	0.0	0.0

Table 4b. Seattle City Light Load, 2008.1-2020.4

	2020.1	2020.2	2020.3	2020.4
Load (seasonally unadjusted GWH)	10620.0	9296.6	8763.6	10440.6
Residential customers	3968.0	2637.1	2214.9	3704.0
Commercial and government customers	5657.9	5598.4	5491.7	5683.3
Industrial customers	994.1	1061.1	1057.0	1053.3
Rates ($/MWh)	93.76	94.54	95.34	96.14
Residential customers	103.23	104.10	104.97	105.85
Commerical customers	90.27	91.03	91.79	92.56
Government customers	94.40	95.19	95.99	96.80
Industrial customers	80.81	81.49	82.17	82.86
Heating degree-days (degrees)	1942	888	238	1729

APPENDIX B

EViews PROGRAMS

EViews PROGRAMS

B-1. INTRODUCTION

There are two EViews programs that maintain and operate the Seattle City Light Economic Forecasting Model: SCLECONMODEL.PRG and SCLECONMODEL. Correspondingly, there are two EViews programs that maintain and operate the Seattle City Light Load Forecasting Model: SCLLOADMODEL.PRG and SCLLOADMODEL. In each case, the first program does the work, while the second program is the forecasting model. SCLECONMODEL and SCLLOADMODEL, which are the two forecasting models, are contained in SCLMODEL.WF1, the workfile where all of the calculations take place. SCLECONMODEL is controlled by the SOLVE command in SCLECONMODEL.PRG and SCLLOADMODEL is controlled by the SOLVE command in SCLLOADMODEL.PRG.

