050879

Introduction

Now that ICF has finished its analysis they should be commended for the detailed and rigorous job they have done to provide the City Commission with as much relevant and usable information as is possible. It is my belief that the City Commission got great value for the money on their review and that it helps bring into focus the main issues facing the Commission as it attempts to make its decision regarding the City's future power needs. As a frequent participant in this public process I am satisfied that ICF has made a good faith effort to address the concerns I expressed regarding the interim report. I incorporate by reference all written correspondence to the City Commission to date.

This exposition is organized as follows. The next two sections describe the dimensions of risk and uncertainty along with a qualitative characterization of the types of risk a utility like GRU and the City Commission faces when making a decision about how to meet future power needs. The next section qualitatively characterizes the four options analyzed by ICF followed by a section describing one process by which the utility can narrow down the multitude of possible operating environments that are "likely" going forward based on experience and reasonable expectations. The final two sections provide a set of decision criteria and then draw conclusions for future power needs based on the decision criteria and likely operating environment.

Dimensions of Risk and Uncertainty

Types of Risk/Uncertainty Associated with Future Power Needs Decision

There is a multitude of risks/uncertainty associated with the decision on how to satisfy the future power needs of any utility including the City of Gainesville and GRU. The general categories are listed below.

- Input price and input security of supply volatility;
- Wholesale market price volatility, power availability, and reliability;
- Technology, and Construction/Financing risk/uncertainty;
- Policy risk such a climate change policy and new source review enforcement policy; and
- DSM implementation risk.

Qualitative Dimensions of Risk/Uncertainty

Unfortunately, it is difficult in general to quantify these areas of risk/uncertainty. However, we can describe some of the risk/uncertainty in a qualitative manner through what I will call the "Time Dimension of Risk/Uncertainty" and the "Controllability of Risk/Uncertainty".

Time Dimension of Risk:

- One time, up-front risk/uncertainty which happens after the decision is made, but is a one time event such as a cost overrun, and following the event, the realization, there is no uncertainty.

- One time, future risk/uncertainty which happens when a decision is made in the future such as climate change policy, but once the decision is made, the uncertainty is gone.
- Ongoing uncertainty (short-term and long-term) is associated with uncertainty that is repeated over time such as the uncertainty of fuel market prices. This uncertainty can be short lived or long lived.

Controllability of Risk/Uncertainty:

- Physically Controllable meaning the utility has control of physical assets to offset the uncertainty. This also provides some financial control as well.
- Financially Controllable refers to activities such as hedging in fuel markets. The utility does not physically control the asset, but has a financial contract to protect it from price volatility.
- Uncontrollable refers to uncertainty that is out of the utility's hands such as spot wholesale market prices, spot fuel prices, or any activity that is not controlled by the utility such as DSM implementation by customers.

Qualitatively Characterizing the Types of Risk

Input Price and Input Security of Supply Volatility

This type of uncertainty is a **long-lived, ongoing** type of uncertainty. Natural gas prices have fluctuated wildly over the last decade while delivered coal prices have fairly stable over the last decade. In theory, this kind of uncertainty is **financially controllable** through the use of forward or financial futures or options contracts.

The contracting practices for coal are such that they provide price stability. Transportation contracts can last up to 10 years and mine mouth coal contracts have durations in today's market of up to 10 years as well, though the term of coal contracts have been decreasing over time. **Consequently, with low volatility historically and traditions of forward contracting, coal price uncertainty is easily controllable over time.**

Unfortunately, the same cannot be said of natural gas. While forward contracting of pipeline transportation is traditional in the industry, the natural gas commodity price is highly volatile and susceptible to supply disruptions as we have seen this past year with almost all of the Gulf gas production taken off-line in the wake of Hurricanes Katrina and Rita. Moreover, the possibility of financially hedging gas prices is equally volatile when examining the Henry Hub futures price over time. **Natural gas prices and availability are highly volatile and there is currently little use of long-term forward contracting or long-term financial hedging in practice.**

With biomass fuels, there is a great deal of uncertainty regarding the price and availability of fuel as well as transportation. As biomass fuels are not widely traded, there is no financial hedging market for biomass. Moreover, the availability of biomass going forward for large scale applications is still the subject of some debate. **Given the lack of**

information currently, all that can be said is that biomass uncertainty cannot be controlled at this time.

