

Appendix G

Agency Correspondence

Name Date Agency Comment/Response					
		Ministry of the Environment (MOE)			
From Doris Dumais, Director (to Kevin O'Donovan, Vortex)	April 30, 2010	 Letter Provided Aboriginal contact list 			
From Doris Dumais (to Kevin O'Donovan, Vortex)	July 14, 2011	 Letter Provided Aboriginal contact list for Bow Lake Project – Phase 2 			
To Doris Dumais (from BluEarth)	August 03, 2012	 Email Provided Meeting Summary 05 July 2012 - representatives of BluEarth met with the MOE, MNR and REFO to discuss the Project and First Nations challenges. Specific concern was the recent statement by the Michipicoten First Nation ("MFN") that their Nation had an interest in the Project. This stated interest was not raised during the previous 4 years of engagement with the Project (including a letter of no-interest), and on which basis the Batchewana First Nation is now a significant equity partner in the Project. Batchewana First Nation and Project representatives previously met (July 4) with the MFN and during the meeting the MFN maintained that the Project is not located within their traditional territory. BluEarth requested that if the Crown feels additional consultation with the MFN or other aboriginal groups is warranted by the Crown, that it is carried out proactively, rather than later in the approvals process. 			
From Narren Santos	August 27, 2012	 Email If MNR is of the view that the proposed amalgamation of Phase 1 and Phase 2 of the Bow Lake Wind Farm into a single project would result in a different undertaking being carried out by the MNR in respect to the roads that provide access to the wind facility, than the one for which the notice was already given, MOE agrees that the new undertaking would be exempt from the EAA under ss. 15.0.2(1) of Reg. 334. Where the roads are associated with or ancillary to the provision of access to the facility during the construction, installation, use, operation, etc. of the facility (see ss. 1(4) of O. Reg. 160/99 under the Electricity Act, 1998), they must be considered in the REA process as part of the wind facility. As a result of the email the following took place: The two phases were amalgamated into one Project and the REA process was re-started based on the new Project approach. The Class EA process was terminated and roads to be considered under the Class EA process were incorporated into the REA process. 			
From Doris Dumais (to BluEarth)	October 10, 2012	 Letter (email) MOE has received the revised draft PDR, and reviewed the anticipated environmental effects of the project relative to its current understanding of the interest of aboriginal communities in the area. 			

Name	Date	Agency Comment/Response			
		A list of aboriginal contacts that have or may have constitutionally protected aboriginal or treaty rights that may be adversely			
impacted by the project is provided.					
		Ministry of Natural Resources (MNR)			
	1				
From Erin Nixon	July 12, 2010	• Email			
(to Kevin O'Donovan,		Requested confirmation of project layout before review of the Natural heritage Assessment for Phase 1 Bow Lake Project has			
vortex)		commenced.			
From MNR (to Tulloch	March 29, 2011	Vortex advised that the layout was final and agreed upon with Environment Canada weather radar.			
Engineering)	Widi cli 29, 2011	Deemed Aggregate Permit Applications- Category 9 and Category 11 complete			
From MNR (to Tulloch	April 15. 2011	Letter			
Engineering)		 Deemed Aggregate Licence Application – Category 3 Class A Licence complete. 			
From Erin Nixon (to	August 17, 2012	• Email			
BluEarth)	-	MNR indicated that the following:			
		• MNR agrees that the geographic scope and location have changed significantly with the combined Project. As such, the			
		information provided in the Notice of Commencement issued for Phase 1 of the wind farm prior to the July 1, 2012			
		transition date of O. Reg. 334 would no longer apply for the current project. If the company were to proceed with the Class			
		EA process.			
		 MINR does not have concerns about the migration of the multi-purpose roads to the REA process, but will defer to MOE as to whether the company is able to meet the transition provisions for the roads as set out in the amondments to Q. Reg. 			
		334			
		 The Class EA RSFD document provides no direction on the process to terminate the screening of a project. However, in 			
		speaking with MNR's Senior Environmental Planning Advisor, we would advise the company to take the following actions			
		should they determine to screen the multi-purpose roads under REA:			
		An email should be sent to MNR – Sault Ste. Marie District outlining the company's intent to terminate the Class EA, which			
		will be appended to the EA file.			
		 To avoid confusion moving forward, the company should clearly communicate their intent and reasoning to the public and 			
		aboriginal communities, and describe the new process to be used to evaluate the roads. The public and aboriginal communities chould be informed as to any additional opportunities they may have to commont on the roads surroutly.			
		being screened under the Class FA			
To Erin Nixon (from	September 19, 2012	• Email			
BluEarth)		• MNR is aware of your intent to terminate the Class EA, and has no concerns with this approach given that: 1) public and aboriginal			
		communities will be informed of the process change; 2) comments received to date in regards to the Class EA Notice of			
		Commencement will be considered by the company and incorporated into the REA process where appropriate.			
		As the company has provided a process to meet these requirements, we will consider the Class EA terminated.			
1	1				

