

Figure 7.1: NNT Usage–2015-2016 IRP Year

Meeting Hourly Demand Swings

With increasing sales customer base and the associated demand growth, Questar Gas has begun to see actual hourly demand on high-load days that exceed the physical limits to the hourly deliveries Questar Pipeline can make to the City Gates. This instantaneous flow rate is only experienced for a few hours in the morning. It is important to note that currently capacity is sold on a daily basis.

As part of NNT service, Questar Pipeline’s tariff allows delivery of volumes that exceed Questar Gas’ RDC for short periods of time as long as those deliveries do not impair Questar Pipeline’s ability to provide service under any other rate schedule. Questar Gas and Questar Pipeline regularly model their systems to quantify this ability to deliver gas at rates that exceed Questar Gas’ RDC to ensure that the systems can meet peak-flow requirements. This analysis is part of the JOA process described in the “System Capabilities and Constraints” section of this report.

Recent improvements in this process have identified concerns associated with the growth of peak-hour demands and the system’s ability to meet these demands. Questar Gas is working with gas suppliers and transporters to identify prudent short-term and long-term solutions to meet this growing demand.

In addition to the services currently available to Questar Gas, such as intra-day nomination changes and storage services, the Company is considering the following solutions (separately or in combination): 1) upstream hourly services that can be offered to provide supply to match the demand swings, 2) demand response programs, 3)

contracting for additional firm upstream transportation capacity, 4) purchasing excess supply to meet peak demand, 5) facility improvements and 6) the building of a liquefied natural gas (LNG) facility to use for hourly peaking supply. On February 26, 2016 Questar Gas sent out two separate requests for proposals (RFP). The first RFP sought proposals for services to meet the demand swings utilizing upstream pipelines. The second RFP sought proposals for engineering services to begin the design analysis work for an on-system LNG facility.

Questar Gas has determined services will be required for the 2016-2017 heating season in order to meet peak-hour demand. Questar Gas plans to move forward with at least one of these options for the 2016-2017 heating season:

1) *Peak-Hour Services*

Questar Gas received three responses to the RFP for upstream hourly services to meet the hourly demand swings. Two of these proposals provide options that could help meet the hourly-peak demand in the 2016-2017 heating season. The Company, in anticipation of augmenting services to ensure the system is capable of meeting peak-hourly demand, is currently reviewing these proposals.

2) *Demand Response*

Questar Gas is contacting large industrial customers in order to determine interest in participating in demand response programs that could provide additional supply to the Questar Gas system during hours of peak demand. These programs could include agreements for the customer to curtail usage and provide the gas supply to Questar Gas. This would be intended for firm customers and only useful if the large industrial customer has a scheduled nomination in place for the day the service is required by the Company. Assurances such as penalties for non-compliance or automated shut-off valves may also be required.

3) *Additional Firm Upstream Transportation Capacity*

Questar Gas is analyzing the impact of acquiring additional firm upstream capacity in order to meet the peak hour demands. This capacity could provide reliable access to additional supplies on a peak day.

4) *Purchasing Excess Supply*

Questar Gas is analyzing the availability and impact of buying supply in excess of the total supply needed to meet peak-day requirements. This supply could be used to meet the peak-hour demands in the morning and moved to storage during intraday cycles. This would likely result in injections into storage when normally there would be withdrawals to meet peak-day requirements.

5) *Facility Improvements*

In order to facilitate the nomination of excess supplies to the City Gates, Questar Gas may be required to construct or upgrade gate stations and/or distribution pipelines. These facility improvements could take more than a year to complete.

6) *LNG Peak-Shaving Facility*

Questar Gas previously completed an evaluation of the viability of an LNG peak-shaving facility as an alternative to the existing peak-shaving storage currently provided by the Aquifers. As part of the evaluation, Questar Gas conducted research regarding LNG peak-shaving facilities. Questar Gas also contracted with a consultant, CH-IV International, to perform a conceptual cost study of an on-system facility.

The study revealed a number of operational advantages of owning and operating an on-system storage facility. These operational advantages could be used as a long-term solution to the hourly demand swing issues.

An on-system storage facility operated by Questar Gas would not be subject to nomination and scheduling requirements of the upstream pipelines. The Company could withdraw supply from the facility during hours of peak demand as required. This would result in reduced hourly demand swings on the upstream pipelines. Other advantages would include supply redundancy and baseload demand on the system in the summer.

Initial analysis has indicated that sizing for a facility for this purpose may be similar to the facility considered in the conceptual cost study. The Company has received a number of proposals that are being evaluated and the Company plans to proceed with initial engineering work during the 2016-2017 IRP year.

