# APPENDIX C

FUEL PRICE FORECASTS

BACKGROUND

Since the Council's 1991 Power Plan, fuel prices have been following the low forecast. Figure C-1 illustrates this for world oil prices, and similar patterns apply to natural gas. The last five years have surprised most experts in energy markets and forecasting, resulting in energy price forecasts that have been cascading down with each successive year's forecast. The Council staff has been observing and studying these changes because they have important implications for the Council's planning.

Figure C-1
World Oil Prices Have Been Following the 1991 Plan Low Forecast
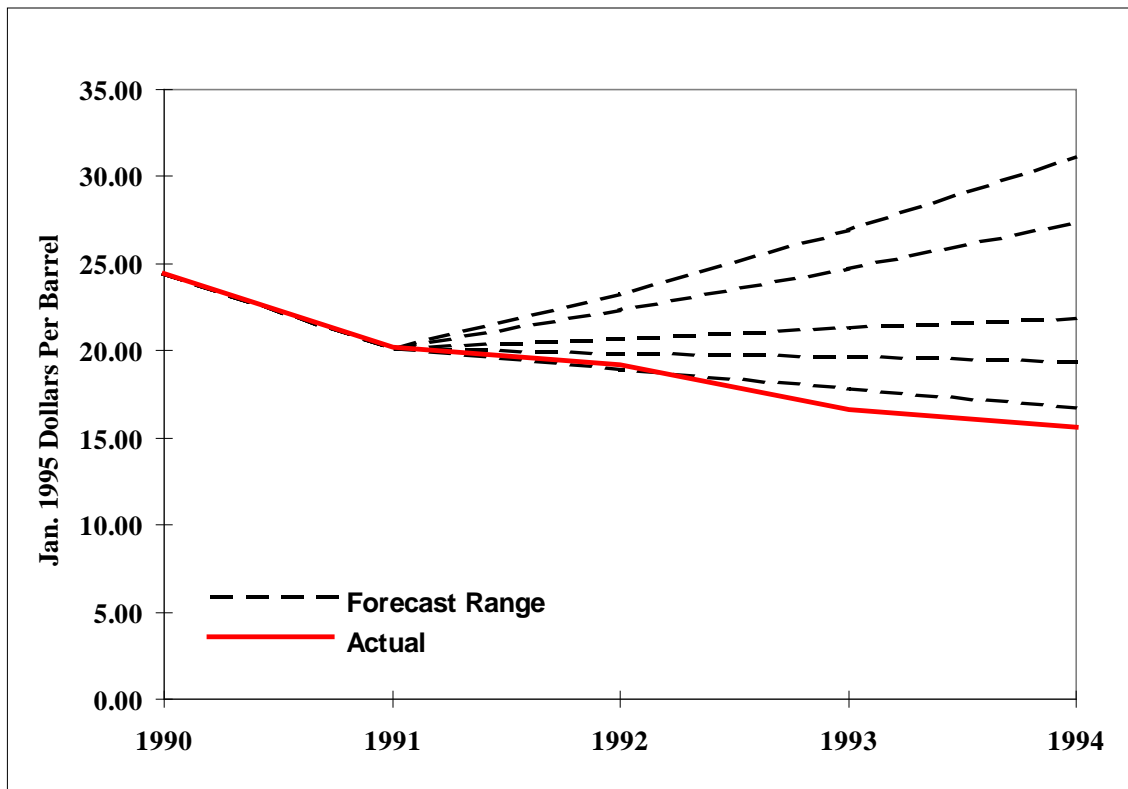
Over the last several years, views of energy markets, supplies and costs have altered dramatically. Changing technology has resulted in increased estimates of energy supplies, increased success rates in oil and gas exploration, and lower expected costs of finding and producing these fuels. The theories of oil and gas supply that were formulated during the 1970s and early 1980s have proven wrong to a large degree. Those theories would have predicted that oil and gas supplies currently would be near exhaustion, but reserves and resource estimates have grown significantly proving the old theories far too pessimistic.[1]

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[1]For an excellent discussion of the changing views on oil and gas supplies see, William L. Fisher, "How Technology has Confounded U. S. Gas Resource Estimators," Oil and Gas Journal, Oct. 24, 1994.

Of particular importance for the Council's plan, are the dramatic changes in the natural gas industry. In the mid 1970s, natural gas was regulated from the wellhead to the end-user. Today natural gas prices are unregulated. Natural gas is a commodity complete with a futures market and derivative products to help gas users and marketers manage price risk. The natural gas supply bubble of the 1980s has ended without the significant run up of prices that was expected. In fact, the years of low gas prices seem to have spurred technological innovation and application to the point where many industry observers expect few real sustained price increases for several years.

The changes in the natural gas market have set in motion similar changes in the electricity markets. The natural gas industry has provided a model of successful regulatory reform. Further, the availability of low-cost, reliable gas supplies combined with technology development in combined-cycle combustion turbine electric generators has provided the kind of competitive small scale generation needed to facilitate increased competition in the electric industry. The Council has discussed the evolution of the electric industry and implications for power planning at length in several issue papers over the past year.[2]

METHODS AND ASSUMPTIONS

Forecasting Methods

A new fuel price forecasting model has been developed since the 1991 Power Plan. The new approach places more emphasis on natural gas as an important consideration both in determining electricity demand and as an electric generation fuel. The emergence of the natural gas commodity market demanded a more independent look at natural gas prices.

In the 1991 and earlier Council plans, natural gas prices were dependent on the assumptions about world oil prices. It was assumed that natural gas prices would equate, in the long run, with residual oil prices at the industrial and utility burner tip. The forecasts presented here recognize that oil and gas prices are still related, but oil prices are only one of a number of possible limits to the upward range of natural gas prices. Competition between oil and gas at the burner tip will keep natural gas prices from going above oil prices for substantial periods of time. However, competition between different sources of natural gas can keep the price of gas substantially below the equivalent price of oil products and has done so for several years recently.

There are a number of other alternatives that may also limit the range of natural gas price movement in the long run. These include alternative fuels such as coal, efficiency improvement options, and less conventional sources of natural gas supply such as coal bed methane, frontier fields, and imported liquefied natural gas.[3] The Council does not have the resources to forecast natural gas prices based on a model that includes all of the factors that might influence natural gas price trends. Instead, as in the case of world oil prices, the staff reviews several forecasts that are done by organizations specializing in such models and analysis. From this background, and with the advice of the Natural Gas Advisory Committee and the Demand Forecasting Advisory Committee, a range of assumptions about future gas prices is proposed.

