

## Wind Power Integration Working Group (SE-29) Recommendations and IESO Responses on Short Term Issues

**TABLE 1: KEY/PRIORITY RECOMMENDATIONS**

Title	WG Recommendations	CanWEA	OPG	Windrush Energy	WG Minutes	IESO	IESO Response / Recommendation
CAA and ME Requirements	<p><b>1.1</b> Consolidated website for educational and industry information.</p> <p><b>1.2</b> Information sharing with CanWEA and OPA.</p> <p><b>Due Date: By end of 2007</b></p> <p><b>1.3</b> CAA and MR requirements should be included as part of OPA RFP's.</p>				<p><u>March 8, 2007 meeting:</u> Regarding educational presentations given during working group meetings, these should be sent out to wider audience and industry. IESO can share and provide this information to wind industry via the CanWEA forum. Also, at the beginning of the connection assessment process, provide to proponents, the "External Guidelines for Connection" and the "Step-by-step Guide to Market Entry". Alternatively, this can be included in the OPA Request for Proposal (RFP) process, thereby giving the necessary requirements and</p>	<p>The IESO recommends a review and update of CAA and Market entry web pages to better reflect needs of new entrants, wind developers and operators. A central information depository web page will include consolidated information and web links to wind related CAA/ME process and requirements. CanWEA and OPA web sites may also include a sub-link that connects to such centralized IESO web page.</p>	<p>The IESO recommends creation of a central information depository web page to better reflect needs of new proponents, wind developers and Market Participants (MPs). This web will include information pertaining to specific wind related CAA/ME processes and requirements.</p> <p>Links and references to this IESO specific web page from CanWEA and OPA web sites. Periodic quarterly presentations by IESO during CanWEA sessions.</p> <p>OPA's RFPs should include a reference to the IESO CAA and ME requirements.</p> <p>(The IESO will pursue items 1.2 and 1.3 with CanWEA and OPA).</p>

**TABLE 1: KEY/PRIORITY RECOMMENDATIONS**

Title	WG Recommendations	CanWEA	OPG	Windrush Energy	WG Minutes	IESO	IESO Response / Recommendation
					timelines of the IESO to the proponents in the early stage of the process.		
Near Term Forecasting Requirements	<p><b>1.4</b> Prescription of wind forecasting performance measures.</p> <p><b>Due Date: By end of April 2008</b></p>			Small generators may have difficulty in costing the latest forecasting techniques. What is the minimum acceptable forecast for a specific generating project?		The IESO recommends development of forecasting performance measures for existing and new wind generators	The IESO will continue to analyze wind forecasting performance of individual projects. IESO would accordingly suggest and prescribe performance measures incorporating an industry recognized forecasting methodology and a minimum acceptable forecast accuracy level.
Near Term Forecasting Requirements	<p><b>1.5</b> MPs coordinate and develop their own centralized forecasting service.</p>		Follow industry's best practices and use advance computer tools and metrological data for day-ahead (DA) and week-ahead forecasting. Metrological data (wind direction/speed, temp, etc) can be inputted to a computer model/power curves to produce a wind generation		<p><u>March 8, 2007 meeting:</u> Various wind operators could partner together with a third party service provider (forecaster) and put all of their information into a model and pass that coordinated information on to the IESO.</p>		If the MPs choose to pursue an option of coordinating and developing their own centralized forecasting system, the IESO would facilitate such activity by providing IESO services and products to MPs. These services include providing forecasting performance data, availability of existing (API) and User setup interface with IESO tools. Cost of third party forecaster services would be borne by participating wind farms.

