

Biennial Review of the Fifth Power Plan

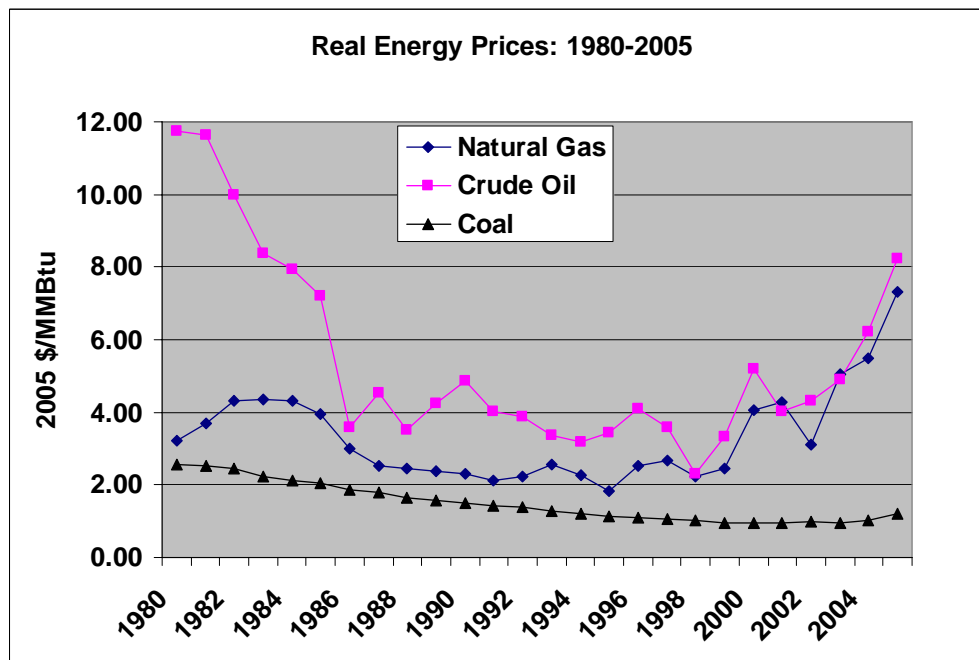
Interim Report on Status of Fuel Price Assumptions

Summary

The Fifth Power Plan includes price forecasts for natural gas, oil, and coal. Natural gas prices have by far the most significant effect on the Power Plan. The Council has always forecast a range of prices for fuels to reflect future uncertainty. A significant addition in the Fifth Power Plan was to consider volatility in natural gas prices in addition to the long-term uncertainty of price trends. The Council's range of natural gas trend assumptions are described in Appendix B of the Plan along with a discussion of how volatility in prices is modeled.

The Fifth Power Plan was developed immediately following a dramatic increase in energy prices in 2000. This increase followed more than a decade of low energy prices since the mid-1980s. Figure 1 shows energy commodity prices since 1980. Between 1986 and 1999 natural gas prices averaged \$1.87 per thousand cubic feet in nominal dollars and \$2.40 in 2005 dollars. Since 1999 natural gas prices have been much higher and very volatile. At the same time world oil prices have increased from an average of \$22.17 per barrel (in 2005 dollars) between 1986 and 1999 to \$49 in 2005. During 2006 world oil prices have exceeded \$70 (nominal) at times, but have fallen to under \$60 in the past week. Higher oil and natural gas prices have put some pressure on coal prices as well, although they remain lower and relatively more stable.

Figure 1



Between 2000 and 2005 natural gas prices averaged \$5.00 in 2005 dollars per million Btu; more than double the average between 1986 and 1999. The very high prices from late 2005 until

recently were strongly influenced by the destructive hurricanes (Katrina and Rita) in the summer of 2005. Prices had remained stubbornly high in spite of a much warmer than normal winter and higher than normal natural gas storage levels. Only in recent weeks have natural gas prices dropped significantly to levels, at times, below \$4.00 (nominal). In recent weeks, world oil prices have also dropped significantly, from in the \$70 per barrel range down to below \$55.

