

A Primer on  
**Liquefied Natural Gas**  
in Massachusetts

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## *Introduction*

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Massachusetts needs an abundant supply of electricity to prosper. And there is no component of our electricity portfolio more important than natural gas. Because of growing demand and tightening supply, it is becoming increasingly important for the state to have access to additional new liquefied natural gas (LNG) terminals in the near future while maintaining the facilities we have now.

New LNG facilities will provide a reservoir of necessary resources, ensuring that the state's current and future natural gas electricity generating plants have the fuel they need to operate in a sustained, efficient manner. A reliable supply from LNG facilities will also help keep on the heat and lights, and provide downward pressure on prices.

Natural gas is a staple source of electricity and heat generation in the Bay State. A sufficient supply of this key fuel is critical to the continued well being of Massachusetts, and indeed the entire New England region.

Virtually every power plant built in New England in the last 10 years is fueled by natural gas. When these plants were constructed, the natural gas supply was abundant and its price was low in comparison to other fuel sources. In addition, because natural gas burns cleaner and more efficiently than most other fossil fuels, it was viewed as the environmentally friendly choice. At the time it was a win-win situation.

But times have changed. Today, prices have increased and supply is tighter. Worldwide demand for natural gas is increasing at an average rate of 2.4 percent annually.<sup>1</sup> The New England region's location at the end of all the pipelines, coupled with natural disasters that cause supply interruptions (e.g. Hurricanes Katrina and Rita), have threatened availability of supply and increased prices.

The U.S. Energy Information Administration said in 2003 that New England consumers paid 30 percent more for natural gas than the rest of the nation. Currently, prices are double what they were in 2002.

Natural gas prices shot up in the fall of 2005 after the two hurricanes devastated the United States' off-shore production. It was only because New England experienced a warmer than normal winter and was able to get supply from the recently completed HubLine<sup>SM</sup> that the region was able to stave off the potential for rolling blackouts. Energy experts agree that if additional new sources of natural gas are not introduced, the region will continue to face the possibility of supply interruptions and price spikes.

ISO New England, the not-for-profit operator of the region's energy grid, has sounded the alarm that the region is headed for rolling blackouts and increasing prices because as demand for electricity is growing (at a rate of 1.9 percent annually) supply is not. Gordon Van Welie, the president and CEO of ISO New England wrote, "The scenario is

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<sup>1</sup>Energy Information Administration, International Energy Outlook 2006, [http://www.eia.doe.gov/oiaf/ieo/nat\\_gas.html](http://www.eia.doe.gov/oiaf/ieo/nat_gas.html)

simple: New England depends heavily on natural gas and oil to generate electricity. Power demand is rising every year, and power supply is not.”<sup>2</sup>

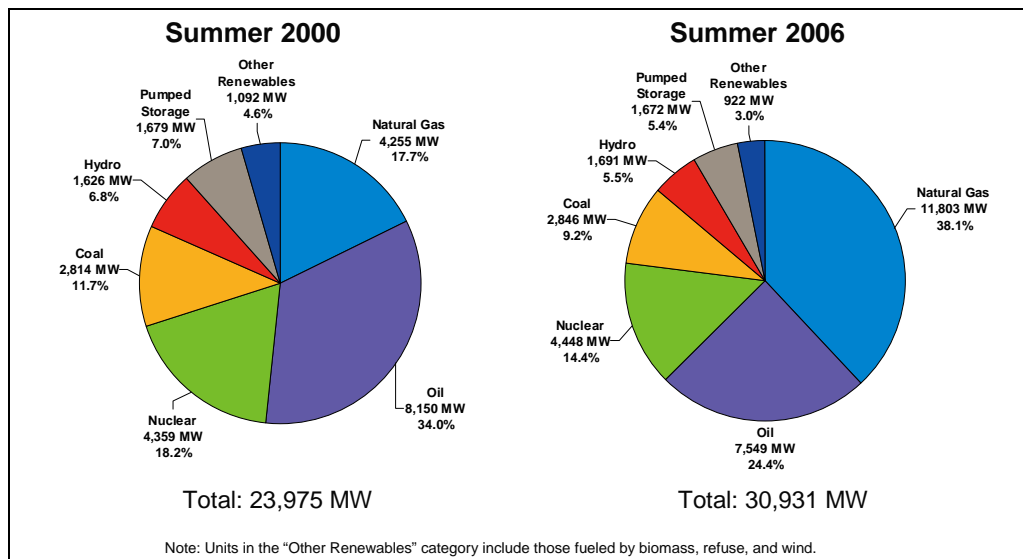
To help increase natural gas supply in the region, several companies have submitted proposals for siting LNG terminals in and around New England, including four in Massachusetts. While each proposal has advantages, in all cases they have been met with “not-in-my-back-yard” (NIMBY) activism. As such, siting progress is slow.

