



CONSULTATION PAPER

Proposed Modifications to D+1 Business Rules

1 September 2016

1. Introduction

Gas Industry Co is currently trialling D+1 allocation, a process that allocates gas to retailers on the day following gas flow. In March 2016, Gas Industry Co published the current version of the D+1 business rules, which outline the process and rules for D+1 allocation. The rules include a change process which requires that Gas Industry Co consult with allocation participants on any proposed change to the D+1 allocation methodology.

The purpose of this paper is to obtain feedback from allocation participants on the following proposed modifications to the D+1 business rules:

- Including a new D+1 process that would address instances where there are anomalous telemetry meter reads;
- Modifying the shutdown rule so that it better reflects the nature of TOU ICP shutdowns;
- Including a new process that would deal with new TOU ICPs;
- Including a new process that would deal with TOU ICPs that have a marked, permanent change in gas consumption;
- Increasing the threshold where estimation of gate volumes is stopped.

2. Telemetry data errors

The current D+1 rules envisage two possible states for a meter with telemetry (i.e. an AG1 ICP meter) on a given day:

- The meter data is available for that day.
- The meter data is not available. In this case, the D+1 algorithm estimates consumption for the day using the same approach that is employed for estimating AG2 ICP consumption (i.e. estimation using a forecast model based on statistical regression).

We have recently identified a third possible state for an AG1 meter: data is available but for some reason that data is inaccurate.

In a recent case a TOU site with telemetry had a reading that was several orders of magnitude greater than the 'true' gas consumption for the day. Using this false value would have had at least two problems. First, the responsible retailer would have been significantly over-allocated gas for the day and all other retailers off the associated gas gate would have been significantly under-allocated gas (even other AG1 ICPs could potentially be under-allocated because meter consumption is scaled to equal the gas gate injection). Secondly, depending on the nature of the gate and the types of consumers served off the gate, the D+1 algorithm could have encountered a logic error and failed.

Gas Industry Co proposes that the D+1 algorithm is adjusted to include a test for an anomalous telemetry meter reading. The test would have the following components.

- On business days:
 - The meter reads from all AG1 ICPs would be checked against their maximum historical demand. If the meter reading of any ICP was five times this demand the algorithm would report the test result and stop.
 - If a high reading is found, Gas Industry Co would contact the responsible retailer to determine whether the reading is anomalous or not. If the reading is anomalous, it would be replaced by an estimate provided by the retailer. If it is not possible to get an estimate in sufficient time the ICP would be estimated by the algorithm (the model currently estimates any TOU ICP that has missing data for a day).
- On non-business days:
 - The meter reads from all AG1 ICPs would be checked against their maximum historical demand. If the meter reading of any ICP was five times this demand the algorithm would replace the reading with an estimate.

The window of time between finding an error and re-running the algorithm is relatively short, given parties' requirements for the timely delivery of allocation information. This is particularly the case for the afternoon run where results are required as an input into ID4 nominations and the BPP process. However, the anomalous reading may be found in the morning run, which would provide a reasonable amount of time to get an estimate at least for the afternoon run. The fall-back of estimating the ICP for the day should ensure that the timing of allocation results publication meets stakeholders' requirements.

The rationale for the 'five times historical maximum demand' is the following:

- If the ICP is new or has added a process such that gas consumption has significantly increased, it may be quite possible that consumption could be substantially above historical consumption. The 'five times' multiplier is an attempt to avoid false positive test results.
- In a recent example of an anomalous reading, the reading was several orders of magnitude higher than the 'real' gas volume; in this example, the 'five times' multiplier would not have stopped the test from reporting an anomalous reading.

Q1: Should this process to address TOU meter errors be added to the D+1 business rules?

Q2: Does the proposed TOU meter error test pick up relevant issues? Do you have any suggestions for improving the test?

Q3: Is the proposed multiplier appropriate?

