Improving the Business Performance of Mid-Stream Gathering And Processing Assets

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ABSTRACT

Mid-stream assets are currently managed from a commercial perspective using traditional spreadsheet tools. These tools are used to analyze gathering and processing options based on current index prices and to evaluate the margins generated by new well connects. Spreadsheets are effective. However, they are cumbersome to use when trying to evaluate multiple contract types, multiple sales points, compressor/plant performance capabilities, and moving index prices.

As Crosstex Energy Services LP (Crosstex) has continued to grow, and its business has begun to move at a much faster pace, their need to reduce dependence on traditional spreadsheets has increased. Traditional spreadsheet tools are difficult to maintain, prone to errors, and may not accurately represent the true capabilities of the gathering and processing systems.

After the acquisition of the Louisiana Intrastate Gas (LIG) gathering and processing system, Crosstex commissioned eSimulation, Inc. (eSimulationSM) to develop a graphical modeling tool to replace the traditional spreadsheet tools used by gas supply personnel. The new graphical model would need to be non-technical, easy to use, and easy to modify to keep track of the ever changing market and operational conditions. The result of this effort is a software product called eSimEvaluator.

This paper will describe the commercial challenges that affect mid-stream profitability, how Crosstex built a model of the complicated gathering system using eSimEvaluator to address those challenges, and how the model is used to optimize system margins. The tool is now available to use at other Crosstex gathering and processing assets and has been shown to help drive commercial business decisions.

MARKET CHALLENGES

The following are some of the challenges that mid-stream processors must address when managing their business to drive shareholder value:

Mid-Stream Challenge 1 - Physical and Geographical Issues

As natural gas wells are drilled, mid-stream processors bid for the contract with the producer to gather, process, and transport the natural gas to mainline pipeline systems. When the mid-stream processor is bidding on a contract with a producer to gather and process a new gas "package" (i.e. the expected volume from the well per day), they typically estimate the costs associated with gathering, processing, and transporting the gas using customized spreadsheets.

A typical midstream processor may have 20 to 1000 well connects, several treating facilities, a processing plant, and several gas / NGL sales points to manage on a single gathering and processing system. There can also be extensive compression optionality that must be managed to minimize the overall fuel costs required to transport the gas. The effectiveness and accuracy of spreadsheet tools to manage the optionality associated with complex gathering and processing systems is suspect.

For example, adding a new gas package to the gathering and processing system will affect compression and processing plant performance. While it appears that processing the new gas package will be profitable, the composition and characteristics of the gas may negatively affect the processing margin for the rest of the gas currently being processed. This is a key issue which must be considered when the mid-stream processor calculates their cost position in advance of negotiations with the gas producer.

The costs for gathering and processing the new gas package must be balanced against the expected revenue to be earned by the mid-stream processor for processing the gas. The revenue is dependent of contractual provisions with the producer and on fluctuating commodity prices.

A tool is needed to help the mid-stream industry to more accurately calculate their costs of gathering and processing new gas packages during the contracting period. The tool must also help the mid-stream processor to manage their gathering and processing system on an ongoing basis to maximize gathering and processing profitability.

Mid-Stream Challenge 2 - Commodity Price Dynamics

Historically, gas gathering and processing was a relatively stable business. Natural gas prices were low (i.e. $1.75/mmbtu) and the Natural Gas Liquids (NGL) prices were relatively high. Therefore, there was usually a good processing margin for the mid-stream processor to work within.

However, the combination of increased demand and increased field decline rates have driven domestic natural gas prices to the $10.00/mmbtu, $12.00/mmbtu and higher levels. The net effect of these price increases is that the fuel costs required to gather and process the gas has skyrocketed.

There has been a corresponding increase in the prices of NGL's during the period. However, the NGL prices don't track exactly with gas prices due to different supply and demand profiles. Therefore, at times the processing margin is strong and the processor can make good money. At times, the prices are "under water" or "upside down" meaning the processing margin is negative or near negative. Therefore, mid-stream processors must have a tool that accurately defines their cost and revenue position so that they can maximize profitability under all market conditions.

