

AESO Short Term Wind Integration Discussion Paper
 Comment Response Matrix
 September 23, 2010

General Comments		
Stakeholder	Stakeholder Comment	AESO Response
IPPSA	<p>We believe the AESO's proposed approach to short term wind integration should be consistent with the approach delineated in last year's Market Operational Framework. In that Framework, the sequence of tools employed began with the energy market merit order and proceeded to operating reserves dispatch and then finally wind power management. We would be concerned if this current discussion led to a revision of a Framework that was concluded just one year ago. A change to the Framework this quickly would not be consistent with investors' need for a stable and predictable policy environment.</p> <p>We appreciate the AESO's delineation of the principles it intends on following to enable wind integration, however we are concern with the distinction the AESO makes between reliability and market objectives. Ensuring reliability is described as the first principle, followed by market principles second. We are concerned with this distinction. In our commoditized market, we submit that reliability is to be met via the market. We encourage the AESO to adopt this understanding.</p>	<p>Analysis presented in the discussion paper indicates that there will be operational issues given the amount of wind generation expected at some point in 2011. In order to accommodate this wind capacity in a fair and transparent manner the AESO is seeking solutions that can be in place in a short timeframe.</p> <p>The AESO recognizes the previous work from the MOF, but has identified that wind integration tools need to be refined in order to integrate wind generation in a fair, efficient and openly competitive manner.</p> <ul style="list-style-type: none"> • The practice of relying on the full extent of the EMMO to integrate wind impacts the integrity of the energy only market price signal (and thereby may not be FEOC) by introducing a ramping element to the price signal in a significant number of hours. • AESO studies referenced in the Discussion Paper indicated a reliability concern with over dispatching the EMMO to respond to wind ramping events due to uncertainty that is not present in current over dispatching events. • Purchasing regulating reserves in the day ahead market may not be efficient given the current accuracy of the wind power forecast in the day ahead timeframe. • Purchasing regulating reserves to accommodate controllable events such as wind ramp ups creates concerns about efficiency and fairness across stakeholder groups. <p>The order of the principles does not imply precedence of one over the other. The AESO agrees that where possible, reliability requirements should be met directly via the market.</p>

CanWEA	<p>The direction and focus of the paper is in identifying short-term solutions to increasing the amount of wind power generation that can be integrated onto the Alberta grid. The issue of increased wind penetration levels is not new in relative terms and has been a topic of negotiations for a number of years. In order to effectively deal with these increasing levels it is CanWEA's opinion that a longer term direction and strategy needs to be contemplated prior to the implementation of short-term mitigations that may ultimately negatively impact that longer term strategy. To suggest there is a sense of urgency now does not in our view adequately recognize the work that has gone before the release of this paper.</p>	<p>Please see the previous reply to IPPSA.</p> <p>The AESO is also proceeding with second phase wind integration studies and will initiate stakeholder consultation later in 2010.</p>
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4.0 Wind Integration Principles		
Stakeholder	Stakeholder Comment	AESO Response
NaturEner	<ol style="list-style-type: none"> 1. It is the AESO's duty according to the EUA s. 16 to operate the system in a "fair, safe, reliable and economic" manner as well as run an "efficient and openly competitive market". A variety of tools, rather than a single solution, would provide for the best protection of system stability. 2. As Alberta's electricity framework is designed as an "Energy Only Market" any solution but market solutions under normal operating conditions would have to lead into a policy discussion and are counterproductive. 3. The merit order is and should continue to be the primary mechanisms for balancing energy requirements on the system. However, as it works today, it lacks some incremental functionality demonstrated in other market environments that could further enhance its effectiveness. 4. We agree, all generation has to be treated fairly, and recognized for their unique characteristics. 5. Ancillary services are the core tool, but need to be one part of a comprehensive portfolio of solutions for balancing the system at all times. <p>The long term wind integration plan not only needs to address the physical aspects of the market, but also needs to reflect the</p>	<p>The AESO does not support the view that price impacts associated with wind should form the basis for wind integration product decisions. A principled approach that incorporates the available tools (EMMO, ancillary services, WPM and the wind forecast) is being developed. This will allow wind to be accommodated on the system in a fair and transparent manner.</p>

	<p>inherent value transfer associated with wind production. There is a fundamental association between those who bear the vast majority of the costs associated with integration and the value that is brought to the price duration curve from wind resources.</p>	
ENMAX	<p>ENMAX agrees that the energy market merit order is primarily a tool for balancing energy requirements on the system. Dispatching up the merit order to achieve a ramp rate violates the fundamental premise of Alberta’s market design, which is that the system marginal price is set at the highest eligible marginal price of supply required to meet AIES demand. Dispatching up the merit order sets a price for all traded megawatts at a value that does not reflect the supply/demand balance.</p> <p>The AESO’s paper quotes the Department of Energy, stating that “The Department does not support one type of generation over another but rather allows competitive market forces to determine the appropriate generation mix.” Given that competitive market forces are to be used to determine the appropriate generation mix, it is imperative that: (a) the market see the “true” cost of each form of generation, which means that costs imposed by one particular type of generation should not be “buried” amongst other costs; and (b) advantages must not inadvertently accrue to one type of generation over others through unbalanced rules, such as some but not all generators having to adhere to “must offer must comply” (“MOMC”). While it may be impossible for an individual wind turbine to guarantee (subject to force majeure) a specific output level, wind generators can meet obligations through mechanisms such as backstop generation and asset substitution through self-supply or bilateral arrangements.</p>	<p>Currently the energy market merit order is used for both ramping and balancing and has been for some time. As indicated, the AESO has both reliability and market impact concerns with over dispatching the EMMO because the issues associated with operating in this manner are expected to be exacerbated in the near future due to the increased variability. The uncertainty associated with wind also creates a reliability concern with over-dispatching the EMMO because wind generation can ‘change direction’ resulting in very large ACE as a result of over dispatching.</p> <p>The must offer must comply obligation for generators is an important element of the Alberta market, but it must be properly adapted for all generators while preserving a level playing field. The wind power forecast was identified as a reasonable alternative to the “must offer” element that must include at a minimum information on wind turbine availability, local atmospheric conditions and actual output.</p>
CanWEA	<p>The discussion paper appears to be based on a fundamental assumption that all generation in the province should behave and respond like existing dispatchable thermal based generation. The nature of all forms of generation appears to be compared and judged through this lens causing an inherent bias against renewable and specifically wind generation. There are</p>	<p>The discussion paper is premised on the need to integrate wind in a FEOC manner while maintaining grid reliability. The AESO understands the generation fleet within Alberta has diverse operating characteristics that must be recognized while preserving a level playing field for competitors within the electricity market.</p>

	<p>many examples from our interpretation of the discussion paper and one is provided for context. For example Section 4 Policy Coherence and Principles in describing Figure 1 (page unknown), states:</p> <p><i>Figure 1 presents a simple range of wind integration options that range from treating wind like load to treating wind like a traditional generator with a must offer must comply obligation.</i></p> <p>This is contrary to the suggested AESO high level principles appearing later in that same section (page unknown), notably principle #4 that suggests all generation should be treated fairly while recognizing unique characteristics. By this token it is problematic to suggest that wind generators must adhere to the obligation of “must offer must comply” – an onerous obligation that does not recognize the variable nature of wind and the benefits it brings to the power market. Further it does not appear to be aligned with FEOC principles, nor is it consistent with Alberta Department of Energy’s stated principle that market refinements not be detrimental to the development of renewable energy resources.</p> <p>As you are no doubt aware this was a fundamental issue that was discussed, negotiated and we assumed dealt with during the replacement of the 900MW threshold with the Market and Operational Framework (MOF) in 2007. At the time it was determined that because of the variable nature of wind power generation, a more appropriate interpretation for wind power producers would be “must forecast must comply”. CanWEA believes if this interpretation is not applied as previously accepted by AESO it will essentially render wind power generation uneconomic to offer wind in the Alberta market.</p>	<p>The figure represents a range of options for discussion. No one option has been identified as the long term direction at this point. All options will be considered against the principles identified in the paper as well as relevant government policy, regulation and legislation.</p> <p>Please see the AESO’s response to ENMAX on the must forecast must comply obligation for wind generators.</p>
CPC	<p>The ISO should not use standby reserves to manage wind ramps. Currently the triggers for activating standby reserves include; under forecast of active reserves by the ISO or the contingency of an active reserve provider. The ISO should not change its protocol for activating standby reserves to accommodate wind ramping events.</p>	<p>Contingency reserves are currently used to manage unexpected declines in generation. The AESO is developing a protocol to manage unexpected declines in wind generation in the most cost effective manner given existing tools. While the AESO acknowledges there are cost recovery issues to consider, it is worth exploring options that involve</p>

	<p>We do not support the use of ancillary services as a long term solution for integrating uncontrollable generation. Wind generators should have the option to firm their energy offers, either through a centrally procured product or through self supply. The technical requirements of the product may differ depending on the direction of wind ramping, however, there should be a market solution developed for firming wind. This product would not be an ancillary service, and the costs should not be attributed to load.</p>	<p>competitively procured ancillary services because they are part of the suite options available under the current market design to manage the challenges that the market will soon be facing.</p> <p>If a wind firming service is pursued in the second phase of the wind integration work, it will be appropriate to examine a minimum reliability standard for all generators. It is not FEOC to require a single fuel type to be firm yet all other generators are only 'relatively' firm.</p>
IPCAA	<p>The fundamental question that is not addressed adequately is "Who is responsible for impacts on reliability?" The AESO takes the view that it is a ratepayer responsibility; therefore, all costs related to wind reliability impacts on the system flow to the ratepayer. It is IPCAA's view that the responsibility for the reliability impacts of wind generation accrues to the wind generator and therefore they should bear the costs. Wind developers are in a much better position to manage these impacts than end users are. The responsibility should lie with the party that is in the best position to manage the impacts.</p> <p>The proposed solutions presented by the AESO all socialize the risks associated with wind generation and charge them to ratepayers with no commensurate benefits.</p> <p>The solutions also result in an un-level playing field for other (nonwind) generators, in that these other generators provide a more reliable product with no associated compensation.</p> <p>IPCAA is concerned that no analysis was conducted about consequences of using Wind Power Management versus additional Ancillary Services. Why is it assumed that minimal WPM "lost opportunity costs" would be applicable to wind generators, whereas considerable additional AS would be required?</p> <p>The numbers for additional AS costs should be examined. No mention was made of the key differences between wind procuring</p>	<p>The AESO is seeking a solution that integrates wind generation in a FEOC manner. A solution that does not recognize that existing market participants rely on 'socialized' ancillary services to maintain reliability is not fair across generator types. However, the AESO acknowledges that wind generators must bear some of the costs associated with their operational characteristics in order to maintain a level playing field.</p> <p>Only incremental ancillary services would be charged to ratepayers. The wind power forecast and WPM are costs borne by wind developers, and the use of EMMO results in costs and benefits to all market participants through the spot market price.</p> <p>There is not currently a direct price signal for generation reliability, although generators only receive revenue when they are available and providing energy or a service. This is true for all generators, including wind power facilities.</p> <p>The AESO will provide incremental information on the amount of WPM expected under different assumptions in the Recommendation Paper.</p> <p>If a wind firming service is pursued in the second phase of the wind integration work, it will be appropriate to examine a</p>

