Market Rule Amendment Proposal

PART 1 – MARKET RULE INFORMATION

Identification No.:	MR-00375-R00
Subject:	Enhanced Day-Ahead Commitment Process (EDAC)
Title:	Market Rule True-up
Nature of Proposal:	☒ Alteration ☐ Deletion ☐ Addition
Chapter:	7 Appendix:
Sections:	2.2, 2.2C, 3.3, 3.3A, 5.1, 5.5, 5.8, 6.3B, 12.1
Sub-sections proposed for amending:	Various

PART 2 – PROPOSAL HISTORY

Version	Reason for Issuing	Version Date
1.0	Working Draft for Discussion Purposes	November 3, 2010
2.0	Second draft for Technical Panel Review	December 8, 2010
3.0	Third draft for Technical Panel Review	February 15, 2011
4.0	Publish for Stakeholder Review and Comment	February 17, 2011
Approved Amendment Publication Date:		
Approved Amendment Effective Date:		

PART 3 – EXPLANATION FOR PROPOSED AMENDMENT

Provide a brief description of the following:

- The reason for the proposed amendment and the impact on the *IESO-administered markets* if the amendment is not made.
- Alternative solutions considered.
- The proposed amendment, how the amendment addresses the above reason and impact of the proposed amendment on the *IESO-administered markets*.

<div style="border:1px solid">

Summary

This amendment proposal is the third set of market rule amendments required to implement the enhanced day-ahead commitment (EDAC) process design approved by the IESO Board in February 2009. The EDAC Project Advisory Group has identified changes that are required to:

- address design detail changes subsequent to approved amendments MR-00348 and MR-00349, including obligations regarding pseudo-units (R00, R01);
- enable the IESO to recover CMSC for the hours associated with a given start that occur after the DACP dispatch day (R01); and
- provide greater clarity and consistency throughout.

Background

EDAC is a modification to the existing Day-Ahead Commitment Process (DACP) that introduces the following elements:
- Optimization of commitment over the entire 24 hours of the next day;
- Use of multiple passes of the constrained algorithm to determine commitment and resource scheduling; and
- Three-part offers, i.e., the use of offers for energy supported by submitted fixed costs and technical data.

For further background information, refer to MR-00375-Q00.

Discussion

Section 2.2 Registered Facilities
Section 2.2.6B describes the required submission for certain dispatchable generation facilities. Minor wording changes are proposed to provide greater clarity. One reference to minimum run-time is unnecessary in this instance and has been deleted. The following editorial changes are required so that section numbering follows the market rules conventional style:
- Delete sections 2.2.6B.1 through 2.2.6.B3, and move to sections 2.2.6J, 2.2.6K, and 2.2.6G, respectively. These sections describe data submission requirements.
- Information will be submitted in accordance with the applicable market manuals and will not be itemized in the rules.

In sections 2.2.6E, 2.2.6F and 2.2.6H, changes include:
- Removing the reference to 2.2.6C which was deleted as part of MR-00348.
- Revise section 2.2.6F to add references to 2.2.6J (which describes the daily submission of information) and 2.2.6G (which describes the information submitted for combined cycle facilities and pseudo-units), all of which the IESO will respect in scheduling. Also change the

</div>

PART 3 – EXPLANATION FOR PROPOSED AMENDMENT

> reference to section 4 since the determination of the real-time schedule is section 6.
> - Revise section 2.2.6H to add a clarifying phrase.
>
> New section 2.2.6I has been added to specify the IESO's obligation to use the submitted daily information referred to in section 2.2.6J to calculate the pseudo-unit technical parameters, provided that the participant has declared to operate as a pseudo-unit in accordance with section 2.2.6G.
>
> **Section 2.2C Generation Facility Eligibility for the Production Cost Guarantee**
> - Modify the section title to reflect the change from Production Cost Guarantee to Day-Ahead Production Cost Guarantee.
>
> **Section 3.3 Dispatch Data Submissions**
> - Modify section 3.3.1 to reflect the change in the deadline for submitting initial dispatch data from 11:00 to 10:00 EST.
> - Modify section 3.3.2. The IESO will determine the initial pre-dispatch schedule after the release of the schedule of record (subject to the operation of the DACP on that pre-dispatch day), rather than during the DACP. Market participants may have revised their initial dispatch data under section 3.3A.6; the initial pre-dispatch schedule will consider the initial dispatch data as revised under 3.3A.6.
>
> **Section 3.3A Dispatch Data Submission for the Day-Ahead Commitment Process**
> - Modify section 3.3A.6 after the word "offers" to insert the words "or bids", referring to submitted information from dispatchable loads and from boundary entities for export transactions. Delete words describing the types of market participants that submit dispatch data; this detail is provided under section 3.3A.2 which is referenced in this section. Also change wording of this section to clarify the timing and requirements for revision of dispatch data after 10:00 EST by market participants.
> - Delete section 3.3A.7. The section is redundant and therefore unnecessary. Section 3.3.2 already requires the IESO to determine the initial pre-dispatch schedule using the initial dispatch data submitted, including the dispatch data submitted under section 3.3A.2 and 3.3A.5.
> - Modify section 3.3A.8 to reflect the correct time after which dispatch data may be revised without restriction (until 2 hours prior to the dispatch hour, subject to 3.3A.9 and 3.3A.10); participants do not need to wait until after the release of the schedule of record, but rather may revise dispatch data after 14:00 EST.
> - Modify section 3.3A.9 to delete unnecessary wording and clarify the meaning of the section.
> - Modify section 3.3A.10 to reflect the change from Production Cost Guarantee to Day-Ahead Production Cost Guarantee.
>
> **Section 5.1 Purpose and Timing of Pre-dispatch Schedules**
> - Modify section 5.1.2 to specify the time for the determination of the initial pre-dispatch schedule for the next dispatch day, "no later than 16:00 EST" (changed from 12:00 EST).
>
> **Section 5.5 Release of Pre-dispatch Schedule Information**
> - Modify section 5.5.1 to specify the time by which the IESO must release and publish the initial pre-dispatch schedule, market schedule projections and market prices, "by 16:00 EST" (changed from 12:00 EST).

PART 3 – EXPLANATION FOR PROPOSED AMENDMENT

Section 5.8 The Day-Ahead Commitment Scheduling Process
- Modify section 5.8.1 to delete the reference to pre-dispatch schedules. Appendix 7.5A is used only for the determination of the schedule of record.
- Modify section 5.8.2 to delete the reference to section 5.5 which refers to the release of pre-dispatch information only, not DACP information. The schedule of record is released in accordance with the applicable market manual. Also modify this section to make the release of the schedule of record subject to the schedule of record first being determined under section 5.8.1.
- Modify section 5.8.4 to reflect the change from Production Cost Guarantee to Day-Ahead Production Cost Guarantee.
- Modify section 5.8.5 to state that a facility will be constrained at minimum loading point or greater for all hours the facility is scheduled in the schedule of record (not just the minimum generation block run-time hours). Also modify this section to make it subject to section 5.8.4 (the facility must be eligible under section 2.2C for the day-ahead production cost guarantee).
- Modify section 5.8.7 to delete the reference to pre-dispatch schedules since they are no longer produced before the schedule of record. The IESO only ignores the net intertie scheduling limit (NISL) for the first hour of the next dispatch day during the DACP timeframe.

Section 6.3B Real-Time Scheduling of Generation Facilities Eligible for the Production Cost Guarantee
- Modify the section title and sections 6.3B.1, 6.3B.2 and 6.3B.3 to reflect the change from Production Cost Guarantee to Day-Ahead Production Cost Guarantee.

Section 12.1 IESO System Status Reports
- Modify section 12.1.1.3 and 12.1.1.4 to reflect the new time for publishing the system status report, at 09:00 EST not 10:30 EST.

