



Williston Basin Interstate Pipeline Company

Natural Gas Transmission & Storage

G+ GAS DAY SETUP

Presented by

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G+ Gas Day Setup - a Brief Overview

The Gas Day Setup Module within G+ represents the next evolutionary stage at Williston Basin and is the technology that Williston Basin will utilize to maximize scheduled volumes and minimize the effect day to day system upsets have on our customers.

With the advent of the deregulation of the natural gas industry and recent Federal Energy Regulatory Commission (FERC) orders related to the scheduling of pipeline capacity, a much tighter and more efficient relationship between pipeline operations, scheduling, marketing, and other departments within Williston Basin was necessary.

Traditional methods for coordinating pipeline operations in the face of ever changing customer requirements has become increasingly difficult with the new complexities of the natural gas industry. Under rules established by the North American Energy Standards Board (NAESB) and approved by FERC, customers may submit and/or revise their nominations 4 times per day, 365 days per year. In fact, FERC Order 637 went so far as requiring pipelines to schedule volumes for No-Notice customers without the benefit of nominations.

It is no longer sufficient to just use pipeline simulation technology to solve hydraulic problems. G+ Gas Day Setup utilizes integration and automation tools to combine steady state pipeline simulation with business analysis to solve the complex scheduling issues that affect customer's utilization of Williston Basin's pipeline system.

G+ Gas Day Setup provides the capability to more efficiently analyze each nomination cycle (4 per day) using steady state pipeline simulation to determine if the pipeline system is capable of supporting the requirements of Williston Basin customers. G+ relies on links to a variety of data bases on Williston Basin's computer network in order to model and analyze the appropriate loading scenario. After loading weather and gas quality data from the company's SCADA system, nominations and contract information from the Gas Management System (GMS), maintenance data from the G+ maintenance data base and set point data via operator dialog, G+ Gas Day Setup determines if the pipeline system is capable of operating under the specific requirements.

In situations where nominations do not exceed pipeline capacity, all nominations are flagged to be scheduled and passed back to the GMS. G+ then identifies and reports locations on the system where excess capacity exists. By knowing and understanding the location of excess capacity, gas control personnel can consider the timely unscheduled maintenance of facilities without affecting the customer's requirements. The real time identification of excess capacity also provides scheduling personnel the potential for marketing excess capacity.

In situations where nominations exceed pipeline capacity, as is the case in a high load situation or in scenarios where line segments, compressor units, or other equipment may not be available, nominations must be analyzed and curtailment must be initiated based on each nomination's specific contractual requirements and the Williston Basin FERC Tariff.

For nominations to be correctly scheduled in these situations it is necessary for G+ to include contract and rate information on each individual transportation and storage contract. The G+ Scheduler Module includes all of Williston Basin's business rules and scheduling logic to insure that volumes are scheduled in compliance with the Williston Basin FERC Tariff. Through this process, G+ provides Williston Basin customers a solution designed to maximize scheduling, minimize curtailment and identify marketing opportunities.

General Functionality

Currently, many of the steps described above are being performed manually. Automating the scheduling process will create an opportunity for additional analysis and provide tools to schedule additional volumes within the tight constraints of the NAESB scheduling timelines. This ultimately leads to a much more efficient scheduling process, a more efficient pipeline operation and increased throughput.

Simply comparing nominations within a particular pipeline segment against predetermined segment capacities does not always adequately take into consideration the daily variations of overall system operations and any outages that may be taking place on that day which would affect capacity. Calculation of the capacity of a segment is not independent of the segments adjacent to it and, for that matter, all other segments in the system.

The determination of available capacity in any part of the system carries with it specific pressure requirements throughout the entire network. By utilizing steady state simulation to calculate system capacity based on weather forecasts, customer nominations and scheduled outages and integrating contract curtailment analysis into the simulation, Williston Basin will maximize utilization of the pipeline while ensuring adherence to all contract and FERC Tariff requirements.

