

**INFORMATION BRIEF**

**Research Department**

**Minnesota House of Representatives**

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## Natural Gas in Minnesota

Natural gas is an important fuel in Minnesota, accounting for one-fourth of all the energy used in the state. The 450 billion cubic feet of natural gas consumed annually heats two of every three Minnesota homes and provides power to the state's vibrant ethanol industry. Minnesota also serves as an important transportation corridor through which natural gas produced in western states and Canada travels to reach customers in midwestern and eastern states. This information brief describes where the natural gas that flows through Minnesota originates, how it is transported here, where in the state it is consumed, and how local gas companies balance supply and demand to meet the needs of end-use customers, including during periods of peak consumption.

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## Interstate Pipelines

### Interstate Pipelines Bring Natural Gas from Field to Market

As a state with no indigenous fossil fuel resources, Minnesota must import all the petroleum, natural gas, and propane its residents use. Natural gas is transported to the state from several producing areas: western Canada, North Dakota, Wyoming, Montana, and the southwestern states of Kansas, Oklahoma, Texas, and New Mexico. After gas has been gathered in the field and impurities such as water and carbon dioxide removed, it is placed in an interstate pipeline for transportation to market. These pipelines, forged of high-strength steel with diameters ranging from 20 to 42 inches, operate at pressures from 200 to 1,500 pounds per square inch to move gas hundreds or thousands of miles. More than 300,000 miles of interstate natural gas pipelines are buried beneath the U.S. landscape.<sup>1</sup>

Interstate pipelines can transport natural gas at up to 30 miles per hour depending on the volume of gas, the pipe's diameter, the level of pressure of the gas, and the ambient temperature and elevation. Compressor stations are located every 50 to 100 miles along the route of interstate pipelines to increase gas pressure in order to accelerate the velocity of the gas.<sup>2</sup>

Interstate pipelines do not purchase or own the natural gas they transport. Their sole function is to deliver natural gas to utilities and to large industrial customers who buy natural gas from producers in the field or from other natural gas suppliers. In 2017, Xcel Energy, Minnesota's second largest natural gas utility, made arrangements with 27 different domestic and Canadian suppliers of natural gas to bring supplies to Minnesota.<sup>3</sup>

Minnesota's location between the oil-<sup>4</sup> and gas-rich fields of western Canada and North Dakota and the large population centers of the Midwest results in large volumes of gas being transported through the state to other destinations. As shown in Figure 1, approximately 2,000 billion cubic feet (Bcf) of natural gas entered the state in 2016; 74 percent of those supplies exited Minnesota to continue journeying to states located to the south and east.<sup>5</sup>

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<sup>1</sup> Interstate Natural Gas Association of America, *Assuring the Integrity of Infrastructure: A Summary of Studies and Solutions*, undated, <https://www.phmsa.dot.gov/sites/phmsa.dot.gov/files/docs/INGAA%20Response%20to%20Request%20by%20Cynthia%20Quarterman%20Received%20March%2018%20%20%204%2015%2011.pdf>.

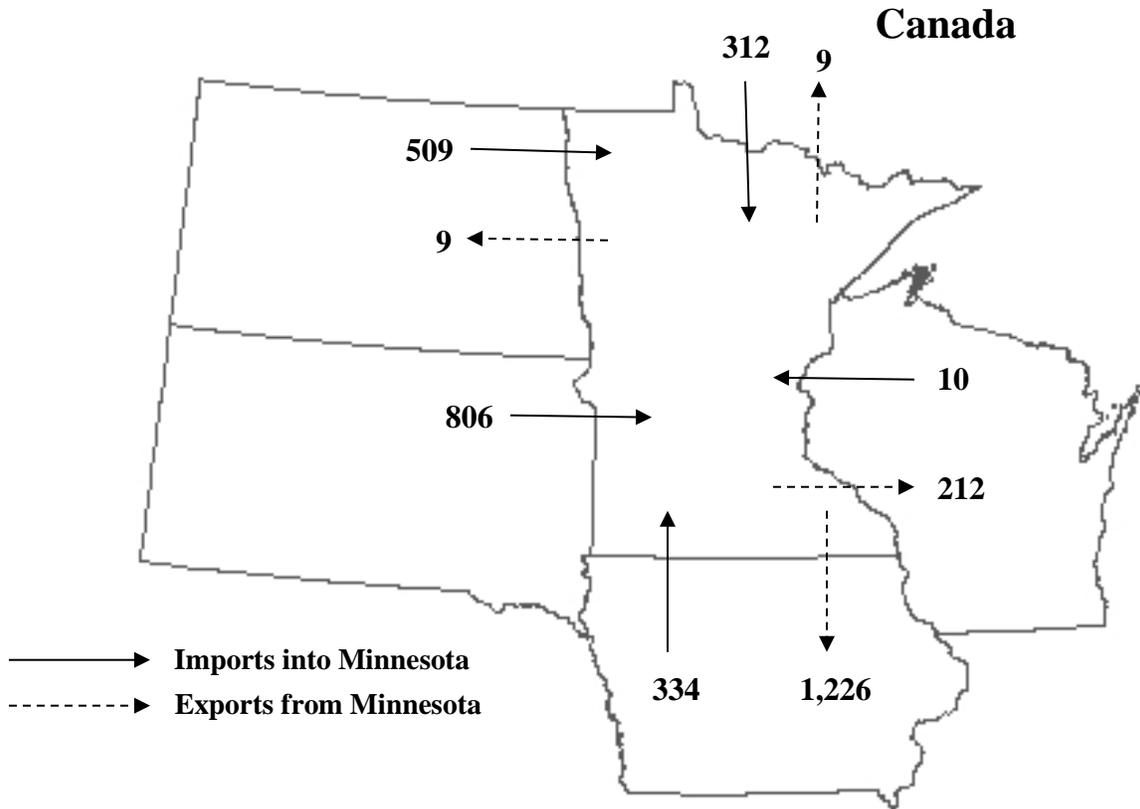
<sup>2</sup> IHS Economics, *The Economic Benefits of Natural Gas Pipeline Development on the Manufacturing Sector*, prepared for the National Association of Manufacturers, May 2016, p. 9; NaturalGas.org, "The Transportation of Natural Gas," [www.naturalgas.org/naturalgas/transport/](http://www.naturalgas.org/naturalgas/transport/).

<sup>3</sup> U.S. Securities and Exchange Commission, *Xcel Energy, Inc., Form 10-K, for the fiscal year ended December 31, 2017*, p. 30, in Xcel Energy, *Leading the Energy Future, Annual Report, 2017*, [www.annualreports.com/HostedData/AnnualReports/PDF/NYSE\\_XEL\\_2017.pdf](http://www.annualreports.com/HostedData/AnnualReports/PDF/NYSE_XEL_2017.pdf).

