Role of Interruptible Customers in Balancing System

Supply and Demand
Local gas utilities serve many customer classes under differing rate structures. In some cases, customers (often larger volume customers) choose an interruptible tariff, either for sales or transportation service. This choice allows the customer to pay a lower service rate, with the possibility that their natural gas service may be interrupted by the utility during critical demand days in order to ensure service to firm customers. Ideally, the interruptible customer has dual-fuel capability and is able to switch to another energy source during interruptions. In fact a customer may be required to have this capability in order to qualify for interruptible rates. For example, a large industrial or commercial customer might have an oil tank and burner on site ready to be turned on, if gas service is interrupted.

For many utilities, interruptible service provides a valuable gas supply and operations management tool, allowing service curtailments on peak demand days to ensure reliable and safe gas service to core customers. During the winter on the coldest days, natural gas utilities may call upon customers designated for interruptible service to cease natural gas use temporarily, at which point these customers switch to a back-up fuel (such as heating oil) or simply choose to halt operations until the critical period passes, thereby reducing natural gas requirements on the distribution system. Natural gas utilities may choose to initiate interruptions with interruptible customers for a variety of reasons, though most often it is to maintain system integrity.

Natural gas utilities often provide tiered classes of service, based on a customer’s natural gas use and requirements. Some utilities do not have a set interruptible service tariff; however, they negotiate terms individually with their largest users that allow them to interrupt service if necessary. As with other elements of natural gas service, utilities operating in 50 different states develop with their regulators and customers varying mechanisms, which achieve the same purpose.

The fact that for the past decade or so winters were generally warmer than normal and the supply base was steadily growing means that many companies did not find it necessary to rely on interruptible customers to help balance their systems in response to critical demand levels. Put simply, interruptible customers have not been interrupted often in the past decade or so. This changed during the 2013-14 winter heating season. The following observations briefly describe the role of interruptible customers on natural gas utility systems and integrates this understanding into the experience of the 2013-14 winter.
Role of Interruptible Customers in System Design

Natural gas distribution systems are designed to meet not only the average requirements of day-to-day service but also peak demand on the coldest day of the year. Utilities have a regulatory mandate or obligation serve firm, or core, customers (generally residential and small commercial), and supply portfolios and system deliverability are built to ensure reliable service to firm customers and others on a design day (or a forecasted peak day load based on historical weather conditions). The methodologies for design day determination vary among utilities but are based typically upon the principle of maintaining service on the coldest days of winter.

Numbering more than 66 million, residential consumers are by far the largest natural gas customer segment in the U.S., and they are mostly dependent on the local utility to manage all aspects of their gas service; however, they consume not more than 64 million Btu of natural gas on average annually. In contrast, the typical interruptible utility service customer is an industrial plant that consumes large volumes of gas each year. According to AGA’s Gas Facts, the average utility industrial customer (numbering about 180,000 in the U.S.) consumes 21,343 million Btu or 339 times more gas than the typical residential customer. Acknowledging that a temporary service interruption of a large volume customer can go a long way to balancing system needs during critical periods, a significant number of utilities have put in place interruptible service arrangements with their large volume customers.

As mentioned earlier, during periods of high usage and system constraints, prevalent on the coldest winter days, natural gas utilities may call upon customers that have contracted for interruptible gas service to cease gas usage temporarily, upon which these customers generally switch to a back-up fuel, such as fuel oil. The tradeoff for these customers is a discounted rate for the natural gas delivery service, compared with firm service rates. In brief, interruptible customers play an important role for many utilities on critical days, helping them maintain system integrity while delivering gas reliably to core customers.

Service Interruptions: Occurrence and Underlying Factors

When overall system demand exceeds available capacity, natural gas utilities may opt to curtail service to interruptible customers on a temporary basis in order to maintain system integrity and service reliability to firm customers. Normally this event occurs on the coldest days of the year and does not last long, after which service is restored to these customers.

Gas distribution service interruptions result from a number of factors, including extreme weather conditions, upstream or on-system constraints or outages, and force majeure events. Companies in the AGA 2013-14 LDC Winter Heating Season Performance Survey cited all these reasons for curtailing service to interruptible customers; however, upstream system constraints played an important role, impacting local distribution systems in the form of operational flow orders and critical days. These orders are necessary to safe pipeline operation, particularly during system constraints, compression outages, maintenance, production freeze-offs, or force majeure events. Similar critical notices are issued for storage injections and withdrawals. Sixty-three percent of AGA survey companies (52 of 83) encountered upstream pipeline operational flow orders which impacted their own system operations (i.e. city gate deliveries). The median number of upstream OFO notices was eight, while the average duration was slightly above 3.5 days.
In addition to operational flow orders, 24 companies (29 percent) noted that pipeline critical transport
days were issued during the winter heating season that impacted their operations, and 14 companies
identified storage critical days. Median critical storage days issued for the companies was 5.5, while
the median point of average durations was 8.4 days.

