Ontario Energy Board Commission de l'énergie de l'Ontario

Ontario

Market Surveillance Panel

Monitoring Document: Monitoring of Offers & Bids in the IESO-Administered Electricity Markets

March 2010

The Market Surveillance Panel is appointed by the Ontario Energy Board. The mandate of the Panel is to monitor, report on, and where appropriate, investigate, the activities and conduct of participants and IESO in the markets administered by the Independent Electricity System Operator (IESO). The mandate and scope of authority of the Panel is set out in Ontario Energy By-law #3, as amended by By-law #5, January 2008. The current members of the Panel are Neil Campbell (Chair), Don McFetridge and Tom Rusnov.

Table of Contents

List of Figures

1. *Introduction*

1.1 Purpose of this Monitoring Document

OEB By-law #3 authorizes the Market Surveillance Panel (Panel) to issue monitoring documents including data catalogues, monitoring indices or other information requirements and evaluation criteria that the Panel considers appropriate to enable it to carry out its monitoring functions effectively. [1] The purpose of this monitoring document is to outline the general evaluative criteria and process used by the Panel in monitoring for anomalous market conduct that could result in abuses of market power.

The Panel has been monitoring the conduct of participants in IESO-administered markets since market opening in May 2002. The development of the Panel's approach to monitoring has benefited from the input of the IESO and its Technical Panel as well as from the formal consultations surrounding the Draft Market Power Framework Discussion Paper issued by the Panel in November 2006.[2] At that time, many stakeholders raised issues regarding the specific quantitative tests and data requirements suggested in the Discussion Paper. The market environment and Panel resources have changed since then, and the Panel has decided not to adopt comprehensive quantitative indicators or require additional data from market participants on a routine basis at this time. However, the Panel believes that it would contribute to the transparency of operation of Ontario's wholesale electricity markets and its oversight of them to explain the principles used to determine whether a particular market outcome is, in whole or in part, the result of the exercise or abuse of market power by a market participant as distinct from other causes.

[1] Ontario Energy Board, By-Law #3 (Market Surveillance Panel), Article 4.2.1, http://www.oeb.gov.on.ca/OEB/_Documents/About+the+OEB/OEB_bylaw_3.pdf,

[2] For the Discussion Paper prepared by the Market Surveillance Panel, see "Market Power Framework for the IESO-Administered Electricity Market: Proposed Framework for Identification of the Exercise of Market Power", November 2006. This was followed by a presentation to, and three meetings with, stakeholders, as well as an invitation to stakeholders to submit comments. The consultation documents, including stakeholder comments, can be viewed at http://www.oeb.gov.on.ca/OEB/Industry+Relations/Market+Surveillance+Panel/Market+Power+Framework.

1.2 Mandate of the Market Surveillance Panel

The Panel was established prior to the opening of the IESO-administered markets in 2002. It is mandated to investigate possible gaming or abuses of market power by market participants as well as recommending changes in Market Rules or design that would improve their efficiency.[3] More specifically, OEB By-Law #3 provides that:

> "The Panel shall monitor, evaluate and analyse activities related to the IESO-administered markets and the conduct of market participants with a view to:
> (a) identifying inappropriate or anomalous market conduct by a market participant, including unilateral or interdependent behaviour resulting in gaming or in abuses or possible abuses of market power;
> (b) identifying activities of the IESO that may have an impact on market efficiencies or effective competition;
> (c) identifying actual or potential design or other flaws and inefficiencies in the market rules and in the rules and procedures of the IESO;
> (d) identifying actual or potential design or other flaws in the overall structure of the IESO-administered markets and assessing whether any one or more specific aspects of the underlying structure of the IESO-administered markets is consistent with the efficient and fair operation of a competitive market; and
> (e) recommending remedial actions to mitigate the conduct, flaws and inefficiencies referred to in paragraphs (a) to (d)."[4]

1.3 Distinguishing Between High Prices and Market Power

Given the characteristics of electricity supply and demand, there are bound to be episodes of scarcity and very high prices, as well as market outcomes that appear to be counter-intuitive or anomalous given apparent supply and demand conditions. The importance of electrical energy and the high public profile of markets for it can lead to concerns that high price events are a result of the behaviour of market participants rather than 'natural' scarcity or, more generally, that the market price has somehow been manipulated by market participants.

[3] The *Ontario Energy Board Act, 1998*, (S.O. 1998, Chapter 15, Schedule B) and *Electricity Act, 1998*, (S.O. 1998, Chapter 15, schedule A) define the establishment, role and powers of the Market Surveillance Panel. The duties and activities of the Panel are elaborated under OEB By-law # 3, Articles 3.1.2 to 3.1.7, which include monitoring, investigation, review and reporting on activities related to the IESO-administered markets.

The Panel explains the results of its examinations of incidents of high prices and of anomalous market outcomes in semi-annual Monitoring Reports.[5] To date, the vast majority of cases addressed by the Panel have involved incidents in which various aspects of Market Rules, market design or market operation have had the effect of distorting market prices or otherwise degrading the fidelity of market price signals. To the extent that the Panel has identified concerns about participant conduct, they have most frequently involved responses to Market Rules or incentive programs that have negative effects on the market.

In the Panel's experience, high prices are usually the result of normal supply and demand forces.[6]

In order to assess whether an abuse of market power has occurred, it is necessary to define what constitutes an exercise of market power. The use of the term 'exercise of market power' in the stakeholder consultations contributed to unease in some quarters because of a perception that it implied inappropriate or sanctionable behaviour. While such an association exists in some other jurisdictions, in Ontario the exercise of market power is not proscribed by the Market Rules and the Panel distinguishes it from both the abuse of market power and gaming. To the Panel, the exercise of market power is simply one of the reasons why market outcomes may depart from the competitive benchmark. When warranted, the Panel uses this term in its explanations of the causes of high price events or anomalous market outcomes. However, a finding by the Panel that a market outcome was caused by an exercise of market power does not normally lead the Panel to take any action beyond the reporting of it, unless it is accompanied by conduct that constitutes an abuse of market power or gaming, or it has been facilitated by market design or other flaws. As this document makes clear, an abuse of market power involves specific conduct that is anti-competitive (e.g., exclusionary, collusive or predatory). In such cases, the Panel may conduct a formal investigation and report an abuse of market power finding to the OEB and the IESO.[7] In

[4] Ontario Energy Board, By-Law #3 Article 4.1.1.

[5] See Ch. 2 of the Market Surveillance Panel's Semi-Annual Monitoring Reports, Accessible from the Ontario Energy Board at http://www.oeb.gov.on.ca/OEB/Industry+Relations/Market+Surveillance+Panel/Market+Surveillance+Panel+Reports.

[6] *Ibid.*

[7] Under Section 38 of the *Electricity Act, 1998*, within 30 days after receiving the report from the MSP, the IESO shall inform the OEB what action it has taken or intends to take in response to the report. After receiving the MSP report and any information provided by the IESO, the

other situations arising from market design flaws, the Panel typically recommends that the IESO or other relevant institutions make changes to Market Rules, procedures or incentive programs.

1.4 Scope of this Monitoring Document

This document explains how actions by market participants which may constitute exercises of market power — particularly withholding their supply from the market or offering it at prices above their marginal cost — are identified and how they are distinguished from scarcity pricing, abuse of market power, and gaming respectively.

This document is concerned with situations where the market prices are elevated above competitive levels. While not discussed in this document, the Panel's monitoring activity also encompasses anomalous conduct which may arise in low-price hours or in hours in which the market price is significantly lower than market circumstances appear to warrant.

This document focuses on the real-time price and efficiency effects of the offer prices of generators and, to a lesser extent, on the bids of dispatchable loads and the offers of importers. This generally involves market participant conduct in Ontario's unconstrained energy market, and in particular, on conduct bearing on the uniform average hourly energy price (HOEP). It does not cover exercises of local market power associated with the constrained scheduling process, the identification and mitigation of which are the responsibility of the IESO as prescribed in the Market Rules.[8] However, the Panel may examine issues related to the constrained schedule under its mandates to monitor for gaming and market inefficiencies.

This document is organized in the following way. First, it explains the benchmark competitive outcome in a properly functioning market. Next, it distinguishes between high prices caused by

OEB may conduct its own review. The OEB may, for the purpose of avoiding, reducing the risk or mitigating the effects of an abuse of market power, amend the licence of any market participant, or direct the IESO to amend the Market Rules.

[8] See Appendix 7.6 (Local Market Power) of Chapter 7 of the *Market Rules for the Ontario Electricity Market*, available at http://www.ieso.ca/imoweb/pubs/marketRules/mr_chapter7appx.pdf. Nor does this monitoring document cover price determination in the IESO's Operating Reserve market, for which the IESO and OPG have a Bid Cap Agreement requiring Ontario Power Generation (OPG) to offer operating reserve and placing limits on the prices offered. Under the terms of their OEB Licences, unless the IESO determined there was a competitive market for any category of operating reserve, the IESO and OPG were required to enter into an agreement which placed limits on the offer prices and required OPG to offer the maximum available operating reserve, consistent with good utility practice. This led to an agreement in 2002, which continues to be in force today. For example, see section 12 of IESO's Operating Licence, No. EI-2003-0088, issued by OEB, available at http://www.ieso.ca/imoweb/pubs/corp2/EI-2003-0088-AppendixA-IESO-Proposed-Changes-Licence-Renewal-2008.pdf.

scarcity and higher-than-competitive prices resulting from the exercise of market power. This theoretical framework is then applied to different types of generation and to demand-side resources. Finally, it discusses how abuse of market power and gaming differ from the exercise of market power.

Given the wide variety of specific factual circumstances which may arise in the market, this document provides only general guidance. It is not a comprehensive or binding statement of how the Panel's monitoring mandate will be exercised in specific situations.

2. *Competitive Outcomes: General Principles*

The starting point for benchmarking competitive outcomes and deviations from them is a series of definitions drawn from economics and the application of these concepts to electricity markets including the distinctive features of the Ontario market.

2.1 Competitive Price

The ***competitive price level*** is the price that would prevail in equilibrium in an idealized perfectly competitive market. Under perfect competition, the price at which the market clears is equal to the short-run marginal cost of the marginal supplier and is at least as great as the marginal supplier's average variable cost. These and other costs concepts are discussed in Section 5 below.[9]

2.2 Ontario Market Prices

In the Ontario market, a new market price is set every five minutes. This five-minute interval price is known as the Market Clearing Price (MCP). The (simple) average of the 12 interval prices in an hour is the Hourly Ontario Energy Price (HOEP).

Conceptually, the MCP is established by stacking all offers of supply from the lowest to the highest offer price until the total quantity offered equals the amount of electric power demanded (estimated non-dispatchable load, plus bids from dispatchable loads and exports) at that point in time. All wholesale market suppliers are remunerated on the basis of the MCP or HOEP, even if they offered the energy at a lower price, and all wholesale market consumers pay the MCP or HOEP (plus any applicable Global Adjustments and / or uplifts).[10]

The MCP is set at the offer price of the generating unit (or dispatchable load bid price) that would have been selected if one additional MWh of electricity had been needed.[11] This price-setting offer (or bid) represents the 'marginal supplier'. Suppliers with lower offer prices are scheduled[12] and are 'infra-marginal'. Those with offer prices higher than that of the marginal supplier are not scheduled and are 'extra-marginal' suppliers.

2.3 The Competitive Benchmark

In a competitive marketplace, a supplier normally has an incentive to produce a rate of output per period such that short-run marginal cost is just equal to the market price. This is its profit-maximizing output. For rates of output below this point, the incremental revenue from an additional unit of production exceeds its incremental cost and therefore contributes to the coverage of fixed costs and to profit.[13]

[9] The Panel recognizes there are several practical issues to be addressed in the estimation of marginal cost. These are dealt with in section 5.3, which discusses production costs for non-energy limited generators, and Section 5.5, which discusses opportunity costs for energy-limited generators.

[10] Dispatchable generators, dispatchable load, imports and exports are paid or pay MCP based on the quantity they supply or consume in each 5-minute interval. Other non-dispatchable generators (for example self-scheduled generators) and non-dispatchable load are paid or pay HOEP for the hourly energy supplied or consumed. While the basic settlement of the spot market begins with MCP or HOEP, there are a various adjustments to these payments, for both generators and loads, associated with OPA contracts and the regulated pricing of OPG. Uplifts are associated with side payments from the IESO market.

[11] This is a somewhat simplified description of the actual processes involved, for the purpose of this document. Actual price determination is the result of a joint optimization of energy and three operating reserve products.

[12] Unless otherwise indicated, in this document's references to 'scheduling' are to the real-time unconstrained (i.e. market) sequence, not to the constrained sequence which is physically implemented.

[13] Assuming the usual case of marginal cost increasing with output.