<sup>4</sup> "Associated gas" is a by-product of crude oil production and represented about 20 percent of gross withdrawals from natural gas wells in the United States in 2016. U.S. Energy Information Administration, *Natural Gas Annual, 2016*, September 2017, Table 3, p. 9, [www.eia.gov/naturalgas/annual/pdf/table\\_003.pdf](http://www.eia.gov/naturalgas/annual/pdf/table_003.pdf).

<sup>5</sup> U.S. Energy Information Administration, *International & Interstate Movements of Natural Gas by State: Minnesota*, [https://www.eia.gov/dnav/ng/ng\\_move\\_ist\\_a2dcu\\_nus\\_a.htm](https://www.eia.gov/dnav/ng/ng_move_ist_a2dcu_nus_a.htm).

Figure 1  
**Movement of Natural Gas Into and Out of Minnesota, 2016**  
**(Billion Cubic Feet)**



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Source: U.S. Energy Information Administration, *International & Interstate Movements of Natural Gas by State: Minnesota*, [www.eia.gov/dnav/ng/ng\\_move\\_ist\\_a2dcu\\_sMN\\_a.htm](http://www.eia.gov/dnav/ng/ng_move_ist_a2dcu_sMN_a.htm).

Five of the six natural gas pipelines that transport gas in Minnesota originate in Canada. As shown in Figure 2, interstate pipelines owned by Great Lakes Transmission and Viking Gas Transmission enter the state directly from Canada at Noyes, the state’s major entry point for imports, while a small amount of natural gas enters through Warroad, Centra Pipelines’ Minnesota entry point.<sup>6</sup> Canadian imports have declined as U.S. natural gas production increased by 49 percent between 2005 and 2017, reflecting the success of horizontal drilling and hydraulic fracturing (fracking) techniques.<sup>7</sup> Imports reached almost 1,000 Bcf in 2005, but fell to less than one-fourth that level in 2015 before rebounding to 488 Bcf in 2017.<sup>8</sup> Canadian

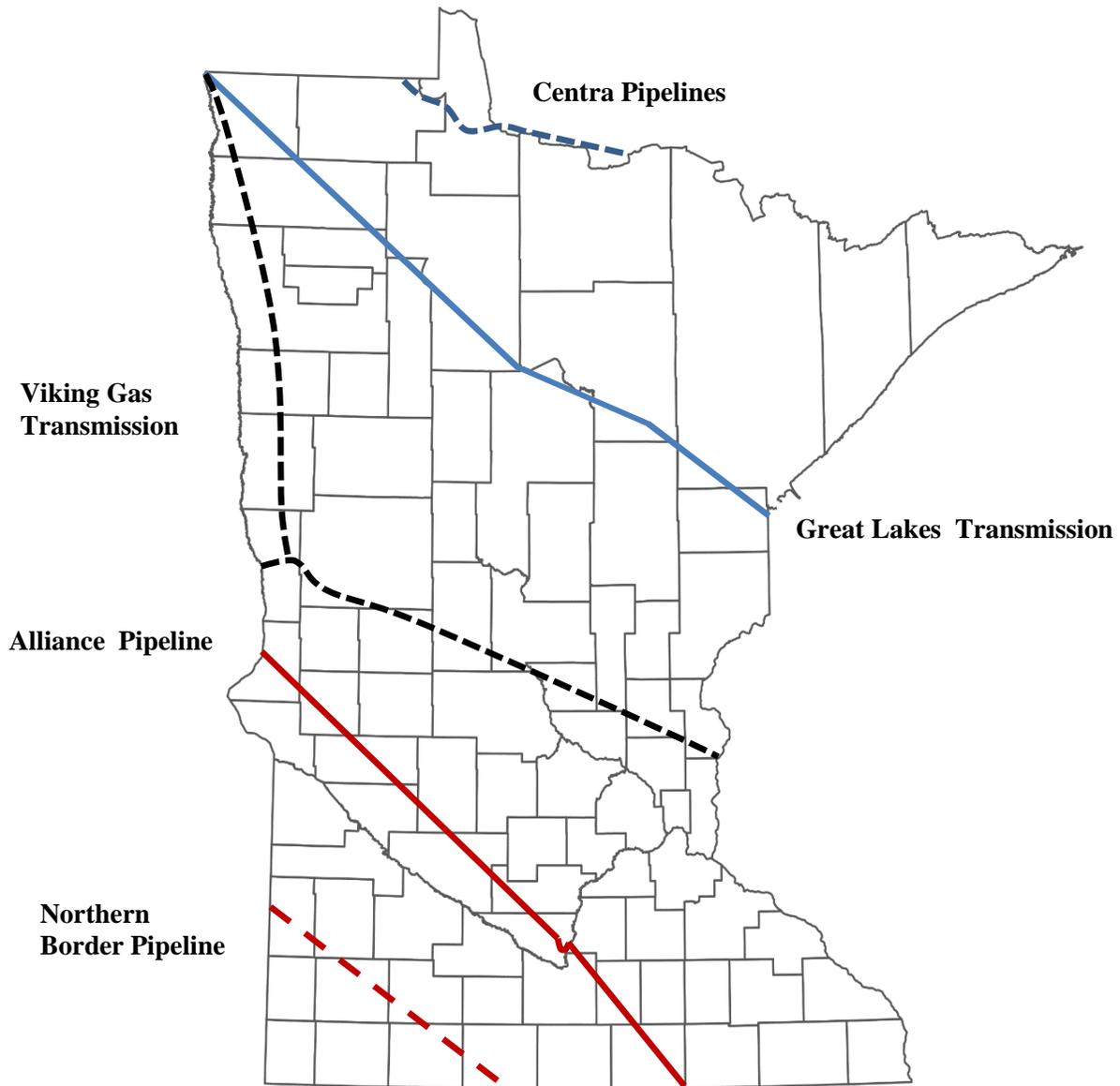
<sup>6</sup> U.S. Energy Information Administration, *U.S. Natural Gas Imports by Point of Entry*, [https://www.eia.gov/dnav/ng/ng\\_move\\_poe1\\_a\\_epg0\\_irp\\_mmcf\\_a.htm](https://www.eia.gov/dnav/ng/ng_move_poe1_a_epg0_irp_mmcf_a.htm)

<sup>7</sup> U.S. Energy Information Administration, *U.S. Dry Natural Gas Production*, [www.eia.gov/dnav/ng/hist/n9070us2A.htm](http://www.eia.gov/dnav/ng/hist/n9070us2A.htm).