B-2. SCLECONMODEL.PRG

Shown with SCLECONMODEL.PRG are the RUN command, the definitions of the "wild cards," and the specific RUN command used with the current version of the model. As noted by the comment statements, SCLECONMODEL.PRG reads the historical economic data from `scldata.xls`, seasonalizes and transforms the data series, estimates the regression equations, generates quarterly and annual economic forecasts, and writes the annual forecasts to `abc.xls`.

```
run scleconmodel %0 %1 %2 %3

%0  last historical quarter
%1  first forecast quarter
%2  last forecast quarter
%3  last forecast year

run scleconmodel 2010.4 2011.1 2020.4 2020

'SCLECONMODEL.PRG
'READ DATA
open quarterly.wf1
smpl 1970.1 %0
read(c7,t,s=employment) scldata.xls 19
read(c78,t,s=employment) scldata.xls 17
read(c7,t,s=population and income) scldata.xls 17
read(c72,t,s=population and income) scldata.xls 15
smpl 1970.1 %2
read(c7,t,s=united states) scldata.xls 14
read(c27,t,s=united states) scldata.xls 4
read(c5,t,s=dummy) scldata.xls 204
store(d=scldata) k* l* u* scpi dum*
save quarterly.wf1
close quarterly.wf1
open sclmodel.wf1
fetch(d=scldata) k* l* u* scpi dum*
'SEASONALIZE DATA
smpl 1970.1 1999.4
x11(m) knconresu knconres
x11(m) knfoodu knfood
```

```
x11(m) knonduru knondur
x11(m) knnmetminu knnmetmin
x11(m) knmetu knmet
series knaer=knaeru
x11(m) knotrneqpu knotrneqp
x11(m) knoduru knodur
x11(m) kntrdu kntrd
x11(m) kntrnutilu kntrnutil
x11(m) knfinu knfin
x11(m) knoservu knoserv
x11(m) kngovu kngov
x11(m) kunrtu kunrt
x11(m) khsu khs
smpl 1985.1 %0
x11(m) knconresu knconres
x11(m) knfoodu knfood
x11(m) knonduru knondur
x11(m) knnmetminu knnmetmin
x11(m) knmetu knmet
series knaer=knaeru
x11(m) knotrneqpu knotrneqp
x11(m) knoduru knodur
x11(m) kntrdu kntrd
x11(m) kntrnutilu kntrnutil
x11(m) knfinu knfin
x11(m) knoservu knoserv
x11(m) kngovu kngov
x11(m) kunrtu kunrt
x11(m) khsu khs
smpl 1970.1 %0
series knmfg=knfood+knondur+knnmetmin+knmet+knaer+knotrneqp+knodur
series kngoods=knconres+knmfg
series knserv=kntrd+kntrnutil+knfin+knoserv+kngov
series kn=kngoods+knserv
series khs=khs*12
smpl 1970.1 1999.4
x11(m) lnconresu lnconres
x11(m) lnfoodu lnfood
x11(m) lnonduru lnondur
x11(m) lnnmetminu lnnmetmin
x11(m) lnmetu lnmet
series lnaer=lnaeru
