OVERVIEW OF GAS VERSUS ELECTRIC PRICES
for Florida Combined Heat & Power (CHP) / Distributed Generation (DG) Projects

Advantek Consulting, Inc.
June 2003

Primary reference:
Annual Energy Outlook 2003 With Projections to 2025
Energy Information Administration, Office of Integrated Analysis and Forecasting
U.S. Department of Energy, Washington, DC 20585

Pertinent Highlights

With projects such as the Alaskan pipeline and various LNG facilities coming online over the next number of years, the EIA said gas prices are projected to increase in an "uneven fashion." Despite the short-term impact when projects come online, the EIA predicts average gas prices will move higher as "technology improvements and new supply sources prove unable to completely offset the effects of resource depletion and increased demand."

"Prices are projected to reach about $3.70 per Mcf by 2020 and $3.90 per Mcf by 2025 (equivalent to more than $7.00 per Mcf in nominal dollars)," the EIA said in its forecast. "At roughly $3.70 per Mcf, the 2020 wellhead natural gas price in AEO2003 is more than 35 cents higher than the AEO2002 projection, due to a downward revision of the potential for inferred natural gas reserve appreciation and a reduced expectation for technology improvement over time. As demand for natural gas increases, expected technology improvements do not completely offset the effects of resource depletion."

On the electricity front, the forecast said coal would remain the primary fuel for electricity generation through 2025. However, the share of electricity generated with gas is projected to increase from 17% in 2001 to 29% in 2025, while the coal share is projected to decline from 52% in 2001 to a still dominant 48% in 2025. In addition, the EIA said 74 gigawatts of new coal-fired generating capacity is expected to be constructed between 2001 and 2025.

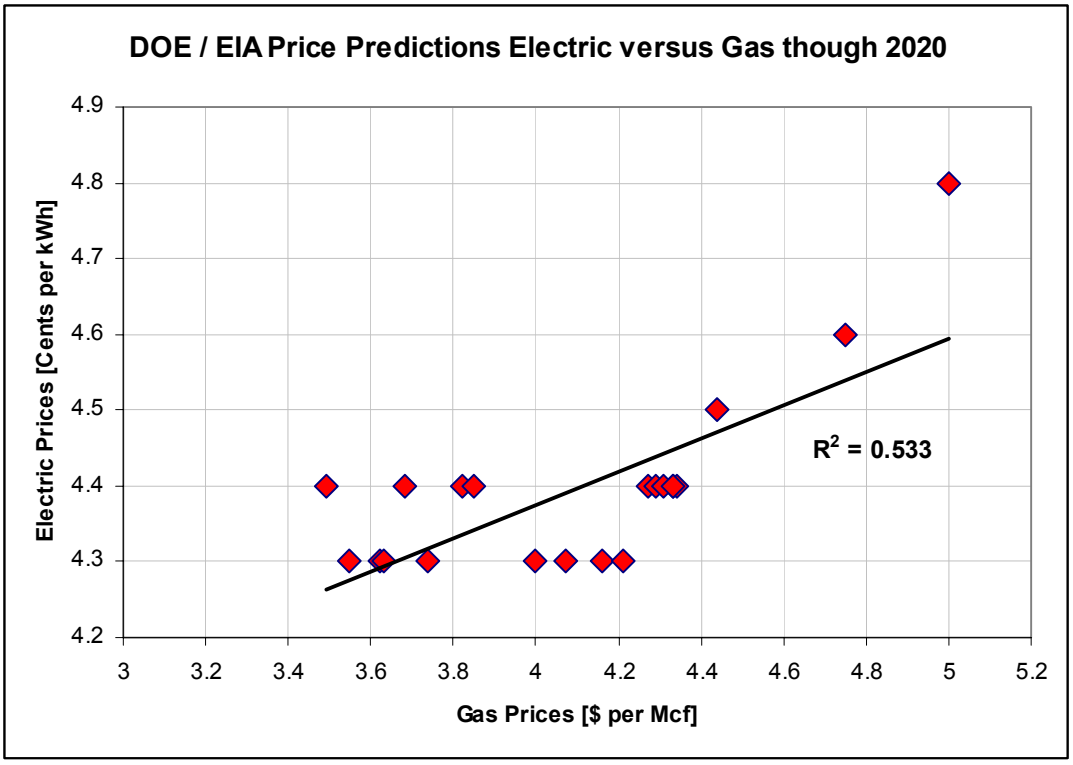
As a result of relatively cheap power prices, renewable electricity generation is expected to increase slowly, likely at a rate of 2.1% a year. Including combined heat and power, total renewable electricity generation is projected to increase from 298 billion kWh in 2001 to 495 billion kWh by 2025. The EIA said growth is also expected to be slow because competitive electricity markets favor less capital-intensive natural gas technologies over coal and baseload renewables in the competition for new capacity.