Mid-Stream Challenge 3 - Processor / Producer Contractual Provisions

To manage their risk and exposure to the dynamic market fluctuations mentioned previously, mid-stream processors strive to enter into contracts with producers that allow them to make money when the processing margin is high, and to minimize potential losses when the processing margin is negative. Example contract structures include Percent of Proceeds, Percent of NGL Liquids, Fixed Recovery POP, Keepwhole, and Fee based contracts.

Each contract type directly impacts the mid-stream processor's cost of gathering and processing the gas, and the amount of revenue they will get for gathering and processing the gas. In most cases, the mid-stream processor will have several different contract types active for each gathering and processing system. The different contract types may actually conflict with each other under certain commodity pricing conditions making it difficult to determine the optimal way to run the gathering and processing system.

With respect to the contract bidding process, spreadsheet tools tend to simplify the relationship between the fuel required to gather the gas (compression costs) and process the gas (compression costs) versus the revenue to be received under each contract type that is being considered. If this simplified representation does not reflect actual gathering and processing costs, the mid-stream processor could be at risk of selecting a contract type and terms that do not provide the expected profit profile for the gas. Or, the proposed contract type and terms may result in the mid-stream processor losing the new gas package to a competitor that more clearly understands their cost position.

Mid-stream processors need a tool to accurately analyze their business risk and profit profile under a variety of contract types.

Mid-Stream Challenge 4 - Business Forecasting

The mid-stream processor must arrange for the processed gas and NGL's to be delivered into the nation's pipeline system. Mid-stream processors "nominate" the amount of gas and NGL's that they intend to deliver during the month. This nomination process assures that the mid-stream processor has a market for the gas and NGL's that it produces.

Determining the amount of gas and NGL's to nominate is typically done with spreadsheet based forecasting tools. These are often the same spreadsheets that are used to manage the contracting aspects of the business. If the spreadsheet tool does not represent the gathering and processing system effectively, the mid-stream processor is at risk of over nominating, or under nominating, gas and NGL's. This exposes the mid-stream processor to potentially significant business losses in the form of nominations pipeline penalties. It is imperative the mid-stream processor has a tool to effectively forecast their monthly gas and NGL volumes.

Mid-Stream Challenge 5 - Increasing Cash Flow

In 2004 and 2005 mid-stream processors often chose to increase cash flow by acquiring new assets. Traditionally, mid-stream assets have traded at 3 to 4 times EBITDA (Earnings Before Interest, Taxes, Depreciation, and Amortization). By the end of 2005, assets were trading at 10 to 12 times EBITDA. This means that new asset purchases have become more difficult to justify as a way to increase cash flow.

Maximizing cash flow from current assets has therefore become the best choice to increase cash flow and shareholder value. Also, mid-stream processors must maximize cash flow from recently purchased assets to achieve promised returns for shareholders.

Maximizing cash flow on a daily basis requires mid-stream processors to manage their business given daily commodity price fluctuations and changing operating conditions:

- The mid-stream processor must determine how best to run their compressor stations to meet operational objectives while minimizing fuel usage.
- The mid-stream processor must determine the most economical route to move the gas through their gathering and processing systems.
- The treating systems must be run so that natural gas and NGL product specifications are achieved in an efficient manner.
- The gas processing plant must be run in the right mode to maximize revenues when considering the fuel costs required to remove NGL products.

- The natural gas and the NGL's have to be sold to the right markets.

Mid-stream processors need a tool to effectively manage the operational aspects of their business on a daily basis to maximize cash flow.

Challenge Summary

These challenges make it difficult for mid-stream processors to run their business to maximize returns and prevent unnecessary business risks. Currently, mid-stream processors utilize complex spreadsheets to manage these commercial aspects of their business to maximize profitability.

Commercial spreadsheets are very complex, difficult to modify, and prone to errors. Spreadsheets are not transparent to mid-stream management and they aren't transparent to producers who may be trying to understand the processor's position during shared risk project negotiations. Most importantly, these tools might not adequately reflect the true costs and capabilities of the gathering and processing system.

