The UNIVERSITY of VERMONT

James M. Jeffords Center's

Vermont Legislative Research Service

Natural Gas Pipeline Systems in Vermont

Currently, the two leading sources of fuel for home heating in Vermont are fuel oil, which heats 47.7% of Vermonter's homes, and propane, which heats 15.4%. This differs drastically to the United States average, having only 6.5% using fuel oil, and 5% using propane. In fact, the largest percentage of fuel type for home heating in the U.S. was natural gas with 49.5%; whereas only 15.2% of Vermonters use natural gas.[1]

Established in 1965, Vermont Gas Systems, Inc. (Vermont Gas) is the only natural gas distributor in Vermont. Northern New England Energy Corporation owns Vermont Gas Systems, which in turn is owned by Gaz Métro, Quebec's largest natural gas company.[2] It first supplied natural gas to 6,400 customers in Chittenden and Franklin counties, and currently serves 40,000 customers in northwestern Vermont.[3] Vermont's natural gas is transported from gas fields in Alberta, Canada via the TransCanada Pipeline and arrives at Vermont Gas System's main pipelines at Highgate, Vermont. Vermont's natural gas pipelines do not connect with any other natural gas pipelines in the U.S., consequently, Vermont relies solely on Canadian imports.[4] Vermont Gas is seeking to extend their service into Addison County through a pipeline expansion called the Addison Natural Gas Project.[5]

This report examines Vermont's current natural gas pipeline system, the proposed Addison Natural Gas Project, and the benefits and concerns of having their current pipeline system expanded.

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[1] U.S. Energy Information Administration, "Vermont: State Profile and Energy Estimates," March 21, 2013, accessed on March 26, 2013, http://www.eia.gov/state/data.cfm?sid=vt.

[2] Vermont Gas, "About Vermont Gas," accessed March 14, 2013, http://www.vermontgas.com/about/about.html.

[3] Public Service Department, "Natural Gas & Propane," accessed March 14, 2013, http://publicservice.vermont.gov/topics/naturalgas_propane.

[4] U.S. Energy Information Administration, "Natural Gas Pipelines in the Northeast Region," U.S. Department of Energy, accessed March 14, 2013, http://www.eia.gov/pub/oil_gas/natural_gas/analysis_publications/ngpipeline/northeast.html.

[5] Vermont Gas Systems, Inc., "Addison Natural Gas Project Overview," accessed March 15, 2013, http://addisonnaturalgas.com/projectoverview/.

Vermont's Current Natural Gas Pipelines

A network of over 650 miles of underground transmission and distribution lines serve natural gas to Vermont customers. These pipelines are in underground rights-of-way, "consecutive property easements acquired by, or granted to, the pipeline company" that provide "sufficient space to perform pipeline maintenance and inspections, as well as a clear zone where encroachments can be monitored and prevented."[6]

Natural gas pipelines can be made of cast iron, steel, copper, or plastic pipe and range in diameter.[7] Depending on soil and geographic conditions, there are various coating material requirements for the pipelines.[8] All natural gas pipelines in Vermont "undergo regular aerial monitoring, ground patrols and leak detection protocols."[9] Every seven years, Vermont Gas uses an electronic inspection device, called a "smart pig," to inspect inside the pipeline for anomalies. The life expectancy of natural gas pipelines is usually at least 100 years as they are designed to operate indefinitely.[10]

Addison Natural Gas Project

On December 20, 2012, Vermont Gas submitted a petition to the Vermont Public Service Board (PSB) requesting a "Certification of Public Good" (CPG) for their proposed Addison Natural Gas Project.[11] According to Vermont Gas, the goal of the project is "to expand natural gas service to Addison County."[12] In his pre-filed Testimony, Vermont Gas President, A. Donald Gilbert explains "expanding natural gas service to Addison County is the first step towards a long term plan to serve Rutland and eventually connect Vermont to the U.S. natural gas system."[13] Vermont Gas hopes to carry out the Project in two parts; Phase I would extend the existing natural gas pipeline from Colchester, Vermont to Middlebury, Vermont. Phase II would extend

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[6] U.S. Department of Transportation, "Pipeline Basics," accessed March 16, 2013, http://primis.phmsa.dot.gov/comm/PipelineBasics.htm?nocache=9202.

[7] Pipeline and Hazardous Materials Safety Administration, "Natural Gas Pipeline Systems," U.S. Department of Transportation, accessed April 1, 2013, http://primis.phmsa.dot.gov/comm/NaturalGasPipelineSystems.htm?nocache=9141.

[8] Pipeline and Hazardous Materials Safety Administration, "Pipeline Construction," U.S. Department of Transportation, accessed April 1, 2013, http://primis.phmsa.dot.gov/comm/construction/index.htm?nocache=6363#Design.

[9] Vermont Gas, "F.A.Qs," accessed May 7, 2013, http://addisonnaturalgas.com/frequently-asked-questions/.

