

QUARTERLY FOCUS

The Expanding Role of Natural Gas Imports in Meeting Increased Gas Demand in New England

by Thomas Dukes

Introduction

The Focus feature that was included in the first quarter 1995 *Quarterly Report of Natural Gas Imports and Exports* (“*Report*”) described the increasing reliance on natural gas imports in the New England gas market. This Focus feature is a follow-up to the 1995 New England natural gas market study. This analysis revisits some of the issues covered by the earlier analysis, but further updates developments that have occurred in the New England natural gas market between then and the year 2000. It also reviews the historical role of natural gas use in New England, the changing dynamics of fuel use in New England, critical infrastructure changes, including natural gas pipeline and liquefied natural gas (LNG) expansion projects as well as several natural gas demand forecasts for New England.

This Focus feature is comprised of **four sections**. The **First Section** includes an overview of the changing structure of the natural gas industry in New England and a look at the historical use of gas in the region. **Section Two** looks at the importance of Canadian gas and LNG imports in meeting New England’s burgeoning demand for natural gas and its growing reliance on imported gas supplies. **Section Three** provides a summary of newly completed and proposed natural gas pipeline expansion projects which are expected to substantially increase New England’s gas pipeline capacity. **Section Four** previews several natural gas demand forecasts for New England based on analyses completed by the Energy Information Administration (EIA), Gas

Research Institute (GRI), and the National Petroleum Council (NPC) as further supported by data compiled by the New England Gas Association (NEGA).

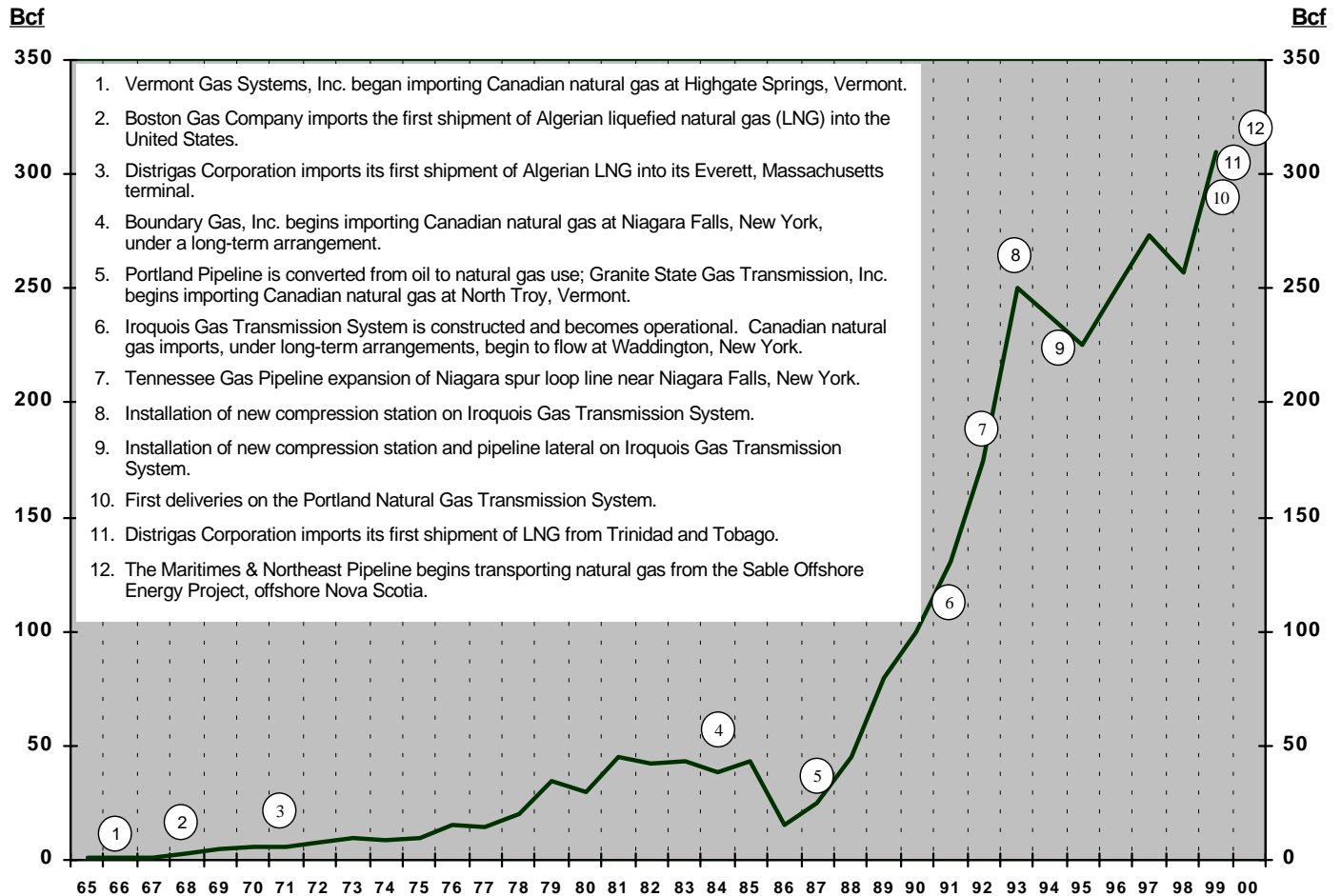
I. Overview and Historical Use of Natural Gas In New England

