

DRAFT: FOR DISCUSSION PURPOSES ONLY

There are three elements that have to be handled:

- Payments for generation associated with the AGC basepoint
- Credits for over-generation so that regulating units over generation is treated comparably with non-regulating units over-generation
- Calculation of side payments and charges to reflect the overall settlement of energy and regulation schedules

AGC > RTD

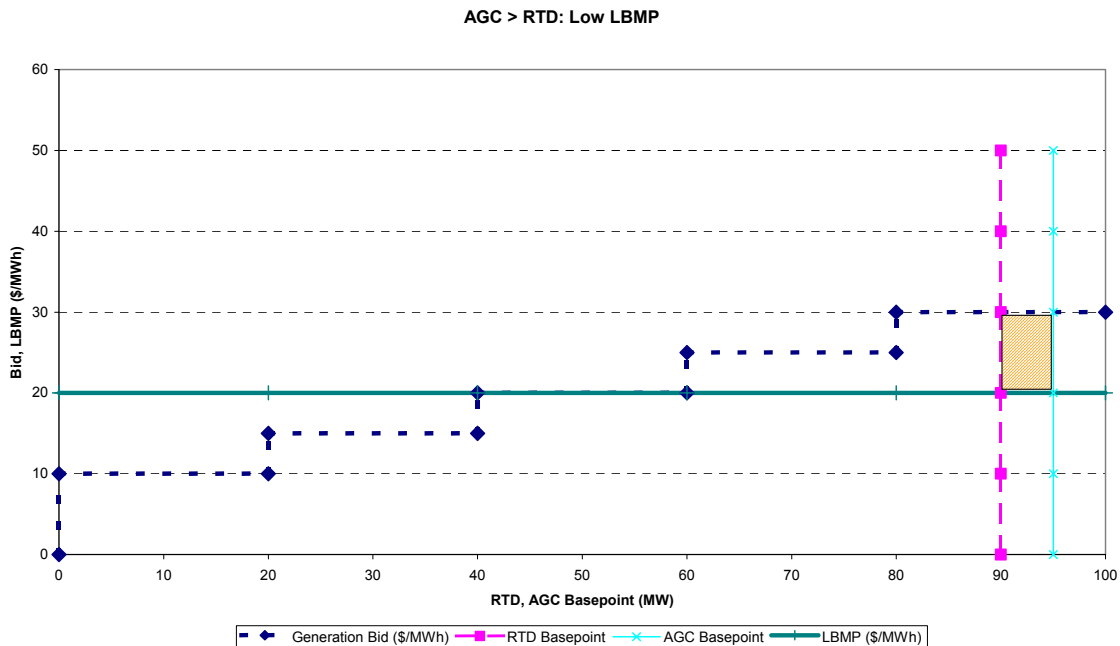
Energy Settlement

When the AGC basepoint is higher than the RTD basepoint the unit will be paid a second settlement for energy consistent with a RT energy injection equal to the lower of their actual generation or their AGC basepoint adjusted up for the 3% over-generation tolerance.