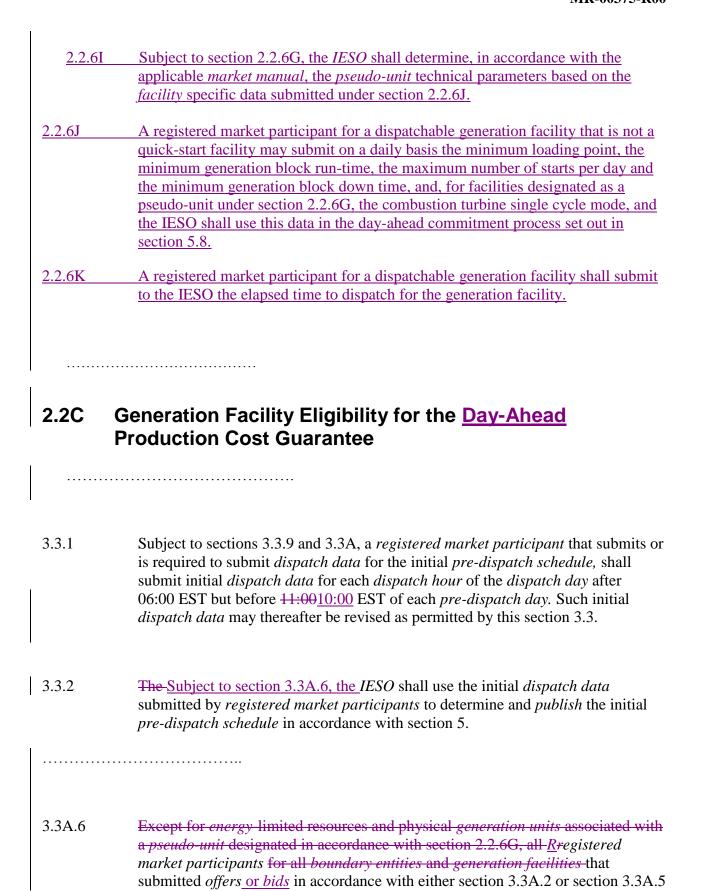**PART 4 – PROPOSED AMENDMENT**

………………………………

2.2.6B   A registered market participant for a dispatchable generation facility shall submit to the IESO the minimum loading point, the minimum generation block run-time, and the minimum run-time for the generation facility, if the minimum loading point for the facility is greater than zero MW and if the minimum generation block run-time ~~and minimum run-time~~ for the facility ~~are~~ is greater than one hour.

~~2.2.6B.1   A registered market participant for a dispatchable generation facility that is not a quick-start facility may submit on a daily basis the minimum loading point, the minimum generation block run-time, the maximum number of starts per day and the minimum generation block down time, and for facilities designated as a pseudo-unit in accordance with section 2.2.6G the combustion turbine single cycle mode, and the IESO shall use this information in the day-ahead commitment process set out in section 5.8.~~

~~2.2.6B.2~~ ~~A registered market participant for a dispatchable generation facility shall submit to the IESO the elapsed time to dispatch for the generation facility.~~

~~2.2.6B.3~~ ~~A *registered market participant* that operates a combined cycle *facility* shall submit to the IESO in accordance with the applicable *market manual* the physical characteristics associated with the combined cycle *facility* and the steam turbine minimum loading point for each combustion turbine/steam turbine configuration.~~

2.2.6C   [Intentionally left blank – section deleted]

2.2.6D   The *IESO* may request, and the *registered market participant* for a dispatchable *generation facility* shall submit to the *IESO*, the following information for the *generation facility*:

- *start-up time; and*
- *minimum shut-down time.*

2.2.6E   If no *facility* specific data is submitted to the *IESO* for the <u>*generation* </u>*facility's minimum loading point*, *forbidden regions*, or *period of steady operation* in accordance with sections 2.2.6A~~,~~ and 2.2.6B, ~~and 2.2.6C,~~ the *IESO* shall assign default values of zero for that data.

2.2.6F   If *facility* specific data is submitted to the *IESO* in accordance with sections 2.2.6A, ~~and~~ 2.2.6B<u>, 2.2.6G, or 2.2.6J</u>~~,~~ the *IESO* shall respect the data as submitted in its determination of the *real-time schedule* in accordance with section ~~4~~<u>6</u> and day-ahead ~~commitments~~<u>schedule</u> in accordance with section 5.

2.2.6G   <u>In accordance with the applicable *market manuals*, </u>~~A~~ <u>a</u> *registered market participant* that <u>operates a combined cycle facility that is not aggregated under section 2.3 shall submit to the *IESO* the required data for that combined cycle facility, and for those *registered market participants* that </u>wish~~es~~ to ~~have a dispatchable *generation*~~<u>designate their non-aggregated combined cycle</u> *facility* ~~included~~ as a *pseudo-unit* in the day-ahead commitment process set out in section 5.8, ~~shall, in addition to the information submitted in accordance with section 2.2.6B, submit to the *IESO* the following information: the steam turbine percentage share of each~~ <u>the required data for that</u> *pseudo-unit*~~; and steam turbine duct firing capacity. .~~<u>.</u>

2.2.6H   A registered market participant for a dispatchable hydroelectric generation facility shall submit to the IESO where applicable the daily cascading hydroelectric dependency <u>for that generation facility</u>.

2.2.6I   Subject to section 2.2.6G, the *IESO* shall determine, in accordance with the applicable *market manual*, the *pseudo-unit* technical parameters based on the *facility* specific data submitted under section 2.2.6J.

2.2.6J   A registered market participant for a dispatchable generation facility that is not a quick-start facility may submit on a daily basis the minimum loading point, the minimum generation block run-time, the maximum number of starts per day and the minimum generation block down time, and, for facilities designated as a pseudo-unit under section 2.2.6G, the combustion turbine single cycle mode, and the IESO shall use this data in the day-ahead commitment process set out in section 5.8.

2.2.6K   A registered market participant for a dispatchable generation facility shall submit to the IESO the elapsed time to dispatch for the generation facility.

……………………………………

2.2C   Generation Facility Eligibility for the Day-Ahead Production Cost Guarantee

………………………………………….

3.3.1   Subject to sections 3.3.9 and 3.3A, a *registered market participant* that submits or is required to submit *dispatch data* for the initial *pre-dispatch schedule,* shall submit initial *dispatch data* for each *dispatch hour* of the *dispatch day* after 06:00 EST but before ~~11:00~~10:00 EST of each *pre-dispatch day.* Such initial *dispatch data* may thereafter be revised as permitted by this section 3.3.

3.3.2   ~~The~~ Subject to section 3.3A.6, the *IESO* shall use the initial *dispatch data* submitted by *registered market participants* to determine and *publish* the initial *pre-dispatch schedule* in accordance with section 5.

………………………………..

3.3A.6   ~~Except for *energy* limited resources and physical *generation units* associated with a *pseudo-unit* designated in accordance with section 2.2.6G, all~~ ~~R~~registered *market participants* ~~for all *boundary entities* and *generation facilities*~~ that submitted *offers* or *bids* in accordance with either section 3.3A.2 or section 3.3A.5

shall ~~not~~ require *IESO* approval to modify those *offers* or *bids* between 10:00 and 14:00 EST ~~and the release of the~~ *schedule of record.* except for~~An~~ *offer* from a *registered market participants* for:

~~an~~ *energy* ~~limited resource~~ dispatchable hydroelectric *generation facilities* which submitted a *daily cascading hydroelectric dependency* in accordance with section 2.2.6K~~H~~ and which are designated by the *IESO* as eligible *energy*-limited resources, and~~or~~

physical generation units associated with a *pseudo-unit* designated in accordance with section 2.2.6G ~~may be modified~~ ~~in accordance with the applicable market manual.~~

3.3A.7   [Intentionally left blank – section deleted]~~The *IESO* shall use the initial *dispatch data* submitted by *registered market participants* under sections 3.3A.2 and 3.3A.5 to determine and *publish* the initial *pre-dispatch schedule* in accordance with section 5.~~

Market Participant Revisions to Dispatch Data

3.3A.8   Subject to sections 3.3A.9 and 3.3A.10, after ~~the *IESO* releases the~~ *schedule of* ~~record~~ 14:00 EST a *registered market participant* may submit revised *dispatch data* with respect to any *dispatch hour* without restriction until 2 hours prior to the beginning of that *dispatch hour*.

3.3A.9   Subject to section 3.3A.10, ~~a~~ *registered market participant* for a dispatchable *generation facility* that did submit *dispatch data* under section 3.3A.2 may revise its *offer* in real-time provided the revised *dispatch data* does not increase the number of hours offered or the offered quantity in any hour relative to the *dispatch data* submitted under section 3.3A.2. ~~*Registered market participants* may revise prices offered.~~ Revised *offers* which represent increases to the number of hours offered~~,~~ or increases to the offered quantity relative to the *dispatch data* submitted under section 3.3A.2 will require *IESO* approval. Changes to daily *energy* limits will not require *IESO* approval.

3.3A.10   A *registered market participant* for a dispatchable *generation facility* that was deemed to have accepted the day-ahead production cost guarantee in accordance with section 5.8.4 shall not increase the *offer* price associated with the *minimum loading point* of the *facility*.

………………………………..