<sup>8</sup> *U.S. Natural Gas Imports by Point of Entry*.

imports represented almost 38 percent of all natural gas entering Minnesota in 2005, 30 percent in 2010, but accounted for less than 16 percent of the total in 2016.<sup>9</sup>

Figure 2  
**Pipelines Transporting Canadian Natural Gas in Minnesota**



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Source: Individual pipeline websites

<sup>9</sup> *International & Interstate Movements of Natural Gas by State: Minnesota.*

The pipelines entering Minnesota from North Dakota rather than directly from Canada supplement their Canadian gas with domestic supplies. The Northern Border Pipeline collects gas from the Powder River Basin in Wyoming and the Williston Basin in North Dakota, as well as synthetic natural gas produced by the Great Plains Synfuels Plant in Beulah, North Dakota.<sup>10</sup> The Alliance Pipeline, which also takes gas from the Williston Basin, is the only pipeline transporting Canadian gas in Minnesota whose supplies are not sold to any Minnesota customers.<sup>11</sup> The natural gas transported by Alliance has a high content of natural gas liquids such as ethane, propane, and butane, which are extracted at a plant near Chicago before the natural gas is shipped to states in the Midwest, on the East Coast, and in eastern Canada.

The largest transporter of natural gas in Minnesota is Northern Natural Gas Company, which owns and operates more than 3,300 miles of pipelines in the state.<sup>12</sup> Most of the natural gas it ships is produced domestically—in Kansas, Oklahoma, Texas, New Mexico, North Dakota, and Wyoming. Northern Natural Gas delivers to retail customers in Nebraska, South Dakota, Wisconsin, Iowa, and Michigan's Upper Peninsula, in addition to those in Minnesota. As shown in Figure 3, Northern Natural Gas pipelines cover much of the southern half of the state and extend to the north shore of Lake Superior and the Iron Range. Northern Natural Gas's pipeline system is interconnected with all the pipelines originating in Canada except Alliance and Centra.

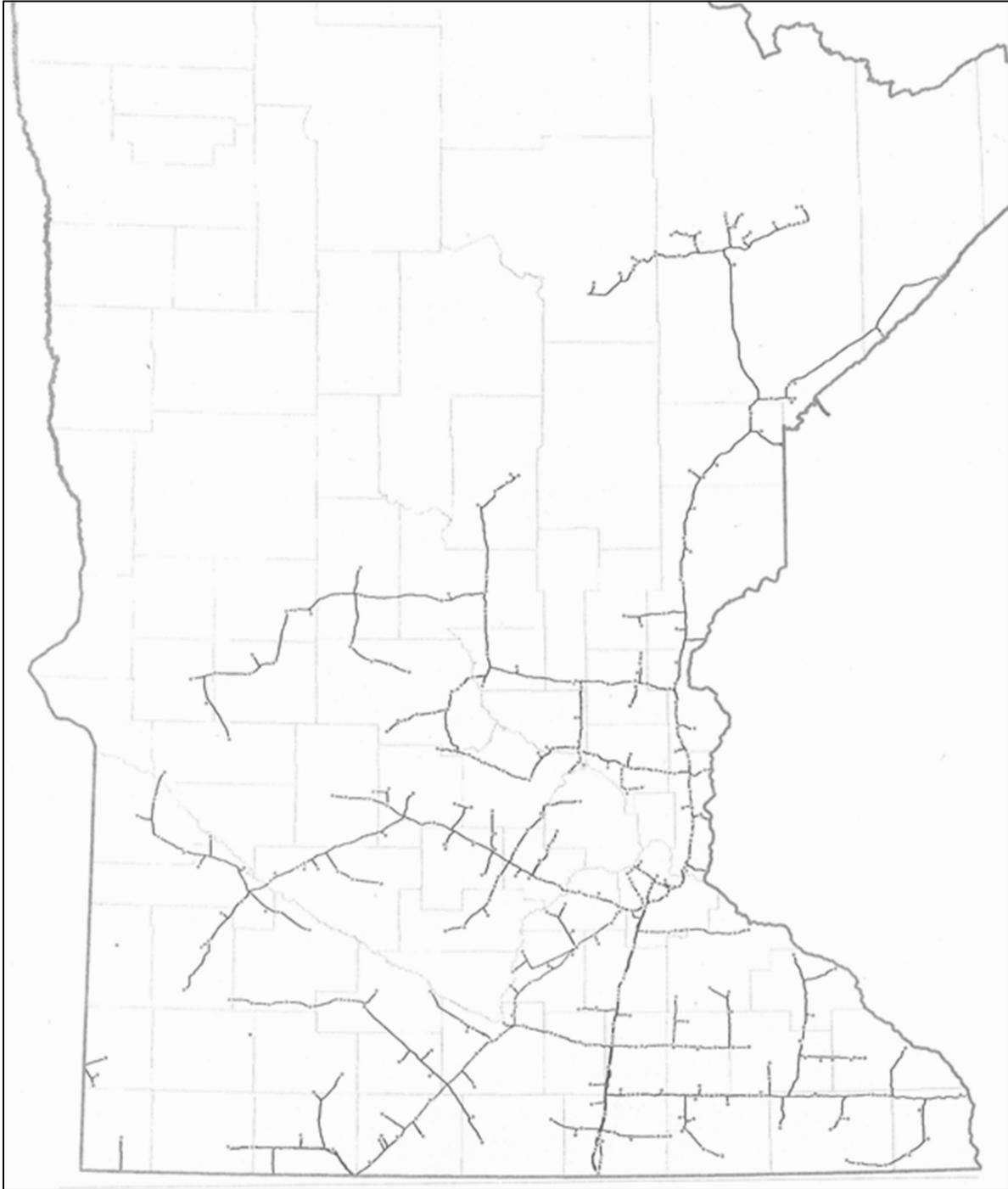
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<sup>10</sup> Synthetic natural gas is produced from carbon monoxide and hydrogen synthesized from coal. The natural gas produced has a slightly lower Btu content than conventional natural gas. Most of the synthetic natural gas produced at the plant is shipped to Ventura, Iowa, a major marketing hub, for distribution to the eastern United States. Dakota Gasification Company, <https://www.dakotagas.com/products/pipeline-and-liquefied-gases/synthetic-natural-gas>; [www.dakotagas.com/about-us/at-a-glance](http://www.dakotagas.com/about-us/at-a-glance).

<sup>11</sup> Alliance Pipeline Limited Partnership, *Management's Discussion and Analysis For the year ended December 31, 2016*, p. 1, <http://www.alliancepipeline.com/AboutUs/InvestorRelations/Documents/2017/cdnlp%20mda%202016.pdf>.

<sup>12</sup> Northern Natural Gas Company, private communication.

Figure 3  
**Northern Natural Gas Pipeline Facilities in Minnesota**



Source: Northern Natural Gas Company

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## Distribution Companies

### Local Distribution Companies Transport Natural Gas to End Users

While interstate pipelines may deliver natural gas directly to large customers located close to pipeline routes, such as electric-generating facilities and ethanol plants, most supplies are transported to utilities located throughout the state for distribution directly to retail customers. These utilities, called local distribution companies (LDCs), are of three types: investor-owned, municipal, and private.