Gas Quality/Interchangeability

Almost all of the gas delivered to the Questar Gas system comes from interstate pipelines (Questar Pipeline, Kern River, CIG and Northwest Pipeline). Each of these interstate pipelines manages gas quality to limits defined in its tariff. These limits have been effective in equitably meeting the delivery needs of shippers and downstream customers.

The most prevalent measure of fuel gas interchangeability in the U.S. is the Wobbe Index.⁸⁰ Natural gas appliances are rated to operate safely and efficiently within a specific Wobbe Index range. Questar Gas used a consulting firm to establish the Wobbe operating ranges for its service areas. For example, Exhibit 7.2 shows the upper and lower Wobbe operating limits for the Utah Wasatch Front (North) region for various

⁸⁰ The Wobbe Index number consists of the higher heating value of a fuel gas divided by the square root of the specific gravity (relative to air) of the fuel gas. Fuel gases with the same index number generate the same heat output over time from a burner given constant pressure and orifice size.

PEAK-HOUR DEMAND AND RELIABILITY

Peak-Hour Requirements

Most customers do not use natural gas evenly throughout the day. Usage rates are typically higher in the morning hours. The apex of these periodic increases in instantaneous flow is the peak-hour demand. Hourly demand exceeds the average daily demand for a few hours each day (see Figure 8.1). As the Company's customer base and associated demand has grown, the Company has seen a corresponding increase in peak-hour demand. It is important to note that capacity is sold on a daily basis, not hourly.

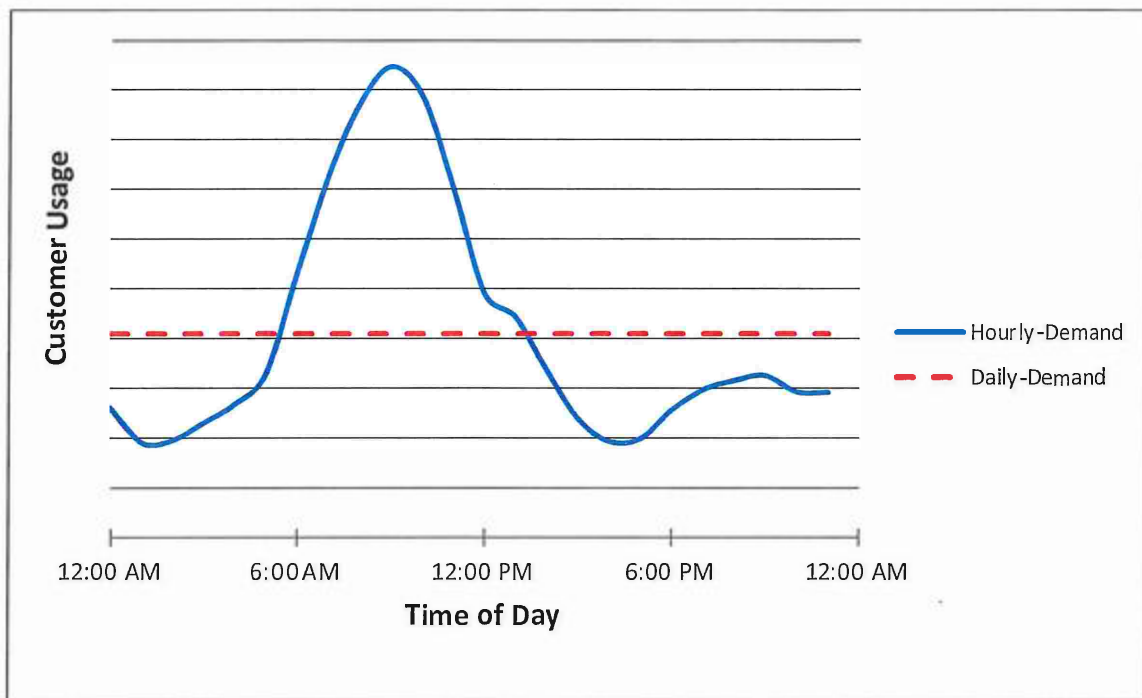


Figure 8.1: Hourly vs. Daily Demand

On December 17, 2015 and in the 2016-2017 and 2017-2018 IRP Workshops, the Company provided updates to the Utah Commission on the impact of peak-hourly demand on its system and the resources available to meet this demand. As indicated later in this section, the Company has taken steps to resolve peak-hour issues.