	<p>AS in order to offer firm supply, and the AESO socializing the cost of AS. If wind procures their own AS for the purposes of submitting firm offers, this supply could be offered back to the market during high price events. If additional AS is procured by the AESO, it would still be held in reserve during high price events.</p> <p>IPCAA believes that having the AESO procure additional AS to accommodate wind, and having load pay for this additional AS is unacceptable, even in the short term. If this practice establishes a principle in the short-term it will set a dangerous precedent in the long-term. Instead, the AESO should set the reliability bar at a high level – then require all generators to meet this level. Since wind generation is unable to offer firm supply, wind generators should arrange their own reliability support services.</p> <p>IPCAA requests confirmation that the AESO has the authority to procure Ancillary Services beyond the levels specified by WECC.</p>	<p>minimum reliability standard for all generators. It is not FEOC to require a single fuel type to be firm yet all other generators are only ‘relatively’ firm.</p> <p>The AESO has discretion to procure incremental ancillary services beyond WECC minimum levels to meet operational challenges. WECC levels are minimums.</p>
TransAlta	<p>TransAlta would like to have “reasonably controlled” as used in Principle 5 defined in the context of wind integration. What is reasonably controlled in terms of magnitude and time for a system event before ancillary services may be used? If this is to be used as a principle it should be defined beyond just Wind as Ancillary Services are used for managing the supply demand balance, not simply the variances associated with Wind. At a minimum we would suggest “reasonably controlled” be changed to “reasonably forecast”.</p> <p>Principle 4 defines how wind is treated in comparison to other generators. Can the AESO clarify how this relates to Principle F in the Supply Surplus rules: “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. TransAlta would suggest that this principle add in “unduly penalizing” to the definition rather than just “favoring”.</p>	<p>Reasonably controlled, in the context of wind integration, means events that cannot be avoided through operator intervention. Wind ramp up events can be reasonably controlled at facilities with the appropriate controls in place.</p> <p>The principles reflect the same concept. Rules are not necessarily obligated to be identical across generator types, but rules must reflect fairness across generator types that have different characteristics.</p>

	<p>TransAlta believes that there are inconsistencies between the principles for Supply Surplus and Short Term Wind Integration and that they need to be aligned and potentially made the same rather than creating different inconsistent principles for each separate initiative.</p>	<p>The AESO will review these principles but is not aware of inconsistencies.</p>
<p>MEG</p>	<p>MEG Energy Corp. (“MEG Energy”) supports the AESO identified principles for the integration of wind to Alberta’s interconnected system with minor adjustments as provided below:</p> <ul style="list-style-type: none"> • Any potential suite of wind integration tools <u>must not adversely impact</u> the safe and reliable operation of the system. Wind integration tools cannot ensure the safe and reliable operation of the system but do need to ensure that, when employed, they do not adversely impact the safe and reliable operation. • Market solutions are preferable to administrative solutions. • The energy market merit order is primarily a tool for balancing energy requirements on the system. • All generation should be treated fairly while recognizing their unique characteristics. • Ancillary services are a tool to protect the system from events that cannot <u>be reasonably anticipated and planned for.</u> • <u>To the greatest extent possible, costs of wind integration mechanisms should be allocated on a cost causation basis.</u> <p><u>Wind integration tools should be consistent with, and promote, a FEOC market.</u></p>	<p>The AESO agrees that wind integration tools should be consistent with a FEOC market and the principles articulated in the paper reflect this approach.</p> <p>The AESO notes that scope for allocating costs on a causation basis must be consistent with fair and equal treatment across different types of generators.</p>
<p>Suncor</p>	<p>Suncor recommends the following principles underlie the consideration, and determination of wind integration tools in the short and long term:</p> <ol style="list-style-type: none"> 1. Any potential suite of wind power integration tools must not adversely impact the safe and reliable operation of the system. Wind power integration tools, by themselves, cannot ensure the safe and reliable operation of the system. 2. Market solutions are preferable to administrative solutions. 	<p>The AESO agrees that wind integration tools should be consistent with a FEOC market and the principles articulated in the paper reflect this approach. The AESO also agrees that rules should be consistent.</p>

<p>3. The energy market merit order is primarily a tool for balancing energy requirements on the system.</p> <p>4. All generation should be treated fairly while recognizing their unique characteristics.</p> <p>5. Ancillary services are a tool to protect the system from events that cannot be reasonably controlled.</p> <p>6. Wind integration tools should be consistent with, and promote, a FEOC market.</p> <p>7. Rules and operating policies and procedures that address the integration of wind power to the interconnected system should be consistent with other rules and operating policies and procedures that impact wind power.</p> <p>In light of these principles, Suncor recommends the following:</p> <ul style="list-style-type: none"> • Release to all market participants, on a facility by facility basis, the wind related data from the two year pilot. The release would include both the forecast data and the actual data from the pilot period. This would allow the AESO and market participants to engage in an informed discussion about the merits and capability of wind power forecasting on both an aggregate and facility basis and determine the ability of wind forecasting to support a must offer, must comply obligation for wind. • Establish a requirement to forecast wind power – this is consistent with all 7 identified principles above. An analysis of the pilot data would suggest whether forecasting is most effective on a facility or an aggregate basis. • Do not institute a must offer, must comply obligation on wind generation facilities. Given the unique and distinct nature of wind generation, it would be unduly discriminatory to require wind to comply with dispatch instructions or to stay within the permissible dispatch tolerance; requiring wind generation facilities to forecast facility output and turbine availability is a reasonable and fair alternative to a must offer, must comply obligation. <p>A review of the pool rules indicates that the term “must offer, must</p>	<p>This data is confidential and owned by the wind facility owners and the AESO does not have access to site specific information from the pilot project. The AESO was only provided with the aggregate wind power forecast from the existing facilities as part of the pilot project.</p> <p>This requirement is being developed in the wind technical rule based on recommendations from the wind power forecasting pilot project work group recommendations. The forecasting pilot project determined that an aggregate wind power forecast is more reliable than a site specific forecast.</p> <p>Please see the AESO’s response to ENMAX in section 4.0 on must offer must comply requirements for wind.</p>
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	<p>comply” is not defined. It is important that the AESO define the term so that all pool participants understand and use it consistently.</p>	<p>Must offer must comply is not explicitly defined. Rule 3.5.3 is the ‘must offer’ component, and Rule 6.6 is the must comply component.</p>
Solas	<p>The issue appears to be ACE mitigation rather than an issue that is caused by wind. Wind appears to contribute at most to 25% of the ACE issues that were indicated by the simulator. Therefore the section 4.0 should be rephrased to discuss ACE as an issue rather than the paradigm that Wind Integration is the issue.</p> <p>Item 1.0 In general, any suite of tools used to mitigate ACE issues must ensure the safe and reliable operation of the system. This should not be stated as wind integration specifically.</p> <p>Item 5 indicates that AS is used to protect the system from events that cannot be reasonably controlled. There is no mention of what is reasonable and from whose perspective is it reasonable.</p> <p>It is unclear if the AESO has tuned the forecasting model to focus on events that create ACE issues, without this clarity, it is difficult to comment specifically on the paper. Unfortunately during the forecasting pilot, the forecasters were not specifically asked to tune their models on any one particular issue. I recommend that if wind ramping creates some of these issues, then perhaps the forecasting could be tuned to these issues specifically.</p>	<p>Wind is the primary cause of the ACE problem about 25% of the time, as noted. However, upon in depth review of the "other" category events and expanding on the contributors to the tie and load events in table 1 of the paper it is noted that wind (including wind forecast error) is a contributing factor in approximately 90% of the events in the base case.</p> <p>Reasonably controlled, in the context of wind integration, means events that cannot be avoided through operator intervention.</p> <p>The forecasting model provides a range of forecasts over a variety of timeframes. The AESO expects to gain experience over time as to which specific forecast is the most beneficial in integrating wind power.</p>
UCA	<p>All of the principles as general statements are reasonable, but aside from (1), judgment must be applied in their application and should not be considered absolutes regardless of cost or consequence.</p> <p>The UCA considers that the discussion paper provides an excellent description of the challenges of successfully integrating larger amounts of wind generation, and potential operating solutions to address those challenges. The analysis of costs and consequences is not necessarily complete, however, in particular with regard to the issue of “over-dispatching” the EMMO.</p>	<p>The cost of over-dispatching EMMO is difficult to estimate because it is driven by offer behaviour and the point in the merit order prior to the ramping event. The AESO also has concerns that the practice would have reliability impacts as well as price impacts that are not consistent with the concept of a FEOC market. Please see the AESO’s response to ENMAX in section 4.0 for further discussion.</p> <p>Confirmed – the AESO is primarily referring to operating reserves.</p>

	(Also, it is assumed that the reference to ancillary services in (5) refers specifically to operating reserves, not the “other ancillary services” that the AESO acquires.)	
ATCO	<p>The AESO currently will not approve a generation facility if it cannot be reliably integrated to the grid; this principle should hold for wind facilities as well.</p> <p>Therefore ATCO Power would like to add the following principle:</p> <p>Additional generation should not be approved if it cannot be reasonably accommodated by the Alberta Interconnected Electricity System (AEIS). Any approvals should be dependant on there being no additional risk of operational problems.</p> <p>ATCO Power is of the view that any addition of generation to the AEIS should be contingent on proper integration measures. The AESO should not prematurely approve new facilities if the system cannot yet handle the variability.</p>	<p>Wind facilities are not connected if they cannot be integrated into the grid at the interconnection point. The wind integration program is focused on the need to manage the aggregate wind production.</p> <p>This principle could be interpreted as a threshold on wind capacity, and the AESO does not believe a threshold on wind capacity is appropriate.</p> <p>The AESO plans to have integration measures in place prior to the wind capacity coming online.</p>
TransCanada	The energy market merit order should be used for energy balancing only, not ramping. Ramping is an ancillary service which should be contracted for separately and not conscripted for free by “over-dispatching” generators.	<p>Currently the energy market merit order is used for both ramping and balancing and has been for some time. As indicated, the AESO has both reliability and market impact concerns with over dispatching the EMMO because the issues associated with operating in this manner are expected to be exacerbated in the near future due to the increased variability associated with wind energy. Please see the AESO’s response to ENMAX in section 4.0 for further discussion.</p> <p>As a result of these concerns, the AESO is exploring a ramping service as a potential market enhancement.</p>
AltaLink	In general, AltaLink supports the principles outlined in the AESO discussion paper.	Acknowledged.

5.2 Short Term Analysis

Stakeholder	Stakeholder Comment	AESO Response
CanWea	<p>The discussion paper assumes that the predictive simulation model used by AESO is effective and accurate in forecasting the Area Control Error (ACE) events that may occur with additional wind power. The current simulation as presented was unable to accurately predict the 2008 actual events. Table 2 indicates that the simulation model resulted in a 50% over prediction of ACE events.</p> <p>It is CanWEA's request that the simulation model be calibrated to ensure that it more accurately predicts each of the 2008 actual ACE events. The paper does not reveal what production profile was assumed by the additional wind power developments and if it is representative of the appropriate wind power production profile. Until this calibration is completed and the appropriate wind production profiles have been used, it is difficult to comment on the specific areas identified in the comment matrix.</p> <p>Given that additional generation is now being developed outside of traditional areas this may serve to mitigate the issues that the AESO is presenting in this discussion paper. This concept was described specifically as part of the MOF documents in 2007. It has been demonstrated in a number of jurisdictions that geographic diversity is beneficial in addressing such issues and it would be useful to understand if the analysis of the various ramping events highlighted in the discussion paper compensated for geographic diversity when increasing the amount of installed capacity. In addition, the consideration of exports, and how these will serve to address significant wind events was not evaluated.</p> <p>The discussion paper also implies that wind power on the system is the primary cause of ACE events and the unreliable operation of the grid. However, the AESO's data show that ACE events are more likely to be caused by Load, Tie or Other events outside of significant wind events. Table 1 of the discussion paper indicated</p>	<p>The model is accurate enough to provide directional results. The intent of the analysis is to demonstrate that 1100 MW of wind capacity provide operational risks that must be managed and to evaluate the efficacy of potential solutions. This is consistent with previous AESO studies that indicated operational issue escalate when wind power development exceeds 900 MW.</p> <p>If experience determines the problem is less than anticipated due to the issues identified, the suite of solutions developed should be capable of adjusting to the actual conditions, i.e. less reserves will be required and less WPM will occur.</p> <p>Wind is the primary cause of the ACE problem about 25% of the time, as noted. However, upon in depth review of the "other" category events and expanding on the contributors to the tie and load events in table 1 of the paper it is noted that wind (including wind forecast error) is a contributing factor in</p>

	that wind power was responsible for 67 of 258 events or 26% of all events. We recommend that all causes be investigated and taken into account when looking for solutions to ACE events. Expecting wind power management and control measures to address all events is unrealistic and unfair to this generation source, particularly in light of the fact that nearly ¾ of all events were caused by something other than wind.	approximately 90% of the events in the base case. Wind power management is not being contemplated for use in events where wind is not a contributing factor. If wind is not ramping up during an over generation event, it would not be FEOC to curtail wind. In these instances, wind power management would be a last resort equivalent to emergency directives given to other generators in order to maintain reliability.
ENMAX	This suggests that the model is not yet accurate enough to reliably estimate the number of future events. Further calibration appears warranted.	The model is accurate enough to provide directional results. The intent of the analysis is to demonstrate that 1100 MW of wind capacity provide operational risks that must be managed and to evaluate the efficacy of potential solutions.