Historically, natural gas use in New England has played a relatively minor role in meeting the region’s energy supply needs due to the fact that the region was located at the end of the domestic interstate pipeline system. The New England region, more than any other region of the country, relied primarily on oil to meet its energy needs. Following the oil supply disruptions in the mid to late 1970s, the New England States and energy supply companies made a concerted effort to diversify their energy supply sources and reduce their heavy dependency on oil. Although oil use in New England continues to remain relatively high compared to other parts of the country, natural gas use has risen over the past fifteen (15) years. Much of this increased gas use in this region can be directly attributed to the growth in imports from Canada and to a lesser extent, imports of liquefied natural gas (LNG) by Distrigas Corporation (Distrigas) into its receiving terminal at Everett, Massachusetts. [In September 2000, Cabot LNG Corporation, the parent company of Distrigas, was sold to Tractebel, Inc., for \$680 million. Tractebel is a global energy and services business and is the sole arm for the energy function of Suez Lyonnaise des Eaux.]

This regional commitment to greater energy supply diversity has resulted in substantial

Figure 1

Chronology in the Growth of Natural Gas Imports Into New England: 1965 - 2000



gains in natural gas use in recent years. New England’s dependency on oil has dropped significantly; today, oil makes up approximately 51 percent of the region’s annual primary energy demand compared with 63 percent in 1987. With the drop in oil use, there has been a corresponding growth in natural gas use during this same time period, rising from 13 percent to 18 percent. Much of the growth in natural gas use during this time period came from increased market shares in residential/commercial space heating and for electricity generation. Despite the inroads natural gas has made in expanding its market share and helping New England diversify its energy supply mix, the region still is more

dependent on oil as an energy source than the rest of the country. In 1998, for example, New England remained the only region “in which oil use was higher than natural gas use in the residential sector.” [*Annual Energy Outlook 2000*, DOE/EIA, (December 1999), p.25].

As mentioned above, the increase in natural gas imports over the past 15 years has made it possible for New England to increase its natural gas use. **Figure 1** provides a thumbnail history of the growth in natural gas imports into the region and provides a chronology of the more significant events which enabled this growth to occur. As shown, Vermont Gas Systems, Inc., a local gas distributor (LDC)

near the U.S.-Canada border, was the first importer of Canadian gas into New England. The next event allowing for an increase in Canadian gas imports occurred almost two decades later in 1984 when Boundary Gas, Inc. began importing gas near Niagara Falls, N.Y., with 29 percent of its volumes (54 MMcf/day) being marketed in New England. Boundary Gas is a corporation whose stockholders are comprised of fourteen companies (13 LDCs, 1 interstate pipeline) serving markets in the Northeast; the gas imports of Boundary Gas are resold to these companies based on their respective shares of ownership. Nine of these companies serve New England. The Boundary Gas Project was followed by the conversion of the Portland Oil Pipeline to natural gas use in 1987 (operated by Granite State Gas Transmission). Although the Portland Oil Pipeline was called back into oil service in 1998, it was replaced by the Portland Natural Gas Transmission System (PNGTS) in March 1999. As depicted in **Figure 1**, the bulk of the pipeline expansions aimed at increasing Canadian gas imports took place in the 1990's, beginning with the Iroquois Gas Transmission System (Iroquois) in 1992 and most recently with the completion of the Maritimes & Northeast Pipeline (M&NEP) in December 1999.

