G Positive Flow Clamping

This appendix provides additional details on the concept of Positive Flow Clamping (PFC). PFC is presented in Chapter 5 as an alternative to zero flow clamping (the current regime) to manage negative residues under certain circumstances. As explained below, PFC has the potential to offer greater firmness of IRSR units relative to zero flow clamping.

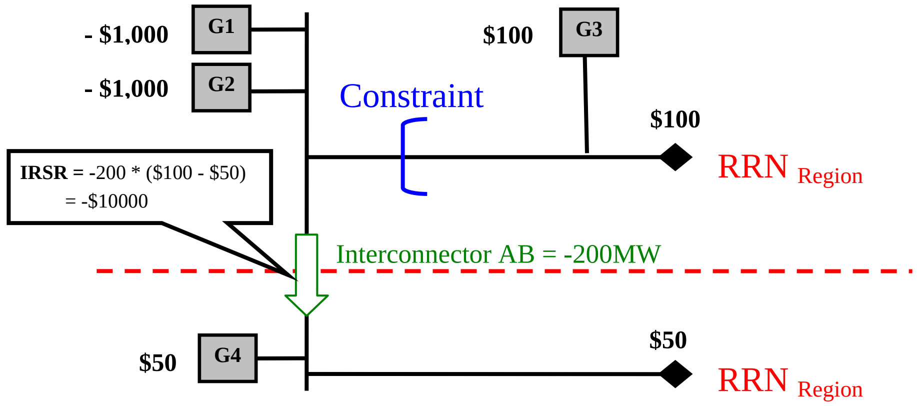
G.1 Description of PFC

Currently when NEMMCO forecasts negative settlement residue to accumulate to a level of $6000, NEMMCO reduces flow on the interconnector towards 0MW until negative residue is no longer accumulating. In simple terms the interconnector is clamped to 0MW.

PFC represents an alternative response to the same set of conditions. Under PFC, NEMMCO also clamps the flow on the interconnector but instead of clamping to 0MW the interconnector is clamped to some level of flow in the positively priced direction (i.e. from low priced region to high priced region). As with the current regime, this option would manage the accumulation of negative settlement residues, but one potential benefit of PFC is that it could make a greater contribution to the firmness of IRSR units by forcing the interconnector to flow in the positively priced direction to generate positive IRSR. When zero flow clamping is invoked, no IRSR is generated to distribute to IRSR unit holders.

This is illustrated in the example below. Constraint B prevents remote intra-regional generators, G1 and G2, from setting the price in Region B. The price in Region B is set by local intra-regional generator G3. Generators G1 and G2 are thus able to bid below cost without affecting their settlement price. If they wish to generate at the RRP of $100, they might well enter very low bids to increase their chances of dispatch. At the extreme, they bid -$1,000. This could induce counter-priced flow on the interconnector. In the absence of intervention, negative residues would accumulate.

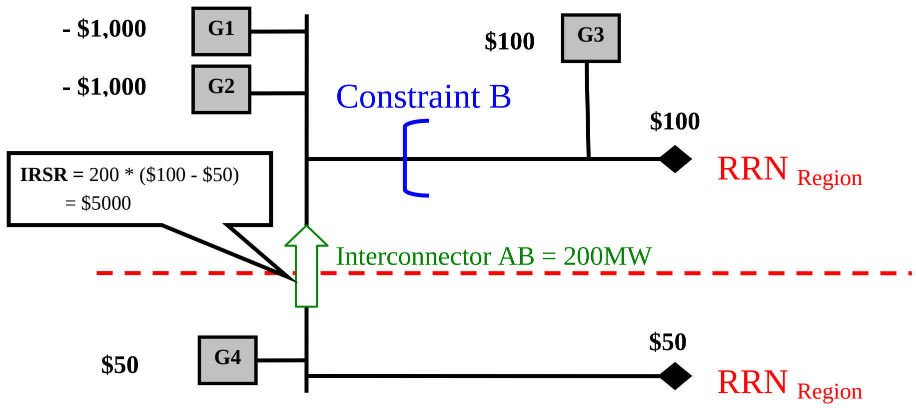
Figure G.1



When the interconnector is clamped under the current regime to zero, neither positive or negative residues accumulate. Clamping to zero manages the issue of negative settlement residues, but for the period of the clamping it renders the IRSR units useless as an inter-regional hedging instrument as zero IRSR is accumulating to distribute to IRSR unit holders. The financial impact of this situation is exacerbated if the regional price separation is high at the times when clamping is required.