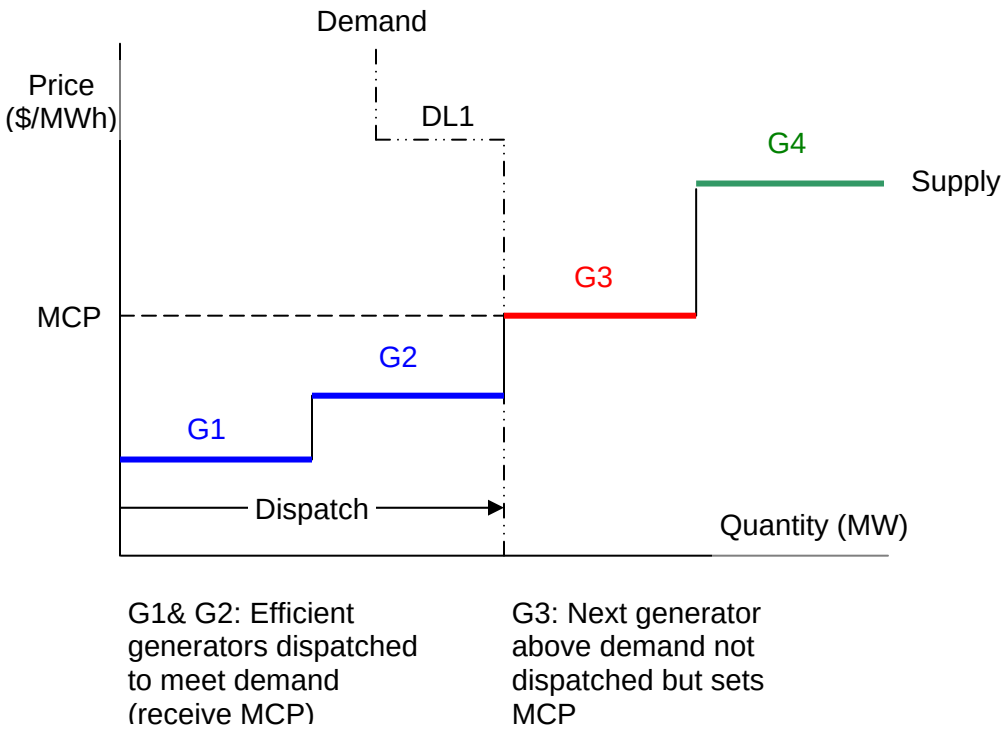
The competitive outcome for a hypothetical interval in the wholesale electricity market is shown schematically in the Figure 1 below.[14] Assume there are four generating units in the market, with Generators 1 and 2 owned and operated by the same market participant. All are offered at their respective marginal costs.[15] When these offers are stacked, this yields a stepped supply schedule or offer stack (also referred to as the 'merit order'). Assume for ease of illustration that all generators are the same size, and only two are needed to meet the market demand. A dispatchable load is also available to reduce demand if high prices occur, as shown by the step in the demand schedule, but otherwise the demand schedule is vertical in the price range relevant to this and most of the later examples.[16] Generators 1 and 2, the lowest cost units, are infra-marginal and are dispatched. This is the efficient dispatch. Generator 3, which would satisfy the next MWh of demand, is the marginal supplier. Although it is not dispatched, its offer sets the MCP. Generator 4 is extra-marginal and is not dispatched. Note that the MCP revenue received by Generators 1 and 2 exceeds their respective marginal costs (and offer prices).

[14] In these simple examples, prices are set by electricity generators. Prices are also set (from time-to-time) by dispatchable loads – industrial consumers that offer to stop consuming an amount of electricity if the MCP reaches a certain level, thereby allowing the remaining market demand to be satisfied without calling on additional generation. While most of this document focuses on generators for the sake of simplicity, section 5.5 discusses the potential application of these principles to dispatchable loads.

[15] For simplicity, we assume that the entire capacity of each generating unit is offered at a single price. In practice, generators may offer portions of capacity in 'laminations' at ascending prices. The principles summarized here would be applied on a lamination-by-lamination basis.

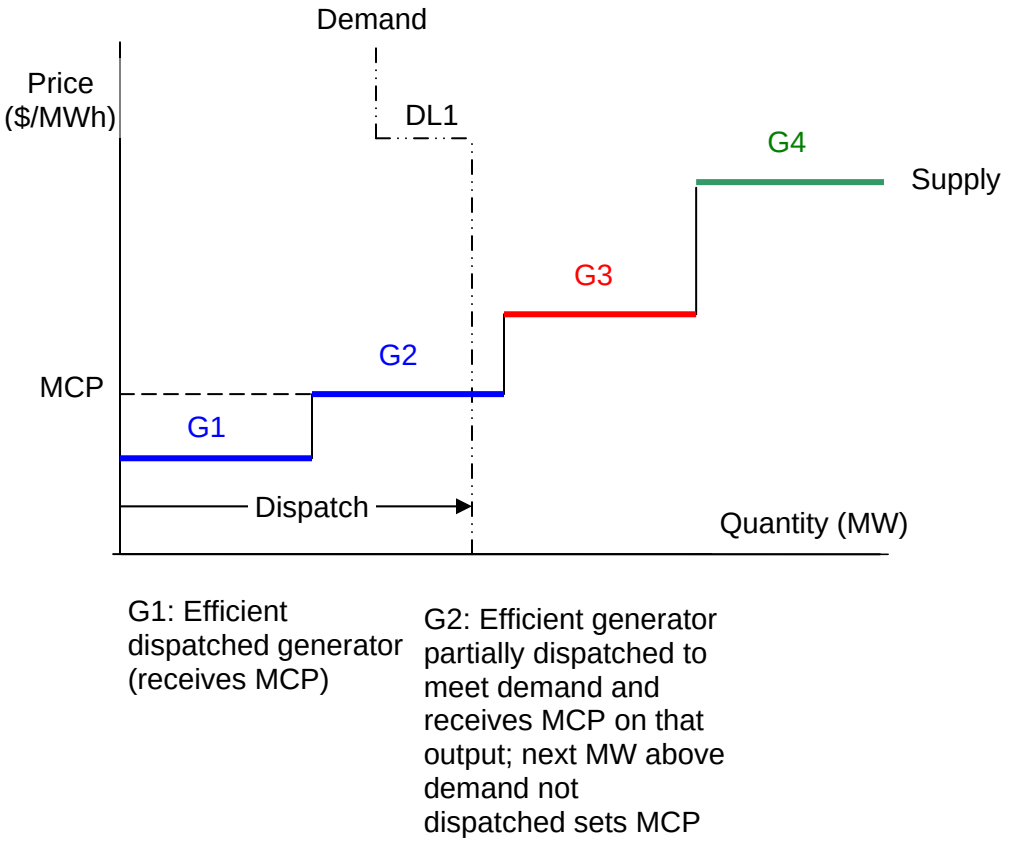
[16] It is common in markets for most products for the demand schedule to be downward sloping and intersect the supply schedule within the range of the production capability of some supplier. There are, however, price ranges over which the Ontario electricity real-time demand schedule is close to vertical. For simplicity, many examples in this document assume steps in the demand schedule at the high price levels typically offered by dispatchable loads, but vertical demand in lower price ranges. The impact of a downward sloping demand schedule is discussed in Section 3.2.3.

Figure 1: Competitive Market



In most situations, demand does not fall precisely at the breakpoint between two generators so that the marginal (price setting) generator is one which is partially but not fully dispatched. This is illustrated in Figure 2, which has demand slightly lower than in Figure 1. In this case, the MCP is set by the offer price of the generating capacity that would satisfy the next MWh of demand, which is near the high end of the capacity offered by Generator 2. Assuming this generating capacity is offered to the market at marginal cost, the result is the competitive price which reflects the lower level of demand relative to Figure 1. In this case, the MCP exceeds the marginal cost of Generator 1 but not Generator 2.

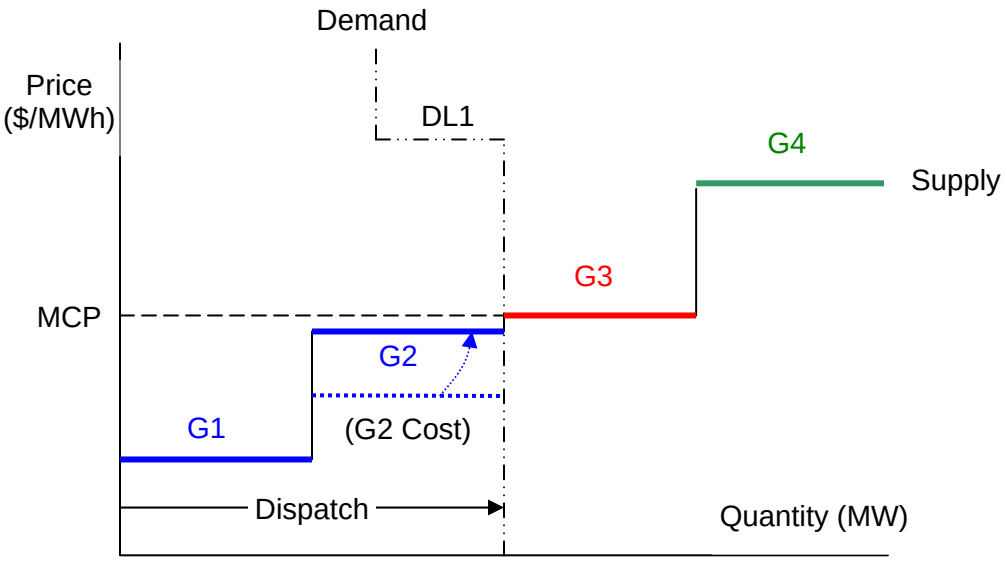
Figure 2: Competitive Market – Marginal Generator Partially Dispatched



The competitive price outcome may occur even if an infra-marginal or extra-marginal generator offers at a price above its marginal cost (MC), as long as the marginal supplier is offering at its marginal cost. Figures 3 and 4 illustrate these cases.

In Figure 3, Generators 1, 3, and 4 offer at their respective marginal costs. In contrast to Figure 1, Generator 2 sets its offer price above its marginal cost (MC) but it remains below the marginal cost and offer price of Generator 3. There is no change to the dispatch, which remains efficient. There is no change to the MCP, which is still set by Generator 3's offer price.

Figure 3: Infra-marginal Capacity Offered Above Marginal Cost

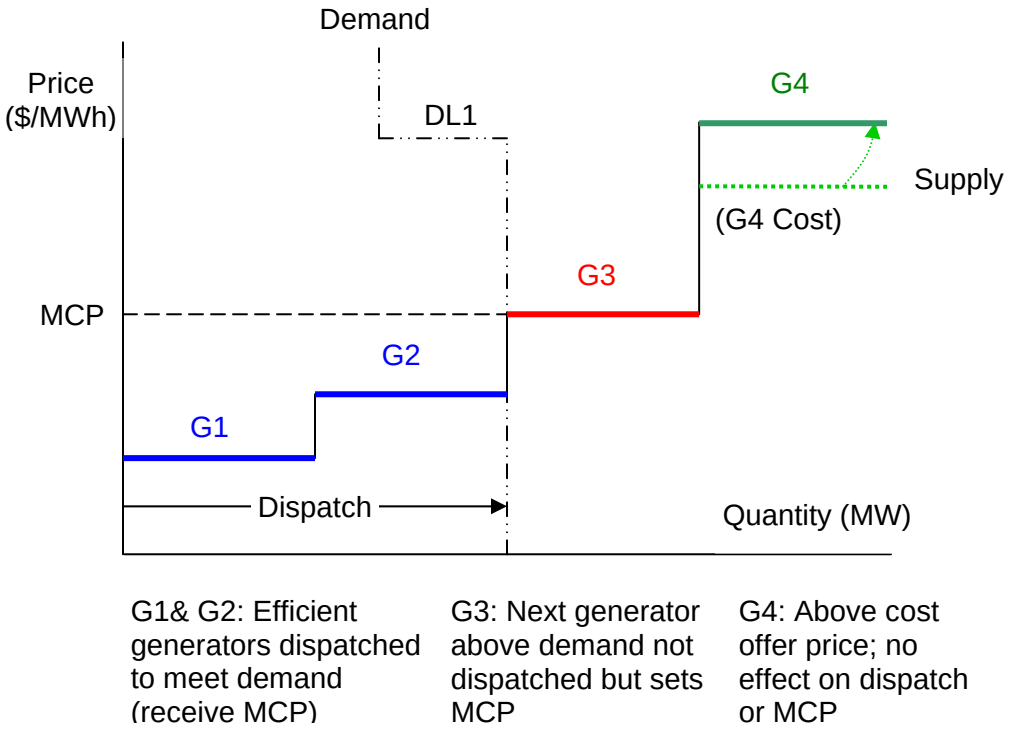


G1& G2: Efficient generators dispatched to meet demand (and receive MCP, despite above-cost offer price on G2)

G3: Next generator above demand not dispatched but sets MCP

In Figure 4, Generators 1, 2 and 3 offer at their respective marginal costs. In contrast to Figure 1, Generator 4 sets its offer price above its marginal cost (MC). There is no change to the dispatch, which remains efficient. There is no change to the MCP, which is still set by Generator 3's offer price.

