SYSTEM CONSTRAINTS AND CAPABILITIES

Questar Gas System Overview

Gas supply costs are the primary focus of the IRP process because they represent a major portion of the total local distribution company (LDC) cost of service as opposed to the electric utility industry where physical plant and the control of the respective costs are typically the focus of electric IRPs. Nonetheless, an important element of natural gas integrated resource planning is an analysis of the physical plant used to deliver the product to the consumer. The capacity of the system must meet the forecasted load in order to provide reliable service to the customer.

Historically, Questar Gas has been served by an integrated transmission and distribution system connecting natural gas fields in Utah, Wyoming and Colorado to the Company's Utah, Wyoming, and Idaho markets. This original integrated system remains intact. Questar Gas' ability to serve its customers is dependent upon gas transmission companies such as Questar Pipeline and Kern River Gas Transmission Company (Kern River). To a much smaller extent, the Company relies on deliveries from Northwest Pipeline Corp. to serve the towns of Moab and Monticello, and Colorado Interstate Gas Company serving the town of Wamsutter. The importance of these pipeline systems and costs are part of the modeling process discussed in other IRP sections. This section will concentrate mostly on Questar Gas' local distribution system.

With continued growth in firm customers, Questar Gas' system is near capacity and new facilities are constantly required to meet customer demand. As part of its planning process, Questar Gas is continually looking at cost-effective ways to meet future capacity needs, as explained later in this section, and to enhance reliability of service to its customers. The following sections review Questar Gas' existing system, capacity, firm transportation issues, system reinforcement projects, system expansion to new service areas and integrity management programs.

Historically, Questar Gas received gas from six city gates along the Wasatch Front which were supplied from interconnects with the Questar Pipeline system. To serve its customers, Questar Gas has 21 additional main interconnects with pipelines. In addition to these, there are several taps/interconnects serving individual customers directly off the pipelines. In 1994, an interconnect in Salt Lake City with Kern River was completed (Hunter Park Tap). In 2002, a second Kern River tap was installed (Riverton Tap). These interconnects increased system capacity, deliverability, reliability, and provided an alternate source of gas supply into Questar Gas' system.

There are another 10 interconnects with pipelines in Wyoming serving Questar Gas' Wyoming communities.

Exhibits 4.1 and 4.2 represent detailed schematics showing Questar Gas' high-pressure feeder line system and the major city gates for the Wasatch Front and Wyoming. The percentages indicate deliveries at gates for a typical winter day. In addition,

Questar Gas receives gas at various taps in central and southern Utah from Kern River and QPC at the Indianola gate. The location of these taps and gates are shown in Exhibit 4.3.

Questar Gas' Utah based delivery system consists primarily of three separate systems. The Northern System is responsible for all gas deliveries along the Wasatch Front. The Central System serves Utah cities that lie along the Kern River corridor in portions of Juab, Millard, Iron and Washington Counties as depicted on Exhibit 4.3. The Southern System delivers gas to communities south of Questar Gas' Indianola gate station in Sanpete, Sevier, Garfield, Piute and portions of Iron and Washington Counties, which is also depicted in Exhibit 4.3. Questar Gas' Wyoming system consists of deliveries to Evanston, Rock Springs and other communities.

Northern System

Questar Gas' current Wasatch Front system takeaway capacity is adequate to meet the total 2007/2008 peak day. The peak day firm load for 2007/2008 is forecasted to be 1,041,067 decatherms per day. In addition to this firm sales obligation, there is a firm transportation obligation of 100,211 decatherms per day bringing the total projected sales plus contracted transportation peak obligation to 1,141,278 decatherms per day (See Exhibit 4.4).

In order to meet its firm obligations, Questar Gas depends on deliveries to its city gates from Questar Pipeline and Kern River Gas Transmission Company. Questar Gas has the capability to take all gas Questar Pipeline can deliver to its city gates. Questar Pipeline can deliver 896,168 decatherms per day to Questar Gas' existing Wasatch Front system.

