

//Final review letter -- settlements 20111006.docx

October 6, 2011

Mr. Paul Murphy
Chief Executive Officer
Independent Electricity System Operator
Station A, Box 4474
Toronto, ON
M5W 4E5
Canada

Dear Mr. Murphy:

Opinion with respect to the Enhanced Day-Ahead Commitment Process Settlements software

PA Consulting Group, Inc. ("PA") has been asked by Independent Electricity System Operator, ("IESO") to review the implementation of the Enhanced Day-Ahead Commitment software and systems for compliance with its design and the relevant Market Rules. There are two components to this review, corresponding to two software components:

- *The market clearing software* associated with the Enhanced Day Ahead Commitment process which comprises the Day Ahead Calculation Engine (DACE) -- part of the Day Ahead Optimization System (DAOS) -- as well as modifications to the Market Information Management (MIM) software to generate pseudo-unit parameters.
- *The settlement software* associated with Enhanced Day Ahead Commitment process which comprises the Commercial Reconciliation System (CRS) which has been modified to incorporate the settlement rules for EDAC, in particular rules governing guarantee payments and failure charges.

This opinion covers the settlement calculations in the Commercial Reconciliation System software. A separate letter has addressed the market clearing software.

Scope of the Evaluation

This opinion represents our best determination based on our experience and expertise. It is not and cannot be in the form of an absolute guarantee. Our opinion assumes that the IESO will continue to operate its software with care, as configured, with parameters in the range of those provided to us for testing, in the manner intended, and with data that conform to the requirements of the Market Rules and which fall within their range of expected values. Over time, actual results that are consistently in compliance with the Market Rules will continue to confirm that the IESO's software operates in strict accordance with those Market Rules.

continued

PA Consulting Group, Inc

This opinion covers *settlement software* associated with Enhanced Day Ahead Commitment process which comprises the Commercial Reconciliation System (CRS) which has been modified to incorporate the settlement rules for EDAC, in particular rules governing guarantee payments and failure charges. The particular modules covered by this opinion are:

- Derived Interval Price Curve (DIPC);
- Export Failure Charge (EFC);
- Generator Withdrawal Charge (GWC);
- Import Failure Charge (IFC);
- Intertie Offer Guarantee (IOG);
- Linked Wheel Failure Charge (LWFC);
- Production Cost Guarantee (PCG); and
- Derived Interval Guarantee Quantity (DIGQ)

Our evaluation did not cover, and this opinion does not cover, the following:

- The settlements uplift calculations;
- The interface software and database which calculate, read, transfer and store the data used by the Commercial Reconciliation System;
- Manual processes or procedures of the IESO used for the Day Ahead market operation and settlements not processed by the automated system.
- The design and operating effectiveness of corporate and administrative controls, IT change management controls or the development methodology. We have not tested or validated aspects of the implementation such as the integrity of manual interventions, script execution or logging of tests run by IT.

Nature of the Evaluation Conducted

The settlements software in scope for this opinion is comprised of eight modules as defined above. The formulation of the calculations for each module is defined in the market rules and/or IESO market manuals. The purpose of our evaluation is to ensure that each module performs its required calculations correctly as an independent module, and where one module is dependent on the outputs of another module, to ensure that the correct end-to-end calculations are performed.

The nature of the implementation of the IESO settlements system is such that we were not able to directly run test cases ourselves. Consequently, our approach to the evaluation of the settlements modules has been as follows:

1. Review the in-house testing performed by IESO staff for completeness, to ensure that the complete functionality of each module has been exercised, and correctness of expected results; and
2. Where gaps have been identified in the IESO test plans, specify additional test cases to be performed by IESO staff; and

continued

3. When those additional test cases have been performed, review the results for correctness.

Prior to our review of IESO test cases, we identified areas in which the Market Rules were incomplete or unclear. Specifically, in the formulas in the Market Rules for day-ahead Import and Export Failure Charges, one of the inputs was not explained or specified, as were several parameters. Also, in Market Manual 9, the formula for one quantity (denoted DICQ) implied that it was an attribute of a steam turbine rather than a pseudo-unit.

Opinion

As a result of our examination of the Market Rules and our testing of the Enhanced Day Ahead Commitment process software, we are able to provide the following opinion with respect to the Enhanced Day Ahead Commitment process software and its formulation:

“Subject to the limitations and qualifications expressed in the “Scope of the Evaluation and Certification” and “Nature of the Evaluation Conducted” sections, we have determined that the IESO Enhanced Day Ahead settlements software as at September 20, 2011 performs all functions, and correctly calculates dispatch and prices for Energy and Operating Reserves and settles all quantities required to be settled in the Enhanced Day-Ahead Market administered by the IESO, in compliance with the Market Rules to come into effect on October 3, 2011.”

Yours truly



Gregg Edeson
Member of PA's Management Group

continued

PA Consulting Group, Inc

IESO Management Response

To PA Consulting's External Review Findings – Settlements

An external review of the implementation of the Settlements calculations associated with the enhanced Day Ahead Commitment Process for compliance with its design and the relevant Market Rules was completed on September 20, 2011.

Responses to noted findings is outlined below:

Finding	IESO Response	Date Closed
Clarification of Market Rule parameters and definitions.	All clarifications sought by PA to market rules are implemented in MR-382 EDAC Market Rules True Up Package #2.	Approved by IESO Board on September 9, 2011.
Corrections to Market Manual 9.	Corrections in MM9, included in EDAC Baseline release.	Posted to Pending Changes September 21, 2011.