$$RT \text{ Energy} = \min(\text{Actual}, \text{AGC} + \text{tolerance})$$

{Note: RT Settlement is (RT Energy – DA Energy) * RT LBMP}

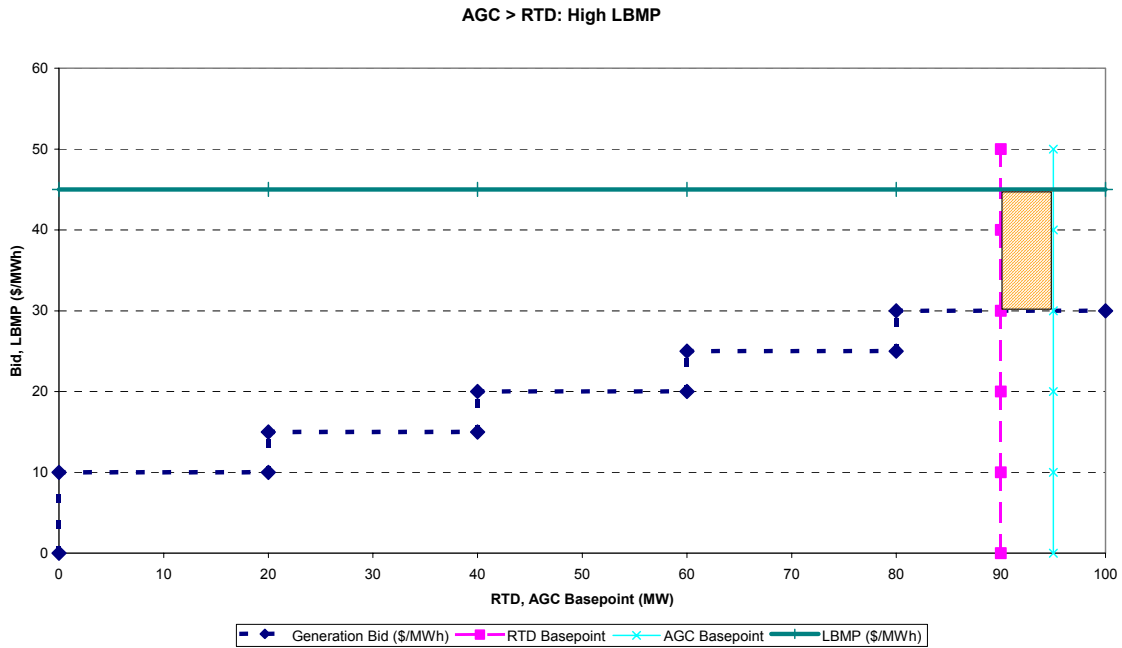
Side Payment or Charge



When the AGC Basepoint is higher than the RTD basepoint and the LBMP is below the bid of the generator, the generator will receive a side payment equal to the difference between the LBMP and its bid for each MW of energy it actually generates above its RTD basepoint up to the level of its AGC basepoint.

This is paid as an explicit side payment rather than a BPCG to ensure that the unit receives full compensation for the energy it produced as a result of AGC basepoint rather than offsetting any losses against profits earned at other times during the day.

$$SidePayment = \int_{RTD\ BP}^{\max(RTD\ BP, \min(AGC\ BP, Actual))} [Bid - LBMP]$$



When the AGC Basepoint is higher than the RTD basepoint and the LBMP is above the bid of the generator, the generator will make a side payment equal to the difference between the LBMP and its bid for each MW of energy it actually generates above its RTD basepoint up to the level of its AGC basepoint.

The LOC was already paid to the regulating units as part of the clearing price of regulation between its RTD basepoint and the RTD basepoint plus the regulation schedule. When a unit's AGC basepoint increases we need only pay its bid to get that energy as we have already through the regulation clearing price paid it to ensure that capacity is available to be sent up for AGC.

The formula for calculating the side payment is identical. The difference is that the sign of the difference between the Bid and the LBMP will be negative now that the LBMP is above the bid indicating that the generator is to make a side payment

$$SidePayment = \int_{RTD\ BP}^{\max(RTD\ BP, \min(AGC\ BP, Actual))} [Bid - LBMP]$$

The side payments, paid by, and to, the generator must be included in the RT BPCG revenue and cost streams.

The table that follows shows an example of the energy settlement and side payments that would be assessed for a unit with a 100 MW RTD BP, a 105 MW AGC BP and a 3 MW over-generation tolerance

RTD BP (MW)	AGC BP (MW)	Actual Generation (MW)	Overgeneration Tolerance (MW)	RT Energy Schedule to Settle (MW) [1]	MW Assessed Side Payment or Charge (MW) [2]	Lower Bound for Integral (MW)	Upper Bound for Integral (MW)
100	105	95	3	95	0	100	100
100	105	96	3	96	0	100	100
100	105	97	3	97	0	100	100
100	105	98	3	98	0	100	100
100	105	99	3	99	0	100	100
100	105	100	3	100	0	100	100
100	105	101	3	101	1	100	101
100	105	102	3	102	2	100	102
100	105	103	3	103	3	100	103
100	105	104	3	104	4	100	104
100	105	105	3	105	5	100	105
100	105	106	3	106	5	100	105
100	105	107	3	107	5	100	105
100	105	108	3	108	5	100	105
100	105	109	3	108	5	100	105
100	105	110	3	108	5	100	105

[1] minimum of Actual Generation or AGC basepoint plus overgeneration tolerance

[2] minimum of (Actual Generation - RTD BP) or (AGC BP - RTD BP), but not less than 0

AGC < RTD

Energy Settlement

When the AGC basepoint is higher than the RTD basepoint the unit will be paid a second settlement for energy consistent with a RT energy injection equal to the lower of their actual generation or their AGC basepoint adjusted for the 3% overgeneration tolerance.

