Supply Surplus

Discussion Paper

April 29, 2010

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1.0 Executive Summary

The rules for dispatching equal priced offers at the price floor (or $0); commonly referred to as Supply Surplus rules were consulted on as part of the Market and Operational Framework for wind. As a result of that consultation, it was determined that further and broader consultation was required.

This paper provides a background and assessment of existing rules and procedures, and previous proposed protocols, while reviewing options for managing Supply Surplus conditions. A set of principles which will be used in evaluating supply surplus initiatives is also provided.

The frequency of supply surplus events may increase due to:

- The projected increase of wind generation on the AIES[1]
- The commissioning of large baseload generators.

The following factors have historically contributed to supply surplus conditions:

1) Low levels of demand (typically during off-peak hours)
2) High levels of base-load generation (high-levels of base-load generation and additional generation testing prior to commissioning)
3) High levels of imports
4) Low levels of exports
5) High levels of wind generation
6) Increased hydro availability during spring run-off

At present, wind generators and cogeneration facilities are exempt from the supply surplus procedures (Operating Policy and Procedure 103). The fairness and appropriateness of allowing such an exemption is evaluated, as all other generators are subject to these procedures, and subject to curtailment.

Cogeneration facility owners indicated concern for the interruption to their processes within their comments on the AESO Recommendation Paper: Implementation of Market and Operational Framework for Wind Integration in Alberta ("MOF Paper"). Legislation requires that consideration must be given to electric energy produced and consumed solely on-site. However, electricity not produced and consumed solely on site must be subject to the appropriate rules and procedures, similar to other generators.

Wind generators also have the ability to limit the output of their facility and this ability must be taken into account when considering the treatment compared to other generators in supply surplus situations.

This paper explores long term and short term options for managing supply surplus conditions. The short term options include: removal of an exemption for wind generators and cogens under OPP 103, the scheduling of exports within T-2 or within the delivery hour, and a voluntary generator curtailment request to the market. The longer term options include: market rules for wind generation, a voluntary generator curtailment

[1] There is currently 7,388 MW of wind generation in the queue- these are subject to market and operational rules and terms to ensure that the reliable operation of the system, and the fair, efficient, and openly competitive operation of the market are maintained and sustainable

program, and negative offer prices. A combination of these options may be considered appropriate. As some of these options require extensive consultation, the AESO will be initiating discussions on the longer term options while determining a short term solution.

Option – Voluntary Generator Curtailment:
Voluntary generator curtailment (VGC) provided by generators that have the ability to curtail supply may be a viable option.

This option could be implemented in two ways: a VGC request to the market to voluntarily reduce generator output, and/or a voluntary generator curtailment program, in which the generator would be compensated to curtail generation through a market based solution where generators could offer to curtail for a price, when the SMP is $0. Generators would pay for the cost of this service, similar to loads paying for the cost of curtailment services in supply shortfall procedures. Both VGC options could be included as a part of supply surplus procedures, although the latter would require more time to implement, if considered appropriate. A proposed procedure is included in section 9.2 of this paper which describes the implementation of these options.

Option- Market rules for wind:
The intent of the ISO Rules is to treat all generators fairly and consistently, regardless of their fuel type[2]. All generators that have a maximum capability of 5 MW or above, are subject to must offer, must comply rules (with the exception of wind). At this time, wind generators do not have an obligation to submit an offer, and therefore are considered price takers. In order to manage the supply-demand balance properly and to ensure a reliable pool price, wind volumes must be included in the merit order. It also allows the system controller to have visibility of wind generation. This is a long term option as it requires additional consultation and development. The AESO will be consulting on the options for integrating wind within the Alberta market as part of the Wind Integration Program, which will be subject to the normal stakeholder consultation process.

Option - Negative Offer Prices:
At present, the price floor is at $0. If the pool price were set at a negative value, generators would pay pool price to remain on-line and load would be paid to consume. Other markets in North America, such as IESO in Ontario and ERCOT in Texas have set their price floor to a negative value. However, after noting some of the differences in the market structure, and the number of issues related to negative pricing in other jurisdictions, implementing a negative price floor may not be a preferred option at this time.

If Alberta were to implement a negative price floor, we may see the high volume[3] of $0 offers in supply surplus situations move to a negative price potentially affecting the price and the long term investment signal, rather than address the supply surplus issue. Section 9.1.3 of this paper provides further detail on negative pricing in the IESO and ERCOT markets. The implementation of negative offer prices would require additional

[2] Alberta's Electricity Policy Framework: Competitive-Reliable-Sustainable of June 6, 2005, Section 4.4.11 states that: "The Department does not support one type of generation over another but rather allows competitive market forces to determine the appropriate generation mix (e.g. no fuel use policy)".

[3] Please refer to section 5.1 of this paper for historical analysis on supply surplus volumes in Alberta

consultation, as well as consideration of other initiatives such as a review of the price cap.

The market and operational framework recommendation paper for wind, as part of the supply surplus workgroup results also recommended the addition of a minimum operating level (MOL). Both minimum operating level and minimum stable generation are physical operating limits determined by the participant. Minimum stable generation (MSG) is currently defined in the ISO rules, and the current definition for MSG may benefit from some refinement to reflect the minimum level of stable operation more appropriately. Therefore, the AESO questions the necessity of implementing both MOL and MSG and would like to explore the possibilities of modifying the existing definition of MSG. This option may require operational tool changes and therefore it may not be possible to implement in the short term.

This review will follow the normal stakeholder consultation process and consider the fair, efficient, and openly competitive operation of the market and safe and reliable operation of the system.

2.0 Purpose

The purpose of this discussion paper is to explore a short term solution for managing supply surplus conditions while initiating discussion on the longer term options. The paper reviews the current rules, policies and procedures, the proposed recommendations within the Market and Operational Framework for wind[4] and subsequent stakeholder comments, including exploring market based options for managing supply surplus conditions. The review is conducted considering the fair, efficient and openly competitive operation of the market and respecting legislative direction.

Since January 2000, there have been 10 events where the SMP reached $0/MWh, and 4 events where the pool price has settled at $0/MWh for at least 1 hour; please refer to Figure 1 and Table 1 below for further detail. While the nature of the events suggests that $0 reflected the price that the market was willing to accept in the short term, the current rules require a review to ensure that dispatching a high volume of equal price offers is being properly managed and that there is no bias in the dispatch between fuel types.

It is also expected that the increase in wind generation on the AIES may increase the frequency of supply surplus conditions. Other factors that may contribute to supply surplus conditions are discussed further in section 5.0 of this paper. The review of Supply Surplus protocols also considers that the System Controller (SC) must always maintain the supply/demand balance to ensure that the Alberta interconnected electric system (AIES) is operating reliably.

3.0 Introduction

Alberta's electricity market was established in January 1996 and it has evolved considerably since then and will continue to develop over time with changes to the social, economic, and technological landscape.

[4] AESO Recommendation Paper, Implementation of Market & Operational Framework for Wind Integration in Alberta, March 2009

Presently, the Alberta market has over 12,000 MW of generation capacity and consists of a supply stack that is heavily weighted to baseload coal: approximately 50% of coal capacity is offered as baseload capacity ($0 offers). The peak load to date is 10,246 MW, the lowest level of demand in 2009 was 6,454 MW, and currently there is approximately 560 MW of transmission connected wind capacity.

Historically, the following factors have been contributors to supply surplus conditions. These are discussed further in section 5.0 of this paper.

1) Low levels of demand (typically during off-peak hours)
2) High levels of base-load generation (high-levels of base-load generation and additional generation testing prior to commissioning)
3) High levels of imports
4) Low levels of exports
5) High levels of wind generation
6) Increased hydro generation during spring run-off

Wind generators currently are not obligated to make offers to the energy market and are price-takers and therefore effectively contribute to the $0 offer block. With the potential for increased wind generating capacity on the system it is prudent to review the rules, policies and procedures to ensure that they are valid, appropriate, and effective for managing Supply Surplus conditions. Even though there is potential for the frequency of supply surplus conditions to increase, the reliable operation of the system, and fair, efficient, and openly competitive operation of the market must be maintained.

Currently, ISO Rule 6.3.8 and OPP 103 provide a set of clear and transparent operating procedures for the system controller to use during supply surplus conditions.

As part of the MOF Paper, the procedures outlined in OPP 103 were reassessed. A Supply Surplus workgroup was established, made up of stakeholders who committed to exploring the issues pertaining to wind integration in further detail, and developing a report and specific recommendations for the AESO to consider. This input formed the basis of the Supply Surplus recommendation within the Market and Operational Framework (MOF) Paper (dated March 2009).

In their comments submitted on the MOF Paper, stakeholders indicated that further and broader consultation on the recommended Supply Surplus protocols was required. There was a concern that not all participants were aware of the potential changes as these were included as part of a consultation for wind integration.

