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DEPARTMENT OF COMMERCE
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To: The Public Service Commission of Utah

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Date: August 15, 2016

Subject: Questar Gas Company's 2016 IRP, Docket No. 16-057-08

INTRODUCTION

On June 14, 2016, Questar Gas Company ("QGC" or "Company") filed its 2016 Integrated Resource Plan ("IRP") for the planning period June 1, 2016 to May 31, 2017. On June 23, 2016, the Utah Public Service Commission ("Commission") issued a scheduling order which set a deadline of August 15, 2016 for parties to file initial comments and August 22, 2016 for reply comments on the IRP in this proceeding.

The Office of Consumer Services ("Office") submits these comments to the Commission regarding the Company's 2016 IRP.

COMMENTS

<u>Air & Ground Source Heat Pumps and Peak Demand Impacts</u>

The Company identified heat pumps in its 2015 IRP as an alternative to natural gas expressing risks caused by this technology on the Company's system. However, little evidence in the 2015 IRP demonstrated that these risks exist. The Office recommended in its 2015 IRP comments that the Company conduct a heat pump study to assess and demonstrate the risks to the system. The study was to include the following elements:

- An overview of how air and ground source heat pumps are used in space and water heating, including an overview of both residential and commercial applications.

- A description of what temperatures result in efficient use of the heat pumps and what temperatures require a switch back to the natural gas appliances.
- A specific explanation of how the operations of heat pumps have the potential to impact the Company's peak demand and any associated infrastructure and gas management challenges.
- A study demonstrating potential cost recovery and cross subsidies associated with heat pump customers.

The Commission ordered the Company to conduct a study addressing the points above. The Company completed the study as ordered and is included on pages 3-9 through 3-16 of the IRP. The Office will comment on the two risks identified in the 2015 IRP as further informed by the study presented in the 2016 IRP. The first risk deals with peak demand impacts caused by heat pump customers. The second risk deals with cost recovery from heat pump customers and cross subsidies.

Peak Demand Impacts of Heat Pumps

The first risk deals with peak demand impacts caused by heat pump customers. Page 3-9 of the 2015 IRP reads, "The first risk arises because these customers will increase the peak demand on the system."[1] The Company identified two elements to this first risk, increased peak demand and difficulty of estimating the additional peak requirement. After reviewing the Company's study, the Office does not agree that these elements do not represent significant risk to the Company's system. Two reasons exist for this conclusion:

1. Utah's weather climate does not allow for efficient use of current heat pump technology.
2. Heat pump customers using natural gas as back up energy will consume natural gas during periods of peak demand just as any other customer.

Utah's Weather Climate

The Company claims that these heat pumps may cause significant risks to the Company and its customers if these devices proliferate. Given the results of the study, it is unlikely that these heat pumps will proliferate. The Company identified the impact on peak demand by using a weather zone analysis based on heating degree days (HDD). The Company identified that heat pump proliferation occurred in areas

[1] 2015 IRP, p. 3-9.

with typically 4,000 HDD in a given year. The ranges between territory ranges are between 2864 (St. George) and 7963 (Park City). Furthermore the Company cites the U.S. Census Bureau's 2015 estimate that 95% of Utah's population lives in areas which average 5,500 HDD in a normal year,[2] which is colder than the conditions reported to result in significant use of heat pumps.

The Office further analyzed efficient operation points relative to Utah average temperatures and minimum temperatures by geographic area defined by weather zones. The Office used data from November through March since this was the time frame most likely to experience a peak day occurrence.[3]

Table 1 below shows average temperature and minimum temperature by Utah weather zones compared to air source heat pump efficiency temperatures. On page 3-13 & 3-14 of the 2016 IRP, the Company identified temperatures necessary for air source heat pumps to operate efficiently as follows:

> "In order to operate at higher levels of efficiency, air source heat pumps issued in space heating applications requires outside air temperatures to be above 30°F. For water heating applications, ambient air temperatures must be above 40°F. At temperatures below those levels, the heat pump's backup heat source would take over."