As stated earlier, New England also has relied on LNG imports to supplement its natural gas supplies over the past 32 years, primarily to meet peak winter demands. The first import occurred in November 1968, when the Boston Gas Company took a shipment of Algerian LNG at Commercial Point, Dorchester, Massachusetts. In 1971, Distrigas received its first shipment of LNG from Algeria at its Everett, Massachusetts, terminal. With the exception of two years (1974, 1987), this LNG import trade has continued ever since, albeit, at various levels of activity. With the introduction of a new LNG supply source (Trinidad and Tobago) in 1999, Distrigas

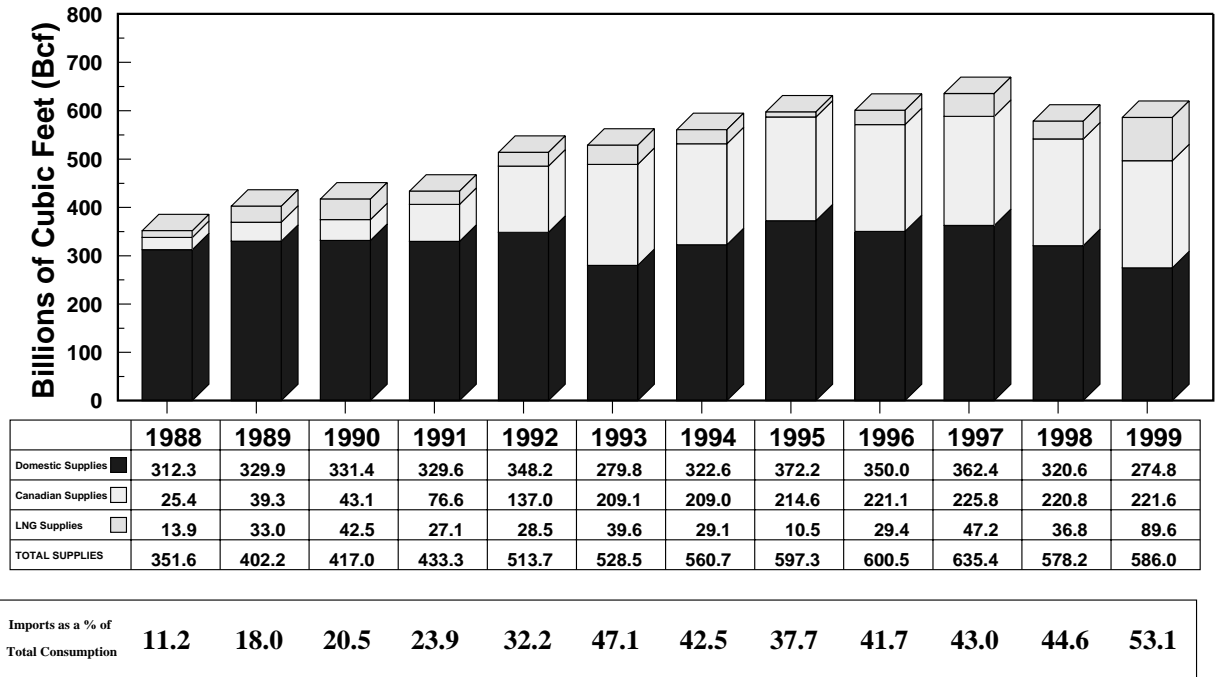
imported a total of 96.1 Bcf, an impressive 123 percent increase over the preceding year. This growth in LNG imports is expected to continue over the next few years because Distrigas has negotiated several long-term sales arrangements to supply LNG for electricity generation.

II. The Growing Importance of Imported Natural Gas In New England

New England has undergone a major transformation in its fuel consumption patterns over the last decade. **Figure 2** shows the sources of natural gas marketed in New England during the past decade (1988-1999). During this period, natural gas demand increased by about 67 percent. However, as shown in **Figure 2**, the sources of gas supplies to meet this increased demand changed dramatically. Comparing 1988 with 1999, domestic gas supplies declined in importance, as volumes dropped from 312.3 Bcf in 1988 to 274.8 Bcf in 1999, a decline of 12 percent. In contrast, imports grew from 39.3 Bcf to 311.2 Bcf during the same time period, or an increase of 692 percent. Although natural gas imports as a percentage of total New England gas consumption represented just 11.2 percent of demand in 1988, gas imports accounted for over 53% of the region's gas use by 1999. While the volumes of Canadian natural gas delivered to New England changed only moderately since 1995, i.e., increasing from 215 Bcf to 222 Bcf, LNG imports grew dramatically between 1995 and 1999 -- moving from 10.5 Bcf to 89.6 Bcf. There was a significant increase of LNG deliveries into New England in 1999 with the commencement of deliveries of LNG from Trinidad & Tobacco in May. The new LNG liquefaction facility in Trinidad & Tobago, of which Distrigas is an equity partner, exports LNG to Spain and the United States, as well as Puerto Rico. Prior to this new project, almost all of the LNG imported by Distrigas came from Algeria.