The competitive nature of the industry is such that not managing the business as prudently as possible could mean that the mid-stream company gets acquired by a stronger competitor. Therefore, it is essential that the mid-stream industry utilize best available technology to manage the commercial aspects of their business.

NOVEL SOLUTION TO HELP ADDRESS MID-STREAM CHALLENGES

Crosstex must find creative ways to address mid-stream business challenges to maximize gathering and processing profitability. Like most mid-stream companies, Crosstex utilizes individual spreadsheet tools to manage the gas supply and forecasting aspects of each of their gathering and processing assets. They also use spreadsheet tools to set operational directives for the plants (i.e. ethane recovery, ethane rejection, bypass) and to evaluate trading options.

With Crosstex' continuing acquisition of new assets, the challenges associated with managing their business have been magnified by the utilization of disparate spreadsheet tools across their assets. The situation is even worse when the person who developed the spreadsheet leaves the company. Such was the case when Crosstex acquired Louisiana Intrastate Gas (LIG) in early 2004. The LIG commercial spreadsheet was very

complex and difficult to modify for forecasting, new gas supply, and trading analyses, and it was developed and used by an employee who would not be coming to Crosstex.

In November 2004, Crosstex contracted to eSimulation for the development of a novel tool to replace the LIG spreadsheet. The resulting software package is called eSimEvaluatorTM. The eSimEvaluator software, and the configured model for Crosstex' first gathering and processing system, were delivered to Crosstex in July 2005.

eSimEvaluator is a high level, offline, business management software solution that allows Crosstex to model, simulate, and optimize their most critical business processes. eSimEvaluator provides a unique visualization environment that allows Crosstex to better understand gas, NGL, and profit flows for their gathering and processing assets.

Visualization

eSimEvaluator allows Crosstex to develop a graphical flowsheet and detailed predictive model of their business. All unprocessed gas, residue gas, and NGL flows throughout the gathering and processing system are modeled using a simple flowsheeting environment.

The underlying modeling package was designed by eSimulation to allow very large scale models to be solved quickly and robustly. The package utilizes a class of technology originally designed for large scale, non-linear, modeling and optimization applications in the refining industry. This sophisticated modeling technology allows all well connects, compression facilities, treating plants, processing plant(s), and residue / liquid sales point optionality to be modeled as one system.

What differentiates eSimEvaluator from other modeling solutions is its ability to graphically superimpose mid-stream economics onto the gathering and processing model. For example, when a new meter is added to the system, the contract type is entered. Then, the residue and NGL prices are graphically linked to each meter. Finally, the plant performance information is graphically tied back to each meter.

Figure 1 shows a simple example of how the process flows, compression, plant performance, residue pricing, and NGL pricing are tied back to each inlet meter:

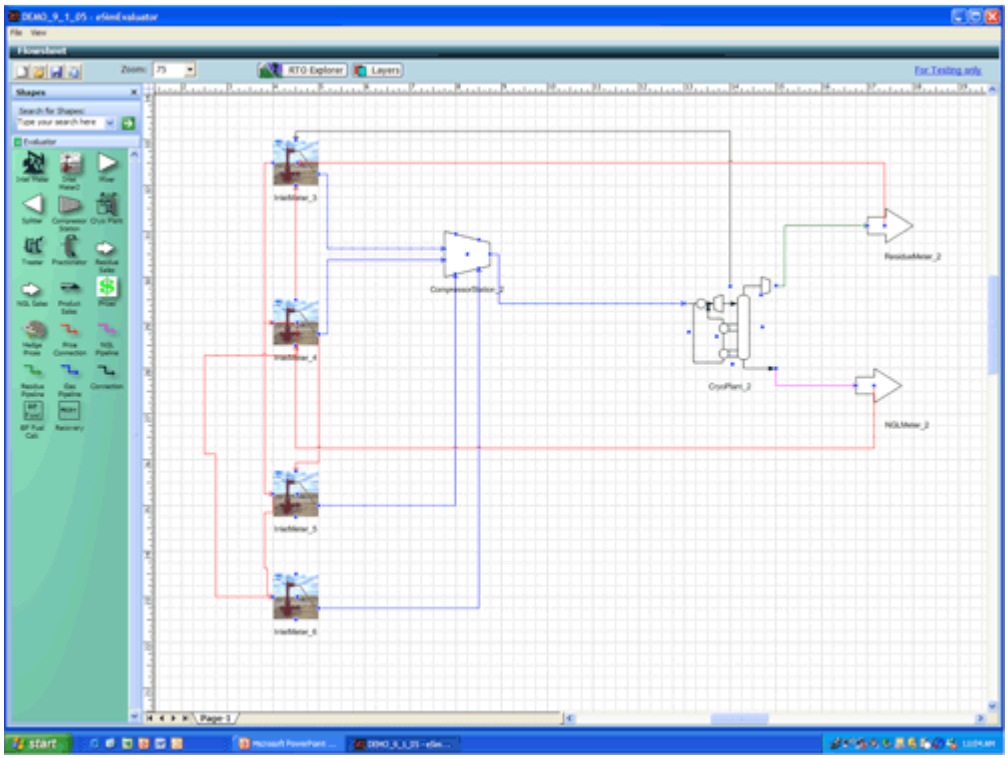

Figure 1 – Simplified Gathering and Processing System

This visualization function allows Crosstex to easily model all the connectivity and optionality associated with their gathering and processing system. Crosstex can focus their efforts on using the eSimEvaluator model for business analysis purposes rather than wasting time trying to determine if the model is configured properly.

Commercial Simulation

Once the model is built, eSimEvaluator is used to calculate Crosstex' gathering and processing margin (profitability) for each producer contract under a variety of processing conditions including; fluctuating unprocessed gas flows and compositions, processing contract types (i.e. keepwhole, percent of proceeds, etc…), fluctuating natural gas prices, and fluctuating NGL prices.

eSimEvaluator allows Crosstex to run economic case studies to analyze the sensitivity associated with changing one parameter (say gas prices) and determining the resultant impact on another parameter (say profitability).

Spreadsheet tools maintain highly simplified representations of the costs associated with each step in the gathering and processing system. For example, the fuel calculation required to compress the gas is usually a

simplified, linear, approximation within spreadsheet tools. However, the actual fuel required to compress the gas is a non-linear calculation that is dependent on a number of variables such as gas composition, inlet pressure, etc.

For those situations where simple approximations are not accurate enough to determine the mid-stream processor's true cost position, eSimEvaluator can be configured with compressor curves, and rigorous chemical engineering models to more accurately describe equipment capabilities and costs. In cases where eSimulation's eSimOptimizerSM online plant optimizer is installed at the processing plant, more accurate plant performance data can be integrated with the eSimEvaluator system. This provides the highest level of modeling accuracy when determining overall gathering and processing costs and capabilities.

With a better understanding of gathering and processing costs, and actual processing margins, the mid-stream processor can structure more competitive contract proposals during its negotiations with producers.

Business Optimization

eSimEvaluator significantly enhances Crosstex' business process. Figure 2 depicts the steps in the mid-stream business process:

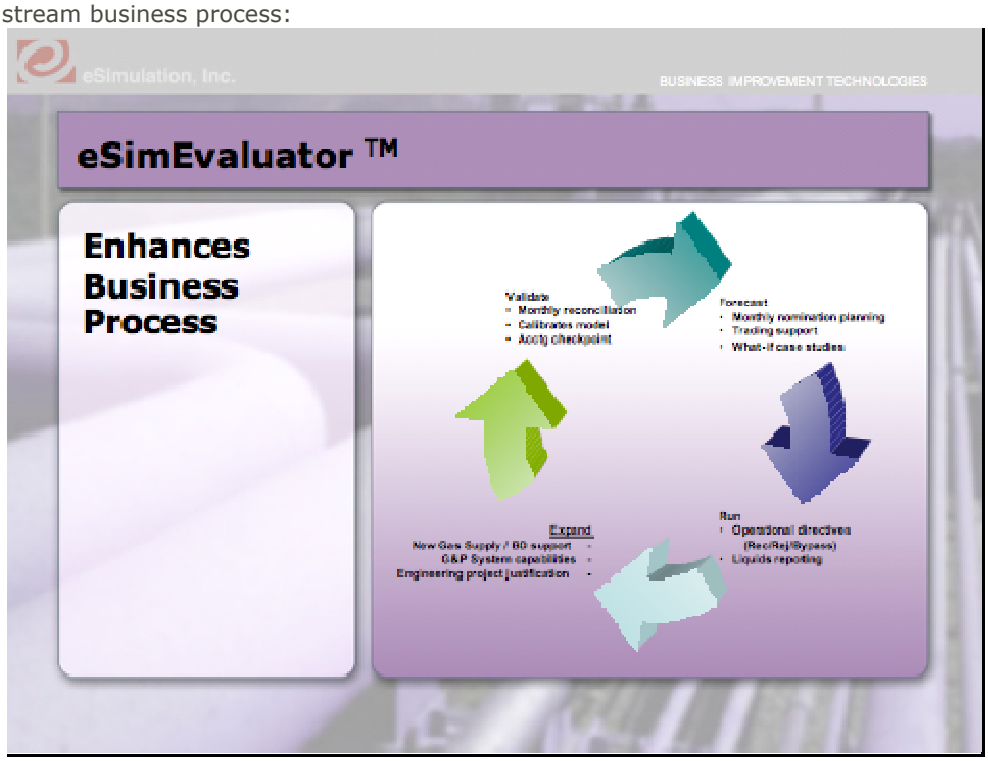

Figure 2 – Mid-Stream Business Process

eSimEvaluator allows Crosstex to run what-if case studies to determine the best way to manage their gathering and processing assets during each step in the business process:

- eSimulation or/and Crosstex builds an accurate model of the business.
- The eSimEvaluator model is then **Validated** with month end accounting data to be sure it considers all aspects of the business correctly. Once the eSimEvaluator model has been validated, it can then be used as a checkpoint on the month end accounting statements during future month reconciliations.
- The validated eSimEvaluator model is then used for **Forecasting** purposes to help the trading group determine how much NGL's to sell for the month, and for the gas marketers to nominate monthly pipeline volume deliveries for the month.
- Crosstex can then run simulation cases to determine the best way to **Run** the gathering and processing system to reduce overall fuel costs and to maximize overall profitability. This includes processing mode decisions for the plant (i.e. ethane recovery, ethane rejection, bypass), natural gas sales point selection, NGL delivery point selection, compressor loading, etc…).
- The same eSimEvaluator model is then used by the business development group to analyze new gas packages to **Expand** the business.

Crosstex uses the same calibrated model for the forecasting, operations, and gas supply aspects of their business. Figure 3 shows an example of a fully configured eSimEvaluator model:

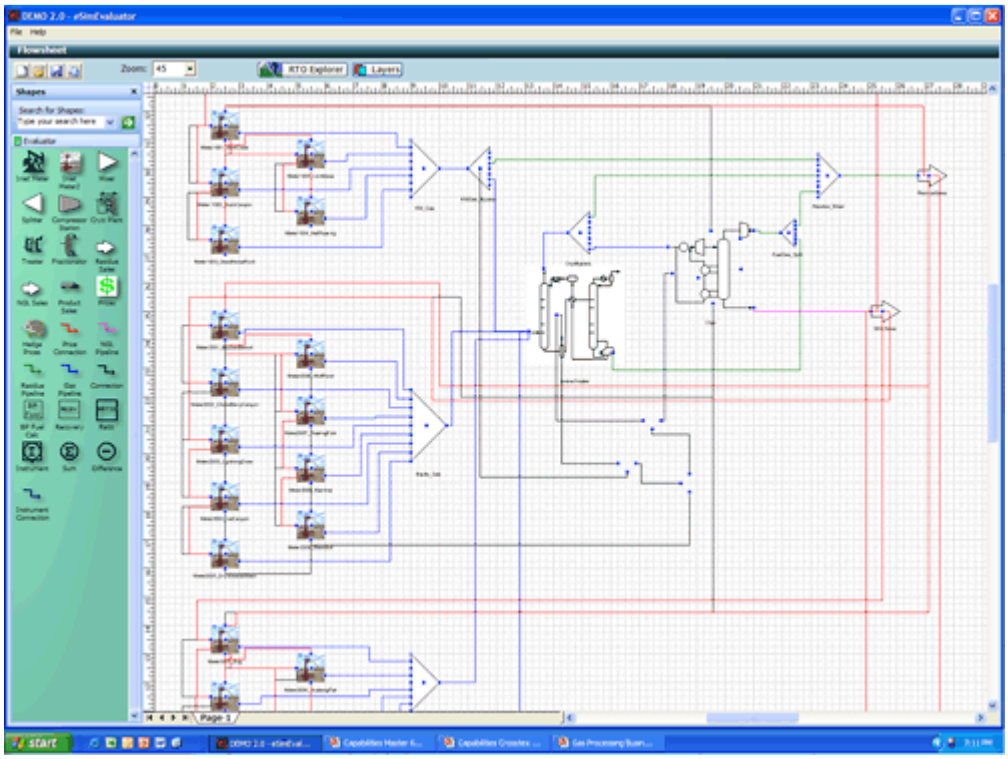

Figure 3 – Fully Configured Model

It should be noted that eSimEvaluator was developed for commercial personnel's use. However, the model's accuracy can be enhanced as required for engineering use.

Business Analysis

The flowsheeting environment depicted in Figure 3 is used for configuring and maintaining the eSimEvaluator model. However, eSimEvaluator includes a unique what-if case study tool called RTO Explorer which is used to access results and to analyze business optionality. Figure 4 shows an example of a RTO Explorer screen that is used to enter commodity prices:

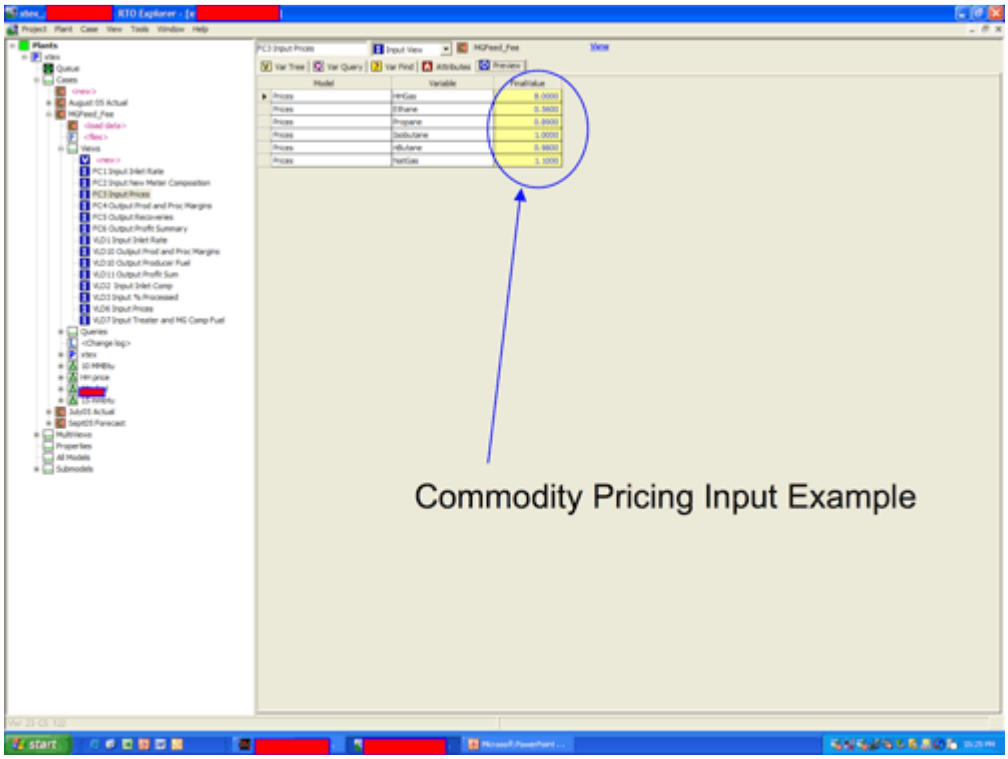

Figure 3 – Price Entry Screen

The user simply enters the new prices and runs the case.