The forecast of natural gas prices in the Plan assumed that prices would peak in 2005 and then gradually decline until 2010, and then grow relative to general inflation levels for the remainder of the planning period. The amount of decrease until 2010, and the rate of increase thereafter, varied across the range of trend forecasts. In addition, continued volatility was assumed to occur in the future and undoubtedly had a significant effect on resource choices in the Plan.

The oil price forecasts in the Plan did not envision prices such have materialized in 2005 and 2006. The high forecast for 2005 in the Plan was \$43 per barrel (nominal) compared to an actual price of \$49. During the first half of 2006 oil prices averaged \$60 per barrel. Like natural gas, oil prices have fallen recently, but remain above the Council's forecast range. However, the oil price forecast has little consequence for the Council's Power Plan. Oil is not a significant alternative to natural gas or electricity in Northwest consumption, nor does the region have significant oil-fired generating capability.

The Council's Plan assumed that coal prices, which had been decreasing for decades, would level off. Coal price has little role in end-use consumption in the Northwest. However, coal prices do affect the cost of coal-fired electricity generation. In addition, the delivered price of coal to power plants located in the region will be affected by diesel fuel costs for trains that deliver coal to the plants. Recent higher prices for coal are partially related to higher oil and natural gas costs. Increased use of coal instead of natural gas increased pressure on rail capacity to deliver the coal and higher oil prices increased the delivery costs as well.

Both natural gas and coal-fired generation played a role in the Plan, but actual commitments to such plants was beyond the 5-year action plan period. Wind and improved efficiency were the most attractive resources in the plan for the near term. The action plan called for aggressive efficiency investment and for confirmation of wind potential.

Natural Gas

Recent Prices

Because of its significance in the Power Plan, natural gas is the primary focus of this review. What does recent data tell us about the validity of the Council's assumptions in the Fifth Power Plan? The power plan was adopted in December 2004 and the natural gas price forecasts were based on data before 2004. Figure 2 shows actual monthly natural gas prices at Henry Hub compared to the Council's annual forecast range in nominal dollars. Figure 3 shows how average annual prices during this time compared to the Council's forecast range.