Figure 2

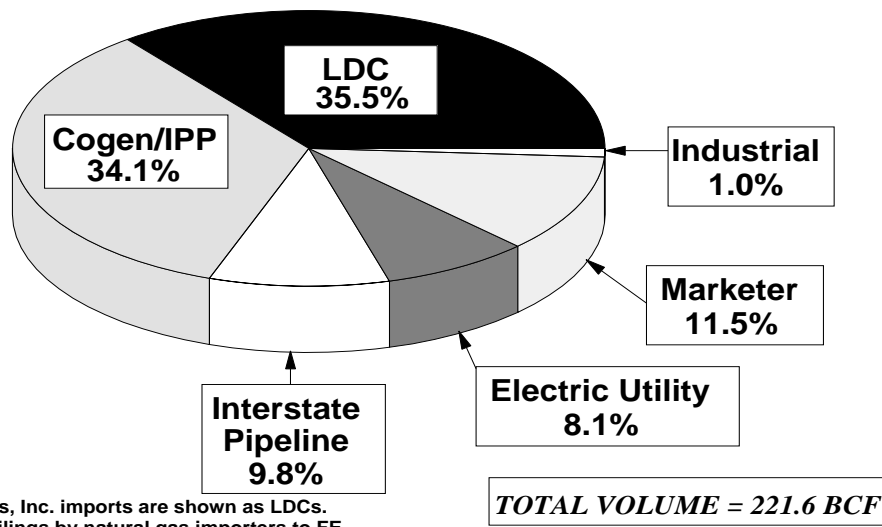
Sources of Natural Gas Marketed in New England (1988 - 1999)



Sources: Natural gas consumption data from 1988 - 1998 came from EIA's *Natural Gas Annual* (DOE/EIA - 0131); 1999 consumption figure is an estimate from FE based on EIA data; Import data are derived from company filings made with FE.

Figure 3

1999 CANADIAN NATURAL GAS IMPORTS INTO NEW ENGLAND BY TYPE OF IMPORTER



Note: Boundary Gas, Inc. imports are shown as LDCs.
Source: Quarterly filings by natural gas importers to FE

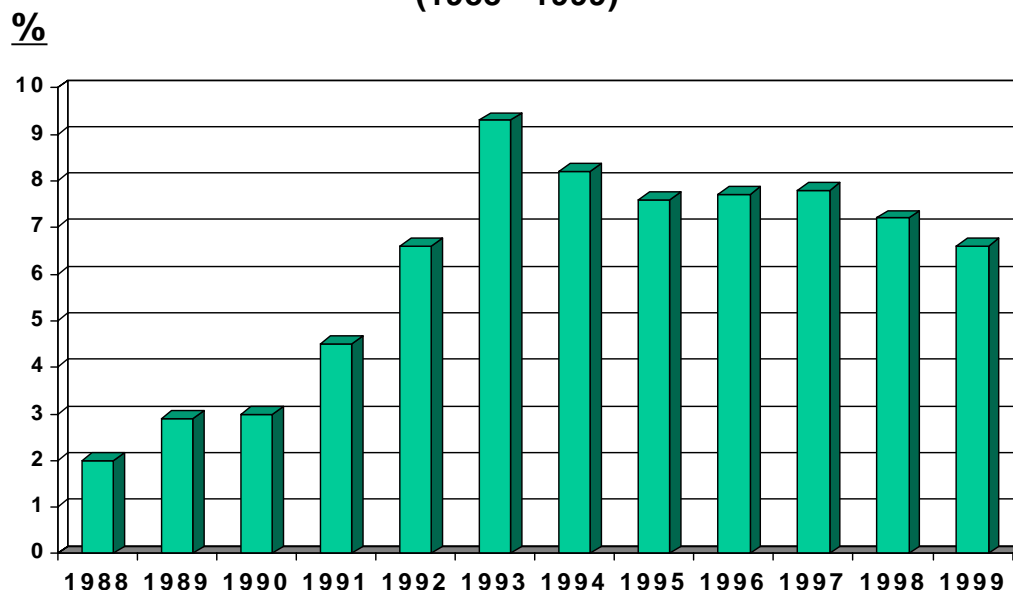
Figure 3 is a pie chart which shows the percentage of Canadian natural gas imported and marketed in New England during 1999, by type of importer. Compared with the rest of the country, New England was significantly less reliant on gas marketers for importing gas, but had a much higher percentage of direct imports by local distribution companies (LDC) and the non-utility generation (cogens/IPP) sector. New England also was the only region of the country which showed any significant imports by an interstate pipeline in 1999 (Granite State Gas Transmission).