x11(m) lnotrneqpu lnotrneqp
x11(m) lnoduru lnodur
x11(m) lntrdu lntrd
x11(m) lntrnutilu lntrnutil
x11(m) lnfinu lnfin
x11(m) lnoservu lnoserv
x11(m) lngovu lngov
smpl 1985.1 %0
x11(m) lnconresu lnconres
x11(m) lnfoodu lnfood
x11(m) lnonduru lnondur
x11(m) lnnmetminu lnnmetmin
x11(m) lnmetu lnmet
series lnaer=lnaeru
x11(m) lnotrneqpu lnotrneqp
```

```
x11(m) lnoduru lnodur
x11(m) lntrdu lntrd
x11(m) lntrnutilu lntrnutil
x11(m) lnfinu lnfin
x11(m) lnoservu lnoserv
x11(m) lngovu lngov
smpl 1970.1 %0
series lnmfg=lnfood+lnondur+lnnmetmin+lnmet+lnaer+lnotrneqp+lnodur
series lngoods=lnconres+lnmfg
series lnserv=lntrd+lntrnutil+lnfin+lnoserv+lngov
series ln=lngoods+lnserv
d *u
store(d=scldata) k* l*
'TRANSFORM DATA
smpl 1970.1 %0
series dlkyp=log(kyp)-log(kyp(-1))
series kype=kyp-kystk-kydiv
series kype05=kype/uspc
series kyppe=(kype/kpop)*1000
series kyppe05=kyppe/uspc
series dlkype=log(kype)-log(kype(-1))
series kypw=kype+0.4*kystk
series kypw05=kypw/uspc
series dlkypw05=log(kypw05)-log(kypw05(-1))
series dlkn=log(kn)-log(kn(-1))
series dlknr=log(kn/usn)-log(kn(-1)/usn(-1))
series dlkunrt=log(kunrt)-log(kunrt(-1))
series dlkunrtr=log(kunrt/usunrt)-log(kunrt(-1)/usunrt(-1))
series dlknconres=log(knconres)-log(knconres(-1))
series dlknfood=log(knfood)-log(knfood(-1))
series dlknondur=log(knondur)-log(knondur(-1))
series dlknnmetmin=log(knnmetmin)-log(knnmetmin(-1))
series dlknmet=log(knmet)-log(knmet(-1))
series dlknaer=log(knaer)-log(knaer(-1))
series dlknotrneqp=log(knotrneqp)-log(knotrneqp(-1))
series dlknodur=log(knodur)-log(knodur(-1))
series dlknserv=log(knserv)-log(knserv(-1))
series dlkntrd=log(kntrd)-log(kntrd(-1))
series dlkntrnutil=log(kntrnutil)-log(kntrnutil(-1))
series dlknfin=log(knfin)-log(knfin(-1))
series knoserve=knoserv-knms
series dlknoserve=log(knoserve)-log(knoserve(-1))
series dlkngov=log(kngov)-log(kngov(-1))
series dlkpop=log(kpop)-log(kpop(-1))
series dlkpopr=log(kpop/uspop)-log(kpop(-1)/uspop(-1))
series dlkhs=log(khs)-log(khs(-1))
series khsb=(ushs/uspop)*kpop
series dlkhsb=log(khs)-log(khsb)
series dlscpi=log(scpi)-log(scpi(-1))
series dlscpir=log(scpi/uscpi)-log(scpi(-1)/uscpi(-1))
series kpophsesnr=kpophsesn/kpophse
series dlkpophsesnr=log(kpophsesnr)-log(kpophsesnr(-1))
