Congestion Management Settlement Credits (CMSC) In the IMO-Administered Electricity Market

Issues related to constrained off payments to generators and imports

Discussion Paper prepared by the Market Surveillance Panel

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1 Introduction

In its October 7th report on the operation of the IMO-administered markets, the Market Surveillance Panel (MSP) signaled its intent to review CMSC payments, and particularly constrained off payments. This followed earlier comments about our concerns that such payments did not seem necessary or appropriate, and opened up opportunities for gaming.[1]

This discussion paper formally launches this review, drawing on eight months of experience of market operation under the current framework. The paper sets out our assessment of the issues, and highlights a number of questions on which we invite comment from market participants and other interested parties. Following a review of these comments, the Panel will prepare a report for consideration by the IMO Board.

We invite interested parties to respond in writing to the Market Surveillance Panel, IMO by March 31. We intend to post all responses on the IMO web site so that they will be available to all interested parties. The Panel will consider the issues further and may seek further information or clarification of some comments through the month of April. Our intent is to present our conclusions, and any recommendations that result from them to the IMO Board in early May.

As this paper makes clear, we believe that there are both conceptual and operational issues associated with constrained off payments that deserve attention. These issues must be assessed in the context of the design and operation of the wholesale electricity market, and also in the context of further steps that are under consideration for its future evolution.

The Panel's starting position, to focus the discussion, is that it is appropriate to reconsider the payment of constrained off payments for energy to generators and to imports. We recognize that this is a complicated issue. Eliminating such constrained off payments would most likely result in higher wholesale electricity prices and would also likely require alternative mechanisms to

[1] See "Market Surveillance Panel Report: May-August, 2002" (released October 7, 2002 and available at www.theimo.com), p. 143; and "The Market Surveillance Panel in Ontario's Electricity Market: Monitoring, Investigating, Reporting", Backgrounder, April 2002 (www.theimo.com), p. 13.

compensate certain generators in order to assure reliability. It is because these issues are complex, interrelated and need to be assessed carefully and in light of future market developments that we are issuing this paper and requesting input.

The discussion paper is organized in the following way.

Section 2 provides some background material and overall statistics on CMSC payments. It also makes the distinction between constrained on and constrained off payments and indicates why we have focused our concerns on constrained off payments. Section 3 deals in more detail with constrained off payments, examining the issues surrounding them, including how they have been addressed in other electricity markets. Section 4 sets out a number of specific questions for comment and discussion.

2 Background

2.1 CMSC rationale and structure

Uniform pricing and the associated congestion management payments were introduced in the IMO market design as an alternative to locational pricing. Each of these addresses the manner in which settlements take place in response to the need to constrain on or constrain off facilities in order to respect transmission and other reliability constraints on the IMO-controlled grid. CMSC payments can apply to energy and to operating reserve but in practice CMSC payments to operating reserve are minor and they are not discussed further in this paper.

As a result of transmission and other reliability constraints, facilities may not be dispatched in strict economic order. In a uniform-price wholesale market, as Ontario has, this leads to differences between the unconstrained schedule and the constrained schedule. Any facility experiencing a deviation from the unconstrained schedule in its actual production or consumption automatically receives a congestion management settlement credit. Examples can include:

Transmission related constraints:

Generators or importers may have offered output and been accepted in the unconstrained schedule but may be 'bottled' because of transmission constraints that prevent them from getting the output they have offered to where the demand is. In such circumstances they will be told not to produce and will receive constrained off payments equivalent to the difference between the market price and their accepted offer. Conversely, other generators or importers that were not selected because their bids were too high may find themselves dispatched (i.e. constrained on) in the constrained schedule, in order to compensate for the energy that has been constrained off because it could not flow to the appropriate geographic market. In this case, such generators will also be compensated through a constrained on payment equivalent to the difference between their offer and the market price.

Transmission related constraints might also apply to exports and to load. When a generator or import is constrained off it reduces the supply of electricity in a given area; when a load or an export is constrained off, the effect is to reduce the demand. Assuming that balance between supply and demand can be created through either increasing supply or reducing demand, the DSO[2] determines the combination of supply-increasing and demand-reducing actions that minimizes CMSC payments.

Non-transmission related constraints:

There are other reasons why the unconstrained and constrained schedules may differ. These include such factors as the use of a '12-times ramp rate' in the unconstrained schedule; seams issues at the interties that lead to transactions being constrained off; dispatch deviations by generators; and actions by the IMO operators to try to preserve the output of energy-limited hydroelectric facilities for periods of peak demand. CMSC payments can also arise when actual dispatch deviates from the constrained schedule, as a result of filtering of dispatch messages. These factors are discussed in more detail in section 3 of this paper and in Appendix B. The point to note here is that CMSC payments can arise for reasons other than transmission constraints.

[2] The DSO is the software system that determines the market price and optimizes dispatch.

There is no precise way to measure CMSC payments that are due to transmission constraints and those that arise for other reasons. Our best estimate is that somewhat less than 20% of constrained off payments (and about 20 to 25% of all CMSC payments) over the period reviewed in this paper result from non-transmission related factors. Conversely, about $145-162 million of the CMSC payments made in the first eight months of market operation are estimated to arise as a result of transmission constraints.

The procedures governing the calculation and payment of CMSC payments are set out in the Market Rules.[3]

Essentially, for transmission-related CMSC payments, the payment is based upon the difference between the market clearing price (MCP) and the offer price. Where the CMSC payment is a constrained on payment, the offer price exceeds the market price and the payment per unit of energy constrained on is the excess of the offer price over the market price. The constrained on payment is intended to cover the excess of a facility's opportunity cost (as reflected in its offer price) over the market price when that facility is dispatched on to ensure reliability.

Where a facility is constrained off, it is paid an amount intended to cover its lost opportunity cost that is equal to the excess of the market price over the facility's offer price on all units of energy dispatched off. The rationale for this payment is less straightforward. It appears to be based upon two arguments. The first argument is that because the facility was accepted in the unconstrained schedule, the market price is lower than it would be if the facility had not been accepted and that the facility involved should 'in fairness' be rewarded for this even though it ultimately provides no energy to the market. A variant of this argument is that, in the absence of constrained off payments, a facility may not offer energy into the market (if it has that option) or may offer energy at a higher price and this would result in a higher market price. According to this argument, it is cheaper for consumers to use constrained off payments to compensate potential energy suppliers who would otherwise either find it uneconomic to bid or engage in withholding than to pay a higher market price. The second argument is that paying a facility to curtail production assists overall

operational efficiency by providing compensation for complying with dispatch instructions. These arguments are discussed in more detail in section 3.

Because the amount of the CMSC payment is linked to the offer price of the facility, for both constrained on and constrained off payments, there may be opportunities for market participants to extract quite sizable CMSC payments by offering energy at very high prices when they reasonably believe they will be constrained on, and at very low prices when they have reason to believe they will be constrained off. Offers are limited by the Maximum Market Clearing Price, which is set at $2,000/MWh. Facilities can, and do, offer energy at negative prices when they want to run so that they will be assured that they will be chosen in the unconstrained schedule, and there is a minimum market clearing price of -$2,000/MWh. As a result of the potential for market participants to influence CMSC payments through their offers, the Market Rules provide procedures by which transmission-related CMSC payments may be mitigated by the IMO in circumstances where market participants are judged to have local market power and to have abused that market power in their offering practices. There is no mitigation authority for non-transmission related CMSC payments.

Before leaving this section on the rationale for, and general structure of the CMSC framework, two further observations are worth noting.

First, the calculation of CMSC is an automatic exercise and occurs whenever there is a difference between the unconstrained schedule and the actual dispatch. As a result, there are occasions where calculated CMSC payments can be negative, reflecting money withheld from market participants. An example would be where an import was selected in pre-dispatch at a price that was higher than the real-time market price. The import would receive an Import Offer Guarantee (IOG) payment equal to the difference between its offer and the market price. If it were then constrained off in real time the constrained off payment would be calculated as the market price less the offer price (a negative number) times the amount constrained off. In this example, it is clear that the negative CMSC is in effect a recapture of the IOG for imports that did not flow.