This paper discusses the impact of supply surplus conditions on the AIES considering all types of generation. The AESO intends to follow the normal stakeholder consultation process to ultimately develop new rules to manage supply surplus.

3.1 Rule History

ISO Rule 6.3.4, Equal Price Offers and Bids, was drafted in Dec 7, 2004 to provide certain guidelines to manage equal priced offers or bids, at any price, during a settlement interval.

The power pool first experienced $0 system marginal prices (SMP) in June 2002 and then again in December 2004. Concerns were raised that the normal procedure of pro-rata dispatch among the many $0 offers would not be effective. In response to these concerns, in March 2005 the AESO issued a discussion paper titled *Dispatching Equal Price ($0) Offer* to identify potential problems, provide options to resolve the problems, and solicit stakeholder comments and input. Based on stakeholder feedback, OPP 103, Dispatching Multiple $0 Offers, and ISO rule 6.3.8, Supply Surplus Directive[5], were developed and effective Sept 29, 2005. Minor changes were made to the OPP on July 11, 2006, which is the version currently in effect at this time.

4.0 Supply Surplus Principles

Any supply surplus initiative must adhere to the concept of a Fair, Efficient and Openly Competitive (FEOC) market and must support a reliable electric system, as per policy and legislation.

While FEOC is not explicitly defined by policy or legislation in the context of supply surplus, this paper will outline principles for supply surplus initiatives that are consistent with the AESO's interpretation of FEOC design principles.

These principles (not in any particular order) include:

a) Competitive outcomes are preferred over administrative outcomes;
The AESO prefers competitive outcomes over administrative outcomes whenever possible, in order to maintain market fundamentals. Whenever possible, market outcomes should be decided by the actions of market participants participating in the market.

b) Supply surplus rules should be drafted so that they encourage competition and reduce barriers to entry;
The supply surplus rules should not create barriers to participation in electricity markets; they should help remove them. Supply surplus rules must be properly structured so that participants can easily predict and understand how they will be treated during a supply surplus event in order to manage their participation in the market accordingly.

c) Impact on neighboring jurisdictions should be minimal;
The impact on neighbouring jurisdictions should be minimal. The AESO has to meet certain reliability standards to be interconnected to the Western Electricity Coordinating Council (WECC). If supply surplus is not managed (i.e. if supply-demand balance is not achieved during these times) then these MW may spill onto the tie lines creating the potential for violation of these standards.

d) Supply Surplus rules should be consistent with the existing market structure and support the existing energy only real-time energy price signal

The supply surplus principles are intended to guide supply surplus initiatives in the context of the existing wholesale market design, which supports the energy only real-time energy price signal. Supply Surplus must be coordinated with other AESO initiatives. Market redesign is not part of the scope of this project.

[5] Was originally ISO Rule 6.3.5 at the time of the original effective date of Sept 29, 2005

e) The market price signal should be visible and transparent to all competitors
In the Alberta energy market there is a single price based on the marginal offer of the most expensive offer or bid required to meet demand. This price is the most important signal to market participants and must be representative of the market activity at any given time.

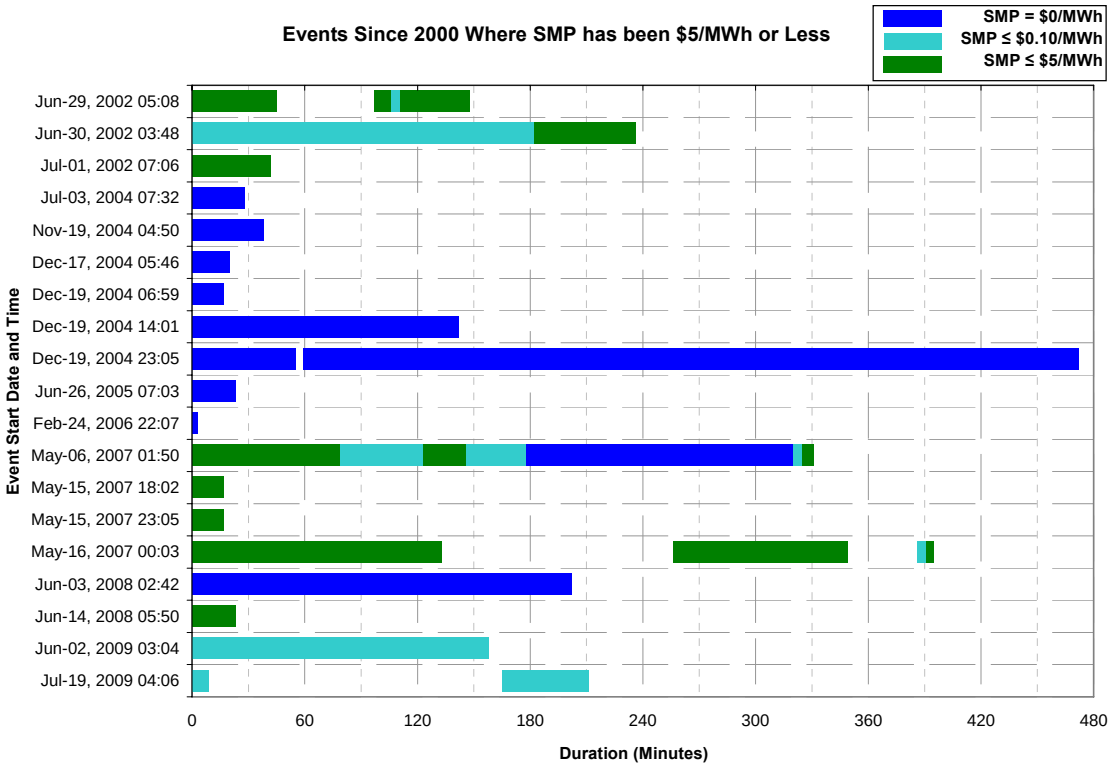
f) Level playing field for all competitors
Rules should consider, and to the extent possible accommodate, the different characteristics of each generation type, without unduly favoring one type of generation over another.

g) Supply Surplus rule changes must balance design complexity and implementation simplicity.
Generally, as design complexity increases, implementation requirements increase. To ensure there is a balance between design complexity and implementation simplicity, factors such as assessment of cost, impact to IT systems, time required to implement, impact to procedures and the process required to implement procedures will be considered.

5.0 Supply Surplus Conditions – contributing factors

Since January 2000 there have been 19 events where the system marginal price (SMP) was lower than $5/MWh. 5 of these events resulted in the SMP reaching a low of $0.10/MWh and 10 of these events saw the SMP reach $0/MWh. Figure 1 presents the dates and the duration of these events.

Figure 1 – Events since 2000 Where SMP has been $5/MWh or Less



It is noted that there have only been 4 events where the pool price has settled at $0/MWh for at least 1 hour. Table 1 presents the periods where the pool price has settled at $0/MWh.

Table 1 – Periods where the Pool Price has settled at $0/MWh

Date	Dec-19, 2004	Dec-20, 2004	May-06, 2007	Jun-03, 2008
HE(s) Settled at $0/MWh	16	2-6	6-7	4-6

5.1 Historical Analysis

Normally more than one of the factors listed in section 3.0 contribute to supply surplus events. Of the four events where pool price settled at $0/MWh, the events of December 2004 were due to a combination of GN3 testing (450 MW offered at $0/MWh) combined with relatively high volumes of $0/MWh offers and lower than expected demand due to warm temperatures.[6]

The event on May 6th, 2007 was due to low demand (AIL = 6,458 MW and AIES = 5,581 MW in HE 7) and low prices in neighboring jurisdictions which is typical during spring. Prices in both Mid-C and Minn-Hub were low due to spring run off conditions, which resulted in a lack of profitable markets for excess Alberta power. A healthy supply stack, particularly for coal units, with few outages and de-rates saw high levels of $0/MWh offered into the system with over 6000 MW offered at $0/MWh. This combined with approximately 100 MW of wind generation and imports from Saskatchewan resulted in the supply surplus event. The system controller managed the event by curtailing opportunity imports from Saskatchewan during in the period (153 MW of imports scheduled).[7]

On June 3rd, 2008 the pool price settled at $0/MWh due to similar circumstances as the event of May 6th, 2007. The one major additional factor was that the BC intertie was unable to export any more than 50 MW during the supply surplus situation due to an outage on the 1201 line. Thus, even if there was a market for the surplus energy in Alberta there was very little capability of exporting that power. Wind generation during this period was relatively high, approximately 300 MW during the supply surplus situation.