series dlkhseszsn=log(khseszsn)-log(khseszsn(-1))
series dlkhseszml=log(khseszml)-log(khseszml(-1))
series dllyp=log(lyp)-log(lyp(-1))
series lype=lyp-lystk
series lype05=lype/uspc
```

```
series lyppe=(lype/lpop)*1000
series lyppe05=lyppe/uspc
series dllype=log(lype)-log(lype(-1))
series lypw=lype+0.4*lystk
series lypw05=lypw/uspc
series dllypw05=log(lypw05)-log(lypw05(-1))
series dlln=log(ln)-log(ln(-1))
series dllnr=log(ln/usn)-log(ln(-1)/usn(-1))
series dllnconres=log(lnconres)-log(lnconres(-1))
series dllnfood=log(lnfood)-log(lnfood(-1))
series dllnondur=log(lnondur)-log(lnondur(-1))
series dllnnmetmin=log(lnnmetmin)-log(lnnmetmin(-1))
series dllnmet=log(lnmet)-log(lnmet(-1))
series dllnaer=log(lnaer)-log(lnaer(-1))
series dllnotrneqp=log(lnotrneqp)-log(lnotrneqp(-1))
series dllnodur=log(lnodur)-log(lnodur(-1))
series dllnserv=log(lnserv)-log(lnserv(-1))
series dllntrd=log(lntrd)-log(lntrd(-1))
series dllntrnutil=log(lntrnutil)-log(lntrnutil(-1))
series dllnfin=log(lnfin)-log(lnfin(-1))
series dllnoserv=log(lnoserv)-log(lnoserv(-1))
series dllngov=log(lngov)-log(lngov(-1))
series dllpop=log(lpop)-log(lpop(-1))
series dllpopr=log(lpop/uspop)-log(lpop(-1)/uspop(-1))
series lpophsesnr=lpophsesn/lpophse
series dllpophsesnr=log(lpophsesnr)-log(lpophsesnr(-1))
series dllhseszsn=log(lhseszsn)-log(lhseszsn(-1))
series dllhseszml=log(lhseszml)-log(lhseszml(-1))
smpl 1970.1 %2
series dlgdp05=log(usgdp05)-log(usgdp05(-1))
series dlx=log(usx)-log(usx(-1))
series dln=log(usn)-log(usn(-1))
series dlunrt=log(usunrt)-log(usunrt(-1))
series dlcpi=log(uscpi)-log(uscpi(-1))
series dlhs=log(ushs)-log(ushs(-1))
series dlpop=log(uspop)-log(uspop(-1))
series dlrmtg=log(usrmtg)-log(usrmtg(-1))
series lrmtg=log(usrmtg)
series dlyp=log(usyp)-log(usyp(-1))
series usyp05=usyp/uspc
series usypp=(usyp/uspop)*1000
series dlny=log((usn/usn(-1))/(usyp05/usyp05(-1)))
'ESTIMATE EQUATIONS
smpl 1970.1 %0
equation kypeeq.ls dlkype dlyp dlknr dum981 dum061 dum071
pdl(dlscpir,4,2,3) ma(1)
equation kunrteq.ls dlkunrt-0.0015 dlunrt dlknr dum702 dum721 dum751
dum001 ma(1)
equation knconreseq.ls dlknconres-0.005 dlkunrt pdl(dlkypw05,4,2,3)
pdl(dlkhs,4,2,3)
equation knfoodeq.ls dlknfood c dlkypw05 dum704 dum724 dum764 dum792