Figure 2

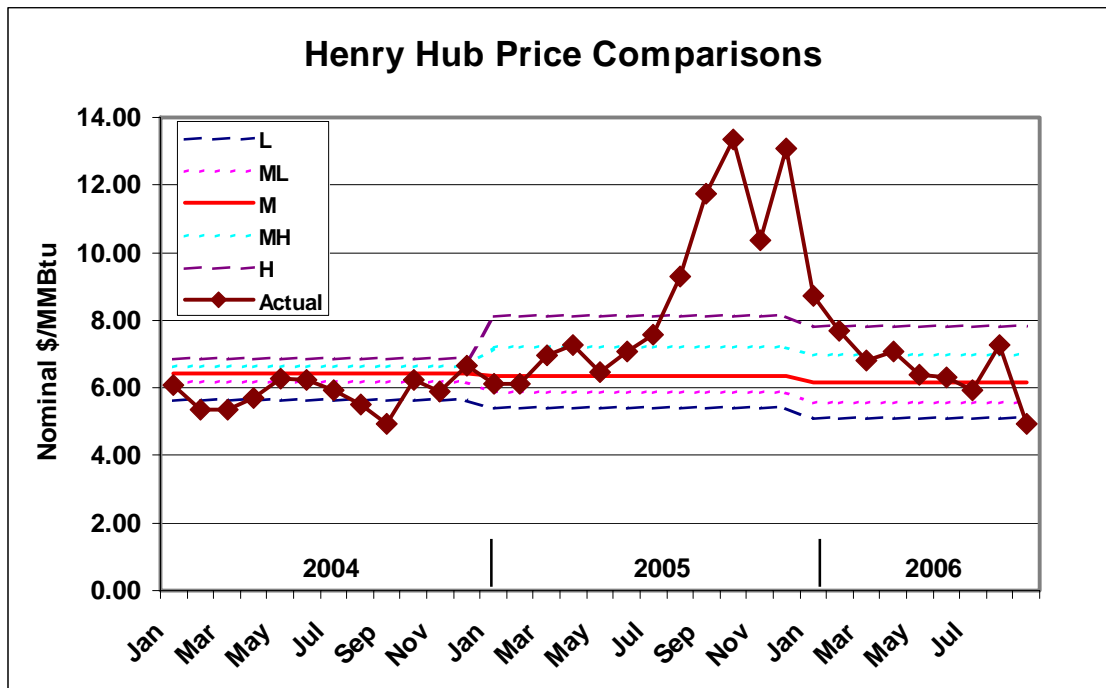
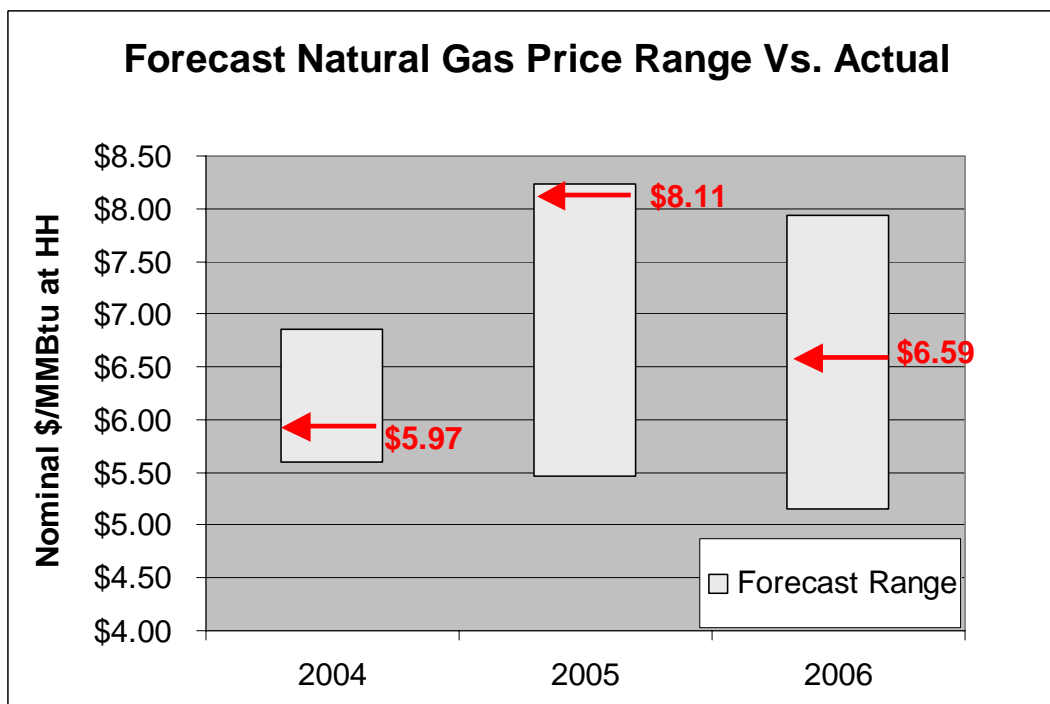


Figure 3



It has been conventional wisdom in the region that the Council's natural gas price forecast is outdated and too low. However, Figures 2 and 3 show a different story. All three years of natural gas prices were within the Council's range of forecasts. Only 2005 prices were near the

high end of the range. Figure 2 shows clearly the effect of Hurricanes Katrina and Rita in the summer of 2005 on natural gas prices. During late 2005 and 2006 the loss in production was absorbed, with the help of a mild winter and demand reductions, and storage levels have been built to levels well above the five-year average.