Name	Date	Agency Comment/Response				
To Frin Nixon (from	n (from Sentember 20, 2012 • Email					
BluEarth)		 MNR is being notified of our decision to terminate the Class EA for Resource Stewardship and Facility Development ("Class EA") process currently underway to screen the multi-purpose roads associated with Phase 1 of the proposed Project. Bow Lake still intends to proceed with the multi-purpose road works as a part of the Project, however in light of the recent 				
		changes to O. Reg. 359/09 and O. Reg. 334, Bow Lake proposes to migrate the environmental assessment of these multi-purpose road works over to the REA process.				
		 Comments from the public have been received in response to the Public Notice for a Category B Project Evaluation issued under Class EA process on February 29, 2012. Bow Lake has considered this feedback and will include and incorporate these comments, as well as Bow Lake's responses, into the REA assessment and documentation. 				
		 Bow Lake proposes to publicly communicate this change in process via a newsletter that will be distributed simultaneously with the Notice of Final Public Meeting that is anticipated to be distributed in accordance with the REA rules to stakeholders and aboriginal communities at the beginning of October. This notice and information on the change in process will also be posted on the Project website. 				
		 Environmental assessment information related to the (former) Phase 1 Class EA works will be included in the Draft Natural Heritage Assessment and other Draft REA documents that will be posted for public review in October. 				
		 Through these documents and the public consultation requirements of the REA process, the public will be able to comment on the (former) Class EA road works and their assessment leading up to and during the final REA Public Meeting, currently expected to occur in early December. 				
To Erin Nixon (from	October 9, 2012	• Email				
BluEarth)		 Provided copies of Draft NHA/EIS and the EEMP for review and comment (multiple revised versions subsequently sent). Advised of upcoming final public meeting. 				
From Martin Blake (to	January 25, 2013	• Letter				
BluEarth)		 MNR confirms the NHA/EIS in accordance with O. Reg. 359/09. 				
		MNR also confirms the proposed EEMP.				
		Ministry of Tourism, Culture and Sport (MTCS)				
From MTCS	August 7, 2009	• Letter				
	Ostabar 6, 2010	MICS concurs with the recommendations made within the Stage I Arch Assessment.				
From MICS	October 6, 2010	• Letter				
		 MILCS provided written comments as required by O. Reg. 359/09 with respect to the Stage II Arch Assessment (Phase 1) and confirms that the assessment complies with the Ontario Heritage Act. 				
From MTCS	April 7, 2011	• Letter				
		• MTCS provided written comments as required by O. Reg. 359/09 with respect to the Stage II Arch Assessment (Phase 2) and				
		confirms that the assessment complies with the Ontario Heritage Act.				
From MTCS	February 24, 2012	• Letter				