As shown in **Figure 3**, 221.6 Bcf of Canadian natural gas was imported into New England in 1999. Of this total, 186.9 Bcf was imported under 45 long-term supply contracts; this represented 84.3 percent of the total Canadian imports into the region. The average length of these long-term supply contracts was 14.8 years. Of the 45 contracts, 24 of these contracts were with LDCs, including three by

an interstate pipeline acting as a surrogate for an LDC; 13 with independent power producers (IPPs)/cogeneration facilities; 5 with industrial firms; and 3 with marketers. The average contract length by type of importer was as follows: LDCs (13.9 years) IPPs/Cogens (18.2 years), industrial firms (14 years) and marketers (9 years). New England also imported 34.2 Bcf of Canadian natural gas under short-term contracts (2 years or less) during 1999. The extensive use of long-term supply contracts for importing Canadian natural gas is unique to New England. During 1999, only 37 percent of the volumes imported from Canada for the rest of the country were done under long-term contracts. The difference between New England and the rest of the country in contracting for Canadian gas supplies was primarily the result of the need for this region to build an entirely new gas pipeline infrastructure in order for it to receive Canadian gas supplies. The long-term nature of the contracts serving New England can be

Figure 4

NEW ENGLAND PERCENTAGE USE OF CANADIAN NATURAL GAS IMPORTS (compared to total Canadian imports) (1988 - 1999)



directly attributed to the underlying need for firm long-term gas supply arrangements to support the large capital investment in building pipelines to serve this region. As a result, these long-term purchase contracts have the additional benefit of providing a very secure source of gas supply to New England.

Figure 4 is a bar chart showing Canadian gas sales to New England as a percentage of total Canadian gas sales to the United States from 1988 through 1999. As shown, this percentage grew from 2 percent in 1988 to over 9 percent in 1993, but for the past five years this percentage has ranged from 6.6 percent to 7.8 percent. With the completion and operation of the M&NE, this percentage will undoubtedly increase this year. **Figure 5** illustrates estimated sales of imported gas by Census Division in 1999. Although the actual volumes of imported natural gas into New England are relatively small compared with other regions,

its overall reliance on these supplies as a percentage total gas demand is the highest of any Census Division in the country (**See Fig. 2**). **Figure 6** on the next page estimates New England's reliance on imported natural gas on a state-by-state basis. The percentage shown for each state represents the portion of the state's gas supplies derived from natural gas imports. Although the overall regional reliance on natural gas imports in 1999 was estimated to be 53.1 percent, there are considerable differences among the 6 states which comprise New England. For example, FE estimates that natural gas imports supplied the entire gas demand in the states of Vermont and Maine during 1999; however, gas consumption in both of these states is small. Massachusetts was the largest user of imported gas in New England (189 Bcf), but it is estimated that only 56 percent of its gas demand was supplied from foreign sources.

