
Auction Engine Testing Report

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Version 1.0

Prepared for:

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Nexant was engaged by Nodal Exchange to evaluate and test the Nodal Exchange electricity futures market auction engine. Nexant (and PCA, the predecessor company acquired by Nexant) have been developing and licensing commercial software for power system and electricity market optimization since 1984. In conjunction with these business activities, Nexant employs engineers and software developers with sufficient expertise and experience in optimization and software development to test and evaluate new optimization applications.

Nexant employees studied the textual documentation provided by Nodal Exchange that describes the auction and its objective, and the theoretical development and mathematical formulae that describe the optimization problems to be solved by the engine. Nexant certifies that the description of the auction engine as described in the “Nodal Exchange Auction Engine – A Technical Overview” (R2.0) as well as the Nodal Exchange Auction Engine Mathematical Formulation dated September 11, 2008, as reviewed, are consistent with the stated objective of the auction as communicated by Nodal Exchange staff, and are, to the best of Nexant’s knowledge, consistent with the implementation, as used during the Nodal Exchange Mock Auction (November 18 and 19).

As noted in the mathematical formulation document, the auction solution comprised of market clearing prices and cleared quantities is determined through a sequence of different optimization processes. In brief, these optimization processes perform order matching, check for price degeneracy, volume degeneracy and collateral insufficiency. Additional processes run in between the optimization modules.

During its testing, Nexant focused first on simple order matching, price degeneracy, volume degeneracy and collateral insufficiency tests. The results of these tests were optimal and the auction engine behaved as described in the documentation.

Secondly, Nexant focused on slightly more complicated volume degeneracy and price degeneracy tests where the auction engine would need to apply a tie-breaker methodology. In Nexant’s judgment, the tie-breakers as implemented generate fair outcomes in which the outcome is decided by an observable and non-discriminatory rule, such as giving priority based on which order was entered first. Auction participants must be aware that in certain situations, application of tie-breaker methodologies can result in the partial or even full reduction of bids based on the rules applied. The general tie-breaker methodology currently described in “Nodal Exchange Auction Engine – A Technical Overview” (R 2.0) is sufficiently described for market participants to understand the methodology and its implications.

Finally, Nexant focused on how the original auction problem is potentially changed (i.e. changes in bid quantities) in between the optimization processes to eliminate fractional quantity clearing and participant collateral insufficiency. Because Nodal Exchange has designed the auction process to run within a limited time window, and with a collateral sufficiency check, for pragmatic reasons some of these adjustments are performed heuristically, outside of the optimization process. Though steps have been taken to mitigate potential sub-optimal solutions,

it is possible that certain auction scenarios could result in sub-optimal results. That is, a long bid may be awarded less volume than its maximum volume when its bid price is greater than the clearing price and also a short offer may be awarded less than its maximum volume when its bid price is less than the clearing price. While these adjustments may result in non-optimal solutions in some cases, Nexant believes that to the extent the time constraints are necessary the adjustments are not unreasonably designed to both minimize auction impact and be fair to the market. Also, it is unclear as to whether these particular inconsistencies between bid parameters and market-clearing price will occur in actual operation. These particular scenarios have been documented in an appendix to the auction technical paper, which is available to all market participants.

Nexant believes that this set of cases provides a thorough test of the solutions' optimality, but it is not possible to test the engine exhaustively. Nexant certifies that in most respects, subject to the description and limitations noted above and described in more detail elsewhere in the document, that the auction engine provided results that were optimal. Testing documentation is available under separate cover

As described above, Nexant has certified the theoretical foundations of the application as well as the results from the optimization. Nexant is unable, however, to certify all aspects of the application and has not reviewed either source code or all possible combinations or permutations of data handling and manipulation which could result in an incorrect problem formulation being presented to the solver. Nexant did not perform specific tests to evaluate the CPLEX solver application, as this is a well-known, well-tested, and commercially standard solver. Nexant does not assume any liabilities with respect to the use of or for damages resulting from the use of any information contained in this testing report. Nexant does not represent or warrant that any assumed conditions will come to pass. This report speaks only as of the date herein and Nexant has no responsibility to update this testing report.