3. ICP shutdown rule

Rule 9 of the D+1 Business Rules deals with cases where an AG1 or AG2 ICP will be shut down for a period:

9. *Where a retailer knows that a TOU customer will be shut down for a period, consuming zero or very little (taken to be less than 10 GJ/day) gas, that ICP's daily allocations can be constrained in the D+1 model. For practical reasons, the D+1 model will be constrained to zero for the shutdown period, even though small amounts of gas may be consumed.*
 - a. *Retailers must notify Gas Industry Co of the period when an estimated AG1 or AG2 consumer will have a shutdown period, consuming zero or very limited (less than 10 GJ/day) gas. The notification should include some level of supporting evidence such as:
 - i. *a reference to similar shutdowns in the past (that can be verified with GAS050 data);*
or
 - ii. *dialogue between the retailer and customer confirming the shutdown period.**
 - b. *Retailers must notify Gas Industry Co if the shutdown period changes and before consumption is to begin again.*
 - c. *Gas Industry Co will review GAS050 submissions to check that constraint requests match actual meter reads.*

This rule has been in place since March. We have found that confining the manual intervention in the D+1 algorithm to ICP shutdown periods (rather than a wider range of possible one-off events) has meant that this manual overlay has been limited to a handful of ICPs at any time. This limited manual intervention has ensured that the top-down approach to allocating daily volumes has largely been preserved. Also, it has meant that the effort required to implement the manual overlay and the potential for error have both been fairly limited.

Nevertheless, our experience with implementing this rule has identified some potential improvements. In particular, the 10 GJ/day threshold has proved to be too low. Some ICPs during a shutdown period consume more than 10 GJ/day. Also an ICP entering or exiting a shutdown period may have lower, but not zero gas consumption during the transition periods. For example, an ICP could begin its shutdown period at midday on the first day of the shutdown period, meaning that consumption for that first day is substantially lower than usual consumption, but not close to zero.

Gas Industry Co proposes that the shutdown consumption threshold is changed to be a maximum of 0.1 percent of the ICP's annual consumption on each day, capped at 100 GJ/day. The rationale for 0.1 percent is that the Gas (Downstream Reconciliation) Rules 2008 require consumers with annual consumption of 10 TJ or more to have a TOU meter; this 10 TJ is effectively a minimum size for TOU ICP. Applying 0.1 percent to this amount results in 10 GJ

which is a) the current de minimus threshold and b) roughly a quarter of the possible daily consumption of a 10 TJ consumer¹.

The 100 GJ/day maximum has been selected after reviewing the consumption for AG2 ICPs over the May-June 2016 period. We have confined this analysis to AG2 ICPs because this shutdown rule applies mostly to this group of consumers. Over this period, the 10 largest AG2 ICPs had a maximum daily consumption of greater than 400GJ, while the largest two AG2 ICPs both had maximum consumption that was well over 900GJ. Given these figures, we think that the 100GJ/day maximum is appropriate for large ICPs during a shutdown period.

On the ramp down/ramp up issue, we consider it reasonable for a shutdown profile that is hard-entered into the D+1 algorithm to recognise these 'real world' factors. Gas Industry Co proposes that it uses its discretion for including amounts reflecting ICP shutdown/restart phases in the manually entered profile. Our review of GAS050 submissions to check that constraint requests match actual meter reads should limit potential misuse of this rule.

Q4: Do you think that the proposed modifications are a reasonable approach to dealing with 'real world' ICP shutdown issues? Do you think that the 0.1 percent of annual volume and 100 GJ parameters are appropriate?

Q5: Do you have any suggestions for either improving the proposed modifications or alternative approaches for dealing with this ICP shutdown issue?

¹ If an ICP with 10TJ annual consumption uses gas uniformly across all business days in a year (250 days), then its daily consumption is 40GJ.

4. New AG1 and AG2 ICPs

Each AG1 and AG2 ICP has an individual forecast model for gas consumption, estimated using statistical regression analysis (based on the set of observed values over time). For an AG1 ICP, this model is used to estimate gas consumption where telemetry data is missing on any day. For an AG1 or AG2 ICP that has less than 100 days of daily gas data, daily gas consumption is estimated as a function of gate demand and whether or not a day is a business day.

