ANCILLARY PAYMENT FUNCTIONAL DESIGN

PREPARED BY: MARKET PERFORMANCE

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FINAL

Contents

Version Release History

Version	*Date*	*By*	*Status*	*Change from last version*
v9.1	15 Apr 2016	Sara Atukorala	Finalft	Change from 9.0 Updated Schedule 2 – (To remove text non-Longford AMDQ)
v9.0	22 Jul 2011	cdiep	Final	Change from v8.2. • Modified section 4.3 to include the logics for creating bid prices for adjusted bid steps if the original values are NULL, and to set the value of Flag=1 for these adjusted bid steps. • Modified section 5.0 to highlight that PS and OS quantities should be allocated to all adjusted bid steps. NULL is not acceptable. • Added section 8.4.4 and 8.5.4 to include equations for calculating AP for adjusted bid steps with flag=1. • Modified section 8.4.6 and 8.5.6 for calculations of final AP. • Minor editorial changes • Updated Schedule 2 with definitions of new symbols
v8.2	8 Oct 2010	Jge / smckelvie	Final	Change from v8.1 • Added section 8.5.7 to Include calculation of average Ancillary Payment rates for use as cap on uplift rates • Minor definition clarification in sections 8.4.5 and 8.4.6
v8.1	10 Jun 2008	cdiep	Final – operat'nal	Change from v8.0 • Modified Clause 8.4.6 and 8.5.6 to state that PCCUC and NCCUC for injection and withdrawal AP are only calculated if UH =0 and accreditation is not null for the given injection and withdrawal points
v8.0	1 May 2008	cdiep	Final – operat'nal	Change from v7.1 • Updated Section 2 to include AP Clawback in Process • Added sections 3.8 and 4.3 to describe capping bid prices to the administered price cap if the cap applies. • Added Section 3.9 to describe AP Clawback • Added Section 8.3 to describe calculation of Matched Changes in Constrained On quantities. • Converted old sections on calculating AP into sections on calculating Initial AP. Now sections 8.4.1 and 8.5.1. • Deleted Table 13 (which seemed entirely pointless and redundant).

				• Added sections 8.4.3 and 8.5.3. on calculation of revised APs (implementing Phase 1 of AP Clawback). • Added sections 8.4.4 and 8.5.4 on calculation of final AP (implementing Phase 2 of AP Clawback) • Modified Appendices (Schedules 1 and 2) to define terminology and output requirements. • Added a new section 9 on the resolution of Ancillary Payment "flip flops" with corresponding changes to the appendices (Schedules 1 and Schedules 2) • Process outline updated accordingly.
v7.1	1 Feb 2007	cpratt	final – operat'nal	• Change from v7.0: Updated during gas market project to match changes made to uplift payment procedure 7.1 • approved January 2006, effective 1 February 2006 • note, Version 7.0 was superseded by this version before it was implemented
v7.0	1 Oct 2006	cpratt	final – operat'nal	Re write for gas market project (approved 11 November 2005, effective 1 October 2006)
v6.1	4 Aug 2004	cpratt	final – operat'nal	Change from v6.0 (highlighted in yellow where possible) – minor definitional clarifications, including clearly specifying that compressor fuel usage will not be included in AMDQ exceedance calculations – Alteration of reference to minimum and maximum estimation of Ancillary Payments at day plus 3 because since 26 October 2002 we have a good estimation of the withdrawal data allowing good estimation of AP's at day plus 3. – Other changes as required reflecting new settlement times including automatic month plus 118 business day revisions.
v6.0	20 Sep 2001	cpratt	final – operat'nal	change from v5.0 – incorporated additional functionality to permit AMDQ credits to be assigned to tariff D customer sites, and applied as a site based uplift exceedance hedge for tariff D customers; Changes for new functionality highlighted in yellow.
v5.0	7 Jul 2001	cprice	final – operat'nal	change from v4.1 – incorporated additional functionality to permit $AMDQ^D$ to be referred to the hub and applied as a global uplift exceedance hedge, following implementation of $AMDQ^D$.
v4.1	22 Mar 2000	cprice	final – operat'nal	change from v4.0 – re-formatted, additional explanation added; no change to functionality.
v4.0	5 Dec 1999	cprice	final – operat'nal	change from v2.04 – additional functionality added to incorporate AMDQ credits

1.0 DEFINITIONS AND REQUIREMENTS

Refer Schedule 2 for glossary and complete list of nomenclature and symbols, and other conventions in terminology adopted throughout.

Refer Schedule 1 for requirements for information storage, reporting, and broad requirements for the user interfaces to the application.

2.0 OUTLINE OF PROCESS

2.1 Pre-processing

a) incorporate minimum daily requirements into price steps for each offer

b) split bids into up to 56 steps for an injection bid or 55 steps for a withdrawal bid

c) where the administered price cap has been applied, any bid price in excess of the administered price cap will be capped at the administered price.

2.2 Processing

2.2.1 Pre-end of month: for each day, following each schedule (to be done in the TMM database)

a) Assume that AGINO, AGWNO and Uplift hedge equal zero

b) calculate effective pricing schedule quantity for each schedule and allocate to adjusted bid steps(assume that the schedule quantities for the remaining schedules of the day do not change)

c) Calculate MSIQ and MSWQ for each adjusted bid step based on the effective pricing schedule quantities

d) Allocate operation schedule quantities for each schedule to bid steps (assume that the schedule quantities for the remaining schedules of the day do not change)

e) Calculate the amount that each participant was constrained up at each point at each schedule

f) Calculate the change in the amount that each participant was constrained up at each point at each reschedule

g) estimate AP's for the initial schedule by multiplying constrained up quantity with the amount by which bid price exceeds market price

h) estimate AP's for each reschedule by multiplying change in constrained up quantity with the amount by which bid price exceeds market price (for injections) and bid price is lower than market price (for withdrawals)

i) publish aggregate of AP payments at each schedule to all participants

j) publish MP AP payments at each schedule to specific MP's

2.2.2 Pre-end of month: for each schedule for each day, at day+3(to be done in settlements database)

a) determine for each participant the amount of scheduled gas at each supply source that was nominated to be used to hedge against uplift and hence is not entitled to receive AP's

b) Using estimated and actual injection and withdrawal information, estimate AGINO and AGWNO

c) calculate effective pricing schedule quantity for each schedule and allocate to adjusted bid steps

d) Calculate MSIQ and MSWQ for each adjusted bid step based on the effective pricing schedule quantities

e) Allocate operation schedule quantities for each schedule to bid steps

f) Calculate the amount that each participant was constrained up at each point at each schedule

g) Calculate the change in the amount that each participant was constrained up at each point at each reschedule

h) estimate AP's for the initial schedule by multiplying constrained up quantity with the

amount by which bid price exceeds market price (for injections) and bid price lower than market price (for withdrawals)

i) estimate AP's for each reschedule by multiplying change in constrained up quantity with the amount by which bid price exceeds market price

j) where estimated AP's are negative for a schedule because the amount a bid is constrained on has reduced, modify the estimated AP's for that schedule so as not to over recover costs incurred. In some cases the negative APs are modified to offset the total amount of positive APs incurred in previous schedules.

k) Calculate the average rates in $/GJ for positive and negative *ancillary payments for each schedule*

l) publish aggregate of AP payments at each schedule to all participants

m) publish MP AP payments at each schedule to specific MP's

n) determine the estimated total uplift payment for each schedule as being equal to the estimated total AP for each schedule offset with other schedules so as to cancel positive and negative total AP's.

2.2.3 Post-end of month: for each day, by month+7 (preliminary), and by month+18 (final), month+118 (revised) (to be done in settlements database)

a) determine for each participant the amount of scheduled gas at each supply source that was nominated to be used to hedge against uplift and hence is not entitled to receive AP's

b) Using estimated and actual injection and withdrawal information, estimate AGINO and AGWNO

c) calculate effective pricing schedule quantity for each schedule and allocate to adjusted bid steps

d) Calculate MSIQ and MSWQ for each adjusted bid step based on the effective pricing schedule quantities

e) Allocate operation schedule quantities for each schedule to bid steps

f) Calculate the amount that each participant was constrained up at each point at each schedule

g) Calculate the change in the amount that each participant was constrained up at each point at each reschedule

h) calculate AP's for the initial schedule by multiplying constrained up quantity with the amount by which bid price exceeds market price

i) calculate AP's for each reschedule by multiplying change in constrained up quantity with the amount by which bid price exceeds market price

j) where AP's are negative for a schedule because the amount a bid is constrained on has reduced, modify the AP's for that schedule so as not to over recover costs incurred. In some cases the negative APs are modified to offset the total amount of positive APs incurred in previous schedules.

k) Calculate the average rates in $/GJ for positive and negative *ancillary payments for each schedule*

l) publish aggregate of AP payments at each schedule to all participants

m) publish MP AP payments at each schedule to specific MP's

n) Store validated energy transfer and AMDQ-AMDQ credit version id's for check and comparison when running uplift allocation application

o) determine total uplift for each schedule as being equal to the total AP for each schedule offset with other schedules so as to cancel positive and negative total AP's. Record this in the *settlement database*.

3.0 ANCILLARY PAYMENTS - GENERAL

3.1 Ancillary Payments Calculated Based on Constrained on Injection and Withdrawal Quantities

Ancillary payments will be paid by or to market participants to the extent that there is an increase or decrease in the amount that their injections or withdrawals are constrained on.

3.2 Ancillary Payments Adjusted at each Schedule

Ancillary payments will be paid to each participant to the extent that they are constrained on in the initial schedule of the gas day at each supply source. The amount of ancillary payments will be increased or decreased at each subsequent schedule in the gas day to the extent that the amount by which a MP is constrained on increases or decreases.

3.3 Effect of Participant Constraints on Ancillary Payments

If gas bid in at higher than market price is scheduled for injection or bid price lower than market price for withdrawal, as a result of a MP imposed constraint, then that gas is not considered to be constrained on and will not be entitled to an ancillary payment. This gas is called Minimum Scheduled Injection Quantity (MSIQ) for injections and Minimum Scheduled Withdrawal Quantity (MSWQ) for withdrawals.

3.4 Effect of Actual injections on Ancillary Payments

If gas is bid at higher than market price and is scheduled for injection (or gas is bid at lower than market price and is scheduled for withdrawal) in a schedule interval, but is not actually injected or withdrawn in that schedule interval, then that scheduled gas is not considered to be Constrained on and will not be entitled to an ancillary payment. This gas is called Actual Gas Injection Negative Offset Quantity (AGINO) for injections and Actual Gas Withdrawal Negative Offset Quantity (AGWNO) for withdrawals.

3.5 Effect of Uplift Hedges on Ancillary Payments

If a MP nominates to use part or all of a gas injection as an uplift hedge, then that portion of the gas injection used as an uplift hedge will not be used to generate positive or negative ancillary payments.

3.6 Effect of Gas Already Delivered on Ancillary Payments

MPs who have already delivered a previously scheduled quantity of gas at the time a new schedule is produced will not receive an increase or decrease in ancillary payment for that gas already delivered.

3.7 Effect of Accreditation on Ancillary payments

No positive or negative ancillary payments will be made to a MP for their controllable injections or controllable withdrawals, unless those controllable injections or controllable withdrawals are accredited with AEMOunder the accreditation clauses within the National Gas Rules (NGR).

3.8 Effect of Administered Price Cap on Ancillary payments

In the event that the market price for a schedule is capped at the *administered price cap* or AEMO has declared a *system force majeure event* or AEMO has suspended the *market* then for the purpose of the determination of ancillary payments all bid prices in excess of the *administered price cap* are to be capped at the *administered price cap*.

3.9 Effect of Correction to Stop Over Recovery of Costs

Where a negative ancillary payment is calculated based on a reduction in constrained on quantity for an injection where the bid price has risen relative to an earlier schedule when the gas was constrained or a withdrawal where the bid price has fallen relative to the earlier schedule when the gas was constrained on then that negative ancillary payment will be replaced with a value based on the bid price in the schedule where the gas was constrained on. In addition, if after the changes the total ancillary payment for the schedule is positive in value then the revised ancillary payments may be made more negative so as to offset the cost of any gas constrained on from other controllable injections or controllable withdrawals in that schedule to offset the decrease in constrained on gas for the bids with revised ancillary payments.

3.10 Effect of reduced bid quantities in reschedules

If the bid quantities in reschedules are reduced such that the constrained on quantities in the reschedules are reduced the negative ancillary payments are modified so as to totally offset the positive ancillary payments incurred in previous schedules. This step is required so that MPs who submit lower bid quantities in reschedules will be financially whole.