[3] For the rules related to transmission-related CMSC payments see Chapter 9, Section 3.5 and Appendix 7.6 of Chapter 7 of the Market Rules. Procedures for calculating the payment of non-transmission related CMSCs are identical, with

Second, the basic rationale for transmission-related CMSC payments derives from the decision that the market clearing price in Ontario should be uniform across the province. As directed by the Minister of Energy when the IMO was created in April 1999, the IMO is in the process of undertaking a review of locational pricing, with the possibility of introducing such a regime. Should locational pricing replace the uniform Ontario price, the requirement for transmission-related CMSC payments would be eliminated or at least substantially reduced, depending upon the specific design of the locational pricing regime. We invite respondents to this paper to frame their comments not only in the context of CMSC payments as they now exist, but also in the broader context that may see a move to locational pricing in the Ontario wholesale energy market.

2.2 Overview of CMSC payments

Table 1 shows total CMSC payments for operating reserve as well as positive and negative payments for energy for constrained on events and constrained off events. These payments are further disaggregated by imports, exports, and dispatchable load, as well as fuel type for generators.

Table 1: CMSC Payments for Energy and Operating Reserve

CMSC payments ($million)	Positive CMSC payments for energy		Negative CMSC payments for energy		Total CMSC for Operating Reserve
	Constrained on	Constrained off	Constrained on	Constrained off	
Fossil	9.5	25.4	-0.9	-0.0	-0.3
Hydroelectric	22.9	18.4	-1.9	-0.2	2.2
Nuclear	0.2	3.6	-2.1	-	-
Imports	83.6	15.8	-4.6	-34.3	0.0
Dispatchable load	0.1	5.7	-0.0	-	0.1
Exports	0.3	10.5	-0.2	-0.4	0.0
TOTAL	**116.7**	**79.3**	**-9.7**	**-34.9**	**2.1**

the exception that there is no provision for mitigation when the payments are not driven by transmission constraints.

Over the period May through December, total positive CMSC payments for energy amounted to $196 million. Negative CMSC payments amounted to $45 million for energy, of which $34 million were in respect of imports.[4] Total operating reserve payments were just over $2 million. This paper focuses on the positive CMSC payments in respect of energy and in particular the constrained off energy payments, which amounted to $79 million over the period.[5]

In our October report we commented on the concentrated distribution of CMSC payments. Using only CMSC payments that are positive for the interval (a slightly different definition from the October report) and focusing on generators and imports only, we have extended the assessment of concentration. Table 2 shows the share of constrained off and constrained on-payments received by the top five and ten generation and import facilities, respectively over the May-December period.[6]

Table 2: Concentration of CMSC Payments for Energy to Generators and Imports (positive payments only)

	Constrained off Payments (%)		Constrained on Payments (%)	
	Top 5 facilities	**Top 10 facilities**	**Top 5 facilities**	**Top 10 facilities**
May -Aug.	49	64	47	56
Sept-Dec	30	42	56	64
May -Dec	35	49	50	59

Since August, experience has shown that the distribution of constrained off payments for energy has become somewhat less concentrated whereas the concentration of constrained on payments has increased. The reduction in concentration of constrained off payments appears to be mainly due to

[4] As indicated in the previous section, negative CMSC payments for constrained off imports, amounting to -$34 million, are effectively a means of recovering IOG payments and are not considered further in this discussion paper.
[5] Totals include some preliminary data for December. Payments for energy are treated as positive if these are positive for a given interval. Payments for operating reserve are the sum of CMSC payments for the three types of operating reserve.
[6] Concentration ratios for the May-August shown in Table 2 differ from those in the October report because of the use of positive payments only and restricting the analysis to generators and imports. The definition of facility is the same as was used in the October report for assessing concentration and refers to the resource for which an offer or bid is placed. For larger generators this is typically a generating unit. For smaller generators and dispatchable load there is normally some aggregation at a plant. For imports and exports there may be several notional facilities for a given participant at a given intertie. Facility is used for analytical purposes since it is the unit that is monitored in terms of market behaviour. More than 400 facilities received CMSC payments over the period under review in this paper.

a substantial increase in the number of facilities receiving such payments in the September-December period. The increase in concentration in constrained on payments is entirely due to the high level of imports in September and the payment of large constrained on amounts to three importers in that month.

The confidentiality provisions of the Market Rules prevent disclosure of CMSC information in respect of specific market participants. However, the following general observations about the totals and distribution of CMSC payments can be made:

With regard to positive constrained on payments:

- Payments totaled $117 million over the May-December period almost all of which was paid to generators and importers.
- The top five facilities received $58 million, or half the total. The top ten facilities received 59% of the total.
- Of the top ten facilities, the top eight were imports, reflecting the very tight supply situation in Ontario. The top three facilities received about 43% of total constrained on payments.
- About 15-30% of constrained on payments are estimated to be unrelated to transmission constraints, but attributable to other factors such as dispatch deviations, multiple ramp rates, or constraining on fossils units for adequacy. (Conversely, roughly $82 to $99 million is due to transmission constraints.)

With regard to positive constrained off payments:

- Payments totaled $79 million over the May-December period.
- Constrained off payments to exports and load amounted to $16 million over the period. Constrained off payments to exports and load are effectively payments not to consume and they contribute to reliability in the same way as constrained on payments to generators and imports.

- Constrained off payments to generators and imports amounted to $63 million, with $47 million flowing to generators and $16 million to imports. These payments are compensation for not producing and are the major focus of our concern in this discussion paper.
- The top five generation and import facilities received $22 million, or 35% of the total constrained off payments to generators and imports. The top ten facilities received 49% of the total.
- About 35% ($22 million) of constrained off payments to generators and imports were made to generating facilities that are 'bottled' in northwest Ontario because of limited capacity in the East-West transmission ties. Substantially less but still significant payments are attributable to bottling of hydro generation and on the 25 Hz sub-system in the Niagara area.
- Somewhat less than 20% of constrained off payments to generators and imports are estimated to be unrelated to transmission constraints but attributable to other factors such as dispatch deviations and multiple ramp rates. (Conversely, over $63 million is due to transmission constraints.)

The Panel views constrained on and constrained off payments quite differently. Generators or importers that are being constrained on, or exports or load that are being constrained off, are adding to supply in Ontario, enhancing reliability, and incurring real, measurable costs in doing so. There is a clear and compelling case for constrained on payments. Where generators or imports are constrained off, however, they are not producing energy, nor are they contributing directly to reliability. A key question for discussion is why they should be compensated for not producing. This issue is pursued in more depth in section 3.

3 Discussion of Constrained off payment issues

The Panel is considering whether to recommend to the IMO Board that constrained off payments for energy to generators and to imports should be eliminated.

This section reviews some considerations related to the role that constrained off payments now play in the Ontario wholesale market, and some implications of retaining them in their current form as opposed to eliminating them, including some operational issues that we believe should be addressed if it is decided to retain constrained off payments.

The bulk of the discussion is in terms of transmission-related constraints, but section 3.3 deals with non-transmission-related constrained off payments and section 3.4 reports how constrained off payments are dealt with in other jurisdictions.

3.1 The role of constrained off payments

In markets for most products, where a product cannot be transported to where it can be consumed it simply loses out in the market and receives no payment. Constrained off payments provide compensation for not producing. A generator who knows with relative certainty that his output cannot get to market can offer to supply at a low (or negative) price and be virtually assured that he will be selected in the auction and paid not to run. Indeed, in such circumstances the generator would be paid not simply the market price for energy but the difference between the market price and his offer, which could substantially exceed the market price if the offer price is negative. Constrained off payments shift the financial risk of being constrained off from generators to electricity consumers.[7]

[7] With frozen retail prices, the financial risk may also be shifted to taxpayers if insufficient funds are generated within the electricity sector to compensate for the difference between retail and wholesale prices.