This document outlines key facts about LNG. It is a primer for policymakers, the news media and others.

### *Supply and Price Challenges Facing New England*

According to ISO-New England<sup>3</sup>, in the summer of 2000 natural gas accounted for 17.7 percent of the generation mix in New England. By the summer of 2006, just six years later, that figure had grown to 38.1 percent (see graph below)<sup>4</sup> -- more than doubling the region’s dependence on natural gas for power generation.

### New England’s Generation Mix



From a residential housing standpoint, more than 1.1 million homes in Massachusetts are heated by natural gas.<sup>5</sup> This is more than the other five New England states

<sup>2</sup> Boston Globe, July 26, 2006, p. A9.

<sup>3</sup> Massachusetts is part of New England's bulk electric power system. The system is comprised of more than 8,000 miles of high voltage transmission lines and several hundred generating facilities, of which more than 350 units are under the direct control of ISO New England. ISO New England ensures the constant availability of electricity by ensuring the daily reliable operation of New England's bulk power generation and transmission system, by overseeing and ensuring the fair administration of the region's wholesale electricity markets, and by managing comprehensive, regional planning processes. [www.iso-ne.com](http://www.iso-ne.com)

<sup>4</sup> Bob Ethier, Chief Economist and Director of Resource Adequacy, ISO New England, presentation to the Restructuring Roundtable, May 19, 2006, <http://www.raabassociates.org/main/roundtable.asp?sel=73>

<sup>5</sup> U.S. Census Bureau statistics, <http://www.census.gov/hhes/www/housing/census/historic/fuels.html>

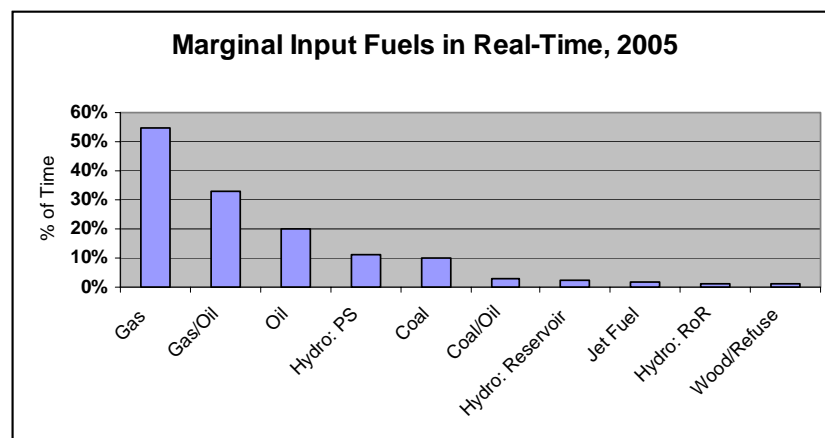
combined as Massachusetts accounts for 61 percent of the region's use of natural gas for residential heating.

The consensus among organizations such as ISO New England and the U.S. Department of Energy is that New England can meet current natural gas demand until 2010. However, if gas demand grows at a rate equal to or higher than recent growth rates, the region's gas delivery infrastructure would be insufficient to meet the total demand.<sup>6</sup> In addition, a November 2005 report from the Analysis Group for the New England Energy Alliance expressed a greater sense of urgency when it warned that "plausible scenarios of demand exceeding available supplies and delivery capacity for both electricity and natural gas occur as soon as within the next two years, and the need for additional supplies may already be upon us."<sup>7</sup>

Furthermore, it takes several years to get from an infrastructure proposal announcement, be it a liquefied natural gas terminal or new pipeline, before we have an actual facility completed and operational. Thus there is precious little time to properly address the anticipated rise in demand that will outpace our expected supply in the next several years

In addition to growing demand, pricing for natural gas has greatly increased over the past several years. In 2002 the price was \$4/One Million British Thermal Units (MMBtu). By 2005, it had doubled. Just from 2004 to 2005 there was a 44 percent increase in natural gas prices, which underscores the volatility of natural gas prices. Because of the structure of our wholesale electricity market, in 2005 natural gas set the price of electricity more than 80 percent of the time (see chart below).<sup>8</sup>