Name	Date	Agency Comment/Response				
		• MTCS provided written comments as required by O. Reg. 359/09 with respect to the Heritage Assessment and are satisfied with				
		the Heritage Assessment.				
From MTCS	April 17, 2012	• Letter				
		• MTCS provided written comments as required by O. Reg. 359/09 with respect to the Revised Stage II Arch Assessment and				
		confirms that the assessment complies with the Ontario Heritage Act.				
From MTCS	April 17, 2012	Letter ATCS and ideal with a second standard by O. Day 250/00 with second to the Store II Auch Associated by a second standard by the second standard b				
		 MILS provided written comments as required by 0. Reg. 359/09 with respect to the Stage II Arch Assessment (Amendment Lands) and confirms that the assessment complies with the Optario Heritage Act. 				
		Lands) and committis that the assessment complies with the Ontario Hentage Act.				
		Ministry of Transportation (MTO)				
To Ken Seabrook & Kevin	April 26, 2010	• Email				
Morphet		• In follow up to phone conversation.				
(from Catherine Taylor-		 Requested confirmation of notes made during conversation. 				
Hell, MKI)		Indicated that Environment Canada weather radar imagery is used by MTO however not for sections of Highways 129 and 556				
	due to distance from the weather radar station.					
		Environment Canada (EC)				
To Chirstine Best.	May 31, 2010	• Fmail				
Manager	,,	Request for meeting				
(from Simon De Pietro,	Simon De Pietro,					
DP Energy)						
To Chirstine Best,	June 1, 2010	• Email				
Manager		Provided discussion document on the Potential Effects of The Bow Lake Wind Farm on the Ability to Predict Snow Conditions on				
(From Blair Marnie, DP Energy)		Highways 129 and 556, paper with MTO and radar information, in anticipation for upcoming meeting.				
Simon De Pietro and	June 9. 2010	• Fmail				
Environment Canada		Proximity to Montreal River weather radar				
		Concerned there will be blockage of radar				
		Requested to leave corridors (cluster turbines radially) where possible within 7km of the radar				
		• Concerned about low-level, winter convective activity that is well defined. Any signal turbulence has very low potential to confuse				
		algorithms or impair forecasters. Winter is less dynamic than summer.				
Simon De Pietro and	June 15, 2010	• Email				
Environment Canada		Agreement reached to incorporate corridors for turbines located within 7km of the Montreal River Radar				

Name	Date	Agency Comment/Response			
		Lindate on any modifications going forward based on additional data (LiDAR, Geotechnical and continual constraint analysis)			
To Stephen Holden	August 11,	• Email			
(Simon De Pietro)	2010/September	Update on layout of Phase 2 (turbines further than 7km).			
	20, 2010 Including	 No substantive change to trigger a need for follow-up or cause any concerns not previously discussed. 			
	responses				
From Stephen Holden	September 21, 2010	• Fmail			
(to Simon De Pietro, DP	September 21, 2010	Confirmed that the Proponent will work with Environment Canada to understand the relationship between Bow Lake turbines and			
Energy)		the weather radar.			
Stephen Holden to	May 6, 2011/ May	• Email			
Simon DePietro (and	25, 2011 Response	Completed 'final' review			
subsequent response)		Stated there was an addition of 2 additional turbines at closer proximity than previous design.			
		Phase 2 layout blocks one of few 'open' corridors approximately 9km from radar.			
		Blockage will significantly impede the issuance of snow squall warnings.			
		Response Letter			
		Layout has been with Environment Canada for 10 months with no communication.			
		Layout actually has three less turbines than previously discussed in June 9, 2010 meeting.			
		Iwo turbines were removed specifically to meet the 7km blockage distance requested by EC.			
		• Agreement was to keep corridors of Phase 1 layout and incorporate corridors though the Phase 2 layout which was completed in line with the agreed strategy.			
		• EC previously stated that as the area is a low population and low infrastructure area, the impact on the safety of the public is			
		reduced and since winter convective weather is less dynamic than summer convection, any impacts on forecasting are much more			
		manageable. The principle users of the highway infrastructure were consulted and raised no concerns.			
		Remain open to working with EC through post construction data gathering and research related to interference mitigation.			
To Stephen Holden	August 8, 2012	Informed EC on new lead developer for the Bow Lake Projects.			
(from Tyler Jans,	rom Tyler Jans, (Followed-up • Provided up to date layout and subsequent independent weather radar impact report.				
BluEarth) August 16, 24, 29 • Layout maintained corridors as agreed by EC.		Layout maintained corridors as agreed by EC.			
	and 31)	Requested list of known users of radar data to ensure thorough consultation.			
From Carolyn Rennie (to	September 5, 2012	• Email			
Tyler Jans, BluEarth)		Advised that the information provided will be analyzed and discussed and a response will be provided.			
Carolyn Rennie to Tyler	September 26,	e Email			
(and subsequent	2012	Kequested update on project schedule			
		Currently reviewing report			
To Corolum Donnio (from	Ostobor 2, 2012	kequested meeting for late October or early November			
Tyler lans Rhufarth)	October 3, 2012	Email Depuided undets on project schedule detailing intent to file DEA and institution with the 2405 in language 2012			
Tyler Jans, Bluearth)		• Provided update on project schedule detailing intent to file REA application with the MOE in January 2013.			