Estimated Sales of Imported Natural Gas by Census Division -- 1999 Figure 5

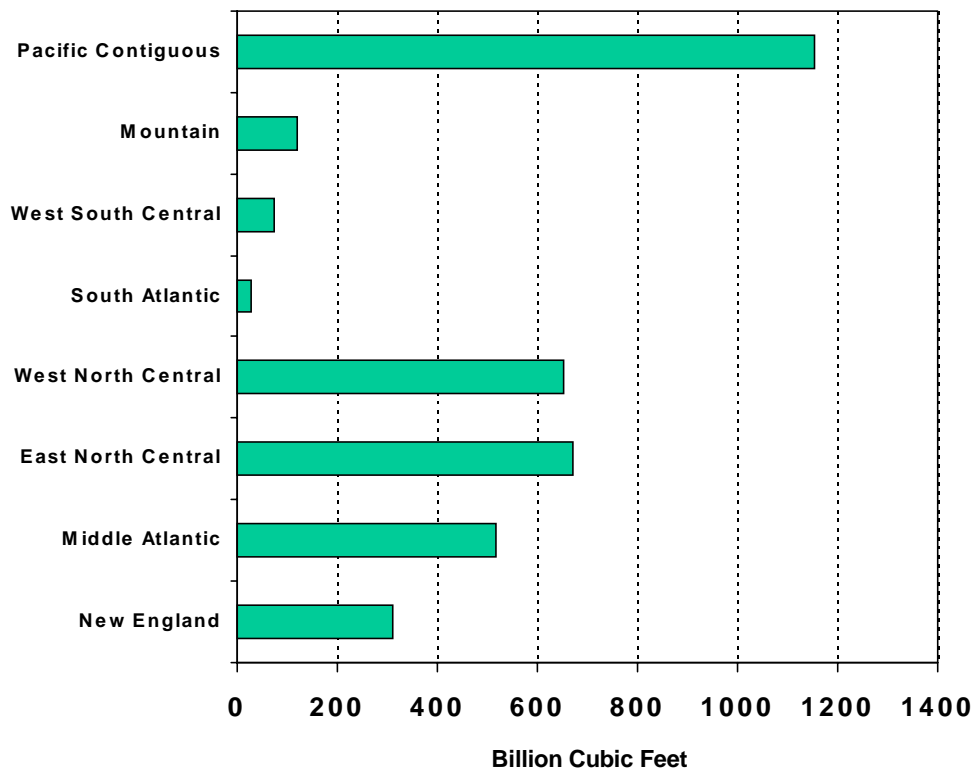
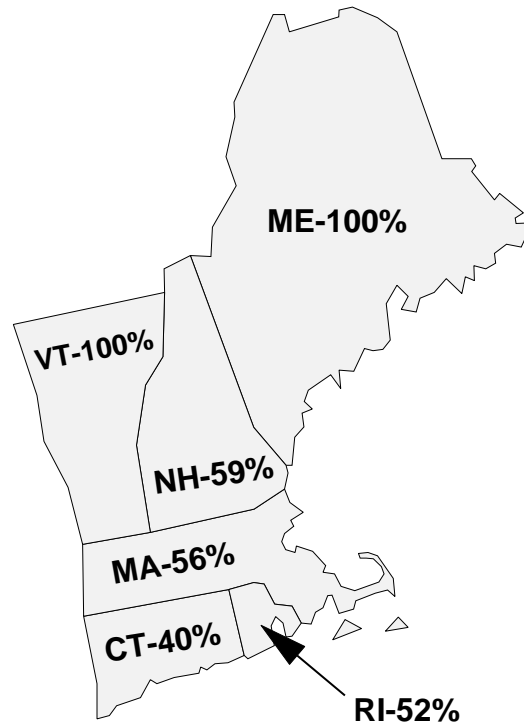


Figure 6

**ESTIMATED STATE RELIANCE ON NATURAL GAS IMPORTS DURING 1999
(As a Percentage of Total State Gas Consumption)**



Sources: Total state gas consumption data are estimates from EIA, Office of Oil and Gas, Reserves and Natural Gas Division, Data Operations Branch; natural gas import consumption data are from quarterly filings submitted to FE from gas importers.

III. Recently Completed and Proposed Natural Gas Pipeline Projects Serving New England

Figure 7 is a map of New England showing a schematic view of the natural gas interstate pipeline infrastructure serving the region. In just over a year, three new gas construction projects have increased significantly New England’s ability to receive, transport and market natural gas imports. Two new pipelines were built in 1999 to bring in additional volumes of Canadian gas imports, the PNGTS and the M&NEP. The third project completed

in 1999 involved certain infrastructure enhancements to the LNG processing facility located at Everett, MA., and owned by Distrigas. Taken together, these three projects alone added an additional 700 million cubic feet per day (MMcf/d) import capacity into the New England region. It is estimated that these three projects had the combined effect of increasing natural gas supplies into the New England region by close to 25 percent. See Figure 7 to review the location of these projects and their interconnections. The projects accomplish the following:

Natural Gas Infrastructure in New England, 2000



Portland Natural Gas Transmission System (PNGTS): The PNGTS interconnects with facilities owned by Trans Québec & Maritimes Pipeline, Inc., an affiliate of TransCanada PipeLines Limited, at the international border near East Hereford, Québec, and Pittsburg, New Hampshire, and consists of about 142 miles of 24-inch pipeline from the border to Westbrook, Maine. At Westbrook, the PNGTS connects with the new jointly owned 30-inch diameter pipeline of PNGTS and M&NEP. This pipeline travels about 101 miles from

Westbrook to Dracut, Massachusetts. The PNGTS is intended to replace the Portland Pipe Line Corp. system, which ran from North Troy, Vermont, to Portland, Maine, because it was converted back to oil service in early 1999. PNGTS has been operational since April 1999 and currently has the capacity of transporting 178 MMcf/d of Canadian gas into New England, but could be easily expanded. For the first 6 months of 2000, it has been transporting about 106 MMcf/d, or at a 60 percent load factor. Utilization of this system

is expected to increase by about 46 MMcf/d when a new 265-MW cogeneration facility being constructed at Rumford, Maine, becomes commercially operational in November 2000.