The rationale for such payments must be considered in the context of the design and operation of the market as well as its future evolution. There are five arguments that are sometimes presented to justify constrained off payments to generators and imports. These are that:

- constrained off payments keep wholesale prices lower than they would otherwise be;
- constrained off payments enhance reliability by maintaining critical plant in the marketplace, even though such plant may be needed only in certain periods;
- constrained off payments, together with the corresponding constrained on payments, provide information about transmission bottlenecks that is helpful in identifying areas for investment;
- constrained off payments provide certain operational benefits to the marketplace; and
- constrained off payments compensate for departures from optimality of the configuration of the existing generation and transmission endowment in the province.

3.1.1 Market Clearing Price (MCP) Reduction

The Market Clearing Price (MCP) in Ontario is a theoretical price that is determined on the assumption that all generation and imports bidding into the Ontario market are available to satisfy market demand. The MCP is determined in the context of a hypothetical system with no constraints on the flow of energy except for the limits on imports or exports at the interties. The real world is then superimposed on this system. As a consequence, some offers that were accepted in the hypothetical market are constrained off while other offers that were not accepted in the hypothetical market are constrained on. CMSC payments are made to market participants who have been constrained on or off. These CMSC payments are part of the uplift and are ultimately paid by electricity consumers. The sum of these CMSC payments is substantially less than the transfer of payment from loads to generators that would have occurred had the market price been determined in a way that reflected the amount of energy actually available and deliverable to the market. It is argued by some that loads have benefited from CMSC payments because these payments have reduced the MCP by more than they have increased the uplift and for this reason constrained off payments should be retained.

There are two issues here. The first is whether using fictional offers of energy to push the MCP further below the marginal cost of energy contributes to market efficiency. The second is whether constrained off payments necessarily have this effect on the MCP and if so, to what extent.

At any point in time, the existence of additional offers of energy at low or negative prices will obviously result in a lower market clearing price in the auction, by shifting the offer curve to the right. It seems to us rather strange that the market price should be determined by offers that are known not to be available to the market. This may be a convenient fiction but it is a fiction nonetheless. Indeed, if even more supply could be induced to offer (even in the certain knowledge that it could not get to market) the MCP would be lower still. The Panel continues to see its role as helping to ensure that the Ontario wholesale market is efficient. Markets include both buyers and sellers and prices that are artificially low are as inimical to efficient resource use as prices that are artificially high. We do not see how a market design that uses fictional resources to lower the benchmark price contributes to market efficiency and we look forward to comments and discussion in response to this paper to clarify this issue.

The magnitude of the effect of constrained off payments on the MCP is difficult to assess. If constrained off payments were eliminated, one would expect units to offer into the market on the basis that they may or may not run, but that they would not be compensated for not running. In this situation, it would be realistic to expect at least some units to offer less frequently, and at higher prices since they would have to recoup their start-up costs over the limited period when they ran. As a result, the wholesale price in Ontario would be higher on average. The Market Assessment Unit has conducted some simulation experiments to calculate the price impact on the basis of specific assumptions. The results are reported in Appendix A. In brief, the simulations suggest that the operation of constrained off payments in the May-December period may have reduced the wholesale market price by between $1.32 and $6.73 per MWh, on average. These hypothetical simulated price increases from eliminating constrained off payments, in a market where the retail price had not been frozen, would have been subject to rebate under the MPMA and the rebate would have amounted to about 70% of any price increase.

3.1.2 Maintaining critical facilities in the marketplace

It has also been suggested that constrained off payments are necessary to provide an acceptable return to generators that may be bottled by transmission constraints for extended periods of time and, for this reason, have difficulty recovering their costs plus a reasonable return on investment when they do operate. The notion here is that such facilities are critical to a particular geographic area. If they cannot make enough from the overall market to sustain their operations then they may shut down and the region served by them may find itself facing shortages. The example most often referred to here are fossil plants in northwest Ontario, which are typically constrained off because of transmission limits in the East-West tie and which, over the period reviewed in this document, received a significant share of the total constrained off payments to generators and imports.[8]

We believe that both reliability and efficiency concerns suggest that ways be found to compensate such facilities appropriately. We are not convinced, however, that the only way – or indeed the most effective way – to do so is through constrained off payments. It seems to us that there are other vehicles available. The local market power mitigation rules recognize that such facilities may offer at higher prices when they do run without incurring a risk of mitigation.[9] An additional option could be for the facility to enter into some form of must-run contract with the IMO that can achieve reliability objectives on a mutually satisfactory economic basis.

As part of its examination of directions for market evolution, the IMO is also exploring various ways that reliability can be enhanced through some form of capacity assurance. It seems to us that the current role played by constrained off payments in contributing to reliability should be considered in that broader context as well.

3.1.3 Information about transmission bottlenecks

Some have argued that constrained off payments play a useful role in signaling where transmission capacity needs to be upgraded. In principle, CMSC payments can provide useful information of this type. Recall that transmission constraints result in both constrained off and consequential

[8] The actual payment cannot be identified because of the confidentiality provisions of the Market Rules. Since every MW constrained off is replaced by another MW constrained on, the E-W transmission constraints will also lead to constrained on payments.

constrained on payments. Together, we estimate that these have amounted to about $145-162 million since market opening. Each dollar of these flows that could be eliminated through investment to ameliorate transmission constraints would justify about $8-10 in new capital spending.[10] In practice, however, there are some reasons why CMSC payments, as currently structured, do not appear to be very useful in playing this signaling role.

First, as noted above, it is virtually impossible for the DSO to segregate those constrained off and the associated constrained on payments that are due to transmission constraints from payments that arise as a result of other factors. It is apparently even more difficult to associate these payments with specific transmission interfaces. Second, even if such payments are identified, the information is not published and it therefore cannot provide signals to the market about the desired location of new investment.

We believe that these are important deficiencies in the operation of the system and we would like to hear the views of market participants with respect to the extent to which efforts should be made to provide the capability to identify CMSC payments related to specific transmission interfaces. In particular, is the current publication of locational prices adequate to provide useful information about the relative benefits of alternative investments to enhance transmission capacity, and would the identification and publication of transmission-related CMSC payments (or constrained on payments only if constrained off payments are eliminated) add valuable information to the market?

We are concerned about the lack of coordination and incentives for transmission planning in the current market design and we expressed this concern in our October report. This is a broad issue that needs attention. In the context of this discussion of constrained off payments we raise two specific issues for consideration and comment:

- First, we believe that the existence of constrained off payments actually make the potential for coordinated transmission planning worse by blunting market signals. We discuss this issue in more detail in the next section.

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[9] See Section 1.6 of Appendix 7.6 of the Market Rules.
[10] This rough estimate assumes that the flow would continue in perpetuity in the absence of the capital investment to eliminate the constraint.

- Second, whether or not constrained off payments are retained in the Ontario market, are there measures (including identification and disclosure) that can be taken to make the CMSC payments related to transmission constraints more useful in providing signals about the potential return to new investment?

3.1.4 Operational issues

There are two operational issues that are sometimes raised when considering the role constrained off payments currently play. These have to do with incenting compliance with dispatch instructions, and with the manner in which the optimization algorithm works to determine the market clearing price.

Assuming that a generator's offer price accurately reflects its average incremental cost of running, constrained off payments make a generator indifferent between producing and not producing at any price between its offer price and the market price. This provides an incentive for a generator that is constrained off to follow this dispatch instruction. The Panel questions whether it is necessary, or indeed desirable, to compensate a market participant to comply with a dispatch instruction. The Market Rules set out a clear regime of penalties for non-compliance, including non-compliance with dispatch instructions. To the extent that generators who are dispatched down fail to comply they create reliability problems for the system. But so does any generator that fails to follow its dispatch instruction. If the market is to work safely and efficiently, compliance is essential. This is the basis upon which the market is organized and constrained off payments are the only instance we are aware of where the argument is advanced that incentive payments for compliance are a desirable part of market design.