The basic driving assumptions for retail natural gas and oil price projections are future world oil prices and average U.S. wellhead natural gas prices. From the world oil price, a simple refinery economics model estimates the price of wholesale residual (heavy) oil and distillate (light) oil.[4] When the data is available, retail prices are estimated from the wholesale price assumptions based on historical differences between

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[2]See Council publication numbers 93-4, 94-4, 94-7, 94-21, 94-30, 94-46, 94-52, and 94-54.

[3]See Ann T. Donnelly, Andrew C. Wetz, and Michael F. Donnelly, "Natural Gas Prices: New Standard in Pacific Northwest Power Competition," presented to ASME, Portland, Oregon, 1994.

[4]This refinery model evolved from the old Council fuel price forecasting method developed by Energy Analysis and Planning, Inc. That company has evolved into Economic Insight Inc.

wholesale and retail prices. For natural gas, retail prices for residential, commercial and small industrial users are estimated from historical differences between average U.S. wellhead price of gas and retail prices for those sectors. Historical data do not support the same approach for the utility or large industrial sectors. In these cases, the Council has estimated the components of cost to deliver wellhead gas to these customers.

World Oil Price Assumptions

The meaning of the large increases in oil prices during the 1970s and early 1980s is being re-evaluated. It is increasingly viewed as an event that could not be sustained because it was not supportable by basic energy economics. As Figure C-2 shows, oil prices had varied between $9 and $18 per barrel (Jan. 1995 dollars) for 40 years prior to the Organization of Petroleum Exporting Countries (OPEC) oil embargo in 1973. The discovery of the huge oil resources of the Middle East added an important element to oil markets: a dominant supply that could be produced at very low marginal cost. The lesson of the 1970s and early 1980s is that there are other supplies of oil that will be produced at prices around $15 and above, and that there are demand responses to high prices. Both of these facts have eliminated the ability of Organization of Petroleum Exporting Countries to cause sustained higher oil prices.

Figure C-2
World Oil Prices: A Long-Term Historical Perspective
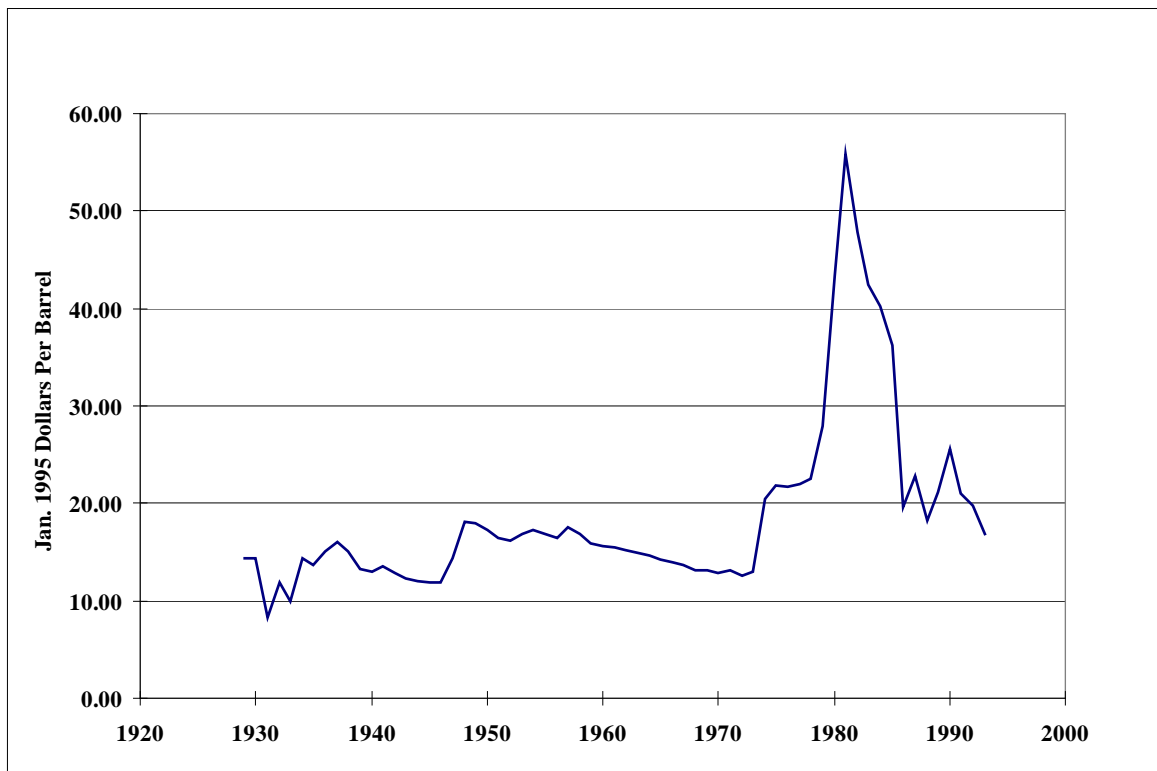
The current perception is that oil prices above $25 could not be sustained for very long. The Canadian National Energy Board (NEB), for example, found that a sustainable range of oil price would be between $15 and $25 per barrel in 1993 dollars.[5] Noting that some authorities still forecast prices up to $30, however, the National Energy Board adopted a forecast range from $15 to $30. Two of those forecasts were by the Energy Information Administration and the International Energy Agency. Both of these higher forecasts reflect assumptions that Organization of Petroleum Exporting Countries may not be able or willing to increase production in the future. The Energy Information Administration forecast shown in Figure C-3 has been revised downward since the National Energy Board document was released.

For purposes of developing the draft power plan, a range of 2015 oil prices from $16 to $30 (in January 1995 dollars) is assumed. The most likely range, medium low to medium high, is $19 to $26 with a medium of $22. Figure C-3 shows the draft price range as dotted lines and compares it with several forecasts by energy organizations. The oil price assumptions are shown in five year increments in Table Council-1.

