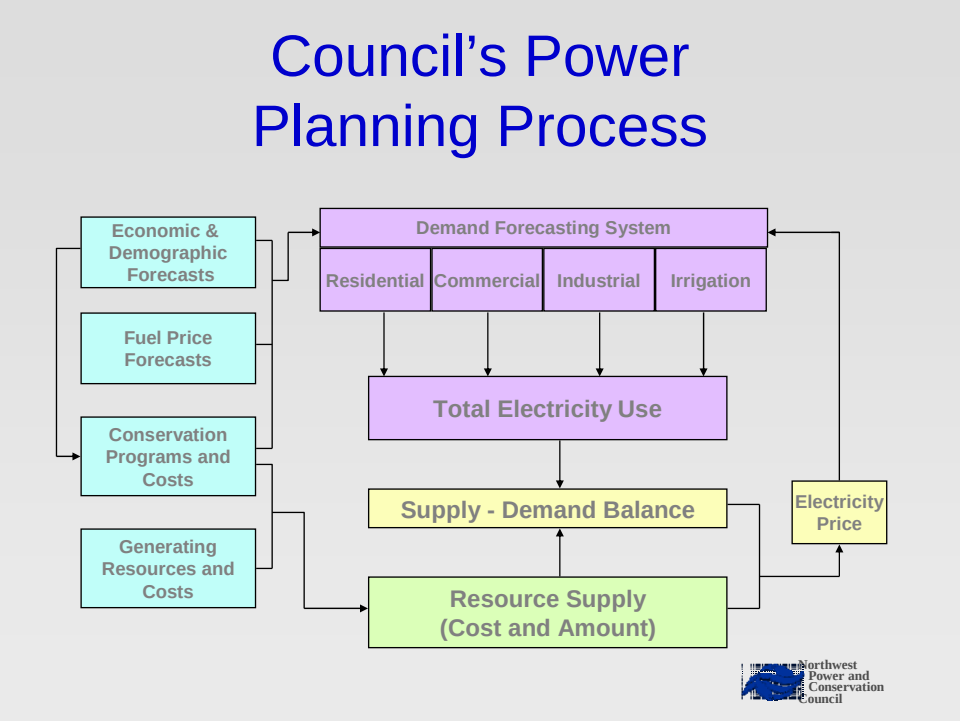
Appendix B: Economic Forecast

ROLE OF THE ECONOMIC FORECAST

A 20-year forecast of demand for electricity is one of the requirements of the Northwest Power Act (Public Law 96-501, Sec. 4(e)(3)(D)). A detailed demand forecast is used in planning future conservation potential, electricity market clearing price projections, as well as in the Council's own resource risk assessments. To better capture the impact of future uncertainties, the Council develops a forecast of future demand for energy that identifies not just one trend but a range of trends. The demand forecast range is determined by a consistent set of assumptions about uncertainties in future economic and demographic activities in the region, the trajectory of fossil fuel and electricity prices, and legislative and market responses to climate change.

The figure below depicts the Council's power planning process. The planning process starts with economic and demographic assessments and then adds fuel and electricity price forecasts to create a forecast for electricity demand. The demand forecast looks at energy use by sector to predict monthly load for electricity generators. The Northwest load forecast, along with the forecast for load outside the Northwest, is used in forecasting wholesale electricity prices. Northwest load is used in the Council's Regional Portfolio Model (RPM) to create least-cost, low-risk resource options for the region.

The demand forecast is also used extensively to develop the conservation supply curves. The key economic drivers for the conservation supply curves are identical to the economic drivers of the demand forecast.



BACKGROUND

Economic Growth Assumptions

The national economic models driving the regional forecast of the draft Sixth Power Plan were updated as of the first quarter 2009. Given the long-term nature of the Council's power plan, the current recession and impact of the federal economic stimulus package were not modeled in detail. However, pace of economic activity was reduced to capture impact of recession on energy consumption. Also, over the next 20 years, economic policy initiatives responding to climate change will affect the regional economy and regional demand for energy. These policy changes have not been explicitly incorporated into the Council's economic assumptions or demand forecast for electricity.

Many things determine the load forecast, and energy demand is influenced by both long-term and short-term factors. Long-term variables may be economic circumstances, life-style choices, demographic changes, or socio-economic trends that take decades to develop and fade. Energy demand is also affected by short-term factors, such as weather conditions or changes in income. The combination of all these conditions determines the demand for energy.

ECONOMIC DRIVERS OF RESIDENTIAL DEMAND

The number of dwellings is a key driver of energy demand in the residential sector. Residential demand begins with the number of units, including single family, multifamily, and manufactured homes. This demand is forecast to grow at 1.3 percent annually from 2010-2030. The current (2008) stock of 5.7 million homes is expected to grow to 7.6 million by 2030, or approximately 83,000 new homes per year.

Another factor affecting residential demand for electricity is life-style trends. As more homes are linked to the internet and the saturation rate for air-conditioning appliances and electronic equipment increases, demand for electricity in the residential sector increases. Over 80 percent of all new homes in the region now have central air conditioning. This compares to 7-8 percent of housing stock with central air conditioning in the 1980s. Another change is the growth rate in home electronics, which has been phenomenal at over 6 percent per year since 2000, and which is expected to continue to increase.

In the residential sector, electricity demand is driven by space heating and cooling, as well as refrigeration, cooking, washing, and a new category called Information, Communication and Entertainment (ICE). This new category includes all portable devices that must be charged, such as laptop computers and cell phones, as well as larger, more energy-intensive televisions and gaming devices. As the regional population grows, and with it the number of homes, demand for these services and appliances will also increase. The energy efficiency of appliances as dictated by state and federal standards, which appliances consumers buy, and how they use them, affect energy demand, as well.

The “number of homes” category is driven by regional population, house size, and composition of the population. The region’s population increased from about 8.9 million in 1985 to about 13 million by 2007, and is projected to grow to over 16 million by 2030 at an annual rate of 1.3 percent.

The following figure reflects the expected population change in each of the four states.

Figure B-1: Population Forecast (000)

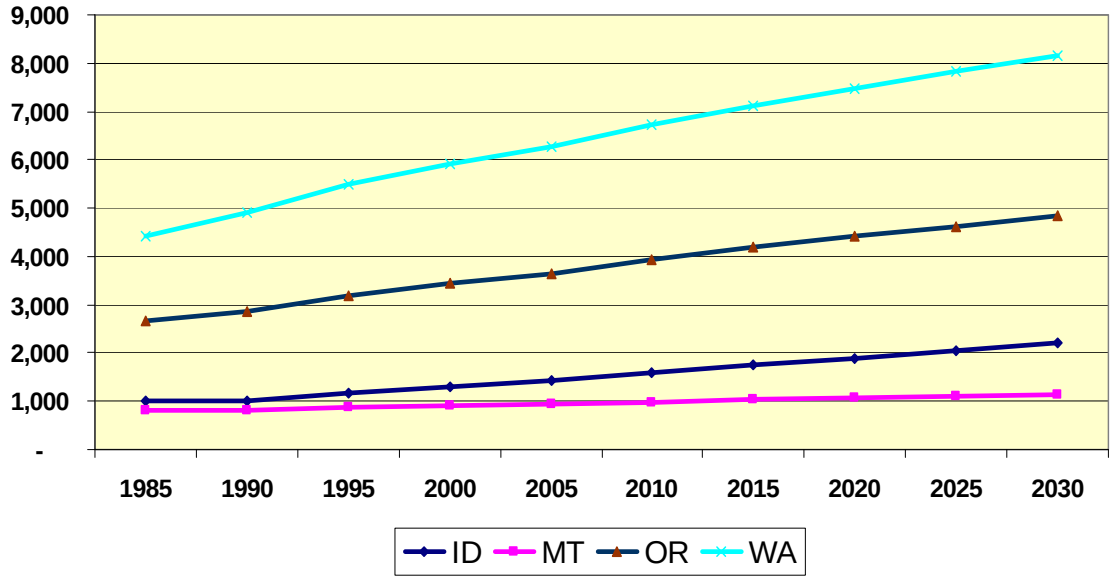


Table B-1: Population in the Region (000)

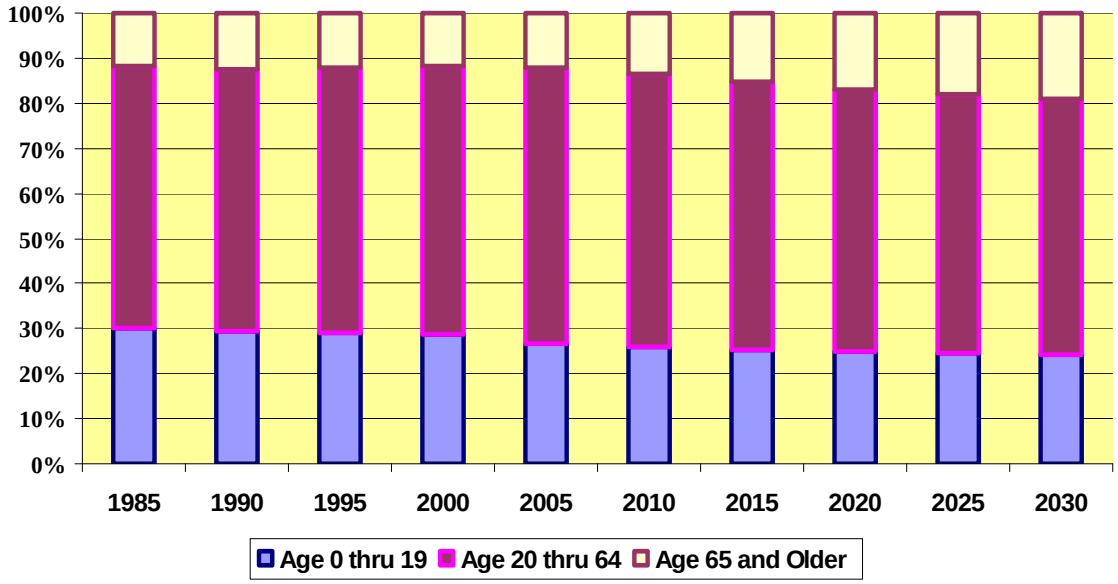
State	1985	2007	2010	2015	2030	Annual Growth rates[1] 1985-2007	Annual Growth rates[1] 2010-2030
ID	993	1,504	1,603	1,746	2,195	1.9%	1.6%
MT	821	959	989	1,032	1,135	0.7%	0.7%
OR	2,674	3,754	3,920	4,178	4,826	1.6%	1.0%
WA	4,406	6,480	6,731	7,100	8,170	1.8%	1.0%
4 states	8,894	12,698	13,244	14,056	16,326	1.6%	1.1%

Table B-2: Composition of Regional Population (000)

	1985	2007	2010	2015	2030
Population Age 0 thru 19	2,673	3,339	3,414	3,540	3,954
Population Age 20 thru 64	5,161	7,776	8,043	8,369	9,266
Population Age 65 & Older	1,060	1,583	1,787	2,148	3,107

[1] Important note: This appendix uses average annual growth rates as summary figures when comparing the historic and forecast periods for many economic drivers and fuel prices. The average annual growth rate is sensitive to the base year values used in calculating the annual growth rates. For a more accurate picture of the year-by-year growth in economic drivers and prices, additional information for each state is available from the companion Excel worksheet available from Council's website. This companion data can provide a more accurate picture of historic and future growth.

Figure B-2: Composition of Population Forecast (000)



Population

The region's population is changing and reflects demographic shifts seen throughout the United States. In 1985, 30 percent of the region's population was younger than 19. This age group has been growing at about 1 percent per year, but it is forecast to grow more slowly for the next two decades, at around 0.7 percent annually. As a percentage of the total population, it is projected to represent about 24 percent of the population by 2030. This generation represents consumers who have grown up with ICE technologies, the fastest-growing segment of residential electricity demand.

The 20-to-64 year-old age group, representing the working group, has grown from about 5 million in 1985 to about 7.7 million in 2007, and is projected to grow to over 9 million by 2030. This age group has been growing at 1.9 percent per year, but its growth rate is expected to be significantly reduced as more and more baby boomers retire. This demographic category plays a critical role in regional employment, demand for homes, major capital equipment, and goods and services.

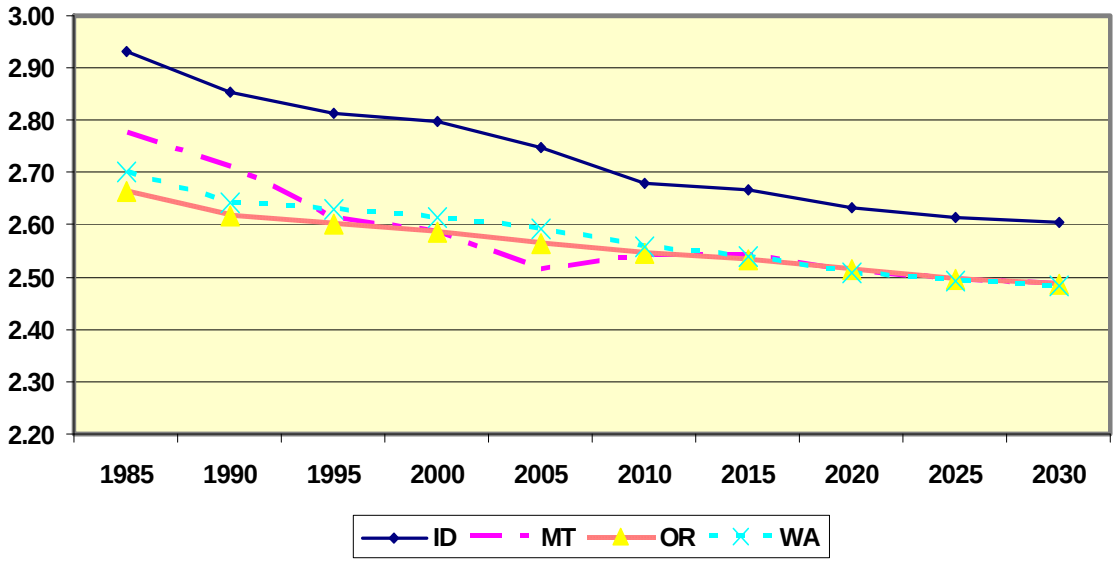
The fastest-growing population segment is people over 64, the "retirees." They represented about 12 percent of the population in 1985, and by 2030 they are expected to represent about 20 percent of the region's population. This segment is expected to grow almost 3 percent per year over the next 20 years, at almost three times the growth rate of the total population. This trend has affected the commercial sector in many ways, and the increase in the number of businesses catering to elders is one example. In 2005, the Bureau of Labor Statistics and county business patterns show there were over 3,200 businesses in the region offering elder care services. Such businesses had more than 100,000 employees and occupied about 60 million square feet of

space. If the current trends continue, by 2030 an additional 50 million square feet of space would be needed for elder care. The demand from this business is tracked in the commercial section of the model. However, the region lacks a good understanding of the demand from this particular market segment, so the Sixth Power Plan recommends pursuing better data on the energy consumption pattern of this sector.

Housing Stock

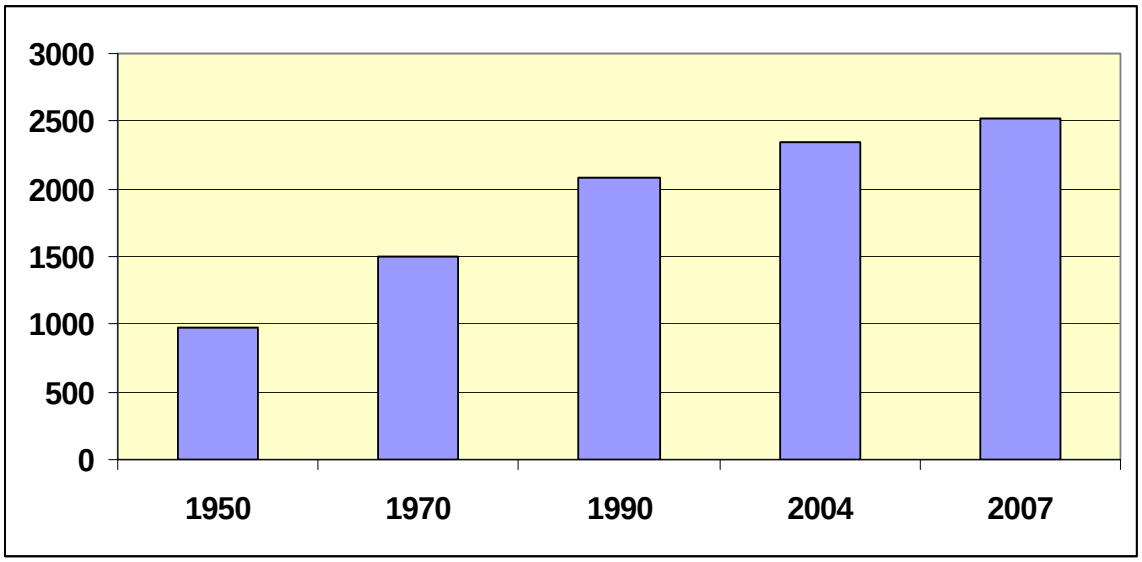
While the regional population has been increasing, the number of occupants per household has been declining. In 1985, the average household size was about 2.95 persons per household, and by 2030 it is expected to go down to 2.6 persons per household, resulting in the number of homes growing at a faster rate than the population.

Figure B-3: Declining Household Size (People per Household)



While the number of occupants per household has declined, the square footage of homes has been increasing. According to the U.S. Bureau of Census's annual survey of new homes, the average single-family house completed in 2007 had 2,521 square feet, 801 more square feet than homes in 1977. Going back to the 1950s, the average square footage of a new single-family home was about 983 square feet. Over the past five decades, the average home size has grown by more than 250 percent. In 2007, 38 percent of new single-family homes had four or more bedrooms, almost twice the number of bedrooms in most homes built 20 years ago. In addition, 90 percent of these new homes had air conditioning. These changes have meant an increased demand for space conditioning and lighting.

Figure B-4: Growing Average Size of New Single Family Homes



The increase in the average size of homes has not been limited to single-family residences. The average square footage of multi-family units completed and built for sale in 2007 was 1,577 square feet, 217 square feet more than in 1999. It is difficult to predict the future trends in house size. However, if the movement toward a more sustainable lifestyle gains momentum, housing size may decline as the number of single-occupant households increases and the population ages.

In absolute terms, the number of single-family housing has been growing at a faster pace than the overall population. Between 1985 and 2007, the population grew at 1.6 percent per year and the number of homes grew at 1.9 percent per year. As incomes increased and as more people purchased homes, the number of households grew at a rate faster than the rate of population growth.