A second operational consideration that is sometimes raised as necessitating constrained off payments is the nature of the optimization function in the DSO algorithm. The algorithm currently chooses which generators or imports to constrain off on the basis of minimizing total supply costs,[11] recognizing that when a source of supply is constrained off, another source must be constrained on. This also results in minimizing CMSC payments. It is suggested that if constrained off payments were not made, a different algorithm would be necessary to select which

sources of supply to constrain off when congestion occurs. We do not see why this necessarily follows. It seems to us that the algorithm could continue to operate on the basis of minimizing total costs, using the offer prices of those generators or imports constrained off. The only difference would be in the settlements function where constrained off payments would not be made.

3.1.5 Compensation for 'initial endowments'

There is a view that constrained off payments appropriately recognize that the decisions that were made historically by Ontario Hydro to site generation and transmission in particular locations reflected decisions that were made by an integrated public monopoly rather than by the forces of a competitive marketplace. The result, according to this argument, is an inherited endowment of physical assets that may somehow provide efficient resource use for the province as a whole but is not necessarily optimal for any given region. Further, the decision to separate the ownership of generation from the ownership of transmission, and to divest generation to the private sector, creates a situation in which owners of generation may find themselves 'bottled', with no effective way of remedying the situation. In these circumstances, the argument has been advanced that such generators should be compensated for their opportunity costs when they cannot get to market, since the impediments are beyond their control.

This argument does not appear to us to be based upon considerations of efficiency, reliability or economic logic. It presumably raises the value of some OPG assets that may be candidates for divestiture by guaranteeing constrained off revenue streams from energy consumers (and, with retail prices frozen, potentially from taxpayers as well) to potential buyers. In this sense, constrained off payments may assist OPG in meeting its divestiture targets at higher reported values but we see no reason why this should be an objective of market design.

We do not see a case for constrained off payments to compensate for initial endowments. But even if such a case could be made, the design should then limit such payments to existing generating facilities, and not extend them to imports or new investment. To the extent that constrained off payments are made to imports and are applied to generation that has yet to be built, they result in

[11] More precisely, it maximizes consumer value minus supplier costs.

the potential waste of resources due to distorted, inefficient investment decisions. Indeed, one of the key concerns that we have with constrained off payments (discussed more fully in the next section) is that they inhibit more productive cooperation between generation and transmission and they may lead to inefficient location decisions for new investment.

3.2 Implications of retaining constrained off payments

The previous section reviewed a number of the salutary effects that constrained off payments are alleged to have on the wholesale market. It is true that eliminating constrained off payments could increase the average MCP. We stress, however, that what constrained off payments are doing is adding hypothetical suppliers to a hypothetical market in order to reduce the price at which it clears. To the extent that it is regarded as desirable to maintain an artificially low wholesale price (and this is debatable), we suggest that this can be done by other means with fewer adverse incentive effects than constrained off payments. The other benefits of constrained off payments seem to us to be even more questionable, with respect to both their existence and whether constrained off payments are the appropriate instrument for achieving them. We hope that the discussion above will help to elicit comments both on how significant the benefits of constrained off payments are and on whether constrained off payments are the best mechanism – in terms of efficiency and reliability – to achieve the objectives sought.

We believe that it is important to reconsider whether constrained off payments should be retained because there appear to us to be some negative aspects of such payments that may offset any positive effects they might have. These negative aspects concern both the impact of constrained off payments on appropriate signaling in the market and certain operational aspects of constrained off payments that appear problematic. This section discusses our concerns in these two areas.

3.2.1 Inappropriate signals

There are two main ways in which constrained off payments may interfere with appropriate signaling in the market.

First, constrained off payments make it unnecessary for existing generators to consider ways in which they might work to increase transmission capacity to get their product to market. So long as they are receiving their offer price for not producing, they have no incentive to lobby for, or to invest in, expanded or alternative transmission facilities. In the absence of constrained off payments we would expect generators to have a much greater concern and take a more proactive role in the development of transmission enhancements. In the current stage of market design, it is not clear that an appropriate regulatory framework exists for this type of generator and customer driven transmission investment. We believe that the evolution of the market needs to examine how integrated decisions can be more effectively made. But it seems to us that the continued existence of constrained off payments blunts a great deal of the potential pressure from market participants that would be helpful in facilitating such evolution.

Second, with regard to new investment in generation, the continued existence of constrained off payments make a potential investor indifferent to transmission system conditions when deciding where to site a new plant. At the extreme, constrained off payments make it profitable to build a new power plant in an area where very little, or even none of its output, can get to market. This would be a serious waste of resources.

3.2.2 Operational issues

CMSC payments are not revenues that are subject to rebate in the Market Power Mitigation Agreement with OPG. As noted above, CMSC payments that arise as a result of transmission-related constraints are subject to potential mitigation under the local market power rules. CMSC payments due to non-transmission related factors (see section 3.3 below) are subject neither to mitigation nor to the MPMA rebate.

There are a number of actions generators and importers may take to increase the constrained off payments they receive. Opportunities to increase constrained off payments arise because the magnitude of these payments is based upon the offer price of the facility. In general, if the facility knows with certainty or has strong reason to believe it will be constrained off, then it can offer at a

low (and even negative) price and by so doing increase the constrained off payments it will receive.

For example, a generator or import that knows it will be constrained off can offer at a price of -$2,000/MWh and, with a market price of $50/MWh, will receive a constrained off payment of $2,050 for every MWh not produced. This is an extreme example, and over the period since the market has opened the practice of bidding large negative prices and being constrained off does not seem to have been widespread.[12]

There are good reasons for allowing negative price offers, since such offers increase the chance of being dispatched. In particular, nuclear plants often offer at low and sometimes even negative prices because the cost of not running and shutting down the plant is very high. However, a market design that provides an opportunity to suppliers to increase their return by offering at low prices and not producing is a design that offers the potential for abuse, even if not abused to date. We pointed this out in April of 2002, prior to market opening, and again in our October report. We have asked the Market Assessment Unit to monitor constrained off payments with extra diligence and to date the MAU has not reported any instances of behaviour that warrant investigation by the Panel. Nevertheless, we believe that the time is appropriate to consider whether the alleged benefits of constrained off payments outweigh their costs including the adverse incentive effects we have discussed above, the potential for abuse and the resulting ongoing cost of monitoring.

The local market power mitigation rules provide for clawing back CMSC payments in certain circumstances and some constrained off payments have been reduced as a result of this process. However, there are some aspects of the local market power mitigation framework that would need to be reviewed if constrained off payments were to continue to be part of the market design.

First, we suggest that if constrained off payments were to be continued then the maximum allowable payment per unit of energy constrained off should not exceed the market clearing price. Negative offers should continue to be allowed but they should not affect the determination of

constrained off payments. In addition, the formula for determining the magnitude of any constrained off payments should be revised to provide a more accurate reflection of losses actually incurred when a generator or an import is constrained off. We welcome suggestions from market participants and others as to how this might best be done.