Another possible contributing factor to supply surplus conditions is that all energy in the $0 offer block is not “dispatchable”. Figure 2 within this section uses sample data from HE18 on November 26, 2009 to represent the amount of MW offered above minimum stable generation levels in block zero, by fuel type. This was determined by using the minimum stable generation level in ETS, and subtracting it from the total MW in block zero. Table 2 includes the supporting data. Over all fuel types and assets considered below, 49% represents the total minimum stable generation, while 51% can be considered dispatchable capacity in the $0/MWh blocks. The dispatchable capacity in the $0 block may be enough to manage supply surplus conditions without having to curtail non-dispatchable generation (below minimum stable generation). It should also be noted that some participants have indicated that the current stated minimum stable

[6] MSA 2004 Year in Review (http://www.albertamsa.ca/files/2004YearinReview032105final.pdf)
[7] MSA 2nd Quarter 2007 Report (http://www.albertamsa.ca/files/Q2_07_report.pdf)

generation level in ETS is not reflective of market operations at all times. Please refer to section 8.1 of this paper for further discussion on minimum stable generation.

Figure 2 – Minimum Stable Generation & Dispatchable Capacity in Energy Block '0' by Fuel type

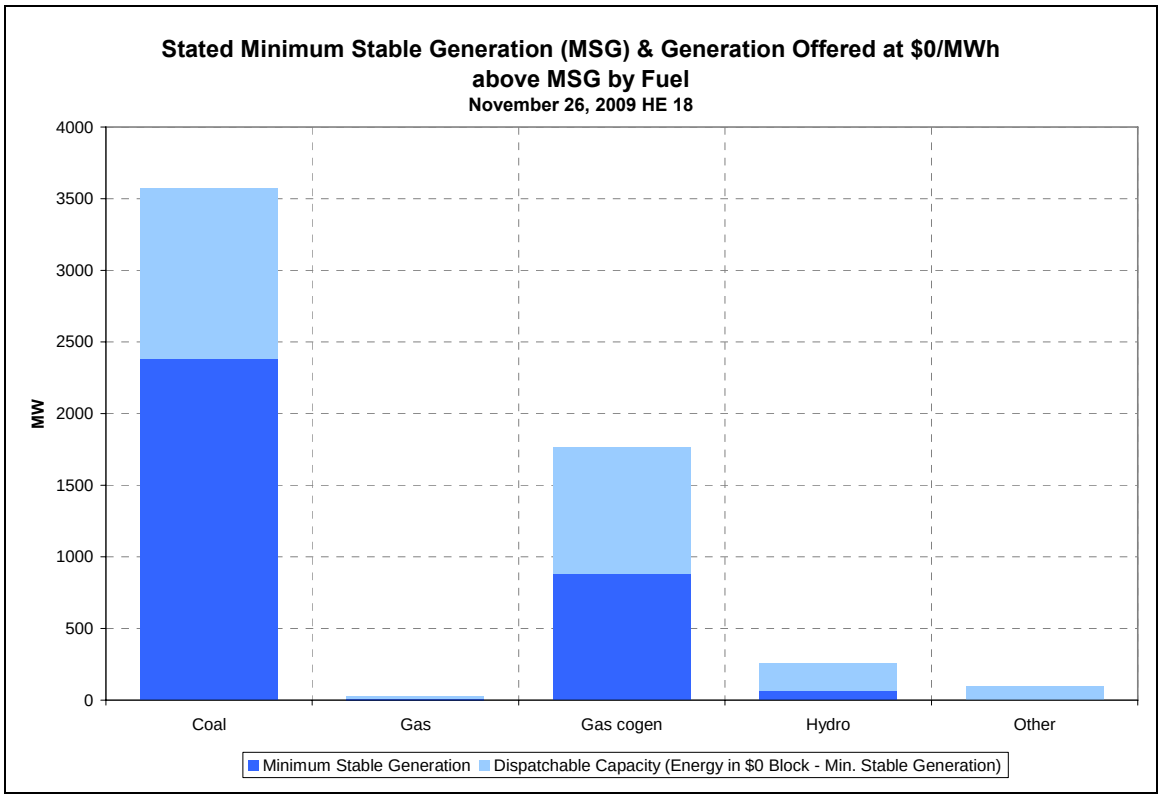


Table 2 – Data for Minimum Stable Generation & Dispatchable Capacity in Energy Block '0' by Fuel type

	#of Assets[8]	% min. stable generation in energy block '0'	% capacity non-min stable generation in energy block '0'
Coal	16	67%	33%
Gas	6	27%	73%
Gas cogen	18	50%	50%
Hydro	4	27%	73%
Other	5	14%	86%

[8] The assets included had offers within the $0 block on Nov 26, 2009 HE18. If the asset did not have offers in the $0 block its data was not included (i.e. some assets may be on planned outages, no $0 offers, etc.)

5.2 Future considerations

Future considerations that could exacerbate the supply surplus issue include:

- The projected increase of wind generation on the AIES[9]
- The commissioning of large baseload generators.

Integrating wind generation presents unique challenges for system operators because wind power is variable, can increase (ramp up) or decrease (ramp down) rapidly and may do so in the opposite direction of load patterns, all of which make predicting wind power and maintaining the reliability of the power system more challenging and can exacerbate a supply surplus situation. Reliable power system operation requires ongoing precise balancing of supply and demand. The AESO System Controller (SC) manages supply-demand balance on a continuous basis considering load forecasts, operating uncertainties (i.e. unit de-rates, outages, and load variations) using current rules, policies, and procedures. When wind suddenly ramps up or down, generating resources (predominately coal, gas, or hydro-electric) must be immediately dispatched to offset the imbalance.

Currently, energy from wind generation is accepted as delivered as opposed to being dispatched and variations are managed by dispatching the offers in the energy market merit order. In this respect, the current size and composition of the generation fleet in Alberta in combination with the limited interconnection capability must be evaluated when considering how best to integrate wind power generation into the current market structure.

Section 9 of this paper outlines options for consideration for managing supply surplus conditions.

6.0 Current Supply Surplus Rules

The current supply surplus rules include ISO Rule 6.3.4, 6.3.8 and OPP 103. A review of the rules is provided within sections 6.1 and 6.2 below.

6.1 Market Participation Rules

This section outlines the components of the existing rule, with an assessment of whether each component remains relevant in today's market.

6.3.4 Equal Price Offers or Bids
If a price of an offer or bid submitted in respect of an asset for a settlement interval is identical to the corresponding price of another offer or bid in respect of another asset for the same settlement interval, the ISO will:
a) Determine the energy market dispatch by considering applicable constraint information for each of the assets, and
b) If equal offers or bids remain; then as necessary proportioning participation amongst the assets within the settlement interval to the extent that identified offer or bid constraints allow and in a manner determined appropriate by the ISO.

[9] There is currently 7338 MW of wind generation in the queue- these are subject to market and operational analysis to ensure that the reliable operation of the system, and the fair, efficient, and openly competitive operation of the market are maintained and sustainable

Rule assessment: This rule is still relevant. This rule explains equal price offers and bids, regardless of price. Proportioning dispatch by pro rata becomes impractical when the entire dispatchable merit order is at zero dollars, for example, when the net result over 6000 MW at zero dollars is less than the allowable dispatch variance. In these cases, pro-rata would have to be applied on a different basis, not just the allocation of MW, which means that appropriate procedures/market mitigation mechanisms are required in these situations.

6.3.8 Supply Surplus Directive
If during the trading day the system marginal price is determined by a $0 operating block, the system controller will use ISO operating policy and procedures to issue directives as required for the applicable settlement intervals. Pool participants shall provide the ISO with asset information necessary to carry out the operating policy and procedure.

Rule assessment: This rule is still relevant as it references the procedure. If the supply surplus protocol, or management procedures are broadened, the rules will require updating accordingly.

6.2 Operating Policies and Procedures

The current procedure for Supply Surplus is detailed within OPP 103.

OPP 103 defines polices and procedures for the System Controller (SC) to dispatch multiple zero-dollar ($0) offers to maintain the balance between system supply and demand when the system marginal price (SMP) is at $0. This section outlines the key components of the procedure, with an assessment of whether each component remains relevant in today's market. Section 9.2 will further discuss the sequencing of these steps.

When the in merit energy supply consists of $0 offer amounts that exceed demand, the following steps are taken to manage system supply and demand:

1. Flexible blocks of the $0 offers will be dispatched for partial volumes on a pro rata basis.

Rule assessment: The use of Pro-rata curtailment is still relevant. Pro-rata allocation for generation curtailment has been used in other parts of the ISO Rules, for example, it is currently used to manage congestion and intertie curtailment. In the absence of offer price differentials the use of pro-rata allocation provides generators a fair and efficient mechanism to compete for system access in conditions where curtailment is required in order to ensure supply demand balance or to maintain or restore system reliability.

2. When all the flexible blocks have been dispatched off, the net generation outputs of all assets with inflexible $0 offers will be compared to their dispatch levels. Starting with the asset that has the highest dispatch variance (net generation output *minus* dispatch level), the asset will be directed to reduce its net generation output to its dispatch level.