Figure B-5: Number of Single-Family Homes (000) Stock

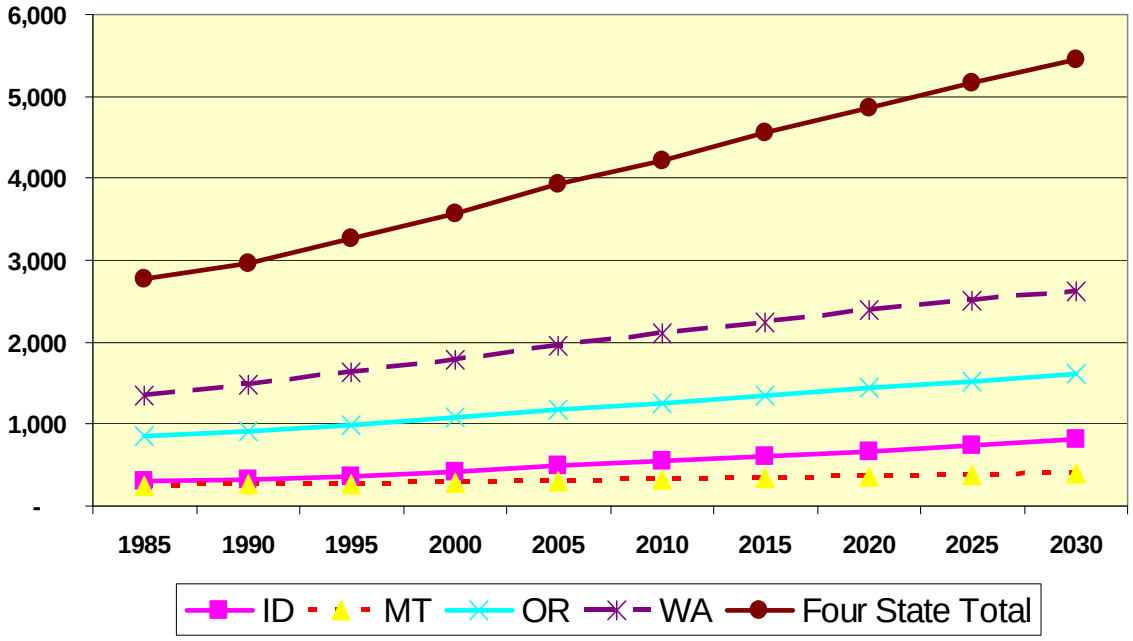
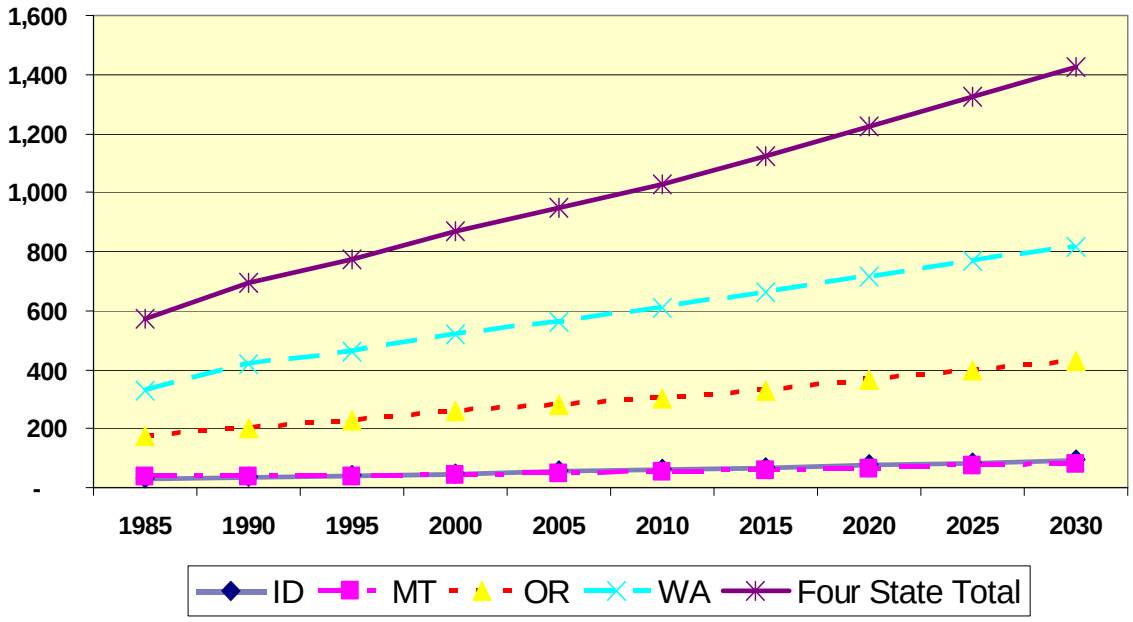
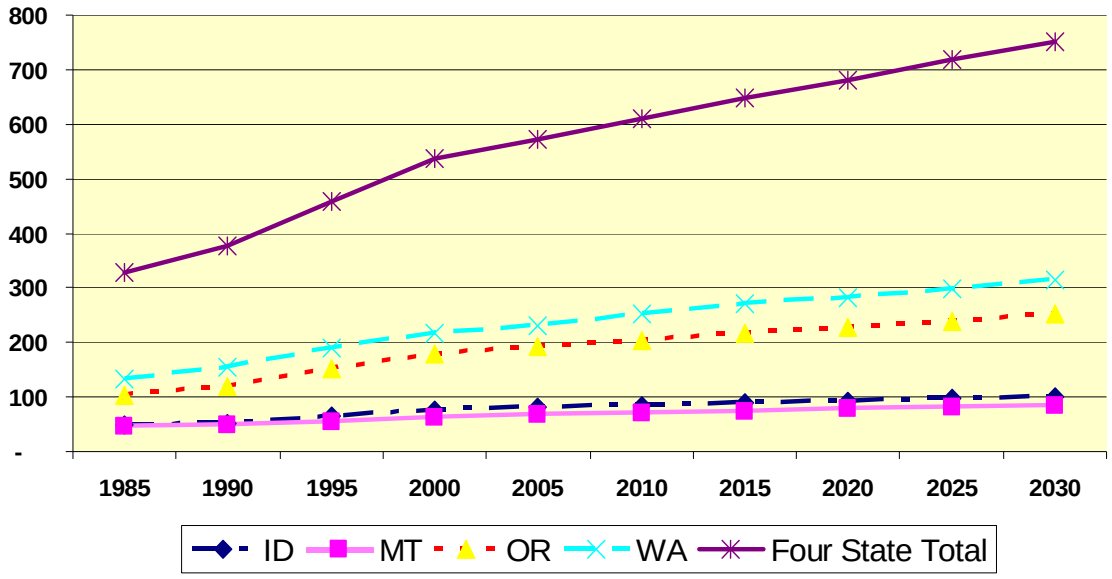


Figure B-6: Number of Multi-Family Homes (000) Stock



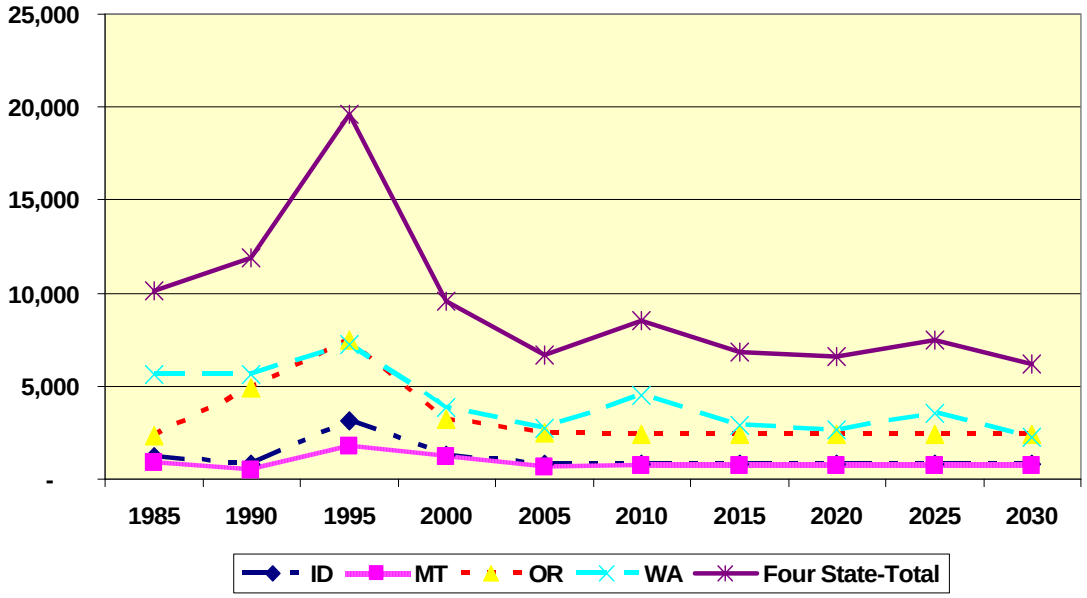
A housing sub-sector that has *not* been growing as fast is manufactured housing. The factors determining demand for this type of housing are income, price of land, and the number of newlywed and low-income populations. Manufactured homes tend to be less-expensive housing options, so an increase in per capita income in the region has slowed demand for these homes. The price of manufactured housing has also increased, although significantly less than stick-built homes.

Figure B-7: Number of Manufactured Homes (000) Stock



Although manufactured housing typically represents about 10 percent of new homes in the region, they represent about 30 percent of electrically heated new homes. Recognizing this high percentage of electrically heated homes, the Manufactured Housing Acquisition Program was established in 1992. The incentive program, supported by the Council, the Bonneville Power Administration, state energy offices, electric utilities, and manufacturers, paid manufacturers the incremental cost to add efficiency measures to each new home. New manufactured homes peaked in 1995 after this program ended. For now, the stock of manufactured homes is projected to increase, although at a slower rate.

Figure B-8: New Manufactured Homes per Year



The overall composition of housing stock has been changing to favor multi-family homes. Single-family homes (defined as a detached single-family home or a multi-plex unit of up to 4 units) has been losing market share. Single-family homes represented 75 percent of homes in the region in 1985, but by 2007 they represented 72 percent of housing stock. By 2030, the forecast is for single-family homes to decline to about 71 percent. Multi-family homes (defined as housing with greater than four units) represented 16 percent of residential housing stock in 1985, 17 percent by 2007, and is projected to be about 20 percent by 2030. Manufactured homes have had a 9-10 percent market share and are projected to retain this status.

Table B-3: Average Annual Number of New Homes

	1985-2000	2001-2008	2010-2030
Single-Family			
Idaho	7,390	12,544	13,148
Montana	2,070	3,620	3,702
Oregon	14,459	17,789	18,124
Washington	28,237	32,364	27,069
Four State Total	52,157	66,317	62,043
Multi-Family			
Idaho	901	1,423	1,504
Montana	551	1,001	1,347
Oregon	5,660	4,510	6,086
Washington	12,762	9,206	10,188
Four State Total	19,873	16,141	19,126
Manufactured Home			
Idaho	1,818	870	837
Montana	1,161	775	714
Oregon	4,983	2,424	2,404
Washington	5,609	3,138	3,157
Four State Total	13,571	7,208	7,111

Each year during 1985-2008, an average of 54,000 new single-family, 19,500 multi-family, and 12,000 new manufactured homes were added to the existing stock. Starting in 2000, each year has seen a dramatic increase in new single-family home additions. Rising income levels in the region and the increased availability of credit caused a shift from multi-family to single-family home ownership. In 2005, more than 87,000 new single-family homes were added in the region. This increase in the number of single-family houses caused a substantial increase in the price of housing. In the 2010-2030 period, the Council anticipates a return to more historic levels of growth. A slow down in new single-family home additions is already evident. The forecast predicts an increase in multi-family homes in the region. The impact of the current recession on new residential construction was incorporated in the revised forecast using Global Insight's short-term economic forecast of March 2009.

Figure B-9: New Single Family Home Additions

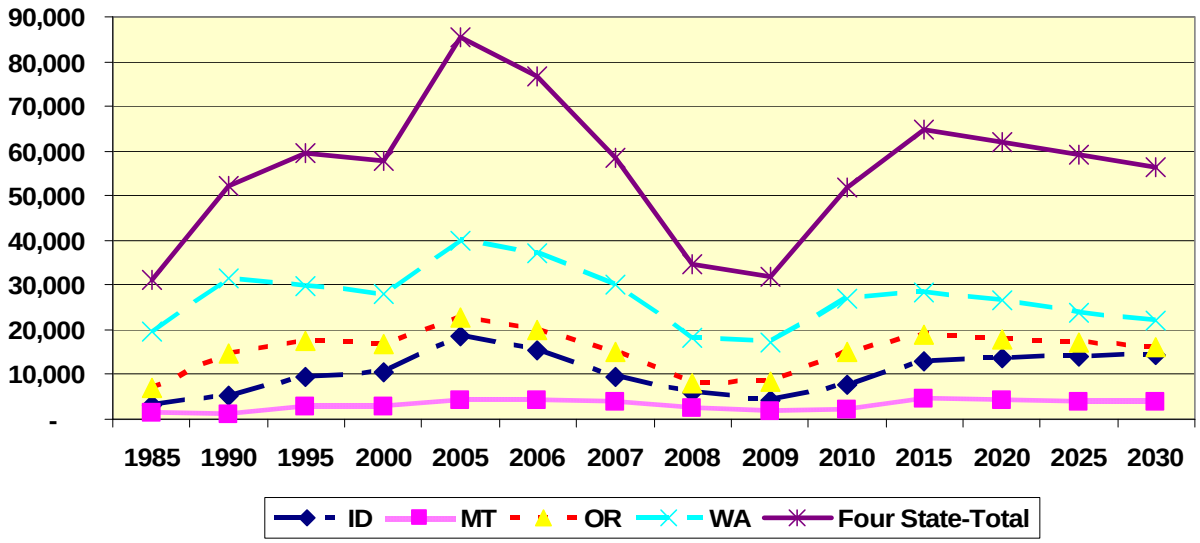
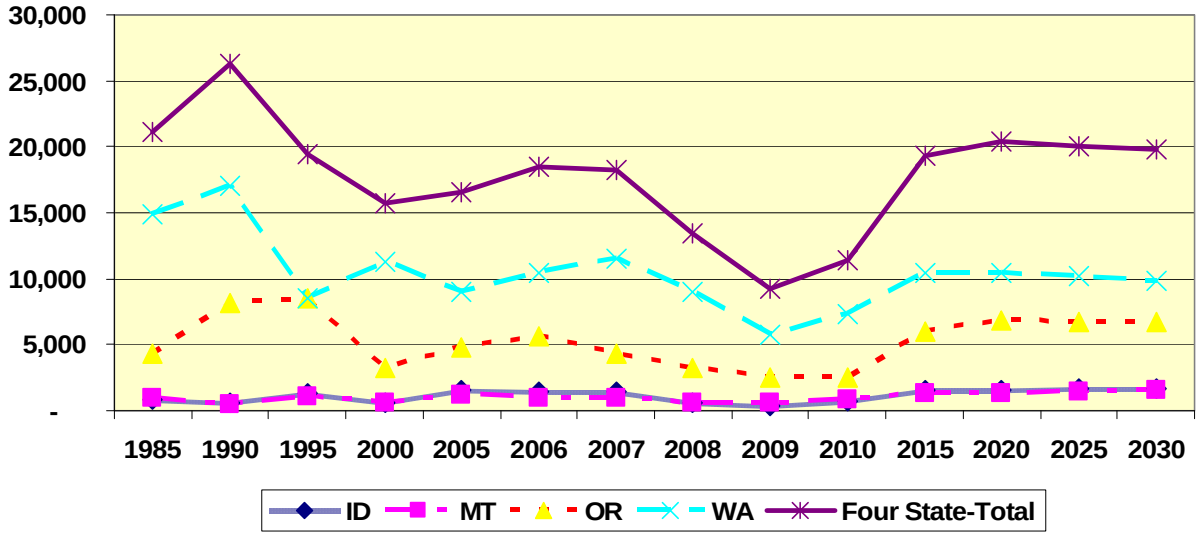


Figure B-10: New Multi-family Additions



In summary, the key driver for demand for electricity consumption in the residential sector is the number of residential units. The following table presents the existing residential units for select years.

Table B-4: Historic and forecast residential units (1000s)

Regional Summary	1985	2007	2015	2020	2030
Single Family	2,767	4,066	4,534	4,850	5,436
Multi Family	571	984	1,107	1,208	1,408
Other Family	329	585	649	681	752

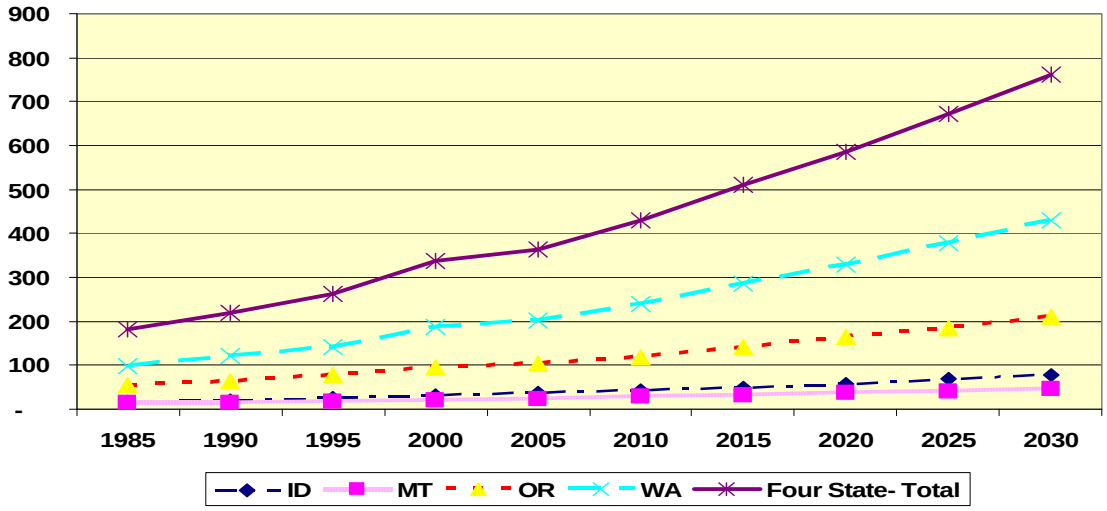
Personal Income

Personal income is another economic driver of energy demand. Energy consumption is elastic, so a decline in personal income causes a short-term reduction in demand. Regional personal income, both in total and on a per-capita basis, has been on the upswing and is projected to continue, although at a slower rate. The following table shows the growth rate, in constant dollars, for personal income in the four states. It should be noted that the impact of the 2008 recession has not been incorporated into these personal income projections.

Table B-5: Growth Rate Personal Income (2000 constant dollars)

	1985-2007	2010-2030
Idaho	3.9%	3.1%
Montana	2.7%	2.4%
Oregon	3.3%	2.9%
Washington	3.8%	2.9%
Four State- Total	3.6%	2.9%

Figure B-11: Personal Income
(Billions in 2000 constant dollars)



Number of Energy-using Appliances in the Average Residence

Energy-using appliances also affect energy demand in the residential sector, and the penetration rate of appliances is a key driver of demand. One group of devices that has experienced significant growth in the residential sector has been home electronics (ICE). Very few sources track the penetration rate of this end-use at the regional level, so the following analysis draws on national-level data.

Information Communication and Entertainment

The explosive growth of these devices has been global, fueled in part by the rapid expansion of the Internet. In a not too distant past, the typical appliances in a typical home consisted of one or two refrigerators; a water heater; perhaps a freezer; some form of space-heating appliance; a cooking appliance; lighting fixtures; and, rarely, an air-conditioning unit. Entertainment appliances were usually limited to a color television and a stereo system.

An average home today has all these appliances, as well as a whole range of ICE devices. Some ICE devices provide services that were once performed outside the home, such as printing pictures or reports. Other ICE devices connect people to the outside world and social networks, and some ICE devices provide entertainment. ICE devices, to a great extent, have removed the boundary between office work and home life. The line between home and work life is increasingly less pronounced as more and more people are able to conduct office work from home.

ICE end-uses are numerous and vary from household to household, depending on the life-style and demographic characteristics of the household. The following table is a partial list of ICE end-uses. The consumption figures are estimates and combine the various duty cycles of the devices.

Table B-6: Partial Listing of ICE Devices and Estimated Annual Consumption[2]

Home Office/Communication Devices	KWh/year	Home Entertainment Devices	KWh/year
Desktop PC	264	Home Theater systems	115
Laptop PC	74	TV- CRT	126
Monitors	68	TV-LCD	108
Inkjet Printer	21	TV-Plasma	281
Laser Printer	97	TV-Projection	237
Scanners	45	Digital Cable box	159
Copiers	51	Digital Satellite Receiver	125
Broadband Devices	79	Digital Video Recorder	264
Home Router	53	DVD players	34
Chargers	13.1	Game Systems	

U.S. national shipment data for 1997-2006 show that the shipment of laptop computers increased at an annual rate of 16 percent.[3] For the same period, desk top computer shipments increased at a rate of 3 percent annually. Meanwhile, the traditional analog color television was declining at 13 percent per year. In 1997, about 400,000 digital televisions (LCD, plasma, and projection) were shipped, and by 2006 the volume of shipment reached over 21 million units.