dum864 dum891 dum892 dum893 dum942 dum951 dum952 dum953 dum982
equation knondureq.ls dlknondur c dlx dlkunrt
equation knnmetmineq.ls dlknnmetmin c dlkypw05(-1) dlkunrt(-1) dum723
dum724 dum752 dum761 dum762 dum763 dum852 dum863 dum872 dum873 dum881
dum891 dum904 dum911 dum913 dum914 dum921 dum982 dum991 dum001 dum011
```

```
equation knmeteq.ls dlknmet c dlknconres dlx dum732 dum742 dum743
dum753 dum762 dum791 dum911 ar(1)
equation knotrneqpeq.ls dlknotrneqp c pdl(dlx,4,2,3) dum743 dum833
dum834 dum911 dum932 dum933 dum941 dum951 dum974 dum981 dum022
equation knodureq.ls dlknodur pdl(dlx,4,2,3) pdl(dlkunrt,4,2,3) dum743
dum774 dum781 dum881 dum933 dum934 dum941 dum981 dum031 ma(1)
equation kntrdeq.ls dlkntrd+0.0014 dlkypw05 pdl(dlkhs,4,2,3) dlny
dum812 dum821 dum861 dum883 dum972 ar(1)
equation kntrnutileq.ls dlkntrnutil+0.003 dlkypw05 dlkunrt ar(1)
equation knfineq.ls dlknfin-0.0055 pdl(dlknconres,4,2,3) dlrmtg(-1)
time ar(1)
equation knoserveeq.ls dlknoserve-0.0045 dlkypw05  dlny dum933 ar(1)
equation kngoveq.ls dlkngov+0.002 dlkpop dum813 dum843
equation kpopeq.ls dlkpop+0.0008 pdl(dlpop,4,2,3) pdl(dlknr,8,2,3)
ar(1) ma(1)
equation khseq.ls dlkhsb c pdl(dlkpopr,4,2,3) ar(1)
equation scpieq.ls dlscpi+0.0008 dlcpi pdl(dlkpopr,8,2,3) dum782 dum791
dum811 dum823
equation kpophsesnreq.ls dlkpophsesnr+0.0008 dum911 ar(1) ma(1)
equation khseszsneq.ls dlkhseszsn+0.0007 dum801 dum811 ar(1) ar(2)
equation khseszmleq.ls dlkhseszml+0.00045 ar(1)
equation lnconreseq.ls dllnconres c dlknconres ar(1)
equation lnfoodeq.ls dllnfood c dlknfood ar(1)
equation lnondureq.ls dllnondur+0.0012 dlknondur ar(1)
equation lnnmetmineq.ls dllnnmetmin c dlknnmetmin ar(1)
equation lnmeteq.ls dllnmet+0.0002 dlknmet ar(1)
equation lnaereq.ls dllnaer c dlknaer ar(1)
equation lnotrneqpeq.ls dllnotrneqp c dlknotrneqp ar(1)
equation lnodureq.ls dllnodur+0.0018 dlknodur ar(1)
equation lntrdeq.ls dllntrd+0.0013 dlkntrd ar(1)
equation lntrnutileq.ls dllntrnutil c dlkntrnutil ar(1)
equation lnfineq.ls dllnfin+0.0004 dlknfin ar(1)
equation lnoserveq.ls dllnoserv c dlknoserve ar(1)
equation lngoveq.ls dllngov+0.0006 dlkngov ar(1)
smpl 1980.1 %0
equation lpopeq.ls dllpop-0.0004 dlkpop ar(1)
smpl 1970.1 %0
equation lpophsesnreq.ls dllpophsesnr c dlkpophsesnr ar(1)