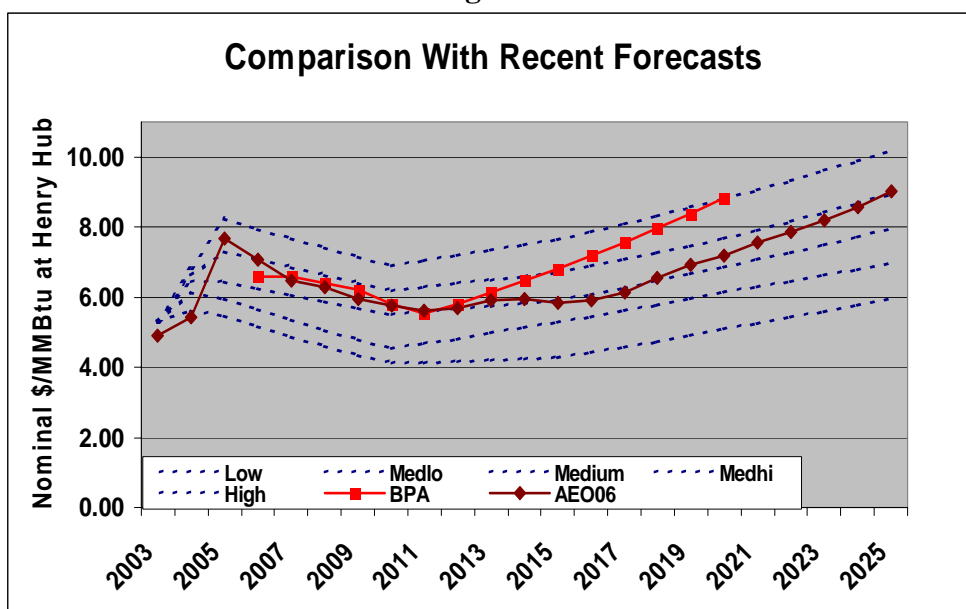
This plentiful storage and a benign 2006 hurricane season have led to a significant collapse of natural gas prices both in the spot market and the futures market in spite of an extremely hot summer. On Monday, October 2, spot prices at Henry Hub were \$3.66 per million Btu. Prices at AECO, a primary trading hub for the Pacific Northwest, were \$3.26. Prices in the U.S. Rockies supply area fell below \$3. Futures prices for natural gas during the coming winter, which had been \$10 to \$12 for much of the year, have recently fallen below \$8. This type of volatility is consistent with the Council's modeling of volatility of natural gas prices in the portfolio model, which includes many excursions well outside the low to high trend forecast range.

On average between January 2004 and September 2006 Henry Hub prices averaged about \$7.00. This is just above the Council's medium high trend forecast. Due to the extreme volatility of natural gas markets, it is difficult to conclude much about the Council's trend forecast range based on the last 2-3 years of experience.

Recent Forecasts by Others

Another source of comparison is forecasts by others. We have access to two long-term forecasts of natural gas prices that have been done since the Council's Plan. Figure 4 shows the Council's forecast range in dashed lines compared to a forecast from the Energy Information Administration's Annual Energy Outlook 2006 and a forecast of natural gas prices used by Bonneville in its most recent rate case. Both of these forecasts share the Council's expectation that prices are likely to decrease until about 2010. Both are between the Council's medium and medium-high forecasts leading up to 2010, but fall to the medium Council forecast in 2010. After 2010, both forecasts show more price escalation than included in the Council's forecasts.