4.0 DETERMINATION OF BID STEPS AND UPLIFT HEDGE

4.1 Determination of Uplift Hedge

Determine the uplift hedge for a MP at a supply source on a gas day is equal to the sum of the quantities determined for a MP under Section 4.4 of the uplift allocation procedures - issue 5.1 as amended from time to time. This is denoted as follows:

$APUH_{(x,\ point,\ CPP)}$

4.2 Determination of Adjusted Bid Steps

In the example in Table 1, the MP submits 5 injection bids up to 75 GJ in the BOD schedule. In the 1st and 2nd reschedule, the MP only submits 4 bids with the maximum cumulative bid quantity up to 64 GJ and 68 GJ respectively. The cumulative bid quantity and bid prices for these reschedules do not exist for bid step 5 and are indicated as “NULL” in Table 1. For the purpose of calculating ancillary payments the missing bid prices will be substituted as explained in section 4.3.

For each *bid* at each *schedule*, break points are determined between quantity ranges working from zero upwards to the maximum quantity offered, as shown in the example in Table 1 and 2 below.

The point at which any *uplift hedge* applies is also determined (37 in the example below).

As shown in columns 1 and 2 in Table 2 below, all break points across all schedules are ranked by their cumulative quantities so that there are up to 55 withdrawal break points between 0 and the maximum quantity *bid* over all schedules and, 56 injection break points between 0 and the maximum quantity *bid* over all schedules.

For each bid at each *schedule*, the existing bid steps are broken into more steps by applying the new break points effectively subdividing existing bid steps. This is demonstrated by associating each pricing break points for each schedule with each cumulative quantity break point in Table 2 below.

Let

$ABi_{(x,point,astep,s)}$ = the injection bid step quantity for each MP(x), at system injection point (point) for each adjusted bid step (astep) in schedule (s) .

ABw $_{(x,point,astep,s)}$ = the new adjusted withdrawal bid step quantity for each MP(x), at system withdrawal point (point) for each adjusted bid step (astep) in schedule (s)schedule.

The resultant subdivided bids will be used in the following *ancillary payment* calculations.

Table 1 – An example of injection bid quantities and bid prices

Bid Step	BOD Schedule		1st reschedule		2nd reschedule		Uplift Quantity
	Cumulative Quantity	Price	Cumulative Quantity	Price	Cumulative Quantity	Price	
1	15	2.0	16	2.1	17	2.2	
2	30	2.5	32	2.6	34	2.7	
3	45	3.0	48	3.1	51	3.2	37
4	60	3.5	64	3.6	68	3.7	
5	75	4.0	NULL	NULL	NULL	NULL	

Table 2 – Adjusted bid step and cumulative injection bid quantity

Adjusted Bid Step	Cumulative Bid Quantity	Incremental Bid Quantity (ABi $_{(x,point,astep,s)}$)
1	15	15
2	16	1
3	17	1
4	30	13
5	32	2
6	34	2
7	37	3
8	45	8
9	48	3
10	51	3
11	60	9
12	64	4
13	68	4
14	75	7

In Table 2, a total of 14 adjusted bid steps are created. The system should generate the same number of adjusted bid steps for each schedule for the relevant bids for each combination of MP(x) and system point (point).

4.3 Association of Prices with Adjusted Bid Steps

If AEMO has not limited the market price to the *administered price cap* for *schedule* s then the bid price associated with the adjusted bid steps are set as follows and illustrated in Table 3.

For injection $ABi_{(x,point,astep,s)}$,

if $BPi_{(x,point,step,s)}$ is not NULL;

the adjusted bid price is $Pi_{(x,point,astep,s)} = BPi_{(x,point,step,s)}$ and

$Flagi_{(x,point,astep,s)} = 0$

Else

the adjusted bid price is $Pi_{(x,point,astep,s)} = BPi_{(x,point,step,s)}$ of the maximum step and

$Flagi_{(x,point,astep,s)} = 1$

For $ABw_{(x,point,astep,s)}$,the bid price is

if $BPw_{(x,point,step,s)}$ is not NULL

the adjusted bid price is $Pw_{(x,point,astep,s)} = BPw_{(x,point,step,s)}$ and

$Flagw_{(x,point,astep,s)} = 0$

Else

the adjusted bid price $Pw_{(x,point,astep,s)} = BPw_{(x,point,step,s)}$ of the maximum step and

$Flagw_{(x,point,astep,s)} = 1$

Where "step" is the bid step corresponding to the bid quantity included in the adjusted bid step "astep".

If AEMO has limited the market price to the *administered price cap* for *schedule* s then the bid price associated with the adjusted bid steps are set as follows:

For $ABi_{(x,point,astep,s)}$ the adjusted bid price is $Pi_{(x,point,astep,s)} = Min(APC, BPi_{(x,point,step,s)})$

For $ABw_{(x,point,astep,s)}$ the adjusted bid price is $Pw_{(x,point,astep,s)} = Min(APC, BPw_{(x,point,step,s)})$

Where

- APC is the *administered price cap*.
- "step" is the bid step corresponding to the to the bid quantity included in the adjusted bid step "astep"

Table 3 – Bid prices assigned to adjusted bid steps

			Price			
Adjusted Bid Step	Cumulative Bid Quantity	Incremental Bid Quantity ($ABi_{(x,point,astep,s)}$)	BOD Schedule	1st reschedule	2nd reschedule	Uplift Hedge
1	15	15	2.0	2.1	2.2	Yes
2	16	1	2.5	2.1	2.2	Yes
3	17	1	2.5	2.6	2.2	Yes
4	30	13	2.5	2.6	2.7	Yes
5	32	2	3.0	2.6	2.7	Yes

6	34	2	3.0	3.1	2.7	Yes
7	37	3	3.0	3.1	3.2	Yes
8	45	8	3.0	3.1	3.2	No
9	48	3	3.5	3.1	3.2	No
10	51	3	3.5	3.6	3.2	No
11	60	9	3.5	3.6	3.7	No
12	64	4	4.0	3.6	3.7	No
13	68	4	4.0	3.6	3.7	No
14	75	7	4.0	3.6	3.7	No

5.0 DETERMINATION AND ALLOCATION OF QUANTITIES TO ADJUSTED BID STEPS

5.1 Pricing schedule

5.1.1 Determination of Effective Pricing schedule Quantities for Ancillary payments

The effective *pricing schedule* quantities used in the ancillary payment calculations for each participant, for each *pricing schedule controllable injection* or *pricing schedule controllable withdrawal*, for the initial *schedule* of the *gas day*, is equal to the actual *pricing schedule* produced at the start of the gas day as follows:

$$Q^{EPS}_{(x,point,s=1)} = \sum_{h=1,24} Q^{PS}_{(x,point,s=1,h)}$$

The effective *pricing schedule* quantities used in the *ancillary payment* calculations for each MP, for each *pricing schedule controllable injection* or *pricing schedule controllable withdrawal*, for each reschedule of the gas day, is equal to:

$$Q^{EPS}_{(x,point,s=2)} = \sum_{h=1,4} Q^{PS}_{(x,point,s=1,h)} + \sum_{h=5,24} Q^{PS}_{(x,point,s=2,h)}$$

$$Q^{EPS}_{(x,point,s=3)} = \sum_{h=1,4} Q^{PS}_{(x,point,s=1,h)} + \sum_{h=5,8} Q^{PS}_{(x,point,s=2,h)} + \sum_{h=9,24} Q^{PS}_{(x,point,s=3,h)}$$

$$Q^{EPS}_{(x,point,s=4)} = \sum_{h=1,4} Q^{PS}_{(x,point,s=1,h)} + \sum_{h=5,8} Q^{PS}_{(x,point,s=2,h)} + \sum_{h=9,12} Q^{PS}_{(x,point,s=3,h)} + \sum_{h=13,24} Q^{PS}_{(x,point,s=4,h)}$$

$$Q^{EPS}_{(x,point,s=5)} = \sum_{h=1,4} Q^{PS}_{(x,point,s=1,h)} + \sum_{h=5,8} Q^{PS}_{(x,point,s=2,h)} + \sum_{h=9,12} Q^{PS}_{(x,point,s=3,h)} + \sum_{h=13,18} Q^{PS}_{(x,point,s=4,h)} + \sum_{h=19,24} Q^{PS}_{(x,point,s=5,h)}$$

Table 4: example calculation of effective Pricing schedule quantities

Q^{PS}_S	SI = 1	SI = 2	SI = 3	SI = 4	SI = 5	Q^{EPS}_S
S=1	1	2	3	4	5	1+2+3+4+5 = 15
S=2	NA	6	7	8	9	1+6+7+8+9 = 31
S=3	NA	NA	10	11	12	1+6+10+11+12 = 40
S=4	NA	NA	NA	13	14	1+6+10+13+14 = 44
S=5	NA	NA	NA	NA	15	1+6+10+13+15 = 45

5.1.2 Allocation of the Effective Pricing schedule Quantities to Adjusted Bid Steps

Allocate each of the effective pricing schedule quantities determined for each MP, for each *controllable injection* or *system withdrawal point* for each schedule to the adjusted *bid* steps of the *bid* that applied to that schedule in order of increasing price for injections and decreasing price for withdrawals.

Table 5: example of effective pricing schedule quantities allocated to adjusted bid step

Cum Quantity	ABi (x,point,astep,s)	Q^{EPS} (x,point,s=1,astep)	Q^{EPS} (x,point,s=2,astep)	Q^{EPS} (x,point,s=3,astep)	Q^{EPS} (x,point,s=4,astep)	Q^{EPS} (x,point,s=5,astep)
15	15	15	15	15	15	15
16	1	0	1	1	1	1
17	1	0	1	1	1	1
30	13	0	13	13	13	13
32	2	0	1	2	2	2
34	2	0	0	2	2	2
37	3	0	0	3	3	3
45	8	0	0	3	7	8
48	3	0	0	0	0	0
51	3	0	0	0	0	0
60	9	0	0	0	0	0
64	4	0	0	0	0	0
68	4	0	0	0	0	0
75	7	0	0	0	0	0
Total	75	15	31	40	44	45

Effective pricing schedule quantities should be allocated to each adjusted bid step including adjusted bid steps where the cumulative quantity for that adjusted bid step exceeds the maximum bid quantity.

5.2 Operating Schedule

5.2.1 Determination of Operating Schedule Quantities for Ancillary Payments

The *operating schedule* quantities used in the *ancillary payment* calculations for each MP, for each *operating schedule controllable injection* or *operating schedule controllable withdrawal*, for the each *schedule* of the *gas day*, is equal to the actual *operating schedule* produced for each *schedule* of the *gas day*. If however an ad hoc *schedule* is authorised in a *scheduling interval* following a *schedule*, then the ad hoc *schedule* will be used in place of that *operating schedule*.

If no ad hoc schedule was performed then:

$$Q^{OS}_{(x,point,s)} = \sum_{h=1,24} Q^{OS}_{(x,point,s,h)}$$

If an ad hoc schedule was performed in a schedule interval then:

$$Q^{OS}_{(x,point,s)} = \sum_{h=1,24} Q^{AHOS}_{(x,point,s=SI,h)}$$

5.2.2 Allocation of the Operating Schedule Quantities to Adjusted Bid Steps

Allocate each of the quantities determined under clause 5.2.1 for each MP, for each *controllable injection* or withdrawal point for each *schedule* to the *bid* steps of the *bid* that

applied to that *schedule* in order of increasing price for injections and decreasing price for withdrawals.

Table 6: example of operating schedule quantities allocated to adjusted bid step

Cum Quantity	ABi (x,point,astep,s)	Q^{OS} (x,point,s=1,astep)	Q^{OS} (x,point,s=2,astep)	Q^{OS} (x,point,s=3,astep)	Q^{OS} (x,point,s=4,astep)	Q^{OS} (x,point,s=5,astep)
15	15	15	15	15	15	15
16	1	0	1	1	1	1
17	1	0	1	1	1	1
30	13	0	13	13	13	13
32	2	0	2	2	2	2
34	2	0	2	2	2	2
37	3	0	3	3	3	3
45	8	0	3	8	7	8
48	3	0	0	3	0	3
51	3	0	0	3	0	2
60	9	0	0	4	0	0
64	4	0	0	0	0	0
68	4	0	0	0	0	0
75	7	0	0	0	0	0
Total	75	15	40	55	44	50

Operating pricing schedule quantities should be allocated to each adjusted bid step including adjusted bid steps where the cumulative quantity for that adjusted bid step exceeds the maximum bid quantity.

6.0 ACTUAL QUANTITIES

The following section describes the method used to calculate the amount within each *bid* step for each *schedule* for each *participant* at each injection withdrawal point that will not be entitled to receive *ancillary payments* due to that *participant*'s failure to inject (or over-injection), or withdraw gas (or over-withdrawal) in accordance with a *schedule instruction*.