Second, if constrained off payments were to be retained, then we suggest that the authority to mitigate, or indeed claw back, these payments should be expanded to cover all the circumstances in which they are made rather than being confined to transmission constraints as is presently the case. We have identified at least two other instances where we feel it is appropriate to mitigate or claw back constrained off payments, if they are not eliminated:

- At times, energy-limited resources (essentially hydroelectric) offer into the market in lower-load periods at a low price and are constrained off because the IMO wishes to preserve the water for peak use for reliability reasons. It is not at all clear that paying a constrained off payment in this situation serves any efficiency or reliability purpose, since the facility can only use the water once and presumably still has it to offer at a period when the need is greater and the price is likely to be higher. By offering with the knowledge that it is likely to be constrained off, a facility has the opportunity to be paid for the same water on more than one occasion. There is presently no provision in the Market Rules to mitigate or deny a constrained off payment in this situation.
- Similarly, at times some generation fails to follow dispatch instructions, possibly for valid operational reasons. Generators can deviate within a 10 MW band around dispatch instructions without becoming non-compliant. If actual production is less than directed in the dispatch for a sustained period, a constrained off payment is likely to be automatically generated and there is no basis for mitigating this payment. Over the period since market opening, nuclear facilities have received a few million dollars in constrained off payments.[13] Most of this appears to be related to dispatch deviations, with the balance attributable to filtered dispatch.

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[12] Over the period from mid-July to December 2002, the period for which the data are readily available, about $3 million in constrained off payments were made to facilities for the components of their offers with negative prices. Most of these payments were made to imports that bid into the market at prices of -$1,000/MWh or less.

[13] The actual payment cannot be identified because of the confidentiality provisions of the Market Rules.

In the event that constrained off payments are not eliminated, we intend to recommend that immediate action be taken to address these two concerns about the mitigation framework.

There may well be other situations that should also be considered. Again, this is a particular set of issues where the Panel looks forward to the benefit of comment and suggestions from interested and knowledgeable observers.

We have additional questions about the operation of the local market power mitigation framework that we would like to raise in the context of this review. These questions are related to, but not entirely dependent upon the issue of constrained off payments, since they apply to all transmission-related CMSC payments. They are also less pressing in our view than the concerns we have expressed above. We raise them here because we note that both the amount and concentration of constrained on payments have been rising and we want to be sure that the mitigation framework is robust enough to prevent manipulation by facilities that are constrained on. There are two issues on which we would appreciate views from market participants.

First, the local market power mitigation framework contains 'safe-harbour' screens that the MSP recommended to the IMO Board prior to market opening. These screens are based upon actual market clearing prices and historical offer prices of facilities, adjusted by certain factors. When an offer that receives a CMSC payment falls within the screen it cannot be mitigated. When the MSP proposed the factors and the structure of the price screens to the IMO Board, it indicated that it might wish to review these screens after some period of experience with the market. The concerns we identified[14] included:

- whether there should be separate factors for different types of generation, or for on-peak and off-peak prices;
- whether there should be separate factors for historical prices and market prices;
- whether a 90-day average for reference prices is most appropriate.

[14] See Local Market Power Mitigation: Price Screen Duration Factors; IMO_STD_0007; January 8, 2002 (available on IMO web site at www.theimo.com); particularly Section 4.4.

At the time the factors for the screens were developed, in view of the lack of operating experience with a competitive wholesale market, it was noted that:

> At this time a relatively simple set of factors has been defined to be used in all time periods and for all types of units. The *market surveillance panel* will monitor the magnitude and flow of constrained on and off payments and will propose more complex duration factors should it become apparent that doing so will assist the competitive efficiency of the marketplace.[15]

As part of this review of CMSC payments, we would welcome comments on whether the screens are appropriate or should be reconsidered.

Second, if an offer falls outside the safe harbours, the onus is on the IMO to pursue a process that is both resource-intensive and time-consuming should it believe that such a payment ought to be mitigated. One aspect of the manner in which market participants currently interpret this process for example, is that a participant must be found not merely to have exercised market power but to have 'abused' that market power. Some market participants have argued that this test requires that the IMO demonstrate 'intent' on the part of the market participant. This makes mitigation very difficult operationally.[16] In our opinion the framework should be revised to provide more automatic mitigation, based upon the screens, while retaining the ability for market participants to justify offers outside the screens to the IMO on the basis of actual cost information. We invite comments on this issue as well.

3.3 Non-transmission related constrained off payments

There are a number of factors that give rise to non-transmission related constrained off payments, but the major ones are:

- dispatch deviations
- filtered dispatch messages

[15] Ibid., p. 9.

[16] For trade dates to the middle of November 2002, there have been about 110 investigations initiated for five market participants, with the initial potential CMSC reduction estimated at $2.7 million. Of these, 19 cases were terminated without an adjustment and 24 cases have been completed with settlement adjustments of more than $850,000. Another 47 cases, amounting to about $1 million, are nearing completion after an inquiry. Some 20 other cases are at the early stages of investigation.

- use of multiple ramp rates in the unconstrained schedule
- operator constrained off imports; and
- plant limitations.

An explanation of these factors and how they lead to CMSC payments is provided in Appendix B.

The nature of the calculation of constrained off payments is such that it is not possible to know what the specific cause of every constrained off payment is, since they are calculated mechanically whenever there is a difference in the constrained and unconstrained schedules. The MAU has estimated that the factors enumerated above account for somewhat less than 20% of total constrained off payments to generators and imports, or about $10 to $12 million over the period reviewed. The MAU further estimates that about 30% of this amount has been paid to nuclear facilities as a result of a combination of dispatch deviations and filtering of dispatch messages. About two-thirds was paid to fossil fuel units constrained off as a result of the use of a multiple (12x) ramp rate in the unconstrained schedule. The small remaining portion appears to be due to imports constrained off as the result of operator action, with a very small and unquantified amount due to plant limitations.

We question whether it is necessary or desirable to continue any of these constrained off payments.

With respect to CMSC payments induced by dispatch deviation, the CMSC results from the participant's own action and is not attributable to any system characteristics. It is in fact compensation for non-compliance and is particularly difficult to justify.

Filtered dispatch is undertaken by the IMO for the benefit of market participants, to provide some smoothing in the actual operation of their plant rather than having them react to very small changes in dispatch. There is no reason we are aware of why filtered dispatch should result in CMSC payments.

Constrained off payments due to the use of multiple ramp rates also have no apparent justification. Multiple ramp rates are a device used by the IMO in the operation of the dispatch algorithm to

reduce the incidence of price spikes. Multiple ramp rates are an artificial construct in that generating units are assumed to be ramping at rates in excess of their actual capabilities for purposes of determining the market clearing price (MCP). Since these units cannot supply the quantities of energy assumed in the market schedule, they must be constrained off (i.e. dispatched to a lower level) and other generating units must be constrained on to replace them. The units that are constrained on receive a constrained on payment and this is essential. The units that are constrained off (to the extent of the difference between the ramp rate assumed in the market schedule and their actual ramp rate) automatically receive a constrained off payment. We see no economic justification for this payment.

IMO actions to constrain off imports from New York occur in the following situation. If, at the two hour ahead pre-dispatch an import offer has not been selected, the IMO notifies the New York system operator that the transaction will not clear in the Ontario market. This notification occurs prior to the determination of the hour-ahead pre-dispatch schedule. At this point, the exporting jurisdiction removes the transaction from its list of possible exports. However, the transaction is still available for the market schedule in Ontario, even though it is no longer physically possible for that transaction to enter Ontario. If conditions change (load increases) the transaction may be scheduled in the hour-ahead pre-dispatch even though it is no longer available. When this happens the import is constrained off in real time and a CMSC payment is made. It appears that the main reason for not removing the import from the market schedule, even knowing that it is unavailable, is that the IMO has no authority under the Market Rules to alter or reject the offer of a market participant except under specific circumstances related to reliability. It seems that in the current situation the market participant is unaware that the New York leg of the transaction has been cancelled, or if it is aware, there is no incentive to withdraw the offer since there is no obligation to produce and a chance to receive a constrained off payment, and similarly there is no way that the IMO can remove the offer. It seems to us desirable to seek a rule change that would allow such offers to be removed.[17]

Finally, plant limitations refer to circumstances in which units are not able to run in strict accordance with their offer because of unanticipated developments (examples might be water flow

[17] See also the description under item B.4 of Appendix B.

issues or environmental factors). The factors that require variances are not system-induced and we see no good reason why generators should be compensated for them.