**TABLE 1: KEY/PRIORITY RECOMMENDATIONS**

Title	WG Recommendations	CanWEA	OPG	Windrush Energy	WG Minutes	IESO	IESO Response / Recommendation
			forecast. It is important and necessary to have an accurate generation forecast for planning, optimization and reliability reasons. Both the IESO and the wind generators have an obligation to the market to provide a good forecast.				
Near Term Forecasting Requirements	<p>1.6 IESO to analyze cost benefits associated with forecasting errors and use of persistence forecasting for 1 Hour ahead basis.</p> <p><b>Due Date: By end of April 2008</b></p>		Use persistence forecasting methodology for both real time (10 min) and hour ahead. Do NOT use persistence methodology for day-ahead.		<p><u>Nov 27, 2006 meeting:</u> Utilize persistence forecasting at more time frames.</p>		The IESO will investigate costs and benefit analysis of current levels of forecasting errors, including costs/benefits of adopting persistence forecasting for the hour ahead pre-dispatch, and impacts on market and price of power. Various levels of wind penetration will be incorporated.
Near Term Forecasting Requirements	<p>1.7 IESO to provide incentives and compliance requirements for wind operators to provide reasonably accurate and updated forecasts.</p> <p><b>Due Date: By end of</b></p>		Develop appropriate incentives and penalties for wind operators to provide reasonably accurate and updated forecasts to the IESO.				Incentives could be part of the OPA contracts with the generators. IESO will pursue option of contract incentives for forecast performance with OPA upon establishment of forecast accuracy levels. Compliance requirements do exist which will be reviewed and may be re-defined to drive appropriate behaviour based on forecasting performance measure and accuracy study results. Meanwhile we expect that MPs would do their best endeavours to

**TABLE 1: KEY/PRIORITY RECOMMENDATIONS**

Title	WG Recommendations	CanWEA	OPG	Windrush Energy	WG Minutes	IESO	IESO Response / Recommendation
	September 2008 or as applicable						produce quality forecasts as well as performing periodic updates as per existing market rules.
Wind Con-straining Issues	1.8 Wind generators need to develop bilateral contracts with loads to encourage consumption during Excess Baseload Generation (EBG) events.		Develop programs with loads to help stimulate consumption during EBG.		Nov 27, 2006 meeting: Load shaping requirement.		Wind generators themselves should promote via their contracts with consumers for load programs to encourage consumption during EBG events.
Operational Control	1.9 IESO to analyze needs of power management control tools for new wind generators.					Analyze needs of power management control tools for new wind generators connected to ICG.	IESO will internally investigate the need to require new wind generators to install power management control (curtailment/ramping) tools at facilities connecting to the ICG.

**TABLE 2: RECOMMENDATIONS – MAY BE RE-VISITED, IF REQUIRED PER LONG TERM NEEDS**

Title	WG Recommendations	CanWEA	OPG	Windrush Energy	WG Minutes	IESO Response/Recommendation
Near Term Forecasting	<p><b>2.1</b> IESO to undertake a pilot project to determine the effectiveness of centralized forecasting.</p> <p><b>2.2</b> IESO to undertake centralized wind forecasting on behalf of wind farms.</p>	<p>The IESO should develop a centralized forecast model that obligates qualifying wind farms to participate in strengthening the model by providing meteorological information and availability from their site where available.</p>	<p>Follow industry’s best practices and use advance computer tools and metrological data for day-ahead (DA) and week-ahead forecasting. Metrological data (wind direction/speed, temp, etc) can be inputted to a computer model/power curves to produce a wind generation forecast. It might be determined that investing in expensive computer/metrological forecasting tools are not appropriate at this point in time considering that wind is a very small percentage of the generation mix. If the IESO is not proactive in forecasting for DA, then it must place more reactive effort into managing HA and RT operations to mitigate the variability of wind.</p> <p>Follow industry’s best practices and use advance computer tools and metrological data for day-ahead (DA) and week-ahead forecasting. Metrological data (wind direction/speed, temp, etc)</p>		<p><u>Nov 27, 2006 meeting:</u> - Update methodology to provide more accurate forecasts.</p> <p><u>May 10, 2007 meeting:</u> - Third party wind forecasting firms have been selected to analyze and provide near-term forecasting methodologies in another province in Canada. Such opportunities need to be explored and initiation of a similar pilot project in Ontario.</p>	<p>Based on estimates from other ISOs, the IESO estimates high costs associated with such a pilot project. Current levels of forecast errors and wind penetration do not support high expenditures at this stage. This option of pilot project may be re-visited in future if higher penetration of wind and associated outcome of forecast accuracy analysis and cost benefit studies warrant such need. Should a pilot project occur, the IESO would consider coordinating the effort. IESO will also monitor forecasting performance of programs of other ISOs and continue to benefit from their experience, as and where applicable, to evaluate its effectiveness in Ontario.</p> <p>Current levels of forecast errors and wind penetration do not necessitate a centralized system at this stage. Based on estimates from other ISOs, the IESO estimates high costs and expenditures associated with this system. IESO has a set of market rules, market manuals and a compliance regime that specifies the forecasting submission and update requirements for intermittent generators. We expect that MPs would do their best endeavours to produce quality forecasts per existing requirements. An IESO centralized system undertaking is dependent upon the outcome of forecasting accuracy studies, cost benefit analysis associated with higher wind penetration levels and a pilot project, which would identify need of any centralized forecasting. Accordingly, this option may be re-visited in future upon outcome of such studies.</p>