Figure 4: Extra-marginal Capacity Offered Above Marginal Cost



G1& G2: Efficient generators dispatched to meet demand (receive MCP)

G3: Next generator above demand not dispatched but sets MCP

G4: Above cost offer price; no effect on dispatch or MCP

3. *Deviations from the Competitive Benchmark*

Although the Panel is attentive to any situation in which there has been a material departure from the competitive benchmark in the Ontario electricity market, the most likely ways in which market power might be exercised are withholding (in either physical or economic terms) and 'pricing up' towards the level of the next offer (or bid) in the merit order. These forms of conduct and their effects on the market are discussed in more detail below.

3.1 Withholding

Withholding creates an artificial scarcity in the market. Withholding leads to a higher market price and thus to a wealth transfer from all consumers to all suppliers in the market during the affected time period. It also results in inefficient dispatch when higher-cost sources of energy are called to market before lower-cost resources. To the extent that loads respond to prices in

excess of marginal cost by substituting other forms of energy, or by relocating or foregoing otherwise productive activities, withholding also results in inefficient consumption decisions.

There are a number of ways in which supply may be withheld from the market:

- Supply may simply not be offered into the market, thus requiring the market to turn to higher-cost sources. This is commonly referred to as 'physical withholding'.
- Supply can be offered at prices that are higher than marginal cost with the consequence that other lower priced (but higher cost) offers are selected instead. This is commonly referred to as 'economic withholding'.
- Supply that can be offered for a limited number of hours (such as hydroelectricity produced from limited supplies of water) may be offered to the market in low-priced periods, rather than in high-priced periods which would be more efficient. This may have the effect of increasing the market price in peak periods without substantially reducing the market price in off-peak or shoulder periods. It may involve economic withholding (pricing above opportunity cost[17]), physical withholding, or both.

3.1.1. Physical Withholding

Physical withholding is defined as a decision not to offer available and infra-marginal or marginal capacity into the market. Physical withholding usually raises the MCP. Physical withholding normally results in dispatch inefficiency as well (unless the unit withheld is marginal.)[18]

Physical withholding may or may not be profitable for a supplier. While the supplier foregoes profit on the output it withholds, any other infra-marginal generation it owns receives higher revenues due to the increase in the MCP above the competitive price.

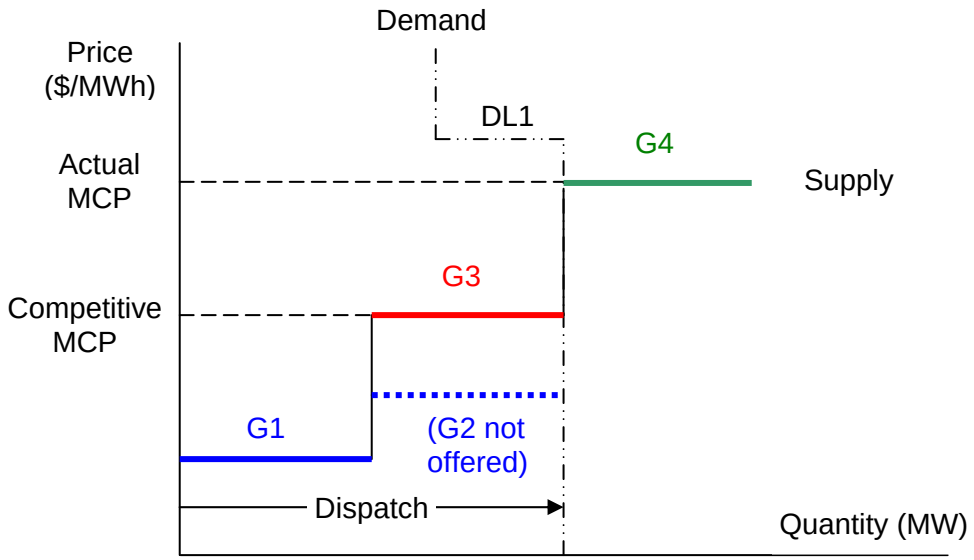
Physical withholding is illustrated in Figure 5. In this scenario,Generators 1, 3 and 4 offer at marginal cost. Generators 1 and 2 are owned by the same firm. Generator 2, whose costs are

[17] Section 5.5 explains the application of opportunity cost in the assessment of departures from the competitive norm by an energy-limited generator.

[18] If demand is price-responsive (i.e. the demand schedule is not vertical in the relevant range), the higher MCP also results in inefficient consumption decisions by loads. See Section 3.2.3.

lower than Generators 3 and 4, is available but does not submit an offer. Generator 3 is dispatched instead. Generator 4 becomes the marginal supplier. It is not dispatched but its offer sets MCP. The dispatch is inefficient because the higher-cost Generator 3 has replaced Generator 2. The Actual MCP is increased above the Competitive MCP. As more fully described in section 5.1, this would likely be regarded as an exercise of market power, assuming that (i) there is no credible alternative explanation for the withholding, (ii) there is a material effect on the MCP, and (iii) the firm that owns Generator 2 benefits from the withholding (e.g. because the additional profits realized by its other Generator 1 from the higher MCP exceeds the profit foregone when Generator 2 is withheld).

Figure 5: Physical Withholding



G1: Efficient generator dispatched (receives Actual MCP)	G2: Available but not offered	G3: Now dispatched to meet demand (receives Actual MCP)	G4: Now next generator above demand; not dispatched but offer sets MCP

3.1.2. Economic Withholding

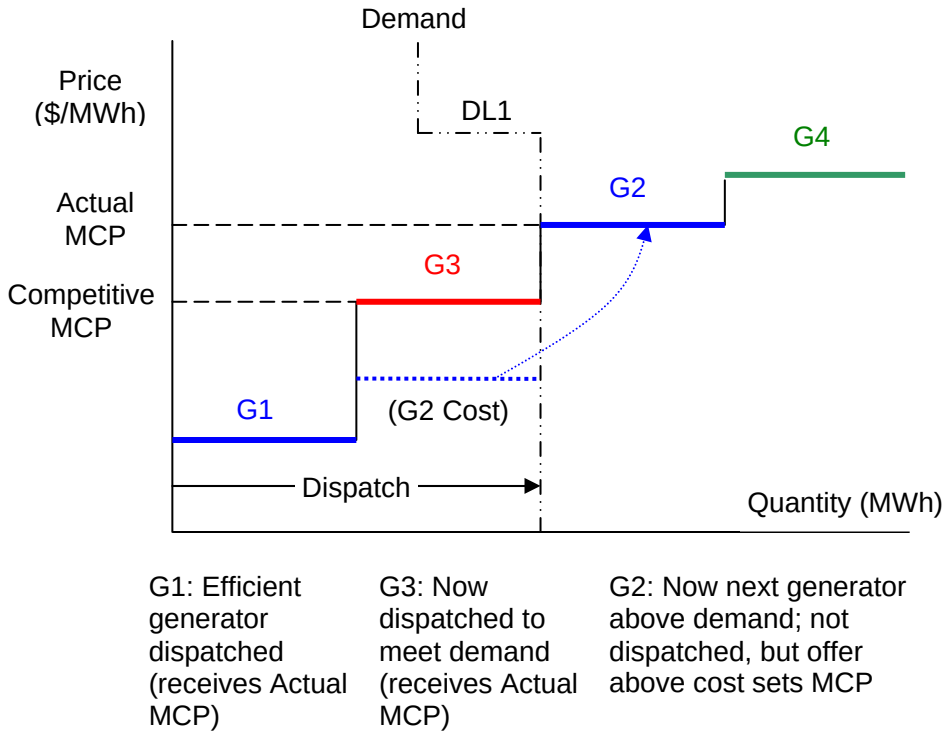
Economic withholding is defined as offering otherwise infra-marginal capacity at a price that exceeds not only the generator's own marginal cost but also the competitive MCP (i.e. the

marginal supplier's marginal cost). Similar to physical withholding, economic withholding normally raises the MCP and results in dispatch inefficiency.

As with physical withholding, economic withholding may be beneficial for a firm if the foregone profit on the withheld capacity is exceeded by additional revenues on other infra-marginal output.

Economic withholding is illustrated in Figure 6. Once again, the same firm owns Generators 1 and 2. In this scenario, Generators 1, 3, and 4 offer at marginal cost. Generator 2, whose costs are lower than Generators 3 and 4, increases its offer price above both its marginal cost and the offer price of Generator 3. Generator 3 is now dispatched instead of Generator 2. This dispatch is inefficient because the higher-cost Generator 3 has replaced Generator 2. Generator 2 is now the marginal supplier and sets the Actual MCP at a price above the Competitive MCP. As described in section 5.1, this would likely constitute an exercise of market power, assuming that (i) there is no credible alternative explanation for the withholding, (ii) there is a material effect on the MCP, and (iii) the firm that owns Generator 2 benefits from the withholding (e.g. because the additional revenue realized by its other Generator 1 from the higher MCP exceeds the profit foregone when Generator 2 is withheld).

Figure 6: Economic Withholding



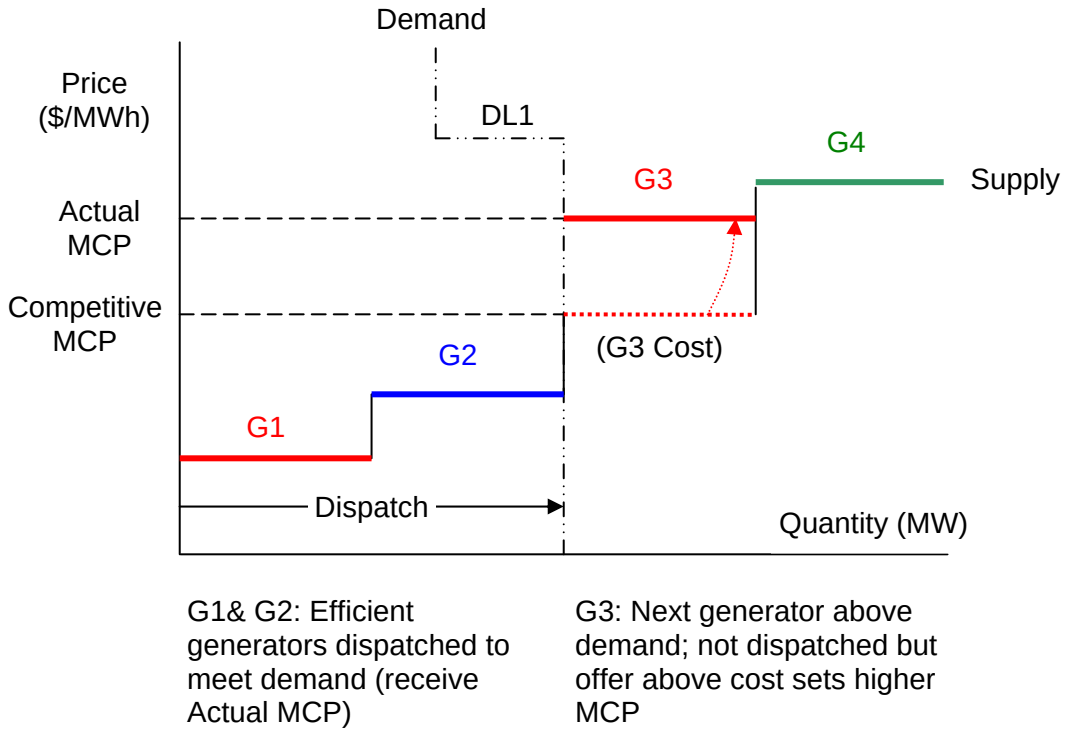
3.2 Pricing-Up

The Panel uses the term '***pricing-up***' to refer to a situation in which the marginal supplier raises its offer price above its marginal cost. Since the market price is set by the offer of the marginal supplier, pricing-up necessarily increases the market price. It therefore leads to a wealth transfer from all consumers to all suppliers in the market during the affected time period. However, unlike withholding, pricing-up does not result in dispatch inefficiency because it does not change the merit order.

As with physical or economic withholding, pricing-up may be a profitable strategy if the market participant concerned has other resources that have been scheduled and therefore benefit from the higher MCP. For example, the market participant involved may own other generators that are infra-marginal (as in Figure 7, below) or the price-setting unit of capacity that is not dispatched may be part of an offer that includes other capacity that is dispatched (as in Figure 8, below).

In Figure 7, Generators 1 and 3 (not 2) are owned by the same market participant. Generators 1, 2, and 4 offer at their respective marginal costs. Generator 3 sets its offer price above its marginal cost, but below (not above) the marginal cost and offer price of Generator 4. There is no change in the dispatch, but the Actual MCP is increased above the Competitive MCP. As described in section 5.1, this would likely constitute an exercise of market power, assuming that (i) there is no credible alternative explanation for the pricing-up,[19] (ii) there is a material effect on the MCP, and (iii) the firm that owns Generator 3 benefits from the pricing-up (e.g. because of the additional revenue realized by its other Generator 1 from the higher MCP).