For a very new ICP (e.g. for an ICP that is only a couple of weeks old) an issue with this approach is that there is insufficient consumption history for a reliable relationship between the factors to be estimated. To address this issue the current business rules requires retailers to provide Gas Industry Co an estimated profile of consumption over the first month for these ICPs.

We propose that this 'estimated profile period' is extended to two months. The regression models underpinning the D+1 algorithm are updated near the beginning of each month (i.e. when initial allocation data is available). With a one month rule, a retailer with a new ICP starting in the middle of a month would provide estimated consumption information for the ICP through to the middle of the following month. In this situation, given the timing of the regression model updates, there would be insufficient historical data to estimate the regression model for this ICP (only slightly more than half a month of information). Extending the 'estimated profile period' would address this issue.

For practical reasons, we suggest that this forecast profile has at most two parts: a daily average estimate for business days and a further average estimate for non-business days. A simple average for each week may also be appropriate.

After this initial two months of operation, there should be enough consumption history for the D+1 algorithm to take over consumption estimation for the ICP.

Q6: Do you think that this proposal to extend the forecast period for a new AG1 or AG2 is a reasonable approach?

Q7: Do you have any suggestions for either improving the proposed approach or for an alternative approach?

5. AG1 and AG2 ICPs that have a changed consumption profile

An analogous issue to the previous issue is the case of an existing AG1 or AG2 ICP that has had a permanent, step change in its gas consumption profile. For example, an ICP may have added a new process to its operation which has resulted in its daily gas consumption increasing by a substantial amount.

In this case, the historical statistical relationship between various explanatory factors is no longer relevant for estimating current consumption. In fact, use of the historical relationship would likely result in systematic under or over estimation (depending on how consumption has changed) of the ICP's gas consumption. An ICP such as this is similar to a new ICP: it has no relevant history on which to base a forecast of gas consumption.

We propose that an ICP under this scenario is treated similarly to the proposed treatment of a new ICP, presented previously:

- The responsible retailer would provide Gas Industry Co with an estimated profile for two months following the step-change in consumption. For practical reasons, we suggest that this profile has at most two parts: a daily average estimate for business days and a further average estimate for non-business days. This hard-entered profile would replace the D+1 model estimation over this period. This period would enable a history representing the ICP's new mode of operation to be established.
- Following this two month period, the estimation period start date would be reset so that it begins at the start of the new mode of operation.

Note that for AG1 ICPs this estimated information would only be used on days where telemetry data was not available.

Q8: Do you think that the proposed solution for estimating the gas consumption of an AG1 or AG2 ICP that has had a permanent, step change in its gas consumption is reasonable?

Q9: Do you have any suggestions for either improving the proposed approach or for an alternative approach?