A marketer quoting Florida Gas Transmission Zone 3 a little more than a nickel behind Henry Hub said that signals how weak demand has gotten in the Florida market this month. Zone 3 had commanded as much as a dime premium over the Hub as recently as late October. Not coincidentally, the reversal of price positions has been accompanied by FGT the pipeline having only a few Overage Alert Days this month following frequent and extensive ones from spring through early fall. "It's called the 'oil factor,'" the marketer continued, saying he was seeing a notable amount of fuel-switching to oil by power generators in Florida.

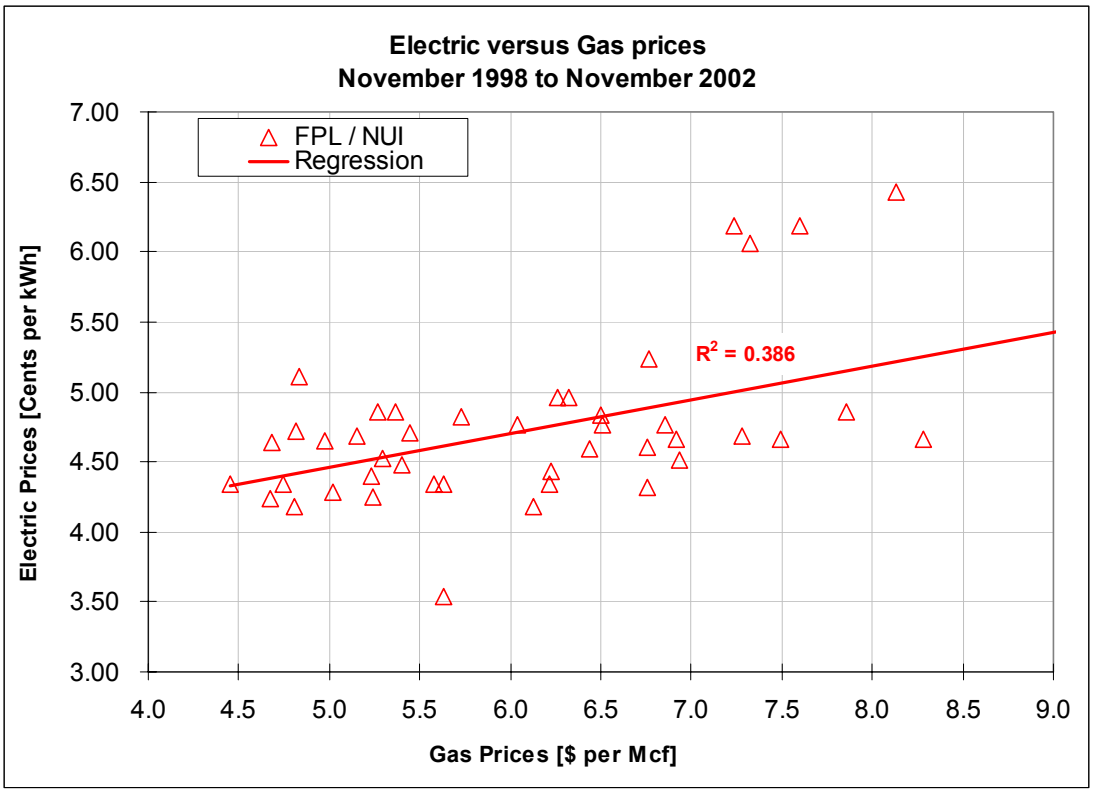
Effect of Gas Prices on Electric Prices

The viability of on-site generation is directly determined by the cost of fuel used by the prime mover, versus the price of the electricity offset by the generator. CHP / DG projects are favored when electric prices are high relative to gas prices. The current concern about rising gas prices seems to lessen the economic viability of CHP / DG projects. One view is that since much of Florida's electric power is generated from gas, the price of electricity will also rise (with a 3 to 6 month delay); this means that the economic effect on CHP/DG projects would be minimal. A competing view is that electric generators will switch fuels from gas to oil wherever possible (and not all areas are served by gas-fueled plants), so gas prices will rise faster than electric prices; this means savings from CHP/DG projects would be significantly reduced.