During a peak day event the Kern River pipeline must supply a minimum 245,110 decatherms per day (the difference between Questar Gas' total firm obligation of 1,141,278 decatherms per day and Questar Pipeline's Wasatch Front delivery capacity to Questar Gas of 896,168 decatherms per day). There is sufficient takeaway capacity at the Hunter Park Tap and the Riverton Tap to accommodate this load. The actual distribution of loads and supplies on a peak day could require higher deliveries from Kern River to ensure system reliability.

Under actual winter-time operating conditions, the distribution system does not operate in a steady-state mode, but rather undergoes significant pressure and volume transients over the course of a day. The two Kern River taps lessen the impact of these transient effects and ease operation by providing a source of gas directly into the demand center for the Wasatch Front.

Because Questar Gas has contractual rights to receive gas from two different pipeline companies, it is equally important to maximize the flexibility for delivery from these pipeline companies. With both pipelines operating in close proximity with each other, there may be times when instantaneous demand along Questar Gas' system is significantly different than the gas supplies Questar Gas has nominated on a daily basis from Kern and Questar Pipeline.

In this situation, Questar Gas will utilize no-notice transportation (NNT) on Questar Pipeline to meet the transient-flow effects. This valuable service is only available on Questar Pipeline, but provides flexibility that enhances operations in all areas, except those served only by Kern River. (Kern River does not offer a similar service.)

Questar Gas is, and will continue to be, in the process of contracting for peaking gas purchases for the 2007-2008 winter season to be delivered at the Hunter Park or Riverton taps.

Questar Gas' actual take away capacity from most of the city gates is higher than the existing delivery contracts. The incremental capacity on Questar Gas' distribution system is dependent on the pipeline facilities and operating mode of the transmission systems upstream of the city gates. The take away capacity from the Hunter Park and Riverton taps is dependent on metering capacity, regulating pressures, and the distribution of loads on the Questar Gas system.

Flow modeling is done using a *steady-state* gas network analysis program. The minimum pressure required for proper operation of the regulating stations located throughout the high-pressure distribution system is 125 pounds per square inch (psi). The minimum steady state design pressure of the distribution system is 175 psi. The low pressures on the system occur near 10600 South State in Sandy (which consists of 6 inch pipe on feeder line 7) and at the end of feeder line 36 in South Jordan. Feeder line 7 is currently being upgraded to a 12 inch pipeline, leaving the low point at the end of feeder line 36.

As mentioned before, capacity is a function of load distribution and mode of operation. If a high percentage of loads are concentrated close to city gates the system has a higher capacity. Moreover, system capacity is affected by the mode of operation and is affected by the pressures upstream pipelines can maintain at city gate stations.

Central System

The Central System is served from several Kern River taps located along its pipeline corridor (see Exhibit 4.3). The distribution systems that serve these communities in the central region are relatively new with relatively slow growth and no reinforcements for these areas are anticipated in the near term. Therefore, there has been no need for new reinforcements for this part of our system. Peak demand of approximately 7,089 Dth per day is allocated for the Central System.

Southern System

The primary supply to the Southern System is from Questar Pipeline at Questar Gas' Indianola gate and Kern River through the WECCO and Central taps (see Exhibit 4.3). The take-away capacity from these three supply taps is 77,500 decatherms per day (21,000 Dth per day at Indianola, 34,000 Dth per day at WECCO and 22,500 Dth per day at Central).

Questar Gas' ability to nominate significant quantities of gas from these taps provides Questar Gas the flexibility needed in meeting future load growth. The peak day firm forecast for the Southern System is 73,129 decatherms per day. There is sufficient pipeline and tap capacity on the Southern System to meet this projected load (see Exhibit 4.5).

The Southern System has been operating at maximum capacity for gas volumes transported southward from the Indianola gate for several years now. Firm gas purchases and/or firm capacity purchases from Kern River are required to meet existing and all new firm customer demands on the Southern System.

In order to keep up with new growth for this part of the system, the metering capacity for the Questar Gas owned meters at WECCO and Central was increased from 36.5 to 56.5 MMcfd. The WECCO tap reinforcement was completed in October of 2004. These reinforcements have shifted the constraint from the Questar Gas metering facilities to the Kern River facilities. The combined metering capacity on Kern River's WECCO and Central meters is 56.5 MMcfd.