5.1.2   The *IESO* shall determine an initial *pre-dispatch schedule* for the 24 *dispatch hour*s of each *dispatch day* no later than ~~12:00~~16:00 EST on the *pre-dispatch day*.

………………………………..

5.5.1   The *IESO* shall release the initial *pre-dispatch schedule* and associated projections of *market schedules* and shall publish *market prices* by ~~12:00~~16:00 EST of each *pre-dispatch day*, and shall release any revised *pre-dispatch schedules* and

projections of *market schedules* and shall publish *market prices* as soon as practical after they are determined. The information to be released to *market participants* is described in this section 5.5.

……………………………….

5.8.1   Starting from 10:00 EST ~~and until the~~ *~~schedule of record~~* ~~is~~ *~~published~~* ~~under section 5.8.2~~, the *IESO* may in accordance with ~~A~~appendix 7.5A determine *~~pre-dispatch schedules~~* ~~for the~~ *~~dispatch hours~~* ~~of the next~~ *~~dispatch day~~*the *schedule of record*.

5.8.2   Where the *IESO* determines the *schedule of record* in accordance with Section 5.8.1, it will be released by ~~T~~the *IESO* ~~shall release the~~ *~~schedule of record~~* no later than 15:00 EST in accordance with ~~section 5.5~~the applicable *market manual*.

5.8.3   [Intentionally left blank – section deleted.]

5.8.4   A *registered market participant* whose *facility* is eligible under section 2.2C for the day-ahead production cost guarantee and whose *facility* is included in the *schedule of record*   is deemed to have accepted the guarantee for its *facility.*

5.8.5   Subject to section~~s~~ 5.8.4 and 5.8.6, the *IESO* shall ensure that the scheduled output for ~~from~~ a *facility* ~~that was included in the~~ *~~schedule of record~~* will meet or exceed its *minimum loading point* ~~for the~~ *~~minimum generation block run-time~~* for all hours that it was included in the *schedule of record* in future iterations of the *pre-dispatch schedule* and in the *real-time schedule.*

5.8.6   The *IESO* may, to maintain the reliable operation of the *IESO-controlled grid*, require a *generation facility* that was included in the *schedule of record* to either desynchronize from the *IESO-controlled grid* or to not synchronize to the *IESO-controlled grid*.

5.8.7   When determining the *schedule of record* ~~between 10:00 EST and 15:00 EST, for the~~ *~~pre-dispatch schedule~~* applicable to the first hour of the next *dispatch day* ~~for which production cost guarantees apply~~, the *IESO* may disregard the net *intertie* scheduling limit.

……………………………….

6.3B   Real-Time Scheduling of Generation Facilities Eligible for the <u>Day-Ahead</u> Production Cost Guarantee

6.3B.1   If the *IESO*, for reasons of reliability, requires a *generation facility* that was eligible for the day-ahead production cost guarantee under section 2.2C to either desynchronize from the *IESO-controlled grid* or to not synchronize to the *IESO-*

controlled grid such that the *generation facility* does not comply with its *schedule of record*, the *generation facility* shall remain eligible for the day-ahead production cost guarantee. The *registered market participant* for the *generation facility* may also apply to the *IESO* for additional compensation under section 4.7E.1 of Chapter 9.

6.3B.2   If a *generation facility* that was eligible for the day-ahead production cost guarantee under section 2.2C does not close its breaker by the start of the first interval of the first hour of its *schedule of record* due to reasons not specified in sections 6.3B.1or 6.3B.3 then the *generation facility* shall not remain eligible for the day-ahead production cost guarantee associated with that start determined in accordance with section 5.8 nor shall the *registered market participant* for the *generation facility* be eligible to apply to the *IESO* for additional compensation under section 4.7E.1 of Chapter 9.

6.3B.3   If a *generation facility* that was eligible for the day-ahead production cost guarantee under section 2.2C does not comply with its *schedule of record* due to reasons specified in section 1.2.3 of Chapter 5 then the *facility* shall remain eligible for a pro-rated day-ahead production cost guarantee determined in accordance with section 4.7D of Chapter 9.

…………………………………

12.1.1   The *IESO* shall *publish* system status reports with respect to each *dispatch day* at the following times:

12.1.1.1   15:30 EST of the day two days prior to the *dispatch day*;

12.1.1.2   05:30 EST of the *pre-dispatch day*;

12.1.1.3   ~~10:30~~09:00 EST of the *pre-dispatch day*;

12.1.1.4   any time of the *pre-dispatch day* subsequent to ~~10:30~~09:00 EST if there is a material change to the information in the previous system status report for the *dispatch day*; and

12.1.1.5   any time during the *dispatch day*, for the current and remaining *dispatch hours* of the *dispatch day*, if there is a material change to the information in the previous system status report for such *dispatch hours*.

PART 5 – IESO BOARD DECISION RATIONALE

Insert Text Here

Market Rule Amendment Proposal

PART 1 – MARKET RULE INFORMATION

Identification No.:	MR-00375-R01
Subject:	Enhanced Day-Ahead Commitment Process (EDAC)
Title:	Market Rule True-up
Nature of Proposal:	☒ Alteration ☐ Deletion ☐ Addition
Chapter:	9 Appendix:
Sections:	3.1, 3.5, 3.8A, 3.8E, 4.7B, 4.7D
Sub-sections proposed for amending:	Various

PART 2 – PROPOSAL HISTORY – PLEASE REFER TO MR-00375-R00

Version	Reason for Issuing	Version Date
Approved Amendment Publication Date:		
Approved Amendment Effective Date:		

PART 3 – EXPLANATION FOR PROPOSED AMENDMENT

Provide a brief description of the following:

- The reason for the proposed amendment and the impact on the *IESO-administered markets* if the amendment is not made.
- Alternative solutions considered.
- The proposed amendment, how the amendment addresses the above reason and impact of the proposed amendment on the *IESO-administered markets*.

Summary

Please refer to MR-00375-R00.

Background

Please refer to MR-00375-R00.

Discussion

It is proposed to modify the market rules in <u>Chapter 9</u> in the following manner:

Section 3.1 Hourly Settlement Variables and Data (for DACP)

- Insert a new subsection 3.1.11 to reflect the IESO obligation to calculate the required information for settlement of a pseudo-unit.

Section 3.5 Hourly Congestion Management Settlement Credits (CMSC)

- Insert a new subsection 3.5.7A to give the IESO the authority to recover CMSC revenue, up to MLP, earned as a result of a constraint in the hours after midnight (after the DACP dispatch day).

Section 3.8A Hourly Settlement Amounts for Intertie Offer Guarantees

- Modify section 3.8A.4 to reflect the change from EDAC to DACP. The name of this project is EDAC; however, the name of the IESO program in the market rules remains DACP.
- Also modify section 3.8A.4 to change "*market schedule*" (i.e. unconstrained schedule) to "constrained schedule" wherever it appears in order to reflect the approved equations in this section.
- Reinstate sections 3.8A.5 and 3.8A.6, which were removed in error under MR-00349 (deleted), noting that they are intentionally left blank.

Section 3.8E Day-Ahead Linked Wheel Failure Charge (DA-LWFC)

- Modify section 3.8E.3 to reflect the correct calculation of the charge when a linked wheel is subject to both the DA-LWFC and the real time failure charge(s), by adjusting the real time

---

PART 3 – EXPLANATION FOR PROPOSED AMENDMENT

failure charges within the calculation. This necessary adjustment is included in the stakeholdered EDAC design and in the settlements market manual.

Section 4.7B Real-Time Generation Cost Guarantee Payments

- Modify section 4.7B.3 to correct the reference to section 4.7B.1.1 (which is currently shown as 4.7.1.1 in error).

- Modify section 4.7B.4 to reflect the change from day-ahead generation cost guarantee to day-ahead production cost guarantee and the change from generation facility to generation unit.

Section 4.7D Day-Ahead Production Cost Guarantee Payments

- Strike out "4.7D.1.1" and "4.7D.2.1", which are unnecessary.

- Modify section 4.7D.2, 4.7D.4, 4.7D.5 and 4.7D.6 to reflect the change from EDAC to DACP and the change from generation facility to generation unit.

- Modify section 4.7D.4, Component 3 to use "schedule of record" not "day-ahead schedule", and minor errata.

- Modify section 4.7D.5 and 4.7D.6 to change the correct the reference to "4.7D.3" by changing it to "4.7D.4".