PFC, by clamping the interconnector flow in the positively priced direction, will ensure funds continue to flow to the IRSR fund when intervening to manage negative residues. Taking the example discussed above and clamping the interconnector to 200MW in the positively priced direction results in a positive accumulation of IRSR (see diagram below). Thus this option eliminates the negative residues, and generates positive residues to contribute to the firmness of the IRSR units. It does, however, mean that "cheaper" generation (based on the value of bids) is backed off to a greater extent.

Figure G.2



G.2 Implementation

PFC would be implemented through the inclusion of additional discretionary constraint equations in the dispatch. We are only considering options which involve the imposition of additional constraints in respect of interconnector flows (i.e. the same form as a "clamping" constraint). This is the most direct approach, and retains the existing scope of the variables that NEMMCO has control over in the dispatch. This contrasts with an "option 1" type formulation, where interconnector flow is taken as given rather than controlled through the dispatch.

In practice, there is little difference between the implementation of the current clamping regime and PFC. In simple terms, under the current clamping regime a constraint in the form of $I/C_{Flow} > 0$ is invoked when negative residues are identified, whereas under PFC a constraint in the form of $I/C_{Flow} > k$ would be invoked under similar circumstances, where k is some positive number (assuming that the positive flow direction is from the low priced to high priced region).

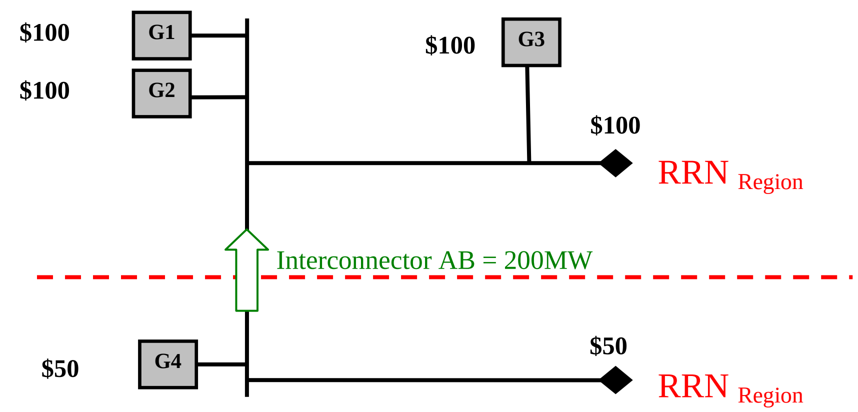
There are several approaches to establishing a value for *k* as described below.

1. **Dynamic "k"**

Under this approach, *k* is based on the actual dispatched flow on the interconnector just prior to PFC being invoked.

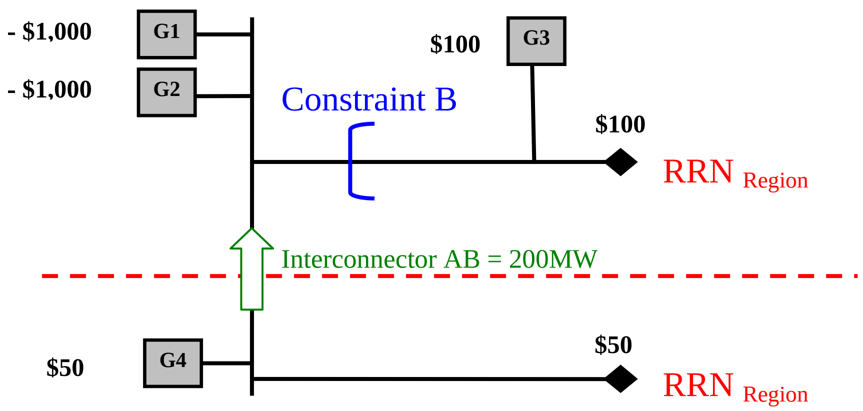
Consider the following example in which the interconnector is initially flowing in a positively priced direction from Region A to Region B.

