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A White Paper on Creating Hubs

> *[S.Walton Note: Preston Michie prepared the first draft of this paper. Comments from Steve Walton and Kieran Connolly have been included in the form of a dialogue. The purpose of the paper is to stimulate discussion among members of the Market Design Working Group. (20Oct02)]*

Discussion

Both the SMD and RTO West proposal anticipated the creation of "hubs" to facilitate transactions within a large system with as many as 3,000 nodes. The idea of a hub is to mathematically aggregate LMPs for a collection of nodes identified as "within the hub" into a single virtual point for purposes of settlement. The resulting hub is not used for physical delivery, which must be scheduled between nodes. However, for purposes of settlement, all injections and withdrawals from nodes within the hub have the same nodal price. In other words, hubs are not used for scheduling.

> *[S.Walton Note: I think this scheduling restriction on hubs does away with part of their value. A hub can serve as an intermediary point, just as the Mid-C does today. In reality all the energy scheduled "To" Mid-C today could not be physically delivered there. The hub should be treated as a location, just like COB and Mid-C are today – neither is a single physical location.]*

Transactions between a hub and some other node would be settled based on the difference between the LMP price at external node and the hub LMP. Transactions at a hub would see no congestion charges.

Hubs may simplify a number of problems. First, forming a hub may be an elegant solution to the PNCA. If all PNCA generator nodes were included in the hub definition, transactions among PNCA generators would not be assessed a congestion charge. Second, hubs may simplify trading between regions—such as MidC to COB.

> *[K.Connolly Note: It is not clear to me that this is the case simply by using hubs, don't you still have to create congestion hedges using those hubs? There are multiple PNCA generators and owners. The nodes that those generators represent mathematically roll up to the hub price. If party "A" has generation at the low priced nodes won't $A > $Hub? The party is only protected if there is a congestion right issued to A from A to Hub, and from Hub to B.]*

Market participants would propose the creation of hubs, for instance for PNCA, which they believe will facilitate transactions. There should be no restriction on the number of hubs RTO West can create. RTO West should create hubs when and where they are requested.

[K.Connolly Note: If they don't meet the needs of participants and facilitate transactions they will fall dormant, I don't see a reason why the RTO would be a gatekeeper with regard to hubs.]

There is no natural "right" answer to the proper size of a hub—or its location. Similarly, there is no natural limit as to how large a hub should be. Reasonably limits seem to be largely a matter of physics, not geographical area. For example, while a large hub would be mathematically feasible, if congestion frequently occurs within a hub, prices at an excessively large hub may be more volatile and erratic than were that hub split into two hubs comprised of nodes with similar price coherency (meaning prices at nodes within each hub tend to move together). Thus, the trade off on size seems to be volatility for simplicity. As Einstein once said, "Things should be as simple as possible, but no simpler."

On its own initiative or in response to a request to consider forming a hub, RTO West ought to create technical advisory committees as needed to assess the desirability of forming. On the other hand, dissolving a hub is less important than creating functions hubs. This is because hubs that are not used for trading will simply fade away from non-use or as contracts expire that used the hub for settlement. There should be no restrictions on the number of hubs that can exist. The number of hubs should be left up to RTO West working with market participants to determine how to best meet market needs and realities.

[K.Connolly Note: If I understand it correctly creating a hub is relatively trivial for the RTO.]

In calculating the hub price, the contribution of each node is usually based on a set of fixed weights. A reasonable approach may be to weight nodal prices according to the amount of generation at each node within the hub. Trading hubs could be formed that would include nodes that are interconnection points.

*[S.Walton Note: The fixed weights are multiplied by the LMP at each node and the sum of the products is the hub LMP. For instance if nodes A, B and C are to be in Hub X and the weights are 0.1, 0.3 and 0.6 with prices of 30, 31, and 32 respectively, then the hub price = (.1*30)+(.3*31+(.6*32) = 3.0 + 9.3 + 19.2) = 31.5 , the point is the weights do not change with load or generation level.]*

[K. Connolly Note: One of the issues on the "to do" list is the affect of using fixed weights. With the variable output of hydro projects – regular and at times massive changes in weighted average output within day, week, and month will the use of fixed weights create too much instability in the hub prices?]

[S.Walton Response Note: I think a larger concern than the variance of output, is the variance of price. If the usual price between hubs is relatively small and they all tend to move together, the fixed weights

reduce volatility by not moving the hub price with different volume contributions. On the other hand if prices vary considerably between units and their prices regularly move against each other (i.e., there is regular substantial congestion between the injection points) then the hub price will be unstable whether production volume or fixed weights are used.]

Issues

What happens if congestion occurs within a hub, i.e., there is a large and variable price spread? If the hub is comprised only of generation nodes, can this happen?

[S.Walton Note: Since this is just a mathematical calculation, there is no reason why not.]

[K.Connolly Note: This doesn't seem to be a problem since the congestion is still managed, someone is either paying for the node to hub and hub to node congestion or they have rights which provide that the congestion is taken care of. The trick for RTO West will be in certifying that the translation of existing rights creates such hedges – our old catalog problem…]

If a transaction is scheduled between an injection and withdrawal pair wholly within a hub that includes intersection points (or maybe load nodes), should it be treated as a normal transaction that will be assessed a congestion charge?

[SLW Note: The transaction is scheduled from the receipt point to the hub and from the hub to the delivery (withdrawal) node. There is congestion cost between the points and the hub, but not charge at the hub. If the load holds the right from the hub to delivery point and the generator from receipt point to the hub, then they are hedged for congestion. The hub is not the old "zone" concept from the physical rights model which created residual congestion. The hub facilitates enable trade; it does not hide congestion.]

In other words, is it correct to think that a hub only has effect when the transaction is between a node within the hub and some external point?

[SLW Note: When an external point is involved, then the schedule is still the delivery point hub, hub to hub and hub to receipt point. The rights between points up to the hub probably don't change much – they either allow the party to delivery energy to the system or take load away. The hub-to-hub transactions are more market driven with active trading of hub-to-hub rights taking place.]

The MCHCA is an agreement that affects real time operation. Could the concept of a hub apply in real time to resolve congestion issues associated with the MCHCA? I think

we need to know more about how we would structure a DA to RT hedge before we can answer that question.