Rule assessment: This step was originally put in place to ensure that participants were not generating above their dispatch level and were complying with their offers. While this is still the intent, it may be appropriate to consider if this step is required given the

allowable dispatch variance described within ISO Rule 6.6. If it is determined that this step is still required, it may be more appropriate to include it as Step 1, and updating the step to reflect all assets (flexible and non-flexible blocks).

3. Current hour import transactions will be curtailed, as required.

Rule assessment: Still relevant. Import is an opportunity service, and it is appropriate to take mitigating measures in order to maintain the safe, reliable operation of the AIES. This step is also aligned with the step in the supply shortfall procedures where exports are curtailed during the current hour.

4. Assets with inflexible $0 offers greater than their declared minimum stable generation levels will be directed to their declared minimum stable generation levels. Assets with the greatest difference (inflexible $0 offer *minus* minimum stable generation level) will be directed first.

Rule assessment: Still relevant. This step minimizes the risk that one participant bears the full implication of submitting an inflexible offer by having their entire unit shut down. Please refer to section 8.1 of this paper for further discussion on minimum stable generation.

If an asset, due to its operating characteristics, is running at a higher generation level than its minimum stable level because it is providing regulating reserve (RR), then an assessment will be made to determine if it should be dispatched off for RR. Considerations will include whether another asset has offered and has not been dispatched for RR and will not require running at a generation level higher than its minimum stable level.

Rule assessment: Still relevant. The use of minimum stable generation level allows for dispatching for short term issues while maintaining longer term system flexibility as plant operations are not jeopardized. It is important to consider the effect of ancillary service (AS) dispatches as these dispatches directly relate to energy market operation.

Exemptions under the current OPP 103

The Current OPP allows certain exemptions:

a) Generating units primarily serving on-site load or steam process, including those supplying to industrial systems with industrial system designation (ISD).

Rule assessment: May violate principles of fairness if the ISD exemption is extended to MW generated or consumed beyond the on site load. Legislation requires that consideration must be given to electric energy produced and consumed solely on-site. However, electricity not produced and consumed solely on site must be subject to the appropriate rules and procedures, similar to other generators. Therefore, this rule requires an update in this context.

b) Generating units with undetermined or uncertain minimum stable generation, such as wind generation.

Rule assessment: May violate principles of fairness if wind generation is exempt from dispatch down protocols. Wind generators are currently price takers and do not offer, therefore are considered non-dispatchable. It is appropriate to evaluate the fairness of allowing such an exemption to one specific generation type as all other types of generators are subject to curtailment. Therefore, this rule requires an update in this context.

c) Import interchange transactions are deemed to be flexible blocks before the scheduling hour. If it is anticipated that system supply will exceed demand and consists of only $0 offers during the next scheduling hour, import interchange transactions will be denied.

Rule assessment: Still relevant. Currently, Import is an opportunity service, and it is appropriate to assess future hours and take mitigating measures accordingly.

d) Import interchange transactions within the scheduling hour are deemed to be inflexible blocks and will be curtailed, if required, before directing assets with inflexible $0 offers to their minimum stable generation levels when system supply exceeds demand and consists of only $0 offers.

Rule assessment: Still relevant. Curtailment of tie line service prior to curtailment of intra-Alberta generation is consistent with other procedures, such as supply shortfall (OPP 801).

e) When system demand exceeds supply and the excess allows more energy supply to be brought on to the system, directives to the assets with inflexible offers will be cancelled in the reverse order that they were issued. Subsequently, as the excess demand allows for more energy supply, the dispatches to $0 flexible blocks will be increased on a pro-rata basis until they are fully dispatched.

Rule assessment: Still relevant.

f) When the above procedures cannot provide an adequate and timely response to balance system supply and demand, the SC will direct necessary actions, including the immediate curtailment of import transactions, to ensure system reliability.

Rule assessment: Still relevant. It is necessary to ensure the safe and reliable operation of the AIES.

7.0 Supply Surplus Workgroup results

In late 2007, the AESO formed an industry work group[10] to investigate and review existing Operating Policies and Procedures for Dispatch (OPP 103) respecting management of supply surplus situations.

The Supply Surplus Protocol Work Group recommendation paper indicated that "The work group will assist the AESO's MOF implementation by developing technically

[10] For a list of the Supply Surplus Workgroup members, please refer to the Supply Surplus Protocol Work Group recommendation paper located on the AESO's website at: http://www.aeso.ca/downloads/Supply_Surplus_Protocol_Work_Group_Paper.pdf (pg 13of17)

feasible and reasonable recommendations to the AESO on “how” and “which” supply offers from generation facilities and the interconnections will be dispatched in accordance to amended OPP 103 by the System Controller to maintain supply-demand balance when the Alberta system marginal price is at $0.”

Following extensive discussion and analysis, the Supply Surplus work group developed a set of recommendations regarding the supply surplus protocol. The overall objectives were to develop a protocol that was fair, efficient and addressed technical/operating and market issues such as intertie capacity, import or export scheduling and inflexible or flexible $0 offers. The work group concluded that all generation facilities should reduce their MW output during supply surplus conditions.

The working group recommendations, as listed within the Market and Operational Framework for Wind Recommendation Paper, are included below:

1. “Include wind power facilities and co-generation facilities in OPP 103 procedures with co-generation to be subject to Minimum Operating Level (MOL) requirements;

2. Establish a Minimum Operating Level (MOL) for each asset and, where possible, assets should not be dispatched below their MOL.

3. Refine MOL definition to include new constraints not included in Minimum Stable Generation (MSG) but that affect the asset's ability to operate at or below a threshold. MOL is a physical operating limit (not an economic limit) for an asset constrained by legal/regulatory, environmental, health and safety, equipment reliability, operating level required to serve dispatched ancillary services, or operating level required to prevent damages to third party equipment. Examples of physical operating constraints for types of generation and import/export are included in the WG paper (Appendix A).

4. Develop a mechanism for pool participants to declare and submit the MOL. It is expected that the need for, approach and frequency of declaration may vary among generators and will need to be defined.

5. Revise the current "inflexible block" definition. The definition of "inflexible block" will need to be amended as follows: "inflexible block" means a block of energy that may be dispatched on or dispatched off, but not partially dispatched on, except for a $0 offer block it may be dispatched to the asset's MOL.

   Definition of "flexible block" does not require any changes since it accommodates the proposed $0 SMP management protocol.

6. Provide market indication of supply surplus conditions (similar to supply adequacy situations) to provide market participants an opportunity to take voluntary actions in the face of potential $0 SMP conditions and also become aware that an out-of-market dispatch to clear the energy imbalance could be forthcoming.”

The Supply Surplus work group also developed the following protocol respecting OPP 103:

"**Step 1**: Curtail opportunity services including import transactions.

Step 2: Take the following actions, taking into account the transmission system operating and reliability constraints and an objective of rotating the curtailments amongst market participants where possible:

a. Curtail flexible $0 blocks, by pro-rata assignment,
b. Where wind generation is required to be curtailed pursuant to (a), assign the curtailment amongst each individual wind power facility using the wind power management protocol,
c. Curtail inflexible $0 blocks to the asset's MOL.

Step 3: Curtail an asset to 0 MW (go off line), considering the asset's minimum off time. A potential consequence of this Supply Surplus protocol on cogeneration could be increases in DTS tariff (that apply to load supplied from the AIES) since they may require additional capacity from the AIES if their own on-site generation is curtailed. This requires further evaluation, and if there are inappropriate consequences in this regard, the AESO may consider amendments to the AESO Tariff."

8.0 Comments on MOF Recommendation paper for Wind

The AESO received comments on the Supply Surplus protocol and proposed modifications to OPP 103 presented within the MOF recommendation paper for Wind. The majority of participants requested further and broader consultation on the recommended Supply Surplus protocols. There was a concern that not all participants were aware of the potential changes as these were included as part of the consultation for wind integration. Participants indicated that the proposal has the potential to constitute a significant change to the market design and will impact all participants extensively regardless of their source of generation.

In addition, some participants indicated that market based solutions for managing supply surplus conditions should be considered and explored in further detail.

Furthermore, there were also participants that questioned the provision and definition of MOL.

Overall, participants supported receiving a market indication of supply surplus conditions.

Cogeneration facilities and ISD's are primarily concerned with the potential interruption to their processes, and associated economic and operational impacts such as reservoir, facility, or equipment damage. The comments from Cogen's also indicated that a stable regulatory ground for further investment and changes should be maintained, and they should remain exempt. Wind generators also indicated that they should remain exempt.

8.1 Minimum Operating Level and Minimum Stable Generation

The ISO rules currently define MSG as: the minimum generation level that an asset can be continuously operated at without becoming unstable.