Wholesale Market Price Volatility, Power Availability, and Reliability

Like input prices and availability, this type of uncertainty is also a **long-lived, ongoing type of uncertainty and can often be driven by swings in the spot fuel markets**. Prices off-peak (in season and time of day) could be as low as $20/MWh, but on peak (by season and time of day) has been in excess of $1000/MWh in some markets. Again, like fuel prices and availability, this kind of uncertainty is **financially controllable.** However, if a utility like GRU and the City of Gainesville chooses to self-generate or be self-sufficient, this type of risk is **physically controllable, and wholesale purchase risk can be avoided to a large extent.** However, if the utility's generating facilities are selling power in the market, there is wholesale market sales risk that can be financially controlled as well through forward contracting.

Reliability is also **long-lived, ongoing type of uncertainty,** but it can be **physically controlled** or hedged by having enough generating, firm deliverable contracts and/or interruptible load capacity to meet mandated reserve requirements. As part of good utility practice, if an unexpected, short-duration outage occurred, other utilities will help serve the load (for a price of course) in order to maintain the reliability of the entire grid. Should the unexpected outage be more prolonged, it is likely the financial consequences will be uncontrollable in the short-term, but can be controlled through contracts in the medium to long-term.

Technology, Construction, and Financing Risk

This type of risk is in general a **one-time, upfront risk as once the realization of the construction costs and financing costs are realized, they are sunk**. I include as part of this risk technology risk as the technology risk could lead to construction times and costs running above the levels originally expected. **This type of risk/uncertainty can be controlled through fixed cost contracting for construction, and federal loan guarantees for financing**.

Technology risk may also have an **ongoing, short to medium-term** aspect as well if the technology proves to not run at the expected availability and capacity factors which requires the possibility for short-term wholesale market energy purchases. **This type of risk may be controllable through contracting or insurance**, but it is not clear if these types of instruments are readily available.

Policy Risk/Uncertainty

This type of risk is a **one time risk with its realization sometime in the future**. But once the policy has been decided, there is certainty going forward. This type of risk is **not controllable** by the utility, but it can be anticipated well enough in advance so as to make decisions accounting for the possibility.

DSM Implementation Risk/Uncertainty

Unlike the construction and operation of a generating facility that can be controlled directly by the utility, **the actual implementation of DSM projects by the utility's customers (behavior), given the incentives provided, is uncontrollable**. Moreover, **DSM programs are assumed to be continuously ongoing over time, resulting in an ongoing long-term type of risk/uncertainty**.

Qualitative Risk Characterization of the Four Options

Max DSM and Max DSM/Biomass

These two options are much the same except one has a 75 MW biomass CFB unit added to the mix. In either case according to the ICF report, there will not be enough DSM and capacity in order to meet energy or reserve requirements. Consequently, there will be a large dependence on wholesale power purchases which in the ICF report are assumed to be driven by inexpensive coal IGCC facilities built in the state.

- There is **ongoing, long-term risk in the wholesale market which is largely uncontrollable** as there is only 30 MW of firm import capacity by which to sign forward contracts. Moreover, there is no guarantee all the coal IGCC predicted to be built, will actually be built on the grid leaving open the likelihood of natural gas units setting the price. In order to satisfy reliability requirements, according to the ICF report, GRU will have to build 249 MW of gas fired combustion turbines by 2025 to meet the reliability reserve requirements to control the availability risk.
- Side-by-side with wholesale market and reliability uncertainty is fuel market uncertainty and particularly natural gas which is **an ongoing-long-term uncertainty that is largely uncontrollable by utilities** under current practices except in the very short-term. This will be a problem for both wholesale purchases as well as fuel to run the combustion turbines mentioned above. For the Biomass CFB, there is a question of the delivered cost of biomass and there is no known hedging instrument for biomass fuels as yet.
- **With DSM, there is ongoing, long-term uncertainty that is uncontrollable** as the utility must depend on customers making the decisions rather than GRU itself. Moreover, it is well known historically that the reality of DSM implementation has not matched the expectation.
- Some may believe that because the utility does not build coal-fired generating capacity, it is hedged against climate change policy risk. In reality, **GRU is still exposed to climate change policy risk, but through the wholesale market where sellers will try to pass along climate change compliance costs and this would be factored into spot and contract purchase alike making this risk uncontrollable!**
- For the Biomass CFB unit, there is technology, construction, and financing risk which is **a largely one time, upfront risk**. Fortunately, the CFB technology is

well established, but the use of biomass only would be a new application increasing technology risk.

