

NATURAL GAS AND POWER GENERATION
IN NEW ENGLAND

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Northeast Gas Association
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The fastest growing natural gas consumption sector, nationally and regionally, is gas for electric generation. In its most recent "Annual Energy Outlook," released in January 2003, the U.S. Energy Information Administration projects the power generation sector to be the fastest growing gas market sector in the region – at an average annual rate of 2.4% over the period 2000 to 2025. This brief paper outlines some trends.

TECHNOLOGY ENHANCEMENTS

New technology, particularly combined-cycle technology, is making the natural gas power plant the energy system of choice.

Its advantages include:

- **higher efficiency:** operating in the range of mid-50s percentile, with 60% efficiency on the horizon - compared to 30-40% efficiency range for coal or oil steam plants;
- **lower heat rate:** the heat rate is a measure of generating station thermal efficiency. Newer gas turbines are generally below 7,000 Btu/kWh, compared to the 9-10,000 range for oil and coal;
- **lower operating & maintenance costs, and shorter construction lead times;**
- **reduced emissions:** less than 1% of the SO₂ emitted by coal units, and 85% less NO_x than coal units.

CHANGING REGIONAL FUEL MIX

In New England, the changing fuel mix is meaning a larger role for natural gas. The table below illustrates the change in percentage of the regional fuel mix.

New England, Electric Generation Fuel Mix, Percentage

	1980	1990	1995	2001
Natural Gas	0.7	5.8	17.9	20.8
Petroleum	55.8	26.5	12.6	5.4
Oil/Gas				11.8
Nuclear	26.5	35.1	31	27
Coal	5.4	15	15.5	12

Coal/Oil				3.2
Hydro	4	5.3	6.3	4.5
Purchases	7.6	6.3	13.8	11.5
Wood/Refuse			5.1	5.8

Sources: Electric Council of New England, NEPOOL, ISO New England. 2001 most recent data year.

In January 2003, the U.S. Energy Information Administration (EIA) released its “2003 Annual Energy Outlook.” For the U.S. as a whole, EIA projects that “the natural gas share of electricity generation is projected to increase from 17 percent in 2001 to 29 percent in 2025.”

For New England, EIA projects that natural gas’s share of total in-region electric generation will grow to 37% by 2005; 39% by 2010; and 44% by 2025.

NEW POWER PLANTS IN THE REGION

In the last four years (1998-2002), about fifteen new power plants fueled primarily by natural gas began commercial operation (or final testing) in the region, increasing regional electric capacity by about 5,700 megawatts, according to ISO New England. Several thousand more are scheduled to enter service in the next few years, further enhancing regional electric system reliability.

INCREASED GAS CAPABILITY

To meet this demand, the region’s natural gas infrastructure continues to grow. The region’s daily pipeline capacity has doubled in the last decade. Additional pipeline projects are in development for the 2003-2006 timeframe to meet growing market demand, particularly in the power generation sector. At the same time, the region’s liquefied natural gas importer has increased its system capabilities considerably – essentially doubling vaporization capacity – to meet growing market demand, particularly from the power generation sector.

FUEL DIVERSITY

As the table above indicates, the region’s fuel sources for electricity are changing over time, with a growing role for natural gas. This greater utilization is raising some concerns about fuel diversity and potential impacts on supply and price.

NGA observes that a diversity of fuels and of supply sources is appropriate. New England in many ways is better diversified and positioned than many areas of the U.S. – even accounting for the fact that the region must import virtually all of its supplies of all its fuels.

It should be noted that the addition of new generation, in this case natural gas, is helping to enhance the capacity and reliability of the regional electric grid. Just a few years ago the grid was experiencing great concerns over capacity shortfalls. The addition of new, efficient gas plants is helping to change that situation. At the same time, New England's gas industry continues to increase its system capabilities, both in terms of pipeline capacity and storage. Furthermore, the region continues to draw natural gas from a more diverse supply portfolio. Supply diversity is also important and helpful.

ISO-NE STUDIES

In February 2001, ISO-NE released a study prepared by Levitan & Associates, entitled: *Steady-State Analysis of New England's Interstate Pipeline Delivery Capability, 2001-2005*. The report addressed the results of a steady-state model analysis assessing the incorporation of new gas-fired units and pipeline capacity. In early 2002, ISO-NE released a follow-up study by Levitan. The reports raised concerns about the adequacy of natural gas pipeline capacity within the region to serve power generation sector demand on a peak winter day.

NGA notes that the ISO reports address an important issue – as more and more new power plants operate on natural gas, how are the electric and gas industries coordinating their systems and meeting supply and demand needs – on both systems?

NGA (as The New England Gas Association) agreed with some central points in the Phase I study, such as the need for increased system coordination and for increased gas pipeline capacity. NEGA disagreed with other central points in the Phase I study, notably the modeling assumptions about which planned pipeline projects were included in the analysis – undervaluing likely pipeline capacity. The Phase I study assumed essentially that every proposed power plant would operate but excluded several likely new pipeline projects. Furthermore, the analysis presented the regional electric grid in somewhat of a vacuum, isolating gas plants and not fully showing interactions with other units on the grid for a more complete assessment of total regional electric capability.