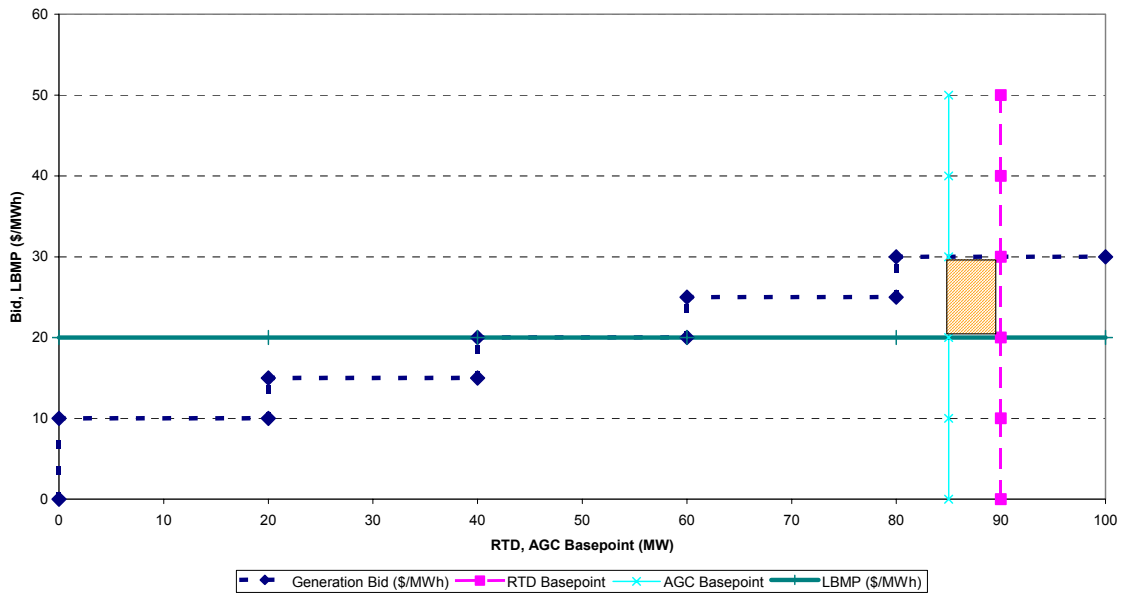
$$\text{RT Energy} = \min(\text{Actual}, \text{AGC} + \text{tolerance})$$

{Note: Settlement is (RT Energy – DA Energy) * RT LBMP}

Note also that this settlement rule is identical regardless of whether the AGC basepoint is above or below the RTD basepoint,