The current total delivery capacity to the Southern System is 21,000 Dth per day through the Indianola gate plus 34,000 Dth per day through WECCO plus 22,500 Dth per day through the Central tap bringing the total delivery capacity to 77,500 Dth per day. This is enough to provide sufficient delivery capacity to the Southern System for the 10 year forecast horizon. However, loads can change rapidly and if demand increases beyond projections, the need for additional reinforcement could change within the 10 year forecast.

Questar Gas Reinforcements

Questar Gas' system reinforcement requirements are determined by many factors including pipeline capacity issues and pipeline integrity regulations. Questar Gas' system continues to have sufficient capacity to meet the existing demand of its firm customers because it is constantly increasing its capacity to meet the future growth in firm demand and provide for enough reserve capacity for system emergencies. Questar Gas is exploring cost-effective options to reinforce its distribution system to serve new demand, improve system reliability, and to reinforce localized low pressure areas.

Completed Projects

Questar Gas completed the following high-pressure pipeline projects in 2006:

- The FL 26 Phase V replacement project was split into two phases, Va and Vb. Va has not yet been completed. Phase Vb, completed in 2006, started at the intersection of 800 North and 400 West and entailed installing approximately 7,542 feet of 24-inch pipe along 800 North to Geneva Road in Orem, Utah.

- The FL 104 extension started at 700 South 1100 West in Lehi, Utah where it

connects to FL 85 and extends approximately 7.7 miles along the Rocky Mountain Power corridor to Lakeside Power Plant. The 20-inch line was constructed to supply natural gas to PacifiCorp's Lakeside Power Plant.

- FL16 Loop Phase II extended from the current 8-inch terminus of FL 16 at Burgie Lane to Main Street in Heber City, Utah. This project involved installing a new full capacity regulator station near the northeast corner of Midway City (around the junction of River Road and Burgie Lane). This new pipeline effectively loops FL 16 and significantly increases deliveries and pressures to Heber City by providing a 2-way feed.

Identified below is a portfolio of potential feeder-line pipeline projects Questar Gas may pursue over the course of the IRP planning horizon (see the schematic maps in Exhibits 4.6 through 4.9). The various projects have been categorized into four areas: Near-Term Capacity, 2008 Projects, Long-Term Capacity, and Integrity Management.

HP Feeder Line System Modeling and Reinforcement

On an on-going basis, Questar Gas monitors and analyzes the High Pressure (HP) Feeder Line system to determine the system's ability to deliver peak day supply and meet pressure demands. Pipe sizing and configuration are checked to ensure adequate pressures and flows are provided to meet regulator-station and customer demands throughout the system.

The engineers primarily rely on the Advantica SynerGee (Stoner) software to model gas flows and pressures on the system. Supply demands from regulator-stations and customers are balanced with natural gas supply receipt points on the system. Regulator station and receipt point operating pressures are used to calibrate and validate data used in the model.

Feeder Line Capacity Projects: Near-Term

Near-Term capacity projects are projects that have been approved by management, budgeted for and are either scheduled for completion or will be constructed during 2007. These projects are identified by the Company as being critical to providing firm, reliable and uninterrupted service to its core customers under a peak-day-usage event. These projects are shown in Exhibit 4.6 and 4.7.

1. Feeder Line 26 Replacement, Phase Va

   Sections of Questar Gas' existing FL 26 have been replaced during the past several years through a phased program. This project was divided into six phases. Questar Gas has completed the first four phases of this project. Phase

V of the project consists of two sections. Phase (Va) will extend from 476 Piute Drive to 5500 North Canyon Road. Phase (Vb) was completed in 2006 and runs along 800 North from 400 West to Geneva Road.

2. Feeder Line 26 Replacement, Phase VI

   This project is currently being installed concurrent with the Utah Department of Transportation's 800 North Widening Project in Orem. The approximate distance of pipeline being replaced is 6 miles. When all phases of the FL 26 project are completed it will add roughly 35,000 decatherms per day of capacity. This additional capacity will be necessary to provide an adequate supply of natural gas to Utah County, including the Vineyard area, where the development of the old Geneva property is anticipated.