6.1 Calculation of AGINO

6.1.1 Determination of the Effective Actual Injection Quantity

For each *participant* at each supply source, determine the sum over all *scheduling interval*s of the minimum of:

- a *participant*s last approved operational *scheduled injection* at a supply source within a *schedule interval*; and,
- a *participant*s actual injection at a supply source within a *schedule interval*

this is calculated as follows

$$Qi^{EA}_{(x,point)} = \sum_{SI=1,5} \text{Min}\ [\ Qi^{OS}_{(x,point,S=5,SI)}\ ,\ Qi^{A}_{(x,point,SI)}\ ]$$

Table 7: example of calculation of effective actual injection

	SI = 1	SI = 2	SI = 3	SI = 4	SI = 5

$Qi^{OS}_{(x,point,S=5,SI)}$	10	10	10	10	10
$Qi^{A}_{(x,point,SI)}$	8	9	10	11	12
Minimum	8	9	10	10	10
$Qi^{EA}_{(x,point)}$	8+9+10+10+10 = 47				

6.1.2 Allocation of the Effective Actual Injection Quantity to Adjusted Bid Steps

Allocate the quantity determined under clause 6.1.1 for each *participant*, for each *controllable injection* point for each *schedule* to the adjusted *bid* steps of the adjusted *bid* that applied to that *schedule* in order of increasing price.

6.1.3 Calculation of AGINO for the Last Schedule of the Gas Day

The AGINO for each *participant*, for each *controllable injection* point for each *bid* step for the last schedule of the *gas day* is defined as the maximum of zero; and,

- The operating schedule injections for the adjusted *bid* step for the last *operating schedule* of the *gas day*

Less

- The effective actual injections allocated to that adjusted *bid* step

this is calculated as follows

$AGINO_{(x,point,s=5,astep)} = Max [0, (Qi^{OS}_{(x,point,S=5,astep)} - Qi^{EA}_{(x,point,astep)})]$

Table 8: example allocation of effective actual injection to bid step

Cum Quantity	ABi (x,point,astep,s)	Qi^{OS} (x,point,S=5,astep)	Qi^{EA} (x,point,astep)	AGINO (x,point,s=5,astep)
15	15	15	15	Max[0, (15-15)]
16	1	1	1	Max[0, (1-1)] = 0
17	1	1	1	Max[0, (1-1)] = 0
30	13	13	13	Max[0, (13-13)]
32	2	2	2	Max[0, (2-2)] = 0
34	2	2	2	Max[0, (2-2)] = 0
37	3	3	3	Max[0, (3-3)] = 0
45	8	8	8	Max[0, (8-8)] = 0
48	3	3	1	Max[0, (3-1)] = 2
51	3	2	0	Max[0, (2-0)] = 2
60	9	0	0	Max[0, (0-0)] = 0
64	4	0	0	Max[0, (0-0)] = 0
68	4	0	0	Max[0, (0-0)] = 0
75	7	0	0	Max[0, (0-0)] = 0
Total	75	50	47	4

6.1.4 Calculation of AGINO for Schedules Prior to the Last Schedule of the Gas Day

The AGINO for each *participant*, for each *controllable injection* point for each *bid* step for each *schedule* prior to the last *schedule* of the *gas day* is defined as the maximum of zero; and,

- the AGINO for the adjusted *bid* step for the last *operating schedule* of the *gas day*

less

  - the *operating schedule* injections for the *bid* step for the last *operating schedule* of the *gas day*
  - less the minimum of *operating schedule* injections for the *bid* step for specified *operating schedule* and all the subsequent *operating schedules* for the remainder of the *gas day*

this is calculated for each of the schedules as follows:

$AGINO_{(x,point,s=4,astep)} = Max[0,AGINO_{(x,point,s=5,astep)} - \{Qi^{OS}_{(x,point,S=5,astep)} - MIN(Qi^{OS}_{(x,point,S=5,astep)}, Qi^{OS}_{(x,point,S=4,astep)}) \}]$

$AGINO_{(x,point,s=3,astep)} = Max[0,AGINO_{(x,point,s=5,astep)} - \{Qi^{OS}_{(x,point,S=5,astep)} - MIN(Qi^{OS}_{(x,point,S=5,astep)}, Qi^{OS}_{(x,point,S=4,astep)}, Qi^{OS}_{(x,point,S=3,astep)}) \}]$

$AGINO_{(x,point,s=2,astep)} = Max[0,AGINO_{(x,point,s=5,astep)} - \{Qi^{OS}_{(x,point,S=5,astep)} - MIN(Qi^{OS}_{(x,point,S=5,astep)}, Qi^{OS}_{(x,point,S=4,astep)}, Qi^{OS}_{(x,point,S=3,astep)}, Qi^{OS}_{(x,point,S=2,astep)}) \}]$

$AGINO_{(x,point,s=1,astep)} = Max[0,AGINO_{(x,point,s=5,astep)} - \{Qi^{OS}_{(x,point,S=5,astep)} - MIN(Qi^{OS}_{(x,point,S=5,astep)}, Qi^{OS}_{(x,point,S=4,astep)}, Qi^{OS}_{(x,point,S=3,astep)}, Qi^{OS}_{(x,point,S=2,astep)}, Qi^{OS}_{(x,point,S=1,astep)}) \}]$

Table 9: example AGINO calculation by adjusted bid step

$Q^{OS}_{s=1, astep}$	$Q^{OS}_{s=2, astep}$	$Q^{OS}_{s=3, astep}$	$Q^{OS}_{s=4, astep}$	$Q^{OS}_{s=5, astep}$	$AGINO_{s=5, astep}$	$AGINO_{s=4, astep}$	$AGINO_{s=3, astep}$	$AGINO_{s=2, astep}$	$AGINO_{s=1, astep}$
1	2	3	4	5	4.5	Max[0, 4.5-{5-Min(5,4)}] = 3.5	Max[0, 4.5-{5-Min(5,4,3)}] = 2.5	Max[0, 4.5-{5-Min(5,4,3,2)}] = 1.5	Max[0, 4.5- {5-Min(5,4,3,2,1)}] = 0.5

Table 10: example AGINO calculation flowing on from Table 8: example allocation of effective actual injection to bid step

$Q^{OS}_{s=1, astep}$	$Q^{OS}_{s=2, astep}$	$Q^{OS}_{s=3, astep}$	$Q^{OS}_{s=4, astep}$	$Q^{OS}_{s=5, astep}$	$AGINO_{s=5, astep}$	$AGINO_{s=4, astep}$	$AGINO_{s=3, astep}$	$AGINO_{s=2, astep}$	$AGINO_{s=1, astep}$
15	15	15	15	15	0	0	0	0	0
0	1	1	1	1	0	0	0	0	0
0	1	1	1	1	0	0	0	0	0
0	13	13	13	13	0	0	0	0	0
0	2	2	2	2	0	0	0	0	0

0	2	2	2	2	0	0	0	0	0
0	3	3	3	3	0	0	0	0	0
0	3	8	7	8	0	0	0	0	0
0	0	3	0	3	2	Max[0, 2-{3-Min(3,0)}] = 0	Max[0, 2-{3-Min(3,0,3)}] = 0	Max[0, 2- {3-Min(3,0,3,0)}] = 0	Max[0, 2- {3-Min(3,0,3,0,0)}] = 0
0	0	3	0	2	2	Max[0, 2-{2-Min(2,0)}] = 0	Max[0, 2-{2-Min(2,0,3)}] = 0	Max[0, 2- {2-Min(2,0,3,0)}] = 0	Max[0, 2- {2-Min(2,0,3,0,0)}] = 0
0	0	4	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
15	40	55	44	50	4	0	0	0	0

6.2 Calculation of AGWNO

6.2.1 Determination of the Effective Actual Withdrawal Quantity

For each *participant* at each withdrawal point, determine the sum over all *scheduling interval*s of the minimum of:

- a *participant*s last approved operating scheduled withdrawal at a withdrawal point within a *schedule interval*; and,
- a *participant*s actual withdrawal at a withdrawal point within a *schedule interval*

this is calculated as follows

$$Qw^{EA}_{(x,point)} = \sum_{SI=1,5} \text{Min} [Qw^{OS}_{(x,point,S=5,SI)} , Qw^{A}_{(x,point,SI)}]$$

6.2.2 Allocation of the Effective Actual Withdrawal Quantity to Adjusted Bid Steps

Allocate the quantity determined under clause 6.2.1 for each *participant*, for each *controllable injection* point for each *schedule* to the *bid* steps of the *bid* that applied to that schedule in order of decreasing price.

6.2.3 Calculation of AGWNO for the Last Operating Schedule of the Gas Day

The AGWNO for each *participant*, for each controllable withdrawal point for each *bid* step for the last *schedule* of the *gas day* is defined as the maximum of zero; and,

- The *operating schedule* withdrawals for the *bid* step for the last *operating schedule* of the gas day

Less

- The effective actual withdrawals allocated to that *bid* step

this is calculated as follows

$AGWNO_{(x,point,s=5,astep)} = Max [0, (Qw^{OS}_{(x,point,S=5,astep)} - Qw^{EA}_{(x,point,astep)})]$

6.2.4 Calculation of AGWNO for Schedules Prior to the Last Operating Schedule of the Gas Day

The AGWNO for each *participant*, for each controllable withdrawal point for each *bid* step for each *schedule* prior to the last *schedule* of the *gas day* is defined as the maximum of zero; and,

- the AGWNO for the *bid* step

less

  - the *operating schedule* withdrawals for the *bid* step for the *last operating schedule* of the *gas day*
  - less the minimum of *operating schedule* withdrawals for the *bid* step for specified *operating schedule* and all the subsequent *operating schedules* for the remainder of the *gas day*

$AGWNO_{(x,point,s=4,astep)} = Max[0,AGWNO_{(x,point,s=5,astep)} - \{Qw^{OS}_{(x,point,S=5,astep)} - MIN(Qw^{OS}_{(x,point,S=5,astep)}, Qw^{OS}_{(x,point,S=4,astep)}) \}]$

$AGWNO_{(x,point,s=3,astep)} = Max[0,AGWNO_{(x,point,s=5,astep)} - \{Qw^{OS}_{(x,point,S=5,astep)} - MIN(Qw^{OS}_{(x,point,S=5,astep)}, Qw^{OS}_{(x,point,S=4,astep)}, Qw^{OS}_{(x,point,S=3,astep)}) \}]$

$AGWNO_{(x,point,s=2,astep)} = Max[0, AGWNO_{(x,point,s=5,astep)} - \{Qw^{OS}_{(x,point,S=5,astep)} - MIN(Qw^{OS}_{(x,point,S=5,astep)}, Qw^{OS}_{(x,point,S=4,astep)}, Qw^{OS}_{(x,point,S=3,astep)}, Qw^{OS}_{(x,point,S=2,astep)}) \}]$

$AGWNO_{(x,point,s=1,astep)} = Max[0, AGWNO_{(x,point,s=5,astep)} - \{Qw^{OS}_{(x,point,S=5,astep)} - MIN(Qw^{OS}_{(x,point,S=5,astep)}, Qw^{OS}_{(x,point,S=4,astep)}, Qw^{OS}_{(x,point,S=3,astep)}, Qw^{OS}_{(x,point,S=2,astep)}, Qw^{OS}_{(x,point,S=1,astep)}) \}]$

7.0 PARTICIPANT CONSTRAINTS

7.1 Calculation of MSIQ

7.1.1 Calculation of MSIQ for the Last Operating Schedule of the Gas Day

The MSIQ for each *participant*, for each *controllable injection* point for each *bid* step for the last *schedule* of the *gas day* equals the effective *pricing schedule* quantity for the last *schedule* of the *gas day.*

$MSIQ_{(x,point,S=5,astep)} = Qi^{EPS}_{(x,point,s=5,\ astep)}$

Table 31: Example of MSIQ allocated to adjusted bid step for final operating schedule

Cum Quantity	ABi (x,point,astep,s)	Q^{EPS} (x,point,s=5,astep)	MSIQ (x,point,S=5,astep)
15	15	15	15
16	1	1	1
17	1	1	1
30	13	13	13
32	2	2	2
34	2	2	2
37	3	3	3

45	8	8	8
48	3	0	0
51	3	0	0
60	9	0	0
64	4	0	0
68	4	0	0
75	7	0	0
Total	75	45	45

7.1.2 Calculation of MSIQ for Schedules Prior to the Last Operating Schedule of the Gas Day

The MSIQ for each *participant*, for each *controllable injection* point for each *bid* step for each *schedule* prior to the last *schedule* of the *gas day* is determined as follows:

- If the *bid* step price for a *schedule* exceeds the *market price* for that *schedule*, then the MSIQ for that *bid* step equals the effective *pricing schedule* injection quantity; or,
- If the *bid* step price for a *schedule* is less than or equal to the *market price* for that *schedule*, then the MSIQ for that *bid* step equals the minimum of
    - the effective *pricing schedule* injection quantity for that *bid* step for that *schedule*; and,
    - the MSIQ for the *bid* step for the following *schedule*

this is calculated as follows:

if $Pi_{(x,point,S=4,astep)} > MP_{(S=4)}$

then $MSIQ_{(x,point,S=4,astep)} = Qi^{EPS}_{(x,point,s=4,\ astep)}$

else if $Pi_{(x,point,S=4,astep)} \leq MP_{(S=4)}$

then $MSIQ_{(x,point,S=4,astep)} = Min(Qi^{EPS}_{(x,point,s=4,\ astep),}\ MSIQ_{(x,point,S=5,astep)})$

if $Pi_{(x,point,S=3,astep)} > MP_{(S=3)}$

then $MSIQ_{(x,point,S=3,astep)} = Qi^{EPS}_{(x,point,s=3,\ astep)}$

else if $Pi_{(x,point,S=3,astep)} \leq MP_{(S=3)}$

then $MSIQ_{(x,point,S=3,astep)} = Min(Qi^{EPS}_{(x,point,s=3,\ astep),}\ MSIQ_{(x,point,S=4,astep)})$

if $Pi_{(x,point,S=2,astep)} > MP_{(S=2)}$

then $MSIQ_{(x,point,S=2,astep)} = Qi^{EPS}_{(x,point,s=2,\ astep)}$

else if $Pi_{(x,point,S=2,astep)} \leq MP_{(S=2)}$

then $MSIQ_{(x,point,S=2,astep)} = Min(Qi^{EPS}_{(x,point,s=2,\ astep),}\ MSIQ_{(x,point,S=3,astep)})$

if $Pi_{(x,point,S=1,astep)} > MP_{(S=1)}$

then $MSIQ_{(x,point,S=1,astep)} = Qi^{EPS}_{(x,point,s=1,\ astep)}$

else if $Pi_{(x,point,S=1,astep)} \leq MP_{(S=1)}$

then $MSIQ_{(x,point,S=1,astep)} = Min(Qi^{EPS}_{(x,point,s=1,\ astep),}\ MSIQ_{(x,point,S=2,astep)})$

Table 12: Calculation of MSIQ

Pi (x,point,astep,s)	$MP_{S=4}$	$Pi_{S=4} > MP_{S=4}$?	Q^{EPS} (x,point,s=4,astep)	MSIQ (x,point,S=5,astep)	MSIQ (x,point,S=4,astep)
2.0	2.7	No	15	15	Min(15,15)
2.5		No	1	1	Min(1,1) =1
2.5		No	1	1	Min(1,1) =1
2.5		No	13	13	Min(13,13)
3.0		Yes	2	2	2
3.0		Yes	2	2	2
3.0		Yes	3	3	3
3.0		Yes	7	8	7
3.5		Yes	0	0	0
3.5		Yes	0	0	0
3.5		Yes	0	0	0
4.0		Yes	0	0	0
4.0		Yes	0	0	0
4.0		Yes	0	0	0
Total			44	45	44

7.2 Calculation of MSWQ

7.2.1 Calculation of MSWQ for the Last Operating Schedule of the Gas Day

The MSWQ for each *participant*, for each controllable withdrawal point for each *bid* step for the last *schedule* of the *gas day* equals the effective *pricing schedule* quantity for the last *schedule* of the *gas day.*

$MSWQ_{(x,point,S=5,astep)} = Qw^{EPS}_{(x,point,s=5,\ astep)}$

7.2.2 Calculation of MSWQ for Schedules Prior to the Last Schedule of the Gas Day

The MSWQ for each *participant*, for each controllable withdrawal point for each *bid* step for each *schedule* prior to the last *schedule* of the *gas day* is determined as follows:

- If the adjusted *bid* step price for a *schedule* is less than the *market price* for that *schedule*, then the MSWQ for that *bid* step equals the effective *pricing schedule* withdrawal quantity; or,
- If the adjusted *bid* step price for a *schedule* is greater than or equal to the *market price* for that *schedule*, then the MSWQ for that *bid* step equals the minimum of
    - the effective *pricing schedule* withdrawal quantity for that *bid* step for that *schedule*; and,
    - the MSWQ for the bid step for the following schedule

this is calculated as follows:

if $Pw_{(x,point,S=4,astep)} < MP_{(S=4)}$

then $MSWQ_{(x,point,S=4,astep)} = QW^{EPS}_{(x,point,s=4,\ astep)}$

else if $PW_{(x,point,S=4,astep)} \geq MP_{(S=4)}$

then $MSWQ_{(x,point,S=4,astep)} = Min(QW^{EPS}_{(x,point,s=4,\ astep)},\ MSWQ_{(x,point,S=5,astep)})$

if $Pw_{(x,point,S=3,astep)} < MP_{(S=3)}$

then $MSWQ_{(x,point,S=3,astep)} = Qw^{EPS}_{(x,point,s=3,\ astep)}$

else if $Pw_{(x,point,S=3,astep)} \geq MP_{(S=3)}$

then $MSWQ_{(x,point,S=3,astep)} = Min(Qw^{EPS}_{(x,point,s=3,\ astep)},\ MSWQ_{(x,point,S=4,astep)})$

if $Pw_{(x,point,S=2,astep)} < MP_{(S=2)}$

then $MSWQ_{(x,point,S=2,astep)} = Qw^{EPS}_{(x,point,s=2,\ astep)}$

else if $Pw_{(x,point,S=2,astep)} \geq MP_{(S=2)}$

then $MSWQ_{(x,point,S=2,astep)} = Min(Qw^{EPS}_{(x,point,s=2,\ astep)},\ MSWQ_{(x,point,S=3,astep)})$

if $Pw_{(x,point,S=1,astep)} < MP_{(S=1)}$

then $MSWQ_{(x,point,S=1,astep)} = Qw^{EPS}_{(x,point,s=1,\ astep)}$

else if $Pw_{(x,point,S=1,astep)} \geq MP_{(S=1)}$

then $MSWQ_{(x,point,S=1,astep)} = Min(Qw^{EPS}_{(x,point,s=1,\ astep)},\ MSWQ_{(x,point,S=2,astep)})$

8.0 CALCULATION OF ANCILLARY PAYMENTS

8.1 Determination of the Constrained on Injection Quantity for a Bid Step and Operating Schedule

The amount by which each *participant*, for each *controllable injection* point for each *bid* step for each *schedule* is determined as the greater of zero and:

- the *operating schedule* injection quantity for that *bid* step and *schedule* for each *participant* at each supply source
- less the AGINO for that *bid* step and *schedule* for each *participant* at each supply source
- less the MSIQ for that *bid* step and *schedule* for each *participant* at each supply source

this is calculated as follows:

$CUI_{(x,point,s,astep)} = Max(0,\ Qi^{OS}_{(x,point,s,astep)} - AGINO_{(x,point,S,astep)} - MSIQ_{(x,point,s,astep)})$

Table 13: Calculation of Constrained up Injection

MSIQ (x,point,S=5,astep)	MSIQ (x,point,S=4,astep)	AGINO s=5, astep	AGINO s=4, astep	Q^{OS} (x,point,s=5,astep)	Q^{OS} (x,point,s=4,astep)	CUI (x,point,s=5,astep)	CUI (x,point,s=4,astep)
15	15	0	0	15	15	Max (0, 15-0-15) = 0	Max (0, 15-0-15) = 0
1	1	0	0	1	1	Max (0, 1-0-1) = 0	Max (0, 1-0-1) = 0
1	1	0	0	1	1	Max (0, 1-0-1) = 0	Max (0, 1-0-1) = 0
13	13	0	0	13	13	Max (0, 13-0-13) = 0	Max (0, 13-0-13) = 0

2	2	0	0	2	2	Max (0, 2-0-2) = 0	Max (0, 2-0-2) = 0
2	2	0	0	2	2	Max (0, 2-0-2) = 0	Max (0, 2-0-2) = 0
3	3	0	0	3	3	Max (0, 3-0-3) = 0	Max (0, 3-0-3) = 0
8	7	0	0	8	7	Max (0, 8-0-8) = 0	0
0	0	2	0	3	0	Max (0, 3-2-0) = 1	0
0	0	2	0	2	0	Max (0, 2-2-0) = 0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
45	44	4	0	50	44	1	1

8.2 Determination of the Constrained on Withdrawal Quantity for a Bid Step and Operating Schedule

The amount by which each *participant*, for each controllable withdrawal point for each *bid* step for each *schedule* is determined as the greater of zero and:

- the *operating schedule* withdrawal quantity for that *bid* step and *schedule* for each *participant* at each withdrawal point
- less the AGWNO for that *bid* step and schedule for each *participant* at each supply source
- less the MSWQ for that *bid* step and *schedule* for each *participant* at each supply source

this is calculated as follows:

$CUW_{(x,point,s,astep)} = Max(0, Qw^{OS}_{(x,point,s,astep)} - AGWNO_{(x,point,S,astep)} - MSWQ_{(x,point,s,astep)})$

8.3 Determination of the Matched Changes in Constrained On Quantities.

8.3.1 Determination of the Matched Change in Constrained on Injection Quantity for a Bid Step and Operating Schedule

The value of MCCUQI, the matched change in constrained on injection quantity for each *participant*, for each controllable injection point for each *bid* step for each combination of two

different *schedules* of the *gas day* must be determined for each *schedule* in turn starting with the second *schedule* (s=2) and then iterating forwards to the last *schedule* (s=5):

For each *schedule s* and for each earlier *schedule* s' = s-1, s-2, …. 1 (in that order) the matched change in constrained on injection quantity for *schedules s* and *s'* is set such that:

- if s' = s-1 it equals the minimum of
  - the greater of zero and the negative of the value of the change in constrained up injection quantity at *schedule s*; and
  - the greater of zero and the value of the change in constrained up injection quantity at *schedule s'.*
- if s' < s-1 it equals the minimum of
  - the greater of zero and the negative of the value of the change in constrained up injection quantity at *schedule s* less the sum over all *schedules s"* from *schedule s'+1* to *schedule s-1* of the matched change in constrained on injection quantity for schedules *s"* and *s.*
  - the greater of zero and the value of the change in constrained up injection quantity at *schedule s,'* less the sum over all *schedules s"* from *schedule s'+1* to *schedule* s-1 of the matched change in constrained on injection quantity for schedules *s'* and *s"*.

This is calculated as follows for all s= 2 to 5 and for all s'=s-1, s-2,…1 where calculations are first performed in the order (s,s') = (2,1), (3,2), (3,1), (4,3), (4,2), (4,1), (5,4), (5,3,), (5,2) and then (5,1):

If s' = s – 1, then

$MCCUQI_{(x,point,s',s,astep]} =$

$Min(Max(0,-CUI_{(x,point,s,astep)} + CUI_{(x,point,s-1,astep)}), Max(0, CUI_{(x,point,s',astep)} - CUI_{(x,point,s'-1,astep)}))$

Otherwise

$MCCUQI_{(x,point,s',s,astep]} =$

$Min(Max(0, -CUI_{(x,point,s,astep)} + CUI_{(x,point,s-1,astep)}) - \sum_{s"=s'+1 \text{ to } s-1} MCCUQI_{(x,point,s",s,astep)}),$

$Max(0, CUI_{(x,point,s',astep)} - CUI_{(x,point,s'-1,astep)}) - \sum_{s"=s'+1 \text{ to } s-1} MCCUQI_{(x,point,s',s",astep)}))$

8.3.2 Determination of the Matched Change in Constrained on Withdrawal Quantity for a Bid Step and Operating Schedule

The value of MCCUQW, the matched change in constrained on withdrawal quantity for each *participant*, for each controllable withdrawal point for each *bid* step for each combination of two different *schedules* of the *gas day* must be determined for each *schedule* in turn starting with the second *schedule* (s=2) and then iterating forwards to the last *schedule* (s=5):

For each *schedule s* and for each earlier *schedule* s' = s-1, s-2, …. 1 (in that order) the matched change in constrained on injection quantity for *schedules s* and *s'* is set such that:

- if s' = s-1 it equals the minimum of
  - the greater of zero and the negative of the value of the change in constrained up withdrawal quantity at *schedule s*, and;
  - the greater of zero and the value of the change in constrained up withdrawal quantity at *schedule s'.*

- if s' < s-1 it equals the minimum of
  - the greater of zero and the negative of the value of the change in constrained up withdrawal quantity at *schedule s* less the sum over all *schedules s"* from *schedule s'+1* to *schedule s-1* of the matched change in constrained on injection quantity for schedules *s"* and *s*
  - the greater of zero and the value of the change in constrained up withdrawal quantity at *schedule s',* less the sum over all *schedules s"* from *schedule s'+1* to *schedule* s-1 of the matched change in constrained on injection quantity for schedules *s'* and *s"*.

