Submission on

FTR Code Amendments

by

Electric Power Optimization Centre

University of Auckland

Professor Andy Philpott

Dr Golbon Zakeri

Dr Geoffrey Pritchard

Dr Tony Downward

http://www.epoc.org.nz

July 30, 2012

Do you agree with the proposal to only use balanced injection patterns for schedule 14.6 calculations?

No, we do not agree. We show that in some circumstances the proposal can fail to deliver the outcomes for which it is designed. The original proposal in Schedule 14.6 was aimed at approximating a flow pattern with losses, by a set of flows with no losses, that aimed to collect at least the amount of constraint and loss rental that accrued in the network with losses.

As argued in the EMS supporting document[1] this construction is not always possible. The new proposal is to use only balanced injection patterns, without considering losses at all. We argue that this might fail to collect a sufficient amount of constraint and loss rental.

The mathematical formulae in Schedule 14.6 determine the amount to be paid into the FTR account for each trading period. These amounts are intended to be sufficient to cover the congestion payments to any point-to-point FTR contracts which are extant at the time of dispatch.

The proposal to use only balanced injection patterns raises several key issues:

(1) The FTR coupon payment is based on final wholesale prices, which include the effects of losses. If losses are ignored entirely, one cannot guarantee revenue adequacy.

(2) The original proposal in Schedule 14.6 aimed to collect at least the amount of constraint and loss rental that accrued in the network with losses. The current proposal does not guarantee that.

(3) Ignoring losses can alter the equilibrium flow on lines in an AC network. Without modelling these losses, the set of extreme flows (which define the allocation of rentals to FTRs) may not reflect where rentals are actually accrued in the network.

(4) By only using balanced FTRs to determine the amount of loss and constraint excess to allocate to supporting FTRs, one may significantly overestimate the FTR capacity available.

We illustrate these issues with a small example (based on the example in the EMS supporting document) that is described in Appendix 1. This example shows that allocating rentals to the FTR account based on an extreme balanced flow may understate the rentals. The FTR grid in this example allows an obligation FTR of 20 MW between node 1 and node 4, which would have to be paid a rental of $150/hour. The sum allocated to the FTR account under the proposed Schedule 14.6 is $0. The actual rentals collected in the dispatch are $42.50/hour.

1

SCHEDULE 14.6 CODE AMENDMENT PROPOSAL, Energy Market Services, 7 May 2012.

The example is very contrived, but no more so that that described in the EMS supporting document. It illustrates the pitfalls of a misalignment between the actual grid (which has losses) and the FTR grid.

We do not propose a remedy to these issues, but observe that much of the difficulty stems from not including spot FTRs in the auction design (i.e. the ability for CfDs to be sold within the auction). The combination of balanced point-to-point FTRs and spot FTRs enables participants to effectively construct unbalanced FTRs efficiently, while also enabling the FTR manager to determine the available volumes of FTRs dynamically, rather than in advance.

We note that the ability to bid for spot FTRs in the auction (along with balanced FTRs) is a proposed later development of the FTR auction design. It seems that including these in the current design is reasonably straightforward, and would overcome many of the difficulties that are being encountered with an auction for balanced FTRs.

Appendix 1: Example

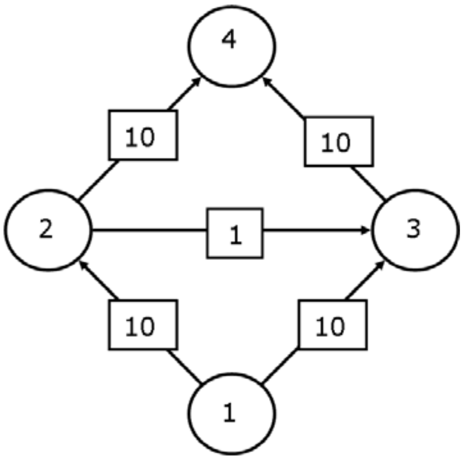

Figure 1

Consider the example shown in Figure 1. All lines have the same reactance, and the capacities are shown in square boxes. The line from 1 to 3 has a 50% loss factor. There is a demand of 13 at node 4.

Suppose there is a generator at node 1 with large capacity and cost \$10/MWh, and a generator at node 3 with large capacity and cost \$30/MWh. The arc flows from the optimal dispatch are shown in Figure 2. The nodal prices are \$17.50/MWh at node 4 and \$10/MWh at node 1. (Nodes 2 and 3 have prices \$5/MWh and \$30/MWh.)

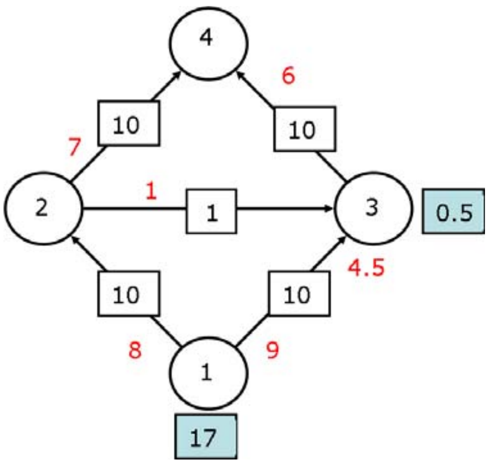

Figure 2: Branch flows are shown next to arcs. Shaded boxes show dispatch.

The optimal dispatch has a cost of \$185 from a dispatch of 17 MW at node 1, and 0.5MW at node 3. All lines are below capacity except for the line from node 2 to node 3. This is the only line that earns constraint and loss rentals. The reduced cost of the flow in this line is -\$42.50, which is the shadow price of the capacity constraint

$$-1 <= f(2,3) <= 1.$$

The rental from this dispatch is therefore $42.50.

We can compare the actual rental of $42.50 with the rental computed from the injections and nodal prices which are $17.50/MWh at node 4, $30/MWh at node 3, and $10/MWh at node 1. The rental per hour is then

$$\sum_i \pi_i g_i(f) = 17.50*13 - 10*17 - 30*0.5 = \$42.50.$$

We might seek an unbalanced FTR from node 1 to node 4. For example (-15, 11) is an unbalanced simultaneously feasible FTR from node 1 to node 4. The rentals needed to support this FTR are

$$17.5*11-10*15 = \$42.50.$$

Since node 1 and node 4 have a price difference of $7.50, these rentals can only support a balanced FTR between node 1 and node 4 of 5.66 MW. Observe that this figure is not derived from simultaneous feasibility, but is simply a function of the dispatch. A different set of offers would give a different set of rentals and this might support a greater level of balanced FTRs.

However the question is: how will the FTR manger determine ex-ante a number of balanced FTRs to offer that is supported by the unknown dispatch?

The proposed approach is to seek a balanced FTR in an approximate lossless network. If this is attempted for this network then one obtains the network in Figure 1 with no losses. An extreme flow from node 1 to node 4 carries 10MW along each side of the network. This might indicate that this would be a good target for the FTR auction: i.e. auction no more than 20MW of FTRs.

According to the proposed Schedule 14.6, the FTR account is augmented with rentals from this set of extreme flows (defined by distribution factors which are 0.50 for each branch). This would determine an ex-ante allocation of rentals from lines (1,2), (1,3), (2,4) and (3,4) to the FTR account. But in the actual dispatch, we see that these rentals are all zero. Thus in this case Schedule 14.6 will not collect sufficient rentals to fund any FTRs between node 1 and 4.