3. Summit and Wasatch County, Utah Reinforcement FL 99

   Due to new residential developments, Questar Gas is currently designing a 12 inch extension of existing FL 99 to the Victory Ranch Development. This 12 inch pipeline will eventually extend to FL 16 and complete the reinforcement loop of FL's 16 and 99.

4. Feeder Line 83 Mountain Green, Utah Extension

   Significant residential growth in Mountain Green is driving the need for high-pressure reinforcement. The plan is to tap FL 83 in Mountain Green and run approximately 9,500 feet of 8-inch and 6-inch pipeline east along the Old Highway Road supplying gas to two new regulator stations. Construction will take place in summer of 2007.

5. Feeder Line 16 Heber, Utah Extension

   Questar Gas is currently in the process of extending HP service to the east side of Heber. High pressure facilities are required on the east side of Heber to help keep pace with development in the area. Work has begun to develop project scope, budget, preparation of construction drawings, and acquiring permits and ROW. Construction is slated to occur in fall 2007. It is anticipated that the line will be a 6-inch pipeline approximately 2.5 to 3.0 miles long.

6. Feeder Line 47 Extension to Syracuse, Utah

   Significant residential growth in Syracuse and the surrounding communities is driving the need for high-pressure reinforcement. The plan is to tap FL 47 near its dead end in Clearfield and run approximately 18,000 feet of 8-inch pipeline west along 200 South to a new station on 3000 West in Syracuse. Construction is scheduled for summer of 2007.

7. Feeder Line 7 Replacement

   FL 7 is approximately 17 miles long and runs along State Street from 3300 South to the Utah County Line. The feeder line currently consists of 6-inch, 8-inch, and 12-inch line sizes. The line will be replaced by 12-inch line. Construction of the project began in early spring 2007 with completion anticipated in fall 2007.

Projected Year 2008 Projects

1. Feeder Lines 4, 5 and 11 Replacement

   This project entails replacing the existing 12 inch, 16 inch and 20 inch sections of FL's 4, 5 and 11 with 24 inch pipe from 2700 East on 33rd South to the Tooele County line. This would allow additional gas supplies to enter into Salt Lake County and Tooele County from the east. Work on this replacement project is projected to start in 2008.

2. High Pressure Tap Lines

   The following High Pressure Tap Lines are currently in the study or planning stages and are needed to reinforce customer growth areas.

   - **Providence** - Significant residential growth in Providence and the surrounding communities is driving the need for high-pressure reinforcement. The plan is to tap FL 23 near regulator station LG0004 in Nibley and run approximately 12,500 LF of 6-inch HP east along 3200 South to a new station near Highway 165. Preliminary design/engineering and property acquisition will take place in 2007/2008. Construction is scheduled for 2008.

   - **Hooper** - Residential growth in Hooper (which is a long distance from a station) is driving the need for high-pressure reinforcement. Preliminary design/engineering and property acquisition is planned for 2007. Construction is tentatively planned for 2008.

3 Feeder Line 19 Replacement

   This project entails replacing the existing 14 inch sections of FL 19 with 20 inch pipe from Sunset Station to 1200 West, south of Harrisville Road. This would allow additional gas supplies to enter into Weber County from the east.

Feeder Line Capacity Projects: Long-Term

Long-term projects are more susceptible to future changes than near-term projects due to the uncertainty of forecasting loads and customer growth several years out. The projects identified below address future capacity constraints that may result due to current demand growth trends over the IRP planning horizon. Some of these projects may not appear in future IRP's or may significantly change as more information becomes available. Due to the complexity associated with acquiring permits, materials and rights of way, almost all projects will be considered over at least a two year planning horizon. By so doing, a more careful and considered approach can be taken to the construction of these projects. These projects are briefly summarized below and shown on Exhibits 4.8 and 4.9.