Name	Date	Agency Comment/Response			
		Requested list of known users of radar data to ensure thorough consultation			
		Agreed to meeting date of October 22, 2012			
Carolyn Ponnio to Tylor	Octobor 11, 2012	Final Final			
Lans (and subsequent	October 22, 2012	 Efficient letter weiting their internal legal review to be cant once complete 			
responses)	Response	• EC diating letter waiting their internal legal review, to be sent once complete			
103001303/	Кезропзе	Consolled meeting out for Otto for 22, 2012			
		• Cancelled meeting set for October 22, 2012			
		Response			
		Reiterated project schedule to EC			
		 EC has been consulted on the project over the past several years and have agreed to mitigations for the project 			
		 Questioned new issues now arising after consultation and mitigation implementation to date 			
Carolyn Rennie to Tyler	October 30, 2012	Email (letter)			
Jans		 EC letter outlining concerns of Blockage Attenuation Donnler Contamination Loss of Donnler Radar Data Multi-nath reflections 			
		Weather forecasts and warnings. Aviation flight briefing, operations and forecasts. Damage to radar receiver, quantitative			
		precipitation estimations and Low quality radar data inputs into models (See letter signed by Stephen Holden dated October 29.			
		2012)			
		• Email			
		Committed to review and set new meeting date as previous meeting was cancelled by EC.			
		Meeting scheduled for January 9, 2013			
Tyler Jans to Carolyn	December 11, 2012	Requested Antenna pattern and information on the Montreal River WSR-98A for use by engineering consultant			
Rennie		Information provided December 21, 2012			
Carolyn Rennie to Tyler	December 11, 2012	• EC comments in response to Draft REA submission documents (see letter signed by Leonard Szarko dated December 11, 2012)			
Jans					
Environment Canada	January 9, 2013	Meeting at EC in Toronto			
and Proponent		Discuss new EC concerns identified in December 11, 2012 EC letter.			
		Discuss results of additional analysis completed by Proponent			
		 Discuss next steps and additional work to be completed by EC and Proponent 			
		Commitment by EC and Proponent to complete further analysis on predicting actual impact to radar and to meet again in near			
		future.to discuss further.			
Tyler Jans to Carolyn	January 10, 2013	• Email			
Rennie		Confirming January 9 meeting outcome.			
		General agreement was that there were two separate issues, one being radar data quality and the second with regards to			
		weather forecasts and warnings.			
		• Specific to radar data mitigation, both parties are in general agreement that given the stage of the project, moving turbines or the			
		radar were not feasible.			
		Next steps were outlined for EC and Proponent			

Name Date		Agency Comment/Response		
Carolyn Rennie to Tyler Jans	January 22, 2013	 Email EC provided meeting notes and deliverables of January 9 meeting 		
		Sault North Planning Board (SNPB)		
	July 30, 2012	 Letter and Notice Provided Notice of Proposal and Public Meeting. Advised that this is a re-issuing of the Notice of a Proposal to Engage and Notice of Public Meeting for the combined Project (Phase 1 and Phase 2) and a new Draft Project Description Report has been prepared (attached). Provided brief description of project. 		
Janice Chirstian Bryan Tripp	September 6, 2012	 First Public Open House Janice Christian, General Manager SNPB attended open house, obtained Project Information Initial discussion around SNPB requirements Commitment by B. Tripp to provide SNPB with information they require to complete their review of the Project. B. Tripp to follow-up with Janice with contact information and phone call. 		
Bryan Tripp to Janice Christian	September 17, 2012	 Phone Call and Email Discussed Project location, general requirements for letter of conformity from SNPB Janice sent Official Plan, Zoning By-lay and township zoning maps to Bryan via email 		
Bryan Tripp To Janice Christian	September 19, 2012	Email Provide contact information		
Bryan Tripp to Janice September 25, 2012 Christian		 Email Noted entire townships of Smilsky and Peever are zoned Rural. Noted that electricity generation was a permitted use on rural zoned land, which applies to turbine 4 location on Patent Land B. Tripp noted project layout meets REA setback requirements. Requested more information from SNPB on specific information requirement for letter of conformance process 		
	October 9, 2012	 Letter and Notice Provided Notice of Final Public Meeting. Noted that as required under O. Reg. 359/09, drafts of all reports required as part of the Renewable Energy Approval (REA) application for the Project have been made available for public review for a period of at least 60-days prior to the Final Public Meeting. Provided scheduled date of the final public meeting. Provided SNPB with hardcopies of draft REA reports for Public viewing 		
Bryan Tripp to Janice Christian	October 24, 2012	Email Informed SNPB about date and location of Final Public Open House		