Maritimes & Northeast Pipeline (M&NEP): M&NEP transports gas from the Sable Island Offshore Energy Project, a new natural gas basin offshore Nova Scotia, to markets in the Atlantic Provinces and New England. The \$2.3 billion project started supplying Canadian gas to New England on January 1, 2000. From the international border near St. Stephen, New Brunswick, and Calais, Maine, M&NEP travels through Maine and New Hampshire and ultimately terminates at Dracut, Massachusetts. Although the portion of the system from the international border to Westbrook, Maine, is solely owned by M&NEP, the pipeline segment from Westbrook to Dracut, as mentioned above, is jointly owned by PNGTS. The M&NEP currently has a capacity of 440 MMcf/d at the international border, but could be expanded easily. After initial start-up problems, gas throughput has steadily grown during the year. The chart below shows the average daily throughput in MMcf for the first 6 months of the year. During June, the M&NEP was running at approximately an 81 percent load factor.

Estimated Average Daily Throughput by Month in 2000 (MMcf/d)					
January	February	March	April	May	June
32	134	259	323	322	358

Cabot LNG: Cabot LNG Trading Limited (Cabot LNG) began making shipments of LNG from Trinidad & Tobago to its subsidiary, Distrigas, in May 1999 to its newly expanded \$100 million LNG import terminal and regasification facility at Everett, Massachusetts (near the city of Boston). With the 1998/99 facility expansions, the regasification plant now has a sendout capacity of 450 MMcf/d in

vapor and 100 MMcf/d in liquids. In addition, the Tennessee Gas Pipeline completed a 7.5 mile pipeline lateral to the regasification plant in late 1998, thereby allowing it to receive up to 90 MMcf/d of gas from Distrigas. These expansions enabled Distrigas to more than double its LNG deliveries into New England in 1999, compared with the level of sales in 1998 (89.6 v. 36.8 Bcf). Cabot LNG's sales of LNG from Trinidad & Tobago in 1999 totaled 47.9 Bcf over an eight month period, and represented 91 percent of the annual incremental growth in LNG sales to New England.

Planned Gas Projects Which Would Facilitate an Increase in Natural Gas Imports

This section describes several infrastructure expansion projects currently in the construction, regulatory permitting, or planning stages, designed to facilitate the supply and transportation of natural gas into New England during the next couple of years. All of these projects would facilitate the expansion of imported gas in this region.

Tennessee's Eastern Express 2000: On October 29, 1999, the Federal Energy Regulatory Commission (FERC) issued a certificate of public convenience and necessity in Docket CP99-262 authorizing the Tennessee Pipeline Company to construct, install and operate 13,320 hp of compression at two existing compression stations and the installation of another delivery tap. The two new compressors will expand Tennessee's pipeline capacity in zone 6 of its system by 288,000 Dth/d from the interconnects with the PNGTS/M&NEP joint pipeline system at Dracut and Haverhill, Massachusetts, to delivery points at Milford and Meriden, Connecticut, and Mendon, Massachusetts. Tennessee has entered into 6 ten-year agreements (one with American National

Power Inc for 34,000 Dth/d and 5 with an affiliate of El Paso Gas Services Co. for 139,000 Dth/d). All of the gas delivered to these two shippers will be used to fuel electricity generation. Tennessee anticipates that service will become available by late 2000.

Tennessee's Londonderry Project: On August 1, 2000, a preliminary determination on non-environmental issues was made by the FERC in Docket CP00-48 to issue a certificate of public convenience and necessity authorizing Tennessee Gas Pipeline to construct, install, and operate its proposed Londonderry Project. The \$32.4 million project consists of replacing 19.3 miles of 8-inch diameter pipe on the Concord Lateral (from Dracut, MA., to Londonderry, N.H.) with 20-inch diameter pipe, and constructing, installing and operating delivery point facilities, including a meter station at Londonderry. The purpose of the proposed project is to allow Tennessee to transport 130,000 Dth/d of natural gas to the planned AES-Londonderry Project, which is a 720-MW, natural gas-fired combined cycle power plant. Tennessee hopes to begin service to the powerplant by October 1, 2001, pursuant to a 20-year gas supply contract with AES. On August 11, 2000, the FERC issued a notice announcing the availability of the environmental assessment (EA) with regard to this project. The FERC staff concluded in the EA that approval of the proposed project, with mitigating measures, would not constitute a major Federal action significantly affecting the quality of the human environment.