Figure C-3
World Oil Price Forecasts: Comparison to Draft Forecast Range
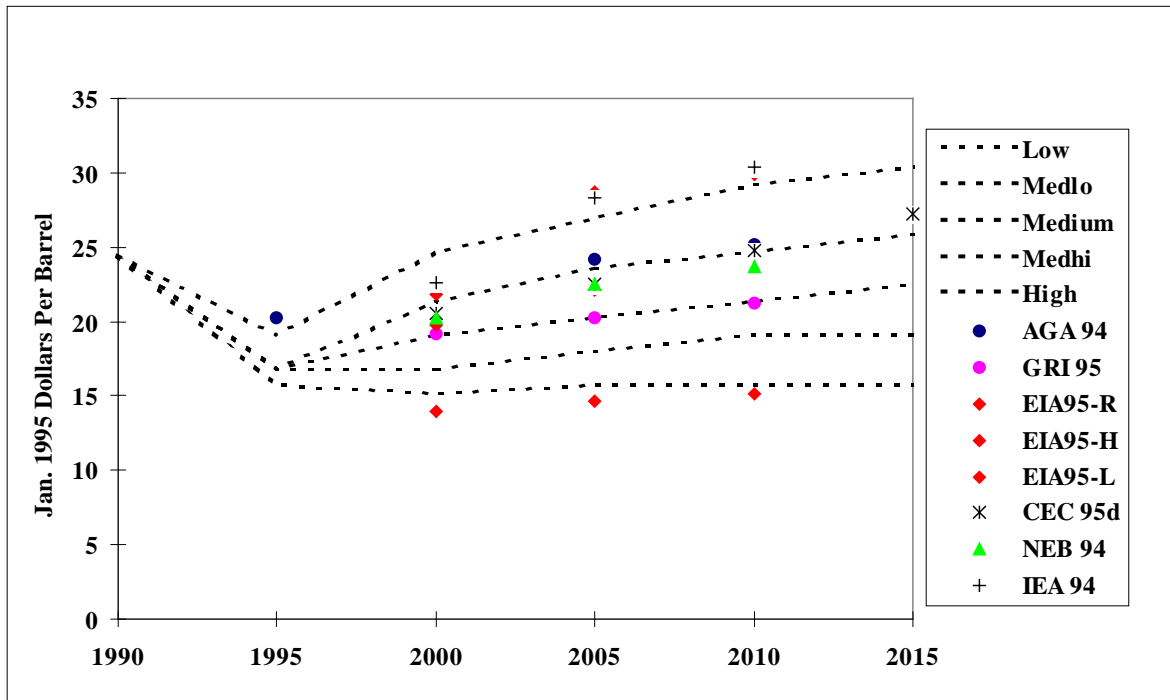
Sources:
    CEC - California Energy Commission, Results of the Delphi VII Survey of Oil Price Forecasts, November 1993.
    IEA - International Energy Agency, World Energy Outlook, 1994 Edition.
    NEB - National Energy Board, Canadian Energy: Supply and Demand 1993- 2010.
    EIA - U. S. Energy Information Administration, Annual Energy Outlook, 1995.
    WEFA - The WEFA Group, Winter 1994.
    GRI - Gas Research Institute, Preliminary 1995 Baseline Report.
    AGA - American Gas Association, The 1994 AGA-TERA Base Case.

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[5]National Energy Board, Canadian Energy: Supply and Demand 1993-2010, July 1994.

Table C-1
World Oil Price Assumptions
(Jan. 1995 Dollars Per Barrel)

Year	Low	Medium Low	Medium	Medium High	High
1994	16	16	16	16	16
2000	15	17	19	21	25
2005	16	18	20	24	27
2010	16	19	21	25	29
2015	16	19	22	26	30
Growth Rate					
1994-15	-0.0	1.0	1.7	2.4	3.2

Wellhead Natural Gas Price Assumptions

The general approach to determining assumptions about future natural gas prices at the wellhead is similar to that followed for world oil prices. The definition of wellhead price is adopted from the Energy Information Administration. The term wellhead is actually a bit misleading because the price includes natural gas gathering and processing costs and taxes and fees. The average U.S. wellhead price is used as the base for retail gas price forecasting because it is a widely used and forecasted measure of natural gas price.

The history of natural gas prices is similar to oil prices. This is not surprising because the two are closely related through discovery and market competition. As shown in Figure C-4, the history of natural gas prices is also one of stable prices in real terms for many years, followed by a rapid escalation of prices between 1970 and the early 1980s. Like oil, the prices collapsed in the mid 1980s, but they did not return to their historical levels of around 55 cents per thousand cubic feet (January 1995 dollars).

The historical pattern of gas prices has been influenced to a large degree by regulation. The price increases of the 1970s, while probably influenced by oil prices and the mentality they induced, were also a result of inadequate incentives to produce and transport natural gas. The structure of the gas industry today is far different than that of the 1970s and 1980s. The price of natural gas in the last few years is probably a good reflection of the underlying market economics.

Forecasts of wellhead gas prices have been falling steadily each year. Several forecasters now expect that there is a good chance of constant real natural gas prices over the long term. Unlike oil, there is not a dominant source of natural gas. Prices are likely to be determined by market forces alone. However, it probably is true that additional gas supplies in the long run will come from smaller and less accessible fields. The recent dramatic technological advances in exploration and drilling have led to optimism that technology can offset the less favorable geology in the future and thus moderate the price increases.