Figure G.3



Then following the invocation on Constraint B, generators G1 and G2 are dislocated from the RRN and are thus incentivised to bid below cost to maximise dispatch.

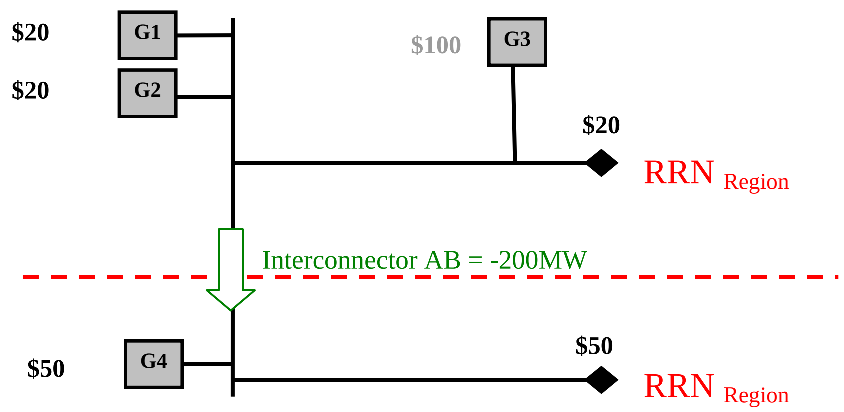
Figure G.4



In the absence of intervention, G1 and G2 would force the interconnector to turn counter-price. As this is signalled through pre-dispatch, PFC would be invoked clamping the interconnector at the pre-PFC flow of 200MW.

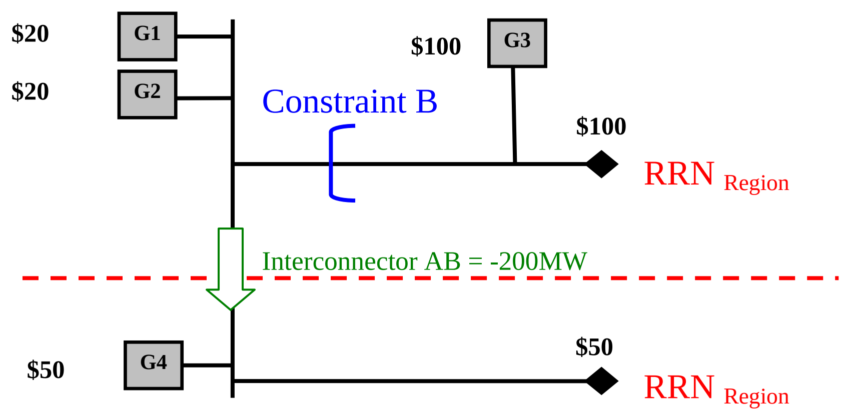
This approach to establishing a value for *k* would, however, not be workable if counter-priced flow is established by a change in relative regional prices rather than a change in interconnector flow. Consider the following example in which the interconnector is flowing in the positively priced direction from Region B to Region A. G3 is not dispatched, and the price in Region B is set by G1 and G2.

Figure G.5



Following the invocation of Constraint B, G1 and G2 are backed off slightly and G3 is dispatched to meet load in Region B. G3 now sets the price in Region B at $100, and creates counter-priced flow.

Figure G.6



In this example, there is no pre-PFC interconnector flow in the positively-priced direction from which a value for *k* could be established. And in any case, it would be undesirable to clamp the interconnector in the positively priced direction in this scenario. This would involve reversing the flow on the interconnector which could require ramping up a large volume of generation in Region A, and backing off a large volume of generation in Region B. This would be a major shift away from the economic dispatch just prior to the invocation of Constraint B.

