

Quick Takes: Compliance Aggregation

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Introduction

Compliance aggregation gives generators flexibility when responding to dispatch instructions. Eligible participants can satisfy the dispatch instructions for two or more facilities by spreading the total megawatt (MW) requirement across the facilities.

Background

Each individual facility is expected to generate to its dispatched output levels, within a range called the 'compliance deadband'.¹ Generating outside of this range is considered non-compliance with the dispatch instruction.

This works well for most generators. However, some generators have interdependencies whereby one facility's response to a dispatch instruction can affect the ability of other facilities to efficiently meet their own dispatch instructions.

For example, consider hydroelectric generators located on the same river system (i.e., a cascade river system). Water used to generate at one facility can directly affect the operations of downstream facilities. In such cases, facility-specific dispatch can make it difficult for participants to meet dispatch instructions while also getting the operational outcomes they need to effectively manage their resources.

What is Compliance Aggregation?

Compliance aggregation allows you to group (aggregate) interdependent generators and flexibly operate them to meet a 'totalized' dispatch instruction. Compliance with IESO dispatch instructions is measured against the aggregate performance rather than on a per facility basis. We assess the suitability of compliance aggregation for a set of facilities on a case-by-case basis to ensure reliability is not compromised.

¹ For an explanation of how dispatch instructions are determined, please refer to the workbook *Introduction to Ontario's Physical Markets* available on the [Marketplace Training](#) web pages

Compliance aggregation gives the operators of related facilities greater flexibility when responding to dispatch instructions. With compliance aggregation:

- You still submit energy and operating reserve offers individually, by facility
- We still send dispatch instructions individually, by facility
- The total output of the compliance aggregate must meet the sum of the energy and operating reserve requirements of the individual dispatch instructions, within a compliance deadband.

Example

Assume that three generators are compliance-aggregated and you offer them as follows:

- Gen A is a 100 MW generator – offer is 90 MW
- Gen B is a 50 MW generator – offer is 50 MW
- Gen C is a 25 MW generator – offer is 25 MW

We send the following dispatch instructions:

- 20 MW for Gen A
- 50 MW for Gen B
- 25 MW for Gen C

Because these facilities are compliance-aggregated, their operators do not have to move each facility to its dispatched operating point. Instead, they need to make sure that the *total* output across all three generators equals the *sum* of the individual instructions:

$$20 \text{ MW} + 50 \text{ MW} + 25 \text{ MW} = \mathbf{95 \text{ MW}}$$

To reach 95 MW of total output, they could run:

- Gen A at 95 MW and not run the other generators at all
- Gen A at 70 MW, Gen C at 25 MW, and not run Gen B
- Gen A at 25 MW, Gen B at 50 MW and Gen C at 20 MW
- Any other combination of outputs that equals 95 MW

Aggregating operating reserve

Facilities registered under compliance aggregation can also aggregate operating reserve (OR):

- You must ensure that you have enough capacity available across the aggregate to meet your scheduled OR. This includes having enough resources with closed breakers to meet scheduled synchronized reserve.
- You can aggregate your response to operating reserve activations (ORA). An ORA for a generator is sent as an energy dispatch instruction requiring a facility to achieve a certain output within 10

or 30 minutes. If desired, the ORA can be spread across your compliance-aggregated facilities in the same way as energy – it's not limited to just the facility that received the dispatch instruction.

Reliability requirements

Please note, for reliability reasons, we can suspend compliance aggregation and require your individual facilities to respond to their own dispatch instructions.

This is referred to as 'unit-specific dispatch'. Unit-specific dispatch does not affect how you are registered. It is simply a temporary reliability mechanism to help deal with issues such as outages or system limit violations. Our control room will contact you if unit-specific dispatch is required. We will also let you know once you can return to using compliance aggregation.

Compliance Deadbands

Facilities are expected to achieve their dispatched level of output. However, we are aware that this is not always possible. Therefore, we have established compliance deadbands.² You are considered compliant with your energy dispatch instruction as long as your facility generates at a level within the deadband.

INDIVIDUAL UNITS

For units that are *not* involved in compliance aggregation (i.e., they are expected to respond to their dispatch instructions individually), the deadband varies depending on the size of the unit. If the unit has a rated output of:

- More than 30 MW: the deadband is the greater of ± 15 MW or $\pm 2\%$ of the facility's dispatch instruction.
- Less than 30 MW: the deadband is the greater of ± 10 MW or $\pm 2\%$ of the facility's dispatch instruction.

NOTE: These individual deadbands are also in effect for compliance-aggregated generators if we have to temporarily suspend compliance aggregation and use unit-specific dispatch.