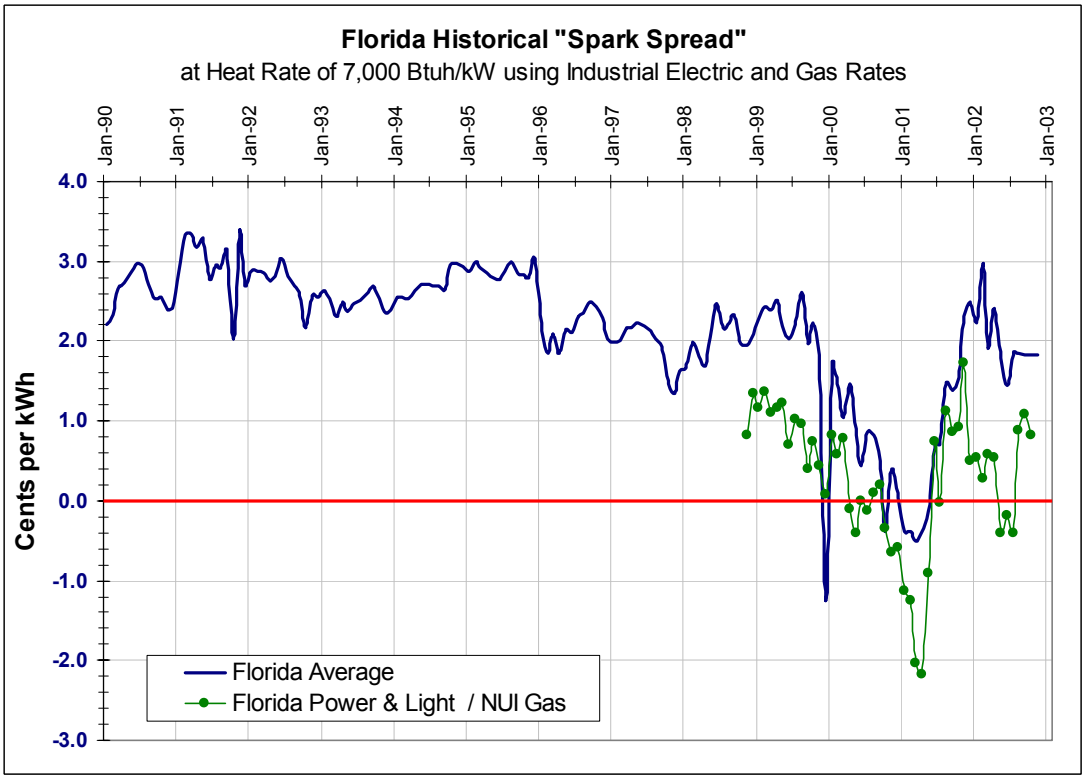
EIA projections seem to support the existence of a correlation between electric prices and gas prices, as plotted in the chart below. In essence, the correlation coefficient means that 53% of the variation in electric prices is explained by variation in gas fuel costs. However, at the lower range of gas costs, electric costs seem to be unaffected. Furthermore, the percentage increase in electric price is about half the percentage increase in the corresponding gas price.



The next chart *Electric versus Gas Prices* shows four years of historical Florida Power & Light industrial electric rates versus NUI Gas prices. These data also seem to support the view that there is significant correlation between electric and gas prices, and that as gas prices rise, so will electric prices. Again, the percentage increase in electric price is about 60% of the percentage increase in the corresponding gas price.