PART 4 – IESO BOARD DECISION RATIONALE

3.1.11   The *IESO* shall, in accordance with the applicable *market manual,* determine the required *settlement* data for *registered market participants* that submitted *dispatch data* for *facilities* operating as *pseudo-units,* using the information submitted under Chapter 7, sections 2.2.6G and 2.2.6J, and shall provide this *settlement* data directly to the *settlement process.*

……………………………..

3.5.7A   A *registered market participant* for a *constrained on generation facility* is not entitled to a congestion management *settlement* credits determined in accordance with section 3.5.2 for that *facility* up to *minimum loading point* if the congestion management *settlement* credit is earned as a result of constraints applied under Chapter 7, section 5.8.5 for hours in the day after the *dispatch day.* In this case, the *IESO* may withhold or recover such congestion management *settlement* credits and shall redistribute any recovered payments in accordance with section 4.8.2 of Chapter 9.

....

3.8A.4   The combined day-ahead and real-time *intertie offer* guarantees and intertie offer guarantee *settlement* credit offset ("IOG Offset") process is as follows. Any adjustment made by the *IESO* under section 3.8A.3 shall be applied with respect to any export transaction in the <u>constrained schedule</u> ~~market schedule~~ for *market participant* 'k' in each *settlement hour* 'h' for which *market participant* 'k' is entitled to receive a real-time or day-ahead *intertie offer* guarantee *settlement* credit meeting the conditions set out in section 3.8A.3. The total amount offset shall be limited by the cumulative quantity of the export transactions expressed in the <u>constrained schedule</u> ~~market schedule~~ for that *settlement hour* and shall not exceed the total combined real-time and day-ahead *intertie offer* guarantee *settlement* credits received for the *settlement hour*. Where the cumulative quantity of the export transactions expressed in the <u>constrained schedule</u> ~~market schedule~~ for the *settlement hour* is less than the cumulative quantity of imports triggering real-time and day-ahead *intertie offer* guarantee *settlement* credits for that same *settlement hour*, the real-time and day-ahead *intertie offer* guarantee *settlement* credits will be offset in ascending order from the import transaction with the smallest real-time and/or smallest day-ahead *intertie offer* guarantee *settlement* rate to the import transaction attracting the largest real-time and/or largest day-ahead *intertie offer* guarantee *settlement* rate and only up until the point at which the total quantity of import transactions equals the total quantity of export transactions, and may be expressed as described in the general rule that follows.

....

The ordering of these *settlement amounts* is described in terms of a general rule as follows:

Let $MI_{k,h}^{t}$ [N,13] be an N by 13 matrix of N pairs of import quantities scheduled for injection by *market participant* 'k' in the real-time *dispatch schedule* and/or the constrained schedule from the ~~EDAC~~ <u>DACP</u> *schedule of record* in the *settlement hour* 'h' ($DA\_DQSI_{k,h}^{i}$ and/or $DQSI_{k,h}^{\ i}$ as the case may be) paired with the corresponding day-ahead *intertie offer* guarantee, the component of the real-time *intertie offer* guarantee *settlement* credit, DA-IOG rate, RT-IOG rate, DA Offset DQSW, DA-Offset Flag, Settlement rate, (gross) IOG$, RT Offset DQSW, IOG Offset $, (net) IOG $ for all *intertie metering points* 'i' arranged in ascending order by *settlement* rate in each row. Columns 1 through 4 are original inputs to the matrix, while columns 5 through 13 are derived.

....

3.8A.5   [Intentionally left blank - section deleted]

3.8A.6   [Intentionally left blank - section deleted]

....

3.8E.3   If a day-ahead linked wheel failure charge specified in section 3.8E.2 applies to a linked wheel where a real-time import failure charge specified in section 3.8C.3 and/or a real-time export failure charge specified in section 3.8C.5 applies to the same linked wheel, ~~the lesser of the day-ahead linked wheel failure charge and the sum of the real-time import failure charge and the export failure charge shall apply to the *market participant*.~~ a charge shall apply to the *market participant* equal to the lesser of:

3.8E.3.1   the day-ahead linked wheel failure charge specified in section 3.8E.2; and

3.8E.3.2   the sum of the real-time import failure charge and the real-time export failure charge, both subject to the scheduling deviation quantity between the *schedule of record* and the *pre-dispatch schedule*, as follows:

$RT\_EFC\_DALW_{k,h}{}^i + RT\_IFC\_DALW_{k,h}{}^i$

Where:

$RT\_EFC\_DALW_{k,h}{}^i$	=	real-time export failure charge for the export portion of the day-ahead linked wheel for the quantity failure from day-ahead to Pre-dispatch

$RT\_EFC\_DALW_{k,h}{}^i$	=	$$\sum^T (-1) \times MIN\left[MAX\left[0, \left(PD\_EMP_h^{m,t} - EMP_h^{m,t} - PB\_EX_h^t\right) \times MAX\left(\left(DA\_DQSW_{k,h}^{i,t} - PD\_DQSW_{k,h}^{i,t}\right), 0\right)\right], MAX\left(0, PD\_EMP_h^{m,t}\right) \times MAX\left(\left(DA\_DQSW_{k,h}^{i,t} - PD\_DQSW_{k,h}^{i,t}\right), 0\right)\right]$$

$RT\_IFC\_DALW_{k,h}{}^i$	=	real-time import failure charge for the import portion of the day-ahead linked wheel for the quantity failure from day-ahead to Pre-dispatch

$$RT\_IFC\_DALW_{k,h^i} = \sum^{T}(-1) \times \text{MIN}\Big[\text{MAX}\Big[0, \big(EMP_h^{m,t} + PB\_IM_h^t - PD\_EMP_h^{m,t}\big) \times \text{MAX}\big((DA\_DQSI_{k,h}^{i,t} - PD\_DQSI_{k,h}^{i,t}), 0\big)\Big], \text{MAX}\big(0, EMP_h^{m,t}\big) \times \text{MAX}\big((DA\_DQSI_{k,h}^{i,t} - PD\_DQSI_{k,h}^{i,t}), 0\big)\Big]$$

………………………………….

4.7B.3   If for each eligible *generation facility* the sum of the revenues calculated pursuant to section 4.7B.1.1 is less than the *combined guaranteed costs* referred to in section 4.7B.1.2, then the *IESO* shall calculate that difference and shall include that amount in the form of additional payments made in respect of the eligible *generation facility*.

4.7B.4   A *real-time* generation cost guarantee shall not be paid for a *generation facility unit* with respect to costs incurred or revenues accrued by that *generation facility unit* for which a day-ahead generation production cost guarantee applies under section 4.7D.

…………………………………

4.7D.1   The *IESO* shall determine on a *per-start* basis, for each *generation facility unit* that has met the criteria set out in chapter 7, sections 5.8.4, a day-ahead production cost guarantee consisting of the following components:

4.7D.1.1a. Component 1 is any shortfall in payment on the delivered real-time *dispatch* of the *schedule of record* and will be based upon the real-time revenue received for that amount of *energy* in comparison with the value as represented in the *generator's* day-ahead *offer* for incremental *energy* and *speed-no-load costs*;

……………………………..

4.7D.2   The *IESO* shall determine the type of schedule and which components described in Section 4.7D.1 are included in the day-ahead production cost guarantee, for each *generation facilityunit*, as follows:

4.7D.2.1a. Variant 1: If the *generation unit* is not operating from the previous *dispatch day* into the current *dispatch day*, the day-ahead production costs guarantee calculation for the current *dispatch day* includes Components 1 through 5. Variant 1 occurs when:

- the *generation unit* is not operating at the end of the previous ~~EDAC~~DACP dispatch day (Day-1 HE 24 indicates off-line status); or

- the *generation unit* is operating at the end of the previous ~~EDAC~~DACP dispatch day (Day-1, HE 24 indicates on-line status) but it is not operating into the current ~~EDAC~~DACP dispatch day (Day 0, HE 1 indicates off-line status); or

   - the *generation unit* is scheduled to start later in the current ~~EDAC~~DACP dispatch day.

b.   Variant 2: If the *generation unit* is operating from the previous *dispatch day* into the current *dispatch day*, to complete its *minimum generation block run-time* the day-ahead production costs guarantee calculation for the current *dispatch day* includes Components 1 through 4 but does not include Component 5. The day-ahead production costs guarantee calculation also includes a clawback for Component 1 and Component 3

c.   Variant 3: If a *generation unit* is operating from the previous *dispatch day* into the current *dispatch day* and has completed its *minimum generation block run-time* in the previous *dispatch day*, the day-ahead production costs guarantee calculation for the current *dispatch day* includes Components 1 through 4 but does not include Component 5. Variant 3 occurs when:

   - the *generation unit* is operating from the previous ~~EDAC~~DACP *dispatch day* (Day-1, HE 24 indicates on-line status) into the current ~~EDAC~~DACP *dispatch day* (Day 0, HE 1 indicates on-line status) and has completed its *MGBRT* in the previous ~~EDAC~~DACP *dispatch day*; or

   - the *generation unit* is operating from the previous ~~EDAC~~DACP *dispatch day* (Day-1, HE 24 indicates on-line status) into the current ~~EDAC~~DACP *dispatch day*, (Day 0, HE 1 indicates on-line status) and has not completed its *MGBRT* and is scheduled in the current ~~EDAC~~DACP *dispatch day* for hours in excess of completing its *MGBRT* from the previous ~~EDAC~~DACP *dispatch day*. Variant 3 in the current ~~EDAC~~DACP *dispatch day* is only for the hours in excess of completing the *MGBRT* hours for the start from the previous ~~EDAC~~DACP *dispatch day*.