Figure 7: Pricing-Up by an Un-dispatched Marginal Generator

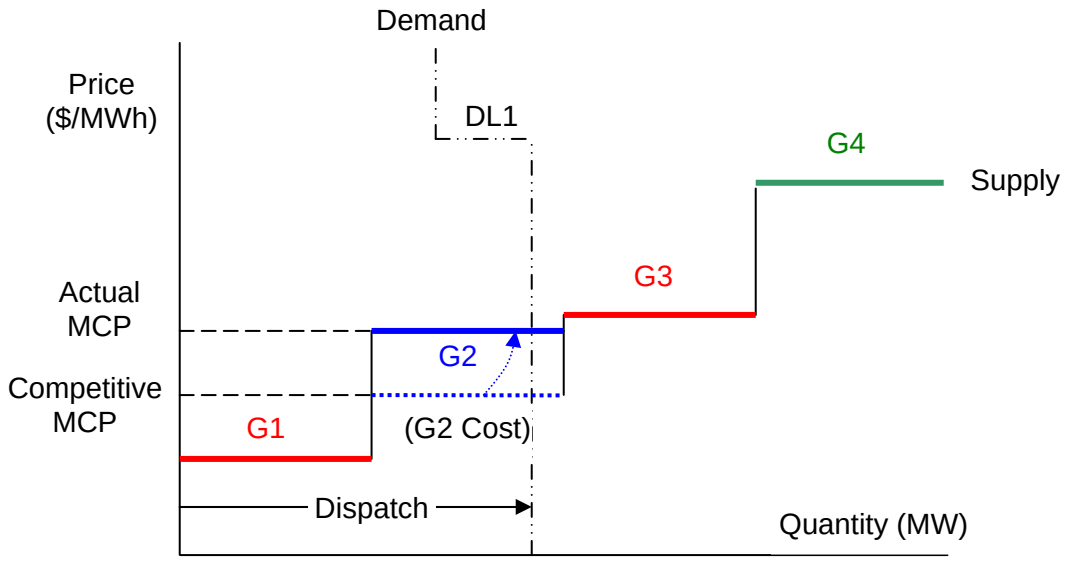


Pricing-up can also occur when the marginal generator is partially dispatched (i.e. when demand falls within the range of a generator's offer rather than between two generators' offers). In Figure 8, Generators 1 and 2 are the most efficient generators, but (unlike Figure 7) Generator 2

[19] In Section 5.3.1, it is noted that there are restrictions on the offers submitted by generators that may require the offer price to exceed marginal cost in some ranges. This limitation has to be taken into account when assessing the relationship between observed offer prices and costs.

is not fully dispatched so its offer sets the MCP. Generator 2 offers its output at a price above its own cost and just below the marginal cost of Generator 3. Generator 2's offer sets the MCP. This does not change the dispatch, but it does raise the Actual MCP above the Competitive MCP. As described in section 5.1, this would likely constitute an exercise of market power, assuming that (i) there is no credible alternative explanation for the pricing-up, (ii) there is a material effect on the MCP, and (iii) the firm that owns Generator 2 benefits from the pricing-up (e.g. because of the additional revenue realized from the higher MCP on the portion of Generator 2's output which is dispatched).

Figure 8: Pricing-Up by a Partially Dispatched Generator



G1: Efficient generator dispatched (receives Actual MCP)

G2: Efficient generator partially dispatched to meet demand and receives MCP on that output; next MWh above demand not dispatched but offer above cost sets higher MCP

3.2.1. Efficiency Consequences of Pricing-Up with Perfectly Inelastic Demand

During the consultations on the Draft Market Power Framework, some stakeholders argued that pricing-up does not constitute an exercise of market power and may in fact be beneficial to the market.[20] The main arguments were that:

- Offer behaviour which increases prices without changing the merit order is not economically inefficient.
- Ontario Market Rules do not require generators to offer at cost.
- Suppliers who fear that pricing up could be construed as an inappropriate exercise of market power may be discouraged from offering supply in scarcity conditions, which is precisely when their supply is most needed.
- A standard that defines the exercise of market power solely in terms of the relationship between the offer price and short-run marginal cost[21] ignores all fixed costs, so that a market participant may be deemed to be exercising market power even though it is not covering its fixed costs.
- To the extent that pricing-up reflects scarcity of supply, it sends an important signal for new investment by investors who may be seeking opportunities to enter the market profitably and may also encourage conservation and demand response in Ontario.

The Panel acknowledges that if the elasticity of demand were zero, pricing-up would have no efficiency effects and that it differs from withholding in this respect. However, as discussed in Section 3.2.3 below, exports and some non-dispatchable loads may be price responsive. As a result, the demand schedule may not be vertical and pricing-up could result in inefficient consumption decisions by loads.

The Panel recognizes that pricing-up towards the level of one's closest competitor is not uncommon in many market situations. For example, in a competitive bidding process (e.g. for a construction contract) a supplier with a cost advantage can win the contract with an above-cost

[20] See stakeholder submissions at http://www.oeb.gov.on.ca/OEB/Industry+Relations/Market+Surveillance+Panel/Market+Power+Framework.

[21] Short-run marginal cost is the additional cost of producing an additional MWh of electric power from existing generating capacity. Long-run marginal cost is the additional cost of all inputs (including the cost of additional capacity) required to produce an additional MWh of electric power.

bid as long as its bid is below the best alternative bid. A bidder is generally not expected to 'bid against itself'. Some economists view the difference between a successful offer price and marginal cost as an 'efficiency rent'.[22]

The Panel also recognizes that, if a particular generator was regularly the marginal supplier, it would not cover its fixed costs if it did not price-up. While the Panel understands that sustaining a market over the long-term requires that participants earn revenues sufficient to cover their fixed costs, it holds the view that, as a matter of definition, the exercise of market power may occur through reduction of losses (increasing the coverage of fixed costs) as well as through earning extra profits.[23] In either case, the exercise of market power can have adverse consequences for the market. Moreover, as a matter of practice there is enormous variation in the identity of the marginal supplier in different hours, days, weeks and months of the year and the Ontario market design allows all suppliers to receive revenues in excess of marginal cost during periods in which they are infra-marginal.

The Panel is aware that the revenue yielded by the Ontario market has generally not been sufficient to induce investment or reinvestment,[24] but doubts that this situation would be ameliorated by treating pricing-up as conduct which does not constitute an exercise of market power. In any event, the question of whether pricing-up would enable new investment in the Ontario electricity market has been eclipsed by the Ontario Government's decision to give the Ontario Power Authority a mandate to source new generation through procurement contracts rather than relying solely on yields available from the HOEP.

In sum, the Panel is not persuaded by the argument that generators — even high marginal cost peaking plants — would be deterred from offering into the market at prices reflecting marginal cost in scarcity and non-scarcity situations. This document seeks to encourage rather than

[22] Efficiency rent is a specialized use of the term 'rent' by economists. It refers to the difference between what the supplier is paid (in this context the higher MCP) and how much it would need to be paid (its marginal cost) to supply a product. It is called an efficiency rent because it is seen as a reward for having lower costs than other suppliers.

[23] A firm is defined to have market power when its optimal price exceeds its marginal cost. This need not yield supra-normal profits. See Dennis W. Carlton and Jeffrey M. Perloff, *Modern Industrial Organization*, 4th ed. (Addison-Wesley, 2005), p. 93.

[24] See, *e.g.*, the net revenue analysis in the Panel's July 2009 Monitoring Report, at pp. 67-68.

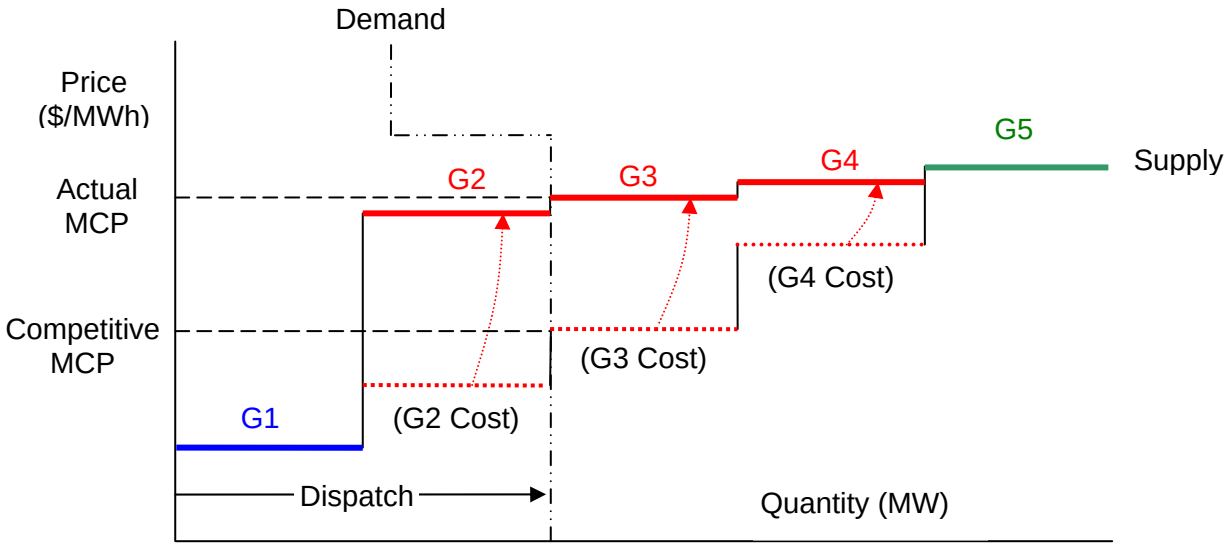
discourage participation in the market in scarcity situations by clarifying distinction between high prices and supra-competitive prices. Moreover, to the extent that pricing up is seen as a mechanism to achieve conservation or demand response, it may be doing so by inducing loads to make inefficient consumption decisions.

Having considered all the arguments carefully, the Panel's view remains that the Ontario market design — in which all dispatched suppliers receive the MCP — was based in part on an expectation that suppliers in a competitive market would be bidding at marginal cost in order to ensure they are dispatched whenever possible. Thus pricing-up, which by definition raises the market price above the marginal cost of the next MWh required to satisfy demand, is appropriately viewed as an exercise of market power. The implication is that when the Panel finds that a high price event or an anomalous market outcome is a consequence of pricing-up by a market participant, it will include this finding in its Monitoring Report. The Panel sees this as a matter of explanation rather than as a form of censure.

3.2.2. Pricing-Up a Portfolio

In electricity markets, a single supplier may have a portfolio of several contiguous units in the dispatch merit order. If the next competing extra-marginal generator has significantly higher marginal costs, it would be possible for a supplier with a large portfolio to price several units just under the marginal cost of a competitor that is well down the merit order. In this case, the MCP could be set close to the marginal cost of the next unaffiliated generator even though it would not be the generator selected to meet the next MWh of demand. This is illustrated in Figure 9, where Generators 2, 3 and 4 are assumed to be owned by a single firm and Generators 1 and 5 are owned by other firms. The offer prices for Generators 2, 3 and 4 are each set above their respective marginal costs. While there is no dispatch inefficiency resulting from a departure from the merit order, the Actual MCP could significantly exceed the Competitive MCP.

Figure 9: Pricing-Up Across a Portfolio of Generating Units



G1& G2: Efficient generators dispatched to meet demand (receive Actual MCP)

G3-G4: Generators not dispatched; priced above cost, just below the marginal cost and offer price for G5; G3's offer above cost sets the MCP above the competitive level.

3.2.3. Pricing-up and Inefficient Consumption when Demand is Price-Responsive

Demand may not be completely inelastic in the relevant range. In such circumstances, pricing-up would result in inefficient consumption decisions by loads to the extent that it induces them to substitute in favour of other forms or sources of energy or to reduce, relocate, or even forego productive activities. Both exports and interval metered non-dispatchable loads can be sensitive to actual or anticipated price increases:

- While the quantities historically have not been large, there is price-responsive non-dispatchable wholesale load in the Ontario market that may modify its planned consumption in response to anticipated or observed changes in the HOEP.[25] The Ontario

[25] Interval MCPs are posted in near real-time on the IESO's website, as are the sequences of pre-dispatch prices. A load may monitor these prices and adjust its consumption in response to the changing price levels. See the Panel's March 2003 and December 2006 Monitoring Reports. pp. 96-105 and pp. 85-90 respectively.

Power Authority (OPA) demand response programs may increase price responsiveness from non-dispatchable loads.[26] As a result, a slightly downward sloping demand schedule would be a more accurate reflection of overall demand response than a demand schedule with lengthy vertical sections.[27]

- The Ontario market is characterized by significant export transactions that are price-sensitive. Thus in many situations, pricing-up of the marginal generator (without changing the dispatch order) is likely to have negative efficiency impacts because higher market prices are likely to reduce the exports that are scheduled. Econometric analysis discussed in several of the Panel's Monitoring Reports indicates that monthly exports are sensitive to changes in the monthly average HOEP.[28] Export demand for a given hour depends in large part on the anticipated HOEP for that hour. To the extent that pricing-up occurs in pre-dispatch and induces a higher pre-dispatch price, economic exports may be bid but not be scheduled. Alternatively, if pricing-up is anticipated to raise real-time prices, exporters may simply choose not to bid and consequently would not be scheduled. The loss of efficiency in these situations is the result of export customers, who would have been willing to pay the marginal cost of energy generated in Ontario, seeking energy from higher cost sources elsewhere.

