

The Cost of Heating with Natural Gas in Santa Fe, and Expected Future Trends

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The intent of this paper is to provide up-to-date information about the cost of heating with natural gas so that people and/or companies that provide – or want to use - heat from other sources can make informed decisions concerning the viability of heating projects. As such, this paper will be updated monthly as natural gas prices are published.

Reality Check

The cost of natural gas is rising. After decades of abundant storage, we have reached the point where our natural gas stores no longer exceed our demands by a sufficient margin to allow for comfortably stable gas prices. In fact, in late 2000 and early 2001, gas storage estimates came alarmingly close to projected demand. The result was an unprecedented spike in gas prices. In the space between January 2000 and March 2001, the price of natural gas from Public Service Company of New Mexico (PNM) went from \$2.66 per million Btu to \$7.56 per million Btu – a 284 percent increase! And while prices momentarily fell back to previous levels for about a year, they were on the rise again by late 2002 and haven't looked back since. Figure 1 below clearly shows the rollercoaster we started riding in 2000.

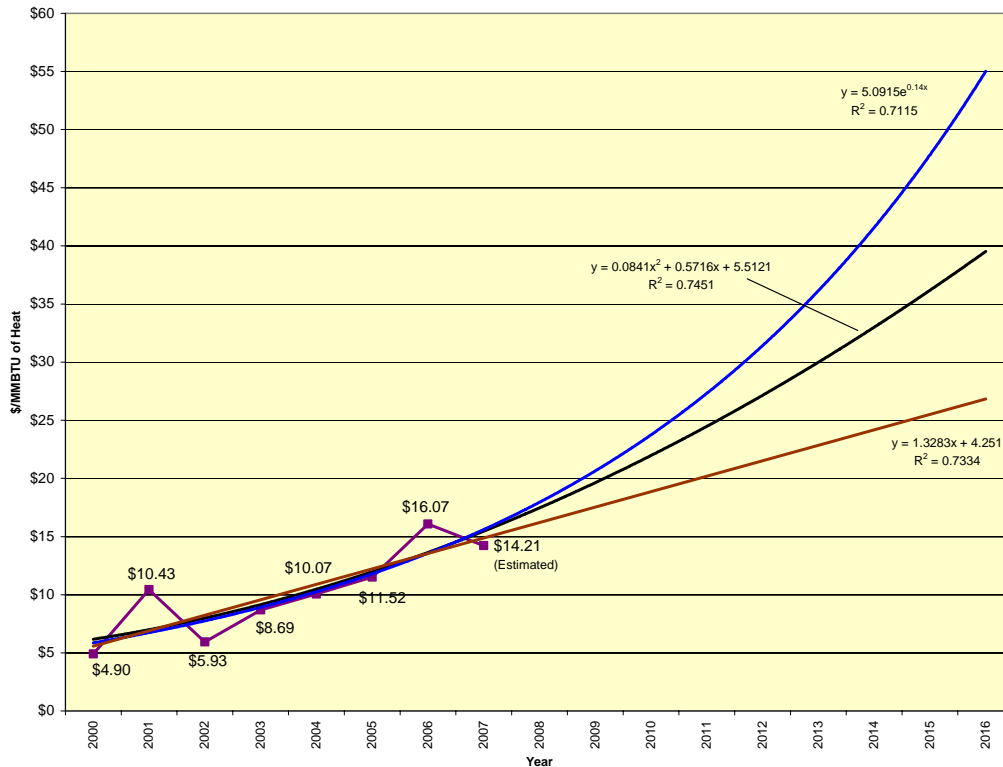
Figure 1: PNM Cost-of-Gas History (does not include transmission, distribution, surcharge, or taxes)



Figure 2 shows trend lines which project the cost of natural gas into the future. It begins with the last stable price year, 2000, and shows how natural gas price escalation might be extrapolated to the future. The three curves represent three different escalation scenarios:

- The blue curve is an exponential function that increases at 14% annually.
- The black curve is a second-order polynomial (essentially price rises as a square). This curve represents an approximately 12-13% annual growth rate.
- The brown curve is a linear function that would translate roughly to a 10% annual growth rate.

Figure 2: Projected Price of Residential Space Heating Using Natural Gas¹



How does this affect Santa Fe?