Five investor-owned utilities distribute natural gas in Minnesota. Collectively, they account for more than 80 percent of the state’s retail natural gas sales, the bulk of which are made by the three largest, CenterPoint, Xcel Energy, and Minnesota Energy Resources Corporation (MERC). As shown in Table 1, these utilities typically obtain supplies from several pipelines, including pipelines that transport natural gas from Rocky Mountain and southwestern states but do not enter Minnesota, instead transferring supplies to interconnected pipelines that operate in the state. Table 2 provides information about the geographic areas in which investor-owned utilities provide natural gas service.

Table 1  
**Interstate Pipelines Serving Minnesota Investor-Owned Natural Gas Utilities**

Interstate Pipeline	Minnesota Natural Gas Utility				
	CenterPoint	Xcel	MERC	Great Plains	Greater MN Gas
<b>Pipelines in Minnesota</b>					
Northern Natural Gas	X	X	X	X	X
Northern Border			X		
Viking Transmission	X	X	X	X	X
Great Lakes Transmission		X	X		
Centra Pipelines			X		
<b>Pipelines Outside Minnesota</b>					
Bison Pipeline			X		
Natural Gas Pipeline of America	X				
Trailblazer Pipeline	X				
ANR Pipeline		X			
WBI Energy Transmission		X			

Source: Minnesota Public Utilities Commission, Docket No. G999/M-18-19, *Minnesota Natural Gas Annual Utility Information Report 2017*

Table 2

**Minnesota Investor-Owned Natural Gas Utilities: Number of Customers and Areas Served**

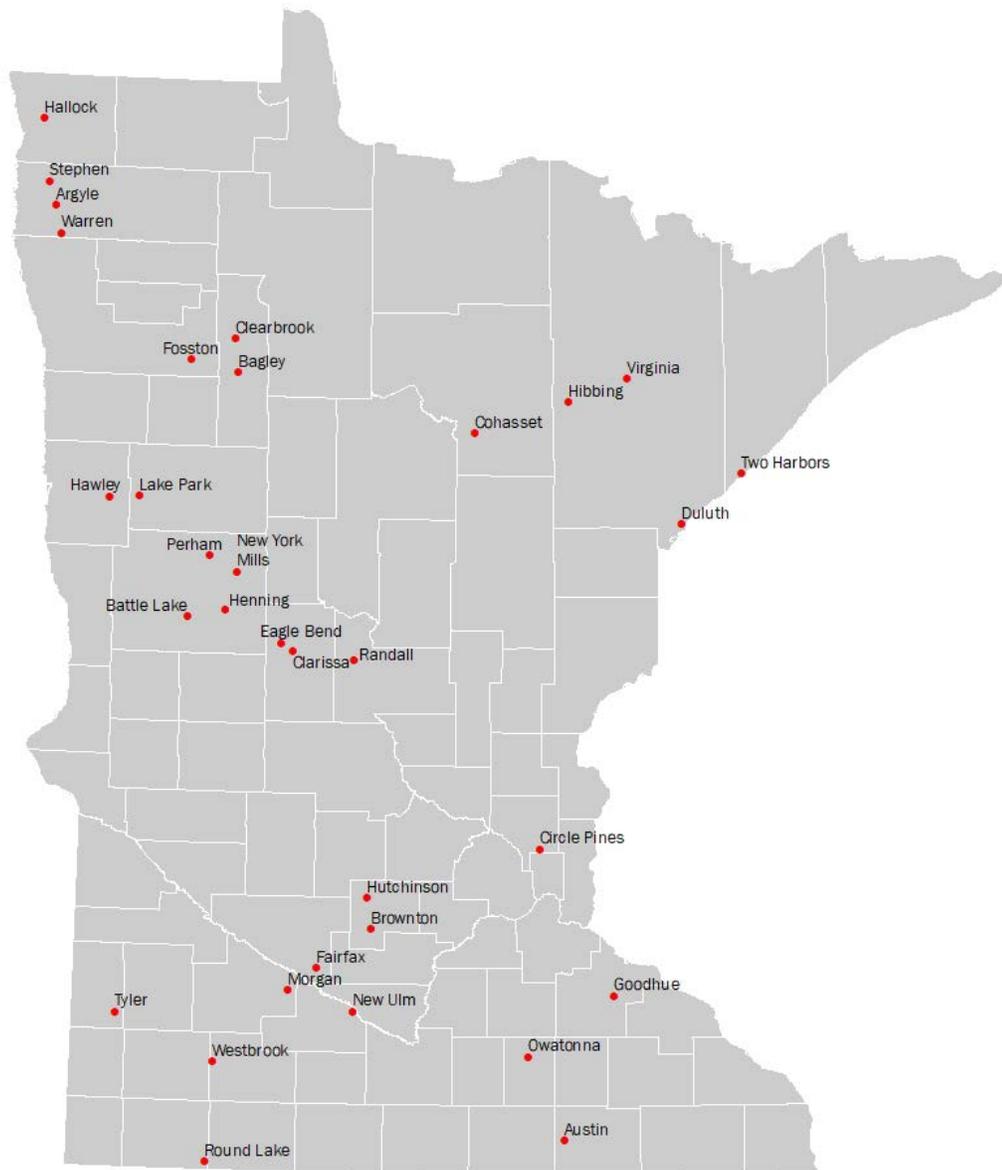
<b>Natural Gas Utility</b>	<b># of Customers</b>	<b># of Counties Served</b>	<b>Minnesota Regions Served</b>	<b>Proportion of Total Sales in Key Counties</b>
CenterPoint	859,010	41	Metro, central, north central, southwest	>1/2 in Hennepin and Dakota
Xcel	457,534	31	East metro, southeast, central, northwest	2/3 in Ramsey and Washington
MERC	234,914	73	All	2/3 in Pine, Dakota, Olmstead
Great Plains	22,082	9	West	3/4 in Otter Tail, Polk, Renville, Lac Qui Parle
Greater Minnesota Gas	7,991	13	Southeast, west central	>1/2 in Todd, Steele, Morrison, Le Seuer
Source: Minnesota Public Utilities Commission, Docket No. G999/M-18-19, <i>Minnesota Natural Gas Annual Utility Information Report 2017</i>				

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Thirty-three publicly owned municipal utilities distribute natural gas to their residents. Many of these utilities serve small communities; only three (Duluth, Austin, and Owatonna) serve 10,000 customers or more.<sup>13</sup> Figure 4 shows cities served by municipal gas utilities.

<sup>13</sup> Minnesota Municipal Utilities Association, [www.mmua.org/about/mn-municipal-utilities/gas](http://www.mmua.org/about/mn-municipal-utilities/gas).