This is calculated as follows for all s= 2 to 5 and for all s'=s-1, s-2,…1 where calculations are first performed in the order (s,s') = (2,1), (3,2), (3,1), (4,3), (4,2), (4,1), (5,4), (5,3,), (5,2) and then (5,1):

If s' = s – 1, then

$MCCUQW_{(x,point,s',s,astep]} =$

$Min(Max(0,-CUI_{(x,point,s,astep)} + CUI_{(x,point,s-1,astep)}), Max(0, CUI_{(x,point,s',astep)} - CUI_{(x,point,s'-1,astep)}))$

Otherwise

$MCCUQW_{(x,point,s',s,astep]} =$

$Min(Max(0, -CUI_{(x,point,s,astep)} + CUI_{(x,point,s-1,astep)}) - \sum_{s"=s'+1 \text{ to } s-1} MCCUQW_{(x,point,s",s,astep)}),$

$Max(0, CUI_{(x,point,s',astep)} - CUI_{(x,point,s'-1,astep)}) - \sum_{s"=s'+1 \text{ to } s-1} MCCUQW_{(x,point,s',s",astep)})$

8.4 Calculation of Ancillary Payments for Injection Quantities

8.4.1 Calculation of Initial Injection Ancillary Payments for the Initial Operating Schedule of the Gas Day

The amount of initial injection *ancillary payment* determined for each *participant*, for each *controllable injection* point for each *bid* step for the *first schedule* in the *gas day* is determined as:

- the Constrained on injections for that *bid* step for the *first schedule* in the *gas day* for each *participant* at each supply source as determined under clause 8.1

Multiplied by a per unit amount of compensation defined as the greater of

- zero; and
- the *bid* price for the *bid* step in the first *schedule* less the *market price* for the first *schedule* in the *gas day*

For the avoidance of doubt a positive initial injection ancillary payment value represents a payment from the market to a *MP.*

If:

- gas within a *bid* step was used for an *uplift hedge*; or,
- gas was injected without that injection being accredited to AEMO under the accreditation clauses within the NGR Rules,

then set the initial injection *ancillary payment* for that *bid* step to zero.

This is calculated as follows:

If $UH_{(x,point,astep)} = 0$ GJ and $accred_{(x,point)}$ is not null

Then $IIAP_{(x,point,s=1,astep)} = CUI_{(x,point,s=1,astep)} * Max(0, Pi_{(x,point,S=1,astep)} - MP_{(S=1)})$

Else $IIAP_{(x,point,s=1,astep)} = \$0$

8.4.2 Calculation of Initial Injection Ancillary Payments for each Revised Operating Schedule of the Gas Day

The amount of initial injection *ancillary payment* determined for each *participant*, for each *controllable injection* point for each *bid* step for each *revised schedule* is determined as:

The change in constrained up injection quantity for the current *schedule* which is defined as:

- the Constrained on injections for that adjusted *bid* step for the current *schedule* for each *participant* at each supply source as determined under clause 8.1 less
- the Constrained on injections for that adjusted *bid* step for the previous *schedule* for each *participant* at each supply source as determined under clause 8.1

Multiplied by a per unit amount of compensation defined as the greater of

- zero; and
- the current schedule *bid* price for the *bid* step less the current schedule *market price*

For the avoidance of doubt a positive initial injection ancillary payment value represents a payment from the market to a *MP.*

If:

- gas within a *bid* step was used for an *uplift hedge*; or,
- gas was injected without that injection being accredited to AEMO under the accreditation clauses within the NGR Rules,

then set the initial injection *ancillary payment* for that *bid* step to zero.

This is calculated as follows:

If $UH_{(x,point,astep)} = 0$ GJ and $accred_{(x,point)}$ is not null

Then $IIAP_{(x,point,s=n,astep)} = [CUI_{(x,point,s=n,astep)} - CUI_{(x,point,s=n-1,astep)}] * Max(0, Pi_{(x,point,S=n,astep)} - MP_{(S=n)})$

where n>1

Else $IIAP_{(x,point,s=n,astep)} = \$0$

8.4.3 Calculation of Revised Injection Ancillary Payments

8.4.3.1 For the Initial Operating Schedule of the Gas Day

The amount of revised injection *ancillary payment* determined for each *participant*, for each *controllable injection* point for each *bid* step for the *first schedule* in the *gas day* is equal to the initial injection *ancillary payment* for that *bid* step for the *first schedule* in the *gas day* for that *participant* at that *controllable injection* point as determined under clause 8.4.1.

This is calculated as follows:

$RIAP_{(x,point,s=1,astep)} = IIAP_{(x,point,s=1,astep)}$

8.4.3.2 For each Revised Operating Schedule of the Gas Day

The amount of revised injection *ancillary payment* determined for each *participant*, for each *controllable injection* point for each *bid* step for the *revised schedule* in the *gas day* is determined as:

- The initial injection *ancillary payment* for that *bid* step for that current *schedule* for that *participant* at that supply source as determined under clause 8.4.2 if this value is greater-than-or-equal to zero.
- Otherwise, the sum over all prior *schedules* in the *gas day* of
  - minus one multiplied by the matched change in constrained on injection quantity of the current *schedule* and the prior *schedule* as determined under clause 8.3.1.

  Multiplied by a per unit amount of compensation defined as the greater of
  - zero; and
    - the lesser of the *bid* price for the *bid* step in the current *schedule and the bid* price for the *bid* step in the prior *schedule*
    - less the *market price* for the current *schedule*

For the avoidance of doubt a positive revised injection ancillary payment value represents a payment from AEMO to a *MP.*

If:

- gas within a *bid* step was used for an *uplift hedge*; or,
- gas was injected without that injection being accredited to AEMO under the accreditation clauses within the NGR Rules,

then set the revised injection *ancillary payment* for that *bid* step to zero.

This is calculated as follows:

If $IIAP_{(x,point,s=n,astep)} \geq 0$ then $RIAP_{(x,point,s=n,astep)} = IIAP_{(x,point,s=n,astep)}$

If $IIAP_{(x,point,s=n,astep)} < 0$ and $UH_{(x,point,astep)} = 0$ GJ and $accred_{(x,point)}$ is not null

Then

$RIAP_{(x,point,s=n,astep)} = \sum_{s'=1 \text{ to } s-1}(-MCCUQI_{(x,point,s',s,astep])} * Max(0,Min(Pi_{(x,point,s',astep),}Pi_{(x,point,s=n,astep)}) - MP_{(s=n)})$

where n>1

Else $RIAP_{(x,point,s=n,astep)} = \$0$

8.4.4 Calculation of Modified Injection Ancillary Payments

8.4.4.1 For the Initial Operating Schedule of the Gas Day

The amount of modified injection *ancillary payment* determined for each *participant*, for each *controllable injection* point for each *bid* step for the *first schedule* in the *gas day* is equal to the initial injection *ancillary payment* for that *bid* step for the *first schedule* in the *gas day* for that *participant* at that *controllable injection* point as determined under clause 8.4.1.

This is calculated as follows:

$MIAP_{(x,point,s=1,astep)} = IIAP_{(x,point,s=1,astep)}$

8.4.4.2 For each Revised Operating Schedule of the Gas Day

The amount of modified injection *ancillary payment* determined for each *participant*, for each *controllable injection* point for each *bid* step for the *revised schedule* in the *gas day* is determined as:

- The initial injection *ancillary payment* for that *bid* step for that current *schedule* for that *participant* at that supply source as determined under clause 8.4.2 if this value is greater-than-or-equal to zero.
- Otherwise, the sum over all prior *schedules* in the *gas day* of
  - minus one multiplied by the matched change in constrained on injection quantity of the current *schedule* and the prior *schedule* as determined under clause 8.3.1.

  Multiplied by a per unit amount of compensation defined as the greater of
  - zero; and
    - the *modified bid* price for the *bid* step in the current *schedule*
    - less the *modified market price* for the current *schedule*

For the avoidance of doubt a positive revised injection ancillary payment value represents a payment from AEMO to a *MP.*

If:

- gas within a *bid* step was used for an *uplift hedge*; or,
- gas was injected without that injection being accredited to AEMO under the accreditation clauses within the NGR Rules,

then set the modified injection *ancillary payment* for that *bid* step to zero.

This is calculated as follows:

If $IIAP_{(x,point,s=n,astep)} \geq 0$ then $MIAP_{(x,point,s=n,astep)} = IIAP_{(x,point,s=n,astep)}$

If $IIAP_{(x,point,s=n,astep)} < 0$ and $UH_{(x,point,astep)} = 0$ GJ and $accred_{(x,point)}$ is not null

Then

$MIAP_{(x,point,s=n,astep)} = \sum_{s'=1 \text{ to } s-1}(-MCCUQI_{(x,point,s',s,astep])}*Max(0, MBPi_{(x,point,s',s,astep)} - MMP_{(s',s)})$

where

$n>1$

$MBPi_{(x,point,s',s,astep)} = Pi_{(x,point,s',astep)}$

$MMP_{(s',s)} = MP_{(s')}$

Else $MIAP_{(x,point,s=n,astep)} = \$0$

8.4.5 Calculation of final Injection Ancillary Payments for the Initial Operating Schedule of the Gas Day

The amount of *final ancillary payment* to be paid to each *participant*, for each *controllable injection* point for each *bid* step for the *first schedule* in the *gas day* is determined as equalling the revised injection *ancillary payment*:

This is calculated as follows:

$AP_{(x,point,s=1,astep)} = IIAP_{(x,point,s=1,astep)}$

For the avoidance of doubt, the AP Clawback feature has no impact on the *first schedule* of a *gas day.*

8.4.6 Calculation of final Injection Ancillary Payments for each Revised Operating Schedule of the Gas Day

The settlement system is to have the capability of having the AP Clawback feature enable or disabled for any given gas day. Once the feature is enabled for a gas day any resettlement of that gas day is to be run with the feature enabled. Likewise if the feature is disabled for a gas day any resettlement of that gas day is to be run with the feature disabled.

The amount of *final ancillary payment* to be paid to each *participant*, for each *controllable injection* point for each *bid* step for the *revised schedule* in the *gas day* equals:

If the Ancillary Payment clawback mechanism is disabled, then the *final ancillary payment* equals the initial injection *ancillary payment*,

Otherwise if $Flagi_{(x,point,astep,s)}$ is set to 1 (because the bid price was not submitted), the *final ancillary payment* equals the modified injection *ancillary payment*,

Otherwise if $Flagi_{(x,point,astep,s)}$ is set to 0 and the following statement is false

- the sum of all revised injection *ancillary payments* across all participants, controllable injection points and all bid steps for the current schedule is greater than zero,
- and the initial injection *ancillary payment* is less than zero,
- and it is false to state that all revised injection ancillary payments equal the corresponding initial injection ancillary payment for each participant, controllable injection point, and bid step for the revised schedule,

Then the revised injection *ancillary payment* for that *participant*, *controllable injection* and *bid* step for the current *schedule.*

Otherwise the greater of

- the initial injection *ancillary payment*, and
- the revised injection *ancillary payment* plus a term calculated as the average rate of *ancillary payment* multiplied by the value of the change in constrained on injection quantity for the current *schedule.*

Where the average rate of *ancillary payment* is determined as the sum of all revised injection *ancillary payments* across all *participants*, controllable *injection* points and all *bid* steps for the current *schedule*. divided by the greater of

- The sum over all *participants*, controllable *injection* points and all *bid* steps for the current *schedule* of the positive valued instances of change in constrained on injection quantity for the current *schedule*
- Negative one multiplied by the sum over all *participants*, controllable *injection* points and all *bid* steps for the current *schedule* of the negative valued instances of the change in constrained on injection quantity for the current *schedule.*

This is calculated as follows

If the Ancillary Payment clawback mechanism is disabled, then

$$AP_{(x,point,s=n,astep)} = IIAP_{(x,point,s=n,astep)}$$

else if $Flagi_{(x,point,astep,s)} = 1$,

$$AP_{(x,point,s=n,astep)} = MIAP_{(x,point,s=n,astep)}$$

else if $Flagi_{(x,point,astep,s)}$ $AP_{(x,point,s=n,astep)tep,s)} = 0$,

calculate $TPRAP_{(s=n)} = \sum_{\text{all x, all points, all steps}} RIAP_{(x,point,s=n,astep)}$

If it is false to state that

- TPRAP(s=n) > 0
- and $IIAP_{(x,point,s=n,astep)} < 0$
- and it is false to state that $RIAP_{x,point,s=n,astep)} = IIAP_{(x,point,s=n,astep)}$ for all *participants*, controllable *injection* points, and *bid* steps for the *current schedule*

Then $AP_{(x,point,s=n,astep)} = RIAP_{(x,point,s=n,astep)}$

Else

$AP_{(x,point,s=n,astep)} = Max(IIAP_{(x,point,s=n,astep)} , RIAP_{(x,point,s=n,astep)} + AVRAP_{(s=n)} * [CUI_{(x,point,s=n,astep)} - CUI_{(x,point,s=n-1,astep)}])$

Where

$AVRAP_{(s=n)} = TPRAP_{(s=n)} / Max(PCCUC_{(s=n)} , -NCCUC_{(s=n)})$ if $Max(PCCUC_{(s=n)} , -NCCUC_{(s=n)})$ is not 0

$AVRAP_{(s=n)} = 0$ if $Max(PCCUC_{(s=n)} , -NCCUC_{(s=n)}) = 0$

$PCCUC_{(s=n)} = \sum_{all\ x,\ all\ points,\ all\ steps} Max(0, IF(UH_{(x,point,astep)} = 0\ GJ$ and $accred_{(x,point)}$ is not null, $CUI_{(x,point,s=n,astep)} - CUI_{(x,point,s=n-1,astep)},0))$

$NCCUC_{(s=n)} = \sum_{all\ x,\ all\ points,\ all\ steps} Min(0, IF(UH_{(x,point,astep)} = 0\ GJ$ and $accred_{(x,point)}$ is not null,

$CUI_{(x,point,s=n,astep)} - CUI_{(x,point,s=n-1,astep)},0))$

8.5 Calculation of Ancillary Payments for Withdrawal Quantities

8.5.1 Calculation of Initial Withdrawal Ancillary Payments for the Initial Operating Schedule of the Gas Day

The amount of initial withdrawal *ancillary payment* determined for each *participant*, for each controllable withdrawal point for each *bid* step for the first *schedule* in the *gas day* is determined as:

- the Constrained on withdrawal quantity for that *bid* step for the first *schedule* in the *gas day* for each *participant* at each supply source as determined under clause 8.2

Multiplied by a per unit amount of compensation defined as the greater of

- zero; and
- the *market price* less the *bid* price for the *bid* step in the first *schedule* of the *gas day*

For the avoidance of doubt a positive initial withdrawal ancillary payment value represents a payment from the market to a *MP.*

If gas was withdrawn without that withdrawal being accredited to *AEMO* under the accreditation clauses within the NGR Rules, then the initial withdrawal *ancillary payment* for that *bid* step is zero.