[10] Vermont Gas, "F.A.Qs."

[11] Vermont Public Service Board, "Prefiled Testimony of A. Donald Gilbert, Jr.," December 20, 2012, accessed on April 1, 2013, http://psb.vermont.gov/sites/psb/files/docket/7970addison/VGS%20ANGP%20Gilbert%20PFT%20%5B12-20-12%5D.PDF.

[12] Vermont Gas Systems, Inc., Addison Natural Gas Project Overview, accessed March 15, 2013, http://addisonnaturalgas.com/projectoverview/.

[13] Vermont Public Service Board, "Prefiled Testimony of A. Donald Gilbert, Jr.," December 20, 2012, accessed on April 1, 2013, http://psb.vermont.gov/sites/psb/files/docket/7970addison/VGS%20ANGP%20Gilbert%20PFT%20%5B12-20-12%5D.PDF, p. 9.

the pipeline in Middlebury across to Ticonderoga, NY.[14]

Phase I of the project will include 41.2 miles of new 12-inch transmission mainline, which will extend from the current mainline in Colchester down to Middlebury. This section of the proposed pipeline will pass through Colchester, Essex, Williston, St. George, Hinesburg, Monkton, New Haven, and Middlebury. The Project will also include 5.1 miles of six-inch distribution mainlines to Vergennes and Middlebury. Lastly, three new pressure regulation states will be built in Williston, New Haven, and Middlebury.[15] The estimated cost of the Project is $86,612,944.[16] Construction for Phase I is expected to start June 1, 2014.[17]

Phase II of the project will include a new transmission pipeline that would originate in Middlebury, extend 24-miles through Cornwall and Shoreham, VT, and end in Ticonderoga, NY, where it would provide service to International Paper's (IP) Ticonderoga Mill. According to Vermont Gas, the company "entered into an agreement with International Paper to provide gas to the mill in 2015 at no cost to Vermont residents or Vermont Gas customers."[18] The company will be submitting a proposal to the PSB for Phase II of their project in July 2013.[19] Construction for Phase II is expected to start June 1, 2015, and expected to be in service by December 1, 2015.[20]

International Paper

As described above in Phase II, International Paper formed an agreement with Vermont Gas to extend a gas pipeline to Ticonderoga, NY. Phase II's transmission pipeline to IP will also be used to bring natural gas service to Rutland, Brandon, Pittsford, and Proctor, while IP helps pay a huge portion of the construction. Reducing IP's energy costs will also help support the paper mills' 1,200 regional jobs, and business production, 20% of which comes from Vermont.[21]

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[14] Addison County Regional Planning Commission, "Energy: Addison Natural Gas Project," accessed on April 9, 2013, http://acrpc.org/programs-services/energy/.

[15] Vermont Public Service Board, "Prefiled Testimony of John Heintz," VGS Addison Natural Gas Project PSB Docket No. 7970, February 28, 2013, accessed on April 9, 2013, http://psb.vermont.gov/sites/psb/files/docket/7970addison/heintz/Exhibit%20Petitioner%20JH-11.PDF.

[16] Vermont Public Service Board, "Addison Natural Gas Project Cost Estimate," December 20, 2012, accessed on April 10, 2013, http://psb.vermont.gov/sites/psb/files/docket/7970addison/heintz/Exhibit%20Petitioner%20JH-11.PDF.

[17] Vermont Public Service Board, "Key Milestones and Dates," December 20, 2012, accessed on April 10, 2013, http://psb.vermont.gov/sites/psb/files/docket/7970addison/Lyons/Exhibit%20Petitioner%20TSL-10.PDF.

[18] Vermont Gas Systems Inc., "Addison Natural Gas Project: Phase II," February 2013, http://addisonnaturalgas.com/wp-content/uploads/2012/12/VTGas_FebProjectPhaseII_04output1.pdf.

[19] Vermont Gas Systems Inc., "Addison Natural Gas Project: Phase II."

[20] Vermont Public Service Board, "Key Milestones and Dates."

[21] Vermont Public Service Board, "Prefiled Testimony of Timothy S. Lyons," December 20, 2012, accessed on April 1, 2013, http://psb.vermont.gov/sites/psb/files/docket/7970addison/Lyons/VGS%20ANGP%20Lyons%20PFT%20%5B12-20-12%5D.PDF.