**TABLE 2: RECOMMENDATIONS – MAY BE RE-VISITED, IF REQUIRED PER LONG TERM NEEDS**

Title	WG Recommendations	CanWEA	OPG	Windrush Energy	WG Minutes	IESO Response/Recommendation
			<p>can be inputted to a computer model/power curves to produce a wind generation forecast. It is important and necessary to have an accurate generation forecast for planning, optimization and reliability reasons. Both the IESO and the wind generators have an obligation to the market to provide a good forecast.</p>			
CAA and ME Requirements	<p><b>2.3</b> Require meteorological data - telemetry (wind speed, direction, temperatures etc) from wind farms along with other parameters in Chapter 4 Appendix 4.15.</p>		<p>Follow industry’s best practices and use advance computer tools and metrological data for day-ahead (DA) and week-ahead forecasting. Metrological data (wind direction/speed, temp, etc) can be inputted to a computer model/power curves to produce a wind generation forecast.</p>		<p><u>Nov 27, 2006 meeting:</u> Use meteorology data in forecasts.</p>	<p>IESO does not require such data. However, we would note that such data would be useful to MPs for (a) demonstrating due diligence with respect to compliance with forecasting related market rules and (b) for utilization in their forecasting methodology (for long term needs) as these requirements are developed.</p>

**TABLE 3: RECOMMENDATIONS – LONG TERM NEEDS**

Title	WG Recommendations	CanWEA	OPG	Windrush Energy	WG Minutes	IESO Response
Near Term Forecasting	<p>3.1 In absence of centralized forecasting, use other market mechanisms to mitigate market impact of poor wind forecasting by MPs (e.g. increase AGC, OR).</p>		<p>It might be determined that investing in expensive computer/metrological forecasting tools are not appropriate at this point in time considering that wind is a very small percentage of the generation mix. If the IESO is not proactive in forecasting for DA, then it must place more reactive effort into managing HA and RT operations to mitigate the variability of wind. For example the IESO may need to:</p> <ul style="list-style-type: none"> <li>- acquire more load following capability (AGC)</li> <li>- increase operating reserves (OR)</li> </ul>			<p>Evaluating AGC and OR requirements is on the Long Term issues list of the WIWG and will be addressed in next phase of our stakeholdering.</p>
Operational Control Requirements	<p>3.2 Need for curtailment should be outlined at time of market entry.</p> <p><b>Due Date: By end of April 2008</b></p>	<p>The term ‘security’ should be replaced with ‘reliability criteria’. Prioritization of curtailment must be established and pre-agreed to at the time of market entry. There needs to be an understanding of the potential and level of curtailment at the outset.</p>			<p><u>Nov 27, 2006 meeting:</u> - Prioritize wind generators who may be curtailed.</p>	<p>Reliability includes both ‘security’ and ‘adequacy’. Refer to definitions under market rules. Curtailment may be required for reliability related reasons such as for purposes of system limits. IESO will continue to use all available dispatchable resources prior to curtailing wind.</p>