Figure C-4
Natural Gas Price History
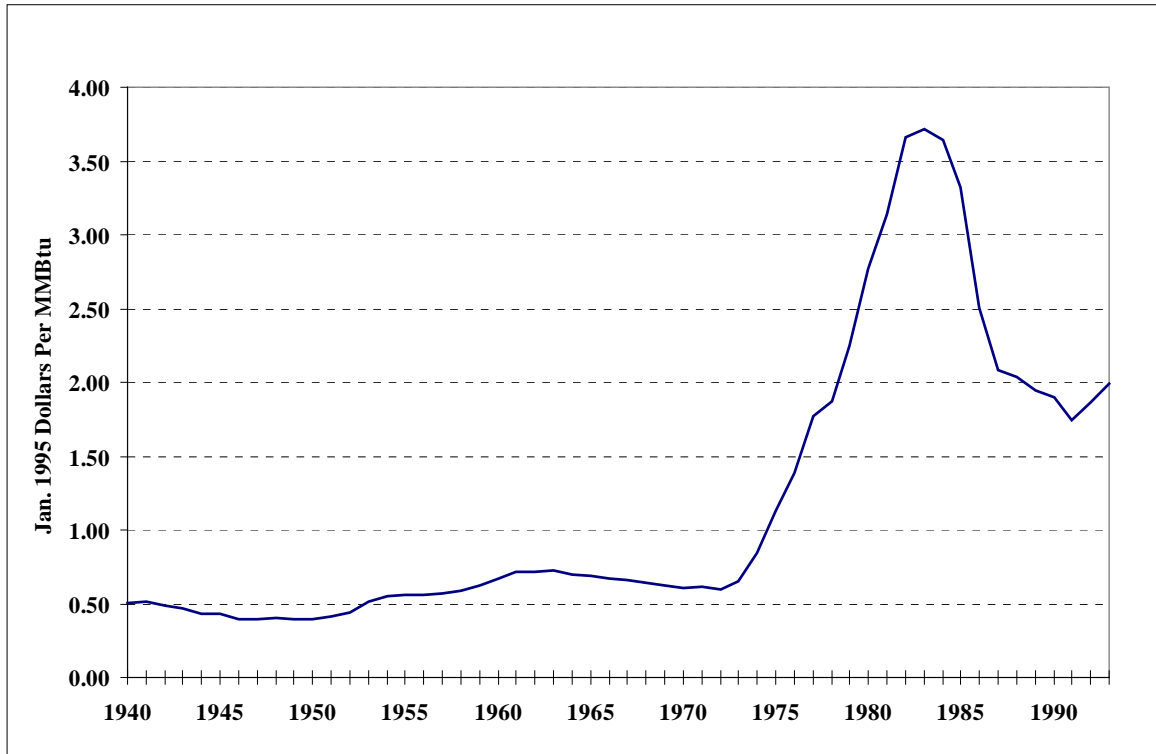
Figure C-5 illustrates the draft U.S. wellhead price forecast range as dashed lines. The 2015 prices change from a 1994 price of $1.81 (Jan. 1995 dollars) to between $1.69 in the low case and $3.37 in the high case. The medium case reaches $2.25 by 2015, a 1.0 percent annual rate of increase from the 1994 base. For comparison purposes a number of other forecasts are shown. The draft assumptions are generally lower than the alternative forecasts, which are closer to the high case. Two important considerations led to a somewhat lower forecast. The first is that forecasts have been falling rapidly over the last few years. Revised forecasts will be issued soon for some of these organizations, and it is anticipated that they will be lower again. A second consideration was the advice of the Council's Natural Gas Policy, Natural Gas Advisory, and Demand Forecasting Advisory committees. Each of these recommended forecasts with little or no real escalation.

The low assumption reflects a case where changing technology and market incentives continue to bring new gas supplies on line at prices not much different from those experienced recently. The higher cases reflect the assumption that gas supplies become more expensive to access, but recognizes that the high side of gas prices is limited by alternatives that compete with gas as energy sources, or reduce the demand for gas by improving the efficiency of use. The middle part of the range recognizes that some combination of these forces is likely to be realized. Table C-2 shows the assumed wellhead gas price range.

Figure C-5
Wellhead Gas Price Forecast: Compared to Selected National Forecasts
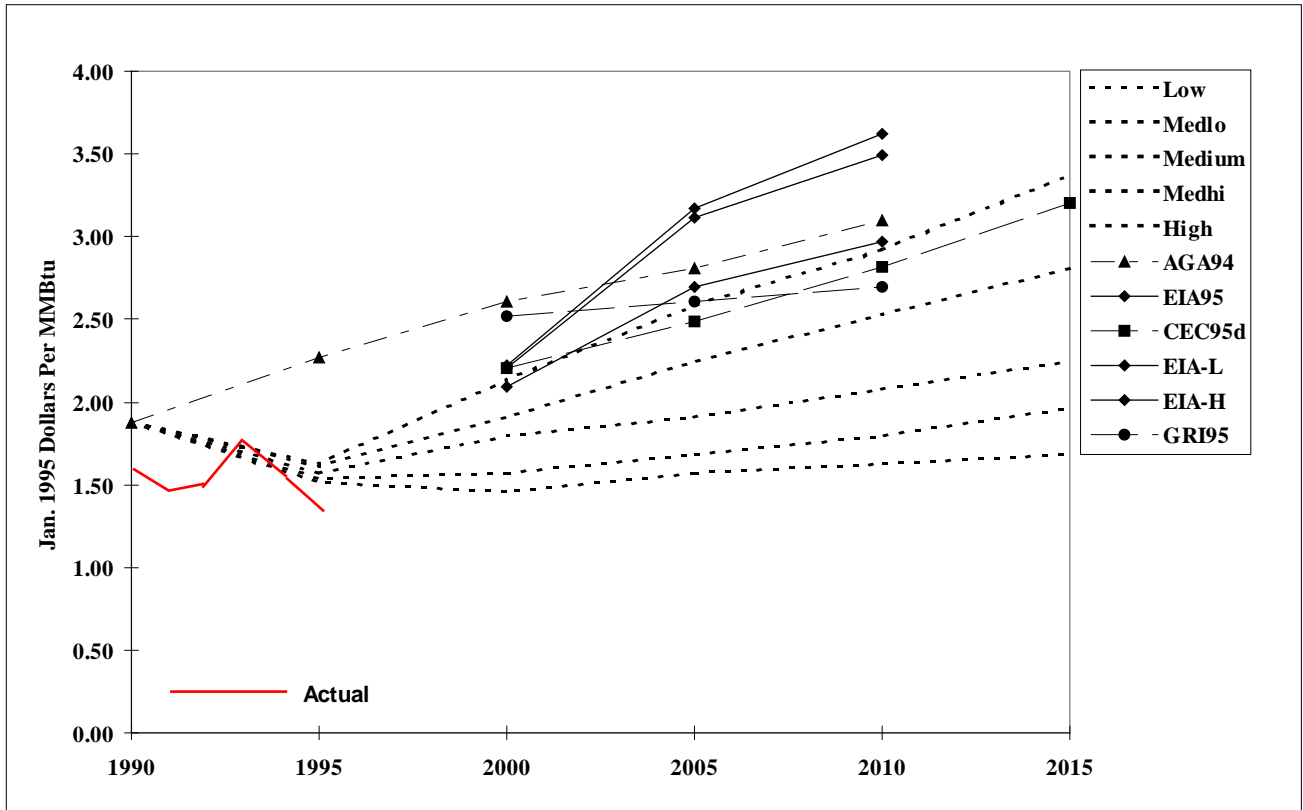
Table C-2
Wellhead Natural Gas Price Assumptions
(U.S. Average in January 1995 Dollars per Million Btu)

Year	Low	Medium Low	Medium	Medium High	High
1994	1.81	1.84	1.84	1.84	1.84
2000	1.46	1.57	1.80	1.91	2.13
2005	1.57	1.69	1.91	2.25	2.58
2010	1.63	1.80	2.08	2.53	2.92
2015	1.69	1.97	2.25	2.81	3.37
Growth Rate					
1994-15	-0.3	0.4	1.0	2.1	3.0

RETAIL ENERGY PRICES

Retail prices for natural gas and oil are derived from U.S. wellhead gas and world oil price assumptions, respectively, by estimating the costs of getting the fuel delivered to the final user. In the case of oil, this involves estimating the price that would be charged at the refinery for light and heavy oil products, and then adding the delivery and marketing costs. The delivery costs are estimated by comparing actual historical retail prices with estimated refinery prices from the model's equations. This, in effect, calibrates the retail price forecasts to actual retail prices.