It is important to note that, particularly with regard to constrained off payments resulting from non-transmission related constraints, it is difficult to identify the specific causes for many of these payments since they are generated entirely through the automated processes of the DSO. In our view, this reinforces the argument for terminating all constrained off payments to generators and imports. It also reinforces our argument that IMO undertake to modify the DSO to enable identification of the causes of CMSC payments.

3.4 Treatment of constrained off payments in other jurisdictions

Different jurisdictions have approached congestion management and settlements in different ways. There are examples of those that use constrained off payments (or the equivalent), those that do not make such payments, and those whose structure does not even allow considering the option. The weight of the recent evidence is that constrained off payments are not regarded as necessary in spot markets.

Markets with full nodal locational pricing do not need constrained off payments. When there is a surplus of generation in an area prices will fall. Those generators constrained off will be those whose offer price is above the local price. Those not constrained off get prices lower than generators elsewhere on the system. Under this market design, there is no compensation for not being selected, and there is reduced compensation for generation that does run in these constrained areas. New York and PJM have this type of market, and New England has announced that it is introducing a locational pricing system effective March 1, 2003, consistent with the FERC Standard Market Design (SMD).

There are a few spot markets with uniform pricing that have decided against constrained off payments. The current New England design encompasses a uniform price, and provides congestion payments only to generation constrained on or imports when appropriate.[18]

In the early 1990's the England and Wales market had a uniform price with both constrained on and constrained off payments. But "this became a major controversy and a source of market manipulation" and was abolished.[19] Two problems with constrained off payments were cited. First, generators understated prices to achieve higher payments. Second, the market rules had assumed any difference between scheduled and actual generation was due to being constrained off. However, this outcome was frequently the result of generators simply generating less than scheduled. When this was discovered, the first response was to publicize under-generation and this had some effect. Subsequently, however, generators themselves were required to pay compensation for their under-generation.

Alberta has just gone through a lengthy review of their transmission expansion and congestion rules. They opted for uniform pricing as opposed to locational pricing, and decided against constrained off payments. Paraphrasing their report,[20] the Energy Utility Board of Alberta heard the arguments which "supported constrained down compensation," namely:

- to reduce risk and uncertainty for energy market investors;
- to send a signal about the true cost of congestion; and
- to ensure equal treatment of load and supply customers.

However, the Board did not accept these arguments. Instead it agreed with others

> "that constrained down payments are perverse as they effectively reward suppliers for locating in a constrained zone. The Board also agrees with those parties who

[18] There are no constrained off payments. However: i) premiums are paid for load response in Connecticut, a load pocket; and ii) there are provisions for Back Down Charges, when all generators in an area have reached their low operating limit and have bid negative prices. Compensation is made to the reduced generator by those generators not reduced.

[19] Transmission Administrator submission to the Alberta Energy and Utilities Board (EUB); also in Exhibit 19 for EUB – Marcus and Woychik (submission by the FIRM Group - Alberta Association of Municipal Districts and Counties, the Alberta Federation of REAs Ltd., the Alberta Irrigation Projects Association, the Municipal Intervenors, the Public Institutional Consumers of Alberta and the Senior Petroleum Producers Association).

have suggested that such payments imply a 100% right of access to the system, a level of service higher than that provided to load.

In addition, the Board considers the risk of being constrained down to be one of the risks accepted by market entrants when they choose to enter the market, similar to the risks faced by any investor in any market. The Board considers the acceptance of this type of risk to be fundamental to the working of a competitive market. The Board therefore rejects the concept of constrained down compensation."

Those markets that rely on bilateral contracting as the primary mechanism for transactions require the equivalent of constrained off payments. These jurisdictions need a mechanism for controlling congestion and dealing with residual load requirements. Balancing energy or INCs (incremental bids) and DECs (decremental bids) are used to create counter-flows across congested lines or to modify total supply. If these lead to zones with different pricing, and a bilateral transaction pays to move between such zones, this design becomes similar to locational pricing. However, for a bilateral within a zone, where there is congestion but no additional charge to move across the congested interface, DEC bids lead to the equivalent of a constrained off payment. This reflects the original design in California, and the current design in Texas. Of interest is the fact that California introduced a limit on decremental bids, not allowing them to be lower than negative US$30/MWh.

4 Questions for discussion

The Panel believes it is time to reconsider whether constrained off payments for energy should continue to be made to generators and to imports. It is important that this issue be considered in an integrated way, bearing in mind the overall operation and evolution of the market and whatever supporting or compensatory measures a decision may require.

For example, if constrained off payments are eliminated, then certain other design changes may well be necessary to ensure the maintenance of critical facilities in particular areas, and possibly for broader reliability reasons as well. It is also likely, as described above, that the elimination of

[20] Alberta EUB Decision 2002-099, November 2002

constrained off payments is a necessary condition for more integrated and efficient transmission investment decisions, but it may not be sufficient. Additional changes in the interaction between generation and transmission, in the accountability mechanisms for transmission planning, and possibly in the regulatory framework governing returns to transmission may also be appropriate. We invite readers to comment in this broad framework.

Similarly, if constrained off payments are not eliminated, then we believe that other changes in market design are necessary. We have outlined some operational adjustments to the mitigation framework that we believe would be appropriate. But there may be other changes that are desirable to overcome the potential inefficiencies in investment decisions that result from constrained off payments.

We are also concerned about time frames. The IMO is investigating the possibility of moving to locational pricing but has informed the market that the earliest such a change could be introduced would be October 2004. If a decision is made to introduce locational pricing, then constrained off payments would, in all likelihood, no longer be necessary. But should any action on constrained off payments wait until a decision on locational pricing is made? And even if the decision is to go forward with locational pricing, should that imply that there should be no changes at all to constrained off payments in the interim?

We request that comment on this paper address the issue of constrained off payments in this broader context. Specifically, we ask that your suggestions and comments include an assessment of:

- the probable evolution of changes in the wholesale market, including the possibility of locational pricing and other changes designed to enhance reliability, and the consistency of your comments and suggestions with that evolution;
- the implications of your suggestions for efficient use of existing resources and for efficient investment decisions in generation and transmission;
- the implications of your suggestions for reliability;

- the implications of your suggestions for the state of overall competition in the wholesale market; and
- any other issues that you believe it is relevant for the Panel to consider.

We look forward to hearing from you.

Appendix A: Simulated impact on MCP of eliminating constrained off payments

A.1 Overview

In order to simulate the impact on MCP of eliminating constrained off payments it is necessary to make some assumptions about how generators and imports would react in an environment where constrained off payments were eliminated. This is not a simple task.

Facilities that tend to be constrained off on a regular basis as a result of transmission constraints that are transparent would most likely modify their strategy either to increase energy revenues or decrease costs. The following examples are suggestive of the types of response that may occur.

- Increased revenues may be sought by attempting to export some of the local surplus (constrained off) energy. This increases demand on the surplus side of the constraint, resulting in less supply being constrained off. The increased export also adds to the total market demand and increases MCP.

- An owner of several resources each partially constrained off, may prefer to shut down some of the units, avoiding unnecessary start-up and speed-no-load costs, and may even save labour costs if the unit is shut down for extended periods. If on extended shutdown, the unit's offers may be withdrawn. For shorter periods, the offer price for the generation would be increased. This would normally keep it out of the market. But, if the additional unit is needed at its minimum levels for local security, it is still available at a higher price that will cover the additional costs. If the unit is offered at higher than MCP or if it is not offered, MCP will rise above the previous levels.

- An importer who is likely constrained off may just simply pull the offer and not participate at that time. Absent this low priced offer, the MCP increases.

Facilities facing a lower probability of being constrained off may assess that modifying their offer can lead to situations where they are not called to run even when they would not have been constrained off. This would decrease their net revenues even more, so they may decide they are better off not changing their offers or bidding behaviour.