…………………………….

4.7D.4   The *IESO* shall calculate the day-ahead production cost guarantee components based on the type of schedule described in Section 4.7D.2.1 as follows:

………………………………….

Component 3 Clawback – Variant 2

- Component 3 Clawback – Variant 2 recovers the congestion management settlement credits (CMSC) paid up to the *minimum loading point* for the remaining hours of MGBRT. Component 3 Clawback – Variant 2 is calculated as follows :

$PCG\_COMP3\_CB_{k,h}^{m,t}$ Income received from real time congestion management settlement credits (CMSC) from the minimum of *generation ~~facility's~~ unit's minimum loading point* and the allocated quantity of energy injected to the ~~generator's~~ real-time unconstrained schedule over the interval

Component 3 Clawback - Variant 2 is only calculated when:

- the ~~day-ahead schedule~~*schedule of record* is not less than both the real-time constrained schedule and the real-time unconstrained schedule and the event is a constrained-on event (i.e. Scenarios 3 and 5);

- the *minimum loading point* is greater than the real-time unconstrained schedule; and

- Component 3 ($PCG\_COMP3_{k,h}^{m,t}$) for the same interval is a value other than zero.

……………………………

Component 5 – Variant 1

Component 5 is the as-offered *start-up cost* incurred to bring an off-line *generation ~~facility~~ unit* through all the unit specific start-up procedures, including synchronization and ramp up to *minimum loading point*. Component 5 is calculated as follows:

$PCG\_COMP5_{k,h}^{m,t}$ As-offered *start-up cost* submitted by the *market participant* for the ~~EDAC~~DACP start event.

The rules for calculating Component 5 are as follows:

- **Scenario 1:** If the ~~market participant~~*generation unit* achieves *minimum loading point* within the first 6 intervals[1] of the start of the ~~EDAC~~DACP scheduled period, the full as-offered start-up cost is considered.

- **Scenario 2:** If the ~~market participant~~<u>generation unit</u> achieves *minimum loading point* between the start of the 7th interval and before the start of the 18th interval of the start of the ~~EDAC~~<u>DACP</u> scheduled period, the as-offered start-up cost is calculated on a fractional basis. The as-offered start-up cost is calculated based on the number of 5-minute intervals the resource takes to achieve *minimum loading point* between the start of the 7th interval and before the start of the 18th interval.

    - **Scenario 3:** If the ~~market participant~~<u>generation unit</u> achieves *minimum loading point* after the 17th interval of the start of the ~~EDAC~~<u>DACP</u> scheduled period (i.e. 18th interval and onwards), the as-offered *start-up cost* is not considered.

…………………………………..

4.7D.5   If for each ~~EDAC~~<u>DACP</u> start event for each eligible *generation ~~facility~~ <u>unit</u>* the sum of the revenues referred to in section 4.7D.~~3~~<u>4</u> is greater than or equal to the sum of the costs referred to in section 4.7D.~~3~~<u>4</u>, then the IESO shall make no additional payments in respect of the eligible *generation facility*.

4.7D.6   If for each ~~EDAC~~<u>DACP</u> start event for each eligible *generation ~~facility~~ <u>unit</u>* the sum of the revenues referred to in section 4.7D.~~3~~<u>4</u> is less than the sum of the costs referred to in section 4.7D.~~3~~<u>4</u>, then the *IESO* shall include that amount in the form of additional payments made in respect of the eligible *generation facility*.

PART 5 – IESO BOARD DECISION RATIONALE

Market Rule Amendment Proposal

PART 1 – MARKET RULE INFORMATION

Identification No.:	MR-00375-R02				
Subject:	Enhanced Day-Ahead Commitment Process (EDAC)				
Title:	Market Rule True-up				
Nature of Proposal:	☒ Alteration		☐ Deletion		☐ Addition
Chapter:	11		Appendix:		
Sections:	n/a				
Sub-sections proposed for amending:					

PART 2 – PROPOSAL HISTORY – PLEASE REFER TO MR-00375-R00

Version	Reason for Issuing	Version Date
Approved Amendment Publication Date:		
Approved Amendment Effective Date:		

PART 3 – EXPLANATION FOR PROPOSED AMENDMENT

Provide a brief description of the following:

- The reason for the proposed amendment and the impact on the *IESO-administered markets* if the amendment is not made.
- Alternative solutions considered.
- The proposed amendment, how the amendment addresses the above reason and impact of the proposed amendment on the *IESO-administered markets*.

Summary

Please refer to MR-00375-R00.

Background

Please refer to MR-00375-R00.

Discussion

It is proposed to modify the market rules in Chapter 11 Definitions in the following manner:

- The definitions of **schedule of record** and **pseudo-unit** will be modified to improve clarity.

- The definition of **combined guaranteed costs** was deleted in MR-00348 because it was no longer used in the calculation of the day-ahead generation cost guarantee once the day-ahead production cost guarantee became effective. However, Combined Guaranteed Costs are still required in the calculation of the real-time generation cost guarantee. The definition will be re-instated.

PART 4 – PROPOSED AMENDMENT

> *schedule of record* means ~~a stage of~~the last valid set of results from the day-ahead commitment process ~~where the resulting constrained schedule is used in~~used by the *IESO* for the application of constraints and the calculation of various day-ahead *settlement amounts*;

> *pseudo-unit* means a combined cycle *generation facility* ~~consisting of a combined cycle *facility*~~that is modeled based on a gas-to-steam relationship between generation units, and which is comprised of one ~~or more~~ combustion turbine~~s~~ generation unit and a ~~single~~ share of one steam turbine generation unit ~~represented as a single *generation unit*~~ ~~for use in the day-ahead commitment process' 24 hour optimization~~at the same combined cycle *generation facility*.

> *combined guaranteed costs* means all fuel costs incurred by a *generation facility* up to and including its *minimum loading point,* as defined in the applicable *market manual,* including costs incurred by that *generation facility* to achieve synchronization and once synchronized with the *IESO-controlled grid* to move to the *generation facility's minimum loading point;*

PART 5 – IESO BOARD DECISION RATIONALE

Insert Text Here

Market Rule Amendment Proposal

PART 1 – MARKET RULE INFORMATION

Identification No.:	MR-00375-R03
Subject:	Enhanced Day-Ahead Commitment Process (EDAC)
Title:	Market Rule True-up

Nature of Proposal:	☒ Alteration	☐ Deletion	☐ Addition

Chapter:	n/a	Appendix:	7.5A
Sections:	various		
Sub-sections proposed for amending:	various		

PART 2 – PROPOSAL HISTORY – PLEASE REFER TO MR-00375-R00

Version	Reason for Issuing	Version Date
Approved Amendment Publication Date:		
Approved Amendment Effective Date:		

PART 3 – EXPLANATION FOR PROPOSED AMENDMENT

Provide a brief description of the following:

- The reason for the proposed amendment and the impact on the *IESO-administered markets* if the amendment is not made.
- Alternative solutions considered.
- The proposed amendment, how the amendment addresses the above reason and impact of the proposed amendment on the *IESO-administered markets*.

Summary

Please refer to MR-00375-R00.

Background

Please refer to MR-00375-R00.

Discussion

It is proposed to amend Appendix 7.5 to reflect that the Production Cost Guarantee is now referred to as Day-Ahead Production Cost Guarantee, and all references to EDAC have been replace with DACP. Also amend this appendix to correct the errata in the numbering of section 6.11.

PART 4 – PROPOSED AMENDMENT

Table of Contents

Appendix 7.5A – The ~~EDAC~~DACP Calculation Engine Process

1.1   Interpretation

1.1.1   This appendix describes the ~~EDAC~~DACP calculation engine process used to determine commitments, constrained schedules, and shadow prices.

