3. DESCRIPTION OF ELECTRIC AND GAS SYSTEM ANALYSES

This chapter outlines the structure of our approach to the integrated electric/gas system analysis. In addition, it provides an overview of the institutional and regulatory factors affecting electric and gas market behavior. The chapter closes with a discussion of how the market fundamentals (*i.e.*, electric load growth and generation technology) must necessarily drive the results of our analyses.

3.1 DEFINITION OF SCENARIOS

Our integrated analyses have been designed to identify and characterize sustained imbalances between total gas demand (for electric generation and all other uses) and the ability of the gas delivery infrastructure to facilitate meeting those demands. The results of this analysis will provide a basis for identifying fundamental imbalances between energy demands and supplies—given assumed electricity and gas demands, electric and gas transmission system expansions, and new generation capacity additions.

Our gas and electric modeling has covered a range of potential electric and gas system conditions. Given that our analysis is conducted at a detailed level—utilizing hourly and daily analysis for individual locations throughout the NYCA and adjacent regions (electrically)—each analysis must be conducted independently for each modeling scenario and year.

Our analysis has focused primary on the year 2005. Our scenarios for that year are defined by electric capacity additions and gas pipeline expansions.

- On the electric side, our analysis includes three generation capacity addition scenarios. All scenarios include 527 MW of new capacity assumed to come on line during summer 2002. Additionally the three scenarios include 1,030 MW, 1,780 MW, or 4,435 MW of net capacity additions over the 2003–2005 time period (4,435 MW is an amount corresponding to the assumptions used in the analysis supporting the December 2001 Draft NYSEP, updated to reflect changes in the status of some projects). Total installed capacity in each of the addition scenarios is sufficient to satisfy NYCA installed capacity requirements (including locational requirements).

- On the gas side, all of our scenarios include 465 MDT per day of pipeline capacity created by projects that have recently been completed or will be in place by the end of 2003.[22] In addition to this capacity, our pipeline cases include expansions that provide between 0 and 800 MDT per day into downstate New York (800 MDT per day, represents the approximate total of the pipeline expansions into downstate New York with provisional FERC approval).

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22 These projects include (1) Transcontinental Gas Pipeline's Phase I Market Link project (completed in 2001) that added 115 MDT per day into the downstate market, (2) the 70 MDT per day Iroquois expansion to service the Athens project, (3) 50 MDT per day of additional capacity to the downstate market, and (4) the Iroquois Pipelines' Eastchester expansion of 230 MDT.

We have also examined cases for the years 2002 and 2010. Our 2002 case, which provides a baseline characterization of the gas and electric system performance, includes only new generation and pipeline capacity that is already operating or is under construction with expected completion dates in 2002. Our 2010 cases cover the same range of pipeline expansions as the 2005 scenarios, and all cases include new generating capacity additions during the 2003–2010 period totaling 5015 MW.

3.2 INSTITUTIONAL AND REGULATORY BACKGROUND

Market, institutional and regulatory factors will influence exactly how future gas and electric demands will be met, as described below. The extent to which new infrastructure will be added and existing infrastructure retired will depend on factors such as siting and environmental approvals, approval of tariff rates, and economic viability of projects. In addition, the rules and operating requirements of both the gas electric markets/systems must be understood before one can characterize how the gas and electric systems will be integrated to meet future electricity and gas demands. Several competing factors drive the expansion of the electric and gas systems.

- **Electric System Expansions**—Electric system expansion is taking place within the competitive wholesale market structure. It is being accomplished primarily through the addition of new generating capacity, with only limited expansion of electricity transmission capabilities almost solely through unregulated entities. New generating capacity is virtually all gas-fired, with only a portion of the new capacity having oil-fired back up capability. Independent merchant generators are responsible for the vast majority of new construction, particularly in the NYCA. Since new generation is being constructed outside of the traditional rate base regulated environment, the economic viability of this generation is driven by market forces within the context of local wholesale market rules (*e.g.*, NYISO, ISO-NE or PJM). Generators earn revenues through the sale of various electric products (*e.g.*, energy, capacity, and various forms of ancillary services).