This is calculated as follows:

If $accred_{(x,point)}$ is not null

Then $IWAP_{(x,point,s=1,astep)} = CUW_{(x,point,s=1,astep)} * Max(0, MP_{(S=1)} - Pi_{(x,point,S=1,astep)})$

Else $IWAP_{(x,point,s=1,astep)} = \$0$

8.5.2 Calculation of Initial Withdrawal Ancillary Payments for each Revised Operating Schedule of the Gas Day

The amount of initial withdrawal *ancillary payment* determined for each *participant*, for each controllable withdrawal point for each *bid* step for each revised *schedule* is determined as:

The change in constrained up withdrawal quantity for the current *schedule* which is defined as:

- the Constrained on withdrawals for that *bid* step for the current *schedule* for each *participant* at each supply source as determined under clause 8.2 less
- the Constrained on withdrawals for that *bid* step for the previous schedule for each *participant* at each supply source as determined under clause 8.2

Multiplied by a per unit amount of compensation defined as the greater of

- zero; and
- the current schedule *market price* less the current *schedule bid* price for the *bid* step

For the avoidance of doubt a positive initial withdrawal ancillary payment value represents a payment from the market to a *MP.*

If gas was withdrawn without that withdrawal being accredited to AEMO under the accreditation clauses within the NGR Rules, then set the initial withdrawal *ancillary payment* for that *bid* step to zero.

This is calculated as follows:

If $accred_{(x,point)}$ is not null

Then $IWAP_{(x,point,s=n,astep)} = [\ CUW_{(x,point,s=n,astep)} - CUW_{(x,point,s=n-1,astep)}\ ] * Max(0,\ MP_{(S=n)} - Pi_{(x,point,S=n,astep)}\ )$

where n>1

Else $IWAP_{(x,point,s=n,astep)} = \$0$

8.5.3 Calculation of Revised Withdrawal Ancillary Payments

8.5.3.1 For the Initial Schedule of the Gas Day

The amount of revised withdrawal *ancillary payment* determined for each *participant*, for each *controllable withdrawal* point for each *bid* step for the *first schedule* in the *gas day* is equal to the initial withdrawal *ancillary payment* for that *bid* step for the *first schedule* in the *gas day* for that *participant* at that *controllable withdrawal* point as determined under clause 8.5.1.

This is calculated as follows:

$RWAP_{(x,point,s=1,astep)} = IWAP_{(x,point,s=1,astep)}$

8.5.3.2 For each Revised Operating Schedule of the Gas Day

The amount of revised withdrawal *ancillary payment* determined for each *participant*, for each *controllable withdrawal* point for each *bid* step for the *revised schedule* in the *gas day* is determined as:

- The initial withdrawal *ancillary payment* for that *bid* step for that current *schedule* for that *participant* at that supply source as determined under clause 8.5.2 if this value is greater-than-or-equal to zero.

- Otherwise, the sum over all prior *schedules* in the *gas day* of
  - minus one multiplied by the matched change in constrained on withdrawal quantity of the current *schedule* and the prior *schedule* as determined under clause 8.3.2.

  Multiplied by a per unit amount of compensation defined as the greater of
  - zero; and
    - the *market price* for the current *schedule*
    - less the greater of the *bid* price for the *bid* step in the current *schedule and the bid* price for the *bid* step in the prior *schedule*

For the avoidance of doubt a positive revised withdrawal ancillary payment value represents a payment from AEMO to a *MP.*

If gas was withdrawan without that withdrawal being accredited to AEMO under the accreditation clauses within the NGR Rules then set the revised withdrawal *ancillary payment* for that *bid* step to zero.

This is calculated as follows:

If $IWAP_{(x,point,s=n,astep)} \geq 0$ then $RWAP_{(x,point,s=n,astep)} = IWAP_{(x,point,s=n,astep)}$

If $IWAP_{(x,point,s=n,astep)} < 0$ and $accred_{(x,point)}$ is not null

Then

$RWAP_{(x,point,s=n,astep)} = \sum_{s'=1 \text{ to } s-1}(-MCCUQW_{(x,point,s',s,astep]})*Max(0, MP_{(s=n)} - Max(Pi_{(x,point,s',astep)}, Pi_{(x,point,s=n,astep)}))$

where n>1

Else $RWAP_{(x,point,s=n,astep)} = \$0$

8.5.4 Calculation of Modified withdrawal Ancillary Payments

8.5.4.1 For the Initial Operating Schedule of the Gas Day

The amount of revised withdrawal *ancillary payment* determined for each *participant*, for each *controllable withdrawal* point for each *bid* step for the *first schedule* in the *gas day* is equal to the initial withdrawal *ancillary payment* for that *bid* step for the *first schedule* in the *gas day* for that *participant* at that *controllable withdrawal* point as determined under clause 8.5.1.

This is calculated as follows:

$MWAP_{(x,point,s=1,astep)} = IWAP_{(x,point,s=1,astep)}$

8.5.4.2 For each Revised Operating Schedule of the Gas Day

The amount of modified withdrawal *ancillary payment* determined for each *participant*, for each *controllable withdrawal* point for each *bid* step for the *revised schedule* in the *gas day* is determined as:

- The initial withdrawal *ancillary payment* for that *bid* step for that current *schedule* for that *participant* at that supply source as determined under clause 8.5.2 if this value is greater-than-or-equal to zero.
- Otherwise, the sum over all prior *schedules* in the *gas day* of
  - minus one multiplied by the matched change in constrained on withdrawal quantity of the current *schedule* and the prior *schedule* as determined under clause 8.3.2.

  Multiplied by a per unit amount of compensation defined as the greater of

- zero; and
    - the *modified market price* for the current *schedule*
    - less the *modified bid* price for the *bid* step in the current *schedule*

For the avoidance of doubt a positive revised withdrawal ancillary payment value represents a payment from AEMO to a *MP.*

If gas was withdrawan without that withdrawal being accredited to AEMO under the accreditation clauses within the NGR Rules then set the modified withdrawal *ancillary payment* for that *bid* step to zero.

This is calculated as follows:

If $IWAP_{(x,point,s=n,astep)} \geq 0$ then $MWAP_{(x,point,s=n,astep)} = IWAP_{(x,point,s=n,astep)}$

If $IWAP_{(x,point,s=n,astep)} < 0$ and $accred_{(x,point)}$ is not null

Then

$MWAP_{(x,point,s=n,astep)} = \sum_{s'=1 \text{ to } s-1}(-MCCUQW_{(x,point,s',s,astep])}*Max(0, MMP_{(s',s)} - MBPi_{(x,point,s',s,astep)})$

where

n>1

$MBPi_{(x,point,s',s,astep)} = Pi_{(x,point,s',astep)}$

$MMP_{(s',s)} = MP_{(s')}$

Else $MWAP_{(x,point,s=n,astep)} = \$0$

8.5.5 Calculation of final withdrawal Ancillary Payments for the Initial Operating Schedule of the Gas Day

The amount of *ancillary payment* to be paid to each *participant*, for each *controllable withdrawal* point for each *bid* step for the *first schedule* in the *gas day* is determined as equalling the revised withdrawal *ancillary payment*:

This is calculated as follows:

$AP_{(x,point,s=1,astep)} = IWAP_{(x,point,s=1,astep)}$

For the avoidance of doubt, the AP Clawback feature has no impact on the *first schedule* of a *gas day.*

8.5.6 Calculation of final withdrawal Ancillary Payments for each Revised Schedule of the Gas Day

The settlement system is to have the capability of having the AP Clawback feature enable or disabled for any given gas day. Once the feature is enabled for a gas day any resettlement of that gas day is to be run with the feature enabled. Likewise if the feature is disabled for a gas day any resettlement of that gas day is to be run with the feature disabled.

The amount of *ancillary payment* to be paid to each *participant*, for each *controllable withdrawal* point for each *bid* step for the *revised schedule* in the *gas day* equals:

If the Ancillary Payment clawback mechanism is disabled then the initial withdrawal *ancillary payment*,

Otherwise if $Flagw_{(x,point,astep,s)}$ is set to 1 (because the bid price was not submitted by MP), the *final ancillary payment* equals the modified withdrawal *ancillary payment*,

Otherwise if $Flagw_{(x,point,astep,s)}$ is set to 0 and the following statement is false

- the sum of all revised withdrawal *ancillary payments* across all participants, *controllable withdrawal* points and all bid steps for the current schedule is greater than zero,
- and the initial withdrawal *ancillary payment* is less than zero,
- and it is false to state that all revised withdrawal ancillary payments equal the corresponding initial withdrawal ancillary payment for each participant, controllable withdrawal point, and bid step for the revised schedule,

Then the revised withdrawal *ancillary payment* for that *participant*, *controllable withdrawal* point and *bid* step for the current *schedule.*

Otherwise the greater of

- the initial withdrawal *ancillary payment*, and
- the revised withdrawal *ancillary payment* plus a term calculated as the average rate of *ancillary payment* multiplied by the value of the change in constrained on withdrawal quantity for the current *schedule.*

Where the average rate of *ancillary payment* is determined as the sum of all revised withdrawal *ancillary payments* across all *participants*, *controllable withdrawal* points and all *bid* steps for the current *schedule*. divided by the greater of

- The sum over all *participants*, *controllable withdrawal* points and all *bid* steps for the current *schedule* of the positive valued instances of change in constrained up withdrawal quantity for the current *schedule*
- Negative one multiplied by the sum over all *participants*, *controllable withdrawal* points and all *bid* steps for the current *schedule* of the negative valued instances of the change in constrained up withdrawal quantity for the current *schedule.*

This is calculated as follows

If the Ancillary Payment clawback mechanism is disabled, then $AP_{(x,point,s=n,astep)} = IWAP_{(x,point,s=n,astep)}$

else if $Flagw_{(x,point,astep,s)} = 1$,

$AP_{(x,point,s=n,astep)} = MWAP_{(x,point,s=n,astep)}$

else if $Flagw_{(x,point,astep,s)}$ $AP_{(x,point,s=n,astep)tep,s)} = 0$,

calculate Otherwise

$TPRAP_{(s=n)} = \sum_{\text{all x, all points, all steps}} RWAP_{(x,point,s=n,astep)}$

If it is false to state that

- $TPRAP_{(s=n)} > 0$
- and $IWAP_{(x,point,s=n,astep)} < 0$
- and it is false to state that $RWAP_{x,point,s=n,astep)} = IWAP_{(x,point,s=n,astep)}$ for all *participants*, *controllable withdrawal* points, and *bid* steps for the *current schedule*

Then $AP_{(x,point,s=n,astep)} = RWAP_{(x,point,s=n,astep)}$

Else

$AP_{(x,point,s=n,astep)} = Max(IWAP_{(x,point,s=n,astep)}, RWAP_{(x,point,s=n,astep)} + AVRAP_{(s=n)} * [CUW_{(x,point,s=n,astep)} - CUW_{(x,point,s=n-1,astep)}])$

Where

$AVRAP_{(s=n)} = TPRAP_{(s=n)} / Max(PCCUC_{(s=n)}, -NCCUC_{(s=n)})$ if $Max(PCCUC_{(s=n)}, -NCCUC_{(s=n)})$ is not 0

$AVRAP_{(s=n)} = 0$ if $Max\,(PCCUC_{(s=n)}, -NCCUC_{(s=n)}) = 0$

$PCCUC_{(s=n)} = \sum_{all\ x,\ all\ points,\ all\ steps} Max(0, IF(accred_{(x,point)}$ is not null, $CUW_{(x,point,s=n,astep)} - CUW_{(x,point,s=n-1,astep)}, 0))$

$NCCUC_{(s=n)} = \sum_{all\ x,\ all\ points,\ all\ steps} Min(0, IF(accred_{(x,point)}$ is not null, $CUW_{(x,point,s=n,astep)} - CUW_{(x,point,s=n-1,astep)}, 0))$

8.5.7 Calculation of Average Ancillary Payments rates

The average rates for positive and negative *ancillary payments* are calculated for each schedule and used to cap the positive and negative uplift rates ($/GJ) respectively which are incurred by any MPs. Any residual or excess uplift, whether positive or negative, is to be allocated to common uplift. Refer to section 8 in the Uplift Payment functional design which prescribes how these uplift caps are applied in the uplift process.