equation lhseszsneq.ls dllhseszsn c dlkhseszsn ar(1)
equation lhseszmleq.ls dllhseszml-0.0005  dlkhseszml ar(1)
save sclmodel.wf1
close sclmodel.wf1
'FORECAST
open sclmodel.wf1
smpl %1 %2
solve(c=0.000001,m=1000) scleconmodel
store(d=scldata)  k* l* scpi* u*
save sclmodel.wf1
close sclmodel.wf1
open year.wf1
fetch(d=scldata) k* l* scpi* u*
smpl 1970 %3
series dkyp=((kyp_0/kyp_0(-1))-1.0)*100
series dkyp05=((kyp05_0/kyp05_0(-1))-1.0)*100
series dkn=((kn_0/kn_0(-1))-1.0)*100
series dkunrt=((kunrt_0/kunrt_0(-1))-1.0)*100
series dkhs=((khs_0/khs_0(-1))-1.0)*100
```

```
series dkpop=((kpop_0/kpop_0(-1))-1.0)*100
series dscpi=((scpi_0/scpi_0(-1))-1.0)*100
series dgdp05=((usgdp05/usgdp05(-1))-1.0)*100
series dyp=((usyp/usyp(-1))-1.0)*100
series dyp05=((usyp05/usyp05(-1))-1.0)*100
series dn=((usn/usn(-1))-1.0)*100
series dunrt=((usunrt/usunrt(-1))-1.0)*100
series dhs=((ushs/ushs(-1))-1.0)*100
series dpop=((uspop/uspop(-1))-1.0)*100
series dcpi=((uscpi/uscpi(-1))-1.0)*100
series dkypdif=dkyp-dkn
series dusypdif=dyp-dn
series knrt=kn_0/kpop_0
series usnrt=usn/uspop
series kyppr=kypp_0/usypp
series dkndif=dkn-dn
series dscpidif=dscpi-dcpi
series khsr=khs_0/(ushs*1000000)
series dln=((ln_0/ln_0(-1))-1.0)*100
series lnshr=ln_0/kn_0
series dlyp=((lyp_0/lyp_0(-1))-1.0)*100
series lypshr=lyp_0/kyp_0
series dlpop=((lpop_0/lpop_0(-1))-1.0)*100
series lpopshr=lpop_0/kpop_0
smpl 1970 %3
write(b2) abc.xls kyp_0 dkyp kyp05_0 dkyp05 kypp_0 kn_0 dkn kunrt_0
dkunrt khs_0 dkhs kpop_0 dkpop scpi_0 dscpi kn_0 kngoods_0 knconres_0
knmfg_0 knfood_0 knondur_0 knnmetmin_0 knmet_0 knaer knotrneqp_0
knodur_0 knserv_0 kntrd_0 kntrnutil_0 knfin_0 knoserv_0 kngov_0  kpop_0
kpopgrqt_0 kpophse_0 kpophsesn_0 kpophseml_0 khse_0 khsesn_0 khseml_0
khsesz_0 khseszsn_0 khseszml_0  lyp_0 dlyp lypp_0 lypshr ln_0 dln lnshr
lpop_0 dlpop lpopshr ln_0 lngoods_0 lnconres_0 lnmfg_0 lnfood_0
lnondur_0 lnnmetmin_0 lnmet_0 lnaer_0 lnotrneqp_0 lnodur_0 lnserv_0
lntrd_0 lntrnutil_0 lnfin_0 lnoserv_0 lngov_0  lpop_0 lpopgrqt_0
lpophse_0 lpophsesn_0 lpophseml_0 lhse_0 lhsesn_0 lhseml_0 lhsesz_0
lhseszsn_0 lhseszml_0 usgdp05 dgdp05 usyp dyp usyp05 dyp05 usypp usn dn
usunrt dunrt ushs dhs uspop dpop uscpi dcpi dkypdif dusypdif knrt usnrt
kyppr dkndif dscpidif khsr
save year
close year
```