## Which Units Set Prices in the Electricity Market



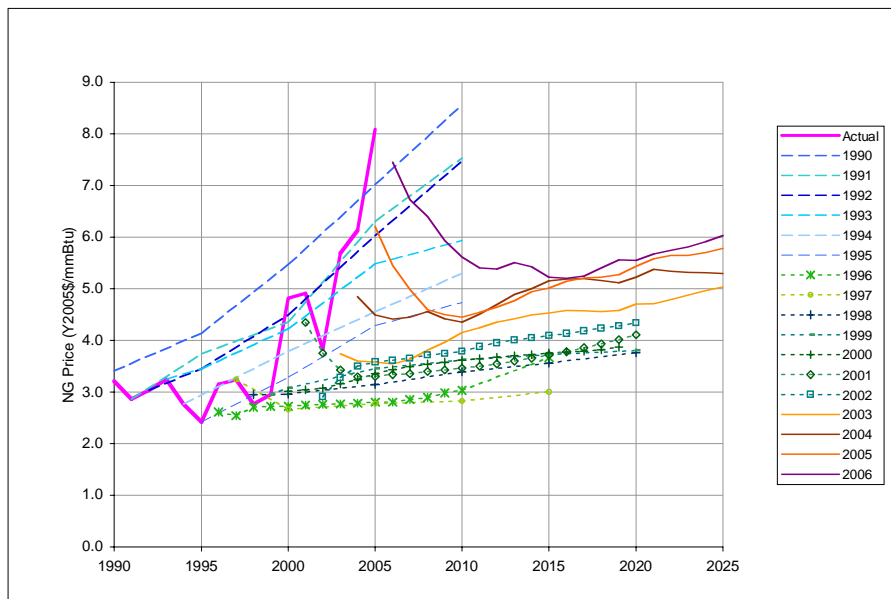
<sup>6</sup> The Power Planning Committee of the New England Governors' Conference, Inc. "Meeting New England's Future Natural Gas Demands: Nine Scenarios and Their Impacts"

<sup>7</sup> "New England Energy Infrastructure, Adequacy Assessment and Policy Review," Susan F. Tierney, Paul J. Hibbard, for the New England Energy Alliance, November 2005, p. 6

<sup>8</sup> Ethier.

As a result of this factor, Massachusetts has the second highest energy prices in the country.<sup>9</sup> Moreover, predicting natural gas prices is difficult and the results often wrong, as shown on the chart below. Regardless, the trend for prices is upward.

## Natural Gas: Projected and Actual Prices



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Options for decreasing the price of electricity include decreasing demand and/or increasing supply. While efforts to reduce electricity consumption and improve efficiency are needed and important components of the overall solution, the sum of these efforts is unlikely to solve the supply and demand problem we are facing.

Massachusetts and New England have no indigenous natural gas resources, so the region relies on five major interstate pipelines for its delivery system, including: Algonquin Gas Transmission, Iroquois Gas Transmission System, Maritimes and Northeast Pipeline, Portland Natural Gas Pipeline System (PNGPS), and Tennessee Gas Pipeline Company.<sup>11</sup> *The Wall Street Journal* recently reported that a new pipeline that would service the northeast United States is under consideration: "CenterPoint Energy Inc. and Duke Energy Corp. said they plan to build a 1,600-mile natural-gas pipeline that would extend from West Texas to Pennsylvania and provide a key link to the growing Midwest and East Coast markets. The project, which could be in service as early as the fourth quarter of 2008, would have a capacity of between 1.5 billion and 1.75 billion cubic feet per day."<sup>12</sup>

<sup>9</sup> Energy Information Administration, average Retail Price of Electricity to Ultimate Customers by End-Use Sector, by State, June 2006, [http://www.eia.doe.gov/cneaf/electricity/epm/table5\\_6\\_a.html](http://www.eia.doe.gov/cneaf/electricity/epm/table5_6_a.html)

<sup>10</sup> Bruce Biewald, Synapse Energy Economics, "Electricity Price Increases: Causes, Effects and Solutions, presentation to the Restructuring Roundtable, May 19, 2006 <http://www.raabassociates.org/main/roundtable.asp?sel=73>

<sup>11</sup> Federal Energy Regulatory Commission (FERC), "New England Gas Infrastructure Report," Dec. 2003