6. Threshold where estimation of gate volumes is stopped

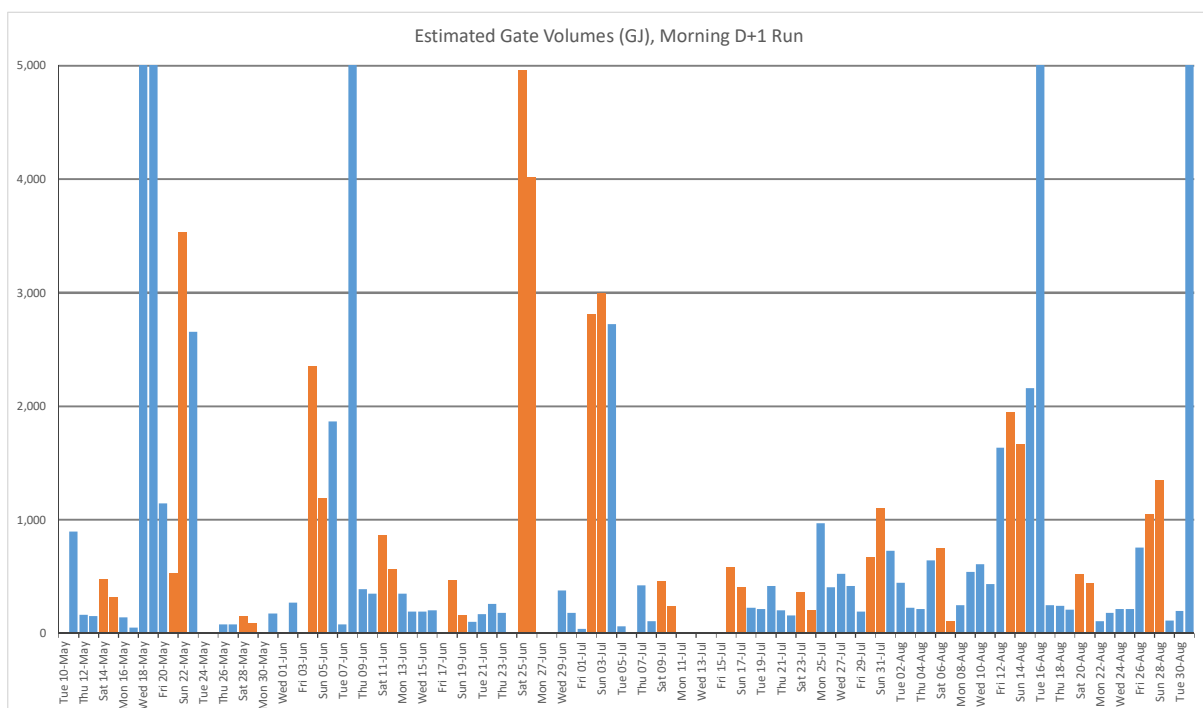
Under the business rules, if no data is available for a gas gate on a given day then the injection at the gate will be estimated by the D+1 model based on the same day from the previous week (Rule 4d). The purpose of the rule is to enable the D+1 model to run with limited manual intervention; prior to the introduction of the rule, the algorithm would stop if there was data missing from any gate.

The rule has markedly improved the running of the algorithm. The rule was implemented in the production version of the D+1 algorithm on 10 May. Over the period following the implementation of the rule, the D+1 algorithm has estimated missing gates in 98 (86%) of the days for the morning run and 81 (71%) for the afternoon run. The greater frequency for the morning run is due to the fact that unvalidated gate information is used in the morning run.

To prevent a scenario where a large portion of gates are estimated without review, we included in the implementation a test so that if the sum of the estimated values are greater than 1,000 GJ then the model will stop and report an error. This threshold test was not included formally in the business rules.

The 1,000 GJ threshold has been exceeded 23 times in the morning run and 15 times in the afternoon run.

The graph below shows the pattern of estimated volumes over the period for the morning run. Weekend runs are highlighted in orange. Note that there have been five occasions where no gate information has been received; these are shown by the five bars that go to the top of the graph. All five instances were in morning runs.



Most of the times where a significant amount of gate volume (i.e. greater than 1,000 GJ) has been missing occur on the weekends with 12 of the instances falling on the weekend. This figure represents 52 percent of the morning run and 80 percent of the afternoon run instances (for the afternoon run, all but three of the 15 days have occurred on the weekend).

We propose adjusting the threshold so that the D+1 model is able to estimate more gas gates (if required) without stopping and requiring input. The revised approach would include the following components.

Component	Comment
Weekend threshold set at 5,000 GJ	Most of the times where there is missing data and the estimated volumes are high occur on the weekend. Weekend runs are already indicative, since data is unvalidated on non-business days. Accordingly, increasing the threshold would not alter significantly the accuracy of the weekend runs. However, it would result in the completion of the weekend runs for nearly all of the weekend days.
Weekday threshold set at 2,000 GJ subject to a check that none of the pools are entirely estimated.	With the weekday threshold set at 2,000 GJ, most D+1 runs would occur without manual input. Over the period since the gate estimation rule was introduced, a threshold of 2,000 GJ would have resulted in all weekday afternoon runs completing and all but three weekday morning runs completing (excluding the cases where no gate meter data has been received). The pool estimation check is to ensure that none of the pools are totally estimated (i.e. none of the gates in the pool had data for the day). The absence of data for an entire pool would indicate a larger issue that should be checked prior to the D+1 run being completed. This check is relevant for the Maui pool (for example, the pool had volumes in the 1,100 – 1,400 GJ range over July).