At the same time that the number and type of home televisions were increasing, television screen size also increased. For example, in 1999, over 83 percent of residential televisions were less than 32 inches, and about 5 percent were larger than 46 inches. In 2008, over 30 percent of

[2] Pacific Gas and Electric Company, Emerging Technologies Program Application Assessment Report #0513 Consumer Electronics: Market Trends, Energy Consumption, and Program Recommendations 2005-2010, Issued: December 2006

[3] Appliance Magazine data for U.S. manufacturers

televisions are now over 46 inches and only 14 percent are less than 32 inches.[4] As screen size increases, so does energy consumption. A 32-inch or less television consumes about 172 kilowatt hours per year compared to the 283 (or more) kilowatt hours that televisions with 46-inch or wider screens consume.

Figure B-12: Growth in Computer Sales

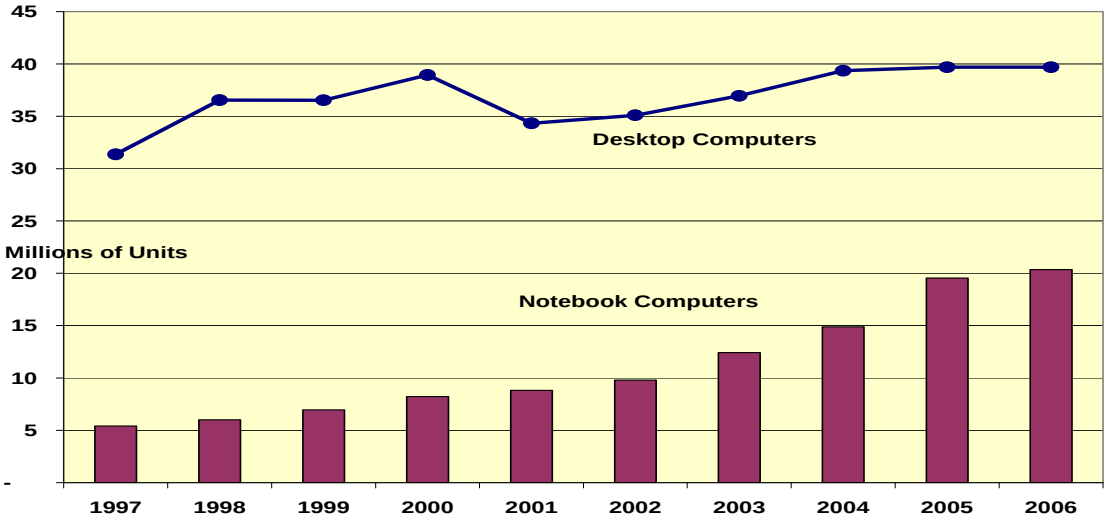
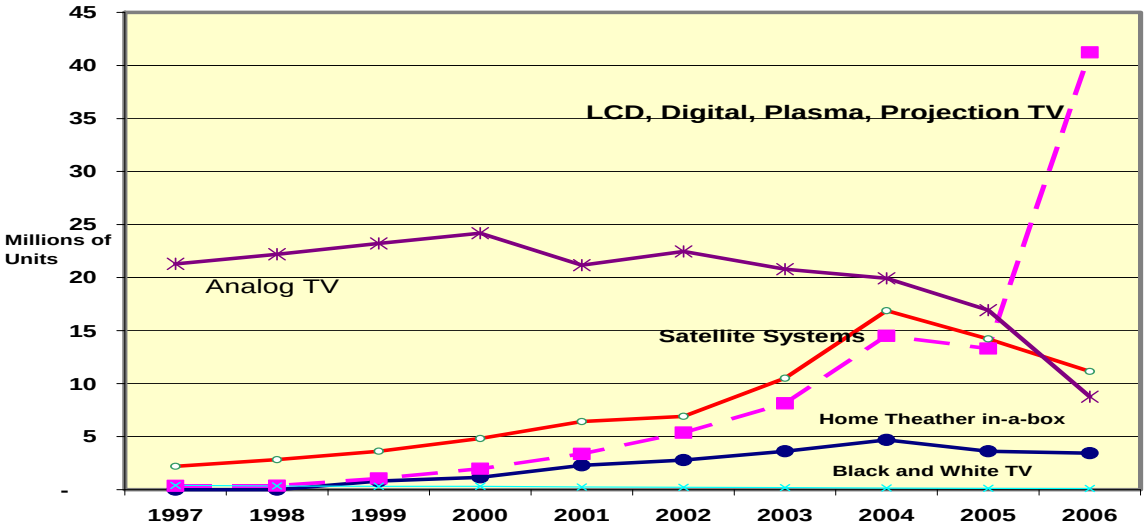


Table B-7: Annual Growth Rate in Shipment of Entertainment Equipment

	1997-2006
Home Theater-In-a-Box	23%
LCD, Digital, Plasma, Projection TV	69%
Satellite Systems	17%
Televisions, Black & White (Monochrome)	-14%
Televisions, Color, Analog	-13%

Figure B-13: Annual Shipment of TVs and Satellite Systems



[4] 2008 study conducted for Northwest Power and Conservation Council by ECOS consulting.

Demand for Air Conditioning

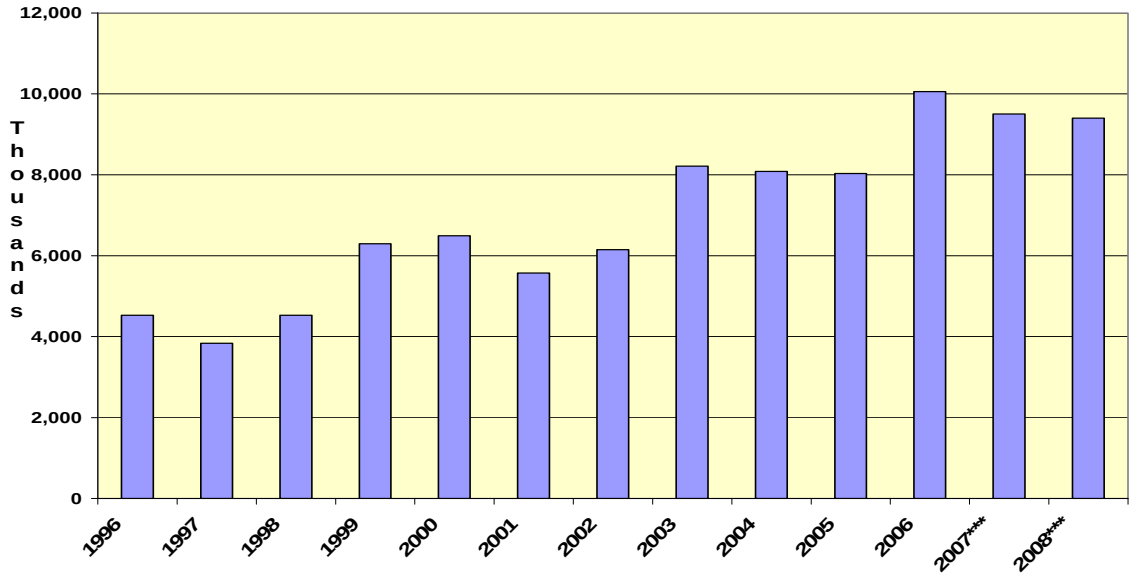
Residential air conditioning has grown rapidly in the region. The market penetration of air conditioning by Northwest homeowners was relatively low, about 10-20 percent, during the 1980s and 1990s. Air conditioning use has been increasing significantly in recent years. This shift in demand can be attributed to warmer summer temperatures, reduced prices of air-conditioning units, and the number of new people moving into the region who are accustomed to using air-conditioning in their previous homes. The following table shows that in 2000, about 40,000 room air conditioning units were shipped to the region. Five years later, the figure had increased to about 140,000. State-specific figures are not available at this writing, but if the national trends are any indication, the volume of room air conditioning units in 2006 would show a significant increase.

Table B-8: Shipment of Room Air Conditions to the Region (number)

	2000	2001	2002	2003	2004	2005	Annual Growth Rate
Idaho	5,300	5,400	7,500	13,000	13,600	9,998	14%
Montana	4,200	4,900	8,000	12,400	15,300	7,926	14%
Oregon	15,800	17,300	21,100	39,800	58,700	55,469	29%
Washington	16,200	27,300	32,600	45,300	90,700	66,163	33%

The increase in room air-conditioning has not been a regional phenomenon. Similar trends can be seen in national figures. Between 1997 and 2006, room air-conditioning sales grew at an annual rate of 11 percent, almost 10 times the population growth rate. Sales increased from about 4 million units in 1997 to about 10 million units in 2006. The sales volume for room air-conditioning depends on summer temperatures, which is evident from the high sales volume in 2006--one of the hottest years on record.

Figure B-14: Recent Trends in Nationwide Shipment of Room Air Conditioners [5]



[5] -Association of Home Appliance Manufacturers data. 2007 and 2008 are forecasts.

ECONOMIC DRIVERS OF THE COMMERCIAL SECTOR

The key economic driver for the commercial sector's energy demand is the square footage needed for commercial enterprises. In modeling this sector, the space requirement of thousands of business activities was calculated and aggregated into 17 different building types.

Methodology in Estimating Commercial Floor Space Requirements

The key driver for the commercial sector is the stock square footage required to conduct business activities in designated building types. To calculate this square footage, a simple model was developed that uses the number of employees per business activity and median square footage per building type. The following analytic steps were taken:

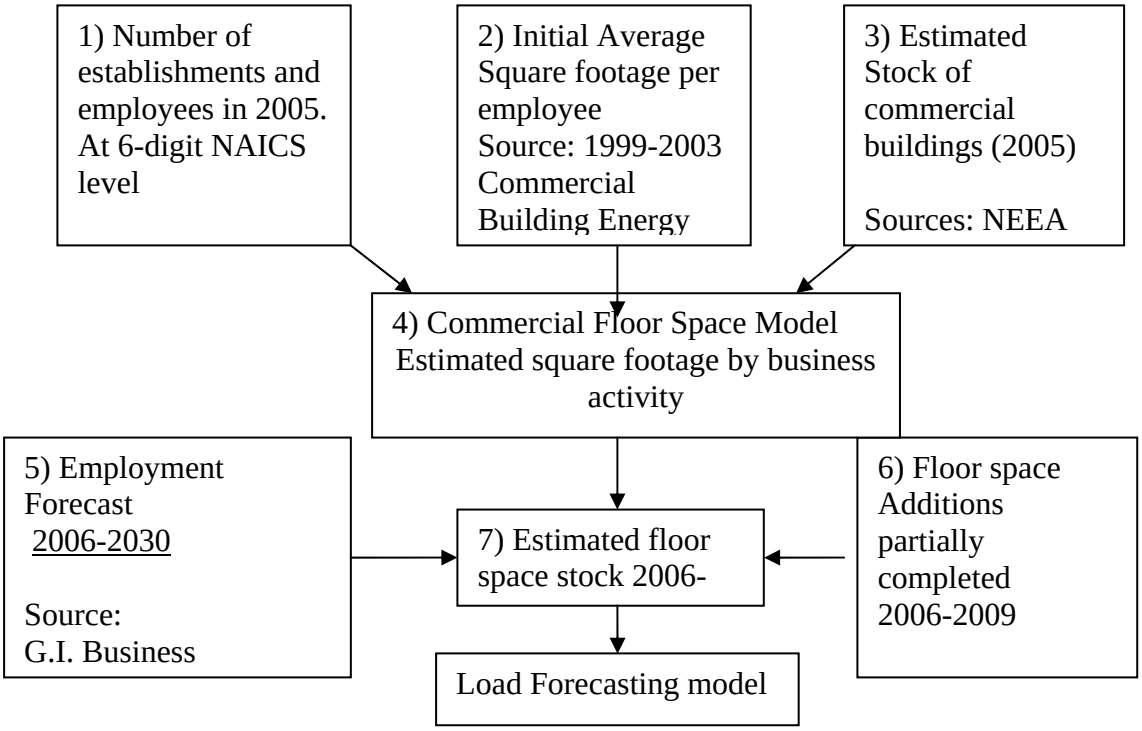
1. The number of establishments[6] and employees in 2005 (at 6-digit NAICS[7] code level) was obtained from the Bureau of Labor Statistics. This enabled a detailed investigation of the type of business activities and the number of employees for each business type. Each business activity was assigned one of the 17 commercial building types used in load forecasting and conservation assessment.
2. The median square footage per main-shift employees (the hours of 8 a.m.-5 p.m.) for various business activities reported as part of Commercial Building Energy Consumption Surveys (CBEC) was obtained from the Department of Energy.
3. CBEC micro data (individual site data) for 1992-2003 for more than 21,000 buildings was used to calculate the median square footage per employee and the number of hours of operation for various establishments.
4. The percent of "major" occupation categories engaged in a business activity (at 4-digit NAICS) was obtained from the Bureau of Labor Statistics. http:/stat.bls.gov/oes/home.htm
5. An estimate of existing floor space stock and the demolition rate by building type was obtained from the Commercial Building Stock Analysis (NEEA 2004).
6. Floor space additions for each building type for 2002-2005 was obtained from F.W. Dodge and used to augment the 2001 building floor space stock to create an assessment of the existing floor space in 2005. This floor space stock was reduced by calculated demolitions during 2002-2005.
7. An initial estimate of 2005 square footage requirements for each business activity was estimated using the following factors:
    a. The assigned building type
    b. Median square footage per employee
    c. Number of employees
    d. Percent of business activity engaged in an occupation
8. The estimated 2005 floor space stock for each business activity was adjusted so that the total square footage for that building type is close to the benchmark floor space stock in 2005.

[6] Establishment - A single physical location where business is conducted or where services or industrial operations are performed.

[7] NAICS - North American Industrial Classification System

9. Future floor space requirements were forecast by applying the annual growth rate in employment in each business activity to Global Insight's forecast (at state, and 4-digit NAICS code level), and to the 2005 floor space requirements for that business activity.
10. For each year, the new floor space requirements across business activities were aggregated by building type, and for each building type, a portion of floor stock is estimated to be demolished.
11. To capture the construction projects that are partially complete for 2006-2009, the Council replaced its model's estimate for the square footage additions with those reported by F.W. Dodge for construction projects in the pipeline.
12. For years 2006-2030, the estimated commercial floor space stock is fed into the demand forecasting model.

Figure B-15: Analytic Steps in Forecasting Floor Space for Each State



The Northwest Energy Efficiency Alliance's (NEEA) market research report[8] estimated that in 2001 the total commercial floor space in the Pacific Northwest was 2.4 billion square feet. Taking these estimates, and the new floor space additions for 2001-2005 from F.W. Dodge, staff estimated the commercial building stock in the region to be about 2.7 billion square feet in 2005. Roughly 300 million square feet were added between 2001 and 2005 and an estimated 60 million square feet were demolished.

[8] "Assessment of the Commercial Building Stock in the Pacific Northwest" March 2004,

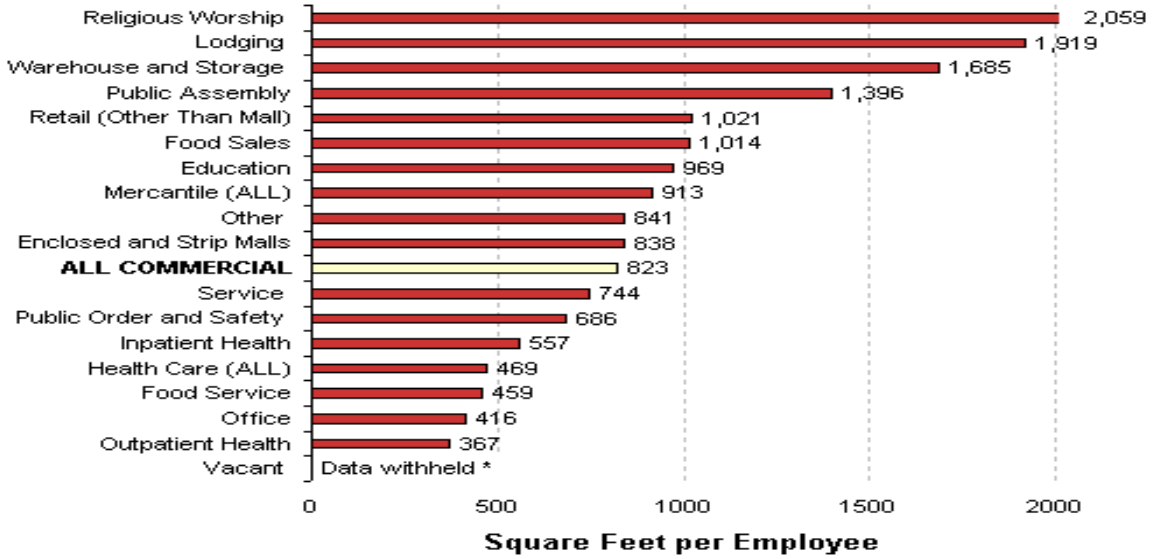
Table B-9: 2005 Commercial Building Stock (1,000,000 SQF)

	Idaho	Montana	Oregon	Washington	Total
Office (3 types)	27	34	104	340	504
Retail (4 types)	29	25	156	289	500
K-12	26	21	38	152	237
University	13	8	20	77	118
Hotel	16	25	52	69	162
Hospital	7	5	20	37	68
Hospital Other (Elder Care)	17	10	32	75	133
Restaurant	3	4	15	25	48
Grocery	8	6	9	32	55
Grocery Other	3	2	4	13	22
Warehouse	26	19	131	156	331
Assembly	17	11	43	130	202
Other	36	21	82	251	391
Total	230	192	705	1,645	2,772

Square Footage Per Employee

Using the Department of Energy's Commercial Building Energy Consumption survey data (micro-data from a national survey of over 21,000 commercial buildings surveyed between 1992 and 2003), we estimate the median square footage per employee for various business activities. A graphic example of the initial square footage per employee used in the model (from CBECS 1999) is shown here.

Figure B-16: Median square footage per employee



Note: "Mercantile (ALL)" includes both "Retail (Other Than Mall)" and "Enclosed and Strip Malls"; "Health Care (ALL)" includes both "Inpatient Health" and "Outpatient Health".
* Relative Standard Error (RSE) greater than 50 percent or fewer than 20 buildings sampled.
Source: Energy Information Administration, 1999 Commercial Buildings Energy Consumption Survey.

Calibration to Benchmark Year Stock

The floor space estimates were then compared with the actual floor space figures by state and building type for 2005. The 2001 commercial building stock assessment had categorized a large portion of the building stock, nearly 20 percent, to the "other" category. To better understand the

nature of this category of buildings, a detailed model was developed to estimate floor space requirements for various business activities. Through this analysis, the amount of floor space that was designated as "other" was reduced and assigned to the appropriate floor space types for "office," "warehouse," or "assembly." This enables us to have a better estimate of the conservation potential of these commercial enterprises and the demand forecast for the region.

Table B-10 shows the estimated share of building stock before and after the detailed analysis of business activities. Other building types now represent about 5 percent of building stock. An increase in the share of office, warehouse, and assembly buildings can be observed.