In Figure 10, Generators 1, 2, and 4 offer at marginal cost but Generator 3 prices-up to just below Generator 4's offer. The demand schedule has a slight downward slope as well as a step relating to a bid by Dispatchable Load 1. The downward slope of the demand schedule captures the potential for non-dispatchable loads and exporters to reduce their purchases as the result of a higher anticipated HOEP, as discussed above. The demand schedule would intersect the capacity of Generator 3 near the upper-range of its capacity if it had priced its offer at its marginal cost. This would have led to dispatching a large portion of Generator 3's capacity and

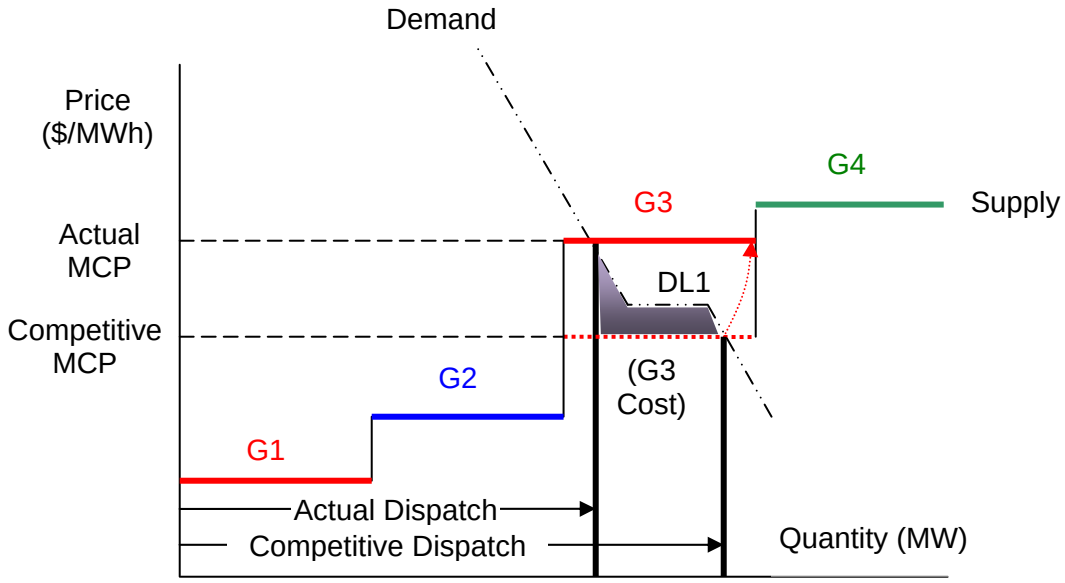
[26] See Ontario Power Authority, Demand Response Programs, http://www.powerauthority.on.ca/Page.asp?PageID=861&SiteNodeID=147. They include Demand Response Programs DR1, DR2 and DR3, as well as the Peaksaver and other programs.

[27] In real-time, as MCP is determined every 5 minutes, there is very limited ability for non-dispatchable load to respond to price changes for individual intervals. Dispatchable load can bid to reduce consumption with increasing price, and this could lead to successive steps in the demand schedule (approximating a downward slope), but this is usually restricted to higher price ranges. This means there is little downward slope to the demand schedule in real-time over large price ranges, including the most typical price ranges, (e.g. under $100 per MWh). If, however, price increases are anticipated by non-dispatchable load and / or exports during pre-dispatch, they may choose to consume less or withdraw from the market. That would actually shift the real-time demand schedule to the left. For ease of exposition, the reduction of demand in response to anticipated prices is illustrated as a downward sloping demand schedule.

[28] For example, the Panel's July 2009 Monitoring Report, pp. 83-84 shows that other things being equal, monthly exports are highly responsive to changes in the monthly average HOEP.

setting the Competitive Price at Generator 3's marginal cost. When Generator 3 offers at a price above marginal cost, demand is reduced because of the higher Actual MCP, and a smaller portion of Generator 3's capacity is dispatched to match the demand reduction. In this case, the increase in the MCP causes inefficiency by inducing a dispatchable load, price-responsive non-dispatchable loads and exporters, all of whom would have been willing to pay the marginal cost of serving them, to reduce their consumption. The dollar magnitude of the resulting market inefficiency is represented by the shaded area between the demand schedule and the supply schedule, between the Actual Dispatch and the Competitive Dispatch.

Figure 10: Pricing-Up with Price-Responsive Demand



G1& G2: Efficient generators dispatched (receive Actual MCP)

G3: Generator partially dispatched and also has next MW above demand; offer above cost sets higher MCP and results in lower dispatch

DL1: Dispatchable load would have been scheduled in competitive outcome but is priced out of the market by higher MCP

4. *Scarcity Conditions*

While 'scarcity' is often used to refer to the general role that competitive market prices play in signalling opportunity costs, the Panel uses the term more specifically to refer to an hour or an interval in which market demand for electricity is high relative to the available sources of supply.

During scarcity conditions, an electricity market must turn to relatively high cost sources of supply to meet demand and this results in market prices that are higher (sometimes much higher) than usual. During scarcity conditions, dispatchable loads are also often dispatched down in order to equate demand with the available supply. In such a case, the market price would be set by the bid of the marginal dispatchable load, which may be priced well above the offer of the highest cost generator dispatched. Since the MCP in the Ontario market is equal to the offer or bid price of the next MW not taken, all of the dispatched generators may be receiving a price that is above (potentially well above) their respective marginal costs during scarcity conditions. As the Panel has noted repeatedly, prices that accurately reflect scarcity conditions can induce loads to conserve, reduce exports, attract imports, and in the longer run, create incentives for new investment.[29]

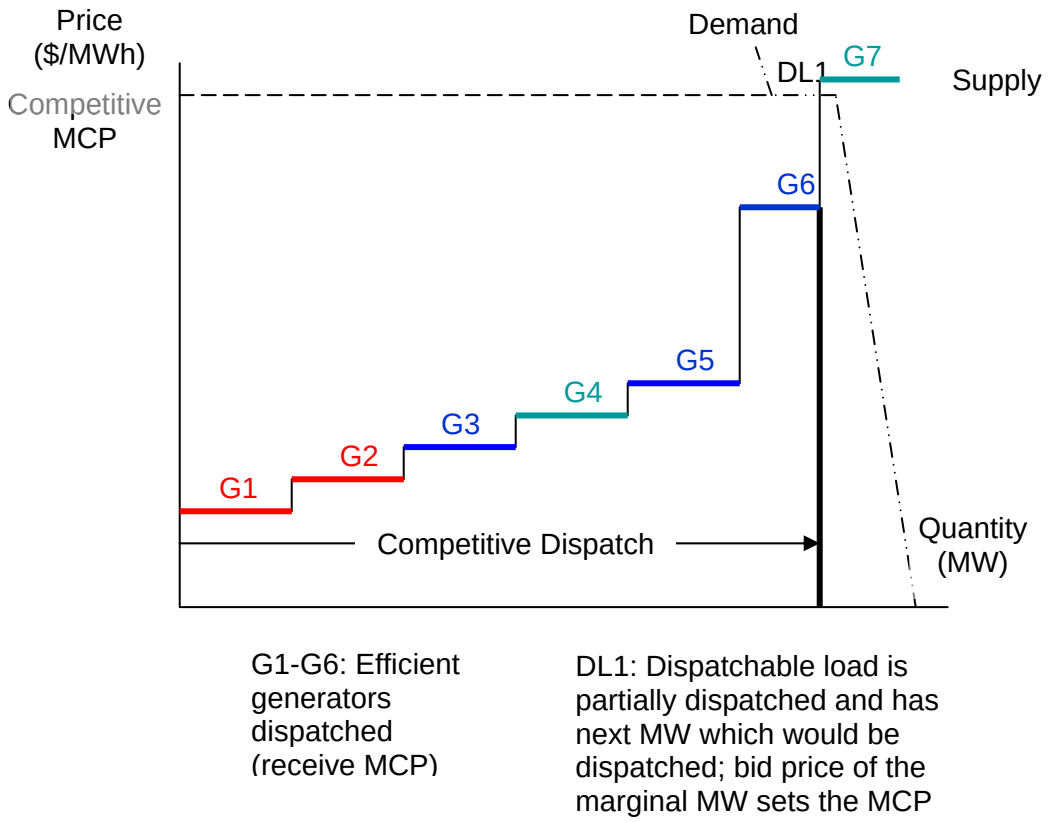
However, scarcity conditions can also be accompanied by divergences from the competitive benchmark. When supply is relatively tight and the market is operating on the steep portion of the offer curve, the withholding or pricing-up of even small quantities of energy can drive up prices substantially. At such times, even small suppliers may be able to move the market away from a competitive outcome. It is therefore important to distinguish between the respective impacts of scarcity conditions and any withholding or pricing-up on market prices.

4.1 Competitive Outcome

Figure 11 illustrates scarcity conditions in which a dispatchable load sets MCP at the competitive level. In this example, supply is scarce in the sense that most of the available capacity is required to satisfy demand. All generators are pricing their offers at marginal cost. The bid of the Dispatchable Load 1 exceeds offer prices for Generators 1 through 6, but is below the price of the last available Generator 7. Rather than pay the higher price for energy from Generator 7, Dispatchable Load 1 prefers to reduce consumption and its bid sets the Competitive MCP. The resulting Competitive MCP is 'high' in absolute terms. However, this is a consequence of scarcity conditions rather than pricing-up.

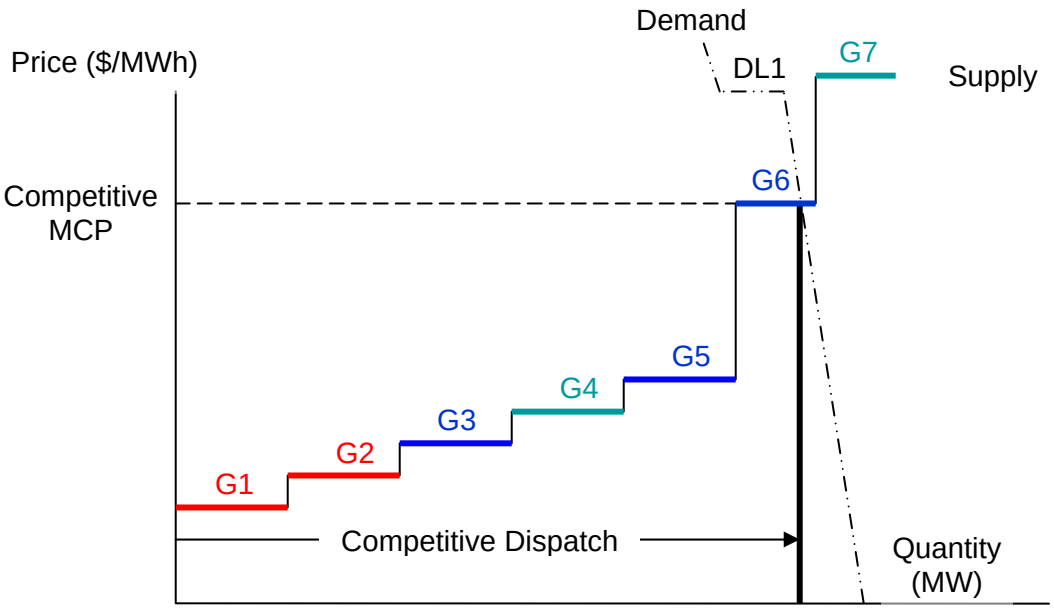
[29] For the most recent discussions of this issue, see the Panel's July 2008 Monitoring Report, p. 193.

Figure 11: Competitive Price Set by Dispatchable Load During Scarcity Conditions



In Figure 12, Generators 1 to 5 are lower cost generators that are all dispatched during a period of high-demand, or near scarcity, where Dispatchable Load 1 is close to being the marginal resource. Generators 6 and 7 are high cost peaking units. The same firm owns Generators 3, 5 and 6. If Generator 6 offers at marginal cost it will be partially dispatched. The price of the next MW of Generator 6 that is not dispatched sets the Competitive MCP. The resulting MCP is 'high' in absolute terms, but reflects a competitive response to near scarcity conditions.