COMPLIANCE-AGGREGATED FACILITIES

There are also deadband requirements on the total output of a compliance aggregate. Under these requirements, the total output of all the units within a compliance aggregate must be within a certain range. There are also requirements on the output of individual non-quick start units³ within a compliance aggregate.

² Please refer to the Interpretation Bulletin [Compliance with Dispatch Instructions Issued to Dispatchable Generators](#) available on the Compliance pages of our website.

³ A non-quick start unit is one that cannot synchronize and meet a dispatch instruction within a 5-minute dispatch interval

Deadband for the total output of the aggregate as a whole

The energy deadband for the total output of all units within a compliance aggregate depends on the type of generation involved.

For quick-start and non-coal fired non-quick start units, the deadband is the greater of:

- One half of the rated capacity of the largest single unit in the compliance aggregate (to a maximum of the total of the individual deadbands for the units), or
- 15 MW

For compliance aggregates composed of coal units with pulveriser mills, the deadband for the compliance aggregate as a whole is one half of the nominal megawatt value of a single pulveriser mill within the aggregate.

Example: Deadband for quick-start and non-coal fired non-quick start units

Using our earlier example of the three units:

- Gen A is a 100 MW generator
- Gen B is a 50 MW generator
- Gen C is a 25 MW generator

Half of the single largest unit in the aggregate is 50 MW (i.e., 50% of Gen A's 100 MW).

Gen A and Gen B are both rated at above 30 MW. Therefore, the individual deadbands for these units is ± 15 MW.

The deadband for Gen C is ± 10 MW because it is rated below 30 MW.

Given this, the total of the individual deadbands for the units in our example is: $15 \text{ MW} + 15 \text{ MW} + 10 \text{ MW} = \pm 40 \text{ MW}$

Keep in mind that the aggregate deadband is half the rated capacity of the single largest unit in the aggregate (± 50 MW), but it cannot exceed the total of the individual deadbands for the units (i.e., ± 40 MW). Therefore, the deadband for the aggregate as a whole in this example is ± 40 MW.

Example: Deadband for coal fuelled non-quick start units

A pulveriser increases the efficiency of a coal-fired unit by crushing the coal before it is fed into the burner. Several pulverisers are typically shared between units. A pulveriser outage reduces a unit's output because it lowers the supply of coal.

If losing a pulveriser would reduce a unit's output by 100 MW, the deadband for the aggregate as a whole would be half of that, or ± 50 MW.

Deadband for individual non-quick start units within a compliance aggregate

In addition to the above requirements, non-quick start units within a compliance aggregate (whether coal-fired or not) are expected to operate within 50 MW of their individual dispatch instructions at all times. Assume:

- There are three non-quick start units in an aggregate
- Each unit has a 500 MW capability
- Each unit is dispatched to 250 MW for a total of 750 MW from the aggregate

In this scenario, you could operate one unit at 300 MW, another at 200 MW and the third at 250 MW and be considered compliant. This is because each unit would be within 50 MW of its individual dispatch instruction and because the total aggregate was producing 750 MW.

You would be considered non-compliant, however, if the units were any further off of their individual dispatch. For example, running one unit at 500 MW and the other two at 125 MW would be unacceptable. The aggregate would be producing 750 MW, but each unit would be more than 50 MW off of their individual dispatch instructions.

This restriction is waived if:

- The offered ramp up and ramp down rates are the same for all units, or within 1 MW/minute for the same MW range, and
- All offered ramp rates above minimum loading points do not vary by more than 1 MW/minute on each unit in the compliance aggregate.

For example, assume:

- There are two non-quick start units in an aggregate
- Each unit has a 500 MW capability and a 100 MW minimum loading point
- The following ramp rates were submitted with the offers for the units
 - Unit A: (100, 5, 6), (250, 7, 9), (500, 8, 9)
 - Unit B: (100, 4, 5), (250, 6, 9), (500, 7, 10)

In this example, each ramp up and ramp down rate is either the same, or within

1 MW/minute for the same MW range across the units. Also, the ramp rates above the 100 MW minimum loading points for both units do not change by more than 1 MW/ minute from one breakpoint to another. Therefore, these units are not bound by the requirement for each unit to be within 50 MW of its individual dispatch.

When is the output of a non-quick start unit considered to be part of the aggregate?