The MAU considers that the most realistic set of assumptions is that only those facilities facing a consistently high probability of being constrained off would change their strategy. To simulate this the MAU assumed that only certain resources in the Northwest area of the province face conditions stable enough to suggest that they should consistently modify their offers. Three different sets of assumptions about how these particular suppliers would respond to the elimination of constrained off payments were made and the resulting simulated impact on the MCP ranged from $1.32 to $6.73 per MWh.

A more complete description of the assumptions and results of these simulations is presented below.

A.2 Description of Simulations

The analysis needs to capture the variety of effects or strategies mentioned above – increasing exports, withdrawing import offers, withdrawing offers as a consequence of long-term or short-term shutdown of units, pricing higher to recover costs if units are needed for security. To model these strategies realistically would be very complex and would require a host of assumptions. Instead, the MAU has performed several simpler analyses that should effectively lead to upper and lower bounds around the more complex response strategies.

Three sets of assumptions were used to simulate the possible likely impacts associated with eliminating constrained off payments on the MCP:

1. all of the constrained off portions of the offers from the designated suppliers in the base case were assumed unavailable, or equivalently, load was increased by this amount;
2. half of the constrained off amounts in the base case was assumed unavailable or equivalently, load was increased by this amount;
3. half of the constrained off amounts in the base case was assumed to be offered at a price of $100/MWh.

The first scenario (Simulation #1) reflects a maximum response from this particular group of generators. It represents some combination of increased exports, withdrawal of import offers and withdrawal of generation offers, possibly based on units being shut down.

The second scenario (Simulation #2) recognizes that the suppliers may not be able to match responses precisely to the level of constrained off resources. This is in part due to the discrete nature of the reduction when shutting down a unit, versus the range of possible constrained off selections. It also recognizes some uncertainty at the time of locking in offers about the precise level that will be constrained off. With some uncertainty the facilities may hedge their position by continuing to offer a portion of their production.

The final scenario (Simulation #3) reflects a desire to shut down units under some of the circumstance encountered (i.e. approximated by half the constrained off MW), but a willingness to run them if local security requires this and constrained on payments will cover the additional costs. For this, as a ballpark figure, the MAU assumed that such generation is offered at $100 per MWh.

All simulations were performed by first calculating the hourly average constrained off MW for the designated resources. This was then added as an increment of load and compared to the aggregate offer curve for the hour. From this the MCP increase for each hour was identified. For Simulation #3, energy prices were not allowed to increase above $100/MWh. (This means if MCP exceeded $100/MWh before adjusting for the constrained off MW, there would be no price change. If MCP is below $100/MWh the adjusted price is limited to $100/MWh.)

A.3 Simulation Results

As noted above, these simulation results show that energy prices in the period May to mid-December 2003 could have been higher by $1.32 to $6.73 per MWh had there been no constrained off payments. Under the terms of the MPMA agreement with OPG, in a market where retail prices had not been frozen, the revenues generated by these higher prices would have been subject to rebate and about 70% of the price effect would have been mitigated. The net effective increase in the MCP would therefore have been in the range of $0.40 to $2.02 per MWh.

Table A shows the total amount of energy constrained off by month and for the period as a whole since market opening. It also shows the amounts of constrained off energy that the MAU has assumed would be offered on a different basis if constrained off payments had been eliminated. (These latter amounts were used in Simulation #1; Simulations #2 and #3 used half these amounts.)

Table A: Constrained Off Amounts (MW)

	Total Energy Constrained Off (Period Average MW)	Energy Offers from Designated Facilities (Period Average MW)
May	265	93
Jun	330	151
Jul	436	218
Aug	460	186
Sep	466	133
Oct	351	62
Nov	344	45
Dec	329	41
Period	373	126

Table B shows the average price impact from the four scenarios detailed above.

Table B: Average Price Impact – Scenarios 1 - 3

	Scenario 1 Full MW	Scenario 2 Half MW	Scenario 3 Half MW $100 Limit
	MCP Increase	**MCP Increase**	**MCP Increase**
May	$3.77	$1.10	$0.73
Jun	$2.26	$1.37	$1.21
Jul	$10.74	$7.62	$2.37
Aug	$11.51	$4.63	$2.05
Sep	$16.81	$13.67	$1.41
Oct	$1.61	$0.61	$0.51
Nov	$2.18	$1.43	$1.27
Dec	$3.20	$1.98	$0.63
Period	**$6.73**	**$4.18**	**$1.32**

Appendix B: Non-transmission related causes of CMSC payments

B.1 CMSC Induced by Dispatch Deviations

CMSC induced by a dispatch deviation can start with a participant not following dispatch in a period where the facility should be ramping up or down. Ideally both the constrained and unconstrained schedule would ramp in unison, limited only by the ramp rate offered for the facility.[21] However, if the facility is slow to follow its dispatch, the two schedules will be different and a CMSC payment will be generated.

The reason for the different schedules has to do with the starting point at the beginning of the interval. For the market schedule, the starting point is the schedule from the last interval. For the constrained schedule the starting point takes into account the actual output level of the facility. When a facility deviates from its dispatch, it can fall behind the market schedule. If the market schedule is moving up, the constrained schedule will fall further behind as the deviation continues. If the facility eventually responds to the dispatch, the constrained schedule can begin to ramp as well, and may ultimately equal the market schedule, as intended. However, in the interim significant CMSC may result.

This is not necessarily an area where the Compliance Division of the IMO (MACD) has a role. A facility is considered non-compliant only when it deviates from dispatch by more than 10 MW or 2% of its capacity. If a facility has a small ramp rate, this may not become a compliance issue at all, since the dispatch may not be 10 MW higher than the actual. Even if it is considered non-compliant, compliance may not be an effective deterrent since the penalty levied may only be a fraction of the unwarranted CMSC.

[21] A multiple of the ramp rate is currently used in the market schedule. This also leads to both constrained on and constrained off CMSC payments. The discussion here is simplified by ignoring the multiple ramp rate effect.

If the plant is suffering some restriction on the output of the facility, ideally the participant should be entering this into the outage tool (IOMS) as a forced outage or de-rating. This does not happen as often as it should.

These points are illustrated in Figure 1 below.