Figure 12: Competitive Price Set by Peaking Generator During Scarcity Conditions



G1-G5: Efficient generators dispatched (receive MCP)

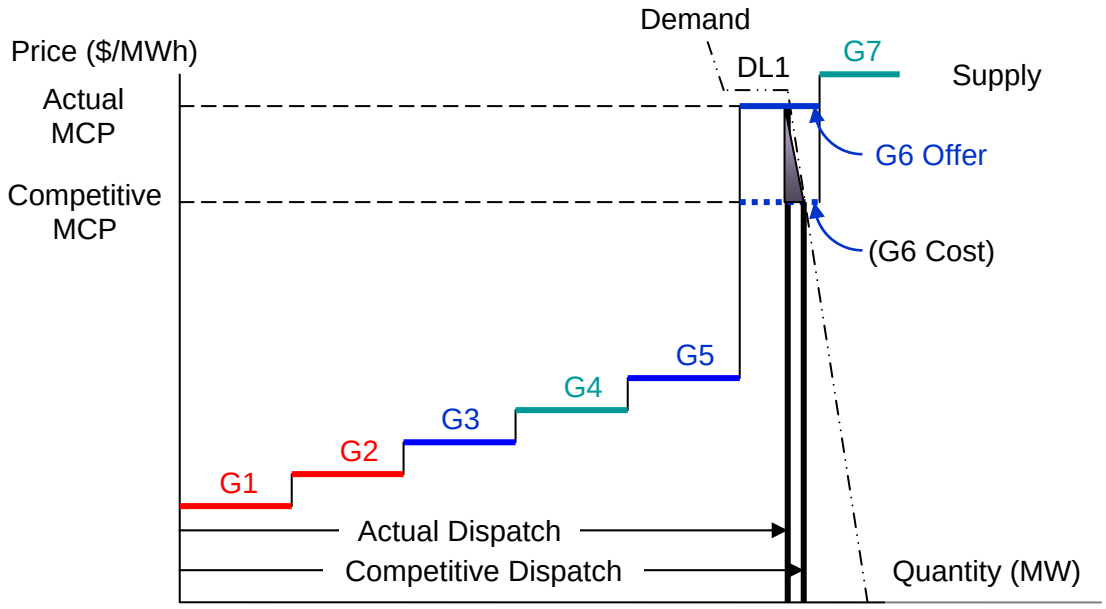
G6: Generator partially dispatched to meet demand and receives MCP on that output; next MW above demand not dispatched and sets MCP.

4.2 Scarcity Aggravated by Pricing-Up

Figure 13 is similar to Figure 12 except that Generator 6 prices-up to just below the bid price of Dispatchable Load 1. The above cost offer price of the next MW of Generator 6 which is not dispatched sets the Actual MCP. The resulting MCP is 'high', both in absolute terms and relative to the competitive benchmark. Dispatchable Load 1 remains fully dispatched and continues to consume, but other price-sensitive non-dispatchable loads and / or exports are reduced. Generator 6 continues to be partially dispatched but at a slightly lower level. The increase in the MCP results in inefficient consumption decisions by price responsive non-dispatchable loads and exporters. The magnitude of this inefficiency (shown as the shaded area) is the excess of the value attached by the loads involved to their foregone consumption over the marginal cost of supplying it. As described in section 5.1, this strategy of pricing up by Generator 6 would likely be viewed as an exercise of market power, assuming that (i) there is no

credible alternative explanation for the pricing-up, (ii) there is a material effect on the MCP, and (iii) the firm that owns Generator 6 benefits from the pricing-up (e.g. because additional revenues realized from the higher MCP on the output of Generators 3, 5 and 6 exceeds the lost profits from the Generator 6 volume decline).

Figure 13: Scarcity Conditions Aggravated by Pricing Up



G1-G5: Efficient generators dispatched (receive MCP)

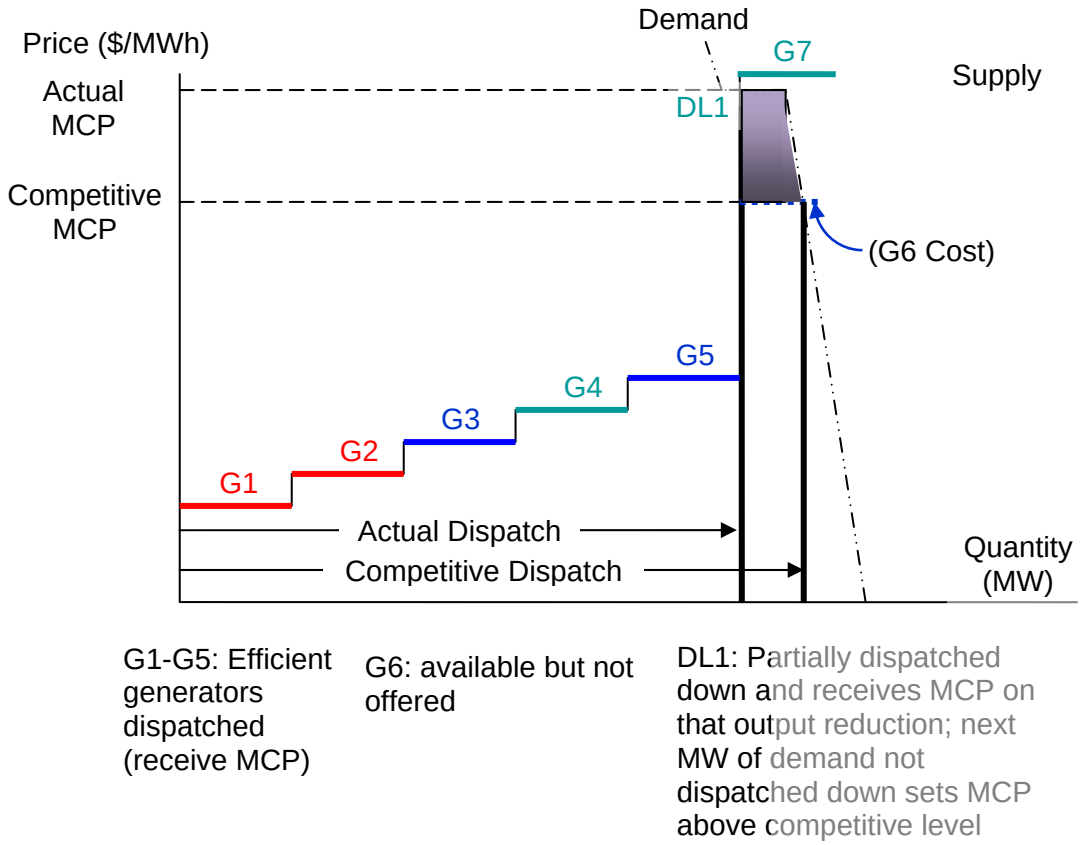
G6: Last generator partially dispatched to meet reduced demand and receives MCP on that output; next MW above demand not dispatched but above cost offer price sets MCP

4.3 Scarcity Aggravated by Withholding

As an alternative to raising its offer price (as shown in Figure 13), Generator 6 could induce an even higher Actual MCP by physical withholding (i.e. not offering the unit) as depicted in Figure 14. In this situation, Dispatchable Load 1 would be partially dispatched down. Since it also represents the next MWh which would be dispatched, the bid of Dispatchable Load 1 sets the Actual MCP. This results in an Actual MCP that is higher than the Competitive MCP and an

efficiency loss (shown as the shaded area) due to the reduced consumption by the Dispatchable Load. As described in section 5.1, this physical withholding strategy would likely be viewed as an exercise of market power, assuming that (i) there is no credible alternative explanation for the withholding, (ii) there is a material effect on the MCP, and (iii) the firm that owns Generator 6 benefits from the withholding (e.g. because the additional revenues realized from the higher MCP on the output of Generators 3 and 5 exceed the profit foregone when Generator 6 is withheld).

Figure 14: Scarcity Conditions Aggravated by Physical Withholding



5. *Methodology for Assessing Withholding or Pricing-up*

The Panel is well aware that determining whether a market outcome is the result of the exercise of market power is not as simple or precise as suggested in the preceding Figures. This section discusses the three tests that are employed by the Panel in its monitoring function to identify

potential divergences from competitive outcomes attributable to market participant actions and some of the practical issues that arise when applying these tests.

5.1 The Three Tests

Identifying a potential exercise of market power normally requires evidence involving:

(i) Conduct — i.e. withholding or pricing-up has occurred;

(ii) Price Effect — i.e. the MCP or HOEP has been increased materially; and

(iii) Benefit to the Participant — i.e. the market participant involved has profited or otherwise benefited from the conduct.

The Panel views these as necessary conditions for finding an exercise of market power. Before concluding that a market outcome is the result of an exercise of market power, however, the Panel also considers any explanation offered by the market participant concerned in respect of the conduct as well as its economic consequences for the market and the participant.

5.1.1. Conduct

The exercise of market power can involve any of physical withholding, economic withholding or pricing-up. For physical withholding, the market participant concerned must have available capacity that is not offered in the market. For economic withholding or pricing-up to occur, the market participant must have offered capacity at a price that exceeds marginal cost. The relevant measures of cost for non-energy-limited and energy-limited generation are discussed in Sections 5.3 and 5.5 below.

There is no specific set of circumstances that initiates an assessment of whether an exercise of market power has occurred, nor is there a fixed time period for which the assessment is conducted. The Panel regularly examines high-priced hours (HOEP > $200 / MWh), low-priced hours (HOEP < $20 / MWh) and hours with high uplift payments (congestion management settlement credit (CMSC) or intertie offer guarantee (IOG) payments greater than $500,000, or operating reserve payments greater than $100,000).[30] However, it may also examine other

[30] See Chapter 2 of the Panel's Semi-Annual Monitoring Reports, available at http://www.oeb.gov.on.ca/OEB/Industry+Relations/Market+Surveillance+Panel/Market+Surveillance+Panel+Reports.

outcomes that appear to be anomalous, as well as situations where there is potential withholding or pricing-up extending for more than one hour.

There may be credible explanations for a market participant to withhold capacity from the market or submit above-cost offers for particular time periods. For example, a planned and / or forced outage that does not extend beyond the time reasonably required for the appropriate maintenance activity to be completed is an acceptable basis for not offering capacity into the market.[31] The shutdown of a nuclear unit for reliability reasons (*e.g.* during a surplus baseload generation condition) is another explanation for withholding. Potential explanations also include other operational problems with the generating unit or a requirement not to run in order to comply with specific environmental or other legal restrictions. Explanations for economic withholding or pricing-up may include the Market Rule that requires non-decreasing price offers, coupled with significant fixed-cost structures for some generation and uncertainty regarding the quantity to be produced.[32]

5.1.2. Price Effect

The Panel will not report an exercise of market power unless the withholding or pricing-up has increased the market price materially above the level that would have prevailed in its absence. The Panel has not adopted a specific quantitative materiality threshold and will consider all of the circumstances relevant to a particular event when determining whether there has been a material impact on the MCP or HOEP. The two most significant factors in materiality assessments are the magnitude of the increases above competitive levels and the frequency / duration of such outcomes.

5.1.3. Profit or Other Benefits

An important consideration in assessing whether there is a credible alternative explanation for apparent withholding or pricing-up is whether this conduct benefits the market participant

[31] An exception could arise if a discretionary planned outage was scheduled in a period of expected high prices when it could reasonably have been performed in a lower priced period.

[32] For elaboration, see Section 5.3.1 below.

involved at the expense of the customers who must pay higher electricity prices and/or forego consumption in order to avoid higher prices.

The usual basis for determining whether conduct benefits the market participant involved is to examine its profit under the actual and competitive market outcomes. This involves comparing the actual profit earned by the supplier on all its energy supplied at the actual MCPs with the estimated profit that the supplier would have earned in the absence of the identified conduct. The additional revenues earned on infra-marginal output and the lost profit on withheld capacity are a starting point, but any other relevant profit impacts are also considered. In the Ontario market, this could include import or export transactions undertaken by the same market participant (or an affiliate), regulated rates and government contracts applicable to many dispatchable and non-dispatchable generators, [33] secondary market trading / contracting, and payments arising from sources such as the day-ahead commitment process and the constrained schedule.

The Panel recognizes that government enterprises may be motivated by considerations other than profit maximization and that this might also be true of investor-owned companies under some circumstances. Thus, where relevant, the Panel will also take into account the possibility that the identified conduct provides some benefit other than increased profit for the market participant concerned.

5.2 Operational Considerations

The three tests outlined above require an understanding of both the costs of the market participant involved and the impact of alternative offer strategies on market outcomes. The Panel recognizes that these assessments may not be straightforward and that approximations, estimates and simulations may be required. Consequently, the Panel allows some tolerances in applying the tests. Most important is the use of a 'materiality' threshold in the market price impact test as discussed above.

[33] In its Monitoring Reports, the Panel has reviewed pricing and other terms of various public agency contracts and the regulated pricing regime for OPG, for their efficiency implications. See particularly the Panel's December 2008 Monitoring Report, pp. 169 – 182, and July 2009 Monitoring Report, pp. 209 – 218, respectively.

The usual approach of the Panel and the MAU has been to request relevant information and discuss preliminary analysis with market participants where necessary to ensure that all the relevant facts and perspectives are obtained. For example, a market participant may have more detailed information about actual marginal cost in a particular situation than is generally available to the MAU. Market participants have typically responded cooperatively to these voluntary communications and information requests. This approach will continue to be employed except in situations in which the Panel believes that an exercise of its formal investigative powers is appropriate.

The remainder of this Section provides an overview of specific factors that are taken into account when assessing the conduct of various types of market participants:

- **Non-energy limited resources:** fossil-fired, nuclear, self-scheduling and intermittent generation.
- **Imports**
- **Energy-limited resources:** the most common being hydroelectric generation, but other types of generation facing environmental controls may also be effectively energy-limited.
- **Demand-side resources:** dispatchable loads and exports.