Additionally, the output of a non-quick start resource can only be counted towards the output of the aggregate once it has reached its minimum loading point. It must respond to individual dispatch instructions while it is below its minimum. For example assume:

- An aggregate includes two non-quick start generators

- Each unit has a 100 MW capacity and a 25 MW minimum loading point
- Unit A is currently producing 30 MW and Unit B is producing 15 MW as it warms up (i.e., it is currently operating below its minimum loading point)
- Unit A receives a dispatch to 40 MW and Unit B receives a dispatch to 30 MW for a total of 70 MW

Under compliance aggregation, Unit B would have to reach at least 25 MW of output before it was considered part of the aggregate. Therefore, Unit A could not increase its output to 70 MW while Unit B shut down. Unit A could, however, increase its output to 45 MW while Unit B increased to 25 MW.

NOTE: You cannot use compliance aggregation to avoid starting a non-quick start unit or to start a unit in place of another. This means that you cannot shut down a non-quick start unit and run another to a higher output level in its place.

Eligibility for Compliance Aggregation

Only related facilities are eligible for compliance aggregation (e.g., facilities on the same river system).

You should also consider how likely it is that we would need to send your facilities unit-specific dispatches for reliability reasons. When you register, we will let you know the chances of this occurring.

CMSC and Compliance Aggregation

Congestion management settlement credits (CMSC) return a participant to the operating profit they would have had if they been dispatched according to their market schedule.⁴ Compliance aggregation can affect CMSC payments because units are not necessarily following their individual dispatches. Consider this example:

	Offered Quantity (MW)	Offer Price (\$/MW)	Market Schedule (MW)	Dispatch Schedule (MW)	Actual Output (MW)
Gen A	100	40	50	30	60
Gen B	50	30	50	30	0

⁴ For more information on CMSC, please see the *Introduction to Ontario's Physical Markets* workbook available on the [Marketplace Training](#) web pages.

If the market clearing price (MCP) for all intervals in the hour is \$50/MWh:

	Offer Price	MCP	Market Schedule Operating Profit	Dispatch Schedule Operating Profit	Operating Profit Based on Actual Output	CMSC
Gen A	\$40	\$50	50 MW X (\$50 – \$40) = \$500	30 MW X (\$50 – \$40) = \$300	60 MW X (\$50 – \$40) = \$600	\$0
Gen B	\$30	\$30	50 MW X (\$50 – \$30) = \$1000	30 MW X (\$50 – \$30) = \$600	0 MW X (\$50 – \$30) = \$0	\$400

$$\begin{aligned} \text{Total revenue} &= \text{Energy payments} + \text{CMSC} \\ &= 60 \text{ MW} \times \$50 + \$400 \\ &= \$3400 \end{aligned}$$

If the units had not been aggregated, and instead had performed according to their dispatch instructions, CMSC would have been:

	Offer Price	MCP	Market Schedule Operating Profit	Dispatch Schedule Operating Profit	Operating Profit if Actual Output had Equalled Dispatch Schedule	CMSC
Gen A	\$40	\$50	50 MW X (\$50 – \$40) = \$500	30 MW X (\$50 – \$40) = \$300	30 MW X (\$50 – \$40) = \$300	\$200
Gen B	\$30	\$30	50 MW X (\$50 – \$30) = \$1000	30 MW X (\$50 – \$30) = \$600	30 MW X (\$50 – \$30) = \$600	\$400

$$\begin{aligned} \text{Total revenue} &= \text{Energy payments} + \text{CMSC} \\ &= 60 \text{ MW} \times \$50 + \$200 + \$400 \\ &= \$3600 \end{aligned}$$

Meter Disaggregation

To avoid the possible loss of CMSC revenue, you can request 'meter disaggregation' when registering your facilities for compliance aggregation. Meter disaggregation takes the aggregated meter data of the units and reapportions it back to the units based on their dispatch instructions. This allows us to calculate CMSC as if your units had followed dispatch.

If the participant in our above example had selected meter disaggregation, the system would have apportioned the 60 MW output of Generator A as 30 MW to Generator A and 30 MW to Generator B. In that way, they would have been eligible for \$200 of CMSC for Generator A and \$400 of CMSC for Generator B.

Summary

Compliance aggregation allows you to satisfy dispatch instructions using more than one facility. You can do this for both energy and operating reserve.

If needed for reliability reasons, we may temporarily suspend compliance aggregation for your facilities, and require that the individual facilities respond to their own dispatch instructions.

If selected, meter disaggregation ensures that you receive CMSC as if you had responded according to your unit's individual dispatch instructions. This protects you against possible lost CMSC revenue.

Additional Information

For additional information, please refer to the following documents, available on the [Rules and Manuals](#) page:

- Market Manual 1.2, Facility Registration, Maintenance and De-registration
- Market Manual 3.7, Totalization Table Registration
- Market Manual 4.3, Real-Time Scheduling of the Physical Markets
- IMO_FORM_1660 – Acceptance of Compliance Aggregation