The Past, Present, and Future of Fuel Prices for Power Generation: What Does it All Mean?

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Disclaimer and Acknowledgements

• The views expressed in this presentation are my own and they do not necessarily reflect the views of the Public Utility Research Center, its sponsors, or its associates.

• The source data for the material presented here comes from the United States Energy Information Administration (EIA) with analysis provided by myself unless otherwise noted.
Presentation Outline

• Looking back where we have been
  – After all, we can’t tell where we are going unless we understand how we got here.

• Do we really know where we are going
  – Do forecasts really tell us where prices are going?

• What will affect the ultimate price path upon which we will travel?
  – So many possible drivers...so difficult to analyze or to build into forecasts.
Where Have We Been?

• Up until 1999-2000 we had been in a world of relatively steady fuel prices for power generation.
  – Electricity prices were stable in nominal terms and declining in real terms

• Since 2000, oil and natural gas prices have been more volatile and on the march upward
  – We have seen increases in electricity prices in both nominal and real terms
Average Residential Rates Florida vs. US

Year

Cents/kWh

Florida (Nominal)
Florida (Real 2005 Cents)
US (Nominal)
US (Real 2005 Cents)
Fuel Price Trends

• Since 1999 we have seen the price of natural gas and fuel oil move inexorably upward.
  – Will this trend continue or will prices level off
  – The answer depends on a lot of things…opening more areas for natural gas exploration, siting and building LNG facilities, nature of future climate change policy, geo-political events, hurricanes.

• Since 2003 we are seeing increases in delivered coal prices that may have a large impact on electricity prices
  – Delivered prices depend on the cost of transportation fuels
  – Prices have a large impact given the continued importance of coal in the fuel mix
  – Still remains a bargain compared to other fuels
  – Transportation bottlenecks in rail
Average Delivered Cost of Fuels in Florida and US
(nominal cents/mmBtu)
Effects of Fuel Prices on Rates

- As fuel prices fluctuate, electricity prices will also fluctuate, but with a lag
  - In Florida and other regulated states, the fuel clause is adjusted once each year so the effects from one year are seen in the subsequent year
  - In market environments such as the Northeast and Mid-Atlantic, fuel prices changes are reflected more immediately

- But large fuel price increases result in smaller electricity price increase in percentage terms
  - Fuel is but one part of rates, and...
  - Fuel supply is spread over different fuels
So Where are Prices Going?

• According to the Energy Information Administration (EIA) in 2005 prices:
  – Coal will hover in the $1.60/mmBtu range out to 2020
  – Natural Gas will come back down to the $5.00/mmBtu range by 2012-2013
  – Oil prices are forecast to fall to approximately $50/bbl by 2012 and remain around $50 out to 2020.
Forecast Coal Prices from AEO 2005-2007 for the Period 2007-2020

2005 Dollars/mmBtu

AEO 2005 Forecast
AEO 2006 Forecast
AEO 2007 Forecast
Forecast Natural Gas Prices from AEO 2005-2007 for the period 2007 to 2020

2005 Dollars/Mcf

Year


2005 AEO Forecast
2006 AEO Forecast
2007 AEO Forecast
Forecast of Oil Prices from AEO 2005-2007 for the Period 2007-2020

2005 Dollars/bbl

Year

AEO 2005 Forecast
AEO 2006 Forecast
AEO 2007 Forecast
EIA Forecasts Compared to Others

• Natural gas:
  – EIA projections seem to be on the low end of other forecasts
  – Other forecasts call for higher demand

• Coal
  – EIA forecasts seem to in the middle of other forecast costs
But do Forecasts Really Tell Us Where We are Going?

- EIA provides the energy industry with comparisons of its forecasts to actual prices
  - Coal: the forecasts are pretty accurate compared to other prices
  - Natural Gas: Since 2000, there seems to be a severe under-forecasting trend that has gotten bigger on a $/mmBtu basis.
Average Absolute Forecast Deviations for 10 Years Prior to the Actual Year

Actual Year

Deviation in $/mmBtu

Natural Gas

Coal

2000 2001 2002 2003 2004 2005
What Will Drive Future Fuel Prices for Generation?

• Climate Change Policy
  – Could increase demand for gas pushing up prices
  – Could decrease demand for coal pushing prices down

• Technology Realizations
  – Will IGCC become a proven technology and CO2 sequestration become a viable alternative sooner rather than later…sooner may relieve price pressures on gas while providing support for coal prices

• Construction Cost Realizations
  – Can nuclear be built as cheap as some believe? This will have consequences on fuel prices in the long term.
What Will Drive Future Fuel Prices for Generation?

• Effectiveness and Penetration of Renewable Energy Mandates, Efficiency and Conservation Programs, and Demand Response
  – Could decrease demand for gas and coal keeping prices down and fossil generation demand is kept down.
  – DR can especially impact gas prices as gas is the marginal fuel.

• Possible expansion of areas open to gas E&P activity and LNG expansion
  – But LNG makes prices subject to world supply and demand dynamics directly

• Future hurricane activity in the Gulf if we have entered a period of increased activity
What Will Drive Future Fuel Prices for Generation?

• World Market Dynamics…it is probably reasonable to expect that gas and oil prices will remain highly correlated
  – Increasing world demand for oil and gas
  – Increasing geo-political instability?
  – Or breakthroughs in major oil and gas producing regions?
  – Oil price affects transportation and mining costs for coal
  – LNG is becoming a world, rather than a regional, market
Levelized Cost per kWh of New Generation Options at 2005 Florida Fuel Prices ($8.44/mmBtu Gas and $2.31/mmBtu Coal) at Different CO2 Prices

- No CO2
- $10/ton CO2
- $25/ton CO2
- $50/ton CO2
- $75/ton CO2

Options include:
- New PC Coal w/scrubber
- IGCC Coal
- Advanced Combined Cycle Gas
- Nuclear
Levelized Cost per kWh of New Generation Options at $2/mmBtu Coal
and $6.50/mmBtu Gas at Different CO2 Prices

![Bar Chart]

- New PC Coal with scrubber
- IGCC Coal
- Advanced Combined Cycle
- Nuclear

Costs are shown for different CO2 prices:
- No CO2
- $10/ton CO2
- $25/ton CO2
- $50/ton CO2
- $75/ton CO2
Concluding Thoughts

• The direction of natural gas prices is at best very uncertain
  – Too many variables that will affect future prices that are yet unknown
  – And with past forecasting errors, there is no reason to believe we will get better very quickly
  – With the recent FPL Glades decision, it seems that the specter of climate change policy trumps lower/more stable fuel price considerations from coal at the FPSC.
  – The Taylor Energy Center Developers seem to have gotten this message as well.

• Coal prices seem much more predictable
  – And past forecasts have been fairly accurate…
  – But with future uncertainty in climate change policy, technology, this may not be so certain

• Stay tuned...we do live in interesting times
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