Natural gas delivery costs include transportation by pipeline to the local distribution company's system, distribution and marketing by the local distribution company, and provision of storage, peaking, reserves, and other services. As noted above, these costs can be calculated directly from available wellhead and retail price data for residential, commercial and small industrial customers. However, they must be estimated from the detailed cost components in the case of large industrial and utility customers.

As a general rule, the costs of delivering fuel to small scale users is higher. This partly reflects selling less gas to recover distribution pipe costs in the case of natural gas and truck and delivery costs for oil. It also reflects a lower load factor for residential and commercial loads, which tend to be more weather sensitive than industrial loads. This generally means these sectors will have higher retail rates. But they also tend to have lower escalation rates because the actual fuel costs are a smaller share of their price, and most non-fuel costs are not assumed to increase in real terms. (Detailed annual forecasts of natural gas prices are attached to this appendix.)

Table C-3 shows retail prices for residential natural gas and oil. The cost of delivering natural gas to residences from the wellhead has decreased steadily over the last 10 years, falling from $5.90 to $3.46 per million Btu (Jan. 1995 dollars). For the forecast, the cost is assumed to remain at $3.37 per million Btu on the assumption that many of the efficiencies have been wrung out of the delivery systems already. In addition, changes in regulation have decreased the ability of large industrial customers to subsidize the smaller customers. The shifting of these costs to smaller users may offset any additional efficiency gains in the delivery system.

The cost of delivering light oil to residences has not shown the same downward trend historically as natural gas. It has averaged about $1.68 per million Btu over the last ten years, and this was assumed to continue into the future.

Table C-3
Residential Retail Price Forecast
(Jan. 1995 $ Per MMBtu)

Natural Gas

Year	Low	Medium Low	Medium	Medium High	High
1994	5.21	5.21	5.21	5.21	5.21
2000	4.83	4.94	5.17	5.28	5.51
2005	4.94	5.06	5.28	5.62	5.96
2010	5.00	5.17	5.45	5.90	6.29
2015	5.06	5.34	5.62	6.18	6.74
Growth Rate					
1994-15	-0.1	0.1	0.4	0.8	1.2

Oil

Year	Low	Medium Low	Medium	Medium High	High
1994	6.38	6.38	6.38	6.38	6.38
2000	6.12	6.44	6.87	7.30	7.95
2005	6.22	6.66	7.09	7.74	8.60
2010	6.22	6.87	7.30	7.95	9.25
2015	6.22	6.87	7.52	8.17	9.68
Growth Rate					
1994-15	-1.1	0.4	0.8	1.2	2.0

Commercial natural gas delivery costs, like residential, have shown a definite downward trend. They declined from $4.95 per million Btu in 1983 to $2.61 in 1993. The forecast assumes that they will remain at $2.60. Oil delivery costs in the model's historical simulation are much smaller than natural gas delivery costs and display little obvious trend. They are assumed to be $.06 and $.21 for heavy oil and light oil, respectively, over the forecast period.

Reflecting smaller delivery cost shares than the residential sector, the growth rates of commercial retail prices are slightly higher than for the residential sector. Neither the residential nor commercial sector oil prices, even in the high case, return to high real price levels seen during the early 1980s.

Table C-4
Commercial Retail Price Forecast
(Jan. 1995 $ Per MMBtu)

Natural Gas

Year	Low	Medium Low	Medium	Medium High	High
1994	4.43	4.43	4.43	4.43	4.43
2000	4.04	4.16	4.38	4.49	4.72
2005	4.16	4.27	4.49	4.83	5.17
2010	4.21	4.38	4.66	5.11	5.51
2015	4.27	4.55	4.83	5.39	5.96
Growth Rate					
1994-2015	-0.2	0.1	0.4	0.9	1.4

Oil

Year	Low	Medium Low	Medium	Medium High	High
1994	4.62	4.62	4.62	4.62	4.62
2000	4.38	4.70	5.12	5.54	6.17
2005	4.49	4.91	5.33	5.96	6.80
2010	4.49	5.12	5.54	6.17	7.44
2015	4.49	5.12	5.75	6.38	7.86
Growth Rate					
1994-2015	-0.1	0.5	1.0	1.5	2.6

For the industrial and utility prices shown in Tables C-5 and C-6, various types of prices have been averaged together to get average sector prices. Oil prices are a consumption-weighted average of heavy and light oil prices. Natural gas prices are a weighted average of local distribution company customers, and industries that buy their own gas on an interruptible or firm basis. The delivery costs are smaller than for residential or commercial customers, and as a result the retail price growth rates are higher.

Oil prices for the utility sector are shown separately for heavy and light oil. It is expected that new combustion turbines will use light oil as a fuel. In this case the average the heavy and light oil prices is not appropriate.

Industrial coal prices play a very small role in determining industrial electricity demand. For this reason, little effort has been allocated to forecasting that price. A simple growth rate range is used on an historical base price to generate the range of coal price assumptions for the industrial sector.