Regarding the Phase II study, NGA found itself in general support of the study's recommendations. Among the further points that NGA would like to make:

Point #1: The regional natural gas system continues to grow in capacity and reliability. The regional natural gas industry continues to make significant investments in its regional gas infrastructure to meet growing market demand. In recent months, federal energy regulatory approvals were issued for several major gas pipeline projects in New England and New York (several of which are scheduled to come into operation in 2003). Additional new infrastructure projects are planned for the region for the 2004 – 2006 timeframe. These projects will help further increase regional natural gas capacity, deliverability, flexibility and reliability, as well as provide economic benefits to

the region. With federal and state regulatory oversight, the region's natural gas system is growing to meet market demand in a reliable, cost-effective, appropriate, and timely manner – in large measure to meet significant market growth in the power generation sector.

Point #2: A key issue for gas-fired electric power plants, as the ISO study indicates, concerns contracting for gas supply through levels of gas transportation agreements. The ISO study correctly notes that some power generators are opting to sign up for secondary capacity instead of contracting for more secure primary firm gas transportation. The dynamics of the new merchant plant environment and competitive marketplace are central to this issue. Those who contract for and pay for primary, firm rights will receive their gas first as planned, approved and regulated. In every case, the gas suppliers in the region have spent capital and executed firm contracts with all power developers who have requested and agreed to such firm supplies. Similarly, the suppliers have been clear in explaining "non-firm" risks to other developers. It is an economic decision by market participants.

- **Point #3: In light of the ISO's responsibility for setting electric system reliability standards, the ISO is the agency with the opportunity and means to send the right market signals to address electric reliability concerns.** ISO-NE is the entity which sends price signals through the dispatching of generating units. In that role, ISO-NE should develop dispatch pricing mechanisms which encourage the level of reliability desired. The pipelines and other suppliers in turn will respond to the pricing signals of the end users and provide the infrastructure requested.
- **Point #4: The report suggests potential electric system shortfalls in the region in the next year owing to some proposed new gas units being unable to run – despite indications that the regional electric grid has sufficient capacity to meet peak demand requirements – thanks in great measure to the capabilities of gas-fired units.** The identification of certain numbers of new gas units unable to run on a winter peak day could be misconstrued if consideration is not given to the whole regional electric grid capability. This analysis and the Phase I Study refer to "at-risk" generation on a peak winter day. The report does state on page iii that "it is necessary to bear in mind that the amount of merchant generation unable to burn natural gas is *not* tantamount to a shortfall in generation." This remark is made in the context of possible alternate fuel back-up that could mitigate gas transportation contract issues. NEGA would suggest that this statement applies not only to the possibility of alternate fuel back-up but to the supply capacity position of the entire grid. The addition of thousands of megawatts to the system, as the report envisions, would mean a substantial increase in total regional electric capability. Even if one accepts Levitan's analysis that there might be a constraint on certain new gas units at limited times, NGA can only assume from the numbers presented in the studies that there will be sufficient electric supply in the region, in both summer *and* winter periods. While the issue of reliability

for individual units must be monitored and assessed regarding its implications for electric grid operations, the capacity position of the New England system seems positive, thanks in large measure to the addition of new power plants in recent years, principally natural gas.

Note: On December 19, 2002, ISO New England issued a press release projecting adequate electricity supply for the winter season of 2002-03. Said ISO: "The forecast projects record energy consumption this winter; however, the addition of newly installed generating capacity ensures that electricity supply should be adequate to meet peak demand this season." For the week of January 13, 2003, the region is facing colder-than-normal weather. ISO on its web site as of January 13 is projecting a surplus of from 6,700 to 7,300 megawatts for the week, with total installed capacity of 30,000 megawatts, and with projected peaks of close to 22,000 megawatts on the coldest days of January 15 and 16.

The ISO/Levitan analysis was intended to highlight operational issues surrounding the greater use of natural gas in power generation in the region. While NGA has some differences of emphasis as outlined above, NGA agrees with ISO that this topic is important to the regional energy system. NGA will continue to work with ISO and others in the future to monitor key issues and to help ensure that the regional energy market continues to grow in a reliable and secure manner.

NEGA'S INITIATIVES

NGA has formed an Advisory Committee on Power Generation, comprised of representatives of the interstate pipelines, the LNG importer, and several local distribution companies (LDCs), to monitor issues relating to gas and power generation and to work with ISO New England and others on gas/electric system coordination. In June 2002 NEGA convened a useful workshop on system operational and coordination issues – participants included ISO New England, power generators, oil suppliers, and gas system representatives. NGA has also invited several power generators to participate on its Gas Supply Task Force, to help monitor the regional natural gas delivery system during the winter months.

Increased coordination and communication between electric and gas systems is paramount in this developing power market. Market dynamics are changing quickly and greater coordination among all market participants can help to ensure greater system stability, efficiency, and reliability.