Solid Fuel 220 MW CFB (w/30 MW biomass)

This option is the most conventional of the four options studied by ICF. Through 2020 the addition of this unit will allow GRU to meet its reserve requirements and through much of the period it will be a net seller in the wholesale market.

- There is **ongoing, long-term risk in the wholesale market which is largely uncontrollable** due to the lack of firm export capacity but this risk here is related to wholesale sales rather than purchases. However, **there is little downside risk** as GRU will only be selling when the price in the market is greater than its costs. In fact, if the wholesale market price is set by gas units, then it will mean ever greater revenues by which to offset costs.
- From the standpoint fuel for the CFB, there is **ongoing, long-term risk, but is largely controllable in the medium to long-term with mine mouth coal and transportation contracts that have terms up to 10 years in duration.**
- **Because GRU self-builds and generates in this option there is no reliance on DSM to meet demand or reserve requirements, thus controlling the DSM uncertainty.** Moreover, it will be able avoid natural gas price volatility as it will not need to build combustion turbines to meet reserve requirements.
- CFB offers **some controllability of policy risk with respect to climate change** as GRU has proposed to co-fire up to 30 MW of biomass (considered carbon neutral) with coal and petroleum coke. This capability could be enhanced with additional retrofits but at the cost of capacity deratings going forward.
- **The technology, construction, and financing risk associated with the CFB technology is probably the least of all the generating options examined by ICF** as CFB is a proven technology in use at many utilities in the US.

Solid Fuel 220 MW IGCC (w/30 MW biomass)

This generation option is the cleanest and most advanced coal-fired technology currently. Consequently, **it will have a great deal of technology, construction, and financing risk compared to the other generating technologies. However, the components of IGCC, gasification and combined cycle technology are well understood and it is but a matter of combining the technologies together.** Of course, ways to mitigate these risks include federal loan guarantees if available, turn-key fixed price contract to hedge cost over-runs, and insurance against problems getting the unit up and running at the expected capacity factors during the initial year or so of commercial operations.

With respect to the other risks, IGCC has the same characteristics as the 220 MW CFB described above except IGCC has another way of mitigating climate change policy risk. In addition to gasifying biomass, IGCC also can capture CO_2 under high pressures and could possibly sequester it more inexpensively than with CFB or conventional coal technologies.

Narrowing Down the Cases by Which to Make a Decision

ICF has provided the Commission with 36 possible cases in which decisions must be made. The 36 cases are made up of combinations of 3 natural gas price cases, 3 CO_2 policy cases, 2 demand growth cases, and 2 biomass fuel cost cases. Obviously, this creates a dilemma regarding which case or set of cases is the most relevant for decision making.

CO_2 Policy

I think it is reasonable to assume that at some point in the future there will be some sort of CO_2/Climate Change Policy in the United States. This inevitability is made all the more clear by the following **quote from former Assistant EPA Administrator for the Office of Air and Radiation, Jeffery Holmstead, at the Coal 2020 Conference in October 2004.**

> **"Unless there's some changes in the way the scientific community is going, there in some point in the future will be a carbon-constrained world."** [1]

Such a statement from a Bush Administration appointee only shows the inevitability of a carbon policy at some point in the future. Morever, with three separate bills in Congress from Senators McCain and Leiberman, Senator Jeffords, and Senator Carper, it is only a matter of time until we do live in a carbon constrained world. Consequently, the 12 cases where there is no CO_2 policy in place can be reasonably eliminated.

Fuel (Natural Gas) Price Scenarios

For fuel there are three cases (low-4.50, base-6, high-7.50) with CO_2 policy and (low-4, base-5.50, high-7) without CO_2 policy. All prices are in dollars per million BTUs. If the assumption is made that there will be a carbon policy at some point in the future, then it is extremely unlikely that we will see natural gas prices at the low levels as represented in the analysis. This would be the case since a carbon policy would likely cause some utilities to shift to natural gas for generation increasing the demand for gas. And even if areas off the Florida Gulf Coast and US Atlantic cost are opened for gas exploration, it is doubtful that the increase in supply would offset the increasing demand for gas for generation. Moreover, while there are many plans for LNG terminals to increase natural gas imports, it is not clear they would be sufficient to drive down the price. Consequently, it seems reasonable to eliminate the low gas price scenarios from consideration given the assumption of a carbon policy at some future date. This eliminates another 8 cases and along with the 12 cases eliminated before results in 16 cases to examine.