Table B-10: Percent of Commercial Floor Space by Building Type

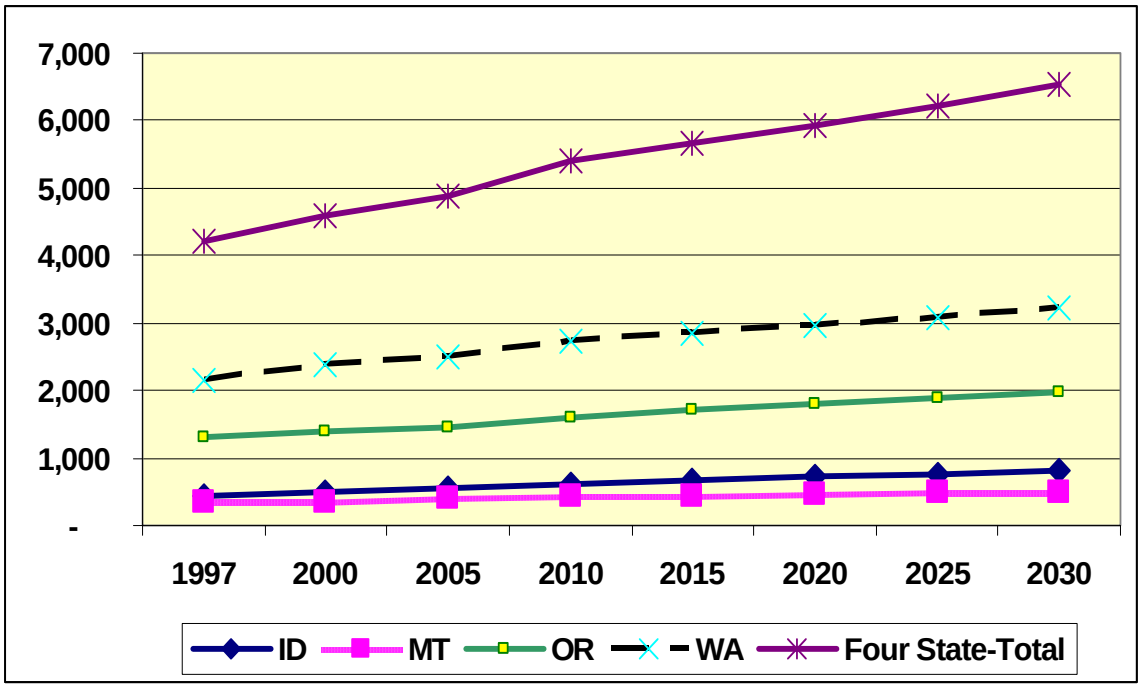
	Initial Market Segmentation	Final Market Segmentation
Office	18.2%	24.1%
Retail	18.0%	18.1%
Hospital	2.5%	2.5%
Hospital Other	4.8%	4.8%
Hotel	5.9%	6.3%
Restaurant	1.7%	1.8%
Grocery	2.0%	2.0%
Grocery Other	0.8%	0.8%
K-12	8.6%	8.9%
University	4.3%	4.4%
Warehouse	11.9%	12.0%
Assembly	7.3%	9.2%
Other	14.1%	5.1%

Other sources of information used for verifying the results of the analysis were the grocery and supermarket data that NEEA had purchased. This data confirmed that grocery store square footage developed by our model was within 2 percent of actual floor space data.

Forecasting Commercial Floor Space Requirements

A model forecasting the square footage requirements of the commercial sector was developed and calibrated to the known square footage data for 2005. Then, using Global Insight's business demographic forecast of employment, the Council was able to forecast the square footage requirement for commercial buildings. The following figures show the historic and forecast commercial employment totals in the region, and then broken down by major business activity. Between 2010 and 2030, the overall commercial employment is expected to grow at an annual rate of 1.1 percent, with total commercial employment growing from 5.1 million in 2007 to about 6.5 million by 2030.

Figure B-17: Commercial Employment Projection (thousands)



Changing Composition of Commercial Sector

The employment market share of business activities in the commercial sector has not been constant. Over the past 10 years, some business sectors have increased their market share, while other sectors experienced a declining market share. For example, businesses engaged in health care, information technologies, professional and technical services, and wholesale trade services have increased their market share, while government and retail trade have reduced their market share. The historic and forecast trends are presented in the following table.

Table B-11: Percent Market Share of Employment

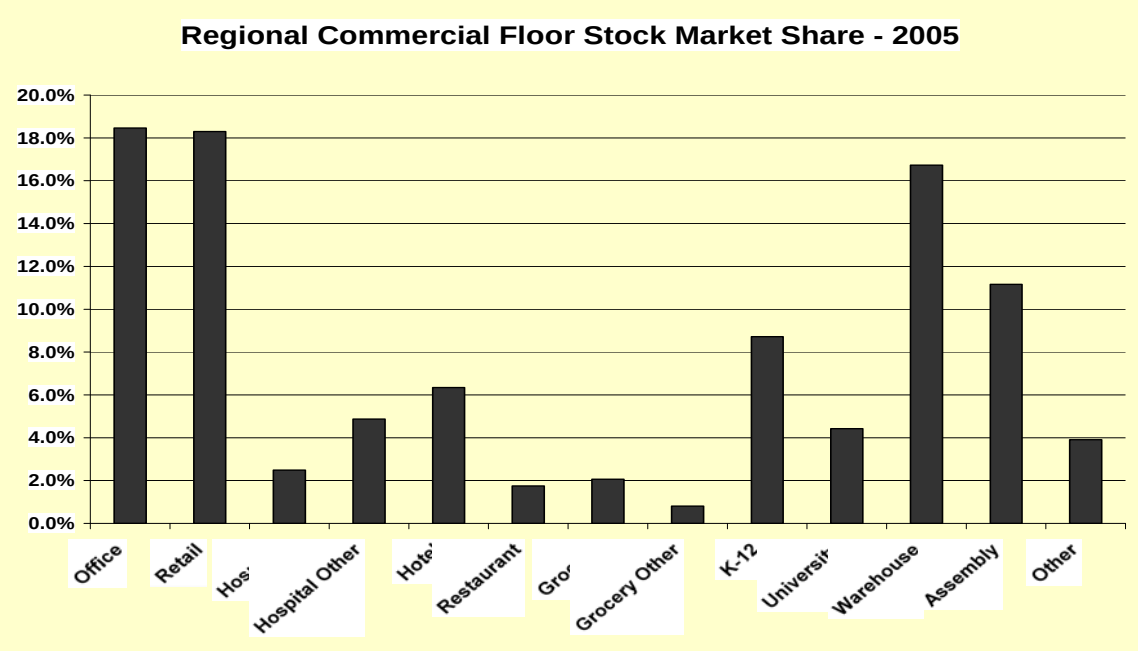
	1997	2007	2030
Businesses with Increasing Employment Market Share			
Health Care and Social Assistance	10.8	11.7	12.5
Administrative and Support and Waste Management	5.4	6.1	9.7
Information	2.9	3.1	3.7
Construction	6.4	7.4	7.8
Professional, Scientific, and Technical Services	5.1	5.5	7.4
Wholesale Trade	5.5	5.0	5.4
Businesses with Declining or stable Market Share			
Government Employees	21.3	20.0	18.0
Retail Trade	13.8	13.1	10.7
Accommodation and Food Services	9.6	9.4	7.8
Transportation and Warehousing	3.9	3.4	3.5
Other Services (except Public Administration)	4.4	3.9	3.5
Finance and Insurance	4.0	4.1	3.4
Real Estate and Rental and Leasing	2.2	2.2	1.9
Arts, Entertainment, and Recreation	1.6	1.7	1.7
Educational Services	1.5	1.7	1.6
Management of Companies and Enterprises	1.4	1.4	1.3
Utilities	0.4	0.3	0.2
Total Employment in Commercial Activities (000)	4,222	5,117	6,531

To establish the relationship between floor space requirements and the number of employees, data from the Commercial Building Stock Analysis (NEEA 2004) was used to estimate the existing floor space stock and the demolition rate by building type in 2004. It was then used to estimate the commercial floor space stock in 2005. The following figures show the estimated commercial floor space stock in 2005. These estimates, along with the data on the number of employees, were used to forecast floor space requirements.

Table B-12: Commercial Floor Space Stock 2005 (millions SQF)

Building type	Idaho	Montana	Oregon	Washington	Total
Office	29	36	100	340	505
Retail	29	26	155	290	500
hospital	7	5	20	37	68
Hospital Other	17	9	32	75	133
Hotel	18	27	57	72	173
Restaurant	4	5	15	24	48
Grocery	8	6	10	32	56
Mini Marts	3	2	4	13	22
K-12	27	21	38	152	238
University	13	9	20	78	121
Warehouse	35	21	131	272	457
Assembly	25	31	95	155	305
Other	11	9	31	56	107
Total	225	207	708	1,596	2,735

Figure B-18: Regional Commercial Floor Stock Market Share (2005)



The floor space stock in each year is the sum of new floor space additions and retirements from the floor space in that year. The forecast for floor space additions for each state and the region is shown in the following figure. The Council's Sixth Power Plan forecasts about 900 million square feet of new floor space. A large portion of this will be in warehouse space, office space, K-12 schools, and elder care facilities.

Table B-13: 2010-2030 New Commercial Floor Space Additions (millions of SQF)

	Idaho	Montana	Oregon	Washington	Region
Large Off	6.87	5.63	17.38	64.12	94.00
Medium Off	3.10	2.54	7.83	28.89	42.35
Small Off	3.63	2.97	9.19	33.90	49.69
Big Box-Retail	2.11	1.37	8.46	10.13	22.06
Small Box-Retail	3.89	2.53	15.62	18.70	40.75
High End-Retail	0.97	0.63	3.91	4.68	10.19
Anchor-Retail	1.88	1.22	7.54	9.03	19.67
K-12	6.62	4.73	6.71	34.33	52.39
University	3.99	1.62	4.98	20.18	30.78
Warehouse	24.61	8.33	65.04	177.32	275.30
Supermarket	0.89	0.52	1.05	3.03	5.48
Mini Mart	1.20	0.33	0.55	2.51	4.59
Restaurant	2.06	1.31	4.48	6.55	14.40
Lodging	3.96	1.86	7.02	9.38	22.23
Hospital	2.50	0.84	5.50	7.73	16.57
Other Health*	10.06	4.40	11.06	39.17	64.68
Assembly	21.30	8.44	31.60	31.45	92.79
Other	8.42	6.35	17.56	23.37	55.70
Total	108.05	55.63	225.47	524.46	913.61

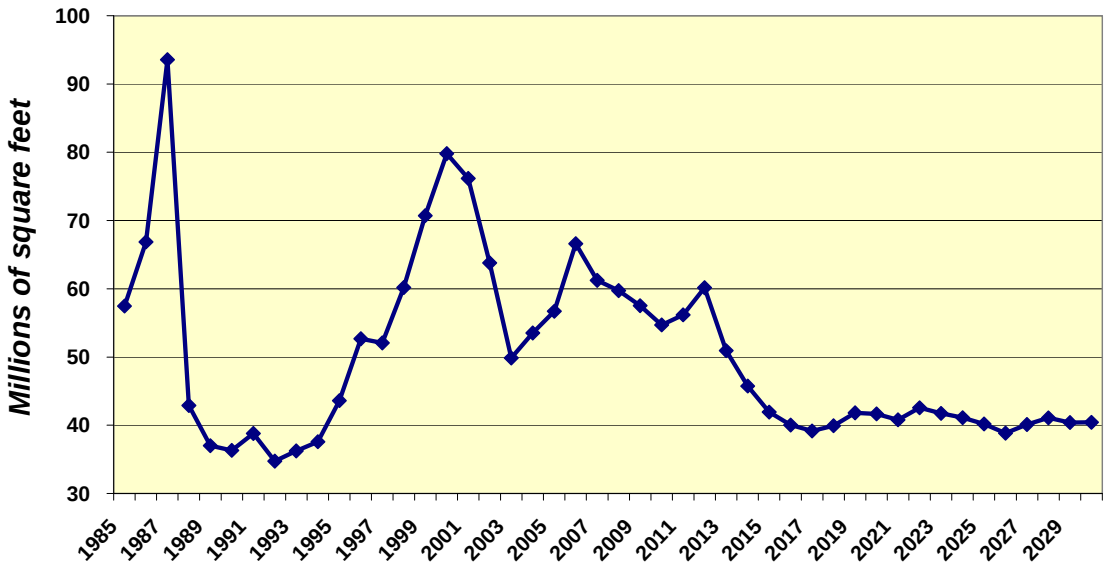
*- elder care facilities

Commercial Floor Space Additions

The overall pattern of floor space additions for the commercial sector is presented in the following graph. A quick review of the historic data shows the cyclical nature of commercial floor space additions. The sharp increase in late 1980s is followed by a significant slow down in the early 1990s. The late 1990s indicate a sharp increase in new construction activities. The 2000-2002 recession slowed construction activities. In 2005, another wave of commercial construction took place. Due to the long construction time for commercial activities, it would typically take a year or two for construction activities to reflect the economy. The slow down in construction activities due to the current recession would be reflected in the level of new commercial construction activities after a few years. The current forecast indicates that it would be at least 2011-2012 before commercial construction activities increase.

The long-term forecast projects a slow down in floor space additions, from 60 million square feet per year to about 40 million square feet. The forecast for future floor space additions does not show a wide swing in construction activities in the sector. However, there are different patterns of floor space additions, depending on the building category.

Figure B-19: Total Commercial Floor Space Additions (Northwest Region)

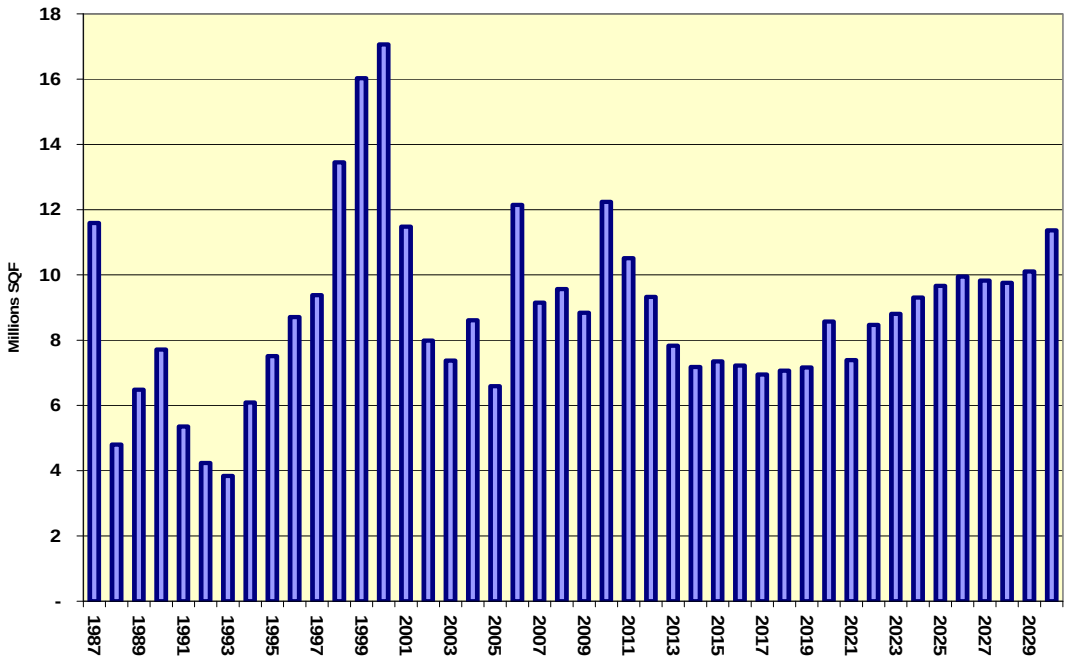


Patterns of Commercial Floor Space Additions

Commercial floor space additions typically show a cyclical pattern of overbuilding followed by high occupancy and demand for more space. This is especially true for the more speculative building types such as office or retail. A brief review of commercial floor space additions for 1987-2030 shows the different patterns of floor space additions for office, retail, warehouse, K-12 schools, and elder care facilities. An increase in office space additions, declining retail space requirements, substantial increases in new warehouse space, and declining K-12 school floor space requirements are forecast.

Office space requirements suggest a decline in new office space additions for 2012-2014, followed by a stable period from 2015-2019. Starting with 2020, the Council forecasts an escalation of commercial office construction activities.

Figure B-20: Pattern of Office Space Addition



A decrease in retail floor space requirements and new retail space additions are expected to decline over the forecast period. This decrease reflects slower population growth and the move to e-commerce. Retail space additions peaked in 2005-2006. In the 2010-2030 period, retail commercial floor space is forecast to average around 4 million square feet per year.

A decrease in retail space requirement is off-set by an increase in demand for warehouse space. The increase in warehouse space reflects the expanding market for e-commerce.