<sup>12</sup> *The Wall Street Journal*, June 2, 2006, "Business Brief -- CenterPoint Energy Inc.: East Coast Demand Inspires Texas to Pennsylvania Pipeline"

In addition, the region has one LNG receiving and regasification terminal, the Distrigas LNG facility, in Everett, Massachusetts.<sup>13</sup> Seven percent of the LNG brought to this facility is stored either on-site or brought to other LNG storage tanks in the region. LNG storage is important in order to maintain system reliability and avoid shortages during high use periods such as the winter months when residential heating customers are competing with utilities for natural gas supply. This is noted in a report by the New England Governor's Conference which states, "...if current LNG storage and vaporization were unavailable during winter months, reliability problems would be felt immediately."<sup>14</sup> The balance of the LNG brought into the Everett Distrigas facility - 93 percent -- is turned into vapor and put into the gas pipeline system or used at a nearby electric generation facility. Overall, this facility provides a vital contribution to the stability and supply of natural gas for the region.

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### *What is LNG?*

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Composed mainly of methane, Liquefied Natural Gas (LNG) is formed when natural gas (a vapor) is subjected to extreme cold (minus-260-degrees Fahrenheit) and transformed into a liquid. In this chemical state, LNG is not flammable and takes up much less volume than its gaseous counterpart (nearly 600 times less) which makes it much easier to transport and store.

Most LNG brought to Massachusetts comes in ships from Trinidad & Tobago off the coast of South America. Once the tankers dock, either at a land-based facility such as the one in Everett or at an off-shore buoy-system, the gas is warmed into a vapor and pumped into the gas line. It can also be stored as liquid in tanks on land and converted into vapor supply when needed.

Several prestigious groups already support LNG as a solution to our gas-supply needs. The New England Governors' Conference determined that expansion of LNG delivery and storage terminals provide considerably greater improvements to gas supply reliability<sup>15</sup>. The New England Council said in its May 2005 report that LNG is the most realistic infrastructure/supply option and additional LNG infrastructure construction is required now.<sup>16</sup> The New England Energy Alliance advocates that declining production of and increasing competition for continental gas supplies in the U.S. and Canada mean that imports of LNG may be the most economic and reliable option available to our region.<sup>17</sup>

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<sup>13</sup> U.S. Department of Energy Office of Fossil Energy, "Liquefied Natural Gas: Understanding the Basic Facts" [www.fossil.energy.gov/programs/oilgas/publications/lng/LNG\\_primerupd.pdf](http://www.fossil.energy.gov/programs/oilgas/publications/lng/LNG_primerupd.pdf)

<sup>14</sup> The Power Planning Committee of the New England Governors' Conference, Inc. "Meeting New England's Future Natural Gas Demands: Nine Scenarios and Their Impacts," March 1, 2005, p. vii, <http://www.negc.org/DOCUMENTS/NATURALGASSTUDY.PDF>

<sup>15</sup> Ibid

<sup>16</sup> "The Economic Imperative for Additional LNG Supplies in New England," the New England Council, May 2005, [http://www.newenglandcouncil.com/pdf/rep\\_webReports/rep\\_lng.pdf](http://www.newenglandcouncil.com/pdf/rep_webReports/rep_lng.pdf)

<sup>17</sup> "New England Energy Infrastructure, Adequacy Assessment and Policy Review, Prepared for the New England Energy Alliance, November 2005 <http://www.newenglandenergyalliance.org/downloads/Tierney-HibbardInfrastructureNovember32005.pdf>

Recently, the Special Commission Relative to Liquefied Natural Gas Facility Siting and Use (Special Commission) recommended that the Commonwealth “should facilitate siting new natural gas infrastructure and import facilities in close proximity to the Commonwealth... to assure our energy security.”<sup>18</sup>

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### *A Public Safety Threat?*

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LNG expansion creates safety concerns, especially if terminals are located near population centers. Despite the excellent safety record associated with the transport and storage of LNG, there is concern that LNG import facilities might become targets of potential terrorist activity.