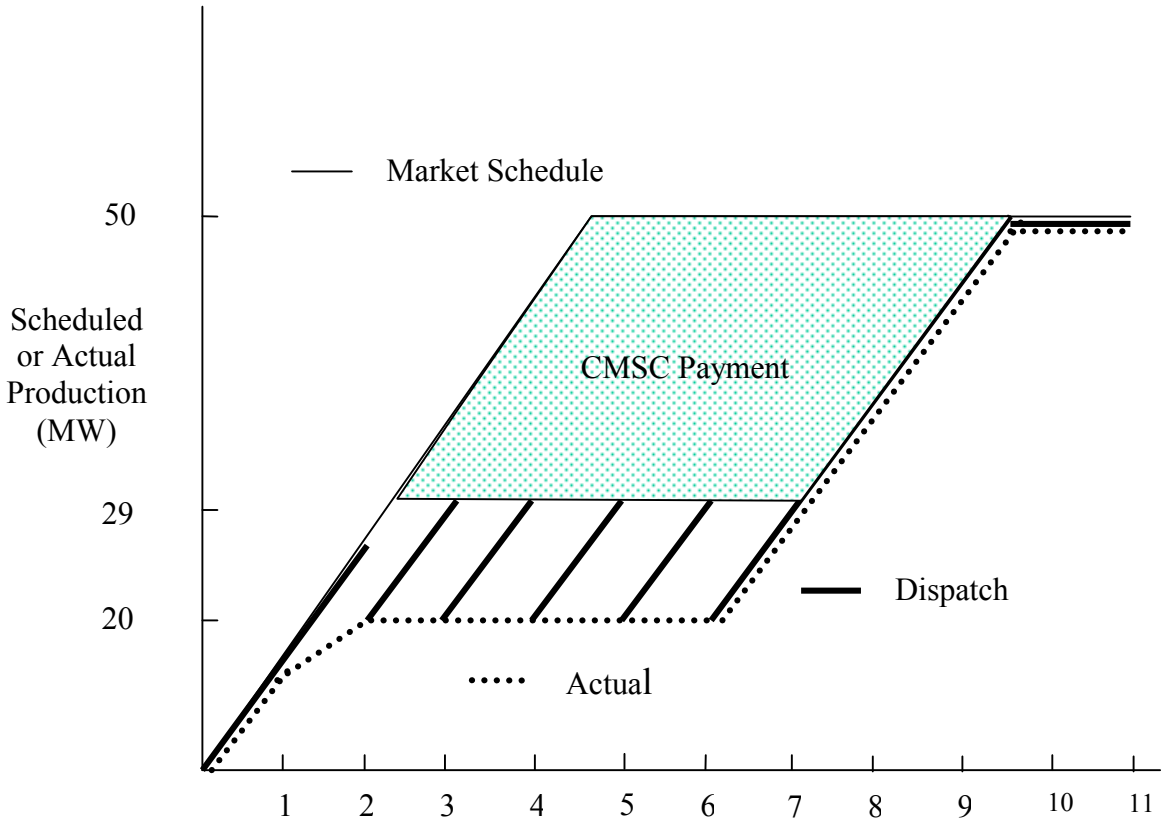
A 50 MW facility is being ramped up. Between interval 1 and 2 it encounters a problem and fails to meet the dispatch that interval. It stalls at 20 MW output until interval 7. The market schedule moved to the maximum 50 MW by the end of interval 5. However, the dispatch schedule, which is sensitive to the actual level, resets the starting point each interval and produces a dispatch of 29 MW each interval. In interval 7 the facility begins ramping again, allowing the dispatch schedule to ramp up the maximum.

If the energy price is a constant $50/MWh and the facility offer price is $20/MWh, the resulting CMSC is equivalent to the energy difference between schedules (the shaded area) times the price difference = (50-29)* 5 intervals / 12 intervals per hour * ($50-$20)/MWh = 21 * 5/12 * 30 = $262.50.

Note also, that in this example there is a 9 MW deviation of actual from dispatch. First, this implies that this would not become a non-compliance issue. Second, even though the deviation (dispatch – actual) is 9 MW the CMSC is based on a larger amount, 21 MW, the difference between the two schedules.

The example here leads to a constrained off CMSC payment, but overproduction can lead to constrained on payments, especially when market prices are falling.

Figure 1: CMSC Payments Resulting from Dispatch Deviations



In the example above, the magnitude of the CMSC is not large. But cumulative payments can be large since this can persistently occur for many facilities. Payments can also be particularly large in a few cases.

- If a nuclear unit offers at prices much below $0/MWh and because of its actual production its dispatch remains just 5 MW below its market schedule, CMSC can be large. For example, with an offer price of -$100/MWh, and an average daily energy price of $50/MWh, the daily CMSC could be 5 MW * 24 hours * ($50 – (-100)) = 120 MWh * $150/MWh = $18,000 per day.
- Consider a dispatchable load that consumes well below its market schedule level, causing the dispatch to be 20 MW less than the market schedule, even though dispatch minus actual is less than 10 MW. If its bid price is $500/MWh, with average energy price at $50, and if this persists for the entire day, its CMSC payment would be 20 * 24 * (500 – 50) = $216,000.

In each of the above examples, the facility may follow this behaviour without becoming non-compliant as long as the ramp up or down rates are sufficiently low. This is uncommon for fossil units, so such facilities have more incentive to meet the dispatch.

B.2 Filtered Dispatch Messages

In order for a participant to avoid receiving and having to respond to many small deviations in dispatches, the dispatch message sent by the IMO is filtered. When the change in dispatch is less than 10 MW or 2%, the message is suppressed. Since the participant receives no new dispatch instruction, he is to assume the last instruction still applies. This last instruction then becomes the official, recorded dispatch.

This can lead to CMSC payments in a few ways.

- If a participant has structured his offer with small MW differences in the laminations, a price jump can move the market schedule to the next level, but the dispatch schedule may not change.
- Between hours, the offer price for a lamination may change (higher or lower), and move the market schedule, without affecting the dispatch schedule.
- Between hours the maximum capability in the offer may change by a few MW or within an hour the unit may be derated (e.g. decreases 5 MW). The market schedule and constrained DSO output may change, but the actual dispatch instruction would be modified so it does not change.

The magnitude of the CMSC generated depends on the MW difference, the price difference and the number of hours these occur. It is possible that the CMSC payments due to filtering can be negative – in the case where the maximum offer quantity drops.

For filtered dispatch messages, total CMSC payments may not be particularly large, but they can be significant in some instances. For example, the filtering can account for a significant portion of constrained off payments to nuclear units, which may be on the order of a few million dollars per year.

The suppression of dispatch signals has also limited energy production at times when resources were tight on the system and every extra MW is important. Recognizing the two problems, for energy and CMSC, the IMO has initiated efforts to modify the tools to provide a larger measure of control for managing what dispatch is filtered and by how much. If dispatches are not filtered the participant would have the discretion whether to follow each minor change in the dispatch, to the extent it remains within the allowed compliance deadband of 10% or 2 MW.

B.3 Multiple Ramp Rates

Fossil units may be constrained off as the result of multiple ramp rates being used in the market schedule. These facilities are selected in the market schedule, but the lower ramp rate used in the constrained schedules prevents them from being selected there, with faster ramping units actually being selected. The use of the multiple ramp rate smoothes out spikes in the market price and scheduling, but also leads to CMSC payments that are concentrated among fossil plants.

B.4 Constrained off Imports

Imports may be constrained off as the result of imperfect scheduling interactions between Ontario and the exporting jurisdiction (most often New York). When an import has not been selected in the two hour ahead pre-dispatch run the New York system operator is informed prior to the hour-ahead pre-dispatch run. If conditions change such that the import then becomes scheduled in the hour-ahead pre-dispatch (even though it is no longer available because of actions taken by New York) it will be constrained off and does not get dispatched. In such circumstances the import will receive a constrained off payment. If the offer price of the import is below the real time market clearing price the import retains the constrained off payment. If, however, the offer price is above the real time market clearing price the constrained off payment is negative and usually equal to the IOG payment so that the import essentially is not compensated from the Ontario market.[22]

[22] This negative CMSC and IOG are not strictly identical since IOG is calculated on an hourly basis and CMSC on a 5-minute basis, but they are very close in magnitude.

B.5 Plant Limitations

A facility may face the situation that it needs to run in a manner not represented by its energy offer. For example, there may be emission limits for a fossil plant, river flow or level conditions requiring specific operation of the plant, or the plant needs to perform a test or procedure requiring a fixed output.

This could be for part of an hour or a few hours, but the participant is unable to reflect this in the offer, because

- the change is for the current hour;
- the window for changes is passed;
- the situation only applies for part of an hour.

If the plant requirement limits the output of the facility, ideally the participant should be entering this into the outage tool (IOMS) as a forced outage or de-rating. This does not happen as often as it should. However, this would not be sufficient for a facility that needs to run higher than the economic level. Nor would it be effective for a short-lived situation because of the time delays between identifying the requirement, entering the data and running the DSO for the interval ending about ten minutes later.

When faced with information from a market participant that the facility is required to operate in a specified way, the operator could simply note this, and the issue might come to compliance. However, in order to get the most accurate dispatch, the operator will normally feed this information into the DSO by fixing the production of the facility to the specified level. This allows the DSO to correctly select the required remaining amount of generation. It also appears as a constraint on the facility by the IMO and results in a CMSC payment.