Figure 4 and Figure 5 shows examples of the eSimEvaluator results output screens:

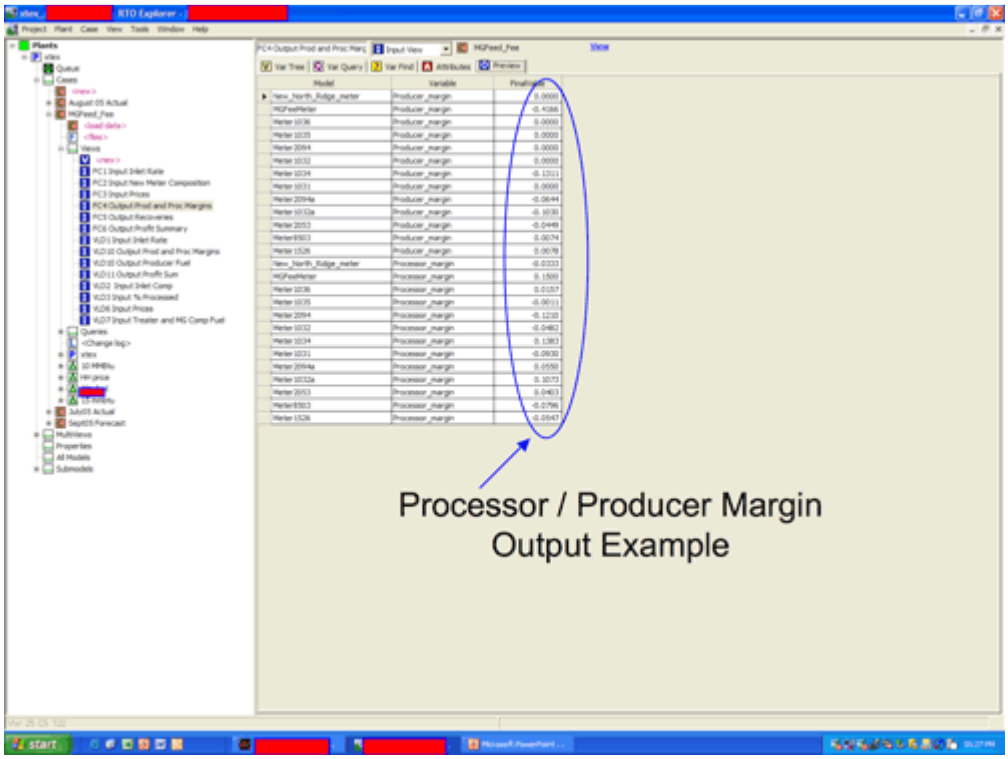

Figure 4 – Producer / Processor Margin

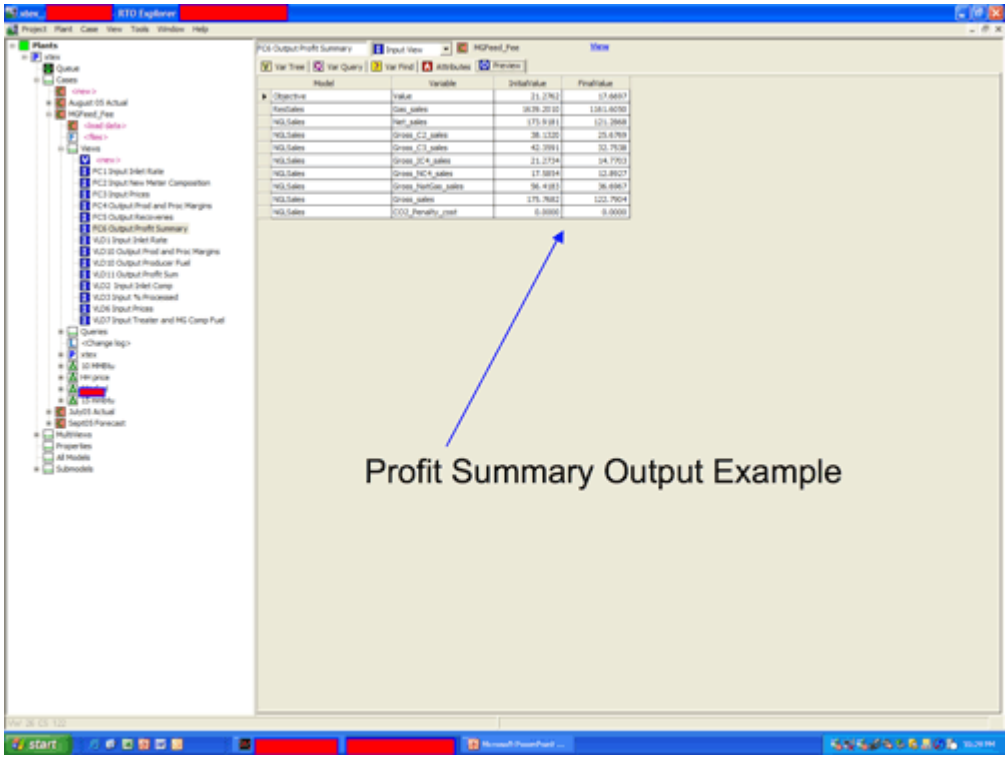

Figure 5 – Profit Summary

CONCLUSIONS

Validating the eSimEvaluator system involved updating flows and compositions with month-end settlement accounting data. Any deviations between the accounting data and the eSimEvaluator results were reconciled. This process was completed for three consecutive months to be sure the eSimEvaluator model was configured properly.

During the validation period, discrepancies were found between the accounting settlement data and the spreadsheet tool being used for forecasting, trading and gas supply analyses. For example, accounting was allocating fuel differently than was reflected in the spreadsheet tool. This discrepancy had existed for over 7 months.

Crosstex and eSimulation are now working to expand usage of the eSimEvaluator system with the various groups that support the business. Currently, the NGL trading organization is working to incorporate the technology into their job function. eSimEvaluator has been introduced to the Gas Supply organization and plans are to hold training sessions to get them comfortable with the system. Other groups such as Financial Forecasting have also been introduced to the system.

The project resulted in a software tool that Crosstex can use to manage its business and to strategically address mid-stream challenges.

Mid-Stream Challenge	Addresses Challenge
