NETWORK SERVICE RIGHTS

1. DESCRIPTION

This document describes a Congestion Revenue Right (CRR) product called Network Service Right (NSR), as filed with FERC by the CAISO in the context of the Market Design 2002 (MD02) effort. The Network Service Right definition is as follows:

Network Service Right is a fixed power transfer from multiple sources to multiple sinks for specific amounts of power injections and ejections at the associated sources and sinks. In MD02, a lossless network model is proposed for CRR allocations and auctions; therefore, the power injections at the sources and the power ejections at the sinks constitute a balanced schedule where the sum of injected power at the sources equals the sum of ejected power at the sinks. The sources and sinks are either network nodes or hubs. Hubs are defined load aggregation areas where the injected or ejected power can be distributed to the underlying network nodes according to the hub's Load Distribution Factors (LDFs). LDFs remain fixed for the duration of the CRR.

Network Service Rights are offered solely as CRR Obligations. Network Service Rights are solely financial rights; they are paid the sum of the products of the Day-Ahead Locational Marginal Prices (LMPs) at the associated sinks multiplied by the respective power ejections and are charged the sum of the products of the Day-Ahead LMPs at the associated sources multiplied by the respective power injections. The LMP at a hub is the weighted average of the LMPs at the underlying network nodes where the corresponding LDFs are used as weights.

Network Service Rights can be acquired through Available Transmission Capacity (ATC) allocations, or purchased in the CRR primary auctions, or traded in the secondary CRR market. Scheduling Coordinators (SCs) representing Load Serving Entities (LSEs) may acquire NSRs in the ATC allocations by submitting NSR nominations. All SCs may acquire NSRs in the CRR primary auctions by submitting NSR bids. NSR bids specify the sources and sinks, and for each source and sink a staircase quantity-price curve with no more than 10 steps. The first quantity must be zero (0) MW. The curve should be monotonically increasing for sources and monotonically decreasing for sinks. The valuation of the NSR bid in the auction is a function of its power injections and ejections; it is the sum of the integrals of the bid curves at the sinks minus the sum of the integrals of the bid curves at the sources, with the requirement that the power injections balance the power ejections. NSR nominations are similar to NSR bids with the exception that specified priority levels are used instead of prices.

2. MODELING

Each Point-To-Point (PTP) or NSR bid is modeled in general as a balanced schedule of sources G and sinks L, each with an associated bid function C:

$$PTP_s \hat{=} \left\{ \begin{array}{c} G_{s,p}, C_{s,p}(G_{s,p}), L_{s,q}, C_{s,q}(L_{s,q}),\ p \in P_s, q \in Q_s \\ \sum_{p \in P_s} G_{s,p} = \sum_{q \in Q_s} L_{s,q} \end{array} \right\} \quad (1)$$

where P_s is the set of sources and Q_s is the set of sinks associated with PTP or NSR bid s. For PTP bids, P_s and Q_s contain a single source and a single sink, respectively. For NSR bids, at least

one of these sets contains more than one point. In general, if any of the points, p or q, is a hub the source or sink is distributed to the underlying nodes according to the LDFs of the hub:

$$G_{s,p} = \sum_{i \in N_p} G_{s,i} = \sum_{i \in N_p} LDF_{p,i}\ G_{s,p}$$
$$L_{s,q} = \sum_{j \in N_q} L_{s,j} = \sum_{j \in N_q} LDF_{q,j}\ L_{s,q} \qquad (2)$$

where N_p is the set of nodes in hub p and N_q is the set of nodes in hub q.

3. EXAMPLE

Figure 1 shows an example of a NSR bid with two sources at nodes A and B and a sink at node C.

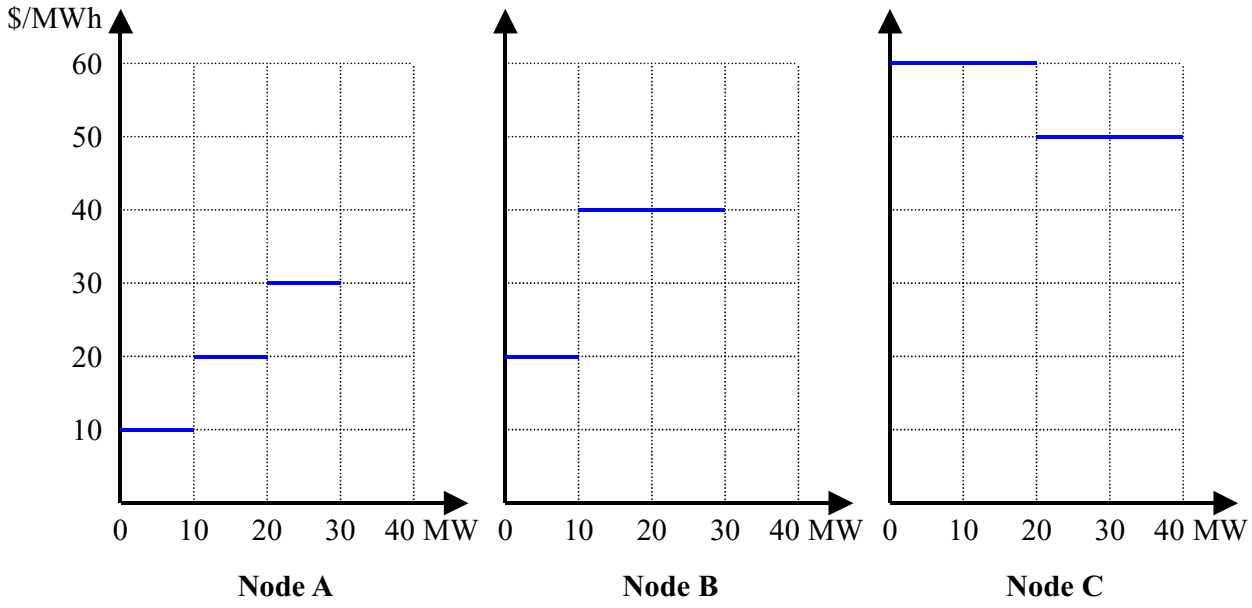

Figure 1. *Network Service Right bid*

Table 1 shows a possible outcome of the CRR auction for this NSR bid.

Table 1. *CRR Auction outcome*

	Node A	**Node B**	**Node C**
LMP ($/MWh)	25	40	45
Injection (MW)	20	20	–40

The awarded NSR consists of a 20 MW injection at Source A, a 20 MW injection at Source B, and a 40 MW ejection at Sink C, for the entire CRR term. The purchase cost for this NSR is as follows:

$$NSR\_Cost = 40 \times 45 - 20 \times 25 - 20 \times 40 = \$500$$