Like other fuels, natural gas can burn at certain temperatures, but the vapor is no more explosive than gasoline. In the event of a leak, a vapor cloud could ignite, causing significant damage on land and/or at sea. The most significant impacts to public safety and property exist within 500 yards (3/10 of a mile) of a spill, due to thermal hazards from fires, with lower public health and safety impacts at distances beyond approximately one mile.<sup>19</sup>

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### *LNG Proposals Under Consideration in Massachusetts*

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Four companies have submitted proposals for LNG off-loading facilities in Massachusetts. Two are land-based and two are off-shore. Each one has a different schedule and its own set of reviews for obtaining permits. These four proposals are among 16 proposed projects in the northeastern United States and Eastern Canada.

Given that New England operates a regional energy grid, local, state and federal legislators have called for a regional study to determine the actual natural gas supply needs of the region and the best sites for locating new pipelines or LNG terminals. A regional approach was also recommended in a report to the Special Commission that noted, “The realities of our energy patterns suggest that from a siting point of view, we might begin to consider the impacts of our energy options and decisions in the context of larger common interests and shared burdens.”<sup>20</sup> To date, no region-wide study has been commissioned and concerns have been raised that such a study could only delay bringing much-needed natural gas supply to the area.

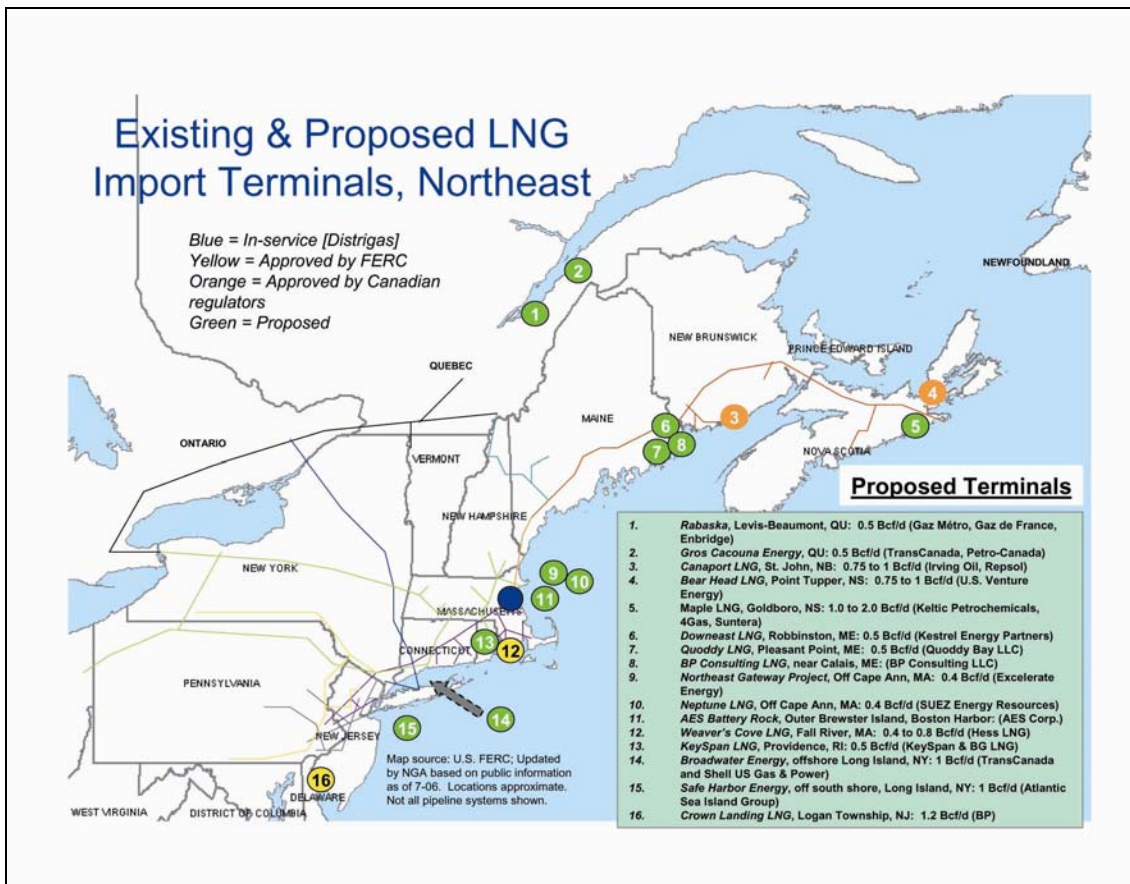
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<sup>18</sup> Report of the Special Commission Relative to Liquefied Natural Gas Facility Siting and Use, July 28, 2006  
[http://www.mass.gov/legis/reports/Final\\_LNG\\_Commission\\_Report\\_Filed\\_7-28-06.pdf](http://www.mass.gov/legis/reports/Final_LNG_Commission_Report_Filed_7-28-06.pdf)