The MOF recommendation paper for wind, as part of the supply surplus workgroup results, recommended the addition of MOL, which is defined as: a physical operating limit (not an economic limit) for an asset constrained by legal/regulatory, environmental, health and safety, equipment reliability, operating level required to serve dispatched ancillary services, or operating level required to prevent damages to third party equipment.

As indicated in section 8.0 of this paper, there were some participants that questioned the provision of implementing a new definition, very similar to the existing definition of MSG.

Both MOL and MSG are *physical* operating limits, determined by the participant. The current definition for MSG may benefit from some refinement to reflect the minimum level of stable operation more appropriately.

The AESO questions the necessity and appropriateness of including both MOL and MSG and would like to explore the possibilities of modifying the existing definition of MSG to better suit the needs of market participants and the AESO.

Options for updating the application of MSG consider allowing participants the ability to update the value day-ahead (in conjunction with day-ahead energy submission timelines), or possibly prior to T-2. Currently, only the AESO has the ability to change the participant's MSG, however, the value must be provided by the participant- this application was based on the premise that the MSG is a value that does not change unless there is a physical change to the facility.

9.0 Supply Surplus Rule Options

This section outlines the options for consideration for managing supply surplus conditions.

The AESO Recommendation paper for wind generation ("the MOF paper") indicated that a "must forecast provision for wind generators would be an appropriate substitute for the must offer requirement". The MOF paper also indicated that "wind generators are exempt from must offer, must comply (MOMC) until appropriate comparable rules can be implemented"[11]. Due to the potential for the large scale integration of wind and it's impact on market and system operations, the AESO is initiating the review and consultation of these "appropriate comparable rules", which include: market rules for wind generation, voluntary generator curtailment, negative offer prices, removal of an exemption for wind generators and cogens under OPP 103, and the scheduling of exports within T-2 or within the delivery hour.

As it may take more time to appropriately consult and implement some of the options listed above, the Supply Surplus rules consultation (through this forum) will be initiating discussion with stakeholders on the longer term approaches and determine a short term solution. In addition, the Supply Surplus rules consultation will be coordinated with the wind integration program and any other related work.

[11] AESO Recommendation Paper: Implementation of Market & Operational Framework for Wind Integration in Alberta, March 2009, Section 4.6, pg 22 of 52

The short-term solution will address the immediate need of updating the Supply Surplus rules and procedures and includes the removal of an exemption for wind generators and cogens under OPP 103, the scheduling of exports within T-2 or within the delivery hour, and the inclusion of a voluntary generator curtailment request to the market as an option.

The options for longer term solutions include: market rules for wind generation, a voluntary generator curtailment program and negative offer prices.

The Option description is detailed below, and the assessment of each option is detailed within Table 3 (section 9.3 of this paper). It should be noted that a combination of these options may be considered and appropriate.

9.1 Long-term options

9.1.1 Market rules for wind generators

The Market Policy rules implementation of December 2007[12], included merit order stabilizers such as MOMC for all generators that have a maximum capability of 5 MW or above, in order for the system controller to have visibility of all the MW available on the AIES. MOMC rules require generators to must offer their maximum capability, and comply with all dispatches and directives. If the generator has an acceptable operational reason, as defined in the ISO rules, an available capability may be submitted for any difference between its maximum capability and available capability, which are also defined within the ISO Rules.

Currently, wind generators do not have an obligation to submit an offer, and therefore are considered price takers. Other jurisdictions, such as Australia, require wind generation to offer into the merit order.

The ISO Rules must treat all generators fairly, and consistently, regardless of their fuel type.

In order to manage the supply demand balance properly and to ensure a reliable pool price, wind volumes must be included in the merit order. Table 3 further details the pros and cons for this option.

The options for integrating wind within the Alberta market will be included as part of the AESO's consultation on the wind integration program, which will be subject to the normal stakeholder consultation process.

9.1.2 Voluntary Generator Curtailment Program (VGCP)

Voluntary generator curtailment (VGC) may be a viable option for generators that have the ability to curtail supply.

Under the VGCP option, the generator would be compensated to curtail generation through a market based solution where generators could submit an offer to curtail for a price, when the SMP is zero.

[12] Alberta's Electricity Policy Framework: Competitive-Reliable-Sustainable, Section 4.2.1, provides the policy framework for implementation of the rules implemented on Dec 2007

All generators that remain on line during a supply surplus condition would compensate one or more generators who would curtail on their behalf. Requiring generators to pay for this service is aligned with current requirement of loads paying for curtailment services in supply shortfall procedures.

If implemented, the market would be activated after imports are curtailed and intra-hour exports are allowed and before flexible $0 blocks are curtailed in the supply surplus procedure.

9.1.3 Negative Offer Prices

One method of managing excessive $0 offers is to implement a negative price floor which would allow participants to reflect their desire to keep their asset on line by submitting a negative offer price. Thus, if the pool price were set at a negative value, all generators would pay pool price to remain on-line and load would be paid to consume.

Some energy markets in North America, such as IESO in Ontario and ERCOT in Texas have set their price floor to a negative value. However, there are differences between these jurisdictions and Alberta in generation mix, market structure, or both.

Ontario has a different generation mix than Alberta. The majority of Ontario's electric energy is supplied by nuclear and hydro, with some coal, gas and wind. Negative pricing was implemented to allow for a market solution so that curtailment priorities could be determined by the merit order, and participants could reflect the economics of their plant; as nuclear, for example, is generally baseload and must run. The frequency of negative prices has significantly increased in Ontario since 2006 (see Appendix 2 for further detail). The IESO has indicated that "off-peak demand has decreased, while off-peak supply has grown". During these times, it is recognized that there may be some units that have the inability to reduce their output (nuclear and hydro units that are limited by operational or environmental constraints); however, the IESO has stated that "the frequency of negative prices in Ontario has been aggravated by generators incented by their contract design to produce in all hours, regardless of market conditions"[13].

Overall, markets have observed a decline in the average price of electricity in the past couple of years due to a number of factors such as a decline in the economy and gas prices. In the AESO's view, an increased frequency of lower or negative prices is not a short term adequacy issue as the price reflects market economics considering there are no out of market incentives for generators to ignore the market price, however, it may create a long term adequacy issue. Ontario manages their long term adequacy issues through programs to attract generation by providing standardized prices through multi-year contracts[14]. Alberta's wholesale market for electricity relies on investor response to the Pool Price.

ERCOT is observing lower market prices due to the amount of wind that they have in the west part of Texas. Alberta is also expecting to see an increase in wind generation

[13] IESO presentation to SAC, Effective Pricing in Ontario's Hybrid Electricity Market, slide 8: http://www.ieso.ca/imoweb/pubs/consult/sac/sac-20091028-Item_7-Electricity_Pricing.pdf

[14] These contracts are developed and held by the Ontario Power Authority: http://www.powerauthority.on.ca/. The attached link provides further information on electricity supply contracts in Ontario: http://www.powerauthority.on.ca/Page.asp?PageID=924&ContentID=6972

within the energy market in upcoming years[15]. Rather than deal with the supply surplus issue, if Alberta were to implement a negative price floor, we may see the high volume[16] of $0 offers in supply surplus situations move to a negative price potentially affecting the price and the long term investment signal.

As there are a number of issues related to negative pricing in other jurisdictions, in the AESO's view, implementing a negative price floor is not a preferred option at this time. The IESO and ERCOT situations should continue to be monitored as wind is added in those jurisdictions.

9.2 Short Term Options

Table 3 explores the pros and cons for each of the options listed below:

- No exemption for wind generators under OPP 103. Wind generators are currently exempt from OPP 103
- No exemption for cogens under OPP 103. Cogens are currently exempt from OPP 103.
- Voluntary Generator Curtailment Request (VGCR). Under this option, the system controller would send out a request to the market for generators that have the ability to curtail supply, to do so as a step within the supply surplus procedures. An example of the procedure including this option is shown below.
- Exports within T-2. The current procedure does not consider maximizing the export ATC limit within the current hour, to allow for exports during supply surplus conditions. An example of the procedure including this option is set out below.

Example of supply surplus management procedure:

1) Direct generators that are operating above their dispatch levels, to their dispatch level starting with the asset that has the highest dispatch variance. Note: this step may not be necessary given the enhanced dispatch compliance rules. It is currently step 2 in OPP 103; please refer to section 6 of this paper for further information.
2) Current hour import transactions will be curtailed, as required. Note: this step is included in the current procedures in a different order.
3) Maximize the posted export ATC limit to allow for exports within the hour.
4) Send out a request to market participants to voluntarily reduce generator output (VGCR).
5) Flexible blocks of the $0 offer will be dispatched for partial volumes on a pro-rata basis. Note: this is currently step 1 in OPP 103; please refer to section 6 of this paper for further information.
6) Wind generation will be curtailed on a pro-rata basis using the wind power management protocol, which is being developed as part of the wind integration program. The AESO's consultation on the wind integration program will follow the normal stakeholder consultation process. Note: this step is not applicable if wind generation is required to submit offers.