Flows are generally applied to meters within the model for a typical steady state simulation; however, beyond that, G+ also identifies the transportation and/or storage contract and the receipt and delivery points associated with each nomination to fully track each transaction at a meter level. When a nomination is processed G+ populates contract records at each meter within the steady state model with their associated receipt and delivery points, their flows, their contract priority, and other specific information used in the scheduling process.

Using this information, G+ is able to select the optimum pipeline configuration scenario from the Multi-Scenario Library and accurately and consistently schedule nominations during periods of curtailment. New operating scenarios can be configured and saved in the Multi-Scenario library at any time. Of particular concern to Williston Basin is the fact that the major Local Distribution Company (LDC) served by Williston Basin has contracted No-Notice service for approximately 40% of their total firm transportation requirements. This means that a major portion of the firm transportation on Williston Basin's system is not necessarily nominated and generally has to be scheduled and served without the benefit of customer nominations.

LDC No Notice receipt volumes are scheduled and confirmed by Williston Basin from the LDC's firm storage account while the remaining (up to approximately 60%) LDC firm receipt volumes nominations are scheduled under the LDC's regular firm transportation contract. This places an extreme importance on the G+ Load Forecaster which must accurately calculate the LDC firm requirements. Using third party weather forecasts which are electronically interfaced to the company's SCADA system, the weather data is passed from the SCADA system to the G+ Load Forecaster which calculates the total weather dependant LDC requirements using MCF per Degree Day correlations provided by Williston Basin. G+ Gas Day Setup then adds any additional firm and interruptible nominations to the appropriate meters to achieve the total system load requirements.

G+ also provides the capability for load forecasting using Gregg Engineering's Regression analysis, Neural Network, and Generic Algorithms. If at some point in the future, Williston Basin deems one of these techniques to be more accurate than the current MCF per Degree Day technique for any specific location we can change the technique being used by adjusting a flag at that point in the model.

The G+ Load Forecasting Module is also a critical tool in Gas Control as it performs a 72-hour forecast automatically every hour or on operator demand. Selected Load Forecasting data which is critical to Gas Control operations is transferred from G+ to the SCADA system "real time" data base where critical Load Forecast variables can be alarmed and values can be displayed and trended on the SCADA Gas Control consoles. This feature allows the Gas Controllers to remain focused on their consoles while G+ Load Forecasting is running in the background and feeding them results.

After taking into consideration weather forecasts, No Notice volumes, customer nominations, contract data, SCADA gas temperature and gas quality data, and any scheduled system outages, if the system is capable of operating, G+ marks the nominations as capable of being scheduled and returns them to the Gas Management System to complete the scheduling process. A segment capacity analysis is then performed by G+ and any additional available capacity in each segment is calculated and reported to the operator so they can analyze short term potential market capability and/or potential unscheduled maintenance.

If G+ determines the system is not capable of operating under the specific loading requirements of the customers, (i.e. Curtailment is necessary) the G+ Gas Day Setup operator will be presented with dialog screens allowing the opportunity to change settings such as Operational Balancing Agreements (OBA), Receipt Point Operational Balancing Agreements (ROBA), Target Pressures, Storage Targets and Purchased Fuel Priority in an attempt to obtain an acceptable operating scenario.

If, after making changes to settings, the pipeline system is still not capable of operating, the operator may choose to initiate the G+ Scheduler Module. Once this Module is launched, three types of curtailment may be applied as necessary: Receipt Point Curtailment, Delivery Point Curtailment, and Storage Curtailment.

In practice, it will be rare to apply Receipt Point Curtailment and Delivery Point Curtailment within the same region but it is, nonetheless possible and therefore is supported. The curtailment process will use contract and rate information passed from the Gas Management System and a business rules script will translate this information into curtailment rankings based on Williston Basin FERC Tariff and specific business rules.