[2] See 2016 IRP, p. 3-14

[3] The design-day firm customer peak demand projection is based on a theoretical day when the mean temperature is -5 degrees Fahrenheit at the Salt Lake Airport weather station and the corresponding design-day temperatures are seen coincidentally across the Company's service territory.

Table 1 - Air Source Heat Pump Temperature for Space Heating: Comparison Analysis

Zones	Avg. Temp*	Difference from Temp Required for Efficient Ops	Min. Temp**	Difference from Temp Required for Efficient Ops
Utah	32.80	2.80	21.79	-8.21
Western	34.03	4.03	22.60	-7.40
Dixie	44.42	14.42	33.73	3.73
North Central	32.63	2.63	22.93	-7.07
South Central	32.25	2.25	20.91	-9.09
Northern Mountains	26.40	-3.60	16.17	-13.83
Uintah Basin	28.84	-1.16	17.65	-12.35
Southeast	35.98	5.98	24.97	-5.03

Source: http://www.ncdc.noaa.gov/temp-and-precip/climatological-rankings/

*Average temperature during November – March for years 1986 – 2016

**Average minimum temperature during November – March for years 1986 - 2016

Table 2 - Air Source Heat Pump Temperature for Space Heating: Comparison Analysis

Zones	Avg. Temp*	Difference from Temp Required for Efficient Ops	Min. Temp**	Difference from Temp Required for Efficient Ops
Utah	32.80	-7.20	21.79	-18.21
Western	34.03	-5.97	22.60	-17.40
Dixie	44.42	4.42	33.73	-6.27
North Central	32.63	-7.37	22.93	-17.07
South Central	32.25	-7.75	20.91	-19.09
Northern Mountains	26.40	-13.60	16.17	-23.83
Uintah Basin	28.84	-11.16	17.65	-22.35
Southeast	35.98	-4.02	24.97	-15.03

*Average temperature during November – March for years 1986 – 2016

**Average minimum temperature during November – March for years 1986 - 2016

Negative values in efficiency difference values represent inefficient running of air source heat pump systems and thus the need for a backup energy source for heating. Tables 1 and 2 show that while average temperatures appear to support air source heat pumps for space heating in most zones in Utah, in fact, minimum temperatures in all zones are below the temperature required for efficient operations. Thus, a back-up heating source would be needed in all zones. Further, the average and minimum temperatures are below the temperature required for efficient operations for water heating in all zones.

Table 3 below shows average temperature and minimum temperature by weather zones compared to ground source heat pump efficiency temperatures. For ground source heat pumps, the efficiency temperature is higher since the heating elements are below ground. Page 3-14 of the 2016 IRP states,

> "Data suggests that ground source heat pumps can function at very high levels of efficiency even when air temperatures are very low because the ground deeper than 20 feet maintains a nearly constant temperature of 50° to 60°F….System performance is further impacted if air temperatures stay at or below 15° for extended periods of time."

Table 3 – Ground Source Heat Pump Temperature Comparison Analysis

Zones	Avg. Temp	Difference from Temp Required for Efficient Ops	Min. Temp	Difference from Temp Required for Efficient Ops
Utah	32.80	17.80	21.79	6.79
Western	34.03	19.03	22.60	7.60
Dixie	44.42	29.42	33.73	18.73
North Central	32.63	17.63	22.93	7.93
South Central	32.25	17.25	20.91	5.91
Northern Mountains	26.40	11.40	16.17	1.17
Uintah Basin	28.84	13.84	17.65	2.65
Southeast	35.98	20.98	24.97	9.97

*Average temperature during November – March for years 1986 – 2016

**Average minimum temperature during November – March for years 1986 - 2016

Table 3 indicates that on average and minimum temperatures, all zones are efficient. Thus, ground source heat pumps is the heat pump technology that would likely proliferate based on temperatures required for efficient operations. Yet installation costs for ground source heat pumps appear to be cost prohibitive. The Company stated that:

> Ground source systems are costly to purchase and maintain. A recent study performed by the Company found costs for ground source systems in Utah average between $30,000 and $60,000 for residential applications and $1 million or more for commercial systems. System prices vary due to factors such as size, soil composition, system type (e.g. vertical or horizontal closed loop, open loop) and the percentage of space heating being provided by the ground source heat pump. Because of these costs, payback periods on ground source systems are 15 years or more when compared to the common natural gas furnace and water heater."[4]

Furthermore, the Company surveyed an installer who estimated that 2000 ground source heat pumps are operating in Utah as of 2015 and slowing to 30 constructions annually.[5] Without verifying this data against other installers, ground source heat pump constructions are decreasing. In summary, proliferation of the current heat pump technology is unlikely due to weather climate and cost ineffectiveness.

Back up Energy and Peak Demand Impacts

The Company identifies in its study that inefficient levels require substitute use of natural gas or electricity for heating purposes. The Company's contention in the 2015 IRP was that heat pumps customers will increase peak demand and require back up energy sources. In the 2016 IRP, the Company acknowledged that the effect on peak demand would be minimal assuming natural gas backup is the standard throughout Utah.[6] Thus, the real issue is not that heat pump customers will be creating a significant burden on the peak demand, but rather whether Questar has adequately foreseen and planned for the upcoming strain on peak demand. So long as the effect of peak demand by heat pump customers is minimal, the more important priority for the Company and regulators is to evaluate whether Questar is making adequate and reasonable plans to meet its peak demand. The Office is also unpersuaded that the impact on peak demand from heat pumps is unpredictable as the Company earlier indicated. Based on the analysis of Utah temperatures relative to the temperatures required for efficient operations of heat pumps, it seems to be a reasonable

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[4] See 2016 IRP, p. 3-12
[5] 2016 IRP p. 3-16.
[6] 2016 IRP p. 3-15 & 3-16

assumption that all air source heat pumps will be using back-up during the time of peak demand.

Heat Pumps and Cross Subsidy Issues

The second risk deals with cost recovery from heat pump customers and cross subsidies. The Company indicates concern that the current rate design will not recover the portion of the cost to serve heat pump customers requiring other customers to make up the difference. The Company's study did not provide evidence to support this conclusion derived in the 2015 IRP. The Company did not indicate the need currently to manage differently peak demand with the current deployment of ground source heat pumps. The Company indicates in the 2016 IRP that "the potential exists for heat pump owners to create cost recovery and cross subsidies by terminating the natural gas back up in the summer and then reinitiating service as winter approaches."[7] While this is a possibility, there is no evidence provided at this time that disconnection would occur. In summary, the Company has provided no evidence that current rate design would not be adequate for managing heat pump customers at this time. The Company should continue to monitor heat pump growth and its impacts on peak demand and cost recovery.

Demand Side Management (DSM) Impact on Peak Demand

On page 7-6 of the 2016 IRP, the Company for the first time in any IRP has identified a concern that the QGC system may not be able to meet peak-hour demand on a high-load day. The Company explains that this problem is not caused by a lack of capacity on QGC's system but is due to QGC's hourly demand on peak days exceeding the hourly deliveries that Questar Pipeline can make to QGC's city gates. Interestingly however, the Company has also indicated that they would not exceed their daily contracted capacity on Questar Pipeline's system on these high-load days. The Office notes that it appears that this intra-day gas delivery problem was not foreseen or addressed in the transportation contract between QGC and Questar Pipeline.[8]

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[7] 2016 IRP p. 3.16.

[8] Since QGC is not exceeding its daily contracted capacity on Questar Pipeline's system and hourly delivery maximums are not stated in their transportation contract, the Office is concerned about who should be responsible for solving (and paying) for Questar Pipeline's inability to meet hourly demand on peak days. If it ends up that QGC's general service customers bear the sole responsibility for these costs, the Office questions whether this would be appropriate and fair.

The Company is investigating several solutions to this peak hour demand problem including new peak hour transportation services, demand side management (DSM) and an LNG peak-shaving facility. In the IRP, the Company states that some type of new service will be required for the 2016-2017 heating season to meet peak-hour demand.