[15] There is currently 7388 MW of wind generation in the queue- these are subject to market and operational analysis to ensure that the reliable operation of the system, and the fair, efficient, and openly competitive operation of the market are maintained and sustainable. There is 629 MW of wind on the AIES currently (Q1, 2010), and it is expected to increase to approximately 1100 MW by Q4, 2011

[16] Please refer to section 5.1 of this paper for historical analysis on supply surplus volumes in Alberta

7) Assets with inflexible $0 offers greater than their declared minimum stable generation levels will be directed to their declared minimum stable generation levels. Assets with the greatest difference will be directed first (same as current procedures, please see section 8.1 of this paper for further discussion on MSG).

The AESO seeks input from stakeholders regarding the proposed procedure in this example.

9.3 Long Term and Short Term Option Assessment

Table 3 includes the Pro's and Con's for each of the long term options described in section 9.1 and short term options described in section 9.2.

Table 3 – Supply Surplus Option Assessment

Option	Pros	Cons
Market rules for wind generation **Long Term option**	-offering volume would provide visibility of the wind energy in the merit order and would subsequently allow curtailment on the same basis as other generators -allows the system controller to have visibility of wind generation -wind generators will be treated the same as all other generation types, which is consistent with government policy[17] -if there is no wind, "no fuel" fits with the current ISO Rule definition of acceptable operational reason[18] -a wind power facility can be limited or curtailed down, therefore this should not be a barrier to comply with market rules -a wind power facility can be dispatched when there are wind conditions. -wind may choose to enter a non $0/MWh offer thereby reducing the likelihood of supply surplus.	-offering volume may depend on a reliable forecast. Forecasting provisions may also need to be considered as part of dispatch tolerance.
VGCP **Long Term**	- decreased risk of curtailment for generators that would like to continue normal operation of their	-may provide a perverse incentive for generators to wait until this step in the procedure to voluntarily

[17] The 2005 Electricity Policy Framework states that "The department does not support one type of generation over another but rather allows competitive market forces to determine the appropriate generation mix (e.g. no fuel use policy)."
[18] ISO Rules, Definition, Acceptable Operational Reason

Option	Pros	Cons
option	facility due to operational or economic reasons -depending on the complexity, it may be a relatively cost effective option to implement -market solution, with minimal intervention from the AESO	curtail generation. -it may not make sense to pay a generator to curtail, when the market economics reflect $0 -the VGCP market may require significant resources to create and maintain -a VGCP may not even be required; we may not ever reach this step in the procedure.
Negative Offer Prices **Long Term option**	-in market solution; allows curtailment priorities to be determined by the energy market merit order -no intervention from the AESO -provides an opportunity for participants to reflect the economics of their facilities. If a participant offered volumes at a negative price, the participant is indicating that it is more economic to pay to generate power, than to shut down their facility.	-A negative price floor may simply move the high level of equal price offers to a new floor thus moving the supply surplus issue to a new price. The price floor must be set low enough to promote additional depth in the merit order. -At this time, importers are required to submit $0 offers and are not eligible to set pool price. Pricing of imports would need to be reviewed and likely revised since they are not dispatchable when the price goes below $0. It should be noted that current AESO initiatives include consultation on dispatchable interties. -The practicality of implementing negative price offers requires consideration. For example, there are procedural, operational, and IT system changes for the AESO and market participants -All price boundaries, such as price cap, require consideration prior to implementation of negative pricing
No exemption for Wind generators and Cogens under OPP 103 **Short Term option**	-Fairness: all generators are subject to Supply Surplus protocols -Fairness: all generators are subject to curtailment. -Wind generators have the ability to limit the amount of wind generation (assuming fuel is available) -an exemption is not required for cogens as there is legislative direction regarding electric energy produced and consumed solely on	-the process may be more procedural if wind generators are not subject to market rules because the SC will not have visibility of wind generation through the energy market merit order. -cogens have indicated that this may have an effect on the operational and financial viability of the facility

Option	Pros	Cons
	site.	
VGCR **Short Term option**	-request for voluntary curtailment may result in enough energy curtailment to avoid having to curtail generators more significantly impacted. -comparable step in supply shortfall procedures (i.e. Request to generators to provide more supply)	-no obligation therefore there may be no MW curtailed.
Exports within T-2 **Short Term option**	-comparable step in supply shortfall procedures -including this step early in the procedure may help in reducing the impact, or avoiding curtailment of generators under supply surplus procedures	-may have only a minimal impact in the current hour

10.0 Reporting

An important enabler for allowing the market to respond to supply surplus conditions on its own without AESO intervention is information. Similar to the approach taken with the supply adequacy report the AESO intends to provide the market with an indication of supply surplus events prior to real time so that participants can respond to market signals and adjust accordingly.

The AESO seeks participant feedback on the report provisions.

11.0 Alignment with Policy

The AESO mandate is set out in government legislation, regulation and policy. At the highest level, the AESO has two overarching duties: operate the market in a manner that promotes the fair, efficient and openly competitive (FEOC) exchange of electricity, and provide for the safe, reliable and economic operation of the interconnected electric system. Therefore, any options for consideration for managing supply surplus conditions must be evaluated for whether they do or do not support Alberta's policy framework and the AESO's mandate.

11.1 Electric Utilities Act (EUA)

As noted, the AESO has two key duties that must be recognized when examining supply surplus options.

Duty to Act Responsibly

16 The Independent System Operator must exercise its powers and carry out its duties, responsibilities and functions in a timely manner that is fair and responsible to provide for the safe, reliable and economic operation of the interconnected electric system and to promote a fair, efficient and openly competitive market for electricity.

Duties of Independent System Operator

17 The Independent System Operator has the following duties:

(a) to operate the power pool in a manner that promotes the fair, efficient and openly competitive exchange of electric energy;

(b) to facilitate the operation of markets for electric energy in a manner that is fair and open and that gives all market participants wishing to participate in those markets and to exchange electric energy a reasonable opportunity to do so;

(c) to determine, according to relative economic merit, the order of dispatch of electric energy and ancillary services in Alberta and from scheduled exchanges of electric energy and ancillary services between the interconnected electric system in Alberta and electric systems outside Alberta, to satisfy the requirements for electricity in Alberta;

(h) to direct the safe, reliable and economic operation of the interconnected electric system;

(k) to collect, store and disseminate information relating to the current and future electricity needs of Alberta and the capacity of the interconnected electric system to meet those needs, and make that information available to the public;

(m) to perform any other function or engage in any activity the Independent System Operator considers necessary or advisable to exercise its powers and carry out its duties, responsibilities and functions under this Act and regulations.

The EUA does not specifically address supply surplus, but it is clear that the duties related to promoting a FEOC market, providing a reasonable opportunity for the exchange of electric energy, establishing the merit order based on relative economic merit, and directing the safe, reliable and economic operation of the interconnected electric system all impact the types of supply surplus options that can and should be pursued by the AESO.

The Purposes of the Act section also provides direction with regard to the fair treatment of all participants. The Supply Surplus options for consideration must ensure that there is not an unfair advantage by any participant:

Purpose of the Act

5(c): “The purposes of this act are…….to provide for rules so that an efficient market for electricity based on fair and open competition can develop in which neither the market nor the structure of the Alberta electric industry is distorted by unfair advantage of government-owned participants or any other participant”

The Electric Utilities Act also provides certain exemptions to electric energy produced and consumed on site. The Supply Surplus options and ultimately rules, must consider these exemptions:

> 2(1) (b): “This Act does not apply to……electric energy produced on property of which a person is the owner or tenant, and consumed solely by that person and solely on that property”
>
> 40(1): “Each owner of an industrial system must assist the Independent System Operator to enable the Independent System Operator to carry out its duties, responsibilities and functions.”

The EUA does not exempt Electric energy that is not produced and consumed solely on site, and therefore is subject to the ISO rules.

11.2 Policy Documents

In addition to the EUA, the ISO takes guidance from government policy documents. The Alberta Electricity Policy Framework provides guidance relevant to the supply surplus discussion. It supports a level playing field and rules that allow wind and other renewables to participate fairly in the energy market.

> 4.4.11: “The department does not support one type of generation over another but rather allows competitive market forces to determine the appropriate generation mix (e.g. no fuel use policy). As a result, the Department does not support market refinements that will create an uneven playing field or be detrimental to the development of renewable resources…” (pg. 47 of 51)
>
> 4.2.1: “The attributes of wind generation technology must be considered while maintaining fairness to all market participants. The ISO will make rules to ensure that wind and other intermittent resources are able to participate fairly in the energy market. The rules will consider characteristics of wind generation so that wind may be properly accounted for in any reliability assessment.” (pg 25 of 51)

12.0 Next steps

The AESO is interested on feedback on this discussion paper.