Figure B-21: Pattern of Retail Space Addition

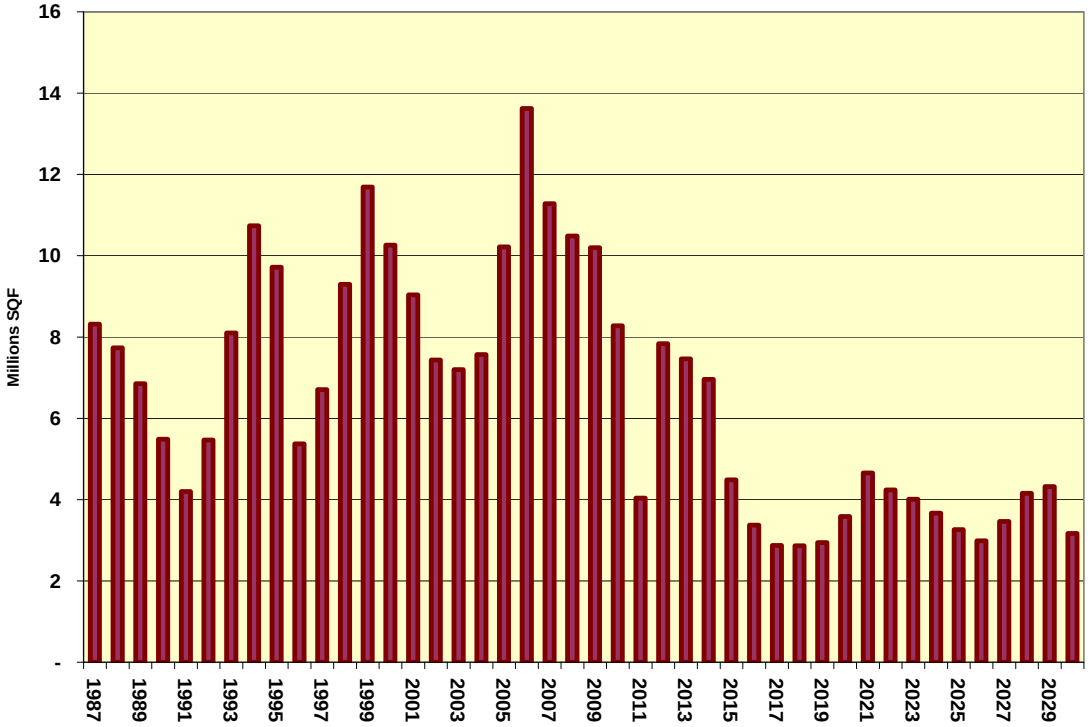
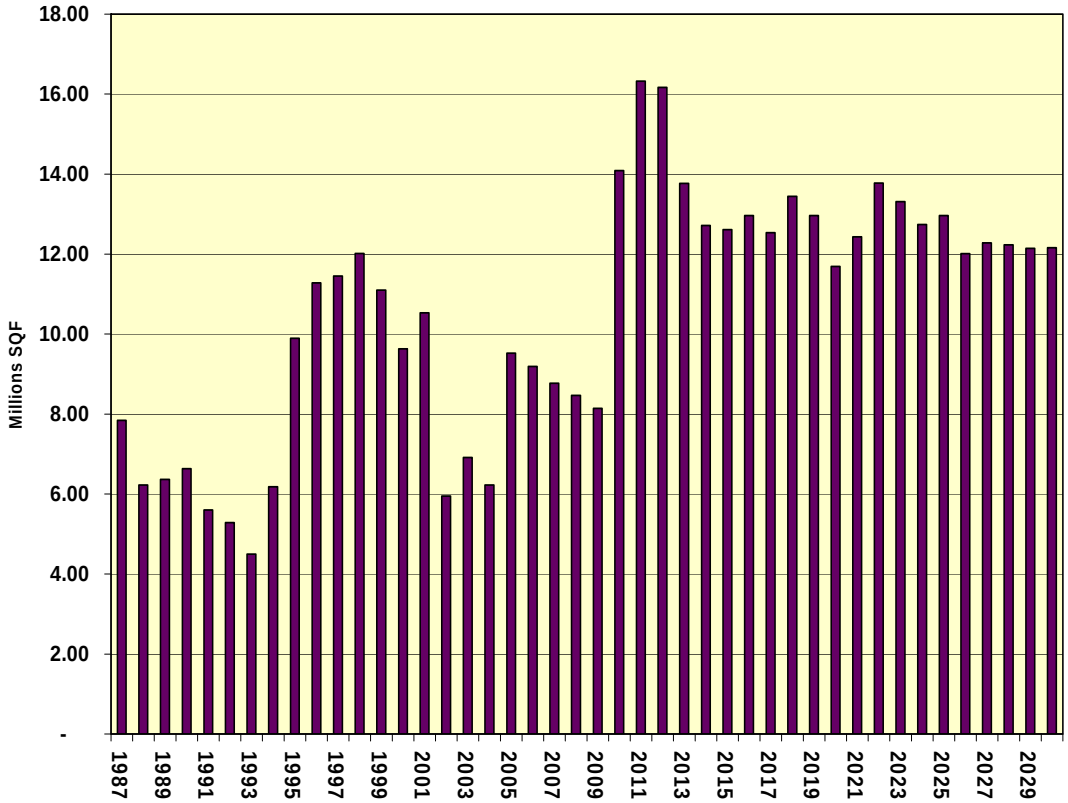
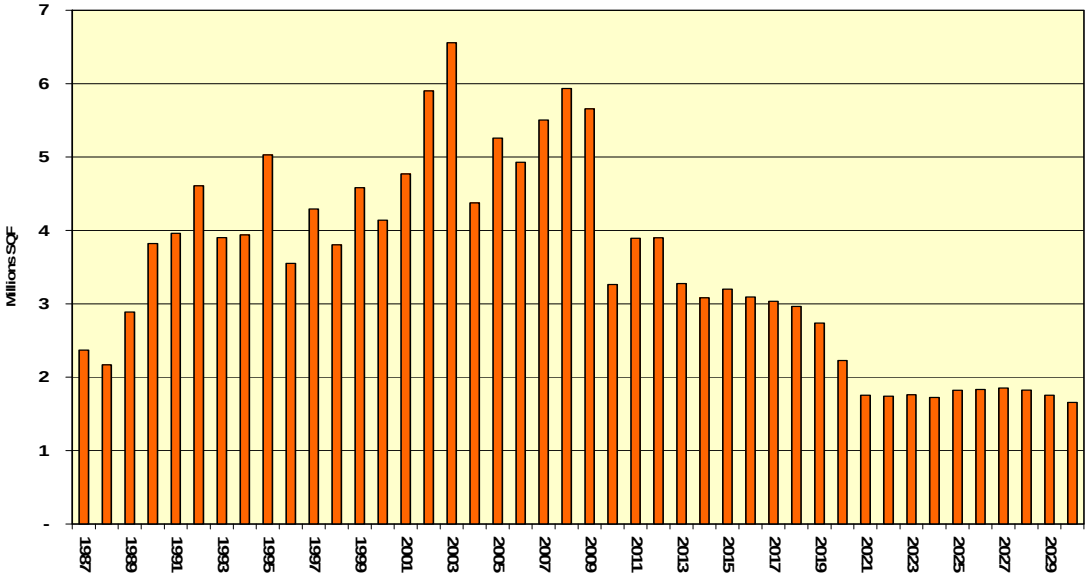


Figure B-22: Pattern of Warehouse Floor Space Addition



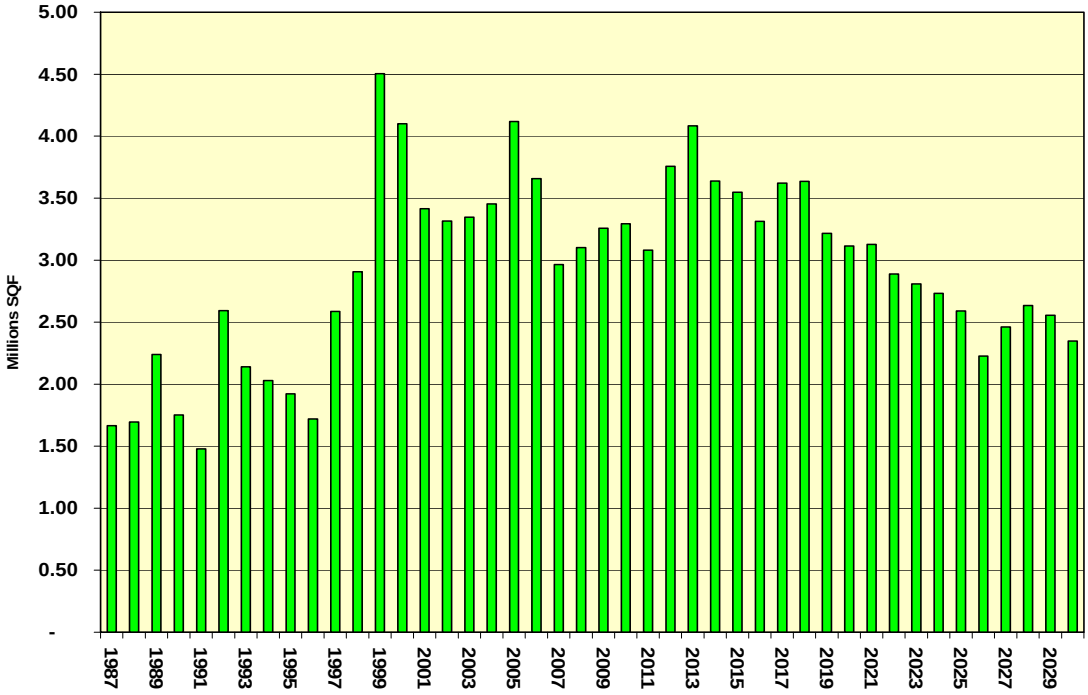
The demand for the schools and elder care are driven by the demographic changes facing the region. Population in the region is growing at a slower rate and a larger population is at retirement age. The pattern of floor space additions for K-12 schools reflects the declining share of the under 19 population. Between 1985 and 2007, the regional population of this age group increased by 666,000. But between 2010 and 2030, this population group is forecast to grow by about 540,000 people. The floor space requirement forecast for K-12 schools is expected to decline in two steps. From 2011-2018 the forecast for floor space additions is for about 3-4 million square feet per year. From 2020-2030, the forecast goes down to less than 2 million square feet per year.

Figure B-23: Pattern of Floor Space Addition for K-12 Schools



The elderly population, 65 and older, is increasing from about one million in 1985 to about 1.5 million in 2007, and to over 3 million by 2030. This more than doubling of population is forecast to increase the demand for special elder care facilities. In the 2011-2018 period, new floor space for these facilities is forecast to increase by about 3.5-4.0 million square feet per year. After 2020, the forecast for new floor space drops to 2.5 to 3.0 million square feet per year.

Figure B-24: Pattern of Floor Space Addition for Elder Care Facilities



Commercial Floor Space Stock

Commercial floor space stock is projected to increase from 2.9 billion square feet to about 3.9 billion square feet over the 2007-2030 period. Sectors showing the greatest increase in floor space additions are large office, warehouse, and other health (elder care) facilities. Warehouse floor space shown here does not include self-storage facilities or warehouses associated with manufacturing facilities.

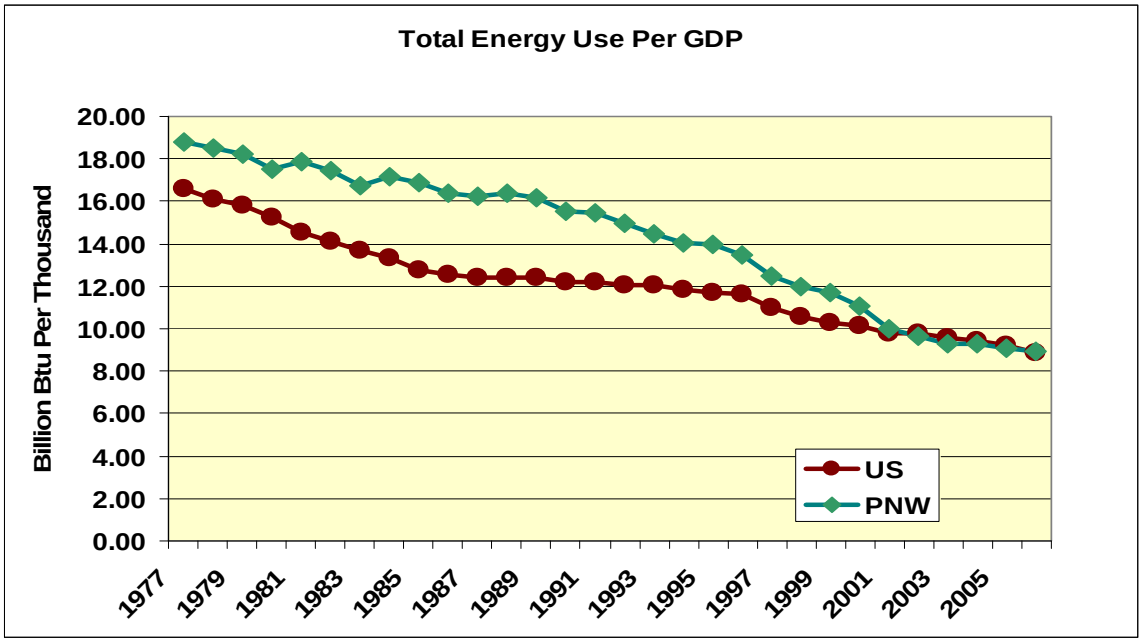
Table B-14: Regional Commercial Floor Space Stock (millions sqf)

Regional Summary	1985	2007	2015	2020	2030	2007-2030 Addition	Market share 2007-2030
Large Office	190	266	303	321	369	103	10%
Medium Office	49	120	136	145	166	46	4%
Small Office	90	141	160	170	195	54	5%
Big Box-Retail	20	125	139	143	152	27	3%
Small Box-Retail	171	231	257	264	280	49	5%
High End-Retail	44	58	64	66	70	12	1%
Anchor-Retail	98	111	124	127	135	24	2%
K-12	155	248	280	294	312	64	6%
University	77	123	139	147	159	36	4%
Warehouse	170	349	452	515	641	292	28%
Supermarket	43	55	57	58	60	5	0%
Mini Marts	5	22	24	25	27	5	0%
Restaurant	36	48	55	58	63	15	1%
Lodging	116	169	184	188	196	27	3%
Hospital	39	67	77	81	87	20	2%
Other Health (Elder Care)	85	144	172	188	215	71	7%
Assembly	123	211	252	272	312	101	10%
Other	240	420	457	471	496	76	7%
Total	1,751	2,908	3,332	3,533	3,935	1027	100%

ECONOMIC DRIVERS FOR INDUSTRIAL SECTOR DEMAND

Demand for energy in the industrial sector is driven by the demand for goods and products produced in the region. Historically, demand for electricity in the industrial sector was dominated by a few large energy-intensive industries. However, the regional mix of industries has been changing toward less electricity and energy-intensive industries, and the region's industries now resemble the rest of the country. The following figure tracks total energy use per dollar of GDP (constant dollars) for the nation and the Northwest. Since 1960, there has been a trend toward less energy use in this sector. During the 1980s and 1990s, industries in the Northwest used significantly more energy for every dollar of output they produced. Since 2002, however, the intensity of energy use for both the region and nation has been identical.

Figure B-25: Change in National and Regional Energy Intensity



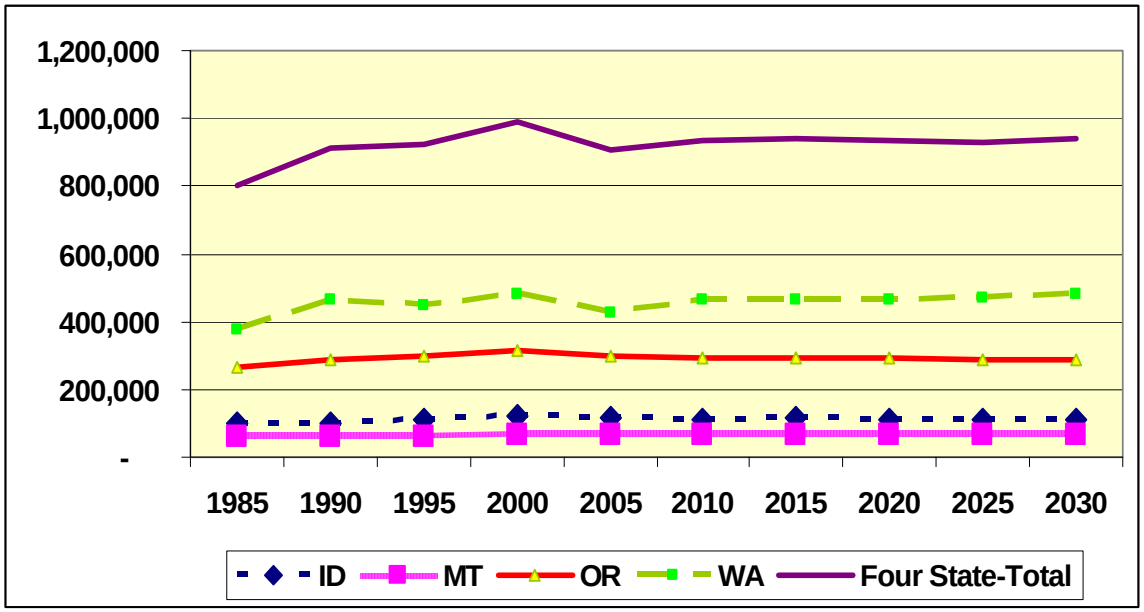
Projected Employment Growth

The demand forecast model tracks 21 distinct industries. The demand for energy consumed in each industry is forecast using the estimated growth in the product output in that industry. Output in each industry is forecast based on the projected employment in the industry and the average productivity of employees. Productivity is measured in terms of dollars of output per number of employees. Industrial employment has been on the decline, but that decline is projected to slow. The following figure shows the number of industrial employees for 2000, 2002, 2007, and 2030. Industrial employment peaked at about 730,000 in 2000, but it declined significantly during the 2000-2002 period to about 650,000. Industrial employment has been growing slowly; by 2007 it reached 650,000, and by 2030 it is forecast to go slightly above the year 2000 employment level. The composition of industrial employment is also forecast to change: lumber, apparel, rubber, and transportation industries are projected to lose employment, while food, fabricated metals, and printing industries are forecast to experience an increase in employment. In total, industrial employment is forecast to grow at an average annual rate of 0.3 percent per year for the 2007-2030 period.

Table B-15: Number of Industrial Employment

Industry	2000	2002	2007	2030	2007-2030 Change
Food & Tobacco	91,458	87,078	87,184	91,119	3,935
Lumber	77,229	68,820	69,190	59,211	(9,978)
Paper	25,091	22,513	20,622	21,520	897
Textiles	5,853	5,119	4,351	4,594	243
Apparel	7,610	6,413	6,259	3,067	(3,193)
Leather	1,518	1,591	1,570	420	(1,151)
Furniture	23,065	21,074	23,756	33,267	9,511
Printing	103,422	98,275	111,067	174,656	63,589
Chemicals	14,002	13,140	13,618	14,077	459
Fabricated Metals	45,474	40,124	47,439	57,990	10,552
Petroleum Products	3,785	4,079	3,979	3,059	(920)
Rubber	20,846	18,584	19,920	14,951	(4,969)
Stone, Clay, etc.	18,283	17,116	20,596	23,381	2,784
Machines & Computer	139,945	119,982	116,760	110,113	(6,648)
Transport Equipment	112,824	93,113	98,204	64,236	(33,968)
Electric Equipment	8,381	7,238	8,851	11,043	2,192
Other Manufacturing	30,197	29,628	32,259	48,695	16,436
Total	728,983	653,887	685,625	735,398	49,773

Figure B-26: Employment in Manufacturing Sectors (number)

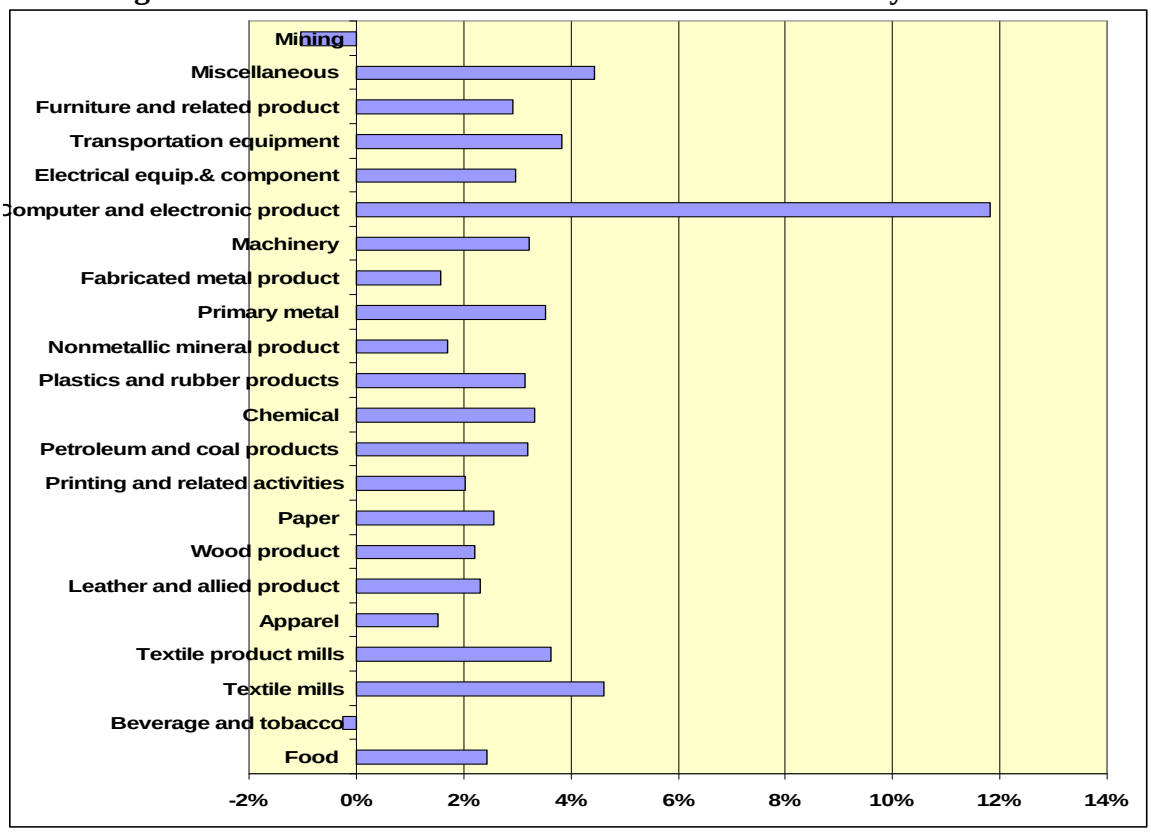


Industrial Output

Industrial output is calculated using industrial employment and output per employee (defined as productivity). The U.S. Bureau of Labor Statistics tracks labor productivity, measured as dollars of output (constant dollars) per unit of labor. The following figure shows the labor productivity index. In most industries, gains in labor productivity have been in excess of 2 percent, with

some industries, such as machines and computers, exceeding 10 percent per year. In this analysis, long-term productivity in the manufacturing of machines and computers was capped to 3 percent, reflecting the productivity of a matured industry.