B-3. SCLECONMODEL

SCLECONMODEL is composed of regression equations (e.g., `:kypeeq`, which predicts `dlkype`, the change in log of King County personal income excluding stock option income) and accounting identities (e.g., `kype=exp(log(kype(-1))+dlkype)`, which predicts King County personal income excluding stock option income). Rather than explicitly showing the multivariate regression equations, SCLECONMODEL refers to them by name (e.g., `kypeeq`). The regression equations are re-estimated and stored in SCLMODEL.WF1 and replaced in SCLECONMODEL each time SCLECONMODEL.PRG is run.

```
'SCLECONMODEL
:kypeeq
kype=exp(log(kype(-1))+dlkype)
kyp=kype+kystk+kydiv
```

```
kyp05=kyp/uspc
kypp=kyp/kpop*1000
kypw=kype+0.4*kystk
kypw05=kypw/uspc
dlkypw05=log(kypw05)-log(kypw05(-1))
:kunrteq
kunrt=exp(log(kunrt(-1))+dlkunrt)
dlkunrtr=log(kunrt/usunrt)-log(kunrt(-1)/usunrt(-1))
kn=kngoods+knserv
dlkn=log(kn)-log(kn(-1))
dlknr=log(kn/usn)-log(kn(-1)/usn(-1))
kngoods=knconres+knmfg
:knconreseq
knconres=exp(log(knconres(-1))+dlknconres)
knmfg=knfood+knondur+knnmetmin+knmet+knaer+knotrneqp+knodur
:knfoodeq
knfood=exp(log(knfood(-1))+dlknfood)
:knondureq
knondur=exp(log(knondur(-1))+dlknondur)
:knnmetmineq
knnmetmin=exp(log(knnmetmin(-1))+dlknnmetmin)
:knmeteq
knmet=exp(log(knmet(-1))+dlknmet)
knaer=knaer
dlknaer=log(knaer)-log(knaer(-1))
:knotrneqpeq
knotrneqp=exp(log(knotrneqp(-1))+dlknotrneqp)
:knodureq
knodur=exp(log(knodur(-1))+dlknodur)
knserv=kntrd+kntrnutil+knfin+knoserv+kngov
:kntrdeq
kntrd=exp(log(kntrd(-1))+dlkntrd)
:kntrnutileq
kntrnutil=exp(log(kntrnutil(-1))+dlkntrnutil)
:knfineq
knfin=exp(log(knfin(-1))+dlknfin)
:knoserveeq
knoserve=exp(log(knoserve(-1))+dlknoserve)
knoserv=knoserve+knms
:kngoveq
kngov=exp(log(kngov(-1))+dlkngov)
:kpopeq
kpop=exp(log(kpop(-1))+dlkpop)
dlkpopr=log(kpop/uspop)-log(kpop(-1)/uspop(-1))
:khseq
khs=exp(log(ushs/uspop*kpop)+dlkhsb)
dlkhs=log(khs)-log(khs(-1))
:scpieq
scpi=exp(log(scpi(-1))+dlscpi)
dlscpir=log(scpi/uscpi)-log(scpi(-1)/uscpi(-1))
kpopgrqt=kpopgrqt(-1)/kpop(-1)*kpop
kpophse=kpop-kpopgrqt
:kpophsesnreq
kpophsesn=kpophse*exp(log(kpophsesn(-1)/kpophse(-1))+dlkpophsesnr)
kpophseml=kpophse-kpophsesn
:khseszsneq
khseszsn=exp(log(khseszsn(-1))+dlkhseszsn)
```

```
:khseszmleq
khseszml=exp(log(khseszml(-1))+dlkhseszml)
khsesn=kpophsesn/khseszsn
khseml=kpophseml/khseszml
khse=khsesn+khseml
khsesz=kpophse/khse
lyp=kypp*lpop/1000
lyp05=lyp/uspc
lypp=kypp
ln=lngoods+lnserv
lngoods=lnconres+lnmfg
:lnconreseq
lnconres=exp(log(lnconres(-1))+dllnconres)
lnmfg=lnfood+lnondur+lnnmetmin+lnmet+lnaer+lnotrneqp+lnodur
:lnfoodeq
lnfood=exp(log(lnfood(-1))+dllnfood)
:lnondureq
lnondur=exp(log(lnondur(-1))+dllnondur)
:lnnmetmineq
lnnmetmin=exp(log(lnnmetmin(-1))+dllnnmetmin)
:lnmeteq
lnmet=exp(log(lnmet(-1))+dllnmet)
:lnaereq
lnaer=exp(log(lnaer(-1))+dllnaer)
:lnotrneqpeq
lnotrneqp=exp(log(lnotrneqp(-1))+dllnotrneqp)
:lnodureq
lnodur=exp(log(lnodur(-1))+dllnodur)
lnserv=lntrd+lntrnutil+lnfin+lnoserv+lngov
:lntrdeq
lntrd=exp(log(lntrd(-1))+dllntrd)
:lntrnutileq
lntrnutil=exp(log(lntrnutil(-1))+dllntrnutil)
:lnfineq
lnfin=exp(log(lnfin(-1))+dllnfin)
:lnoserveq
lnoserv=exp(log(lnoserv(-1))+dllnoserv)
:lngoveq
lngov=exp(log(lngov(-1))+dllngov)
:lpopeq
lpop=exp(log(lpop(-1))+dllpop)
lpopgrqt=lpopgrqt(-1)/lpop(-1)*lpop
lpophse=lpop-lpopgrqt
:lpophsesnreq
lpophsesn=lpophse*exp(log(lpophsesn(-1)/lpophse(-1))+dllpophsesnr)
lpophseml=lpophse-lpophsesn
:lhseszsneq
lhseszsn=exp(log(lhseszsn(-1))+dllhseszsn)
:lhseszmleq
lhseszml=exp(log(lhseszml(-1))+dllhseszml)
lhsesn=lpophsesn/lhseszsn
lhseml=lpophseml/lhseszml
lhse=lhsesn+lhseml
lhsesz=lpophse/lhse
```