6.1 Short Term Wind Integration Tools – Energy Market Merit Order

Stakeholder	Stakeholder Comment	AESO Response
NaturEner	<p>Energy dispatch is already the market tool used for handling variation. It is the most economical way to cover a majority of the transient ramps. The power pool will be able to see when an up or down ramp is approaching through the use of wind graphs and adjust for it, in advance. Better predictability in the wind energy forecasts due to improvements in the wind level forecasts will result in increasing confidence in the usefulness of EMMO and reduced market volatility. An overriding consideration must be that wind energy resources be able to comply with controllable up-ramp rate caps (instead of using a merit order) that will necessarily control the up-transient to match the responsiveness and capacity of the ancillary services. However, only extreme transients would be expected to result in an actually constrained up-ramp rate.</p> <p>If the EMMO is implemented for wind energy resources, it must include all wind energy sources, and not exempt small wind energy sources to ensure it does not result in “an uneven playing field.”</p>	<p>A principled approach that incorporates the available tools (EMMO, ancillary services, WPM and the wind forecast) is being developed. This will allow wind to be accommodated on the system in a fair and transparent manner.</p> <p>The AESO believes the ramp rate inherent in normal EMMO dispatches will be sufficient in most cases, and the wind power forecast will increase the ability of the system to absorb wind through the EMMO.</p>

	<p>1. It is likely that if a situation is deemed contrary to FEOC principles by one customer class, it is to the detriment of another. Handled and calculated properly through the analysis of comprehensive data sets, it is likely that nearly every instance when this practice could be deemed contrary to FEOC principles could be avoided.</p> <p>2. If the need can be ascertained prior to real time, incremental products and dispatching techniques should be used in place of an inefficient use of EMMO. Handled properly this would eliminate the need to even consider WPM.</p> <p>3. NaturEner would encourage the AESO to develop Ancillary products and procure those, with the clear purpose to balance the the system in a comprehensive manner.. NaturEner also suggests including dynamic and intra hour products to further eliminate the need for WPM.</p>	
ENMAX	<p>As noted above, ENMAX agrees that the energy market merit order is primarily a tool for balancing energy requirements on the system. For this and other reasons (such as operational efficiency), the creation of a new, market-based ancillary service to manage ramps is a better long-term option than over-dispatching the EMMO.</p> <p>ENMAX does not agree with the AESO's assertions that "over dispatching the merit order has not created issues historically" or that "over dispatching is consistent with the energy only market design that is in place today." Among other things, over-dispatching the EMMO increases SMP volatility, causes additional wear and tear on generators that are dispatched on-again/off-again, and masks the true value of ramping capability (i.e., it undervalues flexible generation as compared to baseload generation).</p> <p>ENMAX notes that, while wind is a significant contributor to ramping requirements, it is not the only contributor. Care must be exercised in developing new tools to ensure that wind is required to contribute neither more nor less than its fair share. For example, wind power management should be used to manage the</p>	<p>Over dispatching has an impact on the SMP and results in more frequent dispatches, and any associated costs, for generators. Price responsive load is also impacted by price volatility created by ramping needs. A ramping service is being explored as a market enhancement, noting that the concerns associated with over dispatching will become more prevalent as the variability on the system increases.</p> <p>The AESO agrees that this is a key element of a FEOC market.</p>

	<p>variability that wind imposes on the system, but not the variability that load and other generators impose on the system.</p>	
<p>CPC</p>	<p>The energy market merit order should only be used to set price. In principle it is inappropriate to use the energy market merit order to manage ramp rates. Over-dispatching of the energy market merit order should only be used to manage unforeseen and unpredictable events. To the extent that an over-dispatch of the energy market merit order can be avoided through the use of other mechanisms such as wind power management or ancillary services it should be.</p> <p>As stated in the above principles, ancillary services are a tool to protect the system from events that cannot be reasonably controlled (emphasis added). There are a number of different types of generating technologies in Alberta that generate power, and the energy produced can be classified as either controllable or uncontrollable. Historically ancillary services have been procured to increase the reliability of the electric system by backstopping what is typically controllable energy. Capital Power sees this product as something very different from a product that is procured with the intention of making uncontrollable resources controllable.</p> <p>Until such time that wind is able to declare their offers as firm, we support the use of wind power management to curtail uncontrollable forms of energy to manage system disturbances prior to curtailing controllable energy. Capital Power understands that wind power management can only be used to curtail wind resources as they are ramping up and therefore does not offer a complete solution for managing uncontrollable resources. We recognize that the ISO has very few options for integrating wind in the short run and we believe that the energy market merit order should not be used to manage the ramp rates of uncontrollable resources. Therefore, the only alternative appears to be the procurement of ancillary services to manage the ramp rate of wind resources that cannot otherwise be managed via wind power management until such time a wind firming service can be</p>	<p>The EMMO supplies ramp rate by nature. The difficulty is that 'over dispatching' is often only apparent after the fact given that there is a significant amount of uncertainty inherent in the system. Over dispatching may occur in the operational timeframe as a result. Nonetheless, it is not a desirable solution to plan on over dispatching the EMMO as a matter of course.</p> <p>The AESO agrees that ancillary services are a tool to protect the system from events that cannot be reasonably controlled. The distinction between controllable and uncontrollable generation is noted, but it is not clear that there is a basis for this distinction in Alberta's market framework.</p>

	<p>developed.</p> <p>Ultimately wind resources should have the opportunity to firm their offers, either through self supply or via a centrally procured firming service. Should wind chose to firm their offers, they should be treated the same as all other forms of controllable generation (e.g. ability to price into the EMMO) and therefore should not be curtailed via wind power management. Alternatively, if wind chooses not to firm their offers, then wind generated energy should be curtailed prior to controllable forms of generation in the event of a system disturbance.</p>	
IPCAA	<p>IPCAA is strongly opposed to using the EMMO for wind integration. The EMMO is imperfect to begin with – it should not be further obscured by manipulation of the merit dispatch to accommodate wind generation.</p> <p>Even in the short-term, we need to establish fair principles. Temporary solutions have an uncanny way of becoming long-term solutions, and as such we should not settle for another market band-aid when it comes to wind integration.</p> <p>The AESO has provided insufficient analysis in the discussion paper to allow market participants to decide if over-dispatching is “viable” temporary position. A cost-benefit assessment should be conducted in advance of any decision-making.</p> <p>“Ancillary services” as they are currently defined, are paid by ratepayers. In the long-term, AS-like products could be developed to address current problems. However, these products do not need to be paid for by loads.</p>	<p>EMMO will be used to accommodate wind energy in that it balances supply and demand on the system. However, the AESO does not view ‘over dispatching’ EMMO as a desirable wind integration tool except when absolutely necessary.</p> <p>Principles should guide the overall wind integration effort.</p> <p>The analysis in the paper highlighted that over-dispatching EMMO is a reliability concern, and as noted by many stakeholders, is also a FEOC concern in that it impacts the SMP and results in more frequent dispatches for generators.</p> <p>The AESO recognizes that cost allocation is an important issue.</p>
TransAlta	<p>Over ramping the energy market merit order is a “Free” ancillary service to the Alberta System. Given supply and load has to balance then over dispatch must mean that partial blocks are being dispatched. It would also seem probable that the higher priced blocks come from gas-fired and Hydro generation, the</p>	<p>The AESO is exploring a ramping service as a market enhancement.</p>

<p>blocks with higher ramp rate capabilities. The ramp rate of these facilities is really what the AESO is after when they are over dispatching the EMMO. Thus we believe there are better ways to achieve this end.</p> <p>We accept that occasionally the AESO may be in a situation where they may need to employ over dispatch to insure system reliability. Tools such as incremental ancillary services should be used before EMMO over dispatch if the need can be anticipated. However these ancillary services should not be dispatched in advance of a potential problem but when it is actually occurring. This would allow for better price signals in the market. Incremental ancillary service should be used before Wind Curtailments.</p> <p>The information in this section on use of the EMMO is limited and should be expanded so that participants can understand the extent of the current and forecast problem. Specifically can the AESO provide information on the extent to which the EMMO has been over dispatched to manage Wind Ramps in the past few years. Further can they provide the extent of the impact on the pool price and duration of each event.</p> <p>TransAlta would like to know how often EMMO over dispatch would be used? How many MW's? For what duration in time? Price impact?</p> <p>In the long term the AESO should look at procuring new types of Ancillary services to manage fast changes in demand or supply. We believe the AESO needs to consider sending out a price signal for a units ramping capability. This may be as simply as creating two levels of ancillary services where participation is determined by a minimum ramp rate capability. Does the AESO currently use ancillary services in a manner that recognizes the different speeds units are able to ramp or are they using an average ramp rate across all they have procured? If it is an average, it is not an efficient tool to manage fast ramps or declines. Whether these are cause by load or generation or Wind specifically is irrelevant. Thus we believe the AESO should</p>	<p>To the extent the incremental ancillary services are available and acceptable for wind integration, they would be dispatched prior to over dispatching EMMO and/or WPM.</p> <p>Any new products will be subject to the full consultation process and a competitive market solution is the desired outcome.</p>
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	<p>consider procuring two levels of reserves. The first could be called a “base” reserve service which would require a lower ramp rate service. Then the AESO could procure a faster ramp service for events that require this. These events are caused by the volatility of both load and generation, not just Wind. Procurement of this faster ramp service would put the AESO in a better position to manage these fast ramps and declines in a more efficient and least cost manner.</p> <p>New ancillary services should be developed in order to better meet the ramping needs of wind and load. TransAlta believes that the development of new Ancillary Services needs to go through a consultation process to ensure that it complies with FEOC, there will be at least three providers of the service in order for the market to be competitive.</p>	
MEG	<p>In light of the principles identified in section 4.0 above, MEG Energy suggests the following:</p> <ul style="list-style-type: none"> • The AESO institute a must offer, must comply requirement for wind (supported by a wind forecast). Must offer, must comply obligations could be managed through both wind power management services and “wind firming” services which could be procured in a centralized or decentralized manner. A must offer, must comply obligation for wind would be consistent with the following principles: <ul style="list-style-type: none"> ○ Any potential suite of wind integration tools must not adversely impact the safe and reliable operation of the system. Neither of wind power management or wind firming services would adversely impact the safe and reliable operation of the system; in fact, these services would enhance the safe and reliable operation of the system. ○ Market solutions are preferable to administrative solutions. Reliance on over-dispatching the EMMO to manage the variability of wind generation is a quasi-administrative solution. The over-dispatched units’ offers were most probably premised on being 	<p>This is consistent with option 3 identified in the paper as one potential long-term wind integration approach.</p>