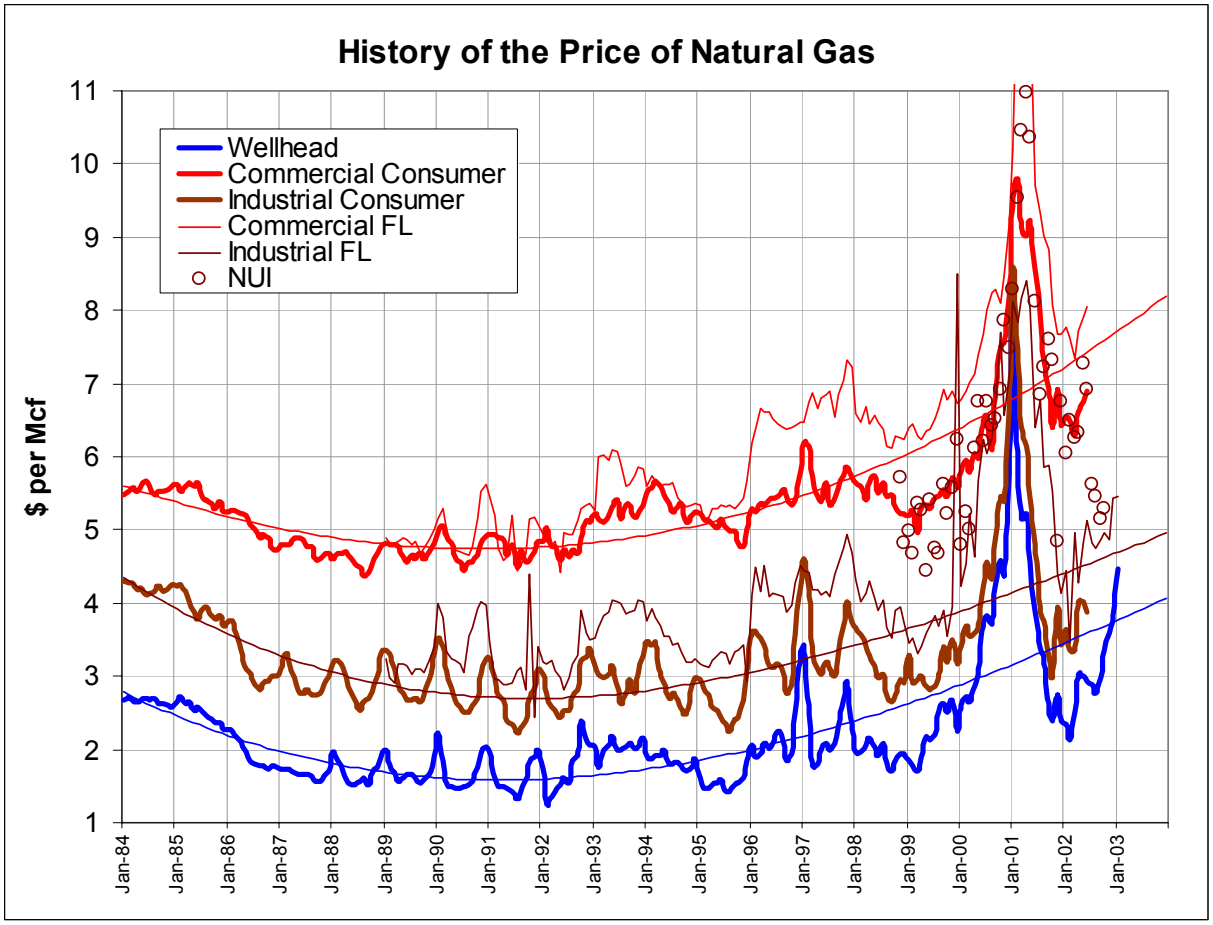
The same data were used to calculate the "Spark Spread," which is the cents per generated kWh that can be saved by a CHP project. Spark Spread is the cents per kWh potential gross savings compared with electric utility prices. For example, a Spark Spread of 2.0 means that the site could generate it's own electricity with a gross savings of 2 cents per kWh.



Commodity Prices

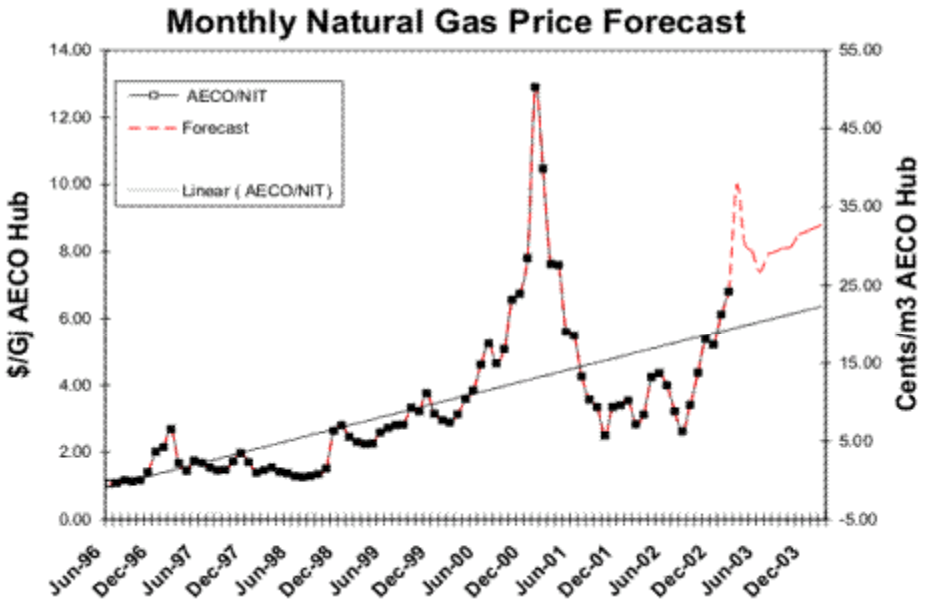
Natural gas production is expected to increase more slowly than consumption over the forecast period, from 19.3 trillion cubic feet in 2000 to 29.0 trillion cubic feet in 2020. Production over the forecast period is expected to total about 500 trillion cubic feet, or roughly 40 percent of the 1,281 trillion cubic feet of estimated recoverable resources as of the beginning of 1999.