Figure 4

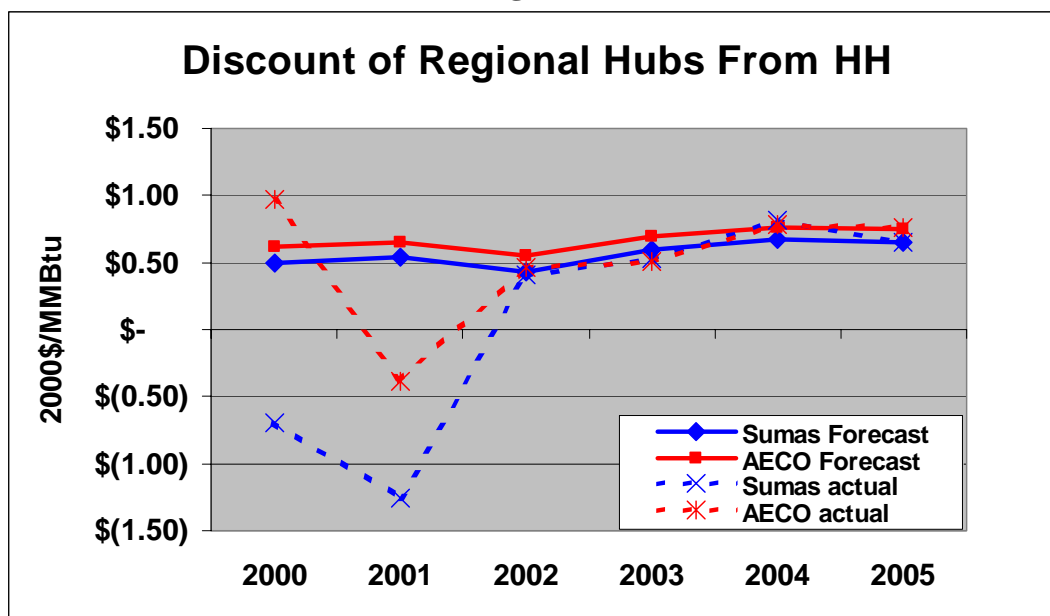


Regional Natural Gas Prices

Natural gas prices that have a direct effect on the Power Plan are prices in the Northwest. The natural gas price forecasts include prices for many pricing points in the West. Prices at major trading points into the Pacific Northwest were forecast based on historical relationships. Natural gas has typically been cheaper in the Pacific Northwest than at Henry Hub. Figure 5 shows differences in price between two Northwest gas trading points (AECO and Sumas) and Henry Hub. The dashed lines are actual differences and the solid lines are forecast differences. Actual differentials are volatile as clearly illustrated for 2000 and 2001 during the energy crisis. After 2001 the forecasts and actual differences track pretty closely. Both increase from around \$.50 to \$.75 per million Btu.

The price of natural gas delivered into the region from AECO and Sumas are based on estimated pipeline costs to move the gas into the region. For new resources in the Power Plan, these costs are estimated to reflect incremental cost of delivery capacity, which is more appropriate for long-term planning. However, that makes comparison of actual spot prices with the forecasts difficult. Nevertheless, it appears that actual difference between the spot prices of natural gas delivered to Stanfield, Oregon and prices at the AECO trading hub are less than the cost forecast in the power plan to deliver natural gas from AECO to Stanfield (or PNW-E). In some years the Stanfield prices are actually lower than the AECO price. This is probably due to the delivery of low-priced natural gas from the Rocky Mountain area, which has limited exporting pipeline capability, to Stanfield via the Williams Northwest Pipeline. It is likely that the higher delivered prices used in the plan are more appropriate to a power plant that has purchased pipeline capacity to ensure its ability to get natural gas when it is needed. This is an issue that staff will discuss with the Natural Gas Advisory Committee.

Figure 5



Conclusions and Implications

There is some inconclusive evidence that recent natural gas prices, and other forecasts of prices, are somewhat higher than the Council's forecast range. How would higher natural gas prices affect the outcome of the Council's Power Plan? As part of the plan development, sensitivity cases were run assuming higher natural gas prices. In general, higher natural gas prices would translate into higher electricity price forecasts and higher cost for gas-fired power generation. Higher natural gas prices would tend to make conservation and wind more attractive. However, the amount of conservation and wind in the plan were constrained by assumed development limits that were effective in most futures modeled. Therefore the mean development of these resources would be only affected marginally by higher natural gas prices. Development of natural gas-fired resources does not occur until very late in the planning period and there are few short-term actions that would change based on higher natural gas prices.