	<p>dispatched for energy and not premised on being dispatched, up and down, to manage the variability of wind. The AESO, in directing the units to ramp up and down to respond to wind variability, is employing a quasi-administrative solution.</p> <ul style="list-style-type: none">○ The energy market merit order is primarily a tool for balancing energy requirements on the system. As the AESO stated in the discussion paper, “The EMMO supplies ramp rate to the market by its nature, but persistently dispatching multiple units for short periods to achieve a higher system ramp rate results in impacts to generating unit operators, price responsive load and other market participants. While EMMO may be dispatched in this manner on an as needed basis, <u>it is not a desirable practice.</u>” [emphasis added]. Units that are prepared to be frequently dispatched for short periods and incur impacts to the facilities can offer into the wind firming service market.○ All generation should be treated fairly while recognizing their unique characteristics. A must offer, must comply obligation would be applicable to all generation supply thereby leveling the competitive field.○ Ancillary services are a tool to protect the system from events that cannot be reasonably anticipated and planned for. With the commencement of wind forecasting, the variability of wind can be reasonably anticipated and managed through the use of both wind power management and wind firming services as appropriate.○ To the greatest extent possible, costs of wind integration mechanisms should be allocated on a cost causation basis. The costs of both wind power management and wind firming services would be allocated to wind.○ Wind integration tools should be consistent with, and promote, a FEOC market. A must offer, must comply obligation for all generation supply would be consistent	
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	<p>with, and promote, a FEOC market.</p> <p>In both the short term and the long term, tools such as wind power management and wind firming services should be used in place of over dispatching EMMO or procuring additional ancillary services to manage the variability of wind.</p>	
Suncor	<p>In light of the principles identified and recommendations proposed in section 4.0 above, Suncor suggests reliance on the EMMO to manage the variability of wind power would violate the following principles:</p> <ul style="list-style-type: none"> • Market solutions are preferable to administrative solutions. Non-wind generation submitted offers on the assumption that the facility would be dispatched for energy. Using the EMMO to manage the variability of wind power is a quasi-administrative tool. In relying on the EMMO to manage the variability of wind the system controller is dispatching facilities on the margin based on offers submitted for a different purpose. • The energy market merit order is primarily a tool for balancing energy requirements on the system; it should not be used to manage the variability of wind power in the long term. • All generation should be treated fairly while recognizing their unique characteristics. A reliance on EMMO to manage the variability of wind power requires persistently dispatching units for short periods of time to achieve the desired system ramp rate; this has adverse impacts on the dispatched generating facilities, which is not consistent with fair treatment. 	<p>EMMO will be used to manage a change in supply demand fundamentals due to changes in wind generation levels. However, the AESO has concerns around over dispatching EMMO, as noted. Please see the AESO's response to ENMAX in Section 4.0 for further discussion.</p>
Solas	<p>In other markets the concept of over-dispatching is completed outside the merit order so that there is little impact on the pricing and associated volatility. It is unfortunate that the market design in Alberta has resulted in a merit order that is so dramatic, with a significant portion of the merit order as zero bidders, and the remainder at significantly higher pricing.</p> <p>Has there been any thought to potential alternative market design parameters that would provide a more gradual merit order?</p>	<p>A ramping service is being considered as a market enhancement. Wholesale market redesign is beyond the scope of the wind integration program.</p> <p>EMMO will be used transparently and fairly to manage supply and demand balance. The EMMO will be the first and primary tool to balance the system, and available ancillary services will be dispatched prior to WPM. The AESO is proposing to limit the use of over dispatching the EMMO (i.e. do not plan to</p>

	<p>As indicated previously, without tuning the forecasting model to focus on ACE causing events from wind power, it is difficult to know how much could be forecasted and potentially avoid the use of over-dispatching EMMO.</p> <p>It is interesting that the use of EMMO is not being contested in the use of ACE events that are not generated by wind power, and the focus appears to be only on EMMO usage for wind power ACE events. How does this match with the principles of FEOC?</p> <p>Again, the issue is ACE events, rather than wind power ramping. EMMO should be used transparently for any ACE causes, and there should not be discrimination between wind caused versus other causes. It is often difficult in the moment to determine which events were wind caused rather than from other causes. It is unfortunate that wind power management is being considered as being used in all ACE events, but EMMO is only being considered for non-wind events. Again how does this match with the principles of FEOC?</p>	<p>over dispatch) due to market and reliability concerns. As a result, over dispatching the EMMO is proposed to be the final action in balancing the system.</p> <p>WPM is not being considered for use in controlling ACE events where wind is not a contributing factor. For example, if the system experiences an over generation event but wind energy is flat or declining, it would not be appropriate to reduce wind energy.</p>
UCA	<ol style="list-style-type: none"> 1. There does not appear to be sufficient data presented to make a determination of how much over-dispatching is “too much”. This analysis appears necessary for trade-offs against additional ancillary services. 2. Regarding additional ancillary services please refer to (1). Regarding WPM, the UCA understands that WPM would only be effective under certain circumstances, but in those circumstances, should be considered. 3. New services should be explored. However, their cost effectiveness should be considered before proceeding with implementation. 	<p>The AESO will work to develop a transparent framework for EMMO dispatch in the event that a ramping service is developed.</p> <p>WPM is primarily effective when wind is ramping up. New services will be fully consulted on with industry if developed.</p>
ATCO	<p>ATCO Power does not consider the degree to which the EMMO vs. AS is used to manage ramp rate is necessarily a FEOC issue and feels that a range of potential outcomes could satisfy FEOC. We are nevertheless very interested in establishing a transparent procedure that governs how the EMMO and AS will be used especially in light of proposals to increase the volume of AS</p>	<p>The AESO is developing a transparent process to manage between different wind integration tools.</p>

	purchased and feel that developing a clear understanding of this is supportive of a FEOC market. We therefore encourage AESO to hold a wider discussion on the relationship between the EMMO and AS.	
TransCanada	<p>TransCanada does not believe there is any legislative or regulatory justification for over-dispatching generators to conscript ramping capability and that in principle it is contrary to FEOC. Incremental ancillary services should be developed and utilized rather than over-dispatching EMMO.</p> <p>New ancillary services to provide the fast ramping capability that the system requires (for wind events or other system and market conditions) should be developed and implemented in the short-term and not be held off for the long-term.</p>	<p>The AESO disagrees with this interpretation and notes that 'over dispatching' is an undefined term that relates to a dispatch of short duration that is necessary to balance the system. However, a ramping service may result in desirable market improvements, and the AESO is exploring ramping service in this context.</p> <p>The timeframe for new ancillary services will not meet the need to integrate 1100 MW of wind on the system in the next year.</p>
AltaLink	AltaLink encourages the AESO to develop new ancillary services in order to reduce over dispatching EMMO for ramp rate. It is AltaLink's view that an appropriately defined new ancillary service product would enable cost-effective technologies and solutions to address ramping rate issue for wind and other reasons.	Acknowledged.

6.2 Short Term Wind Integration Tools – Regulating Reserve

Stakeholder	Stakeholder Comment	AESO Response
NaturEner	<p>1. The primary objective of the wind integration plan is to provide as much diversity, flexibility, and responsiveness into the market as is possible. Active Regulating Reserve should be optimized and as efficiently deployed as possible. If doing this DA proves to be more efficient, it should be done. Proper portfolio forecasting should demonstrate levels that should be procured DA.</p> <p>To minimize the need of these day-ahead transactions, NaturEner supports the standardized production forecasting tool to be implemented across the Province to maintain quality and consistency in generation forecasting. The collection and distribution of the forecast data does need to respect the proprietary nature of the information. The AESO should look to</p>	<p>The AESO now has several months of wind forecast data that suggest day ahead purchases of regulating reserve is not efficient. The wind forecast is not yet accurate enough to justify purchasing additional reserves on a day ahead basis.</p> <p>The wind technical rule creates equipment and facility requirements for wind power forecasting.</p>

	<p>create incentives for wind to be as precise as possible with their individual forecasting efforts.</p> <p>2. Today's marketplace provides a number of very good examples of comprehensive solutions to the integration of wind. The AESO needs to align its market and dispatching methodology to leverage these practices within the Alberta system. A portfolio of dynamic and intra hour products, deployment of reserve pools, better forecasting and diversity tools, as well as the proper acquisition and deployment of traditional reserve products provides for a much more efficient and effective management of balancing needs.</p> <p>a. Taking into account the above, done properly, the full potential output of properly forecasted generation can be accommodated.</p> <p>b. Again by taking a more comprehensive approach to the balancing portfolio this 'trade off' scenario can likely be mitigated, however, if considering this approach the AESO needs to be respectful of the comprehensive value of the lost production for all facilities.</p> <p>c. There is the potential to mitigate this exposure through the use of some dynamic products as well as more comprehensive and accurate forecasting.</p> <p>3. Please see the comment above concerning day-ahead RR. measures, in the longer-term, such as Dynamic Scheduling System, Intra-Hour Scheduling, reducing the two-hour scheduling requirement, etc. should be considered to mitigate the cost of the reserves needed to alleviate ramping issues. NaturEner believes that the AESO needs to continue its efforts to better align the AIES with surrounding jurisdictions to leverage the inherent reliability and operational benefit.</p> <p>4. In the long-term, NaturEner supports the deployment of a holistic portfolio of reserve tools. This can be inclusive of the use of both load following and AGC products. NaturEner has as a wind-only Balancing Authority and continue to successfully integrate our wind production without the inherent benefits of a larger 'system' approach, which is available to the AESO.</p>	<p>These tools cannot be developed in the timeframe required but form part of the available options for the overall wind integration program.</p> <p>The AESO is exploring these issues as part of the inertia initiative.</p> <p>The AESO is actively monitoring developments in other markets and recognizes that load following products are a tool</p>
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		that has been identified as a wind integration tool in many markets.
ENMAX	<p>Procuring regulating reserve over and above normal volumes, if required for no other reason than to accommodate an anticipated wind ramp, violates the principles of fairness and economic efficiency. Fairness between wind generators and loads suggests that, if wind generators are not expected to deliver when the wind is not blowing, load should not be expected to consume all wind volumes just because the wind is blowing. Efficiency suffers because economic decision-making is made more difficult, if not impossible, by the separation between those causing costs to be incurred and those who are required to pay those costs. An effective solution to both issues is to have wind adhere to MOMC-like requirements through market-based “firming” agreements with dispatchable generators, coupled with asset substitution. An additional requirement is an electricity policy that correctly incorporates the principle of cost causation.</p> <p>In the absence of firming arrangements, wind power management should be used to keep regulating reserve requirements within the normal range. Wind power management should also be used to avoid having to dispatch up the EMMO.</p> <p>ENMAX believes that, over the long term, it would make sense to split regulating reserve into a load-following product and an AGC product. However, comprehensive economic and operational assessments should be completed before any decision is made.</p>	<p>The AESO will develop a wind integration strategy that is fair and efficient. The use of ancillary services may form part of the overall solution. A firming requirement for wind, in the absence of a standard for all generators, is not consistent with a FEOC market.</p> <p>This option is being explored, with the note that WPM is primarily a tool that would avoid the need to over- dispatch down the EMMO to accommodate a fast ramp up of wind power production.</p> <p>The AESO will explore this option as the wind integration program progresses.</p>
CPC	As discussed above, it is not appropriate to procure ancillary services to make wind generation controllable; wind resources should be given the option to either firm their energy offers or to accept a lower priority access to the transmission system in response to system disturbances. However, given the lack of tools in the short-run the ISO may need to procure additional regulating reserves to integrate wind generation. We do not	Please see previous response to CPC in section 6.1.

	<p>support the use of ancillary services as a long-term solution for integrating uncontrollable generation.</p> <p>The amount of regulating reserves procured should be based on the volume required to accommodate the forecast and the volume that is required to reliability integrate wind without relying on the energy market merit order. If the ISO is able to reduce the amount of regulating reserves that it procures through the use of wind power management it should do so.</p> <p>The ISO should not use standby reserves to manage wind ramps. Currently the triggers for activating standby reserves include; under forecast of active reserves by the ISO or the contingency of an active reserve provider. The ISO should not change its protocol for activating standby reserves to accommodate wind ramping events.</p> <p>We do not support the use of ancillary services as a long term solution for integrating uncontrollable generation. Wind generators should have the option to firm their energy offers, either through a centrally procured product or through self supply. The technical requirements of the product may differ depending on the direction of wind ramping, however, there should be a market solution developed for firming wind. This product would not be an ancillary service, and the costs should not be attributed to load.</p>	
IPCAA	<p>IPCAA does not support the procurement of any additional Regulating Reserves to mitigate wind volatility. In its wind integration report, the AESO provides a very misleading analysis of the added costs to acquire additional Regulating Reserves. The analysis ignores the costs of existing reserves being all raised to a higher price level if added reserves are procured – it ignores the impact on the costs for spinning and supplemental if more regulating is procured – and it ignores the consequences to prices for energy if additional regulating reserves are taking generating capacity out of the merit order.</p> <p>The AESO does not propose to release the Regulating Reserves back to the energy market in the event of high prices such as the</p>	<p>The impact to reserve costs was indicative only, as indicated in the paper.</p> <p>The historical offer curve was used to estimate the price and volume impact of additional regulation purchases, i.e. added costs of regulating reserves were estimated based on historical data. This data was included in the table.</p> <p>The estimate also assumed purchases for all hours, which would not occur with a wind power forecast that was accurate enough to shape purchases to at least some degree.</p>