The average rate for positive *ancillary payment* for a schedule is determined by:

> the sum of the positive *final ancillary payments* across all *participants*, *all controllable injection* and *withdrawal* points and all *bid steps* for that schedule, divided by the sum of the positive changes in constrained up injection and withdrawal quantities across all *participants*, *controllable injection* and *withdrawal* points and all *bid steps for that schedule*.

and is calculated as follows:

$PAVAPR_{(s)}=$

If $(IPCCUC_{(S=n)} + WPCCUC_{(S=n)}) = 0$, Then 0,

Else $(\sum_{all\ x,\ all\ points,\ all\ steps} Max(0,IAP_{(x,point,s=n,astep)}) + \sum_{all\ x,\ all\ points,\ all\ steps} Max(0,WAP_{(x,point,s=n,astep)}))$
$/ (IPCCUC_{(S=n)} + WPCCUC_{(S=n)})$

The average rate for the negative *ancillary payment* rate is determined for each schedule by:

> the sum of the negative *final ancillary payments* across all *participants*, *controllable injection* and *withdrawal* points and all *bid steps* for the schedule, divided by the sum of the negative changes in constrained up injection and withdrawal quantities across all *participants*, *controllable injection* and *withdrawal* points and all *bid steps for the schedule*.

and is calculated as follows:

$NAVAPR_{(s)}=$

If $(INCCUC + WNCCUC) = 0$, Then 0,

Else $(\sum_{all\ x,\ all\ points,\ all\ steps} Min(0,IAP_{(x,point,s,astep)}) + \sum_{all\ x,\ all\ points,\ all\ steps} Min(0,WAP_{(x,point,s=n,astep)}))$ /
$(INCCUC_{(S=n)} + WNCCUC_{(S=n)})$

Where

$IAP_{(x,point,s,astep)}= AP_{(x,point,s,astep)}$ where the $AP_{(x,point,s,astep)}$ are determined under clause 8.4.5. and 8.4.6.

$WAP_{(x,point,s,astep)}= AP_{(x,point,s,astep)}$ where the $AP_{(x,point,s,astep)}$ are determined under clause 8.5.5. and 8.5.6.

$IPCCUC_{(S=n)} = PCCUC_{(S=n)}$ as determined under clause 8.4.6.

$INCCUC_{(S=n)}= NCCUC_{(S=n)}$ as determined under clause 8.4.6.

$WPCCUC_{(S=n)}$ = $PCCUC_{(S=n)}$ as determined under clause 8.5.6.

$WNCCUC_{(S=n)}$ = $NCCUC_{(S=n)}$ as determined under clause 8.5.6.

Note that the $PAVAPR_{(s)}$ and $NAVAPR_{(s)}$ are always >=0.

The average ancillary payment rates are to be calculated before the flip flop algorithm is applied.

9.0 Calculation of Total *Uplift Payment* By Schedule

9.1 Application of Section 9

This Section 9 is only to be applied to settlement calculations for gas days on or after 1 May 2008 and only to calculations stored in the *settlement database* (not *TMM*).

9.2 Determination of the Total Ancillary Payments By Schedule

The total *ancillary payment* by *schedule* is determined as the sum over all *participants* of the *ancillary payment* to be paid by or to each *participant*, for each controllable withdrawal point or *controllable injection* point for each *bid* step for that *schedule.*

For schedule s this is calculated as follows.

$TAP_{(s)}$ = $ITAP_{(s)}$ + $WTAP_{(s)}$

where

$ITAP_{(s)} = \sum_{x,point,s,astep} AP_{(x,point,s,astep)}$ where the $AP_{(x,point,s,astep)}$ are determined under clause 8.4.5 and 8.4.6.

$WTAP_{(s)} = \sum_{x,point,s,astep} AP_{(x,point,s,astep)}$ where the $AP_{(x,point,s,astep)}$ are determined under clause 8.5.5 and 8.5.6.

9.3 Determination of the Total Adjusted Ancillary Payments By Schedule (adjustments for AP flip flops)

The total adjusted *ancillary payment* associated with each *schedule* must be determined for each *schedule* in turn starting with the first *schedule* (s=1) and then iterating to the last *schedule* (s=5). Positive total ancillary payments at one schedule will be offset with negative total ancillary payments at another schedule calculated in accordance with Section 8 of this functional design.

For each *schedule s*

- if s=1 or the total *ancillary payment* for *schedule s*>1 is greater than or equal to zero then the total adjusted *ancillary payment* for *schedule s* is set to the maximum of zero and minimum over all *schedules s*' from *schedule s* to *schedule* 5 of the sum over all *schedules* s" from *schedule s* to *schedule s'* of the total *ancillary payments* for those *schedules*. This is calculated as follows:

  $TAAP_{(s)}$ = Max(0,$Min_{s'=s\ to\ 5}(\sum_{s"=s\ to\ s'} TAP_{(s")}$)

- if s>1 and the total *ancillary payment* for *schedule s* is less than zero then the total adjusted *ancillary payment* for *schedule s* is set to the minimum of zero and the total *ancillary payment* for *schedule s* plus the sum over all *schedules s'* from *schedule* 1 to *schedule s-1* of $TAP_{(s')}$ minus $TAAP_{(s')}$.

  $TAAP_{(s)}$ = Min(0,TAP(s) + ($\sum_{s'=1\ to\ s-1}$ ($TAP_{(s')}$ - $TAAP_{(s')}$))

9.4 Determination of the Total Uplift Payments By Schedule

The total *uplift payment* to associate with each *schedule s* must be determined by multiplying the total *ancillary payment* for that *schedule s* by the ratio of the total adjusted *ancillary payment* to the total *ancillary payments* over a group of sequential *schedules* including *schedule s* having the same signed total *ancillary payment*.

This is calculated as follows:

$TUP_{(s)} = TAP_{(s)} * (\sum_{s' \text{ in GROUP(s)}} TAAP_{(s')}) / (\sum_{s' \text{ in GROUP(s)}} TAP_{(s')})$

Where GROUP(s) indicates the set of sequential *schedules* containing *schedule s* which have the same signed TAP(s) value as *schedule s.* The rules for defining GROUP(s) are:

- If TAP(s) ≥ 0 then GROUP(s) is the set of *schedules* from *schedule s'* where s' ≤ s to *schedule s"* where s" ≥ s which all have TAP(s) ≥ 0.
- If TAP(s)<0 then GROUP(s) is the set of *schedules* from *schedule s'* where s' ≤ s to *schedule s"* where s" ≥ s which all have TAP(s) < 0.

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Schedule 1. Requirements

1 Outputs and reports:

The outputs defined in the associated table are to be written to tables in the *settlements database*, and associated reports on the MIBB are to provide views into the tables, restricted for participants to that information relating to their own settlements only.

- warnings and associated information are to be provided to the AEMO user of the application at the culmination of a process run;
- it is critical that both AP's and uplift are calculated using exactly the same input data, such as metering, AMDQ, AMDQ credits etc. If not, the results will be invalid. Therefore, the AP application must record the checkvalues for the validated energy transfer version id, and the check value for the validated AMDQ-AMDQ credits transfer version id, for comparison by the uplift application when it is run.
- a view of all of the outputs is to be provided to AEMO;
- each participant is to be provided with a view of information specific to them only, and in addition TAP for each schedule i.e. The total of all the ancillary payments to every participant for each schedule.

2 Requirements

Table 1. Schedule +1 hour estimate of ancillary payments (no UH, no AGINO or AGWNO) : status – permanent, updateable

information	***view***
$APi_{(x,point,s)}$, $APw_{(x,point,s)}$	AEMO, participant x only
$IIAPi_{(x,point,s)}$, $IWAPw_{(x,point,s)}$	AEMO, participant x only
$RIAPi_{(x,point,s)}$, $RWAPw_{(x,point,s)}$	AEMO, participant x only
$MCCUQI_{(x,point,s',s,astep]}$, $MCCUQW_{(x,point,s',s,astep]}$	AEMO, participant x only
$TAP_{(s)}$	AEMO, all participants
TAP	AEMO, all participants
$MSWQ_{(x,point,s,astep)}$, $MSIQ_{(x,point,s,astep)}$	AEMO, participant x only
$AGINO_{(x,point,s,astep)}$, $AGWNO_{(x,point,s,astep)}$	AEMO, participant x only
$UH_{(x,point)}$	Should be zero – not needed
$Pi_{(x,point,s,astep)}$ $Pw_{(x,point,s,astep)}$	AEMO, participant x only
$Qi^{OS}_{(x,point,s,astep)}$ $Qw^{OS}_{(x,point,s,astep)}$	AEMO, participant x only
checkvalue (validated energy transfer version id)	AEMO
checkvalue (validated AMDQ-AMDQ credit transfer version id)	AEMO

Table 2. day+3 estimate of ancillary payments (initial estimation of metering data used full AP calculation) : status – permanent, updateable

information	***view***
$API_{(x,point,s)}$, $APW_{(x,point,s)}$	AEMO, participant x only
$IIAPI_{(x,point,s)}$, $IWAPW_{(x,point,s)}$	AEMO, participant x only
$RIAPI_{(x,point,s)}$, $RWAPW_{(x,point,s)}$	AEMO, participant x only
$MCCUQI_{(x,point,s',s,astep]}$, $MCCUQW_{(x,point,s',s,astep]}$	AEMO, participant x only
$TAP_{(s)}$	AEMO, all participants
$TUP_{(s)}$	AEMO, all participants
TAP	AEMO, all participants
$MSWQ_{(x,point,s,astep)}$, $MSIQ_{(x,point,s,astep)}$	AEMO, participant x only
$AGINO_{(x,point,s,astep)}$, $AGWNO_{(x,point,s,astep)}$	AEMO, participant x only
$UH_{(x,point)}$	Should be zero – not needed
$Pi_{(x,point,s,astep)}$ $Pw_{(x,point,s,astep)}$	AEMO, participant x only
$Qi^{OS}_{(x,point,s,astep)}$ $Qw^{OS}_{(x,point,s,astep)}$	AEMO, participant x only
checkvalue (validated energy transfer version id)	AEMO
checkvalue (validated AMDQ-AMDQ credit transfer version id)	AEMO

Table 3. post end of month (metering data available): status – permanent, updateable

information	***view***
$API_{(x,point,s)}$, $APW_{(x,point,s)}$	AEMO, participant x only
$TAP_{(s)}$	AEMO, all participants
$TUP_{(s)}$	AEMO, all participants
TAP	AEMO, all participants
$MSWQ_{(x,point,s,astep)}$, $MSIQ_{(x,point,s,astep)}$	AEMO, participant x only
$AGINO_{(x,point,s,astep)}$, $AGWNO_{(x,point,s,astep)}$	AEMO, participant x only
$UH_{(x,point)}$	Should be zero – not needed
$Pi_{(x,point,s,astep)}$ $Pw_{(x,point,s,astep)}$	AEMO, participant x only
$Qi^{OS}_{(x,point,s,astep)}$ $Qw^{OS}_{(x,point,s,astep)}$	AEMO, participant x only
checkvalue (validated energy transfer version number)	AEMO
checkvalue (validated AMDQ-AMDQ credit transfer version id)	AEMO

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Schedule 2. Nomenclature

This schedule lists the inputs utilised by the ancillary payments application, the sources of this information, and defines nomenclature for the functionality described in this document.

1. General relationships

In TMM/MCE, the operational scheduled quantities are by pipeline point.

- A physical MIRN is currently associated with each pipeline point.
- At present, participants enter nominations or offers against a pipeline point (physical MIRN) for both injections and controllable withdrawals.
- Supplier and demand point constraints (SDPC) currently apply to pipeline points.
- The constraints in the offers and SDPC are modelled by the MCE formulation as applicable at pipeline points.
- Uncontrollable demand is modelled by node (input from the demand forecasting system by node).
- The results for pipeline points are summed at nodes for the purpose of reporting.