In this scenario where the counter-priced flow was established by a change in relative regional prices, rather than a change in interconnector flow due to disorderly bidding, the interconnector could be (gradually) clamped to 0MW to limit the effect on dispatch.

2. Static "k"

The value for *k* would be fixed at some level below the nominal capacity of the interconnector. The benefit of this approach is that it gives greater certainty as to the contribution to the IRSR fund at times when PFC is invoked. The difficulty of establishing a value for *k* remains. If *k* is set too low, PFC will make little contribution to firming IRSR units, and if *k* is set too high there is a risk that *k* could on occasions exceed the secure limit of the interconnector. Also compared to the approach of basing *k* on the pre-PFC dispatched interconnector flow, establishing a static value for *k* increases the risk of: (1) the price in the exporting region increasing to a level at which PFC itself creates counter-priced flow but in the opposite direction; and (2) requiring generators in the exporting region to be constrained on to support the interconnector flow. These risks would be greatest on those occasions where *k* is significantly higher than the pre-PFC interconnector flow. For the reasons just outlined, this approach to setting *k* would need to be accompanied by a mechanism enabling the value of k to be reduced when necessary (which reduces the benefit of certainty with this approach).

3. Maximum Capacity "k"

Set dynamically based on maximum available capacity of the interconnector at the start of each dispatch interval. The benefit of this approach is that the value of the IRSR fund is maximised. The disadvantages are that constraining the interconnector to this level may represent a major shift from pre-PFC dispatch which could raise issues regarding dispatch efficiency. As is the case with setting a static value for k, this approach also has a higher risk of creating counter-priced flow in the opposite direction and constraining on generation.

The core differences between the three approaches is that approach 1 aims to maintain dispatch as close as possible to the pre-PFC dispatch, approach 2 aims to maximise certainty by pre-defining the expected interconnector flow when PFC is invoked, and approach 3 aims to maximise the value of the IRSR by constraining the interconnector on at its maximum physical capacity.

Of these three approaches, the Commission favours approach 1 because it distorts dispatch the least, and is least likely to cause side effects (i.e. such as exceeding secure interconnector limits, inducing counter-priced flow, and constraining on generation).

G.3 Trigger for invoking PFC

There are several approaches to triggering PFC including: (1) when negative residue is forecast, as is currently the case; or (2) when interconnector flow is first backed off by generators reducing their bids in response to dislocation from the RRN, regardless of the likelihood of negative residue; or by some other means. By invoking the measure when the interconnector is first backed off, the value of the IRSR would be maximised. However this would represent a shift from intervention to manage negative residues, to intervention to influence dispatch results. It may also be difficult to identify reasons for change in interconnector dispatch. As such the Commission is of the view that PFC should be invoked based on a negative residue threshold.

The next question is what should that threshold be. The preliminary policy position reached by the Commission in respect of zero flow clamping thresholds is that the threshold should be increased from $6000 to $100,000. [301]

This is based on the view that clamping creates uncertainty for Market Participants which increases risk premiums, and thus should be avoided or at least minimised. The sole purpose of zero flow clamping is to manage negative settlement residues, whereas PFC offers the additional benefit of increasing the firmness of IRSR units. It would seem contradictory to lengthen the period before PFC is invoked which would have the effect of reducing firmness of IRSR units. The Commission therefore favours setting the threshold for PFC at the existing clamping level of $6000, but increasing the threshold for zero flow clamping to $100,000.

G.3.1 Design Overview

Based on the discussion above, the Commission has developed the following high level design of PFC.

- PFC would be considered only for counter-priced flow events that are caused by generators' incentives to bid below cost due to their dislocation from the RRN. Such events would be pre-defined and identified by constraint equations;
- PFC would be invoked when negative residue caused by one of the defined constraints is forecast to accumulate to $6000;
- Under PFC, the interconnector would be clamped to the flow at which that interconnector was dispatched in the dispatch interval just prior to the PFC invocation; and
- If the interconnector turns counter-priced or was already flowing counter-priced prior to PFC being invoked, then the default arrangements for managing counter-priced flow (i.e. clamping to zero MW) would apply.

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[301] See Chapter 5.