	<p>May 14th to May 17th interval when wind generation was negligible and a coincidence of events resulted in multiple hours of prices in excess of \$200/MWh. If the AESO had acquired added RR on those days we would have seen higher RR and other OR prices, higher energy prices, and a valuable resource held in abeyance for an event that did not occur – i.e. more wind generation</p> <p>IPCAA believes that wind generators can manage their own risk by procuring market-based (“wind-following”) products that will allow them to offer firm supply. Under no circumstances should the AESO use Regulating Reserves as a socialized risk tool for wind generators.</p>	<p>The potential for inefficient use of reserve (purchases that were not required) is a key concern to the AESO. The current wind power forecast accuracy does not appear to justify day ahead purchases of regulating reserve to integrate wind power.</p> <p>These products cannot be developed in the near term, but wind following products will be explored as part of the wind integration program.</p>
TransAlta	<p>TransAlta believes that operating reserves are an important tool for balancing the market. Regulating Reserves should be procured Day Ahead when required to mitigate wind volatility.</p> <p>It is important to be able to integrate wind without sending false price signals, thus we should not rely on over dispatching the EMMO in situations when wind ramps can be anticipated. The volume of RR procured should reflect this.</p> <p>Standby RR should be activated in T-30 or as short a timeframe as possible to manage the system since it is important for system stability. Standby should be activated over the shortest timeframe required and the units chosen for activation should not already be dispatched in the energy market for it to be effective. Specifically reserves should not be activated in advance of a potential change in Wind or Load but rather be used to manage this situation once it occurs.</p> <p>In the long term RR should be split into a fast ramp and base ramp product. The fast ramp product could be used to manage both volatility in load, volatility in Wind production or volatility in any other type of generation production. This would allow for a more transparent market. A consultation process is needed to determine that a competitive market is achievable with at least</p>	<p>The current wind power forecast does not appear to be accurate enough to justify day ahead purchases of regulating reserves to integrate wind power.</p> <p>The AESO does not view over-dispatching the EMMO as a desired wind integration option.</p> <p>Standby RR is not being considered at this time.</p> <p>Changes to RR will be considered as part of the overall wind integration program. These changes cannot be implemented in the near term.</p>

	<p>three providers and that the services are procured in a fair and competitive manner. This would ensure that the products that are procured are only used for situations for which they were intended. Base ramp products would only be used to balance normal fluctuations in the system and the fast ramp products for other system ramp issues. This would result in the most efficient products managing the ramping issues at the least cost.</p> <p>TransAlta would like more information on how the AESO arrived at incremental costs in table 3. Specifically are these the estimated incremental cost of procuring an additional 30 MW's or was this based on an average procurement price. We'd like to better understand the key assumptions used to develop these numbers.</p>	<p>The table was calculated in two ways. First, the historical offer curve was used to estimate the price and volume impact of additional regulation purchases. Second, the volume impact only was estimated assuming no price impact, i.e. the average historical procurement price was assumed for the incremental purchases.</p>
MEG	<p>Given MEG Energy's detailed comments in section 6.1, MEG Energy will not comment further in this section other than to reiterate that MEG Energy does not support the use of ancillary services as a tool for wind integration in the short nor long term.</p> <p>However, if the AESO is querying whether it should procure different "classes" of operating reserve to meet its WECC obligation for ancillary services, then MEG Energy would support the classification of operating reserves requirements and procurement into fast ramping services and slow ramping services. Distinguishing between these two products may allow the AESO to procure and dispatch the "right" amount of ramp services thereby minimizing over-dispatch and its attendant impact on SMP volatility, maintenance costs for the ramped units and increased cost for load.</p>	<p>Please refer to the AESO response in section 6.1.</p> <p>The AESO is examining this option as part of the wind integration program, but the required changes cannot be implemented in time to accommodate the wind capacity expected in 2011.</p>
Suncor	<p>In light of the principles identified and recommendations proposed in section 4.0 above, Suncor suggests acquiring incremental ancillary services ("wind following services") to manage the variability of wind power would be appropriate and consistent with the identified principles. Wind following services could be comprised of both active and stand-by regulating and contingency</p>	<p>Cost allocation of any potential wind following service is an important element that will be examined during stakeholder consultation. The AESO will take a principled approach in these discussions and does not believe price impacts associated with wind energy are an appropriate consideration for the cost allocation decision.</p>

	<p>reserves.</p> <p>Since load benefits from the resultant downward pressure on system marginal price and pool price when wind power is available as well as the resultant cleaner environment, it would be appropriate for load to pay for the cost of wind following services.</p> <p>Suncor requests that the AESO provide adequate information to assist market participants in responding to the questions posed in section 6.2 – regulating reserve and contingency reserve.</p>	<p>The AESO will attempt to provide information to stakeholders as requested but is unclear what data is being requested.</p>
<p>Solas</p>	<p>If a generator of any kind forecasts that there may be fuel volatility, RR is acquired on a day ahead basis. Why would this be any different for wind power? Again, if the wind power forecast is tuned to specifically target these events, then this will provide improved forecast of RR requirements.</p> <p>RR should be determined based on the potential for ACE issues, rather than for wind specific issues.</p> <p>Unfortunately the paper does not review the costs (duration, time of day, season, and frequency) of these events so that a study comparing the alternative of AS versus EMMO could be completed. Perhaps a high EMMO for short duration, short frequency in low power pool price timeframes is more palatable than significant purchases of RR ahead of time. The report does not provide any basis for this comparison. Additional information is required for stakeholders to provide feedback.</p> <p>As with any ACE situation, RR should be used as required, when EMMO no longer has any potential to mitigate the situation.</p> <p>In addition, the simulation does not appear to be able to accurately predict the ACE events for the base year 2008. This is concerning since the simulation is predicting 50% more events than actual. If the simulation model is overpredicting, perhaps the number of ACE events in the three scenarios are also overpredicted. Efforts should be made to ensure that the</p>	<p>Regulating reserve is not currently acquired on this basis.</p> <p>Ancillary services, EMMO over dispatch and WPM will all have different costs at different times. The costs will also fall on different market participants. The AESO is taking a principle based approach in determining the balance between each potential integration measure.</p> <p>The model is sufficiently accurate to indicate that there will be system performance concerns with 1100 MW of wind on the system and that corrective measures are required. Current AESO experience with just over 600 MW of wind on the system is that operational challenges already exist. If experience determines the problem is less than anticipated, the suite of solutions developed should be capable of adjusting to the actual conditions, i.e. less reserves will be required and less WPM will occur.</p>

	<p>simulation is accurate within tolerance. Currently this does not appear to be so.</p> <p>Again, the forecasting pilot did not focus on any one particular event. Fine tuning the forecasting tool to specifically anticipate ramping events will provide a more effective basis for determining the levels of RR required and the potential to activate standby RR.</p>	
UCA	<p>The UCA understands from previous discussions and references to the June 2009 MOF paper that as a matter of Alberta policy and regulation the reliance on WPM is restricted to un-forecast events. This implies that the system is then expected to absorb forecast events. Please refer to comments on Section 6.3.</p>	<p>The AESO is not aware of government policy or regulation that restricts the use of WPM.</p>
ATCO	<p>Yes, additional regulating reserves should be procured based on the volume required to accommodate forecast wind energy.</p> <p>Any ramping events that exceed the capabilities of regulating reserve and the normal EMMO (without over dispatching) should be dealt with through WPM and contingency reserves.</p> <p>If larger volumes of regulating reserves are procured, the AESO should develop a clear and standardized methodology on when the system controllers should use the EMMO (without over dispatching) and when they should use reserves. If additional reserves are procured to manage wind, and wind generation is not as variable as forecast, the system controller should not use those reserves for any other purpose.</p> <p>ATCO Power agrees that standby RR should be activated in near-real time.</p>	<p>The AESO will be developing a transparent methodology to manage wind variability with the available tools – ancillary services, WPM and the EMMO.</p>
TransCanada	<p>The AESO should procure the appropriate level of all ancillary services (regulating reserves and otherwise) that it forecasts it will need, regardless of the driver (wind volatility, load variability, generator contingencies, transmission constraints, etc.)</p>	<p>The AESO does not consider cost when determining ancillary service requirements.</p>

	<p>The AESO should not make cost tradeoffs on ancillary services. If the price of ancillary services rises, more providers will enter the market and the increased supply will, through competitive market forces, reduce the price. Conversely, if the price falls, suppliers will reduce their offerings and the price will rise. The price will settle at the appropriate level.</p> <p>The AESO should not be planning to rely on over-dispatching EMMO.</p> <p>Without further explanation of the details and how it would be accomplished TransCanada cannot take a position on splitting regulating reserves into separate products for load following and AGC.</p>	
AltaLink	AltaLink is of the view that existing regulating reserve should be split into a load following product and an AGC product. Such split would allow each product being supplied by appropriate technologies and solutions. AltaLink encourages the AESO to speed up the implementation of such split to the extent possible.	Acknowledged.

6.2 Short Term Wind Integration Tools – Contingency Reserve

Stakeholder	Stakeholder Comment	AESO Response
NaturEner	AESO should continue to pursue the possibility of using active Contingency Reserve as pursued by the Northwest Power Pool. NaturEner anticipates that the use of active Contingency Reserves for wind energy transient events from the NWPP will be implemented in 2010. NaturEner fully endorses and encourages AESO to continue to pursue the possibility of using active Contingency Reserves. By first using the available active Contingency Reserves within the AIES and then using those hared with the Northwest Power Pool, mitigation of transient wind energy ramp events can be effectively realized. However, active Regulating Reserve and other measures (EMMO) should be effective during normal operations, with the active Contingency	The NWPP has not yet allowed the use of contingency reserves for support of wind. The reserve sharing aspect of this policy would also need to be developed, i.e. it would need to be approved that it is acceptable to use internal reserves for wind support as well as draw on external reserves. The AESO will explore this option if it is available.

	<p>Reserves only being needed for the worst case conditions. See above.</p> <p>3. No, once available, AESO can share reserves from the NWPP's Reserve Sharing Group. AESO should employ their own reserves first and then receive the remainder to cover an event, from the NWPP.</p> <p>4. Yes, however as a function of the forecasting that has been done.</p>	
ENMAX	<p>ENMAX sees no reason why the AESO should not follow NWPP policy, assuming that customers will not face material cost increases as a result.</p> <p>Until wind is required to adhere to MOMC-like requirements, using WPM to manage up-ramps and additional contingency reserve to manage down-ramps would seem to be a reasonable approach that balances the needs of wind generators and loads. Wind generators could be given the option to procure any additional ancillary services needed to avoid WPM; clearly, they would only do so if it makes economic sense.</p> <p>The activation and dispatch of contingency reserves to accommodate wind should, of course, be done in the most economically efficient manner subject to meeting reliability requirements. The system controller will need additional, and most likely probabilistic, tools to perform this task.</p> <p>In the long term, unexpected decreases in wind should not be treated the same as other generation contingencies because they are much more frequent for a given capacity level. Here again, an energy policy that allows for cost allocation based on the principle of cost causation would enable a FEOC solution to this problem.</p>	<p>Acknowledged.</p> <p>The AESO is not aware of Alberta legislation or regulation that supports differentiation of generation contingencies on the basis on the frequency of the contingency event or the variability of the resource. Table 1 in the Discussion Paper does not support the view that wind ramping down causes more concerns than other generation of similar capacity.</p>
CPC	<p>Capital Power understands that the volume of contingency reserves procured is determined by the single largest</p>	<p>Contingency reserve requirements in Alberta are primarily driven by load levels served by thermal and hydro generation</p>