In TMM/MCE, the pricing schedule quantities are derived by pipeline point (the pricing schedule models all supply and demand at one node).

In settlements/metering database,

- the tariff D AMDQ and associated diversity factor is stored by customer site, per allocation to individual tariff D customers
- the block tariff V AMDQ is a system-wide number (not allocated to individual participants/retailers)
- tariff D withdrawals are stored by MIRN by MP who is FRO (i.e. host retailer) by day, and later grouped by customer site for customers of a MP who is FRO (i.e. host retailer).
- tariff V withdrawals are stored by MP who is FRO (i.e. host retailer) by day, across the system (i.e. not zone specific).
- total injections at each system injection point are stored by physical MIRN (which corresponds to a pipeline point).
- injections allocated to a MP by an allocation agent are stored by logical MIRN by MP for the gas day

3 Conventions

3.1 Symbols

Q	daily energy quantities (GJ)
P	energy prices ($/GJ)
AMDQ	authorised Maximum Daily Quantities (GJ)
AP	ancillary payment ($)
UH, TUH	uplift hedge quantities (GJ)
AB	Adjusted Bid

3.2 Superscripts

D	tariff D customers
V	tariff V customers
OS	operating schedule (any)
LAOS	last approved operating schedule
PS	ex ante pricing schedule (forecast)
EPS	Effective ex ante pricing schedule (forecast)
A	metered
M	market (price)
B	bid (MP)
hub	tariff D AMDQ referred to the hub
cert	certificated AMDQ credits
nom	nominated amount of AMDQ credit certificate
cred	AMDQ credits

3.3 Subscripts

i	injection
w	withdrawal
point	pipeline point (TMM/MCE); up to n points
node	node (TMM/MCE); up to n nodes
mirn	physical MIRN (metering identification registration number)
site	tariff D customer physical site location; up to N customer sites
x	MP; up to mp MPs
zone	tariff V withdrawal zone (TMM/MCE) – up to W zones
step	step of the offer (1,2,3,….10), (incl. step 0); up to 11 steps
astep	step of the offer (1,2,3,….10), (incl. step 0); up to 56 steps for injection and 55 steps for withdrawals
h	hour of the gas day (1,2,3,…..24)
s or S	schedule (1,2,3,4,5)

4 Specifics

4.1 Operating Schedule

Source: TMM database - the last approved operating schedule for the gas day being processed

$Q^{OS}_{(x,point,s)}$	Operating schedule controllable withdrawals or injections (cumulative) for MP x at pipeline point (point), in operating schedule S
$Q^{OS}_{(x,point,s,h)}$	Operating schedule controllable withdrawals or injections (cumulative) for MP x at pipeline point (point), in operating schedule S for hour h
$Q^{AHOS}_{(x,point,s,h)}$	Ad hoc operating schedule controllable withdrawals or injections (cumulative) for MP x at pipeline point (point), in operating schedule S for hour h
$Qi^{OS}_{(x,point,S,SI)}$	Operating schedule controllable injections (cumulative) for MP x at pipeline point (point), in operating schedule S for schedule interval SI
$Qw^{OS}_{(x,point,S,SI)}$	Operating schedule controllable withdrawals (cumulative) for MP x at pipeline point (point), in operating schedule S for schedule interval SI

$Qi^{OS}_{(x,point,S,astep)}$	Operating schedule controllable injections (cumulative) for MP x at pipeline point (point), in operating schedule S for adjusted bid step (astep)
$Qw^{OS}_{(x,point,S,astep)}$	Operating schedule controllable withdrawals (cumulative) for MP x at pipeline point (point), in operating schedule S for adjusted bid step (astep)

4.2 Pricing Schedule

Source: TMM database - the approved ex-post pricing schedule for the gas day being processed

$Q^{EPS}_{(x,point,s)}$	Controllable withdrawals or Injections scheduled for MP x by point, in pricing schedule S
$Q^{PS}_{(x,point,s,h)}$	Controllable withdrawals or Injections scheduled for MP x by point, in pricing schedule S for hour h
$Qi^{EPS}_{(x,point,s,\ astep)}$	Effective pricing schedule controllable injections for MP x by point, in pricing schedule S for adjusted bid step (astep)
$Qw^{EPS}_{(x,point,s,\ astep)}$	Effective pricing schedule controllable withdrawals for MP x by point, in pricing schedule S for adjusted bid step (astep)
$MP_{(S)}$	the market price from pricing schedule (S), (or, when price is administered, the published value of the administered price).
$MSIQ_{(x,point,S,astep)}$	Minimum Scheduled Injection Quantity for MP x by point, in schedule S for adjusted bid step (astep)
$MSWQ_{(x,point,S,astep)}$	Minimum Scheduled Withdrawal Quantity for MP x by point, in schedule S for adjusted bid step (astep)

4.3 Actuals:

Source: Metering Database

$Qi^{A}_{(x,mirn)}$	Metered injections for the gas day for MP x for MIRN
$Qw^{A}_{(x,mirn)}$	Metered withdrawals for the gas day for MP x for MIRN
$Qw^{AD}_{(x,mirn)}$	Metered Tariff D withdrawals for the gas day for MP x for MIRN
$Qw^{AD}_{(x,site)}$	Metered Tariff D withdrawals for the gas day for MP x by tariff D customer site (by summing the MIRN's for the site)
$Qw^{AV}_{(x,zone)}$	Metered Tariff V withdrawals for the gas day of all tariff V customers of MP x in withdrawal zone (zone).
$Qw^{AV}_{(x)}$	Metered Tariff V withdrawals for the gas day of all tariff V customers of MP x across the system.
$Qi^{A}_{(x,point,SI)}$	Metered injections for schedule interval SI for MP x for pipeline point (point)
$Qw^{A}_{(x,point,SI)}$	Metered withdrawals for schedule interval SI for MP x for pipeline point (point)
$Qi^{EA}_{(x,point)}$	Effective Actual injections for MP x for pipeline point (point)
$Qi^{EA}_{(x,point,astep)}$	Effective Actual injections for MP x for pipeline point (point) for adjusted bid step (astep)
$Qw^{EA}_{(x,point)}$	Effective Actual withdrawals for MP x for pipeline point (point)

$Qw^{EA}_{(x,point,astep)}$	Effective Actual withdrawals for MP x for pipeline point (point) for adjusted bid step (astep)
$AGINO_{(x,point,s,astep)}$	Actual Gas Injected Negative Offset for MP x for pipeline point (point) for schedule S for adjusted bid step (astep)
$AGWNO_{(x,point,s,astep)}$	Actual Gas Withdrawn Negative Offset for MP x for pipeline point (point) for schedule S for adjusted bid step (astep)

4.4 Offers:

Source: TMM database – MP entered offers and accredited information from accredited information table(s).

$Bi_{(x,point,step,s)}$	Quantity (cumulative) by step (step) in MP x's injection bid at pipeline point (point) for schedule S.
$Bw_{(x,point,step,s)}$	Quantity (cumulative) by step (step) in MP x's withdrawal bid at pipeline point (point) for schedule S.
$BPi_{(x,point,step,s)}$	Bid Price for step (step) of MP x's injection bid at pipeline point (point) for schedule S.
$BPw_{(x,point,step,s)}$	Bid Price for step (step) of MP x's withdrawal bid at pipeline point (point) for schedule S.
$ABi_{(x,point,astep,s)}$	Quantity (cumulative) by adjusted step (astep) in MP x's adjusted injection bid at pipeline point (point) for schedule S.
$ABw_{(x,point,astep,s)}$	Quantity (cumulative) by adjusted step (astep) in MP x's adjusted withdrawal bid at pipeline point (point) for schedule S.
$Pi_{(x,point,astep,s)}$	Bid Price for adjusted step (astep) of MP x's adjusted injection bid at pipeline point (point) for schedule S. If the *administered price cap* applies then this is capped at the *administered price cap.*
$Pw_{(x,point,astep,s)}$	Bid Price for adjusted step (astep) of MP x's adjusted withdrawal bid at pipeline point (point) for schedule S. If the *administered price cap* applies then this is capped at the *administered price cap.*

4.5 AMDQ:

Source: Reference data stored in Uplift application database: the TPO liability limit (LL) is determined under the relevant Service Envelope Agreement and should initially be set at a maximum of $1,000,000 per calendar year. A liability limit of 20$ of uplift per GJ of constraint.

Source: derived – $AMDQ^{cred}$, $AMDQ^{exceed}$, residual credits, hub AMDQ, and exceedances.

$APUH_{(x,\ point,\ CPP)}$	Ancillary Payment Uplift Hedge for MP X at a system injection point "point" of a close proximity injection point CPP. This terms represents the amount of gas which is nominated to be used to hedge uplift and is hence not entitled to receive AP's
LL	Liability Limit: The TPO liability cap (refer relevant Service Envelope Agreement). This should initially be set at $1,000,000.

Q^{TPO}	The quantity in GJ by which the delivery capacity of the Longford to Melbourne pipeline is reduced due to the failure of the transmission pipeline operator to fulfil service envelope obligations.

4.6 Other:

Source: derived

$CUI_{(x,point,s,astep)}$	Constrained up injection for MP x for pipeline point (point) for schedule S for adjusted bid step (astep)
$CUW_{(x,point,s,astep)}$	Constrained up withdrawal for MP x for pipeline point (point) for schedule S for adjusted bid step (astep)
$AP_{(x,point,s,astep)}$	ancillary payment for MP x for pipeline point (point) for schedule S for adjusted bid step (astep)
IAP	Injection ancillary payment for MP x for pipeline point (point) for schedule S for adjusted bid step (astep)
WAP	Withdrawal ancillary payment for MP x for pipeline point (point) for schedule S for adjusted bid step (astep)
$PAVAPR_{(s)}$	Average rate for positive ancillary payments for schedule s
$NAVAPR_{(s)}$	Average rate for negative ancillary payments for schedule s
$accred_{(x,point)}$	Accreditation quantity for MP x for pipeline point (point)
$IIAP_{(x,point,s,astep)}$	Initial injection ancillary payment ($)for MP x for pipeline point (point) for schedule s for adjusted bid step (astep)
$RIAP_{(x,point,s,astep)}$	Revised injection ancillary payment ($) for MP x for pipeline point (point) for schedule s for adjusted bid step (astep)
$IWAP_{(x,point,s,astep)}$	Initial withdrawal ancillary payment ($)for MP x for pipeline point (point) for schedule s for adjusted bid step (astep)
$RWAP_{(x,point,s,astep)}$	revised withdrawal ancillary payment ($)for MP x for pipeline point (point) for schedule s for adjusted bid step (astep)
$MCCUQI_{(x,point,s',s,astep)}$	Matched change in constrained on injection quantity (GJ) for MP x for pipeline point (point) for schedule s' and s for adjusted bid step (astep)
$MCCUQW_{(x,point,s's,astep)}$	Matched change in constrained on withdrawal quantity (GJ) for MP x for pipeline point (point) for schedule s' and s for adjusted bid step (astep)
TPRAP(s)	Total positive revised ancillary payment ($) for schedule s. This term has a different value for injections and withdrawals
PCCUC(s)	Positive change in constrained on quantity (GJ) for schedule s (This term has a different value for injections and withdrawals)
NCCUC(s)	Negative change in constrained on quantity (GJ) for schedule s (This term has a different value for injections and withdrawals)
IPCCUC	Positive change in constrained on quantity (GJ) for schedule s (injection)
WPCCUC	Positive change in constrained on quantity (GJ) for schedule s (Withdrawals)

INCCUC	Negative change in constrained on quantity (GJ) for schedule s (Injection)
WNCCUC	Negative change in constrained on quantity (GJ) for schedule s (Withdrawals)
TAAP(s)	Total adjusted ancillary payment for schedule s.
TUP(s)	Total uplift payment for schedule s.
GROUP(s)	a group of schedules with the same signed TAP(s) value (where zero is treated as a positive value).
APC	Administered price cap ($/GJ)
$Flagi_{(x,point,astep,s)}$	Flag used to indicate whether the bid price (for MP=x, at system injection point =point, adjusted bid step = astep in schedule s) is modified.
$Flagw_{(x,point,astep,s)}$	Flag used to indicate whether the bid price (for MP=x, at system withdrawal point =point, adjusted bid step = astep in schedule s) is modified.
$MIAP_{(x,point,s=n,astep)}$	Modified injection ancillary payment for MP=x, at system injection point =point, adjusted bid step = astep in schedule s
$MWAP_{(x,point,s=n,astep)}$	Modified withdrawal ancillary payment for MP=x, at system withdrawal point =point, adjusted bid step = astep in schedule s
$MBPi_{(x,point,s',s,astep)}$	Modified bid price for MP=x, at system point =point, adjusted bid step = astep in schedule s' and schedule
$MMP_{(s',s)}$)	Matched modified market price for schedule s' and schedule