Figure 4  
**Minnesota Cities Served by Municipal Natural Gas Utilities**



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Source: Minnesota Municipal Utility Association, <https://www.mmua.org/about/mn-municipal-utilities/gas>.

Finally, a handful of private firms distribute natural gas to small Minnesota communities, collectively serving about 3,500 customers in the state.<sup>14</sup>

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<sup>14</sup> Minnesota Department of Commerce, *The Minnesota Utility Data Book: A Reference Guide to Minnesota Electric and Natural-Gas Utilities, 1965-2012*, 2016, Table 15, pp. 140-141, <http://mn.gov/commerce-stat/pdfs/utility-data-book-2012.pdf>.

Natural gas is transferred from interstate pipelines to LDCs at locations known as the city gate or town border station, which is typically jointly managed by the pipeline and the LDC. Here the gas is metered, reduced in pressure, and scrubbed and filtered. An unpleasant-smelling odorant, such as mercaptan, which contains sulfur, is added to the gas to make leak detection easier. The LDC’s pipeline network delivers gas to each customer location. Minnesota LDCs own and operate about 58,000 miles of distribution and service pipeline in the state, 78 percent of which is constructed of polyethylene or polyamide plastic.<sup>15</sup>

Typically, LDCs provide retail customers both the natural gas itself and the transportation needed to bring it to the customer’s location. Alternatively, some large customers—natural-gas fired electric generation plants, for example—contract independently with natural gas producers for supplies, arrange with interstate pipelines to transport the natural gas to the LDC, and contract with the LDC for transportation services only. For these customers, eliminating the risk of future price changes by locking in the price of the commodity for the length of the contract term and arranging and paying for natural gas storage to balance supplies at times of peak demand outweigh the convenience of purchasing the LDC’s supplies.

Table 3 shows the significant volumes of natural gas delivered by investor-owned natural gas utilities in Minnesota under this transportation-only LDC service in 2017. It amounts to more than 38 percent of all the natural gas delivered by these utilities, representing about one-third of total sales for CenterPoint and Xcel and more than 60 percent for MERC.

Table 3  
**Volume of Retail Sales and Transportation Service,  
 Minnesota Investor-Owned Natural Gas Utilities, 2017 (Billions of Cubic Feet)**

	<b>CenterPoint</b>	<b>Xcel</b>	<b>MERC</b>	<b>Great Plains</b>	<b>Greater MN Gas</b>	<b>Total</b>
<b>Retail Sales</b>	122.0	68.5	31.9	3.4	1.2	227.1
<b>Transportation-Only Service</b>	56.7	27.4	53.5	4.9	0.3	142.8

Source: Minnesota Public Utilities Commission, Docket No. G999/M-18-19, *Minnesota Natural Gas Annual Utility Information Report 2017*.

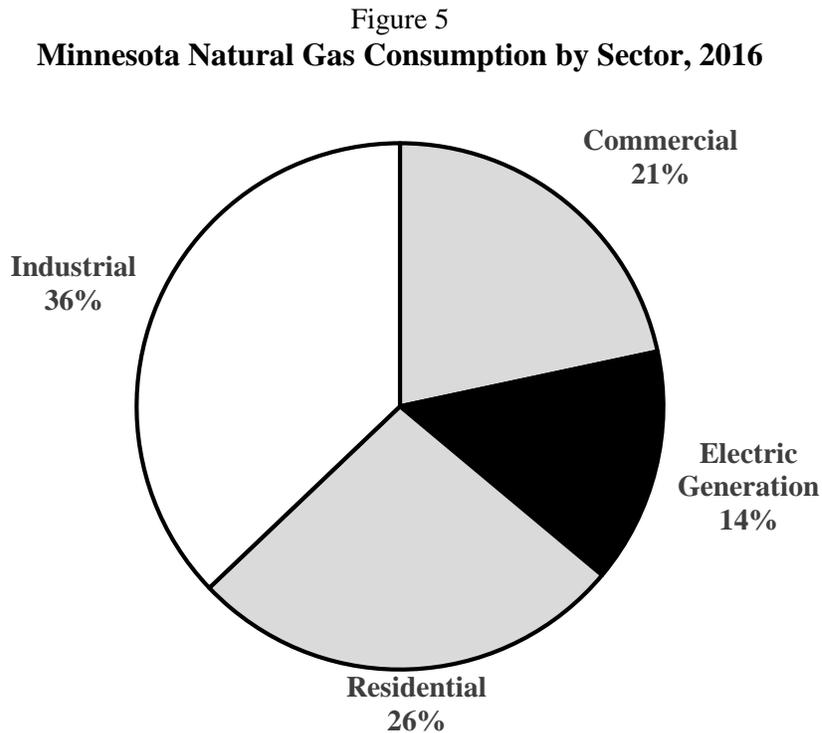
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<sup>15</sup> U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration, *Pipeline Miles and Facilities 2010+*, <https://hip.phmsa.dot.gov/analyticsSOAP/saw.dll?Portalpages>.

## Natural Gas Use in Minnesota

### Consumption Trends

One-fourth of all the energy used in Minnesota comes from natural gas.<sup>16</sup> Although two out of three housing units in the state are heated with natural gas,<sup>17</sup> residential demand accounted for only about one-fourth of the 450 Bcf of natural gas consumed in Minnesota in 2016, as shown in Figure 5. Industrial customers consumed more than one-third of the total, followed by the commercial and electric generation sectors.



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Source: U.S. Energy Information Administration, U.S. States, Table F19, *Natural Gas Consumption Estimates, 2016*, [https://www.eia.gov/state/seds/data.php?incfile=/state/seds/sep\\_fuel/html/fuel\\_use\\_ng.html](https://www.eia.gov/state/seds/data.php?incfile=/state/seds/sep_fuel/html/fuel_use_ng.html).

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<sup>16</sup> U.S. Energy Information Administration, Minnesota State Profile and Energy Estimates, *Profile Data* ([www.eia.gov/state/data.php?sid=MN](http://www.eia.gov/state/data.php?sid=MN)), and *Profile Overview* ([www.eia.gov/state/?sid=MN](http://www.eia.gov/state/?sid=MN)). Consumption data is for 2016.

<sup>17</sup> Minnesota House of Representatives, House Research Department, Information Brief, *Residential Space Heating Fuels in Minnesota*, January 2017, <http://www.house.leg.state.mn.us/hrd/pubs/heatfuel.pdf>; U.S. Energy Information Administration, U.S. States, Table F19: *Natural Gas Consumption Estimates, 2016*, [www.eia.gov/state/seds/data.php?incfile=/state/seds/sep\\_fuel/html/fuel\\_use\\_ng.html](https://www.eia.gov/state/seds/data.php?incfile=/state/seds/sep_fuel/html/fuel_use_ng.html).