	<p>contingency. Currently, the single largest contingency in Alberta is Genesee 3 (450 MW). Is it the case that wind generation with correlated wind profiles could replace Genesee 3 as the single largest contingency? If so, will the ISO have to procure more contingency reserves?</p> <p>Capital Power does not agree that the use of contingency reserves for a loss uncontrollable generation is consistent with the use of reserves to replace lost controllable generation. However, what other options does the ISO have in the interim to manage the ramp rates of uncontrollable generation, without using the energy market merit order?</p>	<p>in the province (7% of thermal plus 5% of hydro/wind form the minimum requirement). This requirement is outlined in OPP 402.</p> <p>The AESO is not aware of the basis for this distinction.</p> <p>The AESO agrees that near term options are limited to existing tools.</p>
IPCAA	<p>IPCAA's position on use of any contingency reserves to support wind generation are the same as for use of Regulating Reserves.</p> <p>The AESO's job is to set the reliability standard at a reasonable level to not jeopardize the system – it is the market's job to achieve this reliability level.</p>	<p>The AESO notes that contingency reserves are used to manage unexpected and uncontrolled loss of generation. This is a materially different situation than the use of regulating reserves to manage wind ramp ups.</p> <p>The AESO's duties are outlined in the Electric Utilities Act.</p>
TransAlta	<p>TransAlta would like the definition of “mandatory active contingency reserve.” What does “mandatory” mean in this case? Would generator be forced to provide contingency reserves when they do not want to participate in the AS market?</p> <p>The AESO should carry incremental active reserves to mitigate decreases in wind generation or volatility in load. Over-dispatching the EMMO would cause price volatility that would not accurately reflect the energy needs of the market since it would only reflect the ramp rate needed. Contingency reserves would better reflect the ramping needs of wind and load without adversely affecting the pool price. Using contingency reserves is also consistent with current market practices since the purpose of contingency reserves is to replace energy from generation loss.</p> <p>Standby contingency reserve should be activated in near-real time if deemed necessary by the system operator to manage</p>	<p>Mandatory refers to minimum contingency reserve requirements outlined by the Northwest Power Pool.</p> <p>This is consistent with principle 5 in the Discussion Paper.</p>

	<p>reliability of the system. This is consistent with current practices. We do not believe contingency reserves should be activated in anticipation of a drop in wind production. Activating them when the change occurs is consistent with how other generation contingencies are managed.</p> <p>The system should carry enough contingency reserves to deal with unexpected decreases in wind generation. Wind generation output decreases should be treated as with any other generator in the system and thus the AESO needs to accommodate for any sudden decrease in generation by procuring enough reserves. If Stand by contingency reserves were used, they must be used as close to real time as possible to manage the event. We are concerned that Standby Contingency reserves could be activated before required and would like to further discuss criteria applicable to determine when it should be used. We would like it to be activated as close to the real time problem as possible.</p>	
MEG	<p>Given MEG Energy's detailed comments in section 6.1, MEG Energy will not comment further in this section other than to reiterate that it does not support the use of ancillary services as a tool for wind integration in the short or long term.</p>	<p>Acknowledged.</p>
Solas	<p>It is unfortunate that the NW power pool currently does not use contingency reserves for wind speed drop off. This restriction does not comply with FEOC. This potential usage of contingency reserves was identified as a potential solution in 2005 as part of the variability studies from several stakeholders. The AESO should lead the development of contingency reserves as usage for wind power since this complies with its principles of FEOC. Currently the AESO has taken a passive approach and is waiting for leadership from NW power pool.</p> <p>Again, the accuracy of the forecasting is dependent on the forecasting model being tuned to the specific event. Until this is completed it is difficult to determine the potential issue that the AESO is trying to resolve. It is possible that the number of ACE</p>	<p>The NWPP has been examining this issue. The AESO participates in the NWPP on an active basis.</p> <p>The AESO's review of the wind power forecast information received to date suggests that the ability of the forecast to accurately predict the need for incremental regulating reserve on a day ahead basis is limited and would not result in efficient procurement decisions.</p>

	<p>events could be dramatically reduced with a significant improvement of the forecasting.</p> <p>The current forecaster WEPROG currently provides a probabilistic forecast. Can this be used to determine the appropriate level of RR that are purchased on a day ahead basis.</p> <p>The principle of FEOC should be used to help guide the answers to the questions in this section.</p>	
UCA	<p>The system reliability aspect of this alternative needs to be considered recognizing the relative frequency of unexpected wind ramping events. Relying on those reserves for wind generation decreases may limit the availability of the contingency reserves when needed for the more traditional requirement regarding unplanned unit outages and compromise system reliability.</p>	<p>Principle 1 indicates that this concern must be mitigated.</p>
ATCO	<p>Yes, AESO should use mandatory active contingency reserve to manage ramp down events. ATCO Power views a sudden decrease in wind generation as equivalent to a conventional station losing its fuel supply and tripping offline.</p> <p>Yes, AESO should carry incremental active contingency reserve to manage ramp down events that exceed the capability of the regular EMMO.</p> <p>ATCO Power agrees that standby contingency reserves should be activated in near-real time.</p> <p>Yes, ATCO Power views unexpected decreases in wind generation to be equal to other generation contingencies; they should therefore be treated the same.</p>	<p>This is consistent with principle 5 in the Discussion Paper.</p>
TransCanada	<p>The AESO should view changes in wind generation due to changes in wind level the same as other generators operational changes which unintentionally impact their output. This includes supporting them with reserves in the same way as other</p>	<p>This is consistent with principle 5 in the Discussion Paper.</p>

	<p>generators.</p> <p>The AESO should carry sufficient reserves to reliably operate the system given all forecast conditions, including decreases in wind speed and thus decreased wind generation, loss of other generation or variances in load.</p> <p>Unexpected decreases in wind generation should be treated equivalent to other generation contingencies with sufficient contingency reserve to manage the system reliably.</p>	
AltaLink	AltaLink supports the use of mandatory active contingency reserve to manage unexpected decreases in wind generation if allowed by NWPP.	Acknowledged.

6.3 Short Term Wind Integration Tools – Wind Power Management

NaturEner	<p>WPM should essentially be a “last resort”. Due to the natural characteristics of wind and its associated value to the market, it should always first be augmented by EMMO and then by ancillary services (such as contingency reserves) whenever possible. WPM (mandated curtailment) should only be utilized in the event of severe system instability (ramp-up beyond EMMO ability and in excess of available reserves and dispatch resources). Ideally this should be less than 1% of the total. For instance, Bonneville Power Authority, with a 20% wind penetration level, is using curtailment as a form of WPM less than 0.5% of the time.</p> <p>WPM should be used as a tool of last resort because it will be prohibitively expensive to plan for and cover all contingencies for the system. Reserve sharing with NWPP, when available, should be considered first. When EMMO is inappropriate and all reserves are deployed, WPM can be an effective tool, but one that has to be used as a last resort.</p> <p>Ultimately, a market solution that rewards performance will tend to reduce the price, improve efficiencies, and motivate creative solutions because wind energy facilities will naturally want to keep</p>	<p>Studies referenced in section 5 of the Discussion Paper indicate that curtailment would impact less than 1% of wind power production based on using WPM to control wind ramp up events that exceed the capability of the EMMO. A follow up analysis will be included in the Recommendation Paper that illustrates WPM should result in less than 1% of energy being curtailed across a wide range of EMMO ramp rate assumptions.</p> <p>WPM is appropriate as the next to last option prior to over-dispatching EMMO. The AESO will seek a market solution in place of or as a supplement to WPM, but in the interim period, a pro-rata WPM solution will be implemented.</p>
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	generating as much as possible for as long as possible.	
ENMAX	Given that the system controller routinely anticipates and mitigates situations that could place the power system at risk, it is sensible to use WPM if needed. (ENMAX notes the AESO's statement that WPM mitigated many of the over-generation situations and resulted in a reduction in total wind energy of less than 1%.) The exact steps required will likely depend on the accuracy of forecasts (as it evolves over time), the level of wind output, the demand level, the mix of generation on the system, and perhaps other factors.	The ability of the system to absorb wind ramp ups is dependant on the factors identified and will change from hour to hour.
CPC	Until such time that wind is considered controllable it should be curtailed using wind power management prior to curtailing controllable resources. If the ISO is unable to manage system disturbances through wind power management then ancillary services may be required in the near-term. The energy market merit order should only be used as a last resort.	The AESO has not contemplated curtailing dispatchable generators in order to avoid WPM. The EMMO is the primary tool to balance supply and demand and will be the first tool used to integrate wind power. Over dispatching the EMMO to 'create' ramp rate is the concern.
IPCAA	See above comments. It is the responsibility of the wind generator to ensure that they meet the reliability standards – not the AESO's responsibility. The AESO should establish levels and let the market decide how to achieve them. WPM is prescribing a solution, which may not be the most effective solution for the wind integration problem. Wind generators need to make the necessary arrangements with other generators and marketers to meet the reliability standards, just as importers are required to firm their supplies. In Alberta we have a ten-year precedence wherein those offering energy are not the same participants as those generating the energy with the PPAs – the same principles and standards that apply between “buyers” and “owners” of PPAs can apply between wind generators and those offering firm reliable energy to the EMMO market.	This option is akin to option three identified in the long term options of the discussion paper.
TransAlta	TransAlta believes that WPM should be not be used prior to activating standby contingency reserve. To be clear there are two	This is consistent with principle 5 in the Discussion Paper with reference to protecting the system against a loss of wind

	<p>things that the AESO can use in relation to wind generating units:</p> <ol style="list-style-type: none"> 1) Wind ramp rate control 2) Wind Curtailments <p>We would suggest that ramp rate control on new units that have this capability be used before Wind curtailments are applied. Units that do not currently have this capability should not be required to put it in place as part of short term wind integration.</p> <p>Curtailment of wind in anticipation of a forecast down ramp suggests that although the down ramp is forecast that the AESO can not put into place sufficient suitable generation to ramp up to cover the decrease in wind and the increase in load. The key to this is the ability to forecast such down ramp rates and to having had such ramp rates occur. The AESO given the forecast must procure the necessary ancillary services and only if they are not available should Wind curtailment be used.</p> <p>The AESO should purchase sufficient contingency reserves in order to accommodate the forecast loss of generation and maintain system stability. If the down ramp is not forecast then the AESO must use available reserves.</p> <p>Wind curtailment or wind ramp rate control should not be used under supply surplus conditions since all types of generation need to be treated equally. All generators still on would be offered at \$0 which is also where wind is currently offered. Thus wind generations will need to be curtailed along with other generators. This would be consistent with a FEOC market where no preference is given to fuel type.</p> <p>In the long run the AESO needs to procure additional services to accommodate the ramps and declines created by load and supply. These services may be used not only for Wind Power, so do not have to be deemed a Wind following service, but rather are additional balancing services.</p>	<p>generation.</p> <p>This refinement will be explored in the development of a wind power management rule.</p> <p>This is consistent with principle 5 in the Discussion Paper.</p> <p>The AESO is currently conducting a stakeholder consultation to address potential supply surplus issues.</p>
MEG	MEG Energy suggests that there are a number of conditions under which wind power management is appropriate:	The AESO would prefer a market solution for WPM, but it cannot be implemented in the timeframe required to accommodate 1100 MW of wind generation. Supply surplus

	<ul style="list-style-type: none"> • Wind power management can be procured as a service by which the variability of wind can be managed, the costs of which are charged to wind generators. • Wind power management can be used to direct a reduction of supply under supply surplus conditions. <p>MEG Energy reiterates that it does not support the use of regulating reserves or contingency reserves as tools for wind integration in the short or long term.</p>	<p>is currently being consulted on by the AESO.</p>
<p>Suncor</p>	<p>Suncor suggests that it is in loads best interest, in terms of a lower pool price and a cleaner environment, that the AESO not use wind power management to administratively manage the variability of wind power. Variability of wind conditions are best managed through the usage of wind following services. The AESO should consider the merit and structure for wind following services that permits all generators, including wind, to offer to constraint ramps up and down in the event of wind power variability.</p>	<p>The structure of a potential ramping, or wind following, product is being explored and will be developed via stakeholder consultation.</p>
<p>Solas</p>	<p>WPM should be used as a measure of last resort. Again, the forecast will only be as good as the events it is focused on forecasting. A forecast that is optimized to deliver on average error, will not perform well with forecasting ramping events. The stakeholders have not been informed as to what events the forecasting model is focusing on. Until this information is available, this is difficult to provide feedback.</p> <p>Wind power management that is completed across the board may not improve the situation overall. Should significant ramping come from one specific area, WPM in another area that has negative covariance will simply exacerbate the issue. Regional WPM should be used to reduce the frequency and duration of potential over-dispatch scenarios.</p> <p>In addition, given that wind power has the ability to be dispatched down (although not up), wind power should be paid for being</p>	<p>WPM is appropriate as the next to last option prior to over-dispatching EMMO. EMMO dispatches and available ancillary services would be used prior to WPM. Over-dispatching EMMO would be used after available ancillary services.</p> <p>WPM will be used to limit the total wind energy on the system under circumstances where the rate the wind ramps up cannot be accommodated. It is unclear how WPM could exacerbate an over supply situation but the AESO will consider further comments on this issue.</p> <p>A ramping service is being explored. Wind could supply a ramp down service.</p>