Figure B-27: National Growth Rate of Labor Productivity 1997-2005



It should be noted that if information on regional labor productivity were available, it would have been used in this analysis. Also, it should be noted that Council staff is currently reviewing a recently completed bottom-up industrial analysis, and the finding from that analysis will be incorporated in the final Sixth Power Plan.

The following table shows the dollar value of industrial output, which drives demand for this sector.

Table B-16: Regional Industrial Output (billions of $2000)

	1985	2007	2015	2020	2030
Food & Tobacco	4.15	5.20	6.31	7.19	8.65
Textiles	0.07	0.21	0.28	0.38	0.65
Apparel	0.23	0.16	0.15	0.14	0.12
Lumber	9.79	4.52	5.94	6.09	6.11
Furniture	0.27	1.19	1.69	2.13	3.30
Paper	2.76	3.08	4.00	4.78	6.38
Printing	2.44	1.25	1.65	1.95	2.90
Chemicals	1.42	1.58	2.01	2.39	3.15
Petroleum Products	0.55	1.39	1.62	1.80	1.97
Rubber	0.27	1.44	1.70	1.89	2.12
Leather	0.04	0.05	0.04	0.04	0.02
Stone, Clay, etc.	0.53	1.79	2.18	2.48	3.21
Aluminum	0.32	0.45	0.54	0.64	0.97
Fabricated Metals	1.20	3.46	4.55	5.25	6.62
Machines & Computer	2.43	42.62	47.70	55.46	74.41
Electric Equipment	0.36	0.95	1.32	1.62	2.36
Transport Equipment	6.32	11.81	15.30	16.20	18.53
Other Manufacturing	0.38	1.92	3.03	4.02	7.17
Agriculture	4.93	12.80	16.64	19.83	27.62

Two other sectors are included in the industrial demand for electricity: custom data centers and direct service industries. The demand for electricity from direct service industries is based on projections provided in the BPA White Book 2008 and data from the Chelan Public Utility District. Detailed discussions on the methodology and forecast for both custom data centers and direct service industries are in the demand forecast appendix C.

ECONOMIC DRIVERS FOR OTHER SECTORS

Irrigation

Demand for electricity for irrigation is linked to agricultural output. A forecast of agricultural output in constant dollars is provided in a state forecast conducted in October, 2008, by Global Insight. Agricultural output in the region is forecast to increase from about $13 billion in 2007 to about $20 billion in 2020, and about $28 billion by 2030.

Transportation

In the current analysis, demand for electricity in the transportation sector is limited to public transportation, such as the Tri-met transportation system or electric buses. The economic driver for this mode of transportation is personal income in the region. The regional income is forecast to grow at an annual rate of 2.9 percent per year, from $399 billion dollars (2000 constant dollars) in 2007 to $763 billion dollars (2000 constant dollars) in 2030.

As part of the sensitivity analysis, the Council will estimate the demand for electricity from plug-in hybrid electric vehicles (PHEV). The key economic driver for the demand for PHEV is the forecast demand for new vehicles, a percentage of which is assumed to be plug-in hybrids. A forecast of new vehicles is provided by Global Insight's October 2008 regional forecast. The

market share of PHEVs will depend on consumer consideration of the PHEV purchase price, available incentives, cost of gasoline, and the price of alternative vehicles. A discussion of demand for plug-in hybrid electric vehicles is in the demand forecast appendix C.

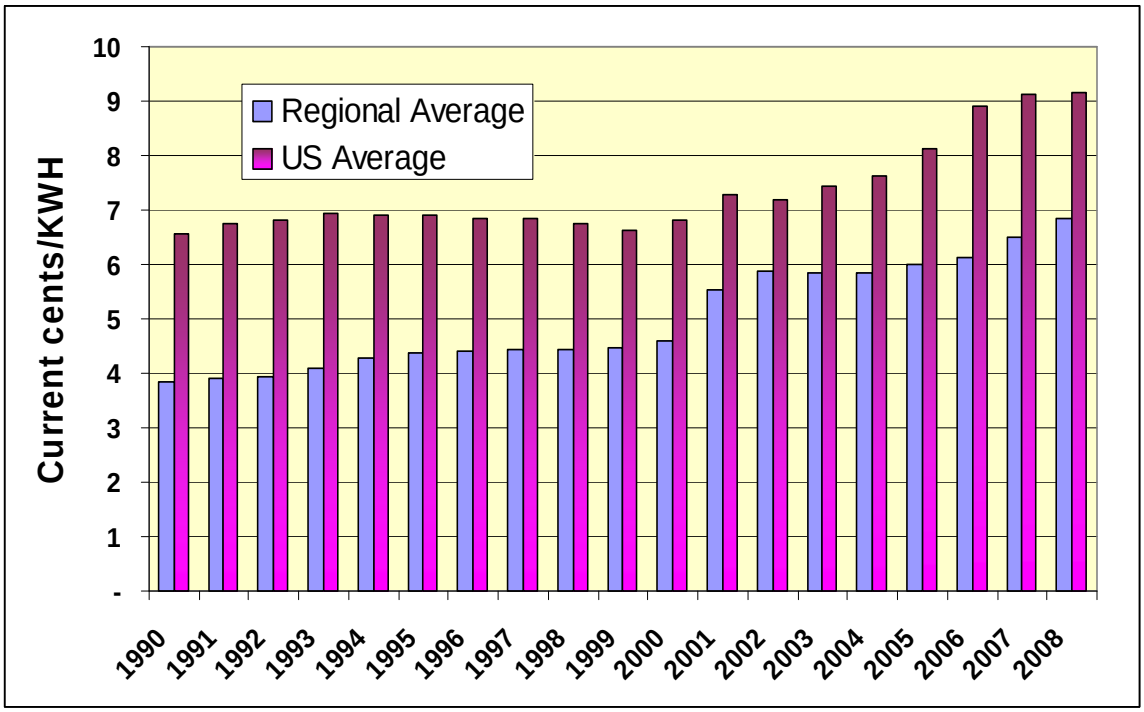
OTHER ASSUMPTIONS

Electricity Prices

Another factor affecting demand for electricity is its price. There are significant differences in electricity prices across the region and among different utilities in the region. To analyze these price differences, the Council used published historic average prices for electricity and other fuel. The average price of electricity is calculated for each sector and each state as the ratio of revenue from the sale of electricity (in megawatt hour sales) to that sector.

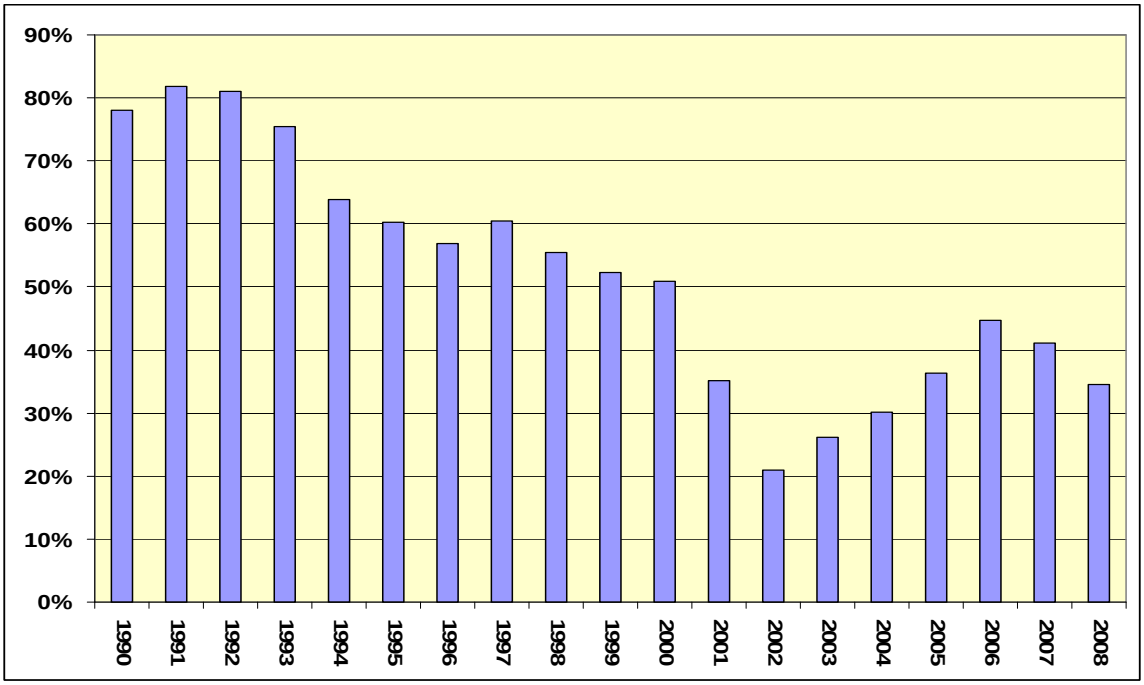
Historically, electricity prices in the Northwest have been lower than the national average. This lower price had attracted more energy-intensive industries to the region. However, since the energy crisis in 2000, the price of electricity has been on the rise both regionally and nationally. In the Northwest, it has been growing at a higher rate compared to the nation.

Figure B-28: Comparison of NW Regional Electricity Price to US Average Price



The average electricity price in the nation was about 50-80 percent higher than the regional average price during the1990-2000 period. The difference between these prices narrowed after the energy crisis of 2000-2001, and the region experienced a dramatic loss of industrial load. However, the difference between regional and national prices is growing again due to the increase in oil and gas prices. The national price of electricity has been increasing at a higher rate than the regional price, resulting in a growing discrepancy between regional and national prices.

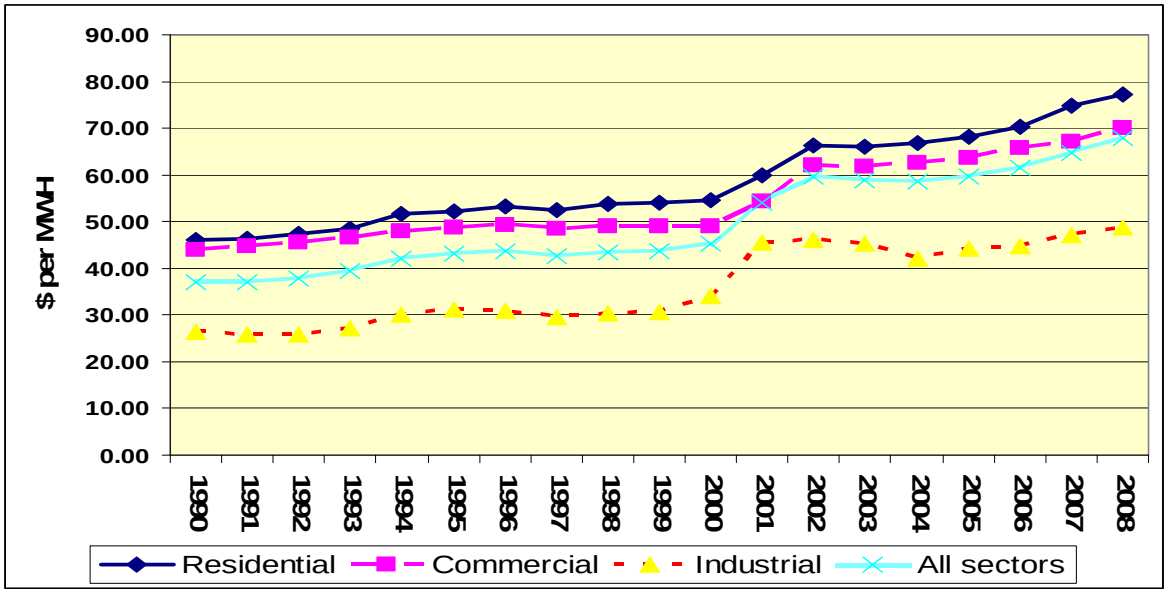
Figure B-29: Difference Between National and Regional Average Price of Electricity



Variations in Price by Sector

The average price of electricity varies across sectors. Typically, residential customers pay a higher price (in part due to higher distribution costs allocated to the residential sector) while commercial and industrial customers typically pay lower rates.

Figure B-30: Average Price of Electricity by Sector



The growth rate of electricity prices across sectors has not been constant over time. During 1990-2000, rate increases were fairly modest. In the late 1990s and early 2000s, the need for new capacity, plus the increase in fuel prices, contributed to an increase in the growth rate of the average price of electricity. During 1990-2000, the nominal price of electricity grew at an

average annual rate of 2 percent, with industrial prices growing at a higher rate. Adjusted for inflation, the price of electricity was flat between 1990 and 2000. Since 2000, the growth rate for electricity prices (adjusted for an average inflation rate of 2.5 percent) has been increasing at about twice the inflation rate, growing at an average annual rate of 5.2 percent. The real growth in regional electricity prices was about 3 percent, and nationally around 1.2 percent.

Table B-17: Average Annual Growth Rate in Electricity Prices

Northwest	Residential	Commercial	Industrial	All sectors
1990-2000	1.7	1.1	2.6	2.0
2000-2008	4.4	4.6	4.5	5.2
US				
1990-2000	0.5	0.1	-0.2	0.4
2000-2008	3.2	3.4	4.4	3.7

Forecast of Electricity Prices

Typically, the price of electricity is determined through a regulatory approval process, with utilities bringing a rate proposal to their regulatory body, board of directors or city council, to seek approval of future rates. Rates are dependant on the anticipated cost of serving customers and the level of sales. Sales are determined either for a future period or for a past period. The approved rates should cover the variable *and* fixed-cost components of serving the customers.

The methodology used for forecasting future electricity prices in the Sixth Power Plan is similar to the methodology used for forecasting other fuel prices such as gas, oil, and coal. A fuel price forecast starts with a national or regional base price and then modifies the base price through the addition of delivery charges to calculate regional prices. In forecasting retail electricity prices, a similar approach is used. Starting with a forecast of the wholesale price at the Mid-C, transmission and delivery charges, plus other incremental fixed costs that are not reflected in market clearing, are added. Examples of these incremental fixed costs include the cost of conservation investments or the cost of meeting renewable portfolio standards (RPS).

Electricity Price Estimation Methodology

A three-step process was used to calculate the retail electricity prices for each state.

Step 1: For each state, the average price of electricity in 2007, measured as the average revenue per megawatt hour of sales, is calculated. The 2007 wholesale market price for Mid-C market is calculated. The difference between the average retail price of electricity and the wholesale price at Mid-C is treated as a proxy for transmission and distribution cost additions.

Note that the transmission and distribution charges calculated here are simply proxies for the actual transmission and distribution charges (shown in the following table under the column labeled -Proxy Non-generation costs). At this point, it is assumed that these charges will stay constant in real terms over the forecast horizon.

Table B-18: Components of Retail Rate

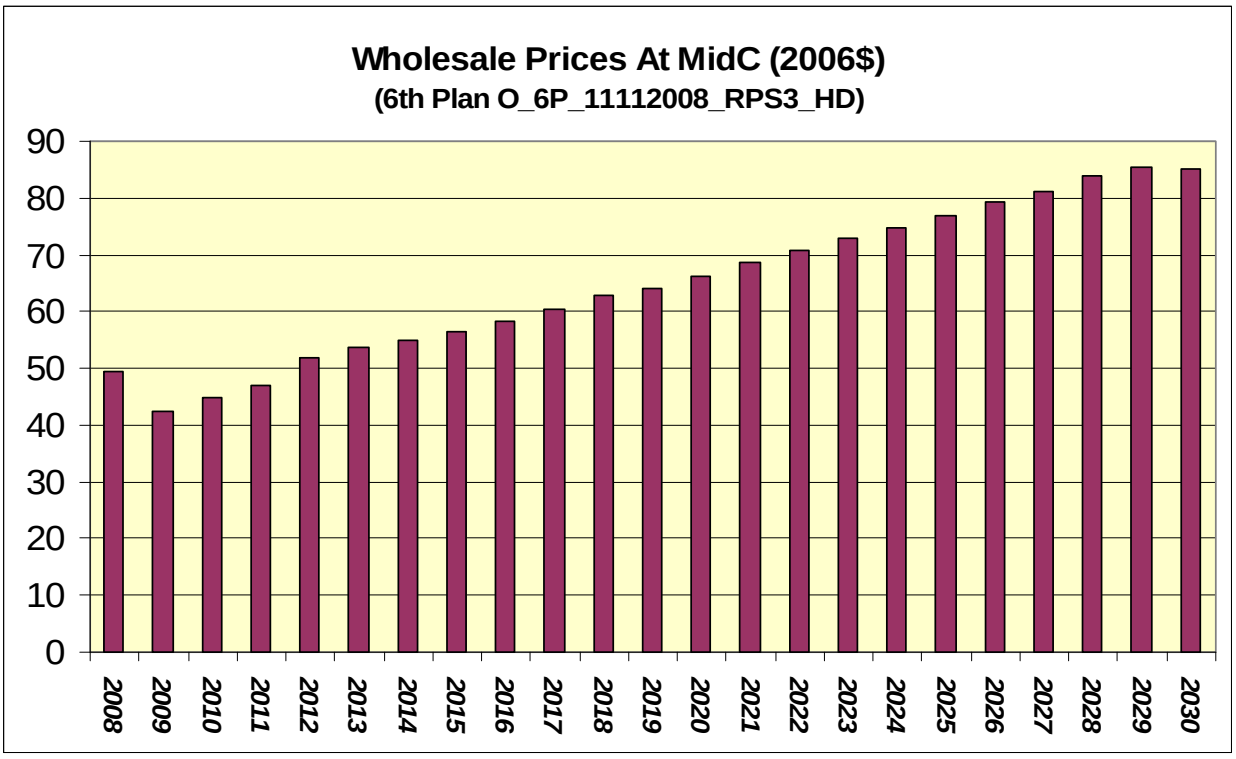
State	Average Retail Price of Electricity 2007 $/MWH	Wholesale Price Forecast for Mid C * 2007 $/MWH	Proxy Non-generation Costs 2007 $/MWH
IDAHO	50.63	45.34	5.03
MONTANA	75.06	45.34	29.46
OREGON	69.96	45.34	24.36
WASHINGTON	64.12	45.34	18.52

*- based on Aurora run 6th Plan 03-13-2008 RPS HCAPTL HD

Step 2: The forecast of wholesale market prices for 2008-2030, derived from the Council's production costing model "AURORA^{xmp}," is used as the base wholesale price for electricity. The AURORA^{xmp} model produces wholesale market clearing prices for a given forecast load and fuel prices, taking into account the operating characteristics of generation plants and the transmission system in the western United States. The AURORA^{xmp} model produces wholesale price forecasts for many markets in the West. For the retail electricity price analysis, the Mid-C wholesale price forecast was selected as the base market hub.

The following graph shows the forecast electricity price at Mid-C for the scenario that is currently used to calculate retail electricity rates. Wholesale prices at Mid-C are projected to grow at an average annual rate of 3.3 percent for the 2010-2030 period. For a more detailed discussion on wholesale price forecast, please see appendix D of the 6th Plan.

Figure B-31: Wholesale Price of Electricity at Mid C



Step 3: Calculate additional costs to meet RPS standards.

RPS targets vary by state. In order to calculate additional electricity rate increases incurred by utilities for added resources to meet RPS targets, it is assumed that the costs of committed RPS resources are already reflected in the rates. Therefore, any additional costs would be due to the new RPS resources.

To estimate new RPS resource requirements, state or utility RPS obligations for a given year are calculated. The RPS obligation is calculated as the load forecast multiplied by the RPS target percent. If the committed RPS is above incremental RPS, no new RPS resources would be built in that year; otherwise, new RPS resources are built.

There are different resource mix options for new RPS resources that need to be built. The following table shows the Council's current assumption on how the uncommitted/new RPS resources are going to be built.