Table C-5
Industrial Retail Price Forecast
(Jan. 1995 $ Per MMBtu)

Natural Gas

Year	Low	Medium Low	Medium	Medium High	High
1994	2.30	2.30	2.30	2.30	2.30
2000	1.99	2.19	2.44	2.56	2.79
2005	2.10	2.29	2.57	2.98	3.35
2010	2.14	2.39	2.73	3.27	3.71
2015	2.18	2.55	2.88	3.54	4.15
Growth Rate					
1994-15	-0.3	0.5	1.1	2.1	2.9

Oil

Year	Low	Medium Low	Medium	Medium High	High
1994	3.80	3.80	3.80	3.80	3.80
2000	3.59	3.89	4.28	4.68	5.27
2005	3.69	4.08	4.48	5.08	5.87
2010	3.69	4.28	4.68	5.27	6.47
2015	3.69	4.28	4.88	5.47	6.86
Growth Rate					
1994-15	-0.1	0.6	1.2	1.8	2.9

Coal

Year	Low	Medium Low	Medium	Medium High	High
1994	2.24	2.24	2.24	2.24	2.24
2000	2.17	2.22	2.27	2.32	2.39
2005	2.13	2.21	2.30	2.38	2.50
2010	2.09	2.21	2.32	2.44	2.61
2015	2.06	2.21	2.35	2.50	2.73
Growth Rate					
1994-15	-0.4	-0.1	0.2	0.5	0.9

Table C-6
Utility Retail Price Forecast
(Jan. 1995 $ Per MMBtu)

Natural Gas

Year	Low	Medium Low	Medium	Medium High	High
1994	1.71	1.76	1.82	1.88	1.93
2000	1.36	1.65	1.97	2.15	2.45
2005	1.46	1.77	2.14	2.65	3.10
2010	1.51	1.89	2.33	2.98	3.53
2015	1.56	2.06	2.52	3.30	4.03
Growth Rate					
1994-15	-0.4	0.8	1.6	2.7	3.6

Heavy Oil

Year	Low	Medium Low	Medium	Medium High	High
1994	2.10	2.10	2.10	2.10	2.10
2000	2.03	2. 27	2.61	2.94	3.44
2005	2.11	2.44	2.77	3.27	3.93
2010	2.11	2.61	2.94	3.44	4.43
2015	2.11	2.61	3. 10	3.60	4.76
Growth Rate					
1994-15	0.0	1.0	1.9	2.6	4.0

Light Oil

Year	Low	Medium Low	Medium	Medium High	High
1994	3.29	3.29	3.29	3.29	3.29
2000	3.19	3.52	3.95	4.38	5.03
2005	3.30	3.73	4.17	4.81	5.68
2010	3.30	3.95	4.38	5.03	6.33
2015	3.30	3.95	4.60	5.25	6.76
Growth Rate					
1994-15	0.0	0.9	1.6	2.3	3.5

For the utility sector, coal prices are more important. Most coal for existing coal plants is purchased under long-term contracts. Coal for new power plants is estimated specifically for different coal sources and different coal plant locations. These forecasts were done by the Bonneville Power Administration. The reason for being specific about location is the importance of transportation costs in delivering coal. Table C-7 shows the Bonneville coal price forecasts.

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Table C-7
Utility Coal Price Forecasts
(Jan. 1995 $/ MMBtu)

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POWDER RIVER COAL TO CRESTON

	Low	Medium Low	Medium	Medium High	High
1994			$1.04		
2005	$0.93	$1.00	$1.06	$1.12	$1.19
2015	$0.90	$0.93	$1.04	$1.11	$1.19
Growth Rate					
1994-2015	-0.72%	-0.53%	-0.01%	0.27%	0.61%

POWDER RIVER COAL TO BOARDMAN

	Low	Medium Low	Medium	Medium High	High
1994			$1.06		
2005	$0.95	$1.02	$1.08	$1.15	$1.22
2015	$0.92	$1.00	$1.06	$1.14	$1.22
Growth Rate					
1994-2015	-0.67%	-0.30%	0.01%	0.32%	0.65%

POWDER RIVER COAL TO CENTRALIA

	Low	Medium Low	Medium	Medium High	High
1994			$1.50		
2005	$1.32	$1.42	$1.50	$1.60	$1.71
2015	$1.29	$1.40	$1.50	$1.59	$1.72
Growth Rate					
1994-2015	-0.71%	-0.32%	-0.01%	0.28%	0.65%

POWDER RIVER COAL TO COLSTRIP

	Low	Medium Low	Medium	Medium High	High
1994			$0.34		
2005	$0.26	$0.28	$0.29	$0.31	$0.33
2015	$0.21	$0.23	$0.23	$0.26	$0.28
Growth Rate					
1994-2015	-2.19%	-1.85%	-1.74%	-1.30%	-0.97%

UINTA COAL TO THOUSAND SPRINGS

	Low	Medium Low	Medium	Medium High	High
1994			$1.40		
2005	$1.18	$1.26	$1.34	$1.42	$1.51
2015	$1.09	$1.19	$1.27	$1.35	$1.44
Growth Rate					
1994-2015	-1.18%	-0.77%	-0.47%	-0.18%	0.15%

UINTA COAL TO VALMY

	Low	Medium Low	Medium	Medium High	High
1994			$1.17		
2005	$0.97	$1.03	$1.10	$1.17	$1.24
2015	$0.88	$0.96	$1.02	$1.08	$1.16
Growth Rate					
1994-2015	-1.34%	-0.96%	-0.67%	-0.38%	-0.04%

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NATURAL GAS FORECAST SUMMARY
Low Case
(Jan 1995$ per MMBtu)

Year	World Oil Price ($/Barrel)	U. S. Wellhead Price	Regional End-Use Gas Prices			
			Average Industrial Price	Residential	Commercial	Average Utility Price
1980	60.17	2.82	7.01	8.82	8.19	2.74
1981	59.78	3.19	6.86	9.02	8.25	3.12
1982	50.97	3.73	7.74	9.79	9.04	3.67
1983	42.78	3.78	7.17	9.68	8.73	3.71
1984	40.40	3.72	6.75	9.21	8.33	3.65
1985	36.40	3.38	6.04	8.63	7.49	3.31
1986	18.39	2.55	4.42	7.64	6.58	2.47
1987	23.08	2.12	3.61	7.13	5.88	2.04
1988	17.84	2.07	3.17	6.92	5.76	1.98
1989	21.21	1.98	2.82	6.36	5.34	1.89
1990	24.45	1.92	2.52	5.89	4.82	1.86
1991	20.23	1.77	2.35	5.48	4.58	1.73
1992	19.13	1.83	2.29	5.50	4.58	1.72
1993	16.54	2.06	2.44	5.52	4.67	1.94
1994	15.66	1.84	2.30	5.21	4.43	1.71
1995	15.73	1.52	1.97	4.89	4.10	1.38
1996	15.62	1.51	2.00	4.88	4.09	1.41
1997	15.50	1.49	2.00	4.86	4.08	1.40
1998	15.39	1.48	2.00	4.85	4.07	1.38
1999	15.28	1.47	2.00	4.84	4.06	1.37
2000	15.17	1.46	1.99	4.83	4.04	1.36
2001	15.28	1.48	2.01	4.85	4.07	1.38
2002	15.39	1.50	2.03	4.88	4.09	1.40
2003	15.50	1.53	2.05	4.90	4.11	1.42
2004	15.62	1.55	2.07	4.92	4.13	1.44
2005	15.73	1.57	2.10	4.94	4.16	1.46
2006	15.73	1.58	2.10	4.95	4.17	1.47
2007	15.73	1.60	2.11	4.97	4.18	1.48
2008	15.73	1.61	2.12	4.98	4.19	1.49
2009	15.73	1.62	2.13	4.99	4.20	1.50
2010	15.73	1.63	2.14	5.00	4.21	1.51
2011	15.73	1.64	2.15	5.01	4.22	1.52
2012	15.73	1.65	2.16	5.02	4.24	1.53
2013	15.73	1.66	2.16	5.03	4.25	1.54