Seventy percent of all households in Santa Fe County heat with natural gas, as do about sixty-nine percent of all impoverished residents of the county. So Santa Fe’s residents feel price increases directly in their monthly gas bills. To see exactly how gas prices and their escalation affect residents, Local Energy calculates the cost of heating with natural gas using a method that allows comparison of year-to-year space-heating costs. We begin with actual PNM charges for gas and delivery, and apply heating-degree-day weighting

¹ The equations for “y” in these functions is a smoothed approximation to the data, and the “R²” value is a measure of how well the curve fits the data. An R² value of 1 would mean a perfect correlation; therefore, the middle curve, representing the 12 -13% annual growth rate fits the historical data best (when taken from year 2000).

factors calculated from historical weather data to account for seasonal variations in the amount of gas purchased each month. The monthly weighting factors are shown in Table 1. The weighting is important because it accounts for the fact that most of our gas consumption occurs in coldest months, from November to March. It may be nice to have a thirty percent decrease in gas prices in June, but if we're not doing anything but heating water, then the lower prices don't have a significant impact on our total energy bills in a year. It turns out that the price of gas now routinely fluctuates by some forty percent over the course of a year! Go back to the graph again and note the regular winter price spikes since 2000 to understand this more clearly.

Table 1: Heating Degree Days and Weighting Factors for Santa Fe

Month	Heating Degree Days	% of total
Jan	1042	0.176
Feb	865	0.146
Mar	769	0.130
Apr	546	0.092
May	301	0.051
Jun	26	0.004
Jul	0	0.000
Aug	2	0.000
Sep	138	0.023
Oct	453	0.077
Nov	777	0.131
Dec	1001	0.169
	5,920	1.000

The Cost of Space Heat

Once gas prices are weighted, the next step is to divide the result by the typical average efficiency by which the gas is converted to heat - typically around seventy-five percent. This number comes from the fact that most furnaces and boilers have advertised efficiencies of eighty percent. But the advertised efficiencies only tell how efficient a boiler is when it is running; when furnaces and boilers repeatedly cycle on and off, additional losses occur during heat-up and cool-down, reducing the operating efficiency considerably.

Dividing weighted gas costs by the average conversion efficiency results in the *cost of heat*. Table 2 shows the calculation of space heating with natural gas for residential customers for the 2005-06 heating season. Table 3 is based on the same kind of calculation and shows the cost of heat for the various types of gas customers from 1992 to the present.

Table 2: Cost of Space Heating Calculation for PNM Residential Customers for the 2005-06 Heating Season

Month	PNM Cost-of-Gas (per MMBTU)	Gas Transmission and Distribution Price (per MMBTU)	Degree-Day Weight Factor	Weighted Fractional Delivered Gas Price
July-05	\$6.6360	\$1.9270	0.00	0.000
August-05	\$6.6820	\$1.9270	0.00	0.003
September-05	\$9.3230	\$1.9270	0.02	0.262
October-05	\$10.9770	\$1.9270	0.08	0.987
November-05	\$11.3540	\$1.9270	0.13	1.743
December-05	\$9.5690	\$1.9270	0.17	1.944
January-06	\$9.7680	\$1.9270	0.18	2.058
February-06	\$8.7670	\$1.9270	0.15	1.563
March-06	\$8.0750	\$1.9270	0.13	1.299
April-06	\$7.2390	\$1.9270	0.09	0.845
May-06	\$7.0560	\$1.9270	0.05	0.457
June-06	\$6.8220	\$1.9270	0.00	0.038
		Weighted Delivered Cost		\$11.20
		Weighted Delivered Cost including NMGR ²		\$12.05
		Cost of Heat		\$16.07

Table 3: Historical Cost of Space Heating With Natural Gas For Various Gas Customer Categories

Heating Season	Small Commercial	Medium Commercial	Large Commercial	Residential
1992-93	\$4.88	\$4.78	\$4.22	\$5.21
1993-94	\$5.45	\$5.35	\$4.79	\$5.78
1994-95	\$4.36	\$4.26	\$3.69	\$4.68
1995-96	\$3.95	\$3.84	\$3.28	\$4.27
1996-97	\$5.10	\$4.93	\$4.47	\$4.97
1997-98	\$5.22	\$4.97	\$4.65	\$4.47
1998-99	\$4.55	\$4.30	\$3.98	\$4.73
1999-2000	\$5.30	\$5.05	\$4.73	\$4.90
2000-01	\$10.11	\$9.85	\$9.50	\$10.43
2001-02	\$5.50	\$5.23	\$4.89	\$5.93
2002-03	\$8.28	\$8.01	\$7.68	\$8.69
2003-04	\$9.63	\$9.28	\$9.01	\$10.07
2004-05	\$10.51	\$10.05	\$9.86	\$11.52
2005-06	\$15.06	\$14.60	\$14.40	\$16.07
2006-07 ³	\$13.20	\$12.74	\$12.54	\$14.21