Table B-19: Assumed Market Share of New RPS Resources

	Montana	Oregon	Washington
Biomass	25.0 percent	20.0 percent	20.0 percent
Geothermal		10.0 percent	
Hydro			
Solar Photovoltaic (Load-side)		5.0 percent	5.0 percent
Solar Thermal			
Wind	75 percent	65.0 percent	75.0 percent

Each renewable generation technology has its own set of costs, including transmission and integration costs. At the moment, however, incremental transmission costs are not included in this analysis.

Interaction of RPS and Conservation: Conservation achievements reduce loads, and by reducing a utility's load, a utility's RPS target is likewise reduced. In this analysis, we calculated the rate impact of RPS with *and* without incremental conservation. Preliminary analysis indicates that, given current load forecasts and committed RPS, the region can meet RPS requirements without any new RPS resources in significant amounts until 2012.

Table B-20: Cumulative New RPS Qualifying Resources Needed (MWa)

	Without Conservation			With 200 MWa / Yr Conservation target		
	MT	OR	WA	MT	OR	WA
2008	0	0	0	0	0	0
2009	0	0	0	0	0	0
2010	1	0	0	0	0	0
2011	16	0	0	15	0	0
2012	31	0	0	30	0	0
2013	38	23	6	37	2	0
2014	46	34	144	44	3	108
2015	54	48	324	52	4	272
2016	54	59	490	52	5	419
2017	55	180	662	52	115	568
2018	56	515	839	53	439	720
2019	56	583	1023	53	494	876
2020	57	654	1214	54	551	1035
2021	58	746	1243	54	626	1049
2022	59	836	1272	55	698	1063
2023	60	929	1302	55	772	1078
2024	61	1027	1334	56	850	1095
2025	62	1130	1368	57	931	1115
2026	63	1164	1403	58	953	1134
2027	64	1196	1441	58	972	1158
2028	65	1231	1479	59	994	1182
2029	66	1267	1518	60	1018	1206
2030	67	1305	1559	61	1044	1232

To calculate the effect on rates, above-market costs for RPS resources are calculated and are assumed to be recovered from target customers. For each state, using Mid-C market prices from step 1 and the levelized total cost of renewable generation technologies, total above-market costs are calculated and recovered from qualified ratepayers. For Montana, the above-market costs are recovered from Northwest customers. For the state of Washington, the RPS is applicable to 84 percent of state load, and must be met by both public and private utilities. For the state of Oregon, three different target rates are given, and the above-market costs are recovered from these target customers.

The following table shows the average rate impact of RPS with and without conservation targets. The average rate increase from RPS for the 2010-2030 period is about 1$/MWh for Montana, $3 dollars/MWH for Oregon, and about $2 per MWH for Washington, averaged over a 20-year period. On an annual basis, incremental cost increases are higher, as shown in the following table. The average rate increase for consumers in these states is similar regardless of whether or not conservation was achieved. Conservation targets lower the growth of new load but they do not significantly lower the RPS requirements.

Table B-21: Rate Impact from meeting RPS (2006 $/MWH)

	Without Conservation			With Conservation		
	MT	OR	WA	MT	OR	WA
2008	0.00	0.00	0.00	-	-	-
2009	0.00	0.00	0.00	-	-	-
2010	0.02	0.00	0.00	0.01	-	-
2011	0.50	0.00	0.00	0.49	-	-
2012	0.94	0.00	0.00	0.95	-	-
2013	1.14	0.22	0.02	1.15	0.02	-
2014	1.30	0.32	0.50	1.33	0.03	0.40
2015	1.45	0.43	1.05	1.49	0.04	0.95
2020	1.41	4.46	3.13	1.46	4.19	3.01
2025	1.37	6.84	3.17	1.44	6.55	3.03
2030	1.34	7.11	3.25	1.42	6.78	3.10
Average 2010-2030	1.14	3.47	1.96	1.18	3.22	1.86

Step 4: Calculate additional costs to meet conservation targets.

The next step in the analysis includes the incremental cost of conservation programs. However, this step of the analysis cannot be completed until the conservation target levels are known. The calculation of incremental costs of meeting conservation targets will be conducted after determining the optimized conservation-acquisition targets.

Forecast for Electricity Prices by Sector

The estimated price of electricity by sector is presented in the following tables. For the residential sector, the annual real growth rate in electricity prices is expected to be in the 1.5-2.0 percent per year for the 2010-2030 period. It should be noted that these forecasts are at the state level, and within each state, some electric utility rates may be higher or lower than the figures presented here. Also, some utilities may have significantly higher rate increases than these average state-wide figures would indicate.

Table B-22: Price of Electricity for Residential Customers ($2006/MWH)

	Oregon	Washington	Idaho	Montana
1985	74	60	68	74
1990	67	62	69	77
1995	70	63	68	77
2000	69	60	63	76
2005	75	68	65	84
2010	79	70	61	85
2015	85	76	66	92
2020	93	83	71	96
2030	114	101	88	114
Annual Growth				
1985-2000	-0.3%	0.0%	-0.3%	0.1%
2000-2007	2.9%	3.9%	0.3%	2.7%
2010-2030	1.8%	1.8%	1.9%	1.5%

Table B-23: Price of Electricity for Commercial Customers ($2006/MWH)

	Oregon	Washington	Idaho	Montana
1985	81	57	65	67
1990	67	56	60	65
1995	64	59	57	68
2000	60	55	50	61
2005	67	65	56	77
2010	70	63	49	77
2015	76	69	54	84
2020	84	76	58	88
2030	105	94	76	106
Annual Growth				
1985-2000	-1.3%	-0.2%	-1.2%	-0.4%
2000-2007	3.2%	3.6%	-0.3%	3.5%
2010-2030	2.0%	2.0%	2.2%	1.6%

Table B-24: Price of Electricity for Industrial Customers ($2006/MWH)

	Oregon	Washington	Idaho	Montana
1985	56	34	42	40
1990	44	34	37	40
1995	44	38	36	44
2000	42	39	37	47
2005	50	44	40	50
2010	47	45	36	55
2015	53	51	41	61
2020	61	57	46	66
2030	82	75	63	83
Annual Growth				
1985-2000	-1.3%	0.6%	-0.6%	0.7%
2000-2007	4.8%	3.2%	-0.1%	8.1%
2010-2030	2.8%	2.6%	2.8%	2.1%

Other Fuel Prices

The demand for electricity is not only affected by the price of electricity, but also the price of alternative fuels. If the price of electricity relative to natural gas is decreasing, one would expect the consumption of electricity to increase and natural gas to decrease. Consumers could substitute natural gas for electricity, and or decrease their demand for natural gas. Consumer's fuel choices are influenced by relative fuel prices. Demand for electricity is affected by the competition between alternative fuels.

This section covers the current assumptions for the retail prices of natural gas and electricity. For each fuel, a base price and a regional delivery charge is calculated. The base, or wholesale commodity, price for each fuel is from the Council's fuel price forecast, discussed in Appendix A. Delivery charges vary by sector and state. Historic and forecast prices for the three main kinds of fuel are shown in the following table. To put the fuel on a comparable basis, prices are shown in constant 2006 dollars per million Btu.

Table B-25: Oregon Sector Level Fuel Prices ($2006/mmBTU)

Sector and Fuel	1985	2000	2007	2010	2020	2030	2010-2030 growth rate
Residential Electricity	21.72	20.22	24.64	23.14	27.30	33.35	1.8%
Residential Natural Gas	10.65	9.24	13.67	14.48	15.20	19.63	1.5%
Residential Oil	11.08	11.57	21.20	22.68	19.43	26.59	0.8%
Commercial Electricity	23.68	17.60	21.91	20.50	24.63	30.67	2.0%
Commercial Natural Gas	9.60	7.37	11.56	12.36	12.91	16.99	1.6%
Industrial Electricity	16.33	12.23	16.94	13.87	17.94	23.96	2.8%
Industrial Natural Gas	7.36	5.61	8.68	9.48	9.79	13.39	1.7%

Table B-26: Washington Sector Level Fuel Prices ($2006/mmBTU)

Sector and Fuel	1985	2000	2007	2010	2020	2030	2010-2030 growth rate
Residential Electricity	17.64	17.64	23.07	20.53	24.27	29.56	1.8%
Residential Natural Gas	10.05	8.06	13.50	14.31	15.02	19.42	1.5%
Residential Oil	12.29	13.02	20.33	21.80	18.48	25.50	0.8%
Commercial Electricity	16.73	16.11	20.62	18.48	22.20	27.49	2.0%
Commercial Natural Gas	8.30	6.78	12.04	12.84	13.43	17.59	1.6%
Industrial Electricity	9.86	11.36	14.16	13.10	16.77	22.04	2.6%
Industrial Natural Gas	7.25	4.51	9.54	10.33	10.71	14.45	1.7%

Table B-27: Idaho Sector Level Fuel Prices ($2006/mmBTU)

Sector and Fuel	1985	2000	2007	2010	2020	2030	2010-2030 growth rate
Residential Electricity	19.95	18.53	18.90	17.90	20.69	25.93	1.9%
Residential Natural Gas	10.40	7.19	11.04	11.85	12.35	16.34	1.6%
Residential Oil	11.54	10.39	21.32	22.79	19.56	26.74	0.8%
Commercial Electricity	19.15	14.55	14.21	14.31	17.06	22.30	2.2%
Commercial Natural Gas	8.59	6.27	10.27	11.07	11.51	15.37	1.7%
Industrial Electricity	12.18	10.70	10.60	10.64	13.35	18.58	2.8%
Industrial Natural Gas	6.83	4.60	8.94	9.74	10.07	13.71	1.7%

Table B-28: Montana Sector Level Fuel Prices ($2006/mmBTU)

Sector and Fuel	1985	2000	2007	2010	2020	2030	2010-2030 growth rate
Residential Electricity	21.80	22.32	26.94	24.89	28.15	33.39	1.5%
Residential Natural Gas	7.63	6.91	9.73	10.53	10.93	14.70	1.7%
Residential Oil	12.54	9.85	19.69	21.16	17.79	24.70	0.8%
Commercial Electricity	19.77	17.98	22.83	22.60	25.84	31.08	1.6%
Commercial Natural Gas	8.07	6.76	9.54	10.34	10.72	14.46	1.7%
Industrial Electricity	11.63	13.64	23.53	16.02	19.20	24.42	2.1%
Industrial Natural Gas	7.46	8.51	9.58	10.38	10.76	14.50	1.7%

On average, the growth rate in fuel prices is anticipated to be slower in the forecast period than they were historically, in part due to extraordinary high prices experienced in 2008. Natural gas price increases are expected to be lower in the forecast period than they were in the historic period. However, the year-by-year increase in prices presents a more accurate picture of change

in the cost of fuel. The year-by-year data on fuel prices is available in the companion Excel workbook. The following graphs show the historic and forecast fuel prices for each state.

Figure B-32: Oregon Sectoral Fuel Prices ($ 2006/MMBTU)

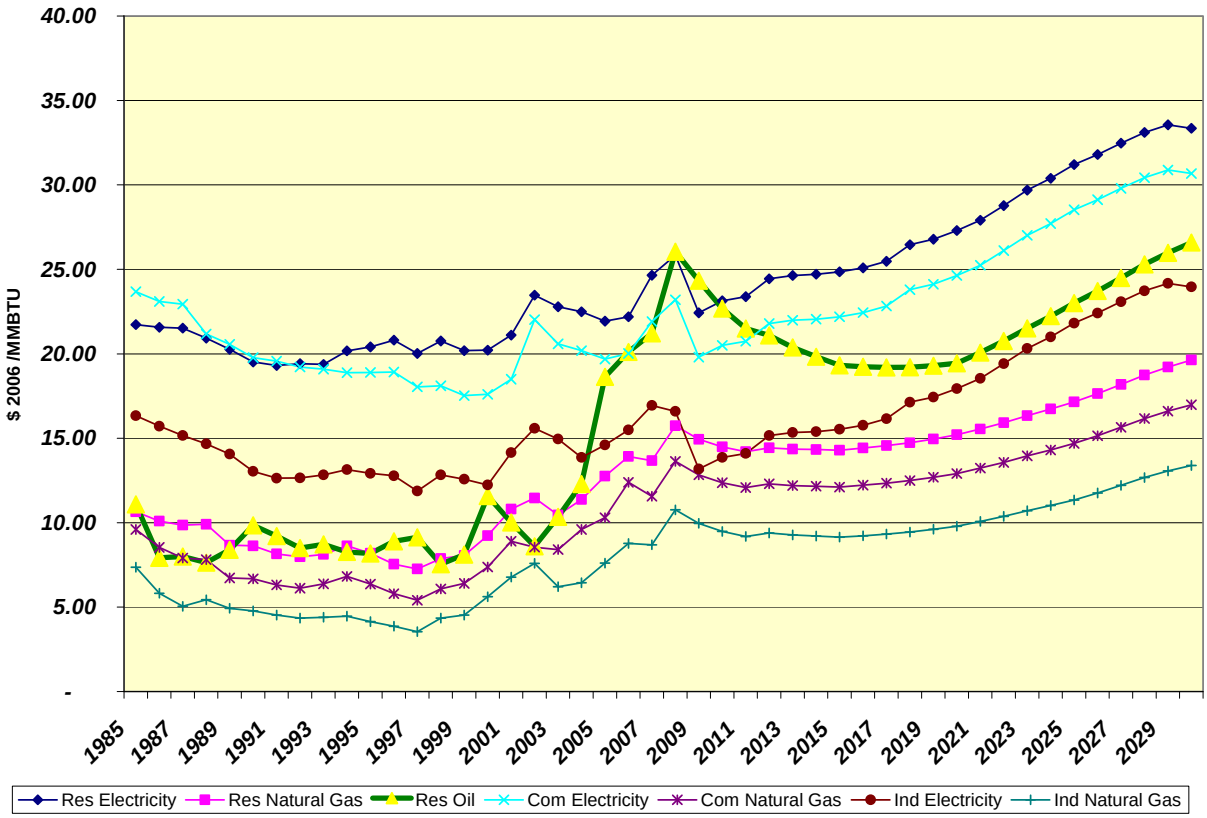


Figure B-33: Washington Sectoral Fuel Prices ($ 2006/MMBTU)

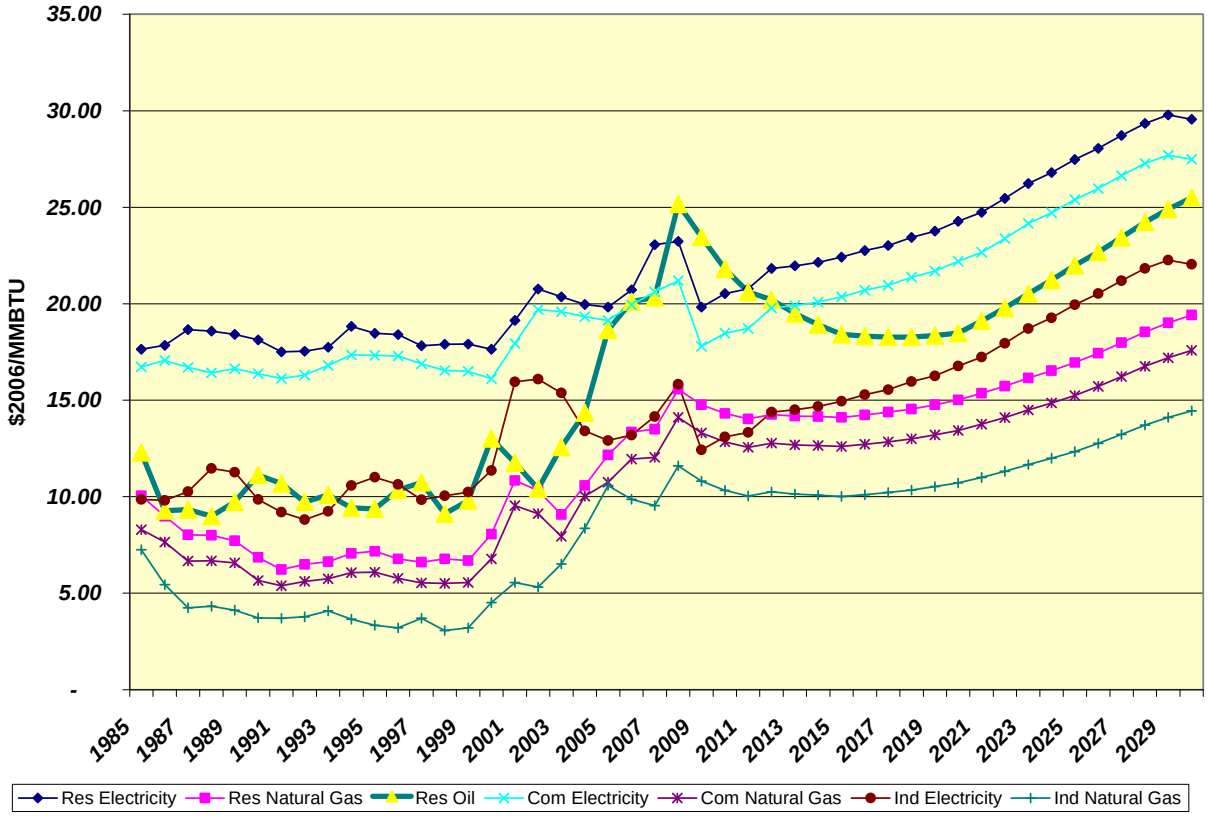


Figure B-34: State of Idaho Sectoral Fuel Prices ($ 2006/MMBTU)

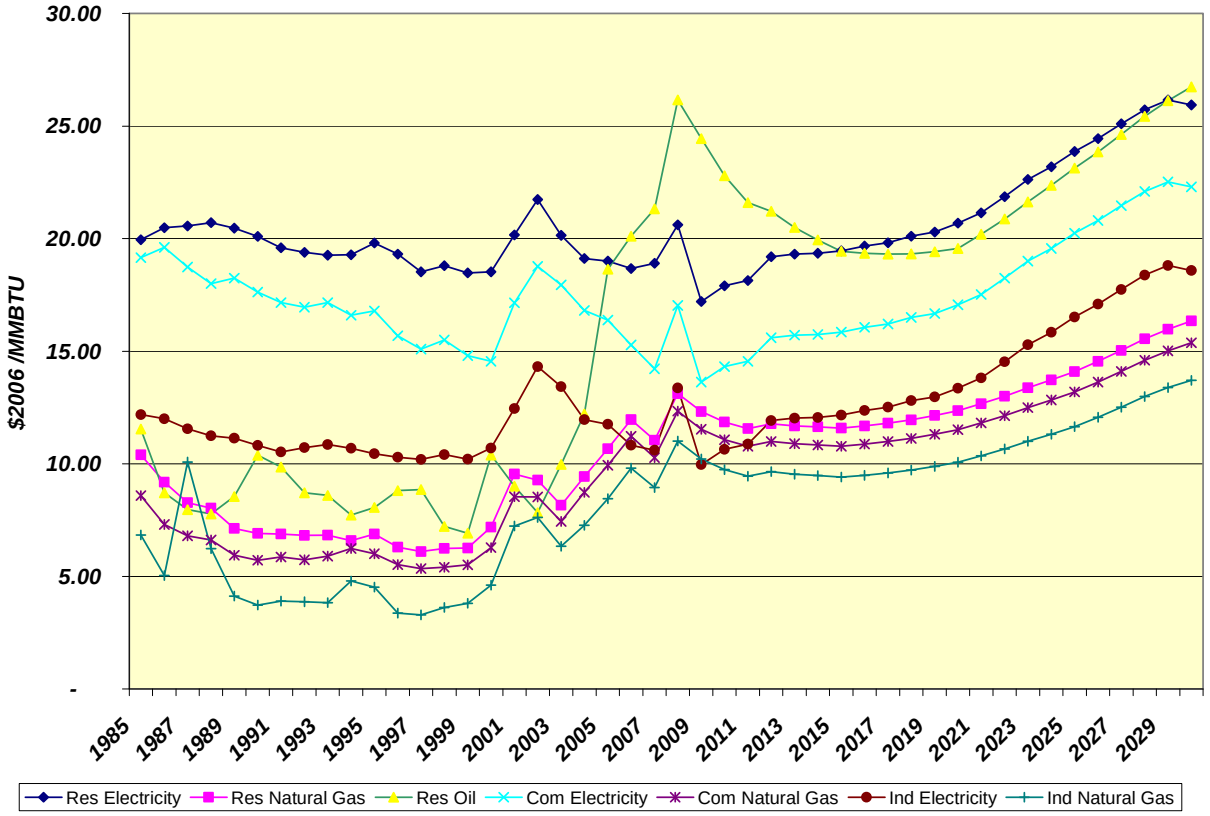


Figure B-35: State of Montana Sectoral Fuel Prices ($ 2006/MMBTU)