1. Loop Feeder Line 23 to allow 50 mmcf/d incremental delivery to the Ogden and Hill Air Force Base Area

   This project, in conjunction with the Tie-Line 112 project that was completed in 2003, would provide 50 mmcf/d of incremental delivery capacity to customers in the Ogden area. Approximately 20 miles of FL 23 needs to be looped with 16-inch pipe starting at the Hyrum Gate Station.

2. Feeder Line 12 Replacement

   This project entails replacing the existing 14 inch and 16 inch sections of FL 12 with 24 inch pipe from the North Temple regulating station to 33rd South. This would allow additional gas supplies to enter into Salt Lake County from the north. A portion of this replacement project is projected to be completed in 2007.

3. Tooele County Reinforcement

   There has been significant residential growth in Tooele County in recent years. Several ideas are being evaluated to reinforce the system in order to provide increased gas deliveries to this area. One idea being considered is the possibility of upgrading or looping portions of FL's 11 and 14 to increase deliveries to Tooele County from the north. Also, under consideration is the possibility of constructing a tie line between FL 85 and FL 48. This project would connect Cedar Fort and Stockton for purposes of providing a two-way feed into Tooele County.

IHP Distribution System Modeling and Reinforcement

Each year, Questar Gas monitors and analyzes the Intermediate High Pressure (IHP) distribution systems to determine their abilities to withstand the demands of a peak-day event. Regulator-station capacities and locations are checked and pipe sizing and configuration are evaluated to ensure adequate pressures and flows throughout the system.

To accomplish this task, the engineers have at their disposal a number of tools to provide the information needed to appropriately configure the IHP distribution systems. The most important tool is the Advantica SynerGEE (Stoner) modeling software. The engineers are using models that are automatically generated using graphical information system (GIS) mapping information (for physical pipe configuration) and customer information system data (for determining peak hour loads). These models are used to evaluate pressure/flow relationships and required regulator capacities under peak-day conditions. In addition to using the Stoner modeling software, pressure recording charts are placed throughout the IHP distribution system in strategically located areas to provide a real time indication of the pressure in a given area. These charts are also used to calibrate and validate the data used in Stoner models. Flow computers, regulator station charts, and other sources of information are also used to ensure the IHP systems are configured and sized to meet peak-day demands.

During 2006, Questar Gas focused on two aspects of the IHP distribution systems. The first was the need to provide IHP main reinforcements to various areas of the IHP distribution systems where pressures below 20 psig were predicted using a computer and hydraulic flow software, or where pressure recording charts indicated a problem existed, or where exceptional amounts of growth have occurred. As a result of this modeling process, a significant footage of IHP main was run to reinforce the system. The second area given priority this year was evaluating the ability of regulator stations to provide the predicted flow under peak-day conditions. There were several stations identified that did not meet the model flow requirements. Each one of these stations was evaluated and a variety of solutions offered that included replacement of regulators, adjustment of set points, replacement of low-capacity stations with medium-capacity stations, replacement of medium-capacity with high-capacity stations, tying regulator stations together with additional IHP main, and the proposal of future regulator station sites. Based on the model calculations and the modifications and reinforcements made, the end result was the assurance that each one of the regulator stations identified had adequate capacity for the upcoming heating season.

Integrity Management

New federal requirements are mandating pipeline integrity management programs for transmission pipelines in high population areas defined as high-consequence areas. The new requirements are extensive and will require an on-going commitment to perform risk analyses, data integration, integrity assessments and remedial repairs on Questar Gas' high-pressure transmission lines. In addition to significant increases in operating expenses for these activities, integrity problems may be identified that will require Questar Gas to refurbish or replace significant portions of its high-pressure pipeline system. These projects will be specified as near-term projects in future IRPs when they are identified. Additional new federal requirements mandating integrity management programs for distribution lines are being discussed.