**TABLE 3: RECOMMENDATIONS – LONG TERM NEEDS**

Title	WG Recommendations	CanWEA	OPG	Windrush Energy	WG Minutes	IESO Response
Constraining Wind Requirements	3.3 Priority continues to be given to non dispatchable generation where dispatchable generation is available to DSO dispatch. Establish documented process for curtailment order during Excess Baseload Generation (EBG) events.	Currently, priority is given to non-dispatchable generation and under current market rules dispatchable generators will receive curtailment payments if there is an oversupply of generation. This should remain. The supply of energy is as important as capacity payment. Unbounded curtailment of intermittent generation, such as wind is unacceptable. The risk is too high to accept. As stated above, prioritization of curtailment needs to be understood and pre-agreed to.	Curtailing generation is necessary during EBG situations to ensure system stability. The market/DSO might not be able to find an optimum solution without manual intervention (i.e. All bids are at -2000). There should be a documented process for the IESO control room for determining which generators should be curtailed in an EBG scenario.	This issue seems like a LONG Term issue, not a short term issue given the very, very small share of market supply coming from wind generation.  It does not appear to be properly addressed under short term issues.		This approach is already established and developed. IESO agrees with this in the short term. IESO will continue to use all available dispatchable resources prior to curtailing wind. Long term implications of increasing wind penetration for curtailment will be evaluated as part of the long term issues for the WIWG.

**TABLE 4: RECOMMENDATIONS – NO CHANGES REQUIRED (RE: PROCESS/PROCEDURES ALREADY EXISTS)**

Title	WG Recommendations	Can WEA	OPG	Windrush Energy	WG Minutes	IESO Response
CAA and ME Requirements	<p>4.1 IESO to facilitate workshops, training during CAA and Market Entry processes.</p>	<p>The IESO and Hydro One should develop a workshop / training seminar to instruct market participants in the rules and criteria for connection assessments. The workshop should be obligatory as part of their connection application. (re: CAA).</p> <p>The IESO has an intake program which instructs all the proponents on obligations as a market participant. As noted above, through better education and instruction at the start of the process, a market participant can be provided with the information required to understand the requirements. (re: ME)</p>			<p>Nov 27, 2006 meeting: Educate proponents prior to starting the Market Entry process.</p>	<p>Given the staggered nature of in service and construction schedules of wind farms, workshops may not be practical or effective. However, the respective suggestions have been covered and addressed alternatively under recommendations #1.1 and 1.2 above.</p>
	<p>4.2 Mandatory meetings with developers during CAA &amp; ME processes.</p>			<p>Suggest mandatory meetings on this issue with market entrants to improve communication between all players.</p>		<p>Options of meetings are already available and generally occur as required. Such needs are also expected to be addressed/covered under recommendation 1.1 and 1.2 above. IESO staff standard practice is to be proactive with new applicants. Additional meetings can also be arranged on an as requested basis during and prior to CAA and ME processes.</p>

**TABLE 4: RECOMMENDATIONS – NO CHANGES REQUIRED (RE: PROCESS/PROCEDURES ALREADY EXISTS)**

Title	WG Recommendations	Can WEA	OPG	Windrush Energy	WG Minutes	IESO Response
CAA and ME Requirements	4.3 Engagement of pre-qualified consultants during application processes.	In lieu of participation in the above seminars, a participant can choose to engage a pre-qualified consultant to handle the application process, provided the client pre-agrees with the process.				This is already an option available to all connection applicants. There is an existing list of consultants who have expressed interest in performing connection assessment studies and is already available on request. Some of these consultants are also capable of completing the application processes. However, these consultants are not 'pre-qualified' by IESO.
Near Term Forecasting	4.4 IESO to use persistence forecasting for real time (10 minutes).		Use persistence forecasting methodology for both real time (10 min) and hour ahead. Do NOT use persistence methodology for day-ahead.		<u>Nov 27, 2006 meeting:</u> Utilize persistence forecasting at more time frames.	Persistence forecasting is already used for RT dispatch (10 min ahead).
Near Term Forecasting	4.5 Require wind generators to update their forecasts to the IESO every 1-3 hr and when the expected output changes by the larger of 2% or a material amount (15 MW).		Require wind generators to update their forecasts to the IESO every 1-3 hr and when the expected output changes by the larger of 2% or a material amount (15 MW).			Wind generators already have an obligation to update forecasts for next hour and beyond when output is expected to be off submitted forecast by more than 2% or 10 MW, whichever is less. Refer to Market Manual 4.2, section 1.3.3.