As shown in Figure 8.2, the Company forecasts that projected peak-hour demand across the system will materially exceed the Company's total firm capacity on a peak day for each of the next ten heating seasons. This excess peak-hour demand is forecasted to increase from 340,000 Dth/day during the 2017-2018 heating season to 390,000 Dth/day during the 2025-2026 heating season.

This was a short-term remedy based on the availability of options for the 2016-2017 heating season; however, prudent long-term planning requires the use of a more diverse portfolio of resources to adequately meet peak-hour requirements and provide reliable supply for customers. The Company continues to pursue the options discussed in the 2016-2017 IRP to develop this diverse portfolio.

Long-Term Remedies

The Company considered the following potential remedies for meeting future peak-hour demand requirements (separately or in combination): 1) implementing demand response programs, 2) contracting for additional firm upstream transportation capacity and purchasing excess supply to meet peak demand, 3) additional off-system storage, 4) upgrading facilities, 5) contracting for upstream hourly firm peaking services, and 6) building on-system storage.

1) Demand Response

The Company conducted analysis of demand-response solutions to peak-hour requirements. Recent experience during supply curtailments indicate that many customers are unwilling or unable to reduce usage when requested, even when facing large financial penalties. Accordingly, the Company has not considered demand response as viable part of the solution to meet peak-hour demand requirements. However, the Company will continue to monitor whether demand response options can be part of a solution at some point.

2) Excess Firm Upstream Transportation Capacity and Supply Purchases

The Company analyzed the impact of acquiring upstream supply and corresponding additional firm upstream transportation capacity in order to meet the peak-hour demands. Contracting for firm upstream capacity provides access to locations which generally have supply available to purchase. However, during periods of extreme cold and/or high demand when prices are at their highest, there is no guarantee the supply will be available at the volume necessary to meet peak-hour demand requirements. While transportation capacity is an essential part of meeting peak-hour demand requirements, exclusive reliance on purchasing excess supply and upstream transportation to meet peak-hour demand does not reduce the customer's exposure to high prices and risk of supply shortfalls on high-demand days.

3) Excess Firm Upstream Transportation Capacity and Additional Off-system Storage

As discussed in the Gathering, Transportation, and Storage section of this report, the Company has contracts for off-system storage and corresponding firm transportation at Clay Basin, the Aquifers and Ryckman at levels that currently meet peak-day demand. While these resources are very valuable in meeting daily demand swings, they are not the best option for meeting peak-hour demand. Off-system storage is reliant on the nomination cycles of the upstream pipelines and therefore do not flow on an hourly basis.

For the 2017-2018 heating season, the Company has also entered into a Precedent Agreement with the Company Questar Pipeline for 250,000 Dth/D of hourly Firm Peaking Service, subject to FERC approval. This service would provide required peak-hour services for locations on the Company's system served by Dominion Energy Questar Pipeline including many that are only served by Dominion Energy Questar Pipeline. Dominion Energy Questar Pipeline must obtain FERC approval to add hourly Firm Peaking Service to its FERC Gas Tariff.

6) On-System Storage

The Company's engineering analysis concluded that owning and operating an on-system storage facility is a critical component of the long-term solution to the peak-hour demand issue. This solution minimizes customer risk by providing a diverse source of supply located near the demand center. This alternate source of supply would provide additional operational advantages, including the ability to replace supply shortfalls that often occur during periods of high demand, thereby enhancing system flexibility and supply reliability.

Benefits of an on-system facility:

- Reduction in upstream supply, gathering, and processing risks
- Immediate access to gas supply given the proximity downstream of the city gate
- Greater operational responsiveness to system/customer needs because withdrawals are not subject to nomination requirements
- Designed so that it can be expanded as demand grows in the future

LNG has been used for more than 40 years by local distribution companies (LDCs) nationwide and is a safe and reliable option for on-system storage. Many LDCs throughout the country use on-system LNG facilities for meeting peak-hour and supply reliability needs. This includes many LDCs that serve similar geographic areas and number of customers. Since there are no known underground storage options available on the Company's distribution system, an LNG facility is the preferred solution to provide on-system storage downstream of the city gate.

Over the past few years, the Company evaluated the benefits of an on-system LNG facility. In 2014, the Company contracted with a consultant, CH-IV International, to perform a conceptual cost study of an on-system facility. On February 26, 2016, the Company sent out an RFP for on-system storage. The Company selected HDR, Inc. (HDR) to complete a preliminary front end engineering design (Pre-FEED) study and initial site selection. HDR completed this study and the Company plans to have them also commence a FEED study in 2017. The process of building an LNG facility typically takes 4-5 years and includes regulatory approval; permitting; FEED; preparation of an engineering, procurement, and construction (EPC) RFP; contracting; and construction.