VERITEK

Audit of D+1 Processes

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Executive Summary

Gas Industry Co wishes to ensure that the daily D+1 processes are as secure, robust, and reliable as reasonably practicable for the duration of the D+1 trial. As the D+1 model has been developed as a test of the concept of day-after allocation, there are no formal rules to assess the performance of the D+1 model against. Instead, the Auditor should examine the operation of the D+1 model, its inputs and outputs, and assess whether the processes are satisfactory or whether enhancements can feasibly be made that would improve the security and integrity of the data inputs and outputs and the robustness and reliability of the calculation processes.

This audit concludes that the D+1 processes and systems are as secure, robust and reliable as reasonably practicable.

The audit findings record four areas where there are potential improvement opportunities. I have listed these in the summary table below. I recommend potential further analysis of registry update processes to determine whether delays in this area or inaccurate status information can lead to material inaccuracy of the apportionment of residual gas. I also recommend potential further analysis of the issue that consumption information may be estimated for TOU ICPs that are ACTC on the registry but which are actually vacant or disconnected.

Area of Evaluation	Opportunity for Improvement?	Comments
Inputting gate injection data	Yes	Injection data is identified by meter number and then a table is used to identify the correct gate. There is no evidence this is incorrect but I suggest a different identification method is used to ensure the gas gate is correctly identified in the event of meter changes.
Inputting TOU consumption data	Yes	Data provided by Vector is identified by meter number not by ICP. The ICP is applied based on a mapping table. I suggest the ICP identifier is provided in the file as well as the meter number to ensure ongoing accuracy of ICP to data mapping. I recommend participants are encouraged to provide supplementary data when they know consumption patterns are different to normal or where a new ICP is created and historic consumption information is not available.
Inputting registry data	Yes	One of the limitations of the D+1 model is that the registry is a historic record and is not accurate on any given day. The status update processes and switching processes allow several days for populating the registry so most status and retailer changes will not be identified for several days. This is not a large concern unless a retailer's customer base is growing or shrinking rapidly. Further analysis of this issue is recommended. Consumption information may be estimated for TOU ICPs that

		are ACTC on the registry but which are actually vacant or disconnected. Further analysis of this issue is recommended.
Checking for missing TOU data	No	
Calculating allocations for TOU consumers	No	
Calculating residual gas volumes	No	
Aggregating residual gas by pool	No	
Allocating residual gas	Yes	This allocation is dependent on the accuracy of status information populated on the registry by allocation participants. Further analysis of this issue is recommended
Apportioning residual gas allocations by gas gate	No	
Providing daily allocation results to each retailer via GEIP	No	
Providing Vector with results for all shippers in Vector specified format via GEIP	No	
Monthly processes	No	

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1. Background

D+1 allocation is a process that, on the day following gas flow, allocates the gas that has flowed through gas gates allocated under the Gas (Downstream Reconciliation) Rules 2008. Gas Industry Co is conducting a trial of the D+1 allocation process. This trial is expected to run to the end of 2016. For the trial, Gas Industry Co and its contractor, Concept Consulting, have developed a D+1 model and intend to use reasonable endeavours to use it to produce allocations to Vector and its shippers on a daily basis. The D+1 allocation model is based on multivariate regression modelling.

There are three separate stages to the D+1 modelling:

1. Estimation of UFG at global one-month gas gates, based on:
    - Individual gate (each gate is modelled separately)
    - UFG for the previous month (UFG is often correlated with the previous month's UFG)
    - Month of the year (UFG is seasonal)
    - Time factor (UFG values can 'drift' over time)
2. Estimation of daily consumption for allocation group 1 and 2 consumers (these estimates are used for allocation group 2 consumers and for instances where daily metered consumption is not available for a group 1 consumer) Each ICP is modelled separately. Consumption for each ICP is based on:
    - Previous month's consumption (ICP consumption is often highly correlated with previous month) (not used for ICPs less than one year old)
    - Month of year (ICP consumption is often seasonal)
    - Injection at the gate (ICPs can sometimes make up a large proportion of the total gas gate injection volume. If this is the case, then gate injection and ICP consumption will be highly correlated)
    - Business day or non-business day (many ICPs have lower consumption on non-business days)
    - Recency of data (the model uses a weighting so that more recent values have more impact on the modelled fit)
3. Allocation of residual gas, based on the predicted share of residual gas volume attributable to each retailer within a pipeline pool (i.e. an aggregation of the shared gas gates served by that transmission pipeline). Residual gas volume in this case is the difference between the sum of consumption volumes allocated to groups 1 and 2 and the gas gate injection quantities. For each pool, the share of residual gas allocated to each retailer is based on:
    - Individual retailer (each retailer has its own mix of customers with different consumption patterns)

- Month of year (retailer share tends to be seasonal)
- Previous proportional allocation for the pool for the most recent historical month, based on retailer submissions (retailer share tends to be relatively constant over a short period of time)
- Proportion of non-TOU ICPs served by each retailer (customer market share influences volume share and can be updated daily)
- Recency of data (the model uses a weighting so that more recent values have more impact on the modelled fit)

To enable the modelled results to be used in place of the initial allocation, the model also apportions the residual gas allocations to the gas gate level. This process uses retailers' gate-level volume market shares as an input but also ensures that allocated volumes for each gate add up to the residual gas volume at that gate and that allocated volumes for each retailer add up to that retailer's D+1 allocated residual gas volumes.

2. Scope of the Audit

Gas Industry Co wishes to ensure that the daily D+1 processes are as secure, robust, and reliable as reasonably practicable for the duration of the D+1 trial. As the D+1 model has been developed as a test of the concept of day-after allocation, there are no formal rules to assess the performance of the D+1 model against. Instead, the Auditor should examine the operation of the D+1 model, its inputs and outputs, and assess whether the processes are satisfactory or whether enhancements can feasibly be made that would improve the security and integrity of the data inputs and outputs and the robustness and reliability of the calculation processes. The Auditor is not expected to review the calculation of the parameters of the regression models. NZIER has been retained to complete this work.

3. Audit Findings

3.1 Data Inputs

3.1.1 Inputting Gate Injection Data

Each day, gate injection data from Vector transmission is delivered via the Gas Information Exchange Protocol (GIEP) facility on the gas registry. The accuracy of this data was verified by manually comparing the raw data from injection files to the data in the database for five gas gates. The totals matched.

There are some gas gates where the injection data is not available and is therefore estimated. Injection data is not available for these gas gates because data is collected monthly, not daily. Missing data is identified by a discrepancy report indicating null values. This report is circulated internally and is also sent to Vector.

Estimation occurs based on data from the same day in the previous week, if that data is available. Estimation occurs based on the previous month if data is not available for the current month and if data for the previous month is not available, then the data from two months ago is used. The accuracy of the estimations was evaluated by comparing different estimation theories to actual data. The comparison showed that data from the same day of the previous week or from the previous day was more accurate than data from the previous month. Data from the previous week is available more often than data from the previous day, so the use of this data is based on sound reasoning.

Injection data is identified by meter number and then a table is used to identify the correct gate. There is no evidence this is incorrect but I suggest a different identification method is used to ensure the gas gate is correctly identified in the event of meter changes.

3.1.2 Inputting TOU Consumption Data

TOU data is provided by AMS and Contact Energy via GIEP and from Genesis Energy via email (the Genesis Energy data will shortly move to being supplied via the GIEP).

The accuracy of this data was verified by manually comparing the raw data from files to the data in the database. The totals matched.

Data provided by Vector is identified by meter number not by ICP. The ICP is applied based on a mapping table. I suggest the ICP identifier is provided in the file as well as the meter number to ensure ongoing accuracy of ICP to data.

The model has a robust methodology but any methodology will be limited to the use of historic data. If a consumption pattern changes, for example a shutdown occurs, the model cannot forecast this. Some retailers are providing useful information for monthly read ICPs that enables the estimation to be more accurate. This issue is also present for new ICPs. The provision of updated information is not systematic and I recommend participants are encouraged to provide supplementary data when they know consumption patterns are different to normal or where a new ICP is created and historic consumption information is not available.