Like any commodity price, however, actual natural gas prices are likely to oscillate significantly around the trend line projected in AEO2001 as a result of business cycles in the industry, unusual seasonal temperature variations, or other special circumstances like war and pipeline ruptures — the kinds of events that have been experienced in the past 24 months.



Nonetheless, short-term predictions through December 2003 show a definite significant increase in natural gas prices to as much as $7.00 per Mcf as shown in the next chart. In no case do long-term EIA projections exceed $4.53 per Mcf[1], before transport (T) and local delivery company (LDC) charges. T&LDC charges have historically totaled about $1.50 per Mcf for large users with interruptible service.

[1] AEO2001 National Energy Modeling System, runs AEO2001.D101600A, OGHRES.D111400A, OGLRES.D111400A, OGHTEC; Low Resource Scenario.



Gas Price Drivers

Weather, the geopolitical situation and gas storage levels are determining short-term prices. The war in Iraq caused higher prices as fallout from high oil prices. The worrying thing is now that the war is over and oil prices have dropped, gas prices are still high. Gas storage levels declined over the winter due to the long, cold winter, and these levels are not expected to be built to comfortable margin by winter.

In the long term, economic activity, demand/supply balance and the price of oil determine gas prices. Natural gas demand in North America is increasing at about 2.5 % per year whereas supply is increasing at about 1%. Economic activity is seen to be increasing through 2004. Production from many older gas wells is declining quite rapidly. More natural gas is being used for electricity generation. Any new electricity capacity brought on line right now is generated by natural gas, rather than oil, coal, water or nuclear. If the price of crude oil increases, some industries switch to natural gas. Many developed this dual fuel capability when gas prices skyrocketed in 2001. Prices are not expected to come down until new major gas pipelines are built connecting new gas fields in Alaska and the Northwest Territories, which is at least a few years away.

Electric Price Drivers

In deregulated States, electricity industry restructuring is expected to contribute to declining projected prices through reductions in operating and maintenance costs, administrative costs, and other miscellaneous costs. After 2008, average real electricity prices are projected to increase by 0.4 percent per year because of rising natural gas prices and a growing need for new generating capacity to meet electricity demand growth. Real electricity prices reach 6.6 cents per kWh in 2020 in AEO2003, identical to the price in AEO2002, and 6.7 cents per kWh by 2025 as natural gas prices continue to increase.

Calculation of Project Economics

- Despite currently rising gas prices, and discussions about a natural gas crisis due to increased demand versus production, the available historical data and price predictions seem to indicate that CHP / DG projects will continue to remain viable over the long term. Two factors seem to dominate the analysis: First, electric prices have and continue to rise along with gas prices, although at a lesser percentage increase. Second, market forces (such as fuel switching, and decreased demand and increased production due to higher prices) seem to keep EIA price predictions steady over the long term (several years) even though there is stormy variation, uncertainly and instability from quarter to quarter.

- For large Florida CHP projects, we suggest a mid-scenario commodity price of $3.84, plus $1.50 for transportation and local delivery, for a total price of $5.35 per Mcf. It must be stressed that aggressive negotiation with the T&LDC (perhaps involving the Florida PSC) will most likely be needed to realize a contract to purchase gas at this extreme low price. Factors to be considered in negotiation should include year-round, constant, predictable, steady gas consumption; and the benefit to the LDC of demonstrating of a new gas-fueled technology.

- Nonetheless, energy price predictions are a very complex issue. In reality, no one can predict the future with great certainty. Another scenario using EIA national data indicates a possible decrease in spark spread by 21% from 1.8 to 1.4 cents per kWh over the next ten years. This would have the effect of lengthening a project's payback period by from approximately 2 to 4 years. This case should be calculated using a delivered gas price of $6.50 and presented alongside the mid-scenario CHP economic analyses.