2014	15.73	1.67	2.17	5.04	4.26	1.55
2015	15.73	1.69	2.18	5.06	4.27	1.56
Growth Rt.						
1993-2015	-0.23%	-0.90%	-0.51%	-0.40%	-0.41%	-0.97%

NATURAL GAS FORECAST SUMMARY
Medium-Low Case
(Jan 1995$ per MMBtu)

Year	World Oil Price ($/Barrel)	U. S. Wellhead Price	Regional End-Use Gas Prices			
			Average Industrial Price	Residential	Commercial	Average Utility Price
1980	60.17	2.82	7.01	8.82	8.19	2.80
1981	59.78	3.19	6.86	9.02	8.25	3.18
1982	50.97	3.73	7.74	9.79	9.04	3.72
1983	42.78	3.78	7.17	9.68	8.73	3.77
1984	40.40	3.72	6.75	9.21	8.33	3.71
1985	36.40	3.38	6.04	8.63	7.49	3.37
1986	18.39	2.55	4.42	7.64	6.58	2.52
1987	23.08	2.12	3.61	7.13	5.88	2.09
1988	17.84	2.07	3.17	6.92	5.76	2.04
1989	21.21	1.98	2.82	6.36	5.34	1.95
1990	24.45	1.92	2.50	5.89	4.82	1.89
1991	20.23	1.77	2.33	5.48	4.58	1.76
1992	19.13	1.83	2.28	5.50	4.58	1.76
1993	16.54	2.06	2.44	5.52	4.67	1.98
1994	15.66	1.84	2.30	5.21	4.43	1.76
1995	16.85	1.54	2.00	4.91	4.12	1.46
1996	16.85	1.55	2.05	4.92	4.13	1.51
1997	16.85	1.55	2.09	4.92	4.14	1.55
1998	16.85	1.56	2.13	4.93	4.14	1.59
1999	16.85	1.57	2.18	4.94	4.15	1.65
2000	16.85	1.57	2.19	4.94	4.16	1.65
2001	17.07	1.59	2.21	4.97	4.18	1.68
2002	17.29	1.62	2.23	4.99	4.20	1.70
2003	17.52	1.64	2.25	5.01	4.22	1.72
2004	17.75	1.66	2.27	5.03	4.25	1.75
2005	17.98	1.69	2.29	5.06	4.27	1.77
2006	18.20	1.71	2.31	5.08	4.29	1.79
2007	18.42	1.73	2.33	5.10	4.31	1.82
2008	18.64	1.75	2.35	5.12	4.34	1.84
2009	18.87	1.77	2.37	5.15	4.36	1.86
2010	19.10	1.80	2.39	5.17	4.38	1.89
2011	19.10	1.83	2.42	5.20	4.41	1.92
2012	19.10	1.86	2.46	5.23	4.45	1.95
2013	19.10	1.90	2.49	5.27	4.48	1.99

2014	19.10	1.93	2.52	5.30	4.52	2.02
2015	19.10	1.97	2.55	5.34	4.55	2.06

Growth Rt.
1993-2015	0.66%	-0.21%	0.20%	-0.15%	-0.12%	0.17%

NATURAL GAS FORECAST SUMMARY
Medium Case
(Jan 1995$ per MMBtu)

Year	World Oil Price ($/Barrel)	U. S. Wellhead Price	Regional End-Use Gas Prices			
			Average Industrial Price	Residential	Commercial	Average Utility Price
1980	60.17	2.82	7.01	8.82	8.19	2.86
1981	59.78	3.19	6.86	9.02	8.25	3.23
1982	50.97	3.73	7.74	9.79	9.04	3.78
1983	42.78	3.78	7.17	9.68	8.73	3.83
1984	40.40	3.72	6.75	9.21	8.33	3.76
1985	36.40	3.38	6.04	8.63	7.49	3.42
1986	18.39	2.55	4.42	7.64	6.58	2.58
1987	23.08	2.12	3.61	7.13	5.88	2.15
1988	17.84	2.07	3.17	6.92	5.76	2.10
1989	21.21	1.98	2.82	6.36	5.34	2.01
1990	24.45	1.92	2.51	5.89	4.82	1.95
1991	20.23	1.77	2.34	5.48	4.58	1.82
1992	19.13	1.83	2.29	5.50	4.58	1.82
1993	16.54	2.06	2.45	5.52	4.67	2.04
1994	15.66	1.84	2.31	5.21	4.43	1.82
1995	16.85	1.57	2.04	4.94	4.16	1.55
1996	17.28	1.62	2.13	4.99	4.20	1.64
1997	17.72	1.66	2.21	5.03	4.24	1.72
1998	18.17	1.70	2.29	5.08	4.29	1.81
1999	18.63	1.75	2.37	5.12	4.33	1.90
2000	19.10	1.80	2.44	5.17	4.38	1.97
2001	19.32	1.82	2.48	5.19	4.40	2.02
2002	19.54	1.84	2.51	5.21	4.43	2.06
2003	19.77	1.86	2.53	5.24	4.45	2.09
2004	19.99	1.89	2.55	5.26	4.47	2.11
2005	20.22	1.91	2.57	5.28	4.49	2.14
2006	20.44	1.94	2.60	5.31	4.53	2.18
2007	20.67	1.98	2.63	5.35	4.56	2.21
2008	20.89	2.01	2.66	5.38	4.59	2.25
2009	21.12	2.04	2.69	5.41	4.63	2.29
2010	21.35	2.08	2.73	5.45	4.66	2.33
2011	21.57	2.11	2.76	5.48	4.70	2.36
2012	21.79	2.14	2.79	5.52	4.73	2.40
2013	22.02	2.18	2.82	5.55	4.76	2.44