        1.1.1.1   Commitment refers to the availability of *generation facilities* and *imports* to provide *energy* and/or *operating reserve* and *dispatchable loads* and *exports* to provide *operating reserve*.

        1.1.1.2   The constrained schedules of the *schedule of record* are assessed in the calculation of day-ahead production cost guarantees.

        1.1.1.3   The shadow price of a location indicates the price of meeting an infinitesmal amount of change in load at that location.

1.1.2   The mathematical description of the optimization algorithm of the ~~EDAC~~DACP calculation engine process is also described in this appendix.

1.1.3   The ~~EDAC~~DACP calculation engine "outputs" described in this appendix refer to data produced by ~~EDAC~~DACP calculation engine and the *IESO* shall not be required to *publish* such data except where expressly required by these *market rules*.

2. ~~EDAC~~DACP Calculation Engine

2.1 Overview

2.1.1 The ~~EDAC~~DACP calculation engine is a core component of the ~~EDAC~~DACP process that performs the functions of commitment and constrained scheduling over a 24-hour period for *energy* and *operating reserves,* and the calculation of shadow prices. The ~~EDAC~~DACP calculation engine executes three passes to produce the final *schedule of record*.

 2.1.1.1 Pass 1, the Commitment Pass determines the initial set of commitments and constrained schedules required to satisfy the average forecast *demand* of the next day. Details of Pass 1 are described in section 4.

 2.1.1.2 Pass 2, the Reliability Pass ensures that if the resources committed by Pass 1 are insufficient to satisfy peak forecast *demand*, additional resources are committed and scheduled. Details of Pass 2 are described in section 5.

 2.1.1.3 Pass 3, the Scheduling Pass uses the commitments made in Passes 1 and 2 to determine the *schedule of record* and the associated constrained schedules to meet average forecast *demand*. Details of Pass 3 are described in section 6.

2.1.2 Since each pass provides constrained schedules, the ~~EDAC~~DACP calculation engine will iterate the calculations for constrained schedules with *security* assessments until there are no *security* violations. The *security* assessment functionality is described in section 4.4.

3. Inputs into the ~~EDAC~~DACP Calculation Engine

3.1 Demand Forecast

3.1.1 The *IESO* shall prepare forecasts of the total *demand* in Ontario for each hour of the next day. This hourly forecast will be modified by the ~~EDAC~~DACP calculation engine so that the expected consumption associated with *dispatchable loads* will be removed. Average hourly *demand* forecasts will be used as inputs to Passes 1 and 3. Peak hourly *demand* forecasts will be used as inputs to Pass 2.

3.2   Energy Offers and Bids

3.2.1   A registered market participant may submit an energy offer or energy bid and associated dispatch data with respect to a given registered facility for each dispatch hour of the next day for ~~EDAC~~DACP. Energy offers, bids and dispatch data shall be submitted in accordance to Chapter 7.

3.3   Operating Reserve Offers

3.3.1   A *registered market participant* may submit an *offer* and associated *dispatch data* to provide each class of *operating reserve* for each *dispatch hour* of the next day for ~~EDAC~~DACP. *Operating reserve offers* and *dispatch data* shall be submitted in accordance to Chapter 7.

3.4   Forecasts from Self-Scheduling Generation Facilities, Transitional Scheduling Generators and Intermittent Generators

3.4.1   The ~~EDAC~~DACP calculation engine will take into account the expected output of *self-scheduling generation facilities, transitional scheduling generators and intermittent generators* when committing resources to meet forecast *demand* for the next day. The *registered market participant* representing such generation at each location will inform the *IESO* of the amount of *energy* it expects to produce in each hour of the next day as a function of price in accordance to Chapter 7.

3.5   Ramp up to Minimum Loading Point

3.5.1   In order for the ~~EDAC~~DACP calculation engine to determine constrained schedules in Pass 3 that account for the *energy* produced by *generation facilities* during ramping to their *minimum loading points*, an approximate value of this *energy* will be used. This *energy* will be represented by a fraction of the unit's *minimum loading point* in the hour prior to the first hour it is scheduled.

3.6   Energy Limited Resources

3.6.1   *Energy* limited resources constitute a subset of *generation facilities* that at times can be limited in the amount of *energy* they can provide during each day.

3.6.2   An *energy* limited resource shall designate the daily limit on the amount of *energy* it could be scheduled to generate over the course of the day.

3.7   Transmission Inputs

3.7.1.   Transmission inputs are based on information prepared by the *IESO* for the *security* assessment function of the ~~EDAC~~DACP calculation engine described in section 4.4. These inputs include:

3.7.1.1   Internal transmission constraints;

3.7.1.2   Limits on imports and exports;

3.7.1.3   Loop flows; and

3.7.1.4   Transmission losses.

3.8   Other Inputs

3.8.1   The *IESO* shall also provide other inputs into the ~~EDAC~~DACP calculation engine that are necessary in order to ensure a solution that is consistent with system *reliability*. These include:

3.8.1.1   Distribution of internal *demand*;

3.8.1.2   Distribution of imports, exports and loop flows;

3.8.1.3   *Operating reserve* requirements;

3.8.1.4   Must-run resources for other reliability purposes;

3.8.1.5   Regulation *(AGC);*

3.8.1.6   Voltage constraints;

3.8.1.7   Initializing assumptions regarding resources in operation; and

3.8.1.8   Costs of violations.

………………..

4.4   Security Assessment

4.4.1   For constrained scheduling, the ~~EDAC~~DACP calculation engine iterates a *security* assessment function with the scheduling function. The scheduling function produces schedules which are passed to the *security* assessment function. The *security* assessment function determines losses and additional constraints which feed back to the subsequent iteration of the scheduling function.

4.4.2   The *security* assessment function used by Pass 1 is common to all passes of the ~~EDAC~~DACP calculation engine process.

………………

4.4.6   Constraint violation variables, when violated indicate the type of problem that is not allowing the optimization of the objective function to have a solution. The equivalent constraint violation variables and their values as used in the *real-time market* and described Appendix 7.5, section 4.12 are utilized by the ~~EDAC~~DACP

calculation engine. Further details of these inputs for the ~~EDAC~~DACP calculation engine are described in section 4.6.2.4.

4.5 Outputs from Pass 1

4.5.1 The primary outputs of Pass 1 which are used in Pass 2 and other ~~EDAC~~DACP processes include the following:

4.5.1.1 Commitments;

4.5.1.2 Constrained schedules for *energy*; and

4.5.1.3 Shadow prices for *energy*.

4.6 Glossary of Sets, Indices, Variables and Parameters for Pass 1

………………..

4.6.2.4 Constraint Violation Price Inputs

PLdViol

The value that the ~~EDAC~~DACP calculation engine will assign to scheduling the forecast load. As measured by the effect on the value of the objective function, if the cost of serving that load (in dollars per MWh) exceeds *PLdViol*, then that load would not be scheduled. This is not applicable to Pass 1 since *PLdViol* will exceed maximum *bid* price allowed and no *bid* load could be scheduled at this price. This equals the shortage cost for *energy* applied in the *real-time market*.

……………….

4.11 Constraints to Ensure Schedules Do Not Violate Reliability Requirements

4.11.1 Load

4.11.1.1 For each hour of the ~~EDAC~~DACP, the total amount of *energy* generated in the ~~EDAC~~DACP schedule, plus scheduled imports must be sufficient to meet forecast *demand*, scheduled exports, and transmission losses consistent with these schedules. It will be easiest to

break the derivation of the constraint that will ensure this occurs into several steps.

4.11.1.2   First, define the total amount of withdrawals scheduled in Pass 1 at each bus *b* in each hour *h*, $With^1_{h,b}$, as the sum of:

- the portion of the load forecast for that hour that has been allocated to that bus;

- all *dispatchable load bid*, net of the amount of load reduction scheduled (since the *dispatchable load* is excluded from the *demand* forecast by the ~~EDAC~~DACP calculation engine);

- exports from Ontario to each *intertie zone* sink bus; and

- outflows from Ontario associated with loop flows between Ontario and each *intertie zone*, allocated among the buses in the *intertie zones* using the distribution factors developed for that purpose, yielding:

$$With^1_{h,b} = LDF_{h,b} \cdot AFL_h + \left[\sum_{j \in J_b} \left(PRL_{j,h,b} - SPRL^1_{j,h,b} \right) \right]; \text{and}$$

$$With^1_{h,d} = \sum_{j \in J_d} (SHXL^1_{j,h,d}) - \sum_{a \in A} ProxyUPOWt_{d,a} \cdot \min(0, PF_{h,a}).$$

………………..