² Cost of heat calculations in Tables 2-4 must include NMGR since this is a real cost for every Btu of energy purchased by a resident and contributes directly to monthly energy bills. These heat prices are based on the NMGR for the city of Santa Fe, NM, so be sure to adjust the tax rate according to state, county, municipality, etc. being looked at.

³ The cost of heat for the 2006-2007 heating season includes prices through April. Since approximately 5% of all heating degrees lie ahead of us, this number is an estimate and will be updated as gas cost data is known.

The Cost of Heating Water

The second major natural gas cost for Santa Fe residents is for heating hot water for domestic use (DHW). We differentiate DHW gas consumption from space heat consumption because the efficiencies of hot water heaters and furnaces are usually markedly different. So given that a normal Santa Fe home uses approximately one-third of its natural gas consumption for water heating, it is worth while to look at DHW energy individually. This is not the case for residents who use a single natural gas-fired boiler for both space heat and DHW, however, and the space heating section above applies to both areas.

Rated efficiencies of typical residential water heaters range from 50 to around 62 percent, with effective operating efficiencies from a little under 50 percent up to about 60 percent. Using an optimistic 60-percent effective efficiency, Table 2 can be recalculated to show the cost of heating DHW, as is done in Table 4 below. The degree day weighting factor is not included in this calculation since hot water use tends to be fairly constant over the course of a year, and is usually far less dependent on outside temperatures than space heat is.

Table 4: Cost of DWH Heating Calculation for PNM Residential Customers for the 2005-06 Heating Season

Month	PNM Cost-of-Gas (per MMBTU)	Gas Transmission and Distribution Price (per MMBTU)	Monthly Gas Cost
July-05	\$6.6360	\$1.9270	\$9.21
August-05	\$6.6820	\$1.9270	\$9.25
September-05	\$9.3230	\$1.9270	\$12.09
October-05	\$10.9770	\$1.9270	\$13.87
November-05	\$11.3540	\$1.9270	\$14.28
December-05	\$9.5690	\$1.9270	\$12.36
January-06	\$9.7680	\$1.9270	\$12.57
February-06	\$8.7670	\$1.9270	\$11.50
March-06	\$8.0750	\$1.9270	\$10.75
April-06	\$7.2390	\$1.9270	\$9.85
May-06	\$7.0560	\$1.9270	\$9.66
June-06	\$6.8220	\$1.9270	\$9.41
		Average Monthly Cost	\$10.45
		Average Monthly Cost including NMGRT	\$11.25
		Cost of DHW @ 60% Efficiency	\$18.74

Combining space heat costs and DHW costs using the empirical observation that natural gas use is divided into one-third to DHW and two-thirds to space heat, a total average cost of heat can be calculated to be \$16.95/MMBtu.

Conclusion

Taken from the last “stable” heating season in 1999-2000, prices have been increasing an average rate of **12 to 13 percent** every year for the past seven years!⁴ And given the nature of the reason for the increase – a diminishing and increasingly-lower quality resource coupled with increasing demand – we have no reason to believe the trend will do anything but continue its climb. It is clear that we are nearing a time when the businesses and residents in Santa Fe will not be able to afford heat with natural gas.

For more information on the destabilization of natural gas prices in North America, see “Natural Gas Prices Will Keep Climbing,” available at <http://www.localenergy.org/documentLibrary.htm>.

⁴ The 12-13% figure constitutes an estimate until natural gas costs through June are known. However, unless there are radical changes in the price of natural gas over the next couple of months, it is not likely the figure will change significantly as we finish this heating season, since the figure is based on seven years of data. Note, however, that the average cost for a particular season *can* impact the overall average rate of increase significantly, as evidenced by the 14% annual increase for the period from 1999-2000 to the 2005-06 heating season.