2014	22.24	2.21	2.85	5.58	4.80	2.48
2015	22.47	2.25	2.88	5.62	4.83	2.52
Growth Rt.						
1993-2015	1.40%	0.40%	0.74%	0.08%	0.16%	0.96%

NATURAL GAS FORECAST SUMMARY
Medium-High Case
(Jan 1995$ per MMBtu)

Year	World Oil Price ($/Barrel)	U. S. Wellhead Price	Regional End-Use Gas Prices			
			Average Industrial Price	Residential	Commercial	Average Utility Price
1980	60.17	2.82	7.01	8.82	8.19	2.91
1981	59.78	3.19	6.86	9.02	8.25	3.29
1982	50.97	3.73	7.74	9.79	9.04	3.84
1983	42.78	3.78	7.17	9.68	8.73	3.88
1984	40.40	3.72	6.75	9.21	8.33	3.82
1985	36.40	3.38	6.04	8.63	7.49	3.48
1986	18.39	2.55	4.42	7.64	6.58	2.63
1987	23.08	2.12	3.61	7.13	5.88	2.21
1988	17.84	2.07	3.17	6.92	5.76	2.15
1989	21.21	1.98	2.83	6.36	5.34	2.06
1990	24.45	1.92	2.51	5.89	4.82	2.00
1991	20.23	1.77	2.35	5.48	4.58	1.87
1992	19.13	1.83	2.30	5.50	4.58	1.87
1993	16.54	2.06	2.46	5.52	4.67	2.10
1994	15.66	1.84	2.32	5.21	4.43	1.88
1995	16.85	1.61	2.09	4.98	4.19	1.64
1996	17.67	1.66	2.19	5.03	4.25	1.75
1997	18.53	1.72	2.28	5.09	4.31	1.85
1998	19.42	1.78	2.38	5.15	4.37	1.95
1999	20.36	1.85	2.47	5.22	4.43	2.06
2000	21.35	1.91	2.56	5.28	4.49	2.15
2001	21.78	1.97	2.64	5.34	4.56	2.25
2002	22.22	2.04	2.72	5.41	4.62	2.34
2003	22.67	2.11	2.80	5.48	4.69	2.44
2004	23.13	2.18	2.89	5.55	4.76	2.53
2005	23.60	2.25	2.98	5.62	4.83	2.65
2006	23.82	2.30	3.05	5.67	4.89	2.73
2007	24.04	2.36	3.10	5.73	4.94	2.79
2008	24.26	2.41	3.15	5.78	5.00	2.85
2009	24.49	2.47	3.21	5.84	5.05	2.92
2010	24.72	2.53	3.27	5.90	5.11	2.98
2011	24.94	2.58	3.32	5.95	5.17	3.04
2012	25.16	2.64	3.37	6.01	5.22	3.10
2013	25.39	2.69	3.42	6.06	5.28	3.17

2014	25.61	2.75	3.48	6.12	5.33	3.23
2015	25.84	2.81	3.54	6.18	5.39	3.30
Growth Rt.						
1993-2015	2.05%	1.42%	1.67%	0.51%	0.66%	2.08%

NATURAL GAS FORECAST SUMMARY
High Case
(Jan 1995$ per MMBtu)

			Regional End-Use Gas Prices			
Year	World Oil Price ($/Barrel)	U. S. Wellhead Price	Average Industrial Price	Residential	Commercial	Average Utility Price
1980	60.17	2.82	7.01	8.82	8.19	2.97
1981	59.78	3.19	6.86	9.02	8.25	3.34
1982	50.97	3.73	7.74	9.79	9.04	3.89
1983	42.78	3.78	7.17	9.68	8.73	3.94
1984	40.40	3.72	6.75	9.21	8.33	3.88
1985	36.40	3.38	6.04	8.63	7.49	3.54
1986	18.39	2.55	4.42	7.64	6.58	2.69
1987	23.08	2.12	3.61	7.13	5.88	2.26
1988	17.84	2.07	3.18	6.92	5.76	2.21
1989	21.21	1.98	2.84	6.36	5.34	2.12
1990	24.45	1.92	2.52	5.89	4.82	2.06
1991	20.23	1.77	2.36	5.48	4.58	1.93
1992	19.13	1.83	2.31	5.50	4.58	1.93
1993	16.54	2.06	2.47	5.52	4.67	2.15
1994	15.66	1.84	2.33	5.21	4.43	1.93
1995	19.10	1.63	2.12	5.00	4.21	1.72
1996	20.11	1.72	2.25	5.09	4.30	1.87
1997	21.18	1.82	2.38	5.19	4.40	2.00
1998	22.30	1.92	2.52	5.29	4.50	2.15
1999	23.48	2.02	2.66	5.39	4.61	2.31
2000	24.72	2.13	2.79	5.51	4.72	2.45
2001	25.36	2.22	2.90	5.59	4.80	2.56
2002	26.02	2.30	3.00	5.68	4.89	2.68
2003	26.69	2.39	3.10	5.76	4.98	2.80
2004	27.38	2.49	3.23	5.86	5.07	2.96
2005	28.09	2.58	3.35	5.96	5.17	3.10
2006	28.73	2.65	3.43	6.02	5.23	3.19
2007	29.39	2.71	3.51	6.08	5.30	3.29
2008	30.07	2.78	3.57	6.15	5.37	3.37
2009	30.76	2.85	3.64	6.22	5.43	3.44
2010	31.46	2.92	3.71	6.29	5.51	3.53
2011	31.90	3.01	3.79	6.38	5.59	3.62
2012	32.34	3.09	3.88	6.46	5.68	3.72
2013	32.79	3.18	3.97	6.55	5.77	3.82

2014	33.25	3.28	4.06	6.65	5.86	3.92
2015	33.71	3.37	4.15	6.74	5.96	4.03

Growth Rt.						
1993-2015	3.29%	2.27%	2.40%	0.91%	1.11%	2.89%

Draft Fourth Northwest Conservation and Electric Power Plan, Appendix C