Potential Economic Benefits

The Addison Natural Gas Project will extend the natural gas service in Vermont and has economic benefits for both prospective customers and towns hosting the pipeline. According to the U.S. Energy Information Administration's "Heating Fuel Comparison Calculator," natural gas is a cheaper alternative to home heating compared to propane and heating oil. Since propane and heating oil are both measured in gallons, they are converted to btu to match the measurement of natural gas. In doing so, the fuel price per million btu of fuel oil is $28.95, and of propane is $26.68. Whereas the fuel price per million btu for natural gas is $6.75. Natural gas furnaces/boilers have a higher efficiency rating of 82% compared to propane and heating oil furnaces/boilers, both having 78%. In conjunction with a cheaper fuel price and higher efficiency rating, the fuel cost per million btu of natural gas is $8.23, as compared to $37.11 for heating oil and $34.20 for propane.[22]

Previous pipeline extension projects have yielded significant property tax revenues. In Jericho, for example, the eight-mile distribution pipeline constructed through the town in 2008 generated $36,000 in annual property tax revenue

Environmental Effects

As seen in Table 1, natural gas is a cleaner fuel type during combustion for home heating. Throughout all three categories of the main greenhouse gases, natural gas had lower emissions compared to both propane and heating oil.[23]

Table 1: Greenhouse Gas Emissions Per Fuel Type Combustion

Fuel Type	kg of CO_2 emitted	g of CH_4 emitted	g of N_2O emitted
Natural Gas	53.02	1.0	0.1
Propane	61.46	3.0	0.6
Heating Oil	73.96	3.0	0.6

Source: Environmental Protection Agency, "Emission Factors for Greenhouse Gas Inventories," last modified November 7, 2011, accessed on April 24, 2013, http://www.epa.gov/climateleadership/documents/emission-factors.pdf.

These numbers indicate that burning natural gas produces fewer emissions than other fuel types. However, the extraction process through hydraulic fracturing comes with adverse effects due to the high risks of releasing benzene and methane. In fact, the Environmental Protection Agency lists natural gas systems as one the "significant methane emitters in the United

[22] U.S. Energy Information Administration, "Heating Fuel Comparison Calculator," accessed on April 24, 2013, http://www.eia.gov/neic/experts/heatcalc.xls.

[23] Environmental Protection Agency, "Emission Factors for Greenhouse Gas Inventories," last modified November 7, 2011, accessed on April 24, 2013, http://www.epa.gov/climateleadership/documents/emission-factors.pdf.

States."[24]

Potential Impact Radius

The Pipeline & Hazardous Materials Safety Administration (PHMSA), a subsidiary of the U.S. Department of Transportation, has developed an equation to determine the potential impact radius (PIR) of a natural gas pipeline. Any high-populated area, containing 20 or more buildings intended for human occupancy, that fall within the PIR, are considered high consequence areas due to the potential for a gas explosion.[25]

Many towns hosting the pipeline expansion but not receiving natural gas service have responded negatively to the proposed Addison Natural Gas Project because of its close distance to residential and commercial areas. For example, in a letter sent to the Public Service Board, the town of Monkton expressed opposition to hosting the pipeline because the zoning will place it only 75 feet away from residential areas. With a calculated PIR of 300 feet, the town requested the pipeline be moved back that far in order to stay out of a high consequence area.[26]

Conclusion

Vermont has only one natural gas distributer, Vermont Gas, which serves 40,000 customers in the state through a network of over 650 miles of distribution pipelines. These pipelines can be designed with various materials and can last over 100 years.

Vermont Gas has applied to expand their current natural gas pipelines to include distribution to Middlebury and Vergennes. Phase I of this project will extend natural gas pipelines through eight towns, thereby providing service to two towns. Phase II will then extend natural gas service to the International Paper mill in Ticonderoga, NY, while also supplying service to four Vermont towns.

There are a many potential benefits with switching over to natural gas home heating, including cheaper fuel costs, more tax revenue, and cleaner fuel-burning emissions. However, there are risks associated with the matter as well, including more harmful chemicals being released through the natural gas extraction process and a high potential impact risk for towns hosting the transmission pipeline.

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[24] Jacquelyn Pless, "Natural Gas Development and Hydraulic Fracturing: A Policymaker's Guide," National Conference of State Legislatures, June 2012, accessed on April 1, 2013, http://www.ncsl.org/documents/energy/frackingguide_060512.pdf, p. 3.

[25] Pipeline & hazardous Materials Safety Administration, "Fact Sheet: High Consequence Areas," U.S. Department of Transportation, December 1, 2011, accessed on April 3, 2013, http://primis.phmsa.dot.gov/comm/FactSheets/FSHCA.htm.

[26] Public Service Board, "Letter from Monkton Recreation Commission," December 11, 2012, accessed on April 3, 2013, http://psb.vermont.gov/sites/psb/files/docket/7970addison/Wark/Exhibit%20Petitioner%20SJW-4.15.PDF.

This report was completed on May 7, 2013 by Jon-Paul Scordio, Carolina Resende, and Tess Knowles-Thompson under the supervision of Assistant Director Kate Fournier and Professor Anthony Jack Gierzynski in response to a request from Representative Kate Webb.

Contact: Professor Anthony Gierzynski, 513 Old Mill, The University of Vermont, Burlington, VT 05405, phone 802-656-7973, email agierzyn@uvm.edu.

Disclaimer: This report has been compiled by undergraduate students at the University of Vermont under the supervision of Professor Anthony Jack Gierzynski. The material contained in the report does not reflect the official policy of the University of Vermont.