- Stakeholder comments are due by May 20, 2010 as per the normal consultation process. Please submit the comments to Ruppa Minhas at ruppa.minhas@aeso.ca.
- Ultimately, ISO rules will be developed, following the normal rules consultation process, based on stakeholder input.

Appendix 1 – Other market research

This section provides information regarding Supply Surplus conditions and protocols in other jurisdictions around the world.

CAISO

What defines a Supply Surplus Condition within the specified jurisdiction
-Overgeneration- circumstances in which Generation exceeds Demand

Supply Surplus Actions/Protocol
After the real-time market
-If potential for over-generation exists, the CAISO shift supervisor is advised of the condition
-If there is insufficient real-time decremental energy bids, then a market notification is sent to all Scheduling Coordinator's (SC) indicating the amount of over-generation expected, and the requirements for decremental exceptional dispatches to mitigate the over-generation
-If the shift supervisor or generation dispatcher determines the need, then the real-time scheduler will survey the adjoining balancing authorities for potential exceptional dispatch energy sales for the affected hours, and list these sources to use in real-time

Real Time Operation (steps may be in any order)
-If generating units are above their dispatch, then the generation dispatcher will contact the respective SC requesting the units to return to schedule immediately, and monitor the response of these units to confirm compliance. If the unit does not respond, the unit would be logged.
-Real-time decremental energy bids would then be dispatched in economic order
-If additional over-generation mitigation is necessary, the shift supervisor will instruct the generation dispatcher to announce the condition to the market
-The generation dispatcher will dispatch exceptional dispatch decremental resources as necessary to maintain reliable operation. If generating resources are ordered off line, an exceptional dispatch for the units' minimum off time will be issued.
-Thermal units on AGC will be directed to go off AGC and go to Pmin (minimum operating level)
-Real time Schedulers will be directed to arrange for exceptional dispatch external export(s) of Energy to adjoining Balancing Authorities in the amount required to maintain reliable operations over the current and next operating hour.

Pro-rata reductions
-If all decremental energy from market and exceptional dispatch sources has been utilized, the generation dispatcher will direct thermal units on AGC to go off AGC control and proceed to Pmin, and apply pro-rata reductions to each SC to reduce either Generation or imports, or both in an amount equal to their pro-rata share.
-If additional over-generation mitigation is necessary, the generation dispatcher will advise the shift supervisor and recommend that units be notified of mandatory reductions in output.

- “An Exceptional Dispatch is a commitment or dispatch instruction by CAISO Operators that is not a result of the market optimization in the IFM, RUC or RTM. To the extent possible the CAISO utilizes market solutions before issuing Exceptional Dispatches.”[19]

Ontario (IESO)

What defines a Supply Surplus Condition within the specified jurisdiction
-The management of minimum load conditions is required when Ontario’s electricity production from typical baseload facilities such as nuclear units, other energy sources that cannot be stored (must run hydroelectric units), and other non-dispatchable generation (i.e. wind, solar) is greater than the market demand. This condition typically occurs on a “global” basis although this condition can also occur in localized areas in the province if associated with limited transmission or transfer capabilities.[20]

Supply Surplus Actions/Protocol
Over-generation procedures are currently under review at the IESO. The current mitigation measures contained in the IESO rules include the following:

-If an over-generation condition is anticipated by the IESO, a system advisory notice will be issued
-An emergency operating state to resolve the over-generation condition will be declared if it is determined that market responses will not resolve the condition (prior to issuing dispatch instructions)
-Declaring an emergency operating state gives the IESO the ability to take action to eliminate an over-generation condition.[21]

-“12.2.1 If the *IESO* issues an over-generation system advisory notice pursuant to section 12.1.3, the *IESO* shall, unless the *IESO* determines that it is not able to do so for operational or system *security* reasons, and notwithstanding any notification requirements or other conditions specified elsewhere in these *market rules*:

12.2.1.1 solicit and accept additional or revised *bids* from *dispatchable loads* willing to increase demand in response to low prices;

12.2.1.2 allow *generators* to de-synchronize from the *IESO-controlled grid* or the embedding *facility*, as the case may be, without penalty, some or all of the *generation units* within any *registered facility* in locations designated by the *IESO;* and/or

12.2.1.3 solicit and accept revised *offers* from *generators* or *wholesale sellers* that will decrease generation resources in response to low prices, in locations designated by the *IESO*.”[22]

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[19] Please see G-202 within the following: http://www.caiso.com/docs/2002/03/25/2002032510240225767.pdf
[20] “The management of Minimum Load Conditions”: http://www.ieso.ca/imoweb/pubs/consult/se57/se57-20090616-Management-Minimum-Load-Conditions.pdf
[21] Section 5.8: http://www.ieso.ca/imoweb/pubs/marketRules/mr_chapter5.pdf
[22] Section 7, 11 & 12: http://www.ieso.ca/imoweb/pubs/marketRules/mr_chapter7.pdf

New York

What defines a Supply Surplus Condition within the specified jurisdiction
-Over-generation: a condition where minimum generation is greater than the minimum system load requirements. Actions are taken to avoid the export of excess energy over NY Control Area (NYCA) inter-Control Area tie lines, in accordance with NERC Guide I.

Supply Surplus Actions/Protocol
Quoted Directly from Protocol:
NYISO Actions:
During periods of NY Control Area actual over-generation, the NYISO Shift Supervisor shall take actions in the following order to the extent needed, when system conditions and time permit.
1. Request all over-generating suppliers that are contributing to the problem to adjust generation to match their schedules.
2. Reduce applicable NY Control Area dispatchable generation to minimum operating limits (through SCD) and shall suspend regulating margins if required.
3. Request Internal Generators to voluntarily operate in the "manual mode" below minimum dispatchable levels.
4. Attempt to schedule variable load, including pumped hydro resources to alleviate the problem.
5. If the accumulated inadvertent interchange account is negative and the time error is negative (slow clocks), the NYISO Shift Supervisor shall unilaterally pay back inadvertent interchange through an offset, in accordance with NERC Guide I.
6. Inform neighboring Control Areas that Real-Time LBMP is zero (or negative) in a specific Zone.
7. Request reduction or cancellation of all other inter- Control Area two-party energy purchases that contribute to the violation. Applicable transactions shall be curtailed on the basis of Decremental bids in conjunction with NERC procedures. Curtailments shall proceed until the over-generation violation is eliminated or all applicable transactions have been curtailed.
8. If the over-generation violation persists, the NYISO shall declare a major Emergency. The NYISO shall then decommit applicable internal Generators based on their minimum generation bid, in descending order, until the violation is eliminated.[23]

Australia (AEMO)

What defines a Supply Surplus Condition within the specified jurisdiction
-Load Rejection Reserve
-Excess Generation

Supply Surplus Actions/Protocol
Load rejection reserve refers to the ability of generating plant actually in service to reduce their output in an emergency due to a sudden loss of the largest single load on the power system (usually a 250MW aluminum smelter). Load rejection reserve is achieved by maintaining a margin of reserve above the aggregate technical minimum output for all units dispatched in the spot market. In real time, frequency control ancillary

[23] NYISO System Operation Procedures, Section 11: http://www.nyiso.com/public/webdocs/documents/manuals/operations/sop.pdf

services will be dispatched by the operator to ensure that there is sufficient load rejection reserve available at all times. Excess generation refers to a system condition in which generating plant is requested to reduce load below self dispatch level in accordance with off-loading prices. The market rules require the spot price be set to zero, and generators pay for energy generated at the "excess generation price" (effectively a negative spot price returned by the dispatch software). The excess generation money collected from generators is refunded to market customers broadly as if the spot price had been allowed to be negative.[24]

PJM

What defines a Supply Surplus Condition within the specified jurisdiction
Light Load Procedures- light load operating problems tend to be characterized by Frequency and ACE running high

Supply Surplus Actions/Protocol
-If it is determined that a light load period is expected, PJM formulates a scheduling strategy for the period. Hydro plant schedules are reviewed to ensure, where possible, pumping at pumped storage plants is maximized and generation at run-of-river plants is minimized during the light load period(s).
-If the expected generation level is within 2,500 MW of normal minimum energy limits, PJM dispatcher will issue a minimum generation alert.
-Generation dispatchers will schedule additional unit maintenance, as appropriate, for the expected load periods.
-Prior to declaring a minimum generation emergency declaration, PJM will update the amount of emergency reducible generation available to determine their final strategy including the anticipated amount of reducible generation to be reduced (by percentage) and a forecast time of the reduction. PJM will reduce units to normal minimum generation and reduce the system Locational Marginal Price to "0" and reduce spot-in contracts as required to maintain system control.
-The PJM dispatcher will issue a minimum generation emergency declaration, including the anticipated amount of reducible generation to be reduced (by percentage) and a forecast time of the reduction.