---

[1] See "EPA Official's Remarks Lead CEI to Call for His Firing" by Iain Murray, October 13, 2004 edition of *Cooler Heads Newsletter*

Making a Decision based on the 16 Remaining Scenarios

In choosing the method by which Gainesville's future power needs are met, there are four dimensions that are perhaps the most important in my opinion: 1) Future Revenue Requirements (lifetime costs); 2) Environmental Attributes; 3) Minimizing risk and controllability of the risk remaining; and 4) Affordability and fairness for the City's poor.

Future Revenue Requirements

Under all 16 remaining scenarios **IGCC has the lowest net present value (NPV) of revenue requirements.** Under all but four scenarios driven by high CO_2 costs and baseline biomass costs, **CFB has the second lowest net present value (NPV) of revenue requirements.** Such consistent results show the robustness of the 220 MW solid fuel options under the likely scenarios to be faced by the City of Gainesville and GRU going forward.

In fact, ICF in its report has attempted to account for the technology and construction risk for IGCC by adding $534/kW cost to its initial capital cost estimate (approximate 25% increase) which resulted in a $46 million increase in net present value of revenue requirements in the base case. Because this is an upfront cost, it should not be affected by the operating environments going forward. Consequently, adding the $46 million cost to IGCC in all cases remaining does not change the outcome for 2006-2025 at all (the relevant comparison). Moreover, with this cost increase, it results in a capital cost that is well in excess of other estimates of the IGCC cost presented earlier correspondence with the City Commission.[2]

Aside on Carbon Policy, Natural Gas Prices, and Expected New Generation Additions in Florida

Also, if there is a carbon policy, there will be more gas-fired generation on the whole as ICF has shown, and it will raise the wholesale prices making the DSM options look less attractive and the IGCC and CFB options look more attractive in terms of wholesale market activity. Additionally, given the risk-averse nature of the industry, it seems unlikely that so many IGCC facilities will be built. JEA's current plans to not call for IGCC nor do FP&L's plans and these are based on the perceived risk. Consequently, gas will likely set the price in the market making the DSM options less attractive and the solid fuel options more attractive than what even the ICF runs would indicate.

Environmental Outcomes

Currently Regulated Pollutants

---

[2] See letter delivered by email March 20, 2006. The range of IGCC capital cost presented was from $1,200/kW to $1,800/kW. ICF estimates the cost at just over $2000/kW with an adder to over $2500/kW.

Gainesville and Alachua County currently exceed the EPA NAAQS by a large percentage. As the emissions from GRU will be much lower for all criteria pollutants and precursors, our air quality will improve rather than be degraded.

According to the ICF Report the following would be the emissions change from current levels of operating a 220 MW IGCC or CFB facility by GRU inclusive of the Deerhaven 2 retrofits already approved by the City Commission. **Note that these emission reductions are occurring as electricity generation is rising.**

- **Emissions of sulfur dioxide (SO_2) will be reduced from 7,000 tons per year to 2,000-2,500 tons per year.**
- **Emissions of nitrogen oxides (NO_x) will be reduced from 4,000 tons per year to less than 2,000 tons per year.**
- **Emissions of mercury will be reduced through the Deerhaven 2 FGD retrofit and through the near elimination of mercury emissions from the IGCC or CFB technologies.**

In spite of these vast improvements and the fact the Gainesville and Alachua County are already in attainment, there are those who wish to reduce local emission even further arguing there will be increased health benefits. In the extreme, a zero emissions level is not a realistic goal as the incremental costs would greatly exceed the incremental benefits. While it would take a detailed analysis to pin down the local health benefits, a recent study from researchers at Resources for the Future (RFF) shows a range of optimal aggregate emissions levels, due to the uncertainty in benefits, between 0.9 million tons and 3.1million tons for SO_2 and 1 million tons and 2.8 million tons for NO_x. Not coincidentally, the recent Clean Air Interstate Rule sets aggregate emissions in the eastern US at 3.5 million tons and 2.2 million tons for SO_2 and NO_x respectively, which is close to the range of the optimal level.[3] This suggests that we are relatively close to the optimal level of emissions already and the net benefits of further reductions are small or possibly even negative nationwide.