<sup>19</sup> Guidance on Risk Analysis and Safety Implications of a Large Liquefied Natural Gas Spill Over Water, Mike Hightower, et al. Sandia National Laboratories, December 2004, p. 77 [http://fossil.energy.gov/programs/oilgas/storage/lng/sandia\\_lng\\_1204.pdf](http://fossil.energy.gov/programs/oilgas/storage/lng/sandia_lng_1204.pdf)

<sup>20</sup> Susan Tierney, Ph. D., the Analysis Group, “Report to the Massachusetts Special Commission Relative to Liquefied Natural Gas Facility Siting and Use, June 30, 2006

# LNG Terminals



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Descriptions on each of the four Massachusetts proposals are provided as follows:

## Weaver's Cove LNG, Fall River, Massachusetts

Hess LNG proposes to construct and operate an LNG import terminal and pipeline to import LNG and deliver from 400 MMcf/d<sup>22</sup> to a peak of 800 MMcf/d. The proposal includes an LNG storage tank of 4.4 Bcf<sup>23</sup> and two pipeline connections to the Algonquin system.<sup>24</sup>

The Federal Energy Regulatory Commission (FERC) approved the Weaver's Cove application in June 2005 and reaffirmed its approval in January 2006. There is significant local opposition to this project because its upstream, land-based location is thought to be too near residential areas. Rhode Island recently passed legislation that seeks to prevent LNG tankers from traveling through parts of the Narragansett Bay and Sakonnet River, which would prevent any ship from getting to the Weaver's Cove facility. Regardless of the challenges, the proponents continue to move forward in the

<sup>21</sup> Northeast Gas Association Chart, [http://www.northeastgas.org/pdf/lng\\_terminals\\_0706.pdf](http://www.northeastgas.org/pdf/lng_terminals_0706.pdf) Note: Map is not to scale

<sup>22</sup> MMcf/d - One million cubic feet per day

<sup>23</sup> The abbreviation for billion cubic feet of gas

<sup>24</sup> Northeast Gas Association, Proposed LNG Import Terminal Projects, Northeast U.S. and Canada (as of 7/11/06)

[http://www.northeastgas.org/pdf/lng\\_table0706.pdf](http://www.northeastgas.org/pdf/lng_table0706.pdf)

permitting process.

#### AES Battery Rock LNG Project, Boston, Massachusetts

AES Corporation proposes an import terminal and storage tanks to be located on Outer Brewster Island in Boston Harbor, to interconnect with an existing pipeline.<sup>25</sup>

This project would require taking an island managed by the National Park Service, which environmental advocates strongly oppose. The proposal was before the Massachusetts legislature, which decided to take no action on the request. However, the Special Commission recommended in its report that the state should continue to explore the use of state-owned land, including Outer Brewster Island for an LNG facility.<sup>26</sup>

Several members of the Special Commission and others filed statements of dissent, citing numerous factors, including insufficient study of the other proposed off-shore sites, lack of a study of its effect on public safety, and environmental and economic impacts (including Logan International Airport operations).

#### Northeast Gateway Project

Excelerate Energy proposes to construct a subsea buoy and riser approximately 13 miles off the shore of Cape Ann (Gloucester, Massachusetts). It is a deepwater port that would be located in federal waters and capable of mooring specially designed LNG ships equipped to store, transport, and vaporize LNG into natural gas. Excelerate's facilities would connect to the existing HubLine<sup>SM</sup> pipeline operated by Algonquin Gas Transmission Company in Massachusetts Bay. The project would be capable of delivering more than 400 MMcf/d.<sup>27</sup>

#### Neptune LNG

Neptune LNG, proposed by Suez Energy Resources, NA, is a deepwater port that would be located in federal waters approximately nine miles south of Gloucester. It would be designed to provide an average of 400 MMcf/d to the New England market. The port would be capable of mooring specially designed LNG ships equipped to store, transport, and vaporize LNG into natural gas that can be sent to customers using the existing HubLine<sup>SM</sup> pipeline.<sup>28</sup>

The two off-shore sites detailed above are under review by the United States Coast Guard Office of Operating and Environmental Standards. Proponents for these facilities argue greater public safety, given their distance from residential areas and the need to bring new natural gas supplies to the region. Opponents stress environmental damage to the sea and detrimental economic impact on the fishing industry, because these sites require a four-mile safety zone that would prevent any commercial or

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<sup>25</sup> Ibid.