3.1.3 Inputting Registry Data

Files are run automatically overnight by the gas registry and picked up by the model in the morning. This file is a snapshot of the registry and does not include history, because the D+1 model is "real time" and does not have a revision capability.

The file is used to identify the responsible retailer for TOU consumers and the share of mass market consumers per retailer.

A check was conducted to ensure the database was correctly loading the registry data. A list file was manually compared to the data in the database. The comparison found the total number of ICPs matched but there were three gas gates that were one ICP low and three gas gates that were one ICP high. They were all allocation group 6 ICPs. This discrepancy is probably due to the timing of the running of the files and is negligible at 0.0023% of the total number of AG6 ICPs.

One of the limitations of the D+1 model is that the registry is a historic record and is not accurate on any given day. The status update processes and switching processes allow several days for populating the registry so most status and retailer changes will not be identified for several days. This is not a large concern unless a retailer's customer base is growing or shrinking rapidly.

The model only recognizes ICPs with a status of ACTC. Whilst the design of the model is correct, because only ACTC ICPs should have consumption, the model can become inaccurate if the registry status is incorrect. The following issues can be present if retailers have inaccurate status information on the registry:

- Consumption information may be estimated for TOU ICPs that are ACTC on the registry but which are actually vacant or disconnected.
- The incorrect NTOU count will be used for apportionment if statuses are incorrect.

All TOU consumption data is used regardless of registry status, so there is no risk of ignoring data due to incorrect registry population.

A check is conducted monthly for any new data, which should identify TOU ICPs with consumption, where the status is not ACTC. This check can be automated once data is provided by ICP rather than by meter identifier.

3.2 Daily Allocation Process

3.2.1 Checking for Missing TOU Data

Missing TOU consumption data is a trigger for the model to produce consumption estimates. The estimation process uses historic data from the same day of the previous week. For monthly read meters, the previous month is used.

3.2.2 Calculating Allocations for TOU Consumers

Consumption (or estimated consumption) is multiplied either by the AUFG factor for the gate or by the estimated MUFG factor for global one-month gates. This was demonstrated during my on-site visit and the calculation appears to be working as expected.

3.2.3 Calculating Residual Gas Volumes

The residual gas quantity equals the gate injection quantity minus the allocated ToU load. This was demonstrated during my on-site visit and the calculation appears to be working as expected.

3.2.4 Aggregating Residual Gas by Pool

This was demonstrated during my on-site visit and the calculation appears to be working as expected.

3.2.5 Allocating Residual Gas

The volume of residual gas in each pool is multiplied by each retailer's estimated share of the residual gas. This allocation is dependent on the accuracy of status information populated on the registry by allocation participants.

3.2.6 Apportioning Residual Gas Allocations by Gas Gate

Allocated residual gas is divided into gate-level allocations so that volumes allocated to retailers equal their allocated residual gas in the pool and so that allocated gate volumes equal gas gate injection.

This was demonstrated during my on-site visit and the calculation appears to be working as expected.

3.3 Data Outputs

3.3.1 Providing Daily Allocation Results to Each Retailer via GIEP (and sometimes email)

These outputs were demonstrated during my on-site visit and they appear to be working as expected.

3.3.2 Providing Vector With Results For All Shippers in Vector-Specified Format via GIEP

These outputs were demonstrated during my on-site visit and they appear to be working as expected.

3.4 Monthly Processes

Each month, the D+1 model is refreshed with updated parameters. These parameters are calculated using the statistical software package and incorporate the most recent allocation data from the allocation agent.

The process for inputting data from the most recent allocation runs into the model was demonstrated and appears to be working as intended, including the exporting of the recalculated parameters to the D+1 model.

4. Conclusions

This audit concludes that the D+1 processes and systems are as secure, robust and reliable as reasonably practicable.

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