  Gas Transmission System Expansions—Unlike electric generation, natural gas production is very concentrated geographically, necessitating long interstate transmission pipelines to deliver the gas to market, particularly to markets in the Northeast. These interstate and international gas pipelines are a highly regulated contract carriage business. Transmission rates (prices) in the United States, regulated by the FERC, are typically based on costs. As such, any pipeline expansion project is also subject to approval by the FERC. Because of the potential impact on the prices paid by existing pipeline customers, an expansion project must meet the traditional public necessity criteria. Essentially, FERC must determine that the project will be socially beneficial, a criteria that covers not only the costs to be born by existing and future customers, but also the environmental impacts on society.

  In order to pass muster on these issues, pipelines typically have had to "prove" the need for the pipeline by demonstrating customer willingness to contract for capacity provided by the project. These may be the existing customers, but more often today, they are new, "incremental" customers, often merchant power plants. Depending on the nature of the "beneficiaries" of the project, the costs may be rolled into existing rates where they are born by all customers or they are allocated to the "new" customers who must pay the incremental (marginal) costs of the expansion. The narrower the class of beneficiaries, the more heated the economic and environment debates are likely to be, making it more difficult to construct.

3.3 BASIC DRIVERS OF THE INTEGRATED ELECTRIC/GAS SYSTEM ANALYSIS

Future requirements for gas by electric generators in the NYCA will be driven by forecasted increases in electricity demands and the generators and fuel sources displaced by new capacity additions, including changes in NYCA electricity imports and exports.

- **Growth in Electricity Demand**—Given that NYCA electricity demands are forecasted to increase at modest rates over the next decade (*i.e.*, at annual rates of less than 1.5 percent) the amount of increase in gas requirements attributable to electric load growth, by itself, will be correspondingly small. For example, between 2002 and 2005 summer peak loads for the NYCA are forecasted to grow by approximately 1,000 MW while annual energy requirements are forecasted to increase by 4,750 GWh. Given the amount of new CC capacity that will be built and the heat rate advantage that these units have over existing units, the growth in electricity demands is met almost completely by the new CCs. In this case, peak summer day gas requirements increase by .168 billion cubic feet (BCF) per day (the amount used by 1,000 MW of new CC capacity operating at full load for the day), and annual gas requirements would increase by 32.3 BCF per year. Put in context, the incremental requirements due to electric load growth represent only 2 percent of year 2005 total annual gas requirements in New York.

- **Heat Rate advantage of New CCs**—Given that the majority of downstate generation is currently supplied by gas-capable steam units (a total of 8,000 MW of existing gas-only and dual-fuel units), the heat rate advantage of new CCs is an important factor that drives future requirements for gas to meet electricity demands. New CCs have full load heat rates of approximately 7,000 Btu/kWh, while existing gas-fired steam units typically have heat rates between 10,000 and 11,000 Btu/kWh. Hence, new CCs will have a substantial cost advantage and will replace gas-fired and oil-fired steam units in the NYCA dispatch merit order. The variable generating costs of new CCs are slightly higher than those of existing coal-fired generation and substantially lower than those for existing steam gas and steam oil units.

The net impact of new CCs on future gas requirements in the NYCA results from the interaction of three factors:

- Increases in gas demands due to electricity load growth, as discussed above.

- Decreases in NYCA gas demand when new CCs replace generation that would have been supplied by existing, less-efficient units. When new CCs simply replace generation that would have been supplied by existing steam units using gas, daily gas requirements for electric generation will correspondingly be reduced. The heat rate advantage of new CCs relative to existing steam units allows them to generate approximately 50 percent more electricity with the same amount of gas.

- Increases in NYCA gas demands when new CCs replace generation from nongas fuel sources and/or imports. If new CCs replace generation that would have been supplied by any fuels (*e.g.*, oil or coal) or imports, gas requirements for electric generation in the NYCA would necessarily increase.

Hence the combined impact on future gas requirements of electricity load growth and the addition of new gas-fired electric generating capacity, cannot be determined without a detailed analysis of the competition among existing and new units in the electric marketplace, as discussed in the following chapter.