Name	Date	Agency Comment/Response			
		Reminder that the draft REA documents have been posted for 60 day public review period.			
		Request that SNPB outline their questions and concerns by Nov 31, 2012.			
		Offered to set up a conference call or attend a meeting at the SNPB office to discuss the Project			
Janice Christian to Bryan	October 30, 2012	• Email			
Tripp		• Janice indicated SNPB generally likes to know where buildings and structures are located in the planning area, including those			
		located on Crown Land.			
		Requested copy of the site survey, which would be sufficient for the Planning Boards purpose.			
		• Janice would be leaving the SNPB as of November 9, 2012, and to direct future correspondence to saultnothpb@shaw.ca			
Bryan Tripp to Jannice	November 5, 2012	• Email			
Chrisian		• Project would be willing to share copies of the site surveys with SNPB, once they are complete which will align with the MNR land			
		tenure process and is anticipated after site construction.			
		We have provided most recent site plan showing proposed layout.			
Janice Christian to Bryan	November 6, 2012	• Email			
Tripp		Provided the Letter of Conformity application document, and Rural Zone requirements			
Bill Wierzbicki (new	November 13, 2012	• Email			
General Manager for		Request locations of residential or recreational dwellings in vicinity of the Project Area			
SNPB) to Bryan Tripp		Bryan Tripp called Bill to confirm his request			
Bryan Tripp to Bill	iripp to Bill November 16, 2012 • Phone Call and Email				
WIErzbicki		Clarified that SNPB was requesting dwelling locations to assess environmental noise			
		B. Tripp committed to send the Acoustic Assessment Report.			
		Bill was the new planner for SNPB but works part time for the board.			
		Bill was preparing SNPB comments on the Project			
		B. Tripp requested that comments are received by December 13, 2012			
		• Empilement on Nevember 16, 2012 from D Tring to SNDD that included the Dowy Joke Accustic Accessment Depart (AAD) propored			
		Email sent on November 16, 2012 from B. http://doi.org/10.100/0000000000000000000000000000000			
		operation of the proposed wind farm will comply with the requirements of the MOE publication NPC-232 Sound Level limits for			
		Stationary Sources in Class 3 Areas (Rural) for all identified recentor locations			
Bryan Tripp to Joy	January 14, 2013	Phone Call			
Decourcy,		 Joy confirmed the SNPB planner Bill Wiezbicki was out of the office until 16 January. 			
Administrative Clerk		 Bryan Tripp indicated the Project intended to submit the REA application on January 31, 2012, and we have not received further 			
SNPB	comment from SNPB.				
		Bryan to follow up with Bill on 16 January.			
Bryan Tripp to Bill	January 16, 2013	Phone Call			
Wierzbicki	Provided update on REA application status and anticipated timing				
		• Bill confirmed the SNPB did not have further questions regarding the REA application. SNPB would not be submitting further			

Name	ame Date Agency Comment/Response					
	comment.					
	Ontario Provincial Police (OPP)					
Wes Moore, Staff	April 26, 2010	• Email				
Sergeant		Follow up to phone conversation.				
	Reviewed information provided that the OPP does not use data from Environment Canada watches/warnings or the weather relationships or the second					
		imagery to direct their operations or planning; and the OPP is not concerned with impacts to data from the Montreal River				
		weather radar.				
		Requested if the OPP could confirm.				

Terella, Andrea

From:	Blair Marnie <blair.marnie@dpenergy.com></blair.marnie@dpenergy.com>			
Sent:	Tuesday, June 01, 2010 4:44 AM			
То:	Best,Christine [Ontario]			
Cc:	Maureen De Pietro; Kevin O Donovan; Ronan; Peter Harte; Catherine Taylor-Hell; Simon			
	De Pietro			
Subject:	RADAR DISCUSSION PAPER			
Attachments:	BLWF_Radar_Discuss_010610.pdf			

As advised by Simon, please find attached discussion paper in anticipation of your forthcoming meeting. If you have any questions in advance of the meeting please dont hesitate to contact me

Best Regards

Blair Marnie

DP Energy Ireland Ltd Mill House Buttevant Co Cork Ireland UK Mobile +44 (0) 7775 846039

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----- Original Message -----From: Best, Christine [Ontario] To: simondepietro Cc: blair marnie ; Holden, Stephen [Ontario] ; Wartman, Dave [Dartmouth] ; Yao, Lillian [Ontario] ; Donaldson, Norman [Ontario] Sent: Monday, May 31, 2010 12:39 PM Subject: RE: Discussion paper

Thank you Simon. I look forward to seeing what has been learned.