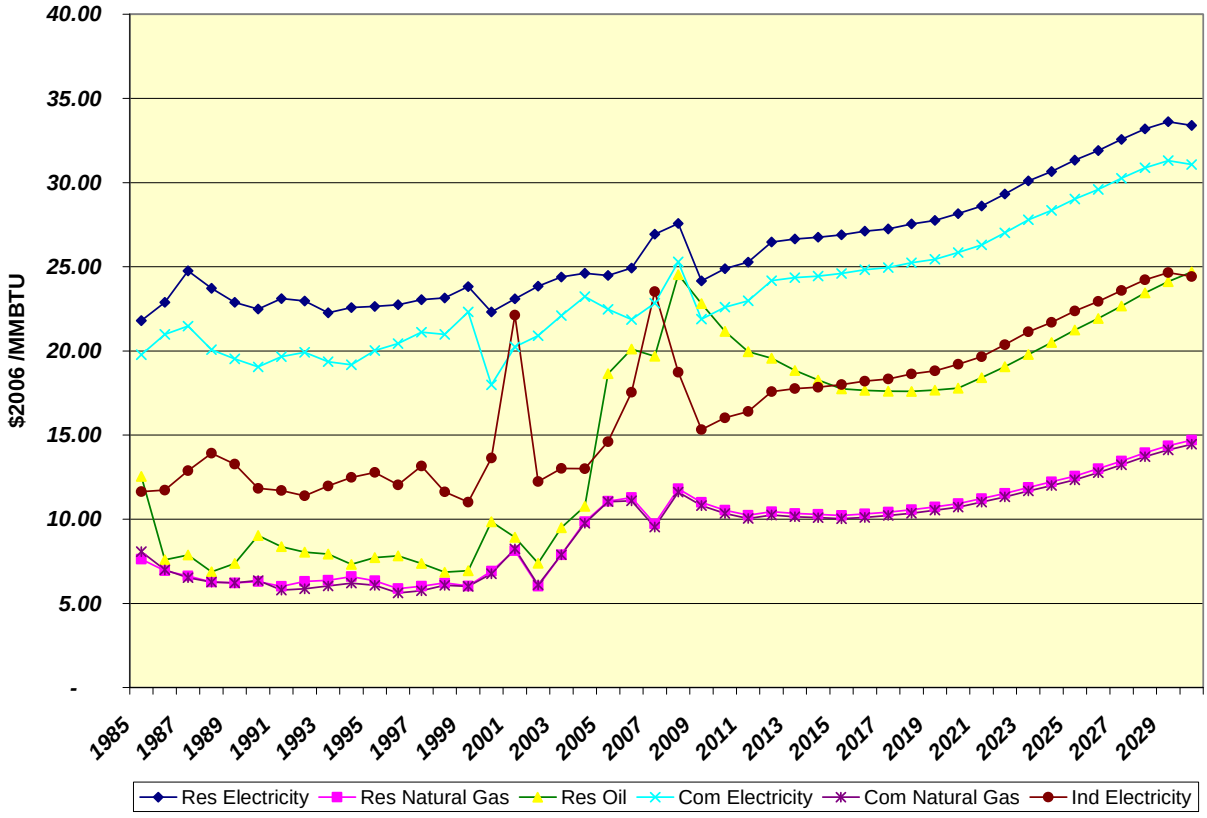


Table B-29: Growth Rate in Retail Electricity Price

Price of Electricity (2006 $/ MWH)	1985-2007	2000-2007	2010-2030
Oregon-Single Family	0.6%	2.9%	1.8%
Oregon-Commercial	-0.4%	3.2%	2.0%
Oregon-Industrial	0.2%	4.8%	2.8%
Washington-Single Family	1.2%	3.9%	1.8%
Washington-Commercial	1.0%	3.6%	2.0%
Washington-Industrial	1.7%	3.2%	2.6%
Idaho-Single Family	-0.2%	0.3%	1.9%
Idaho-Commercial	-1.3%	-0.3%	2.2%
Idaho-Industrial	-0.6%	-0.1%	2.8%
Montana-Single Family	1.0%	2.7%	1.5%
Montana-Commercial	0.7%	3.5%	1.6%
Montana-Industrial	3.3%	8.1%	2.1%

SUMMARY OF ECONOMIC DRIVERS FOR THE SIXTH POWER PLAN

The following summary table shows the annual growth rate for the historic and forecast period for each state and the region. In general, the key economic drivers reflect a slow down in economic growth for 2010-2030.

Table B-30: Historic and Forecast of Annual Growth Rate by Sector

		Oregon		Washington		Idaho		Montana		Region	
Sector	Business/Building type	1985-2007	2010-2030	1985-2007	2010-2030	1985-2007	2010-2030	1985-2007	2010-2030	1985-2007	2010-2030
Residential (Number of household stock)	Single Family	1.6%	1.3%	1.9%	1.2%	2.4%	2.1%	0.9%	1.1%	1.8%	1.3%
	Multi Family	2.4%	1.8%	2.6%	1.5%	2.5%	2.1%	1.6%	2.1%	2.5%	1.6%
	Other Family	3.0%	1.1%	2.7%	1.1%	2.5%	0.9%	1.9%	0.9%	2.7%	1.0%
Commercial (square footage Stock)	Large Office	2.0%	1.2%	1.3%	1.4%	5.7%	1.6%	0.3%	1.3%	1.5%	1.4%
	Medium Office	4.6%	1.2%	3.9%	1.4%	8.6%	1.6%	2.7%	1.3%	4.1%	1.4%
	Small Office	2.5%	1.2%	1.8%	1.4%	6.3%	1.6%	0.7%	1.3%	2.1%	1.4%
	Big Box-Retail	8.6%	0.9%	8.6%	0.6%	13.0%	1.0%	8.6%	0.9%	8.8%	0.7%
	Small Box-Retail	1.1%	0.9%	1.3%	0.6%	4.5%	1.0%	1.2%	0.9%	1.4%	0.7%
	High End-Retail	1.1%	0.9%	1.0%	0.6%	4.5%	1.0%	1.2%	0.9%	1.2%	0.7%
	Anchor-Retail	0.4%	0.9%	0.4%	0.6%	4.2%	1.0%	0.5%	0.9%	0.6%	0.7%
	K-12	3.5%	0.7%	1.9%	0.9%	3.3%	0.9%	1.1%	0.9%	2.2%	0.9%
	University	3.6%	1.0%	1.8%	1.0%	2.9%	1.2%	1.8%	0.7%	2.1%	1.0%
	Warehouse	2.6%	1.8%	4.3%	3.3%	3.9%	3.0%	1.3%	1.7%	3.3%	2.7%
	Supermarket	0.6%	0.5%	0.9%	0.4%	3.2%	0.5%	1.0%	0.4%	1.1%	0.4%
	Mini Mart	6.4%	0.6%	6.2%	0.8%	9.2%	1.5%	6.6%	0.6%	6.7%	0.9%
	Restaurant	1.1%	1.2%	1.4%	1.1%	3.7%	2.1%	1.0%	1.3%	1.4%	1.2%
	Lodging	1.6%	0.6%	2.2%	0.6%	2.4%	1.0%	0.7%	0.3%	1.7%	0.6%
	Hospital	3.7%	1.1%	1.9%	0.9%	3.0%	1.5%	2.3%	0.7%	2.5%	1.0%
	Other Health	3.6%	1.2%	2.0%	1.8%	2.1%	2.0%	2.9%	1.7%	2.4%	1.7%
	Assembly	3.6%	2.3%	2.1%	0.9%	3.2%	3.5%	1.7%	2.5%	2.5%	1.6%
	Other	3.7%	0.8%	2.3%	0.4%	3.4%	0.9%	1.5%	1.2%	2.6%	0.6%
Industrial (output)	Food & Tobacco	2.0%	2.6%	0.9%	2.1%	-0.5%	1.5%	1.4%	2.5%	1.0%	2.2%
	Textiles	1.6%	5.4%	7.1%	5.2%	13.9%	6.3%	16.1%	8.0%	4.8%	5.5%
	Apparel	-1.7%	-0.8%	-1.3%	-1.9%	-2.6%	-2.3%	-4.6%	2.9%	-1.6%	-1.4%
	Lumber	-4.0%	0.8%	-2.9%	1.7%	-2.8%	1.6%	-2.8%	0.8%	-3.4%	1.2%
	Furniture	7.7%	4.1%	6.5%	5.5%	8.1%	4.7%	6.4%	4.6%	7.1%	4.9%
	Paper	0.1%	2.7%	0.8%	3.8%	0.2%	0.5%	0.7%	4.9%	0.5%	3.4%
	Printing	-2.2%	2.9%	-3.2%	4.7%	-3.6%	2.3%	-5.6%	2.4%	-3.0%	3.9%
	Chemicals	5.4%	3.3%	-1.3%	2.9%	0.4%	2.5%	3.0%	5.9%	0.5%	3.1%
	Petroleum Products	-2.5%	1.9%	6.3%	1.4%	3.3%	5.4%	-2.7%	2.5%	4.3%	1.5%
	Rubber	9.3%	1.5%	9.4%	1.7%	1.3%	2.0%	9.3%	2.9%	7.9%	1.6%
	Leather	2.1%	-3.9%	2.1%	-5.1%	-0.3%	-6.4%	-5.3%	-3.7%	1.4%	-4.5%
	Stone, Clay, etc.	5.9%	2.6%	6.2%	2.9%	4.7%	3.2%	2.4%	2.6%	5.7%	2.8%
	Aluminum	4.0%	1.0%	1.3%	4.4%			-4.6%	3.8%	1.5%	3.8%
	Other Primary Metals	4.0%	5.0%	1.3%	4.4%	12.0%	7.8%	-4.6%	3.8%	3.1%	5.0%
	Fabricated Metals	3.7%	2.8%	6.0%	2.9%	5.0%	4.2%	6.8%	4.2%	4.9%	3.0%
	Machines & Computer	15.8%	2.1%	7.6%	3.1%	19.0%	3.1%	14.9%	3.6%	13.9%	2.5%
	Electric Equipment	0.9%	4.3%	8.0%	4.0%	2.3%	3.6%	-1.9%	4.7%	4.6%	4.1%
	Transport Equipment	2.7%	4.0%	2.8%	1.2%	9.3%	3.0%	5.8%	5.1%	2.9%	1.5%
	Other Manufacturing	8.3%	5.9%	6.6%	5.9%	12.2%	7.4%	8.3%	6.6%	7.6%	6.1%
Mining	Mining	4.9%	2.0%	4.2%	-0.1%	7.1%	5.3%	3.7%	2.5%	3.9%	2.8%
Agriculture	Agriculture	4.3%	4.9%	3.8%	2.1%	3.8%	3.7%	6.9%	3.0%	4.4%	3.5%
Transportation *	Passenger	3.3%	2.9%	3.8%	2.9%	3.2%	3.1%	2.7%	2.4%	3.6%	2.9%
	Freight	3.1%	3.7%	3.3%	3.4%	5.6%	5.6%	2.4%	2.9%	3.3%	3.8%
	Off Road	1.4%	0.5%	1.4%	-1.0%	-0.5%	-0.4%	1.7%	0.8%	1.5%	-0.3%

ALTERNATIVE ECONOMIC SCENARIOS

Because future economic conditions are highly uncertain, the forecasts encompass a wide range of possibilities for future economic growth. The demand forecast includes three alternative sets of economic drivers. In the medium case, discussed earlier, the key economic drivers project a healthy regional economy (albeit with a slower growth path than in the recent past). In addition to the Plan case, two alternative scenarios are considered, one representing a low-economic-growth scenario and the other a high-growth projection of the future.

The low-growth scenario reflects a future with slow economic growth, weak demand for fossil fuel, declining fuel prices, a slow down in labor productivity, and a low inflation rate. On the other hand, the high-case scenario assumes faster economic growth, stronger demand for energy, higher prices for fossil fuel, sustained growth in labor productivity, and a higher inflation rate.

In all scenarios it is assumed that climate change concerns, demand for cleaner fuel, and a national cap-and-trade or a CO2 tax push fuel prices higher. Cost of CO2 emissions is assumed to start at $8 dollars per tons in 2012 and climb to about $27 dollars by 2020 and by the end of forecast period, 2030, to reach $47 dollars per ton.

To estimate the low and high range for each key variable for each year, the base value for the driver was multiplied by an annual factor that increases the value (for the high case) or reduces it (for the low case). For example, if the medium case value for new floor space additions for warehouses were 100,000 square feet, for the low-growth scenario the 100,000 square feet is lowered by 9 percent, and for the high-growth scenario it is increased by 20 percent. The 9 percent and 20 percent figures are averages; the actual percentage values used in the model vary by year. The following two figures show the range of percent change from the medium case scenario for each commercial building type and each industry. Similar methodology is used in developing each key economic driver.

Figure B-36: Range of Percent Change from Medium Case - for Commercial Buildings

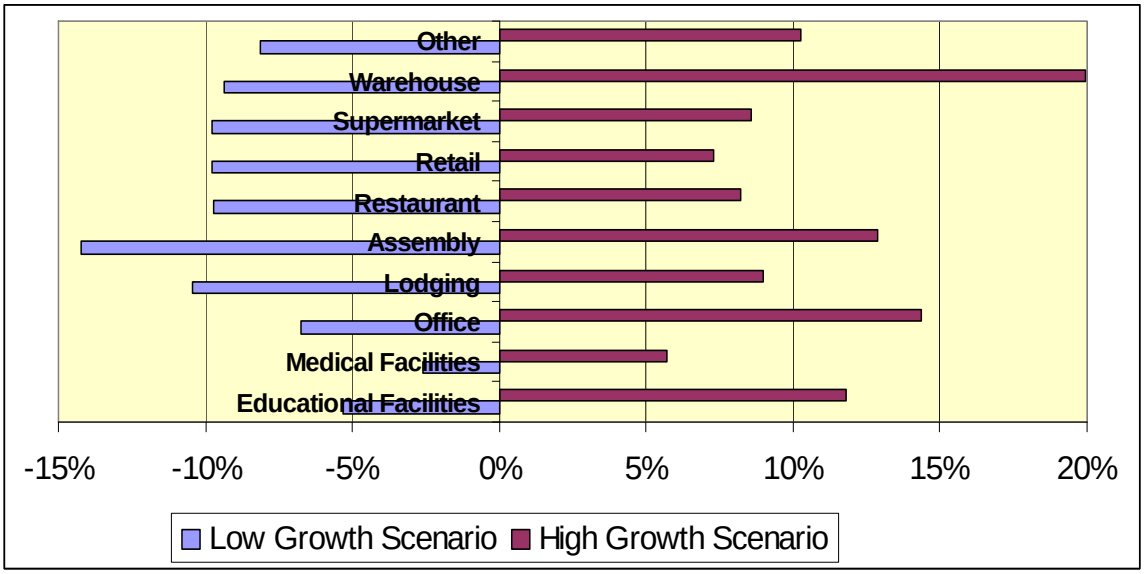
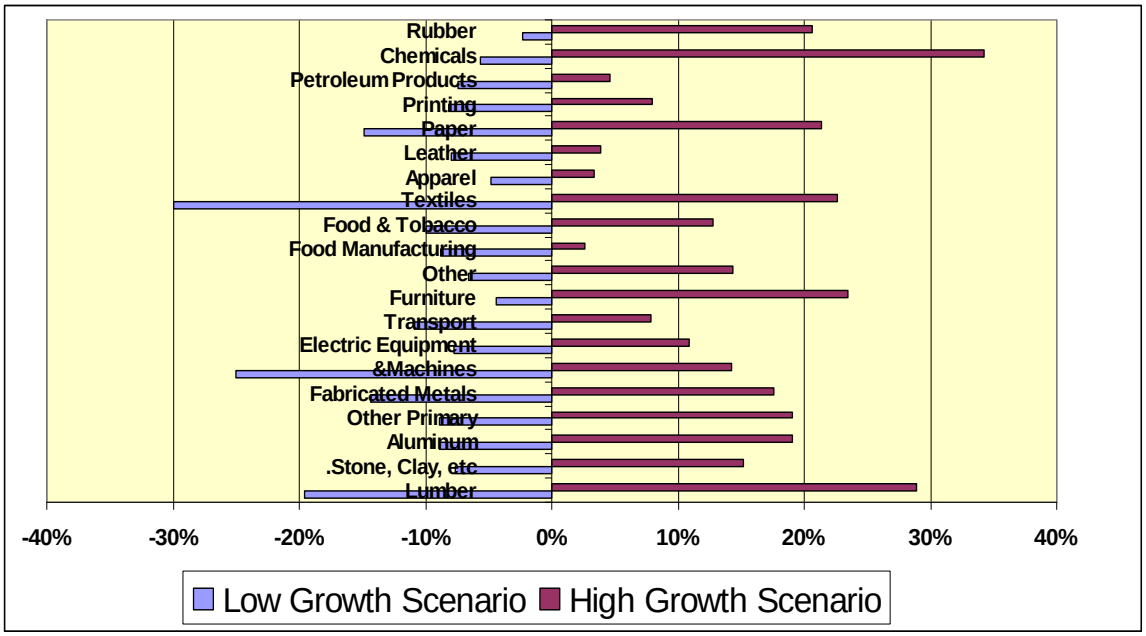


Figure B-37: Range of Percent Change from Medium Case- for Industrial Sectors



The average annual growth rates presented above are summary values. The demand forecasting system, however, uses the year-by-year values rather than the annual average values. The source of the range forecast used in the Sixth Power Plan, is Global Insight's long-term national forecast, October 2008.

The following table shows the growth rate for each sector at a more aggregate level. The price range for oil, natural gas, and coal are based on the Council's Sixth Power Plan.

Table B-31: Historic, Medium Case and Alternative Growth Rates

	1985-2007	2010-2030	2010-2030	2010-2030
Key economic driver for each sector	**Actual**	**Low Case**	**Medium Case**	**High Case**
Population	1.6%	0.6%	1.1%	2.2%
Residential Units	1.9%	0.6%	1.3%	2.2%
Commercial Floor space	2.3%	0.9%	1.5%	1.9%
Manufacturing Output $	4.1%	2.3%	3.0%	3.9%
Agriculture Output $	4.4%	3.0%	3.9%	5.0%
Light Vehicle Sales		0.5%	1.4%	2.2%
Electricity Prices		**Low Case**	**Medium Case**	**High Case**
Inflation rate	2.2%	3.5%	1.9%	1.7%
Average Annual growth rate in Price(2008-2030)*				
Oil Prices	1.7%	-1%	1%	2.0%
Natural Gas Prices	1.8%	-1.3%	0.9%	1.7%
Coal Prices	-4.8%	-0.5%	0.5%	1.2%

* Fuel price assumptions are consistent with the Council's fuel price and electricity price forecast.

Additional Details: A companion Excel workbook containing details on the economic drivers is available from Council's website.