Mid-Stream Challenge 1 - Physical and Geographical Issues	**The software allows all interactions within the gathering and processing system to be modeled. Analyzing a new package of gas is a simple, straightforward, and accurate endeavor.**
Mid-Stream Challenge 2 - Commodity Price Dynamics	**The affect of commodity prices on gathering and processing profitability can be analyzed as often as required to determine the proper setup for the business. eSimEvaluator allows for pro-forma analyses to be developed for new gas packages based on commodity price projections.**
Mid-Stream Challenge 3 - Processor / Producer Contractual Provisions	**eSimEvaluator accurately calculates the cost and breakeven point to transport and process gas. The software calculates the processor and producer margin under a**

	variety of contract types and prices.
Mid-Stream Challenge 4 - Business Forecasting	**The configured and validated eSimEvaluator model accurately estimates liquid and residue gas volumes for the month to facilitate the nominations and trading process.**
Mid-Stream Challenge 5 - Increasing Cash Flow	**eSimEvaluator allows Crosstex to run optimization cases to determine the best mode for the plants, the best loading for the compressors, the best way to load supersystems, and the best liquid / residue sales points to maximize system profitability.**

In early November 2005, the results of the project were presented to Crosstex' executive management staff. Crosstex is now deploying eSimEvaluator at its second gathering and processing system.