Natural gas consumption in Minnesota grew by a moderate 27 percent (96 Bcf) between 1997 and 2016. Commercial use remained virtually flat during this period, while residential use declined by about 8 percent, reflecting the penetration of more efficient furnaces and other conservation measures. Demand growth occurred in two sectors: electric generation, which rose by nearly 60 Bcf, an almost ten-fold increase over 1997 levels, and the industrial sector, whose consumption grew by more than 55 Bcf, a 52 percent gain.<sup>18</sup>

The increasing deployment of natural gas plants to generate electricity reflects a national trend propelled by several factors:

- The increase in natural gas supplies resulting from advanced drilling techniques has kept the price of natural gas low since 2012, while the price of coal, its main competitor in electric generation, has risen.
- Natural gas plants are generally smaller than coal plants, can be built more quickly and at a lower capital cost, and operate at a higher thermal efficiency.
- Natural gas plants are quicker and less costly to activate and deactivate than coal plants, a feature that has become more valuable as intermittent renewable energy sources have come to represent a higher proportion of electric generating capacity.

Minnesota industries that use significant quantities of natural gas include food manufacturing, petroleum refineries, iron and steel mills, and fabricated metals production. These industries grew at moderate rates during these two decades, accounting for a modest portion of the increase in consumption. Ethyl alcohol production also requires large quantities of natural gas.<sup>19</sup> The nearly 20-fold increase in Minnesota's ethanol production over the past two decades<sup>20</sup>—the industry now consumes an estimated 39 Bcf annually—accounts for more than 60 percent of the increase in industrial demand over the past 20 years.<sup>21</sup>

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<sup>18</sup> U.S. Energy Information Administration, *Minnesota Natural Gas Total Consumption* ([www.eia.gov/dnav/ng/hist/na1490\\_smn\\_2a.htm](http://www.eia.gov/dnav/ng/hist/na1490_smn_2a.htm)); *Minnesota Natural Gas Residential Consumption* ([www.eia.gov/dnav/ng/hist/n3010mn2a.htm](http://www.eia.gov/dnav/ng/hist/n3010mn2a.htm)); *Natural Gas Deliveries to Commercial Consumers (including Vehicle Fuel through 1996) in Minnesota* ([www.eia.gov/dnav/ng/hist/n3020mn2a.htm](http://www.eia.gov/dnav/ng/hist/n3020mn2a.htm)); *Minnesota Natural Gas Deliveries to Electric Power Consumers* ([www.eia.gov/dnav/ng/hist/n3045mn2a.htm](http://www.eia.gov/dnav/ng/hist/n3045mn2a.htm)); *Minnesota Natural Gas Industrial Consumption* ([www.eia.gov/dnav/ng/hist/n3035mn2a.htm](http://www.eia.gov/dnav/ng/hist/n3035mn2a.htm)).

<sup>19</sup> U.S. Energy Information Administration, *2014 Manufacturing Energy Consumption Survey*, Table 3.1, Fuel Consumption, 2014, [www.eia.gov/consumption/manufacturing/data/2014/pdf/table\\_3\\_1.pdf](http://www.eia.gov/consumption/manufacturing/data/2014/pdf/table_3_1.pdf).

<sup>20</sup> Production was 70 million gallons in 1996 and 1.2 billion gallons in 2017. State of Minnesota, Office of the Legislative Auditor, *Ethanol Programs*, February 1997, p. 23, <https://www.auditor.leg.state.mn.us/ped/pedrep/9704-all.pdf>; Nebraska government website, *Ethanol Facilities' Capacity by State*, [http://www.neo.ne.gov/statshtml/121/2017/121\\_201704.htm](http://www.neo.ne.gov/statshtml/121/2017/121_201704.htm).

<sup>21</sup> This estimate is based on statistics on natural gas consumed by ethanol producers provided in James Szybist and Scott Curran, *Corn Ethanol: The Surprisingly Effective Route for Natural Gas Consumption in the Transportation Sector*, Oak Ridge National Laboratory, April 2015, p. 3, <https://info.ornl.gov/sites/publications/files/pub55581.pdf>.

## Geography of Natural Gas Service

Natural gas service is only provided to customers located near interstate pipelines or an LDC's distribution lines, "near" being a function of both physical distance and the level of customer demand. Economics determine the feasibility of providing natural gas service to an area. Interstate pipelines cost about \$214,000 per mile per inch of diameter to construct; distribution lines are less costly, but still a significant expense.<sup>22</sup> As a result, unless demand is large enough to justify such a sizeable investment—meaning the presence of one or more large customers or a sufficient number of densely located small customers whose revenues can repay the pipeline investment over a reasonable period—natural gas service will not be extended to unserved areas. In a state like Minnesota, containing more than 2,000 cities and organized towns with fewer than 1,000 residents,<sup>23</sup> customers served by natural gas must be located near the interstate pipelines shown in Figures 2 and 3.

The practical implications of this principle is reflected in Figure 6, which shows the proportion of residential units heated by natural gas in each of Minnesota's counties.<sup>24</sup> Natural gas service is concentrated in more heavily populated areas. In the Twin Cities metropolitan area and adjacent counties extending to the state's eastern and southern borders, natural gas serves 60 percent or more of residential units. (In the seven-county metro area, the proportion of residences heated with natural gas range from 77 percent to 85 percent.) In a second tier of counties surrounding this core area, mostly to the west and south, but also including three Arrowhead counties along the state's northern border, between 40 percent and 60 percent of residences are heated with natural gas. Gas service is less widely available in central and western Minnesota.