B-4. SCLLOADMODEL.PRG

Shown below are the RUN command, the definitions of the "wild cards," and the specific RUN command used with the current version of SCLLOADMODEL.PRG. Like SCLECONMODEL.PRG, SCLLOADMODEL.PRG reads the historical load data from `scldata.xls`, seasonalizes and transforms the data series, estimates the regression equations, generates quarterly and annual load forecasts, and writes the forecasts. For this round of forecasting, there is only one version of the load forecasting model: the aggregated model which was previously called SCLLOADMODEL1 (Model 1). We now refer to it as simply SCLLOADMODEL. The load forecasts from the model are written to `def.xls`.

```
run sclloadmodel %0 %1 %2 %3

%0  last historical quarter
%1  first forecast quarter
%2  last forecast quarter
%3  last forecast year

run sclloadmodel 2010.4 2011.1 2020.4 2020

'SCLLOADMODEL.PRG
open quarterly.wf1
smpl 1980.1 %0
read(c7,t,s=scl load) scldata.xls 19
read(c32,t,s=scl load) scldata.xls 7
smpl 1980.1 %2
read(c45,t,s=scl load) scldata.xls 5
read(c56,t,s=scl load) scldata.xls 2
store(d=scldata) g* ra* hd*
save quarterly.wf1
close quarterly.wf1
open sclmodel.wf1
fetch(d=scldata) g* ra* hd* ln* lh* kunrt* scpi* dum*
'TRANSFORM DATA
smpl 1980.1 %0
series dlgwhrespu=log(gwhresu/lhse_0)-log(gwhresu(-1)/lhse_0(-1))
series dlgwhcomgovpu=log(gwhcomgovu/lnserv_0)-log(gwhcomgovu(-
1)/lnserv_0(-1))
series dlgwhindpu=log(gwhindu/lnmfg)-log(gwhindu(-1)/lnmfg(-1))
smpl 1980.1 %2
series dlrateresp=log(rateres/scpi_0)-log(rateres(-1)/scpi_0(-1))
series dlratecomp=log(ratecom/scpi_0)-log(ratecom(-1)/scpi_0(-1))
series dlrateindp=log(rateind/scpi_0)-log(rateind(-1)/scpi_0(-1))
series dlkunrt_0=log(kunrt_0)-log(kunrt_0(-1))
series dllnconres_0=log(lnconres_0)-log(lnconres_0(-1))
series dlhddu=log(hddu)-log(hddu(-1))
'Model 1
smpl 1980.1 %0
equation gwhreseq.ls dlgwhrespu c pdl(dlrateresp,4,2,3)
pdl(dlkunrt_0,4,2,3) dlhddu dum1 dum2 dum3 dum104 ma(1)
equation gwhcomgoveq.ls dlgwhcomgovpu c pdl(dlratecomp,8,2,3)
pdl(dlkunrt_0,4,2,3) dlhddu dum824 dum832 dum833 dum844 dum852 dum854
dum861 dum873 dum891 dum892 dum904 dum912 dum992 dum011 dum012 dum021
dum033 dum101 dum103 ma(1)
```

```
equation gwhindeq.ls dlgwhindpu c pdl(dlrateindp,4,2,3)
pdl(dlkunrt_0,6,2,3)   dum1 dum2 dum831 dum833 dum852   dum912 dum913
dum914 dum921 dum932 dum953 dum042 dum083 dum084   ma(1)
save sclmodel.wf1
close sclmodel.wf1
'FORECAST
'Model 1
open sclmodel.wf1
smpl %1 %2
solve(c=0.000001,m=1000) sclloadmodel
store(d=scldata) g* ra* hd* ln* lh* kunrt* scpi*
save sclmodel.wf1
close sclmodel.wf1
open year.wf1
fetch(d=scldata) g* ra* hd* ln* lh* kunrt* scpi*
smpl 1980 %3
series dgwhresu=((gwhresu_0/gwhresu_0(-1))-1.0)*100
series dgwhcomgovu=((gwhcomgovu_0/gwhcomgovu_0(-1))-1.0)*100
series dgwhindu=((gwhindu_0/gwhindu_0(-1))-1.0)*100
series dgwhtotu=((gwhtotu_0/gwhtotu_0(-1))-1.0)*100
write(b2) def.xls gwhtotu_0 dgwhtotu gwhresu_0 dgwhresu gwhcomgovu_0
dgwhcomgovu gwhindu_0 dgwhindu gwhtotu_0 gwhresu_0 lhse_0
gwhresu_0/lhse_0 gwhcomgovu_0 lnserv_0 gwhcomgovu_0/lnserv_0 gwhindu_0
lnmfg_0 gwhindu_0/lnmfg_0
save year
close year
```

B-5. SCLLOADMODEL

As noted in the previous section, there is now one version of the load forecasting model: SCLLOADMODEL.   The   model   is   stored   in   SCLMODEL.WF1   and   run   by SCLLOADMODEL.PRG.

```
'SCLLOADMODEL
:gwhreseq
gwhresu=exp(log(gwhresu(-1)/lhse_0(-1))+dlgwhrespu)*lhse_0
:gwhcomgoveq
gwhcomgovu=exp(log(gwhcomgovu(-1)/lnserv_0(-1))+dlgwhcomgovpu)*lnserv_0
:gwhindeq
gwhindu=exp(log(gwhindu(-1)/lnmfg_0(-1))+dlgwhindpu)*lnmfg_0
gwhtotu=gwhresu+gwhcomgovu+gwhindu
```