5.3 Non-Energy-Limited Generation

The following sections identify some distinguishing features of each type of non-energy-limited generation and their implications for the application of the tests set out above. The Panel makes use of two key cost concepts, marginal cost (more precisely, short-run marginal cost) and average incremental cost (AIC). Marginal cost is the additional cost of generating an additional MW of electric power from a generating unit once it is operating. AIC is the cost per MW of starting a generating unit and running it at a specified rate for a specified number of hours. Determination of AIC requires the identification of how many hours a unit may run and at what level of production. The Panel recognizes that the after-the-fact actual run-time and production may be different from the market participant's earlier expectations.

The next subsections identify some distinguishing features for each of the resource types and their implications for the application of the tests used to identify an exercise of market power.

5.3.1. Fossil-Fired Generation

The Ontario market has numerous gas-fired and coal-fired generating units as well as a small amount of oil-fired capacity. The technology of many fossil generation plants is such that the short-run marginal cost is normally increasing as a function of output, while AIC is a U-shaped function (i.e. first decreasing and then increasing). This U-shape is a consequence of the combined effect of unit fixed costs that decline as the level of production increases and marginal cost that increases as production increases.

A generator would normally not have an incentive to offer at prices that are below either marginal cost or AIC. This implies that a fossil generating unit would be expected to be offered at higher prices for both low and high levels of output than for intermediate levels of output. However, the rules of the Ontario market preclude the former because the offer prices of successive laminations must increase (or least not decrease) with the amount of output offered.[34] As a consequence, offer prices may have to exceed marginal cost for some laminations in order to cover average incremental cost. For this reason, the Panel's conduct test for economic withholding or pricing-up requires that the offer price concerned exceed the greater of marginal cost and AIC.

5.3.2. Nuclear Generation

In Ontario, nuclear generators are typically regarded as base-load and their offers are usually infra-marginal. This is because variable costs represent only a small portion of the overall cost

[34] Some markets including the NYISO provide for three-part bids, representing start-up costs, minimum loading costs and incremental energy costs. This allows the offers of fossil generators to reflect their cost structure. In September 2009, the IESO Board approved Market Rule amendments that would allow similar flexibility for day-ahead scheduling for Ontario generators in the future. See IESO, Market Rule Amendment Proposal MR-00348-R00 - Enhanced Day-Ahead Commitment Process (EDAC) September 15, 2009 available at http://www.ieso.ca/imoweb/pubs/mr2009/MR-00348-R00-R06-BA.pdf. .

structure (marginal cost is very low). There are also significant physical limitations on the ability of nuclear units to ramp up and down because of the stresses imposed on the reactor and the risk of the reactor poisoning out. As a result, economic withholding of generation (by increasing offer prices) is usually problematic for a nuclear unit, as is short-term physical withholding. However, the timing of the start-up of a nuclear unit that has been shutdown for a period of time could be influenced by its anticipated effect on prices and thus constitute a potential withholding strategy.[35] Consequently, while the Panel does not normally expect nuclear units to be involved in economic withholding or pricing-up[36], it is attentive to the possibility of physical withholding.[37]

5.3.3. Self-Scheduled and Intermittent Generation

There are many generators with fixed-price contracts that are self-scheduled or intermittent.[38] Self-scheduled generation refers to smaller resources that do not want to be dispatched and prefer to make their own determination regarding when to operate. Intermittent generation consists of small generators whose production is intermittent because the availability of fuel is uncertain. These generators submit estimates of their production each hour for the pre-dispatch schedule. In real-time the scheduling process uses their actual production as the market schedule for each five-minute interval. Since neither self-scheduled nor intermittent generation submit offers, they cannot engage in economic withholding or pricing-up. However they could physically withhold generation by not producing or producing less than their potential output. These generators would not be expected to profit from physical withholding, unless they have other supply in their

[35] The Panel examined a case of possible physical withholding as the result of the extension of a forced outage at a nuclear plant in 2002. Although market prices were increased as a result of the extension, the generator did not profit from the extension. This lent further credibility to the explanation of the operational reasons for the extension of the forced outage, and the Panel concluded that there was no exercise of market power. See the Panel's March 2003 Monitoring Report, pp. 53-54; the Panel's January 2003 Report on the Bruce Power Unit G6 Outage http://www.oeb.gov.on.ca/documents/Panel/investigations_mspreport_bruceoutage_130103.pdf.

[36] The marginal cost of operating a nuclear unit at constant output is quite low relative to marginal costs for other generation. Typical offers at nuclear plants reflect these low costs, and may even be less than $0/MWh in order to avoid the costs associated with changing the unit's production or potential shutdown and subsequent unavailability for many hours. Thus pricing-up would be noticeable, but unlikely given that it invites the same result as economic withholding, i.e. dispatches that may increase or decrease as market conditions changes even slightly.

[37] The shutdown of a nuclear unit during a surplus baseload generation (SBG) for reliability reasons, as has happened frequently in 2009, is an example of a credible alternative explanation for withholding.

[38] There are approximately 1,600 MW of this generation under fixed-price contracts generally referred to as Non-Utility Generation or 'NUG' contracts, which were entered into by Ontario Hydro 15 to 20 years ago and subsequently transferred to the Ontario Electricity Financial Corporation (OEFC). (Many of these are specifically referred to as 'transitional scheduling generators'.) There is another growing group of contracted generators, primarily intermittent renewable energy sources (e.g., wind), with fixed-price contracts with the OPA.

portfolio which receives market price. In the event that physical withholding is detected, the usual price and benefit tests apply.

5.4 Imports

In Ontario, import scheduling decisions are made in the pre-dispatch time frame. Imports are placed into the pre-dispatch merit order along with other Ontario generation (as well as exports and dispatchable load) and are scheduled if their offer prices are at or below the pre-dispatch market clearing price for the hour ahead. Once scheduled in pre-dispatch, imports are placed at the bottom of the supply stack and remain constant at that level throughout the real-time dispatch for that hour (unless there are reliability problems inside or outside Ontario which require curtailing these in part or in whole).

Traders are under no obligation to import into Ontario in any given hour, as opposed to attempting trade elsewhere or not at all. Thus the Panel has not applied the concept of physical withholding to imports.

If an importer does choose to offer into Ontario, the Panel's expectation is that this decision reflects an anticipated opportunity to make a more advantageous trade than is available in other markets that the trader can access. In theory, importers may "price-up" in pre-dispatch relative to their opportunity cost, which is represented by their next best trading alternative or the production cost where the imported power is generated. However, this would not change the MCP or the HOEP because imports are placed at the bottom of the offer stack in real-time.

Economic withholding by an importer is also a theoretical possibility. This could occur if the importer offers above its opportunity cost[39] with the result that other, higher cost sources of supply are scheduled in pre-dispatch and real-time. Under limited circumstances, this could result in a higher real-time market price. The Panel is mindful of the actual or potential benefit to the Ontario market of all import offers and of trade in electric power generally. While the

[39] The opportunity cost represents the importer's best alternative use for the resource.

Panel regards it as prudent to remain attentive to the possibility of economic withholding by an importer, it would only pursue an assessment of economic withholding where an importer has other supply scheduled in the Ontario market which could benefit from an increase in the MCP or HOEP. The usual price and profit / benefit tests would be applied in such a situation.

It may also be possible for an importer to increase its IOG and / or CMSC payments through various actions, including economic withholding and pricing-up in pre-dispatch.[40] The Panel may investigate suspected attempts by importers to extract excessive IOG or CMSC payments as a form of gaming.

5.5 Energy-Limited Generation

Energy-limited generation resources include hydroelectric plants that have limited water inflows and storage capabilities as well as fossil or other units that may experience output restrictions due to fuel shortages, emission limits, or other production constraints.[41] The essential feature of these resources is that they cannot run in every hour and must choose a limited number of hours in which to make their generation available to the market. The use of the limited resource in any given hour means it is not available at a later time. As a consequence, the appropriate cost for assessing energy-limited resources is their opportunity cost, which represents the best alternative use for the resource. This is also the economically efficient offer price for this type of generation.

Establishing a generator's opportunity cost requires the estimation of the future prices it should reasonably have expected to receive. These estimates may differ significantly from the after-the-fact observation of actual market prices. Historical real-time and pre-dispatch price

[40] Since the IOG and CMSC payments are based on the offer price, an importer can increase the payment it receives by pricing-up, i.e. by increasing its offer price without loss of volume.

[41] For ease of illustration, this document focuses on hydro-electric generation. However, similar principles and methodologies can be applied to other types of limits (see, for example, the treatment of CO_2 emission limits on coal-fired generation in the Panel's January 2009 and July 2009 Monitoring Reports, at pp. 235-242 and 181-188, respectively).

data provide potential benchmarks for these assessments, but the Panel also considers any evidence put forward by the market participant to explain its offer strategies.

Hydroelectric plants can be characterized as run-of-river or as peaking.[42] Run-of-river plants have little or no storage capability in the forebay immediately above the plant and generally run when the water is available.[43] Peaking hydroelectric facilities normally do have storage capacity but do not have sufficient water to run at full output all the time. These two types of generation therefore have different operating and cost characteristics.

5.5.1. Run-of-River Hydro

A run-of-river condition is characterized by the plant having sufficient water to run at its full output for all hours of some period, such as a day, a week or longer. If the water is used to generate electricity, the marginal cost of production is usually minimal except for water rental fees. If the water is not used for production, it is spilled and yields no revenue.[44] In essence, the opportunity cost of using water for generation is zero. As a result, a run-of-river plant would generally be expected to operate as a baseload facility, offering its full capacity at relatively low prices. The unavailability of storage means that shifting production to later time periods is not an available alternative. Not running in all hours would likely lead to spill at the plant. If there are no operational restrictions that require water to be spilled, doing so may represent physical withholding or may be the result of economic withholding. In this case, run-of-river hydro is essentially a non-energy limited resource and the relevant cost measure for assessing economic withholding or pricing up would be the marginal cost of production (i.e. the out-of-pocket operating costs). The standard price impact and participant benefit tests also apply.

[42] During some periods of the year (such as spring freshet), a plant may be run-of-river even though it is a peaking plant at other times.

[43] Even without forebay storage capability, a plant which is run-of river by this definition may appear to be a peaking plant if it is downstream from another plant or storage facility which controls the amount and timing of water which reaches the downstream plant.

[44] In some cases, environmental or regulatory concerns do not allow spilling.

5.5.2. Peaking Hydro

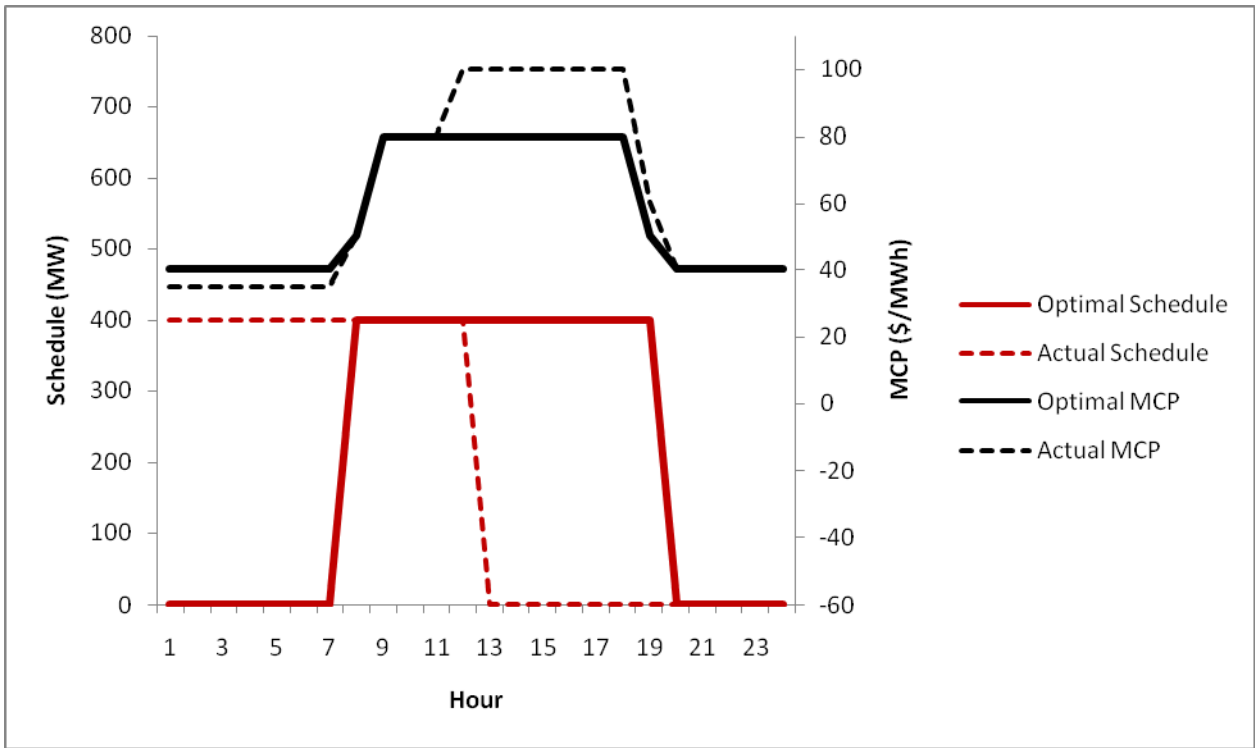
Peaking plants have limited water and limited storage. They normally cannot run in all hours of a day, no matter how attractive market prices might be. Their water rental and other operating costs are essentially irrelevant to their decision of when to run, because they will be incurred at approximately the same level regardless of when the plant is operated. For a peaking plant, using limited water to generate in one hour means foregoing the opportunity to use it at some other time. A profit-maximizing peaking hydroelectric generator in a competitive market would normally be expected to offer into the market at its expected opportunity cost. This is the revenue foregone in the highest priced hour in which it does not operate. The number of available hours to choose from at any particular point in time is a function of the remaining forebay storage capacity and the expected timing for additional water to enter the forebay.