Because this new problem is a result of high peak hour demand, it seems very intuitive that a cost effective solution could involve a DSM or demand side management approach. For several years now, the Office has requested that the Company investigate how DSM could be effective to achieve more than its currently single measured outcome of gas usage reduction. For example, in our comments on the Company's 2013 and 2014 IRPs, the Office recommended that the Company explore how DSM could impact the need for new infrastructure and how DSM programs might impact IRP planning for design-day gas demand.[9]

In our comments on the 2013 IRP, the Office purposely asked a very pointed question:

> *"For example, in areas where the Company's system is constrained, would it be possible to design targeted efficiency programs to eliminate or delay the need to construct new facilities?"*[10]

In this question we were referencing one type of DSM, energy efficiency programs, and how they could impact the need to build new infrastructure. Let us now rephrase this question:

> *Is it possible to implement DSM programs to reduce peak day and/or peak hour demand in order to avoid purchasing new services and/or avoid building new infrastructure to meet peak-hour demand in future heating seasons?*

Because the Company spends very large sums of money on DSM every year, this seems very possible.

On page 8-1 of the 2016 IRP, the Company states that spending on its DSM energy-efficiency program totaled $24.2 million in 2015. In 2014 and 2013, these amounts were $26.3 million and $28.9 million respectively.[11] As we can see, year after year substantial funds have been spent on DSM energy efficiency. Despite all this spending on this Demand Side Management program, the Company cannot identify any benefits of DSM in meeting peak-day demand, or in the newly-identified issue of meeting peak hour demand.

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[9] See OCS Comments on QGC 2013 IRP, Docket No. 13-057-04, August 9, 2013, pages 4 – 5 and OCS Comments on QGC 2014 IRP, Docket No. 14-057-15, August 13, 2014, pages 1 – 2.

[10] Page 5, OCS Comments on QGC 2013 IRP, Docket No. 13-057-04, August 9, 2013.

[11] See page 8-1 of the 2015 IRP and March 19, 2014 DSM Advisory Meeting Slide presentation entitled, "2013 Results".

In addition, the company cannot produce any system benefits gained by its DSM program. The Company has explained to the DSM Advisory Group that the DSM program only reduces overall gas consumption, does not produce system benefits, and may even contribute to peak hour demand as a result of certain energy efficient measures that burn more gas during peak time. The Company now refers to the DSM program not as demand-side management, but as energy efficiency programs only. This title change was made by the Company despite the fact that the measures available in the DSM program are funded by the "DSM Amortization" rate as found in section 2.02 of the Company's tariff, and are discussed by the DSM Advisory Group as identified in the stipulation in docket 05-057-T01 on September 13, 2006.

The Office notes that the Company's DSM program not only spends money to subsidize energy efficient technology, but that a significant amount of money is spent on raising awareness of the DSM programs. More money is later spent to measure the effectiveness of the awareness campaign.

The Office asserts that DSM could also have been used to address a growing problem with meeting peak day and peak hour demand, a problem that has now come to the forefront in this 2016 IRP. However, it appears that the Company has focused the DSM program on measures that simply reduce overall consumption, and has not made effective efforts to use DSM measures or advertising dollars to benefit all customers by preventing or alleviating the kinds of system constraints associated with peak day and peak hour demand.

The Office recommends that the Company explore and then implement cost-effective DSM programs that provide system benefits with respect to peak day and peak hour demand. In addition, the Office recommends that if DSM energy efficiency programs actually increase peak day and peak hour demand as the Company asserts, then the Commission should order the Company to include the costs of any new infrastructure that address these new demand problems in the costs of the DSM energy efficiency programs when conducting associated cost-benefit tests.

RECOMMENDATIONS

The Office recommends the following:

The Office recommends that the Commission require the Company to continue to monitor the potential future effects of heat pumps.

The Office recommends the following changes to the Company's DSM program with respect to peak day and peak hour demand:

1. Implement new cost-effective DSM programs that help to alleviate peak day and peak hour system constraints.

2. If energy efficiency increases peak day and peak hour demand, include the costs of mitigating these problems in the costs in the cost-benefit analysis for this type of DSM program.