<sup>26</sup> Special Commission report, p. 13

<sup>27</sup> Northeast Gas Association, Proposed LNG Import Terminal Projects, Northeast U.S. and Canada (as of 7/11/06)  
[http://www.northeastgas.org/pdf/lng\\_table0706.pdf](http://www.northeastgas.org/pdf/lng_table0706.pdf)

<sup>28</sup> Ibid.

recreational water-craft from entering when a ship is on-buoy and off-loading LNG.

Information about these two offshore projects and their dockets are located online at: [www.uscg.mil/hq/gm/mso/mso5.htm](http://www.uscg.mil/hq/gm/mso/mso5.htm).

The four proposals are each capable of delivering enough natural gas to fuel an enormous amount of electricity. Weavers Cove and AES Battery Rock are both capable of receiving and storing enough LNG to generate an estimated 4,545 Megawatts (MW)<sup>29</sup> to 9,090MW of power each<sup>30</sup> (a megawatt is capable of powering 800-1,000 homes). Neptune LNG and Northeast Gateway Project are each capable of receiving and immediately putting the gas into the pipeline delivering an estimated 4,545 MW worth of fuel.

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### *Where do we go from here?*

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The energy plan released by the Romney administration on August 11, 2006 says Governor Romney expects to make decisions on offshore LNG projects this fall. Although the Coast Guard is reviewing these projects, according to the Deepwater Port Act, the Secretary of Transportation shall not issue a license without the approval of the governor of each adjacent state.<sup>31</sup>

Another option for solving our natural gas supply problem includes relying on out-of-region suppliers such as Canada, but this approach too has been criticized. Canada has signed on to the Kyoto Protocol and is expected to retire many of its coal-fired power plants in favor of new natural gas plants. As such, Canada's demand for natural gas is expected to increase greatly. In addition, the cost to transport the gas to Massachusetts and New England would do nothing to stabilize prices.

Locally, organizations such as Keyspan report that the importation of additional LNG as a way to avoid constructing in-region LNG supplies could be too expensive.<sup>32</sup> ISO New England also has stated that out-of-region gas-fired power plants would also drive prices for out-of-region LNG higher due to increased competition for the fuel.<sup>33</sup>

David O'Connor, Commissioner of the Massachusetts Division of Energy Resources, was quoted in a *Salem News* article on November 15, 2005, saying, "The Canadian proposals make a very useful contribution, but...I do not think they will meet the demand."

While calls for a regional approach are relevant and should be undertaken by an appropriate authority, Massachusetts must move forward with siting one or more of the

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<sup>29</sup> a megawatt (MW) is capable of powering 800-1,000 homes

<sup>30</sup> Energy Information Administration, "Natural Gas Transportation - Infrastructure Issues and Operational Trends", October 2001, p. 22

<sup>31</sup> Tierney, p. 74

<sup>32</sup> "Mass warned not to count on Canadian gas," Boston Globe, May 23, 2006

<sup>33</sup> Ibid.

four LNG proposals, or soliciting new proposals if other sites are deemed more appropriate.

Stringent siting regulations are in place and involve several federal, state and local agencies. Presently, more support is building for offshore facilities than for those that are nearer to or onshore. All proposals should be allowed to have fair hearings via the siting process and have decisions for their approval or denial based on facts and not emotion.

Waiting for our neighbors to the north or south to solve our energy needs, or giving in to all NIMBY arguments regardless of merit, is only going to exacerbate the supply and pricing problem we are facing. The fact remains that Massachusetts' economy relies on businesses (e.g., biotech, semiconductor, healthcare) that utilize a vast amount of electricity in their operations. Moreover, residents are requiring more and more electricity to power their computers, DVD players, home entertainment equipment as well as to charge cell phones and MP3 players among others. If we are going to keep expanding the Massachusetts economy and retain residents, we need to do something about electricity supply and pricing.

There are no simple solutions to solving the Commonwealth's many energy challenges, but increasing natural gas supply by siting a nearby LNG facility is a good first step in the process.

*Mass AREA is a diverse group of more than 60 business, labor, and community organizations and professional leaders committed to finding clean, low-cost and reliable electricity solutions that foster prosperity for all of Massachusetts.*