These business rules scripts encompass all the details to correctly schedule volumes associated with Firm and Interruptible Transportation, Firm and Interruptible Storage, Pooling, Park and Loan, Imbalance Management, and Meter Bouncing. Volumes at meters in the affected segment(s) are then systematically lowered based on their contract rankings to levels which allow for operation of the system.

Contracts identified for curtailment within the violation regions will be balanced by applying likewise curtailments at the opposite end of the contracts. When in Receipt Point Curtailment, the appropriate curtailment is made at the receipt point and the associated delivery point volume is calculated “net of fuel”.

When in Delivery Point Curtailment, the appropriate curtailment is made at the delivery point and the associated receipt point is calculated “grossed up” for fuel. As a result of ever changing NAESB standards and FERC regulations the business rules scripts which are used to define and control the curtailment process must be easily changeable. These custom scripts are supplied to Williston Basin to allow company personnel to easily edit and modify the G+ Gas Day Setup scheduling procedures as dictated by changes in the company’s business practices.

Once an acceptable solution is achieved the results are presented to Gas Control personnel to validate the simulation and recommended pipeline configuration. Upon verification of an acceptable operational solution volumes capable of being scheduled are passed back to the Gas Management System to complete the scheduling process.

In situations where curtailments are required, G+ will also pass the reason code (why cuts were made) to the Gas Management System so that information can be included in the scheduled quantity report which is available to each customer at the conclusion of each scheduling cycle.

As previously mentioned, the steady state simulation takes into account scheduled maintenance projects on the pipeline system. The G+ Maintenance Tracking Module allows Gas Control personnel to specify outages in lines or equipment and includes the date and time that the outage starts and when it is expected to end. This includes “leg” elements such as compressor units, pipes, regulators, valves, and other information that connects any two points in the model.

All meter level outages are handled either through the scheduling process or OBA and ROBA adjustments. Subsequent runs of the other modules within G+ make use of the maintenance records in this database when calculating capacity and feasibility of operation.

Computer Systems and Interfaces

The following computer systems are networked to comprise the array of tools Williston Basin will use to fully implement the G+ Gas Day Setup process:

- Gregg Engineering G+
 - G+ is distributed across three Dell PowerEdge 2650 servers. G+ clients are able to run multiple concurrent G+ sessions from their desktop computers. Although G+ Gas Day Setup and G+ Load Forecasting are mission critical functions, the G+ servers are not configured for automatic backup/failover operation. In the event a critical function is running on a server which fails, that function can be manually started on one of the other 2 online servers or on a 3rd backup server.

- SCADA
 - The Invensys SCADA system consists of dual redundant Dell PowerEdge 2650 servers running Microsoft Windows 2000 and Invensys Wonderware SCADA software.

- Gas Management System
 - The Gas Management System is running on an IBM AS400. The AS400 will continue to perform initial nomination checking and verification before passing the nominations and contract data to G+. Upon completion of a successful G+ Gas Day

Setup run, G+ will pass the recommended scheduled quantities back to the GMS for final scheduling and confirmation with customers. The AS400 also performs all the billing and accounting functions associated with transportation and storage.

- Measurement Accounting System
 - The company's utilizes Software Performance's MIPS Gas Accounting Package running on an HP 9000.

All four computer systems sit on the company's Local Area Network (LAN) and exchange data using preferred SQL routines or lesser preferred flat file transfers. The exchange of data between the systems is coordinated using a WBI developed Microsoft SQL Cross Reference data base which ensures that data to/from G+ is properly addressed to the right meters within G+.

Project Status

Williston Basin's SCADA and Nomination and Scheduling System upgrade consists of Gregg Engineering's G+ package and suite of associated tools in conjunction with an Invensys Gas Control SCADA Master Station and associated application software and the installation of 99 Fischer ROC RTU's. Currently the SCADA and G+ projects are in the testing phase of the project, with Final Acceptance expected in the mid-October timeframe.

For any questions concerning the Williston Basin G+ implementation, please contact:

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