PJM Member actions include the following:

- Generation Dispatchers ensure their units are following PJM economic base points to Economic Minimum output.

- Wind Generator Operators will adjust Wind Turbine Control Systems or manually adjust turbine output to achieve the desired UDS basepoint.

- Generation dispatchers reduce generation as reported via eDART[25] on the Minimum Generation Form in the Reducible on Declaration column.

[24] Pg. 8: http://www.aemo.com.au/electricityops/431-0002.pdf
[25] eDART (Dispatcher Application and Reporting Tool) is an Internet application that allows generation and transmission owners to submit generation and transmission outage requests electronically. eDART allows its users to manage their outage data by viewing the status of their outages and obtaining outage reports.

- Generation dispatchers determine the specific units that will be reduced and the sequence and timing of reductions based on the direction given by PJM.

- Generation dispatchers contact PJM Scheduling Coordinator and report additional Reducible Generation that is reduced beyond what is reported on the Minimum Generation Form upon a Minimum Generation Emergency Declaration.

- A minimum generation event is implemented when the PJM dispatcher can no longer match the decreasing load and utilization of emergency reducible generation is necessary.
-No differentiation is made between resource types during a minimum generation emergency event. All resources are expected to reduce proportionally based on the percentage Emergency Reducible Generation declared.
-The PJM dispatcher issues a minimum generation emergency event and requests local generation dispatchers to reduce emergency reducible generation (ERG), in proportion to the total amount of ERG reported minus what was reported as being reducible on declaration.
-The PJM dispatcher would also attempt to sell Emergency Energy to external systems[26]

Midwest ISO

What defines a Supply Surplus Condition within the specified jurisdiction
-sum of supply from the Self-Schedules, Imports, Virtual Supply Offer, and non-price sensitive Offers within the Transmission Provider Region exceeds all demand reflected in Demand Bids, Exports, and Virtual Bids within the Transmission Provider Region

Supply Surplus Actions/Protocol

-39.2.11 Surplus Conditions in the Day-Ahead Energy Market:

a. Step One. The Transmission Provider will employ any Offers submitted in conjunction with Imports to cut Dispatchable External Bilateral Transactions Schedules to zero (0) MWs.

b. Step Two. The Transmission Provider will employ the low Emergency range (specified in the Emergency Energy Offer) of all on-line Generation and as required to clear the
Day-Ahead Energy Market. LMP is based on the lowest
Offer of all on-line units that have cleared in the Day- Ahead Energy Market.

c. Step Three. If the Energy balance is not achieved after Step One and Two, the Transmission Provider will reduce supply according to the following scheduling priorities (see section 40.2.16 below). The Transmission Provider will then set Offers to the Offer Floor. Supply will be reduced proportionately until balance is achieved and the Day-Ahead Energy Market cleared.

-40.2.16 Surplus Conditions in the Real-Time Energy Market:

[26] PJM Emergency Operations Manual, Section 2.4:
http://www.pjm.com/documents/~/media/documents/manuals/m13.ashx

a. Step One. The Transmission Provider will employ the low Emergency range of all on-line Resources as required to clear the Real-Time Energy Market using SCED and will calculate LMPs. Offers for this low Emergency range will be used in the calculation. The specifications for these Emergency range Offers are developed in the Business Practices Manuals.

b. Step Two. If the Energy balance is not achieved after the Step One, the Transmission Provider will reduce supply by decommitting units with the shortest start-up times in the appropriate area. Supply associated with Bilateral Transaction Schedules will not be reduced to the extent feasible. In these cases, Offers will be set at the Offer Floor.[27]

South West Power Pool (SPP)

What defines a Supply Surplus Condition within the specified jurisdiction
-A Market Participant is deemed as having too much energy supply if the following condition is met:

Sum of Min Econ MW > Energy Obligation

-Min Econ MW is calculated from a Market Participant's Resource Plan and Ancillary Service Plan

Supply Surplus Actions/Protocol
-A market participant is deemed to have inadequate supply in the case of over-generation if sum of Min Econ MW > Energy Obligation

-SPP will compare the aggregation of the Market Participants' Resource Plans and schedules by each Balancing Authority Area within the EIS Market footprint against SPP's Load forecast and Ancillary Service requirements for each Balancing Authority Area

-If the analysis indicates that the Balancing Authority Area has inadequate supply, SPP will notify the Market Participant(s) deemed inadequate and its host Balancing Authority.

-The Market Participant will resolve the issue by modifying its Load Forecast, Resource Plan and/or schedules by 1700 day prior to the inadequacy event

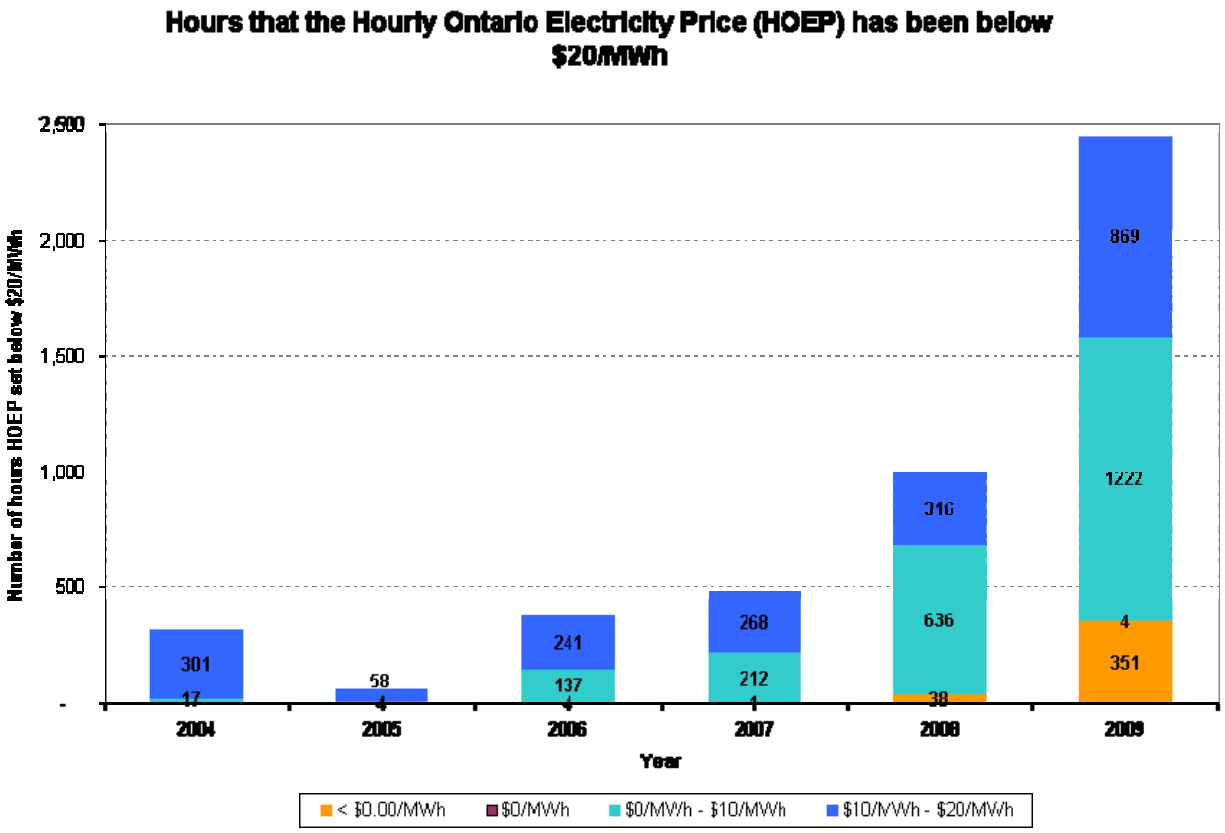
- The Market Participant shall make the appropriate modifications no later than 45 minutes prior to the Operating Hour (OH) for any energy supply inadequacy revealed by the hourly study.

-In the event a Market Participant does not resolve the issue and it contributes to a reliability problem at or prior to real-time, the Market Participant will be subject to interruption of Load, interruption of Resources, curtailment of schedules and or manual deployment of Resources, if deemed necessary.

[27] Open Access Transmission and Energy Markets Tariff, Sections 39.2.11 & 40.2.16: http://www.midwestmarket.org/publish/Document/3b0cc0_10d1878f98a_-7d060a48324a/Modules.pdf?action=download&_property=Attachment

-All instances where the Market Participant fails to resolve an identified issue at or prior to real-time and it contributes to a reliability problem will be reported to FERC on an after-the-fact basis.[28]

Appendix 2 – Number of hours that the HOEP has been below $20/MWh (2004-2009 data)



[28] Southwest Power Pool Market Protocols, pg. 56-57: http://www.spp.org/publications/Mkt_Protocols_10%200.doc#_Toc233019561