	<p>dispatched down since there is a potential cost saving for AS or RR dispatch. Again this could be a solution for ACE events, rather than wind integration issues.</p>	
UCA	<ol style="list-style-type: none"> 1. Recognizing that the wind forecasting requirement takes the place of the “must offer, must comply” obligations for wind generation, WPM should be used when possible to address any condition beyond forecast conditions. The paper appears to suggest that a relatively small amount of WPM (less than 1% lost energy) would be effective in significantly reducing requirements for incremental ancillary services and the corresponding costs. If the trade-off is in fact as lop-sided as this would suggest, perhaps the previously-expressed policy position should be revisited regarding use of WPM for only un-forecast events. 2. If a WPM market solution is considered, then it would appear to need to be limited to wind generation and funded from within the wind generation community, at least initially. To do otherwise would only be acceptable if the AESO is creating a ramping service/charge outside of the structure of the EMMO, and insufficient dialogue has taken place to support that broad change. 3. A longer term product should be considered and explored 	<p>The wind power forecast was developed to meet the “must offer” element, as noted in the AESO’s reply to ENMAX on page 3 of this matrix.</p> <p>The Recommendation Paper contains further analysis on the use of WPM versus incremental regulating reserves that highlights the greater efficiency associated with WPM to manage wind ramp up events.</p> <p>Ramping services will be explored in the next phase of the wind integration program.</p>
ATCO	<p>ATCO Power does not support using WPM proactively to manage possible ramp down events. In these cases standby contingency reserves should be used. Sufficient ancillary services should be purchased to accommodate any forecast ramp events.</p> <p>ATCO Power supports the use of WPM for ramp up events that exceed what the EMMO can accommodate without over dispatching. This solution treats wind as any other generator.</p> <p>A market solution for WPM is too complex. ATCO Power supports pro-rata as a simple and fair solution.</p> <p>Any ancillary service developed specifically to accommodate wind</p>	<p>This is consistent with principle 5 in the Discussion Paper.</p> <p>This is also consistent with principle 5 in that wind ramp up events can be controlled by wind generators, provided the necessary controls are in place.</p> <p>The AESO would prefer a market solution for WPM, but this solution cannot be in place in time to meet the operational needs. However, the AESO will continue to seek market solutions to the challenges presented by wind power on the</p>

	ramps should be borne by wind generators not load.	system.
TransCanada	<p>Wind Power Management (“WPM”) should be used to facilitate the inclusion of wind generation into the must offer must comply market that all generators should equally be held to. It could also be used to provide the fast ramping ancillary services the system requires.</p> <p>If it is necessary to utilize WPM then a market solution, with participants competing and driving efficiencies is preferable to a pro-rata allocation.</p> <p>In the short-term the AESO should develop and implement an ancillary service that provides the fast ramping that the system requires. This service could be provided by wind generators, other generators, interties or non-generators (storage solutions). The cost of this service would be treated the same as all rest of the ancillary services used to support the reliable operation of the system.</p>	<p>The AESO agrees that wind could provide a ramp down service if that service is developed. Please see the AESO’s response to ENMAX in section 4.0 for further discussion on must forecast must comply requirements for wind.</p> <p>The AESO would prefer a market solution for WPM, but this solution cannot be in place in time to meet the operational needs. However, the AESO will continue to seek market solutions to the challenges presented by wind power on the system.</p> <p>Ramping services are being explored, but these solutions cannot be in place in time to accommodate the 1100 MW of wind capacity anticipated on the system in 2011.</p>
AltaLink	<p>AltaLink will be concerned if the proposed WPM practices create operational risk to TFO facilitates.</p> <p>Please see AltaLink’s comment on Section 6.1 regarding new ancillary service product.</p>	Acknowledged.

6.4 Short Term Wind Integration Tools – Wind Power Forecast

Stakeholder	Stakeholder Comment	AESO Response
NaturEner	<p>Yes, the system needs to be able to accommodate forecast wind generation. If reserves are purchased to account for every contingency cost can be prohibitively high to the system, and thus other tools need to be deployed to manage these cost.. As NaturEner has described above, there are tools today that can be used to accommodate a high degree of penetration of wind into the supply stack.</p> <p>As forecasting by definition will never be exact NaturEner does not believe in a must offer must comply obligation, but thinks that incentives could be created for developers to better manage and provide this level of data.</p>	<p>The AESO plans to use the EMMO, ancillary services and WPM to manage wind power. The AESO agrees that no single tool is a fair or efficient way to manage wind variability on the system.</p>
CanWEA	<p>Regardless of how wind power is integrated onto the Alberta system it is understood and accepted that forecasting will assist the AESO in the operation of the system in a reliable manner. The centralized forecasting service now being supported by wind power generators needs to be fully implemented and transparent in order to deal with issues highlighted above as well as an examination of operating reserves as a potential mitigation tool. Additionally it is generally accepted, that regardless of what mitigation measures and management tools are utilised, forecasting will assist in improving the success of those measures and tools.</p> <p>The CanWEA caucus is unaware of which metrics or events the forecasting model is tuned. This would be helpful to understand if the forecasting model is tuned for specifically these ramping events, and the success rate of forecasting these events. The Caucus is aware that during the forecasting pilot, no one type of event was the focus of the study, however given the importance of system reliability and ACE, perhaps the forecasting model should be tuned to predict ramp events specifically.</p>	<p>The AESO is currently implementing the forecast into a variety of tools. The AESO expects that an accurate wind power forecast will improve the effectiveness of wind integration tools.</p> <p>The forecasting model (the results of which are currently posted to the AESO website) is tuned to predict wind energy production.</p>
ENMAX	<p>In ENMAX's view, it is still too early to make any judgments about the usefulness of wind power forecasting or to make any design or operational decisions based thereon. A forecast whose range</p>	<p>The AESO continues to monitor the wind power forecast and expects that it will improve when site specific data is made available to the forecaster later this year.</p>

	<p>is often 50% or more of installed capacity (see Figure 10) is of almost no value. Unless forecasts get far more accurate over time, the use of some type of “must forecast must comply” rule is likely unworkable and the use of WPM will continue to be appropriate.</p> <p>As discussed in ENMAX’s response to previous sections, in the future wind should adhere to MOMC-like requirements through market-based “backstop” arrangements and asset substitution. And while ENMAX appreciates that market redesign is not being considered as part of the short-term wind integration framework, there are some market design adjustments that would significantly enhance the market’s ability to accommodate higher volumes of wind generation.</p>	
CPC	<p>In the short-run the ISO should rely on wind power management as the primary tool for managing uncontrollable generation. The ISO should procure enough reserves using the wind power forecast while taking into account its ability to use wind power management.</p> <p>In the long-term if wind firms its energy offers through the use of ISO procured firming service, then wind will pay its share of the incremental system costs resulting from its integration and additional ancillary services will not be required. Wind generators should have the ability to make firm energy offers just like other forms of generation and they should be subject to the same must offer must comply requirements that other forms of generation are subject to.</p> <p>If wind energy is controllable then the system should be able to accommodate all wind energy in the merit order under normal conditions. It would be inappropriate to use wind power management to curtail controllable energy. If curtailments are required, all controllable energy should be treated the same.</p>	<p>Contingency reserves are currently used to manage unexpected declines in generation, and the AESO is not aware of a basis for differentiating between generation types in this regard.</p> <p>If a wind firming service is pursued in the second phase of the wind integration work, it will be appropriate to examine a minimum reliability standard for all generators. It is not FEOC to require a single fuel type to be firm yet all other generators are only ‘relatively’ firm.</p>
IPCAA	The wind power forecast risk MUST be borne by the wind generator, not the AESO. Wind developers can acquire energy	It is not FEOC to require a single fuel type to be firm yet all other generators are only ‘relatively’ firm. The AESO also

	<p>support products from the market to accommodate any forecast risk – rather than have ratepayers pick up these costs.</p>	<p>notes that all current generators rely on system support services paid for by ratepayers, and to exempt wind generators from this treatment is not consistent with fair and equal treatment.</p>
TransAlta	<p>Wind power forecast will be essential for any or a combination of the proposals as it will allow for AESO response in a timely manner. It is important that the AESO develop an accurate wind power forecast, once this is in place then the system should accommodate forecast wind generation. The AESO should procure sufficient reserves as forecasted instead of relying on WPM or over dispatching EMMO.</p> <p>The wind power forecast was the wind industry substitution for the “must offer must comply” obligation. The forecasts will ensure that the system operator will have a more accurate picture of the system at all times.</p> <p>The use of the power management aspects of Wind Power Management in this rule is only placed on Wind, i.e. curtailment. Thus it should be used only as a last resort and be considered similar to a directive for other types of generation. The circumstance would occur when the wind production, given all other system considerations, exceeds what can be accommodated and wind must be curtailed. For example, load is relatively low and ramping down whereas wind at the time is ramping up. Other system requirements preclude curtailing other forms of generation and wind then must be curtailed.</p>	<p>The improvement of the wind power forecast will proceed throughout 2010 and the AESO will continue to monitor its accuracy.</p> <p>Acknowledged.</p> <p>WPM will be used when the ramp up rate of wind capacity exceeds the ability of the system to absorb it through normal market operation.</p>
MEG	<p>In light of the principles identified in section 4.0, MEG Energy supports a wind power forecast (whether on a facility basis or an aggregate basis) resembling a must offer, must comply obligation in both the short and long term.</p> <p>In both the short term and the long term, tools such as wind power management and wind firming services should be used in place of over dispatching EMMO or procuring additional ancillary services to manage the variability of wind.</p>	<p>Please see the AESO’s response to ENMAX in Section 4.0 for a discussion of must forecast must comply obligations for wind.</p> <p>The AESO also notes that it is not FEOC to require a single fuel type to be firm yet all other generators are only ‘relatively’ firm. The AESO also notes that all current generators rely on system support services paid for by ratepayers, and to exempt wind generators from this treatment is not consistent with fair</p>

		and equal treatment.
Suncor	As per the comments provided in section 4.0, Suncor suggests it is appropriate to require a forecast of facility output and turbine availability as a reasonable and fair alternative to a must offer, must comply obligation for wind generation. This forecast can be employed to procure sufficient additional wind following services to manage the variability of wind power.	Acknowledged.
Solas	Within Alberta there are a significant number of large final emitters that are regulated under the Alberta Government Specified Gas Emitters Regulation and are dependent on the generation of offsets from wind power in Alberta. Wind power management will reduce the ability of these facility to be under compliance and drive up the cost of compliance. As such, WPM should be used as a measure of last resort, after expending all other efforts.	WPM is expected to be utilized after utilizing the EMMO and available ancillary services (but prior to over-dispatching EMMO). As noted previously, studies indicate that less than 1% of wind energy would be curtailed across a wide range of ramp rate assumptions for the EMMO.
UCA	The UCA understands from previous discussions and references to the June 2009 MOF paper that the reliance on WPM is restricted to un-forecast events. This implies that the system is then expected to absorb forecast events. If this understanding is correct, then it would be inappropriate to factor in additional margins to further minimize reliance on WPM.	The AESO is seeking comments on the use of incremental ancillary services and the extent to which EMMO should be 'ramped' prior to WPM.
ATCO	Yes, the system should be able to accommodate forecast wind generation. Sufficient reserves should be purchased to accommodate any ramp down events and WPM should be used to manage ramp up events that cannot be handled by the regular EMMO. ATCO Power does not support must offer must comply obligations for wind generators.	Acknowledged.
TransCanada	The system should be able to reliably accommodate all anticipated in-merit generation, wind or otherwise. While wind generation may deviate slightly from its forecast level other forms	Please see the AESO's response to ENMAX in section 4.0.