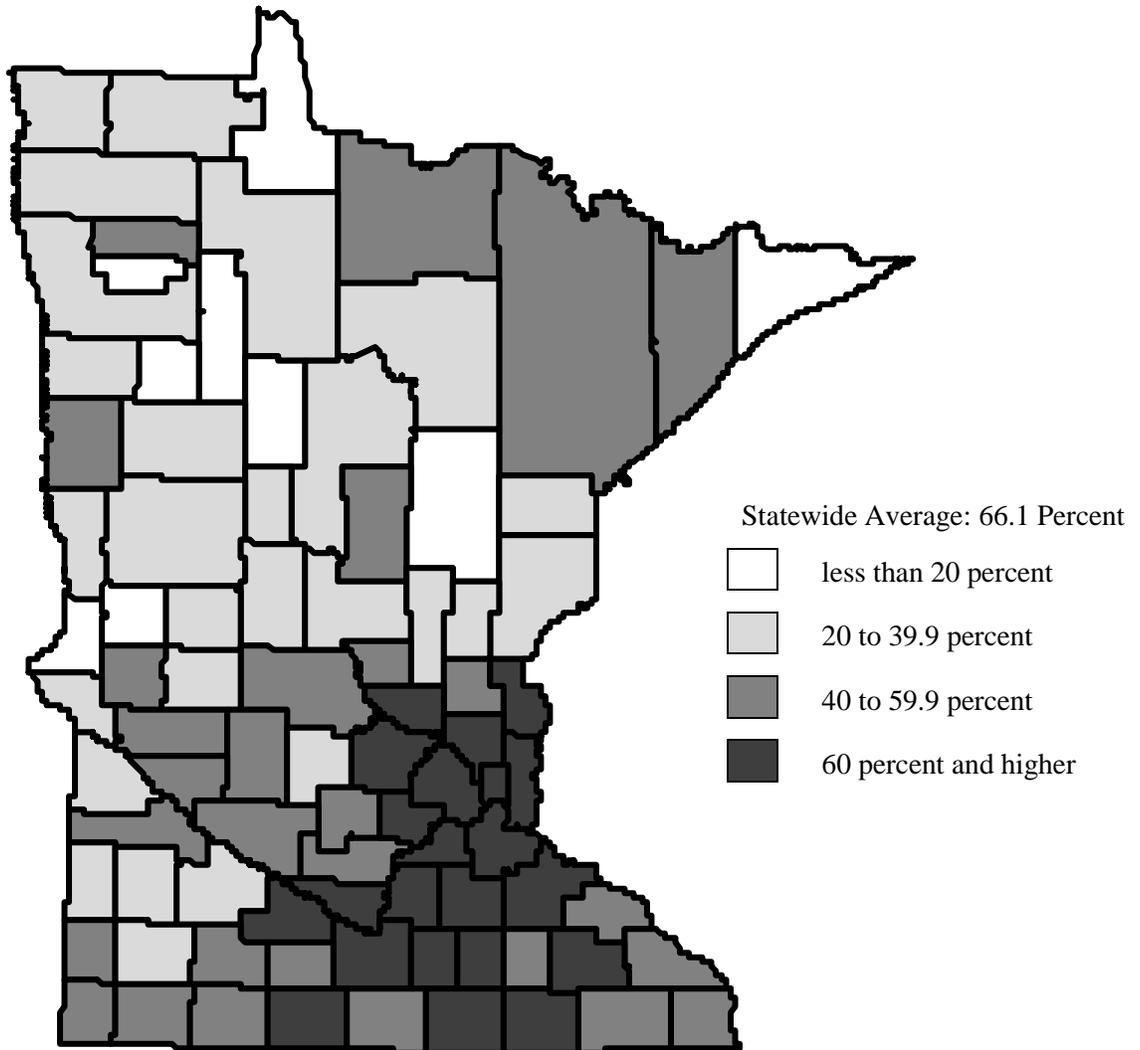
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<sup>22</sup> ICF, *U.S. Oil and Gas Infrastructure Investment Through 2035: An Engine for Economic Growth*, Prepared for the American Petroleum Institute, April 2017, p. 20, <https://www.api.org/~media/Files/Policy/Infrastructure/API-Infrastructure-Study-2017.pdf>.

<sup>23</sup> Minnesota State Demographic Center, *Data by Place, City and Township*, <http://www.mn.gov/admin/demography/data-by-place/>.

<sup>24</sup> Presumably, natural gas in most of these dwelling units is used for cooking and clothes drying as well.

Figure 6  
**Percentage of Housing Units Using Natural Gas as a Heating Fuel, 2010-2014**



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Source: U.S. Census Bureau, American Community Survey five-year estimates

Since natural gas is the least expensive home heating fuel in Minnesota, unserved communities have an incentive to seek to have service lines extended to them, despite the high cost of pipeline construction. These costs are paid via a surcharge on the natural gas bills of the new customers, which can exceed \$30 per month and last for decades.<sup>25</sup> In 2015, Minnesota enacted a statute to make such extensions less costly to new customers by allowing utilities to recover from the

<sup>25</sup> *Residential Space Heating Fuels in Minnesota*, pp. 7, 12-13.

utility's existing customers up to one-third of the cost of extending natural gas service to an unserved community.<sup>26</sup>

## Meeting Peak Demand

### Natural Gas Utilities Have Options to Address Periods of Peak Demand

The significant proportion of natural gas consumption used for space heating in Minnesota presents a challenge for LDCs: how to ensure that sufficient supplies are available when, unpredictably, severe cold temperatures strike for days or weeks at a time. This challenge is not merely a matter of physically obtaining the necessary supplies, it also has significant economic consequences, as purchasing supplies at times of peak demand can be very expensive. LDCs have developed several strategies as a hedge against paying these high prices.

#### Supply Contracts

Supply contracts vary by duration. Long-term or base load contracts (CenterPoint Energy's current agreement with Northern Natural Gas has a term of 16 years) require the buyer to purchase agreed-upon quantities of natural gas every day. Seasonal contracts are signed for the winter, typically split between a base load amount and a supplementary volume to allow for fluctuating demand. Daily call options purchased prior to winter entitle a company to request gas any day with 24-hour notice. In the summer, spot contracts can cover supplies for a day or a month.<sup>27</sup>

#### Stored Natural Gas

Storing natural gas to be drawn upon when needed is one strategy utilities use to address sudden demand spikes. Storage has the advantage of allowing utilities to purchase natural gas at off-peak times when prices are low. Natural gas can be stored underground in depleted oil or gas fields, in salt caverns, or in natural aquifers where the water-bearing sedimentary rock formation is overlaid with impermeable rock. As shown in Table 4, CenterPoint Energy owns the only Minnesota-based natural gas storage facility, located in an aquifer in Waterville in Waseca County. This facility holds up to 2.2 Bcf of natural gas. Up to 50,000 Mcf per day can be withdrawn from this facility when full; that amount is reduced to 15,000 to 20,000 Mcf per day

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<sup>26</sup> [Minn. Stat. 2018, § 216B.1638](#). A bill incorporated into the 2018 omnibus tax bill lowered the cost of extending natural gas service to unserved areas by exempting from property taxes for a period of 12 years new natural gas transmission or distribution pipelines extended to unserved communities outside the Twin Cities metropolitan area. See [H.F. 4063 \(2018\)](#). The bill was vetoed by Governor Dayton.