Regulatory Drivers for Increased Costs

The federal government has taken an aggressive stance in recent years toward further reducing the safety risk associated with the nation's natural gas pipelines. Federal actions include new pipeline safety legislation, the Pipeline Safety Improvement Act of 2002 signed into law by the President on December 17, 2002, as well as an aggressive agenda of regulatory and non-regulatory initiatives from the U.S. Department of Transportation, Research and Special Programs Administration (RSPA). These federal actions will require increases in operating and capital expenditures for Questar Gas to be in compliance. The cost impacts of some of the recent federal actions are further discussed below. Further increases in operating and capital expense may be required as a result of future federal regulations. The most significant federal actions, from a cost impact perspective, are those associated with transmission integrity management. The Pipeline Safety Improvement Act of 2002 included extensive risk analysis and integrity management requirements for transmission pipelines in high consequence areas. The act requires that baseline integrity assessments begin June 17, 2004, and that fifty percent (50%) of segments be assessed within five years (by December 17, 2007), and that all baseline assessments be completed within ten years (by December 17, 2012). Baseline assessments are to be prioritized based on risk and must be done utilizing internal inspection (also known as "smart-pigging"), hydrostatic pressure testing, direct assessment, or an alternative method approved by the Secretary of Transportation. The Act further requires a reassessment interval every seven years. The operating costs associated with these assessments are significant – typically tens of thousands of dollars per mile, depending on method, plus the cost of any remedial action.

RSPA has initiated a two-part rulemaking on integrity management for transmission pipelines. The first part of the rulemaking was promulgated as a final rule on August 6, 2002. This final rule established the definition of a "high consequence area" subject to integrity management. The second part of the rulemaking was promulgated as a final rule on December 15, 2003. These new requirements are incorporated into 49 CFR Part 192 as a new Subpart O, "Pipeline Integrity Management."

Questar Gas operates two types of pipelines, a high-pressure feeder line system, and an intermediate high-pressure distribution system. Under the federal legislative mandate, Questar Gas began baseline integrity assessments on its high-pressure transmission lines in June 17, 2004, and has begun completion of a host of other compliance activities required under the Act and final integrity rule.

Questar Gas began preliminary integrity assessment work in 2004 and continued the work during 2005 and 2006. These initial surveys will give the Company a better understanding of the costs to comply with the new rules.

The framework document for Questar Gas' Integrity Management Plan (IMP) was completed in December 2004. It includes the baseline assessment plan and schedule for all High Consequence Areas (HCA) on the Questar Gas system.

The cost of these compliance activities is anticipated to be substantial. Although the recent additions and replacements on the feeder line system are designed to accommodate in-line inspection tools ("smart pigs") with the addition of end facilities, the original high-pressure feeder lines were not designed for in-line inspection. Where in-line inspection is necessary and feasible, capital modifications will be required. "Smart pig" launchers and receivers will need to be installed, potentially at new above ground sites. Questar Gas completed modifications and in-line inspection on a portion of FL 4 in 2006. Restrictions in the pipeline that would not allow passage of an in-line inspection tool such as valves, taps, and fittings, were replaced. Direct Assessment is another preferred method that will be utilized to the extent permitted under the new rules.

If external corrosion direct assessment (ECDA) or in-line inspection is not feasible, a hydrostatic pressure test will be used. Hydrostatic testing is not favored as a testing method due to the lengthy service disruption required, as well as other factors. To hydrostatically test a line while providing uninterrupted service to customers, additional looped lines, isolation valves, and facilities may be required. These new facilities and lines will become permanent additions to the system, allowing Questar Gas to repeat the required inspections at specified intervals.

Integrity Management Drivers for Increased Capital Costs

Pipelines are a proven, safe and reliable method for delivery of natural gas. Well maintained pipelines can last for many decades. However, pipelines are subject to a number of integrity threats, including time-dependent factors such as external corrosion. External coatings and cathodic protection are very effective means for slowing the corrosion process on buried steel pipelines. However, as pipelines age, the coatings may begin to degrade and may dis-bond from the pipeline causing increased cathodic protection demands. Over time, coating deterioration and damage (such as caused by excavators not following the Blue Stakes law), can result in corrosion pitting. As the feeder line system ages a continued need for pipeline replacement is anticipated.

The ongoing FL 26 replacement in Utah County is an example of this process. This line is being replaced specifically because of integrity concerns and our desire to maximize the safe delivery of natural gas through that portion of the system. Portions of FL 18 in Davis County were replaced during 2006 as a part of the Integrity Replacement Program.