Q10: Do you support the proposed approach where the threshold for weekend gate injection estimation is set at 5,000 GJ and the weekday threshold is set at 2,000 GJ (subject to a check that none of the pools is totally estimated)?

Q11: Do you have any suggestions for modifications to the proposed approach?

Questions

Proposed Modifications to D+1

Submission prepared by: Mercury – William Turner

QUESTION	COMMENT
Q1: Should this process to address TOU meter errors be added to the D+1 business rules?	Mercury supports the continual improvement of D+1 accuracy with the addition of new processes to the D+1 business rules.
Q2: Does the proposed TOU meter error test picks up relevant issues? Do you have any suggestions for improving the test?	Would the test have picked up any occasions other than the one described if run against D+1's history?
Q3: Is the proposed multiplier appropriate?	Perhaps the multiplier could be lowered and paired with a materiality threshold, say 200GJ or 10% of gate volume?
Q4: Is the 30 minute window a reasonable amount of time?	
Q5: Do you think that the proposed modifications are a reasonable approach to dealing with 'real world' ICP shutdown issues? Do you think that the 0.5 and 100/GJ parameters are appropriate?	
Q6: Do you have any suggestions for either improving the proposed modifications or alternative approaches for dealing with this ICP shutdown issue?	It may be reasonable to create more tools beyond the zero constraint if it is not covering all scenarios. What if a retailer notified the GIC that a consumer is in a maintenance period with 30% of their usual consumption? I'd favour a system that would accept this good faith estimate to improve accuracy for all.
Q7: Do you think that the proposed solution for estimating the gas consumption of a new AG2 ICP is reasonable?	Extending the forecast period is reasonable, perhaps even more than two months. The multiplier test might otherwise require an age threshold as well?
Q8: Do you have any suggestions for either improving the proposed approach or for an alternative approach?	Looking to the future new connections and shutdowns could be put into a more formalised process. Standard estimation templates with good faith legal obligations and breach thresholds.

QUESTION	COMMENT
<p>Q9: Do you think that the proposed solution for estimating the gas consumption of an ICP that has had a permanent, step change in its gas consumption is reasonable?</p>	<p>Sounds reasonable, another scenario for a future template.</p>
<p>Q10: Do you have any suggestions for either improving the proposed approach or for an alternative approach?</p>	<p>Possible for hard entered numbers to exceed injection at gate?</p> <ul style="list-style-type: none"> ○ <i>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)</i>
<p>Q11: Do you think the threshold for gate injection estimation should be raised to 5000 GJ?</p>	<p>Could flag as estimate and include warning message instead of cancelling run for morning and weekend (indicative runs). Support the increase of the threshold.</p>
<p>Q12: Alternatively do you support the alternative approach where the 5000 GJ threshold is limited to morning and weekend D+1 runs with a lower limit of 3000 GJ for the weekday afternoon runs?</p>	<p>The D+1 formulas allow shippers to absorb one bad run without punishment. Missing runs combined with bad estimates are where the issue is. Support either plan to raise thresholds and get a run out.</p>
<p>Q13: Apart from these two options are there any other approaches you propose for improving the automation of the D+1 algorithm while at the same time ensuring it is allocating gas as effectively as reasonably possible?</p>	<p>How accurate have the estimates been? A difficult to estimate 1,000GJ gate may be more important than a stable 3,000GJ gate. May be worth classifying gates by size, reason for missing data, accuracy of estimates.</p>

ABOUT GAS INDUSTRY CO.

Gas Industry Co is the gas industry body and co-regulator under the Gas Act. Its role is to:

- develop arrangements, including regulations where appropriate, which improve:
 - the operation of gas markets;
 - access to infrastructure; and
 - consumer outcomes;
- develop these arrangements with the principal objective to ensure that gas is delivered to existing and new customers in a safe, efficient, reliable, fair and environmentally sustainable manner; and
- oversee compliance with, and review such arrangements.

Gas Industry Co is required to have regard to the Government's policy objectives for the gas sector, and to report on the achievement of those objectives and on the state of the New Zealand gas industry.

Gas Industry Co's corporate strategy is to 'optimise the contribution of gas to New Zealand'.