<sup>27</sup> CenterPoint Energy, *Minnesota 2018 Gas Procurement Plan*, July 2018, pp. 5-6, 33, submitted to the Minnesota Public Utilities Commission, Docket No. G-008/M-15-912, on August 3, 2018.

as the field is emptied.<sup>28</sup> A minimum of 1.0 Bcf is required to be maintained in the facility in order to protect the structure of the storage field.<sup>29</sup>

Table 4  
**Supplemental Natural Gas Supplies of  
 Minnesota’s Largest Investor-Owned Natural Gas Utilities**

	<b>CenterPoint</b>	<b>Xcel</b>	<b>MERC</b>
<b>Underground Storage-Minnesota</b>			
Capacity	2,200,000	–	–
Maximum daily withdrawal (Mcf/day)	50,000	–	–
Actual Withdrawal 2017	1,433,185	–	–
<b>Underground Storage-Other States</b>			
Capacity	30,515,727 <sup>30</sup>	14,698,450	7,275,421
Maximum daily withdrawal (Mcf/day)	NA	253,823	NA
Actual Withdrawal 2017	24,766,815 <sup>31</sup>	13,883,327	6,661,627
<b>Liquified Natural Gas Storage</b>			
Capacity	1,000,000	2,145,124	–
Maximum daily withdrawal (Mcf/day)	72,000	156,000	–
Actual Withdrawal 2017	182,588	411,313	–
<b>Propane-Air Facilities</b>			
Capacity	1,000,000	238,512	–
Maximum daily withdrawal (Mcf/day)	158,000	90,000	–
Actual Withdrawal 2017	10,493	22,200	–
Note: All units are in Thousands of Cubic Feet of Gas (Mcf), unless otherwise specified. NA: Not available. Source: Minnesota Public Utilities Commission, Docket No. G999/M-18-19, <i>Minnesota Natural Gas Annual Utility Information Report 2017</i> .			

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LDCs also contract with interstate pipelines to store natural gas in other states and deliver it to Minnesota when demand is needed.<sup>32</sup> Table 4 shows that these supplies from other states are the

<sup>28</sup> One Mcf is equal to 1,000 cubic feet of natural gas. The average Minnesota home consumes about 85 Mcf annually for heating and cooking.

<sup>29</sup> *Minnesota 2018 Gas Procurement Plan*, pp. 35-36.

<sup>30</sup> *Ibid.*, p. 32.

<sup>31</sup> *Ibid.*, p. 12.

<sup>32</sup> CenterPoint currently has long-term storage contracts with two interstate pipelines and a natural gas marketer that total 29 Bcf annually. *Ibid.*, pp. 32-35.

LDCs' largest supplementary supply source. In 2017, CenterPoint drew 26.2 Bcf of stored underground supplies into its system, representing 26 percent of its entire winter heating season natural gas deliveries in Minnesota.<sup>33</sup> Xcel's storage agreements amount to an identical proportion of its winter demand requirements in the state.<sup>34</sup> Northern Natural Gas provides storage service to some municipal natural gas utilities in Minnesota.<sup>35</sup>

### Supplemental Energy Supplies

Natural gas can also be liquified, by cooling it to a temperature of minus 260 degrees Fahrenheit, which also reduces its volume by a factor of 600, allowing it to be stored in insulated tanks. In 2017, CenterPoint and Xcel withdrew 182,588 Mcf and 411,313 Mcf, respectively, from liquified natural gas storage facilities in the state.<sup>36</sup>

Propane-air facilities are another source of supplemental energy. LDCs store propane purchased during summer months when prices are low. When needed, the liquid propane is heated and blended with compressed air to produce a mixture consisting of approximately 55 percent propane and 45 percent air, a natural gas substitute that is injected directly into a natural gas distribution system.<sup>37</sup>

Utilities develop a portfolio of these supply options, balancing them as they see fit. For example, CenterPoint plans to meet 37 percent of its winter 2018-2019 demand from its baseload contracts, 28 percent from storage, and 35 percent from call options or spot purchases.<sup>38</sup> Xcel estimates that its supplementary supplies equal 30 percent of its peak firm requirements in Minnesota,<sup>39</sup> although Table 4 shows that the company's actual use of LNG and propane-air facilities in 2017 was limited, reflecting the fact that these supplements are sized to address the most extreme periods of peak winter demand.

### Interruptible Demand Customers

LDCs have another tool they can use to address winter peaking problems. Rather than augmenting available supplies of fuel, they can restrict the demand of some customers.

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<sup>33</sup> *Ibid.*, p. 40.

<sup>34</sup> *Xcel Energy, Inc., Form 10-K*, p. 44.

<sup>35</sup> Northern Natural Gas Company, private communication.

<sup>36</sup> *Minnesota Natural Gas Annual Utility Information Report*, Minnesota Public Utility Commission, Docket No. G999/M-18-19. Xcel has leased much of its propane storage space to Flint Hills Resources, Minnesota's largest petroleum refinery, since the late 1990s. In April 2018, Xcel filed a petition with the Public Utilities Commission for approval of the sale of its propane storage tanks to Flint Hills. Minnesota Public Utilities Commission, *In the Matter of the Petition of Northern States Power Company for Approval To Sell Land and Tanks to Flint Hills Resources Pine Bend, LLC*, Docket No. G002/PA-18-294, April 25, 2018, p. 5.

<sup>37</sup> Argonne National Laboratory, *Preliminary Assessment of a Propane-Air Backup System for the Anchorage, Alaska, Area*, prepared for the U.S. Department of Homeland Security, February 2012, p. 3, [www.ipd.anl.gov/anlpubs/2012/07/73792.pdf](http://www.ipd.anl.gov/anlpubs/2012/07/73792.pdf).

<sup>38</sup> *Minnesota 2018 Gas Procurement Plan*, p. 39.

<sup>39</sup> *Xcel 10-K*, p. 44.

Commercial and industrial customers can choose to become “interruptible customers” if they agree to halt consumption of natural gas within an hour of being notified by their utility that service must be curtailed; these customers then switch to an adequately supplied backup energy source, such as propane or fuel oil. In exchange for agreeing to these terms, interruptible customers receive a significantly lower rate for natural gas service throughout the year. Approximately 30 percent of total demand by industrial and commercial customers in 2017 for CenterPoint, Xcel, and MERC came from interruptible customers.<sup>40</sup>

The extent to which interruptible customers are curtailed is a function of weather and natural gas supply disruptions. The winter of 2013-2014 saw the most extensive curtailment in recent years, as Xcel curtailed its interruptible customers on 20 separate days. In comparison, no curtailment was instituted by Xcel in the two winters preceding and following 2013-2014, and the number of days of curtailment for the winters of 2008-2009 through 2010-2011, were seven, ten, and two, respectively.<sup>41</sup>

*For more information about energy sources, visit the utility regulation area of our website, [www.house.mn/hrd/](http://www.house.mn/hrd/).*

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<sup>40</sup> *Minnesota Natural Gas Annual Utility Information Report.*

<sup>41</sup> Xcel Energy, *MN PUC Winter Meeting* (slide presentation), May 29, 2014, [https://mn.gov/puc-stat/documents/pdf\\_files/5-29-2014xcel\\_presentation.pdf](https://mn.gov/puc-stat/documents/pdf_files/5-29-2014xcel_presentation.pdf); Xcel Energy, *Interruptible Gas Rates Program: Minnesota/North Dakota Natural gas system curtailment history*, <https://www.xcelenergy.com/staticfiles/xcel/PDF/Marketing/NSP-BUS-MN-ND-Rate-History.pdf>.