**TABLE 4: RECOMMENDATIONS – NO CHANGES REQUIRED (RE: PROCESS/PROCEDURES ALREADY EXISTS)**

Title	WG Recommendations	Can WEA	OPG	Windrush Energy	WG Minutes	IESO Response
Near Term Forecasting	4.6 In absence of centralized forecasting, use other market mechanisms to mitigate market impact of poor wind forecasting by MPs (e.g. decrease bid window to 1 hour to allow other MPs to react).		It might be determined that investing in expensive computer/ metrological forecasting tools are not appropriate at this point in time considering that wind is a very small percentage of the generation mix. If the IESO is not proactive in forecasting for DA, then it must place more reactive effort into managing HA and RT operations to mitigate the variability of wind. For example the IESO may need to: - move from a 2 hour to a 1 hour ahead bid window, thus allowing market forces the opportunity to react.			We feel that decreasing the bid window to 1 hour would not allow other MPs to react since the impact of poor wind forecasting is seen between the last pre-dispatch and real time operation.
Operational Control Requirements	4.7 IESO to ensure that wind farms understand curtailment instructions.		The IESO needs to ensure that wind farms understand and can promptly (within 5 min) comply with curtailment instructions.	This information can be relayed to market participants at mandatory meetings with the system operators early in the project management cycle.		The instructions are clearly stated in market rules. The MPs need to understand these requirements. The consolidated web site option (recommendations # 1.1 – 1.3) would further facilitate MPs in understanding such requirements.

**TABLE 5 – RECOMMENDATIONS - PERTAINING TO SEPARATE STAKEHOLDER ENGAGEMENT (SE) PLAN**

Title	WG Recommendations	CanWEA	OPG	Windrush Energy	WG Minutes	IESO Response
CAA and ME Requirements	5.1 Small scale wind farm entrants may not bear cost of state of art telemetry but basic requirements should be clearly announced. This could then be included in their business plans.			Small scale market entrants may not be able to bear the cost of state of the art telemetry, but basic requirements necessary for regulatory process should be clearly announced to market entrants such that it can be included in the individual business plan.		The electrical telemetry is required for those generators that are connected to IESO-controlled grid and these requirements are specified in MR, Ch 4, appendix 4.15. Such electrical telemetry is essential for reliability related purposes. There is no telemetry requirements for any embedded generation that is less than 20 MVA. Telemetry requirements for small generators will be considered under a separate embedded generation related future Stakeholder Engagement (SE) plan.
Near Term Forecasting	5.2 Develop accurate and transparent method for forecasting embedded wind generation.		Develop a more accurate and transparent method for forecasting embedded wind generation.			This pertains to embedded generation and does not fall under terms of reference of the wind power working group. This matter will be considered under a separate embedded generation related future Stakeholder Engagement (SE) plan
Operational Control Requirements	5.3 IESO should develop a protocol with distributors to promptly curtail embedded wind generation at times of Excess Base Generation (EBG).		The IESO needs to work with distributors to develop a method to promptly (within 5 minutes) curtail embedded generation without affecting the loads which may share the same feeder as the wind generator.			Addressed at a high level under the obligations of distributors to follow IESO directly promptly. However, this is not unique to wind and will be considered under a separate embedded generation related future Stakeholder Engagement (SE) plan.

**TABLE 5 – RECOMMENDATIONS - PERTAINING TO SEPARATE STAKEHOLDER ENGAGEMENT (SE) PLAN**

Title	WG Recommendations	CanWEA	OPG	Windrush Energy	WG Minutes	IESO Response
Operational Control Requirements	5.4 IESO should test to ensure compliance to operational control requirements, particularly ability to curtail.		Wind/embedded wind generators need to be tested and occasionally curtailed and to ensure that they are compliant with market rules.			Already in place for wind farms connected to the ICG. The embedded generator related matter will be considered under a separate future Stakeholder Engagement (SE).
Near Term Forecasting	5.5 In absence of centralized forecasting, use other market mechanisms to mitigate market impact of poor wind forecasting by MPs e.g. issue SSR when wind forecast is off by more than 250 MW in the aggregate.		It might be determined that investing in expensive computer/metrological forecasting tools are not appropriate at this point in time considering that wind is a very small percentage of the generation mix. If the IESO is not proactive in forecasting for DA, then it must place more reactive effort into managing HA and RT operations to mitigate the variability of wind. For example the IESO may need to: - issue an SSR when the cumulative change in wind generation varies by more than 250 MW.			This matter will be considered under a separate embedded generation related future Stakeholder Engagement (SE) plan.