Additionally, engaging in demand-side management and energy efficiency (DSM & EE) while **relying on wholesale markets simply shifts the emissions to other power plants and may even increase our exposure to emissions due to transport and the possibility that the plants running to produce power for the wholesale market may produce more emissions than a IGCC or CFB facility operated by GRU.**

Carbon Emissions

Currently, there is no US policy on Global Climate Change or carbon. However, as mentioned above, both IGCC and CFB provide some option value on carbon sequestration or reduction in two ways. The first is through the use of biomass in the IGCC or CFB facility. If biomass under future carbon policy is considered zero net CO_2 emissions, then simply using biomass as a fuel provides a hedge against future carbon

---

[3] See Spencer Banzhaf, Dallas Burtraw, and Karen Palmer, "Efficient Emissions Fees in the US Electricity Sector" , Discussion Paper 02-45, October 2002 at http://www.rff.org/Documents/RFF-DP-02-45.pdf . This paper was later published in *Resource and Energy Economics* 26, pp. 317-341, 2004.

policy. Secondly, with IGCC in particular, less expensive sequestration is possible as CO2 under pressure is less expensive to capture from the exhaust stream. Regardless of the method of carbon emissions abatement, there are costs associated with retrofits of the facility as well as possible capacity deratings so abatement is not costless. However, if we wish to act in an environmentally conscious manner, deploying an option we can control is better than hoping for other generation owners, who would be supplying power to us in the wholesale market under the DSM options, to have the same kind of environmental consciousness as those in the City of Gainesville.

Minimizing and Controlling Risk

It is difficult to think about minimizing risk when the risks GRU and the City face are qualitative in nature. However, **one can think about minimizing risk by attempting to control or eliminate the ongoing, long-term risks.** With the choices at hand, there is a trade-off between the one-time risks (technology, construction, and financing) and the ongoing risks associated with the decision. However, even the one-time risks can be controlled to some extent through contracting and choices.
Of the four options, the two with the least amount of ongoing, long-term and uncontrollable risks are the two 220 MW solid fuel options, CFB and IGCC. Fuel and fuel transportation costs can be contracted forward, the wholesale market risk is all upside risk as GRU would not sell in the market unless the price was greater than costs. The technology, construction and financing risks can be controlled through contracting and financial arrangements.

Affordability and Fairness for the City's Poor

One way to measure affordability is to look at the revenue requirements and translate those to rates. **Clearly, the lower the revenue requirement, the lower the electricity rates in general from an affordability perspective.**

However, there is also a fairness issue with respect to rates. That is, if we are concerned about the poor in Gainesville, we would want to make certain that we are not creating cross-subsidies in the implementation of rates that has the poor subsidizing the rich. If anything, we would want subsidies to flow from the rich to the poor! DSM programs that pass the total resource cost test (TRC) will result in cost shifts in general. Now if one considers that many of the DSM programs under consideration will only be undertaken by wealthier citizens since even with incentives, the investments in DSM equipment are likely still out of reach of the poor and lower middle class, then the DSM program have created cross-subsidies from the poor to the rich since the poor pay for the program with increased rates to see the wealthy effectively have their rates reduced. This outcome would only be prevented under the rate impact measure (RIM) test that is currently used by the City and GRU. **Consequently, from a fairness perspective, as ICF has used the TRC test to find cost-effective DSM, the Max DSM options run contrary to ideas of fairness for poor GRU customers.**

Conclusions

There are many types of risk and uncertainty as well as dimensions of risk and uncertainty that must be considered in determining how to meet Gainesville's future power needs. There are also a large number of operating environments that can be realized going forward. However, a methodical characterization of risks and the most likely operating environments based on past experience and reasonable expectations helps is better focusing the debate and decision.

Finally, with a reasonable set of attributes including cost, environment, risk minimization and control, and affordability and fairness that I believe are important to the Citizens of Gainesville in aggregate and members of the City Commission, the conclusions from the information drawn from the ICF report are clear in my mind. The best course forward over the long term is to meet Gainesville's future power needs with either the 220 MW IGCC option or the 220 MW CFB option. Moreover, I believe strongly that if Gainesville wishes to be a leader in both environment and technology that provides possible option value for climate change mitigation, then IGCC is the best course of action. IGCC provides the greatest certainty once commercially operational and working out the initial problems that may arise and at the lowest expected cost for customers.