Side Payment or Charge

AGC < RTD: Low LBMP

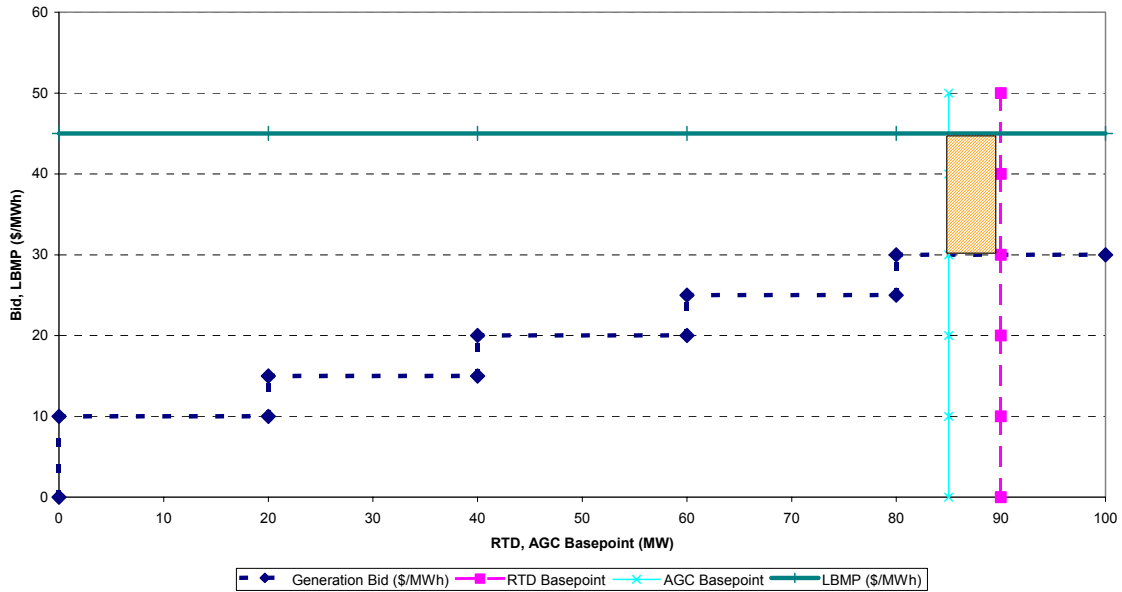


When the AGC Basepoint is lower than the RTD basepoint and the LBMP is below the bid of the generator, the generator will make a side payment equal to the difference between the LBMP and its bid for each MW of generation reduction below the RTD basepoint down to the level of its AGC basepoint.

The LOC was already paid to the regulating units as part of the clearing price of regulation between its RTD basepoint and the RTD basepoint minus the regulation schedule. When a unit's AGC basepoint decreases the generator must settle out the net real-time energy positions at its bid price.

$$SidePayment = \int_{\min(RTD\ BP, \max(AGC\ BP, Actual))}^{RTD\ BP} - [Bid - LBMP]$$

AGC < RTD: High LBMP



When the AGC Basepoint is lower than the RTD basepoint and the LBMP is above the bid of the generator, the generator will receive a side payment equal to the difference between the LBMP and its bid for each MW of generation reduction below the RTD basepoint down to the level of its AGC basepoint.

The generator is either being forced to buy out of its day-ahead position at a high price or is missing out on an opportunity to profit from generating energy it would otherwise have generated but for the reduced AGC basepoint.

This is paid as an explicit side payment rather than a BPCG to ensure that the unit receives full compensation for the energy it produced as a result of AGC basepoint rather than having the loss offset against profits at other times of the day.

The formula for calculating the side payment when the AGC basepoint is below the RTD basepoint is identical whether the LBMP is higher or lower than the generator's bid. The difference is that the sign of the difference between the bid and the LBMP will be negative now that the LBMP is above the bid indicating that combined sign of the side payment results in a payment to the generator.

$$SidePayment = \int_{\min(RTD\ BP, \max(AGC\ BP, Actual))}^{RTD\ BP} - [Bid - LBMP]$$

The side payments, paid by, and to, the generator must be included in the RT BPCG revenue and cost streams.

The table that follows shows an example of the energy settlement and side payments that would be assessed for a unit with a 100 MW RTD BP, a 95 MW AGC BP and a 3 MW over-generation tolerance

RTD BP (MW)	AGC BP (MW)	Actual Generation (MW)	Overgeneration Tolerance (MW)	RT Energy Schedule to Settle (MW) [1]	MW Assessed Side Payment or Charge (MW) [2]	Lower Bound for Integral (MW)	Upper Bound for Integral (MW)
100	95	90	3	90	5	95	100
100	95	91	3	91	5	95	100
100	95	92	3	92	5	95	100
100	95	93	3	93	5	95	100
100	95	94	3	94	5	95	100
100	95	95	3	95	5	95	100
100	95	96	3	96	4	96	100
100	95	97	3	97	3	97	100
100	95	98	3	98	2	98	100
100	95	99	3	98	1	99	100
100	95	100	3	98	0	100	100
100	95	101	3	98	0	100	100
100	95	102	3	98	0	100	100
100	95	103	3	98	0	100	100
100	95	104	3	98	0	100	100
100	95	105	3	98	0	100	100

[1] minimum of Actual Generation or AGC basepoint plus overgeneration tolerance

[2] minimum of (RTD BP - AGC BP) or (RTD BP - Actual Generation), but not less than 0

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