Distrigas of Massachusetts (DOMAC)

Project: On August 28, 2000, DOMAC filed an application with the FERC in Docket CP00-447 requesting a certificate of public convenience and necessity to construct, install, operate and maintain facilities at its LNG terminal in Everett, Massachusetts. The improvements are necessary to supply an

expansion of an existing 1,068-MW electric generating facility owned and operated by Sithe Mystic Development LLC (Sithe) adjacent to the DOMAC terminal. The expansion would add an additional 1,500 MW of capacity by adding four new combined-cycle combustion turbines. The proposed \$35 million Distrigas project would involve, among other things, the installation of four submerged combustion vaporization units, each having a send-out capacity of 150,000 Mcf per day of natural gas. These proposed facilities will allow DOMAC to supply approximately 70 Bcf of vaporized LNG per year to the Sithe plant (about 25 LNG cargoes per year) from Algeria and Trinidad & Tobago. The Sithe power plant is being developed in two phases: the first phase involves the installation of two turbines by November 2001 and the second phase (installation of the other two turbines) is scheduled for commercial operation in 2002. In addition, Cabot Power Corporation, an affiliate of DOMAC, is also planning to build a 350-MW cogeneration plant at the Island End Industrial Park in Everett, Massachusetts. This facility, scheduled for completion in late 2003 or early 2004, also would be supplied with LNG from DOMAC. Under this project, DOMAC would be supplying approximately 20 Bcf of vaporized LNG per year to fuel this facility. These two LNG supply arrangements represent the third such arrangement in the past 18 months to supply gas to third-party electric power generators. Last year, DOMAC also signed a long-term supply arrangement with El Paso Energy to fuel a part of its fuel needs at its Berkshire cogeneration facility at Berkshire, Massachusetts.

Algonquin/Maritimes Hubline Project: This proposed project would involve constructing a 25-mile, 24-inch diameter pipeline between the terminus of the M&NEP near Methuen, and Salem, Massachusetts vicinity -- then travel about 25 miles underwater across Massachusetts Bay to Quincy (just south of

Boston). At Quincy, the Maritimes/hubline would interconnect with Algonquin Gas Transmission. If completed, the pipeline could carry downstream from M&NEP up to 400 MMcf/d of offshore Sable Island gas supplies. Algonquin anticipates the project could be operational in late 2002. To date, no regulatory filings have been made.

IV. New England Natural Gas Demand Forecasts

Several forecasts predict steady growth in natural gas demand for New England through the 2015-2020 period. The EIA projects a 2.4% annual growth rate through 2020 with natural gas having the highest increase of any fuel. The GRI issued an even stronger gas demand forecast for New England of 3.4% annually through 2015. GRI's forecast is partly based on increased gas demand by New England electric utilities which it expects will have incremental annual demand growth of 7.4%.

Taking into account the pipeline and LNG expansions described in **Section III**, the New England region should have both adequate pipeline infrastructure as well as new gas supply sources to ensure both reliability and competitiveness in the near-term. The NEGA estimates that the current pipeline capacity into New England, with the addition of M&NEP earlier this year, is about 3.5 Bcf/d [2000 *Statistical Guide*, NEGA, March 2000, p.8]. On an annualized basis, this pipeline capacity would seem more than adequate as New England's annual gas demand in 1999 was about 586 Bcf, or 1,605 MMcf/d. However, this does not take into account the peak demand periods in the winter months. During peak demand periods, gas requirements exceed 4 Bcf/d. Much of the difference between total pipeline capacity and total demand is made up with LNG storage facilities and propane air plants. There are about 20 LNG storage and

regasification facilities in New England with a combined storage capacity of 13.8 Bcf and a sendout capacity of 1.4 Bcf/d. Taking into account the pipeline and LNG facility expansions described in **Section III**, as supplemented by the LNG peaking facilities described above, the New England region should have access to adequate supplies of gas in the near-term. Given the robust demand forecasts, New England will require continuous infrastructure improvements and expansions to support this anticipated growth.

Commensurate with new gas pipeline capacity provided to New England in the last year, there are two pipelines currently under construction in the Midwest which are scheduled to be operational by late October: the Alliance and Vector Pipelines. These two pipelines have initial capacities of 1.325 Bcf/d and 1 Bcf/d, respectively. The Alliance Pipeline will deliver western Canadian gas to the Chicago marketing hub, where it will connect with the Vector Pipeline. The Vector Pipeline will transport gas from the Chicago area to parts of Indiana, Michigan and southern Ontario. It is likely that Vector will move some gas supplies into Ontario for upstream delivery through the pipeline systems of Union gas and TransCanada PipeLines for delivery to existing export points in New York and New England.

Competitive supplies of Canadian gas imports should continue to be available to New England as producers continue to develop offshore resources in the Maritimes regions near Nova Scotia/Sable Island, and increase exploration of the northern frontier regions in eastern Canada. The EIA estimates there are 107 Tcf of technically recoverable reserves in eastern Canada that are largely undeveloped. Canada has supplied much of New England's incremental gas demand for the past decade and, along with LNG imports, will remain critical in meeting New England's growing natural gas needs for the future.