An energy-limited generator may withhold its resources by allocating relatively more water to off-peak (i.e. lower priced) periods than to on-peak (i.e. higher priced) periods. This could be achieved through physical or economic withholding. Such an allocation would likely cause prices in the chosen off-peak hours to be somewhat lower (unless there is no change in the marginal generator in such periods). Similarly, on-peak prices could be higher than they would have been under a more efficient allocation if the peaking generator is infra-marginal or marginal in these time periods. If the owner of the energy-limited generation has a portfolio of generation, it may profit from this strategy provided the revenue reduction on the output shifted from higher-priced to lower-priced hours is more than offset by higher overall revenues from the remainder of its portfolio in the periods it is operating.

Figure 15 provides a stylized example of withholding by an energy-limited generator. A 400 MW hydro-electric station has sufficient water to generate at full output for 12 hours. The 12 hours with the highest prices occur between HE8 and HE 19, and represent the ‘optimal schedule’, i.e. the period where market revenue for the station would be maximized. Rather than generating in these hours, the station runs at full output between HE 1 and HE12, the ‘Actual Schedule’, at which point there is no further water to support generation. In other words, generation is used in some low-priced hours and thereby physically withheld from some high-priced hours. The availability of more energy to the market between HE1 and HE 7 suppresses

the MCP in these hours, while the availability of less energy between HE 13 and HE 19 increases the MCP in those hours. Because less spare low-cost supply is normally available at mid-day than in the early morning (since demand is higher mid-day), the price impacts are asymmetric, with mid-day 'Actual MCP' exceeding 'Optimal MCP' by more than early morning 'Actual MCP' falls below 'Optimal MCP'. The overall net effect is a rise in MCP and increased payments by load for energy. Running in the early hours is also inefficient, since it means offsetting some other lower-cost generation, compared to the higher-cost generation that must be run between HE 13 and 19, in the absence of the energy-limited production. If this market participant had a sufficient quantity of other generation in the market, this shifting in this example would likely be viewed as an exercise of market power, provided: (i) there is no credible alternative explanation for this conduct; (ii) there is a material net effect on the MCP and; (iii) the firm that owns the energy-limited generation profits or otherwise benefits from the withholding (e.g. because the additional revenues realized by its other generators from the higher MCP exceed the profit foregone by shifting its energy-limited generator to lower priced-hours).

Figure 15: Withholding by Energy-Limited Generation



The application of a conduct test for identifying a potential exercise of market power by an energy-limited generator is more complex than for other resources since the opportunity cost of generating in a particular hour depends on the price at which the generator could expect to sell the output in other available hours. The starting point for identifying a departure from the competitive benchmark by an energy-limited generator is the observation of either of the following types of conduct:

i) offering generation above its opportunity cost in high-priced hours, thereby causing even higher prices during those hours (i.e. economic withholding or pricing-up); or

ii) pricing generation below its opportunity cost in low-priced hours, making it unavailable for use in the higher priced-hours (which is effectively a form of physical withholding).

The Panel recognizes that, in practice, the storage capacity and the time horizon over which energy can be produced affect the alternatives available to a hydro generator. Variations in water flows and storage levels can lead to changing opportunity costs for a plant in different hours. Moreover, decisions must be made on a forecast basis by the generator at the time that offers are finalized. The Panel considers the imperfect information that generators have when estimating their opportunity costs or making allocation decisions, rather than assuming perfect information based on after-the-fact outcomes. As with any potential exercise of market power, the Panel also considers whether the conduct in question has had a material effect on market prices and also whether the strategy is privately profitable or otherwise beneficial on an overall basis for the firm that owns the energy-limited resource.

The operation of peaking plants can be complicated by environmental regulations governing the release of water from a plant related to upstream or downstream lake or river levels. Further complications arise when water released from an upstream plant flows to the next downstream plant. These are referred to as cascade plants. The optimization of production among several cascade plants on the same river system must take into account the time delay for water to flow between plants and the storage capability above each plant. Limited storage may mean the downstream plant must use the water whenever it arrives. The time delay could be a fraction of

an hour or several hours. In either case, using water at the upstream plant when it is most valuable means it is available later to the downstream facility only when it has a lower value. The Panel considers any information provided by the generator regarding such inter-relationships and limitations in applying the conduct test to identify a possible departure from the competitive benchmark for peaking hydroelectric plants. [45]

5.6 Demand Side Resources

While dispatchable loads and exports theoretically have the ability to exercise market power in certain circumstances, in practice this is rarely a concern for the reasons set out below.

5.6.1. Dispatchable Load

Dispatchable loads may have the ability to influence market prices, but raising prices (which is the focus of this document) normally harms rather than benefits a load. If a dispatchable load also has a generation portfolio which is sufficiently large, this might provide an incentive to bid at a price in excess of the value derived by the load from the electricity being consumed and consume more than is economic in order to drive up the market price. To assess such a situation, the Panel attempts to estimate the value of consumption for the load. The standard price and benefit tests also apply.[46]

5.6.2. Exports

As is the case with dispatchable load, exporters may have the ability to influence market prices, but raising prices normally harms rather than benefits an exporter. If an exporter also has a generation portfolio, this might provide an incentive to bid at a price greater than the value derived by the exporter from the electricity being consumed and consume more than is economic

[45] One technique to do so is to analyze plants on a river system in aggregate, where their operation is strongly coupled by cascade effects.

[46] See Section 5.1.

in order to drive up the market price. For example, exporting 500 MW to a market in which prices are lower than in Ontario is inefficient and would normally be unprofitable. But doing so could have an effect on the Ontario MCP similar to withholding 500 MW of infra-marginal generation. To assess this type of conduct requires an estimate of whether the export was uneconomic relative to other alternatives available to the exporter (which may differ depending upon whether the exporter is a generator or a trader buying and reselling energy). Possible explanations for such conduct include contractual obligations or other factors which explain the apparently uneconomic export. The standard price and benefit tests also apply.[47]

6. *Abuse of Market Power*

The abuse of market power by a market participant is a serious matter. The Panel may commence a formal investigation if it believes an abuse of market power may have occurred. The market participant is entitled to notice and an opportunity to provide input to the Panel during an abuse of market power investigation unless the Panel reasonably determines, and the OEB Chair confirms, that such notification will jeopardize the investigation.[48] If the Panel concludes that there has been an abuse of market power, it would submit a written report to the Chair of the Ontario Energy Board, as well as the IESO and any other person the Panel considers appropriate.[49]

In the Panel's opinion, an abuse of market power entails some action on the part of a market participant (or group of market participants) that lessens or prevents competition. In other words, abuse of market power involves anti-competitive conduct by a firm (or a group of firms acting together). The Panel has adopted this approach because the design of the Ontario market and the Panel's monitoring mandate focus on conduct which is an "abuse", rather than the type of mitigation regimes that have been employed in other jurisdictions.

[47] See Section 5.1.

[48] See Article 5.1.9 of OEB By-Law #3.

[49] The procedures following the completion of an investigation by the Panel are described in Article 7.2 of OEB By-Law #3. If there is a finding of abuse or possible abuse, according to the Section 38(1) of the *Electricity Act, 1998* the IESO is required to inform the OEB within 30 days regarding actions it has taken or plans to take. There is no corresponding provision with respect to a finding of gaming.

Anti-competitive conduct is behaviour that in some way impedes competitive responses to price signals. Exclusionary practices, collusion (bid rigging, price fixing, agreements to withhold capacity, etc.) and predatory pricing (pricing below marginal cost to drive out or discipline competition) are classic examples of anti-competitive activity which could constitute an abuse of market power if engaged in by a firm (or multiple firms) that has (or collectively have) market power.[50] Examples in the electricity sector could include:

- **Exclusionary Practices:** A generator or an importer prevents other possible market participants from accessing the interties with Ontario (e.g. a generator which holds Transmission Rights at an interface bids to congest the intertie and blocks out other importers in pre-dispatch, but regularly fails in real-time).
- **Collusion:** Two generators agree they will price-up, which will push up market prices at times when one or the other is the marginal generator.
- **Predatory Pricing:** A large generator reduces prices on its output below marginal cost, forcing down the market price and reducing production by other moderately priced generation, which subsequently decides to exit the market.

In the absence of supporting anti-competitive conduct the Panel does not regard departures from the competitive norm resulting from unilateral physical or economic withholding or pricing-up as an abuse of market power, even though these actions may be noteworthy from the perspective of the performance and efficiency of the market. In other words, the ability to exercise market power is a necessary but not sufficient condition for finding an abuse of market power.

While a systematic exercise of market power is not abuse of market power in the absence of anti-competitive conduct, it will be reviewed to determine whether corrective competitive responses are being impeded by market structure, rules or procedures or other barriers. This could lead to recommendations that the Market Rules or aspects of market design be changed.

[50] Such conduct may also be subject to the abuse of dominance, conspiracy or other provisions of the *Competition Act*, R.S.C. 1985, c. C-34, as amended, but the Panel does not regard a *Competition Act* violation as a pre-requisite for finding an abuse of market power.

7. *Gaming*

While gaming is not addressed in detail in this document, in general the Panel regards ***gaming*** as the exploitation of opportunities to profit or benefit from defects in the design of the market, from poorly specified rules or procedures, or from circumstances that are not expressly covered by Market Rules or procedures. An essential characteristic of gaming is that the conduct profits or otherwise benefits the market participant concerned at the expense or disadvantage of the market as a whole. In extreme cases, gaming may involve fraud, deceit or manipulation of market prices or of payments that may form part of the uplift paid by load.[51]

When it detects either gaming or a potential gaming opportunity, the Panel often recommends changes to rules or procedures. The IESO has been prepared to implement remedial rule amendments very quickly in serious cases. For example, on July 29, 2002, shortly after the Ontario market opening, the IESO passed its first urgent rule amendment which limited payment of the IOG for imports where the trader had a corresponding export (constituting an 'implied wheel'), in order to prevent possible gaming of the difference between the higher import payment and the HOEP export price.[52]

The Panel notes as a general matter that conduct can be subject to either an abuse of market power investigation and / or a gaming investigation depending on the nature of the activities involved. A finding of gaming could be made in the absence of an abuse or even a mere exercise of market power. Similarly, an abuse or exercise of market power could be found to occur in

[51] In the United States, one of the more egregious forms of gaming was addressed in the U.S. Energy Policy Act of 2005, which granted authority, including penalty authority, to the Federal Energy Regulatory Commission (FERC) to prevent market manipulation in U.S. wholesale electricity and gas markets. As implemented, the law prohibits the use of "fraud or deceit" in the purchase or sale of electric energy (amongst other things). See *Prohibition of Energy Market Manipulation*, 18 CFR Part 1c, Order No. 670 (2006). FERC's market manipulation powers deal only with an extreme form of gaming. In Ontario, if such elements were found to exist, market participants may be subject to investigation by the IESO's Compliance group, and/or subject to general criminal laws in addition to any gaming investigation which may be undertaken by the Panel.

[52] See Market Rule Amendment Proposal MR-00204-R00 — Eliminate Payment of Intertie Offer Guarantee for Wheeling Transactions, http://www.theimo.com/imoweb/pubs/mr/ua/mr_00204_r0i.pdf. In another example, an urgent rule was passed on June 26, 2003, which limited CMSC payments to generators with negative priced offers, since large CMSC payments were being paid for very low (negative) prices which were "not consistent with the intent of CMSC payments". See Urgent Market Rule Amendment Proposal MR-00239-R00 — Eliminate CMSC Payments Associated with Negative Priced Offers , http://www.theimo.com/imoweb/pubs/mr/mr_00239-R00_URAC.pdf.

respect of conduct that might not constitute gaming. It is also possible the Panel could conclude that conduct constituted both gaming and an abuse of market power.[53]

[53] Investigations of gaming and abuse are similar in many respects (for example the Panel's powers to access information and its reporting requirements). They differ in minor respects such as the statutory requirement for the IESO to respond within 30 days to a finding of abuse of market power. See Section 38(1) of the *Electricity Act, 1998*.