	<p>of generation also deviate from their offered amount, due to fuel supply issues, system constraints, on-site process changes, etc. This results in dispatch variances and restatements which are established and accepted realities in the system. Wind power deviation from the forecast level should be treated in the same manner.</p> <p>Wind generation should be integrated into the system as similarly as possible to other forms of generation, including must offer must comply. The obligation will be similar to the obligation all generators face.</p>	
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6.5 Summary of Mitigation Options – Short Term Requirements

Stakeholder	Stakeholder Comment	AESO Response
NaturEner	<p>As stated above, incremental ancillary services are not the only approach that should be considered for efficiently integrating wind.</p> <p>The process for implementing a WPM should be clearly defined as a “last-case” scenario.</p> <p>NaturEner does not support the adoption of a WPM scheme that is deployed in advance of all other, more efficient methods, in advance as it is not a market based solution, and therefore should only be used as a last option.</p>	<p>The AESO is exploring 3 options for integrating wind in the near term: EMMO, incremental ancillary services and WPM. A wind power forecast is also being developed to ensure efficient use of the available tools.</p> <p>The AESO is not considering WPM in advance of EMMO dispatches and/or deployment of available AS.</p>
CanWEA	<p>It has always been CanWEA’s position that wind power management (WPM) tools should be used only as a last resort, and that even then, these should only be used to address wind specific issues on the system and not as a general tool to address non-wind related issues.</p> <p>As outlined and suggested earlier in this submission, identifying and attempting to address wind related issues in isolation from the rest of the market is not useful. For example, the suggestion that the Energy Market Merit Order (EMMO) use of over dispatch and the resulting system reliability issues are not sustainable and attributable to increased wind generation does not address the</p>	<p>As noted previously, WPM would not be used when wind is not a contributing factor to an over-generation situation.</p> <p>Tools such as a ramping product are being examined as part of the overall wind integration program.</p>

<p>fundamental issue. The use of over dispatch to deal with system operation is a function of the energy only market design in Alberta and is not a wind caused problem. It is punitive to expect the wind power industry to be solely responsible for solving these difficulties and speaks to the issue of the need for a longer-term, sustainable and relevant integration strategy.</p> <p>As has been discussed, identifying short-term mitigations in the absence of a longer-term direction or strategy will not provide a fair and equitable solution going forward. CanWEA strongly suggests that there be an initiative to build upon the collaborative work that has transpired over the preceding three years to develop this strategy.</p> <p>One need only look at the projects that are currently in the AESO interconnection queue to identify the fact that there are more wind projects interested in connecting to the Alberta system than any other generation source. This speaks to the importance of developing this strategy that allows for this form of non-emitting renewable energy to fully develop and assist Alberta in addressing such critical and fundamental issues as reducing our provincial greenhouse gas emissions.</p> <p>As discussed throughout this paper it appears further consultation is required to ensure that a market strategy is able to be formulated that allows for a FEOC interpretation of the regulations currently in place in Alberta and allow the AESO to fulfill the government's direction of expanding the role renewable energy plays in the Alberta market.</p> <p>CanWEA and our membership will continue to work with AESO to fully understand and assess what actions are required to facilitate wind integration onto the Alberta electrical system. We both have a common interest in seeking to minimize the costs associated with wind integration and ensuring the reliability and stability of the grid as greater wind penetration levels occur in Alberta. CanWEA appreciates and values the opportunity to work collaboratively with AESO and we will continue to do so going</p>	<p>The AESO is developing a long term wind integration paper that will build on the concepts explored in the short term wind integration initiative.</p> <p>The AESO's mandate is to allow market forces to determine the mix of generation in the province.</p> <p>The consultation process will be ongoing with respect to both the immediate needs for integrating the wind capacity expected in 2011 and for developing a wind integration model that will be sustainable for the wind capacity expected in the longer term.</p> <p>Acknowledged.</p>
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ENMAX	In ENMAX's view, the most viable short-term option is to use WPM to manage up-ramps and reserves to manage down-ramps, with over-dispatching the EMMO as a secondary (and limited) option. Over the longer term, implementing MOMC-like obligations for wind and developing additional ancillary services to avoid over-dispatching the EMMO are appropriate.	This short term option is consistent with the principles identified in the paper.
CPC	As long as wind is not controllable the ISO should use wind power management as the first option for managing uncontrollable resources. If wind power management is ineffective or unavailable the ISO may then be forced to procure enough ancillary services to avoid using the energy market merit order to manage system disturbances.	Acknowledged.
IPCAA	As stated IPCAA opposes all of these short-term solutions in the absence of any discussion on long-term solutions – and will oppose any Rule changes that are proposed to implement these actions.	Acknowledged.
TransAlta	TransAlta would like the AESO to develop a process to integrate wind by first utilizing operating reserves, then EMMO (once all the reserves are dispatched), then using WPM as a last resort. When WPM is used, wind ramp rate control should be applied before wind curtailment is applied. WPM should not be used until all other solutions have been utilized. That means operating reserves have been exhausted and EMMO has been dispatched.	EMMO dispatches (without over dispatching) are the first option to balance the system as part of normal market operations. It is not appropriate to dispatch reserves prior to EMMO. WPM is appropriate as the next to last option prior to over-dispatching EMMO.
MEG	MEG Energy suggests that a better result would ensue from establishing processes and options for managing wind integration for the long term. If short term options are truly required they should be consistent with the principles of managing wind integration in the long term. Wind power management is an	The principles identified in the paper are intended to represent both short and long term principles.

	example of an option that could be utilized in the short term and would be appropriate for the long term.	
Suncor	Suncor suggests it would be appropriate for the AESO to establish processes and options for managing wind in the short term that are appropriate for employment in the long term and are consistent with the identified principles. As per the comments in section 4.0, the AESO should release the data gathered during the two year pilot period to inform the discussion on the volume, mix and procurement strategy for wind following services to replace reliance on EMMO as the means to manage wind power variability. Suncor recognizes that in the interim the AESO will need to continue its reliance on EMMO as it transitions to procuring wind following services.	<p>The principles identified in the paper are intended to represent both short and long term principles.</p> <p>This data was provided to the AESO on a confidential basis and the data is not relevant with respect to the expected forecast improvements as more data is made available to the wind forecaster (WEPROG).</p>
Solas	<p>Short term</p> <ol style="list-style-type: none"> 1) Calibrate the simulation model to accurately predict events in 2008. Each event should be matched to determine if the simulation model is acceptable. This should be done on a transparent manner and invite the wind power stakeholders into the analysis. 2) Re do the simulation to determine the total number of ACE events. 3) Categorize the events to understand the patterns of events, time of day, duration, frequency, time of year. 4) Complete a commercial analysis of the impact of EMMO usage, RR and the loss of compliance alternatives for LFE regulated under AB SGER. 5) Publish the results and seek further input. 6) Focus forecasting models to predict ramp events and others that are troublesome that could potentially cause ACE issues. 7) Complete a forensic analysis of the other causes (75% of incidents) of ACE events and potential solutions for all ACE events. <p>Without a credible simulation model, the steps identified in 6.5 are premature.</p>	<p>The AESO does not believe it is necessary to revisit the analysis. The simulation is sufficiently robust to suggest that the status quo is insufficient to accommodate 1100 MW of wind capacity on the system in a reliable manner.</p> <p>The AESO is using a principle based approach in developing wind integration tools. The tools and order of deployment should not change as a function of the severity of the challenge. Volumes and frequency of use should be driven by actual operational experience over time.</p>

ATCO	ATCO Power supports Option #2 as a long term direction with the exception of must offer must comply obligations. It would be appropriate to use WPM to mitigate ramp up events and reserves to manage ramp down events.	Acknowledged.
TransCanada	TransCanada proposes that the AESO maintain status quo in the short term and instead deploy its resources on the long term solutions so that they can be brought to the market more expediently.	The status quo is insufficient to safely integrate 1100 MW of wind which is anticipated at some point in 2011.

6.5 Summary of Mitigation Options – Potential Long Term Direction

Stakeholder	Stakeholder Comment	AESO Response
NaturEner	<p>Long term, the AESO needs to consider more than just a centrally procured ancillary service. There are significant efficiencies to be gained by exploring all options.</p> <p>a. Planning to avoid any use of WPM, without adequate compensation, should be the long-term direction of the AESO. There is no long-term solution with a WPM protocol. WPM must be acknowledged as a “last-case scenario”.</p> <p>b. This cannot work without a fundamental shift in dispatching and market clearing processes as they are today.</p> <p>c. This could be a key component of the portfolio of options.</p> <p>The AESO needs to continue its efforts to eliminate seams between its system and neighboring jurisdictions. This effort needs to be inclusive of facilitating the types of transactions and dispatching methodologies that other system operators are proving to be successful means of integrating wind.</p> <p>Any use of WPM, without adequate compensation, should be the long-term direction of the AESO. The AESO needs to focus on changes that are the most efficient and transparent, not necessarily the easiest to implement. Due to the economics of wind developments as well as the low capacity factors, power management schemes are a very unproductive approach to mitigating integration issues. NaturEner has found there are a wide variety of better market based solutions to integrate wind.</p>	<p>The second phase of the wind integration discussion paper will explore the range of options available.</p> <p>Fundamental changes to market design are beyond the scope of the wind integration effort.</p> <p>Options such as dynamic scheduling are being explored at the current time.</p>

	<p>2. Please see comment above on forecasting.</p> <p>3. The least preferred alternative. The long-term direction must acknowledge that wind generation has certain inherent characteristics that distinguish it from traditional sources.</p> <p>a. There could be an incremental benefit for creating incentives for wind developers to better forecast their own production.</p> <p>b. As an experienced operator of a wind only Balancing authority, it is clear to NaturEner that this is a very inefficient exercise when done without the benefit of geographic diversity and the inherent efficiencies that are gained by a more comprehensive system wide approach.</p> <p>c. As just stated, this approach is most effective and economically efficient when done on a system wide basis while deploying all known effective tools for the exercise.</p>	
CPC	<p>In the long-term wind should be subject to the same must offer must comply requirements that all other forms of generation are subject to.</p> <p>We do not support the use of ancillary services as a long-term solution for integrating uncontrollable generation. Wind generators should have the option to firm their energy offers, either through a centrally procured product or through self supply. The technical requirements of the product may differ depending on the direction of wind ramping; however, there should be a market solution developed for firming wind. This product would not be an ancillary service, and the costs should not be attributed to load.</p>	Please see the AESO's response to CPC in Section 4.0 for a discussion of a wind firming service.
IPCAA	IPCAA supports Option 3 – and is willing to begin immediate discussions on how this may be implemented. IPCAA believes that this can be done in a timely manner and meet any concerns that the AESO may have with integrating wind into the system.	This will be explored in the second phase of the wind integration work discussion paper and the ongoing consultation process.
TransAlta	Wind generation's solution to the "must offer must comply" obligation was to produce the wind power forecast. This gives an accurate forecast of wind production T-2 and thus is the equivalent of MOMC. MOMC would place unfair cost on wind generators since they would have to restate every time wind	Please see the AESO's response to ENMAX in section 4.0 for a discussion of the must forecast must comply obligation for wind.

	<p>output changes and would change it to reflect current production. Lack of wind would be an AOR. The T-2 production estimate is accomplished with the wind forecast and thus restatement would offer no added benefit to the market through a MOMC obligation</p> <p>WPM should only be used as a last resort since this unfairly penalizes wind. The cost associated with WPM could be very large and thus would be unfair for wind to bear the brunt of it.</p> <p>AS will need to be developed and procured to address the issue with ramping and volatility of wind.</p>	<p>The AESO is exploring 3 options for integrating wind in the near term: EMMO, incremental ancillary services and WPM. A wind power forecast is also being developed to ensure efficient use of the available tools. WPM will be used only when wind ramps up at a rate greater than can be accommodated by the system under</p>
MEG	<p>MEG Energy supports the adoption of option 3 as described by the AESO and has provided detailed comments of such in section 6.1.</p>	<p>Acknowledged.</p>
Suncor	<p>As per Suncor's comments on the summary of integration options for short term requirements, the AESO should establish processes and options for managing wind in the long term that are consistent with the identified principles.</p> <p>Suncor recommends that wind power variability be managed through the deployment of centrally procured wind following services rather than EMMO or administratively directed wind power management and that wind power forecasting be a reasonable and fair alternative to a must offer, must comply obligation for wind power.</p>	<p>The principles articulated in the Discussion Paper apply to both the short and long term.</p>
TransCanada	<p>TransCanada would support the direction of Option 3. All generators facing similar obligations, sufficient reserves to manage system reliability including a newly developed fast ramping product, minimal use of WPM and market driven solutions for generators to provide firm power.</p>	<p>Acknowledged.</p>
AltaLink	<p>Please see AltaLink's comment on Section 6.1 regarding new ancillary service product.</p>	<p>Acknowledged.</p>