A number of companies found it necessary to curtail service to interruptible customers this past
winter, predominantly due to upstream system constraints: 51 percent (43 of 84 reporting
companies) halted service to interruptible customers temporarily, either on a peak day (40
companies) or on another day (27 companies). Significantly, 33 companies did not interrupt any
customers, even during extreme winter conditions.

Based on AGA query of members, a significant portion of companies with interruptible arrangements
reported a growing number of customers that were interrupted in the 2013-14 winter relative to prior
winters, which is not surprising, given the exceptional weather conditions, particularly in January
through March: 38 percent reported that the number of customers that were interrupted increased
this past winter, compared with the prior winter (32 percent said they increased compared to the five
year average from the 2008-09 to 2012-13 winters). However, the majority of companies reported
that the number was unchanged (42 percent), decreased (9 percent), or that there were no
interruptions at all (11 percent).

The median number of interruptions per local distribution company was five this past winter, and
three fourths of companies initiated 10 or fewer interruptions. The median duration per interruption
was two days, and nearly two thirds of companies reported average durations of two days or less.
Overall, the median volume of gas not delivered due to interruption represented two percent of a
utility’s total gas deliveries. While the median percentage of volumes appears small, it is not
insignificant for the utility, where reliable service to core customers on critical days lies on the
margin.
The proportion of gas that is interrupted can vary, depending on the number of interruptions, their duration, and the end user’s gas requirements for that period. The median proportion of interrupted gas relative to total utility gas deliveries was two percent for the 36 reporting companies, ranging from less than 0.1 percent to 18 percent. Also 78 percent of the companies reported less than 8 percent of gas volumes interrupted.
Companies generally have a specific order in which customers are interrupted. In fact, based on an AGA Query, 81 percent (47 of 58) of companies with interruptible service arrangements initiate interruptions in a specific order, often based on rate class, tariffs, and zones. This winter, 23 percent (14 of 48) of reporting companies interrupted customers farther down the queue, and for eight of these companies, this was unique to the 2013-14 winter heating season, compared to the past five years.

The manner in which utilities manage interruptible customers varies. While the majority of companies (46 of 58 reporting) do not view interruption events as an opportunity to encourage interruptible customers to switch to firm service (perhaps because these customers provide operational and reliability benefits to the distribution system), 25 percent (13 of 52) indicated that their customers on an interruptible tariff elected to switch to a firm rate in response to service interruptions this past winter. Generally, utilities do not allow mid-season switches to firm service and defer such changes to the following year. Others limit switching opportunities (for example, once every few years). However, in some cases, in keeping with tariff provisions, a utility may decide to switch a customer to firm service when they fail to comply with multiple curtailment orders.

**Distribution System Operational Flow Orders**

An operational flow order (OFO) is a mechanism used to protect distribution system integrity, issued either to specific customers or system-wide, requiring them to rigorously balance customer gas usage with delivered quantities, usually within a specified tolerance band. As with upstream pipelines, these orders are necessary to safe and reliable operations (sustaining critical system pressure), particularly during capacity constraints, compression outages, maintenance, or force majeure events.

As stated earlier, upstream constraints impacted LDC operations. In fact 57 percent of survey companies (48 of 84) issued distribution system operational flow orders (OFOs) to non-core customers in order to protect distribution system integrity. For 58 percent of the 48 companies, the OFOs were issued system-wide, while 10 percent issued customer-specific OFOs, and 31 percent applied both. Customer-specific flow orders were based on usage, geographic area, or rate class. The factors that drove OFO issuances on utility distribution systems varies, ranging from upstream constraints to on-system issues; however upstream constraints were the predominant factor.
If customers take unauthorized volumes after the OFO is posted, a utility may enforce the flow order by either billing the customer for the unauthorized volumes and/or assess a non-compliance penalty or charge per unit of unauthorized gas usage. Eighty-eight percent of reporting companies (42 of 48) enforced OFO non-compliance this past winter.

Approaches to assessing OFO penalties to large volume customers vary: 63 percent of reporting companies (53 of 84) charge a penalty, and the median penalty is $20 per Dekatherm. Fifty percent of companies (28 of 56) assess the penalty at a prescribed tolerance threshold—the median tolerance band being 5 percent—and 14 percent (8 of 56 companies) have a pre-determined de minimus non-compliance level where no penalty applies.

CONCLUSION

Natural gas distribution system schedulers use specific tools to maintain system balance and integrity. These include operational flow orders (OFOs), emergency flow orders (EFOs) and curtailments of interruptible service customers. Due to exceptional demand created by extreme winter conditions, upstream constraints, and force majeure events, natural gas utilities made use of these tools this past winter to a larger extent than recent winters. However, utilities are not limited to these actions and employ diligent planning and preparedness, which involve a mix of supply and operations management approaches. This affords them a degree of flexibility and serves as a buffer against such contingencies. Generally, the use of flow orders and service curtailments are a last resort.
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