4.11.1.4   Injections and withdrawals at each bus must be multiplied by one plus the marginal loss factor to reflect the losses (or reduction in losses) that result when injections or withdrawals occur at locations other than the *reference bus*. These loss-adjusted injections and withdrawals must then be equal to each other, after taking into account any system loss adjustment that is required due to the difference between average and marginal losses. Load reduction associated with the *demand* constraint violation will be subtracted from the total load and generation reduction will be subtracted from total generation associated with the *demand* constraint violation to ensure that the ~~EDAC~~DACP calculation engine will always produce a solution. These violation variables are assigned a very high cost to limit their use to infeasible cases.

$$\sum_{b\in B}(1+MglLoss_{h,b})With^1_{h,b} + \sum_{d\in D}(1+MglLoss_{h,d})With^1_{h,d} - SLdViol^1_h$$

$$= \sum_{b\in B}(1+MglLoss_{h,b})Inj^1_{h,b}$$

$$+ \sum_{d\in D}(1+MglLoss_{h,d})Inj^1_{h,d} - SGenViol^1_h + LossAdj_h.$$

………………..

4.11.3 Internal Transmission Limits

4.11.3.1 The *IESO* must ensure that the set of ~~EDAC~~DACP schedules produced by Pass 1 of the ~~EDAC~~DACP calculation engine would not violate any *security limits* in either the pre-contingency state or after any contingency.

4.11.3.2 To develop the constraints to ensure that this occurs, the total amount of *energy* scheduled to be injected at each bus and the total amount of *energy* scheduled to be withdrawn at each bus will be used.

4.11.3.3 The *security* assessment function of the ~~EDAC~~DACP calculation engine will linearize binding (violated) pre-contingency limits on transmission *facilities* within Ontario. The linearized constraints will take the form:

$$\sum_{b\in B}PreConSF_{b,f,h}(Inj^1_{h,b} - With^1_{h,b}) + \sum_{d\in D}PreConSF_{d,f,h}(Inj^1_{h,d} - With^1_{h,d})$$

$$- SPreConITLViol^1_{f,h} \le AdjNormMaxFlow_{f,h}$$

where *D* is the set of sink and source buses outside Ontario, for all *facilities f* and hours *h*.

4.11.3.4 Similarly, the linearized binding post-contingency limits will take the form:

$$\sum_{b\in B}SF_{b,f,c,h}(Inj^1_{h,b} - With^1_{h,b}) + \sum_{d\in D}SF_{d,f,c,h}(Inj^1_{h,d} - With^1_{h,d})$$

$$- SITLViol^1_{f,c,h} \le AdjEmMaxFlow_{f,c,h}$$

for all *facilities f*, hours *h*, and monitored contingencies *c*.

4.11.4 Intertie Limits and Constraints on Net Imports

4.11.4.1 The *IESO* must ensure that the set of ~~EDAC~~DACP schedules produced by Pass 1 of the ~~EDAC~~DACP calculation engine would not violate any *security limits* associated with *interties* between Ontario and *intertie zones*. To ensure this, we must calculate the net amount of *energy* scheduled to flow over each *intertie* in each hour and the amount of *operating reserve* scheduled to be provided by resources in that

control area. This will be summed over all affected *interties*. The result will be compared to the limit associated with that constraint. Consequently:

$$\sum_{a\in A}\begin{bmatrix} EnCoeff_{a,z}\left(\sum_{d\in DI_a,k\in K_d}(SHIG^1_{k,h,d})+PF_{h,a}-\sum_{d\in DX_a,j\in J_d}(SHXL^1_{j,h,d})\right)+ \\ 0.5(EnCoeff_{a,z}+1)\begin{bmatrix}\sum_{d\in DI_a,k\in K_d}(SI10N^1_{k,h,d}+SI30R^1_{k,h,d}) \\ +\sum_{d\in DX_a,j\in J_d}(SX10N^1_{j,h,d}+SX30R^1_{j,h,d})\end{bmatrix} \end{bmatrix}$$

$$\leq MaxExtSch_{z,h}$$

for all hours *h*, for all *intertie zones a* relevant to the constraint *z*

($EnCoeff_{a,z}\neq 0$), and for all constraints *z* in the set Z_{sch}.

4.11.4.2   In addition, changes in the net *energy* schedule over all *interties* cannot exceed the limits set forth by the *IESO* for hour-to-hour changes in those schedules. The net import schedule is summed over all *interties* for a given hour. It cannot exceed the sum of net import schedule for all *interties* for the previous hour plus the maximum permitted hourly increase. It cannot be less than the sum of the net import schedule for all *interties* for the previous hour minus the maximum permitted hourly decrease. Violation variables are provided for both the up and down ramp limits to ensure that the ~~EDAC~~DACP calculation engine will always find a solution. Therefore:

$$\sum_{d\in D}\left(\sum_{k\in K_d}(SHIG^1_{k,h-1,d})-\sum_{j\in J_d}(SHXL^1_{j,h-1,d})\right)-ExtDSC_h-SDRmpXTLViol^1_h$$

$$\leq \sum_{d\in D}\left(\sum_{k\in K_d}(SHIG^1_{k,h,a})-\sum_{j\in J_d}(SHXL^1_{j,h,d})\right)$$

$$\leq \sum_{d\in D}\left(\sum_{k\in K_d}(SHIG^1_{k,h-1,d})-\sum_{j\in J_d}(SHXL^1_{j,h-1,d})\right)+ExtUSC_h+SURmpXTLViol^1_h$$

for all hours *h* (schedules for hour, *h*=0 are obtained from the initializing inputs listed in section 3.8).

....

5.0   Pass 2: Constrained Commitment to

Meet Peak Demand

5.1   Overview

5.1.1   Pass 2 performs a least cost, *security* constrained unit commitment and constrained scheduling to meet the forecast peak *demand* and *IESO*-specified *operating reserve* requirements.

5.1.2   In each hour, peak *demand* occurs for a fraction of that hour. If additional commitment of *generation facilitie*s above those made in Pass 1 are required to meet peak *demand*, these *generation facilities* would only need to be operating for a fraction of the hour. Therefore, in Pass 2, the ~~EDAC~~DACP calculation engine performs least cost optimization with respect to minimizing commitment costs to satisfy peak *demand*.

………………..

5.5   Outputs from Pass 2

5.5.1   The primary outputs of Pass 2 which are used in Pass 3 and other ~~EDAC~~DACP processes include the following:

      5.5.1.1   Commitments; and

      5.5.1.2   Constrained schedules for *energy*.

………………..

5.12   Constraints to Ensure Schedules Do Not Violate Reliability Requirements

5.12.1   Load

      5.12.1.1   Load constraints are structured in the same manner as described in section 4.11.1 for Pass 1.

      5.12.1.2   The total amount of withdrawals scheduled in Pass 2 at each bus *b* in each hour *h*, $With^2_{h,b}$, is the sum of:

- the portion of the load forecast for that hour that has been allocated to that bus;

- all *dispatchable load bid*, net of the amount of load reduction scheduled (since the *dispatchable load* is excluded from the *demand* forecast by the ~~EDAC~~DACP calculation engine);

- exports from Ontario to each *intertie zone* sink bus; and

- outflows from Ontario associated with loop flows between Ontario and each *intertie zone*, allocated among the buses in the *intertie zones* using the distribution factors developed for that purpose, yielding:

$$With^2_{h,b} = LDF_{h,b} \cdot PFL_h + \left[\sum_{j \in J_b} \mathbf{(}PRL_{j,h,b} - SPRL^2_{j,h,b} \right]; \text{ and}$$

$$With^2_{h,d} = \sum_{j \in J_d} (SHXL^2_{j,h,d}) - \sum_{a \in A} ProxyUPOWt_{d,a} \cdot \min(0, PF_{h,a}).$$

………………..

5.12.3 Internal Transmission Limits

5.12.3.1 The *IESO* must ensure that the set of ~~EDAC~~DACP schedules produced by Pass 2 of the calculation engine would not violate any *security limits* in either the pre-contingency state or in any contingency. To develop the constraints to ensure that this occurs, the total amount of *energy* scheduled to be injected at each bus and the total amount of *energy* scheduled to be withdrawn at each bus will be used.

………………

6.6.2 Variables and Parameters

………………..

6.6.2.6 Output Schedule and Commitment Variables

……………….

RAMPUP_ENRG	The estimated fraction of a *generation facility*'s *minimum loading point* in the hour prior to the first hour it is scheduled. This value is used by the ~~EDAC~~ DACP calculation engine to determine constrained schedules in Pass 3 so that the *energy* produced by the *generation facility* during ramping to their *minimum loading point* is accounted for.

……………….

6.11 Constraints to Ensure Schedules Do Not Violate Reliability Requirements

6.11.1   Load

      6.11.1.1   The total amount of withdrawals scheduled in Pass 3 at each bus *b* in each hour *h*, $With^3_{h,b}$, is the sum of:

- the portion of the load forecast for that hour that has been allocated to that bus;

- all *dispatchable load bid*, net of the amount of load reduction scheduled (since the *dispatchable load* is excluded from the *demand* forecast by the ~~EDAC~~DACP calculation engine);

- exports from Ontario to each *intertie zone* sink bus; and

- outflows from Ontario associated with loop flows between Ontario and each *intertie zone*, allocated among the buses in the *intertie zones* using the distribution factors developed for that purpose, yielding:

$$With^3_{h,b} = LDF_{h,b} \cdot PFL_h + \left[\sum_{j \in J_b} \left(QPRL_{j,h,b} - SPRL^3_{j,h,b} \right) \right] ; \text{and}$$

$$With^3_{h,d} = \sum_{j \in J_d} (SHXL^3_{j,h,d}) - \sum_{a \in A} ProxyUPOWt_{d,a} \cdot \min(0, PF_{h,a}).$$

………………

6.11.3   Internal Transmission Limits

      6.11.3.1   The *IESO* must ensure that the set of ~~EDAC~~DACP schedules produced by Pass 3 of the calculation engine would not violate any *security limits* in either the pre-contingency state or in any contingency. To develop the constraints to ensure that this occurs, the total amount of *energy* scheduled to be injected at each bus and the total amount of *energy* scheduled to be withdrawn at each bus will be used.

      6.11.3.2   Then the pre-contingency limits on transmission within Ontario will not be violated if:

$$\sum_{b \in B} PreConSF_{b,f,h}(Inj^3_{h,b} - With^3_{h,b}) + \sum_{d \in D} PreConSF_{d,f,h}(Inj^3_{h,d} - With^3_{h,d})$$
$$- SPreConITLViol^3_{f,h} \le AdjNormMaxFlow_{f,h}$$

for all *facilities f* and hours *h*.

6.11.3.3 Post-contingency limits on transmission *facilities* within Ontario will not be violated if:

$$\sum_{b \in B} SF_{b,f,c,h}(Inj_{h,b}^3 - With_{h,b}^3) + \sum_{d \in D} SF_{d,f,c,h}(Inj_{h,d}^3 - With_{h,d}^3)$$
$$- SITLViol_{f,c,h}^3 \leq AdjEmMaxFbw_{f,c,h}$$

for all *facilities f*, hours *h*, and monitored contingencies *c*.

6.11.~~3~~4 Intertie Transmission Limits and Constraints on Net Imports

6.11.~~3~~4.1 The calculation engine would not violate any *security limits* associated with *interties* between Ontario and *intertie zones*. To ensure this, we must calculate the net amount of *energy* scheduled to flow over each *intertie* in each hour and the amount of *operating reserve* scheduled to be provided by resources in that *control area*. This will be summed over all affected *interties*. The result will be compared to the limit associated with that constraint. Consequently:

$$\sum_{a \in A} \left[\begin{array}{l} EnCoeff_{a,z}\left(\sum_{d \in DI_a, k \in K_d}(SHIG_{k,h,d}^3) + PF_{h,a} - \sum_{d \in DX_a, j \in J_d}(SHXL_{j,h,d}^3) \right) + \\ 0.5(EnCoeff_{a,z}+1)\left[\begin{array}{l} \sum_{d \in DI_a, k \in K_d}(SI10N_{k,h,d}^3 + SI30R_{k,h,d}^3) \\ + \sum_{d \in DX_a, j \in J_d}(SX10N_{j,h,d}^3 + SX30R_{j,h,d}^3) \end{array} \right] \end{array} \right]$$
$$\leq MaxExtSch_{z,h}$$

for all hours *h*, for all *intertie zones a* relevant to the constraint *z*

($EnCoeff_{a,z} \neq 0$), and for all constraints *z* in the set Z_{sch}.

6.11.~~3~~4.2 In addition, changes in the net *energy* schedule over all *interties* cannot exceed the limits set forth by the *IESO* for hour-to-hour changes in those schedules. The net import schedule is summed over all *interties* for a given hour. It cannot exceed the sum of net import schedule for all *interties* for the previous hour plus the maximum permitted hourly increase. It cannot be less than the sum of the net import schedule for all *interties* for the previous hour minus the maximum permitted hourly decrease. Violation variables are provided for both the up and down ramp limits to ensure that the calculation engine will always find a solution. Therefore:

$$\sum_{d \in D}\left(\sum_{k \in K_d}(SHIG^3_{k,h-1,d}) - \sum_{j \in J_d}(SHXL^3_{j,h-1,d})\right) - ExtDSC_h - SDRmpXTLViol^3_h$$

$$\leq \sum_{d \in D}\left(\sum_{k \in K_d}(SHIG^3_{k,h,d}) - \sum_{j \in J_d}(SHXL^3_{j,h,d})\right)$$

$$\leq \sum_{d \in D}\left(\sum_{k \in K_d}(SHIG^3_{k,h-1,d}) - \sum_{j \in J_d}(SHXL^3_{j,h-1,d})\right) + ExtUSC_h + SURmpXTLViol^3_h$$

for all hours *h* (schedules for hour, *h*=0 are obtained from the initializing inputs listed in section 3.8).

6.11.~~4~~5   Intertie Schedule Limits Based on Pass 2 Outputs

6.11.~~4~~5.1   Pass 3 will not reduce the amount of imported *energy* scheduled from each *intertie zone* in any hour. Additional imports of *energy* may be scheduled in Pass 3, Therefore, for imports that are not part of a linked wheeling transaction:

$$SHIG^3_{k,h,d} \geq SHIG^2_{k,h,d}$$

for all *offers k*, hours *h* and *intertie zones* source bus *d*, and:

6.11.~~4~~5.2   Pass 3 will not increase the amount of exported *energy* scheduled from each *intertie zone* in any hour to the amount scheduled in Pass 2.

6.11.~~4~~5.3   Therefore, for exports that are not part of a linked wheeling transaction:

$$SHXL^3_{j,h,d} \leq SHXL^2_{j,h,d}.$$

………………..

7.   Combined-Cycle Modeling

7.1   Overview

7.1.1   *Registered market participants* with combined-cycle plants of one or more combustion turbines and one steam turbine may choose to have the associated *generation facilities* modeled as one or more *pseudo-units*. Each *pseudo-unit* comprises of a single combustion turbine and a share of the steam turbine capacity. Inputs for *pseudo-units* used by the ~~EDAC~~DACP calculation engine are described in Chapter 7, section 2.2.6G.

7.2 Modeling by ~~EDAC~~DACP Calculation Engine

7.2.1 The *pseudo-units* are independently scheduled in each pass subject to the optimization objective function described in sections 4.3, 5.3 and 6.3 respectively. However, the security assessment described in section 4.4 is performed for each *generation facility* of the combined-cycle plant.

7.2.2 As the security assessment function iterates with the scheduling function of the ~~EDAC~~DACP calculation engine, the output relationship of each combustion turbine and its share of output from the steam turbine is respected. This output relationship is described as follows:

7.2.2.1 For a combined-cycle plant with i combustion turbines and one steam turbine, it is represented by i *pseudo-units*.

7.2.2.2 For each *pseudo-unit i*, let $pst_{i,k}$ represent the percentage of the *pseudo-unit*'s schedule that relates to the steam turbine in association with *offer k*.

7.2.2.3 Then for each *pseudo-unit i*, the percentage of the *pseudo-unit's* schedule that relates to the combustion turbine i is $(100\% - pst_{i,k})$.

7.2.2.4 For a given *pseudo-unit* schedule $SPSU_{k,h}$ for hour h and k offers its associated combustion turbine schedule is:
$$\sum_k SPSU_{k,h} \times (100\% - pst_{i,k}).$$

7.2.2.5 And the steam turbine schedule of the *pseudo-unit* plant for hour h is:
$$\sum_i \sum_k SPSU_{k,h} \times (100\% - pst_{i,k}).$$

PART 5 – IESO BOARD DECISION RATIONALE

Insert Text Here