If at all possible it would be best to aim for Wednesday June 9. I will be out of the country from June 3 to June 8, then on annual leave before starting in a new position June 21. However, I could easily meet with you on the 9th and my replacement may also be available. Although I will be staying in touch with the Radar Program for a while to help with the transition, I will not be nearly as involved in individual projects.

Effective June 1, Stephen Holden (<u>stephen.holden@ec.gc.ca</u>, 416-739-4103) will be taking over as Manager, National Radar Program. There will be a transition period, but I suspect that by mid-July the hand-off will be complete.

If you could suggest a time on the 9th, I could organize some meeting space here in our building. I will also see if I can bring together the people involved in the turbine/radar analysis.

Christine Best

Manager, National Radar Program 416-739-4292

From: simondepietro [mailto:simon.depietro@dpenergy.com]
Sent: May 31, 2010 7:19 AM
To: Best,Christine [Ontario]
Cc: blair marnie
Subject: Discussion paper
Importance: High

Christine

I'm actually in the Soo at moment...here until Tuesday evening/Wednesday then notionally flying to Boston briefly for a wake on friday – back to Canada 6th.

I've asked Blair to put together discussion paper on what we've found out from MTO etc (through Catherine at MKInce) and from our radar chap Norman plus what we've gleaned from talking to people and seeing what's published. It's a bit rough and ready but I'd hope would be useful to talk around.....I'm hoping that will be with you by end of today.

Would you be available sometime maybe early/middle next week? I've meeting with 1st Nations on Tuesday 8th but Monday or Wednesday might work..... alternatively I could delay trip south and drive to Toronto Wednesday and meet you this week?

Can you let me know what your availability might be please

Regards

Simon

Simon De Pietro DP Energy Ireland Ltd Registered Office: Mill House, Buttevant, Co Cork Registered in Ireland no 345411 Tel: + 353 (0) 22 23955 Fax: + 353 (0) 22 23027 Mobile: +353 (0) 879722399 email:simon.depietro@dpenergy.com www.dpenergy.com Discussion Document on the Potential Effects of The Bow Lake Wind Farm on the Ability to Predict Snow Conditions on Highways 129 and 556.

1.0 Introduction

This discussion document seeks to consider and discuss the concerns raised by Environment Canada (EC) in respect of the Bow Lake Wind Farm and its potential effects on the Montreal River radar station.

Concerns have been raised during consultation in respect of potential blockage of the radar signals within its southeast arc and in particular interference with low level coverage (below 3000ft) over the sections of Highways 129 and 556 (the target area) where Lake Effect Snow forecasting and identification of 'snow streamers' is required.

The key elements of the discussion are noted as:

- EC's primary concern is winter weather warning and in particular Lake Effect Snow impacts on Highways 129 and 556
- Snow warnings are typically given 10 to 13 times a year over the winter period from November through to February.
- Lake Effect Snow generally forms below 3000 ft, and
- Streamers can be very discrete sometimes only 10km wide

On the basis of EC`s defined concerns ⁽¹⁾, an assessment has been conducted focusing on three topics:

- 1. Coverage: A baseline assessment of the coverage area of Montreal River, Timmins, Britt and Gaylord (USA) radar stations;
- 2. Blockage and Interference Effects: A detailed assessment of the potential for the wind farm to create blockage of and interference to radar data from Montreal River radar station; and
- 3. End users: Consultation with principal users of the weather radar in order to assess the potential significance of any impact.

Expert technical opinion on this assessment has been provided by Norman Stewart who has been a consulting engineer with BAE Systems since 1987 with responsibilities to provide consultation to all radars designed by the company. Normans C.V is appended to this document.

2.0 Wind Farm Project Proposal

Vortex Wind and DP Energy propose to develop a wind generation facility (Bow Lake Wind Farm) in the District of Algoma, Ontario, 80km north of Sault Ste Marie. The site

lies immediately south of the Montreal River and approximately 10km inland from the rivers entrance into Lake Superior

The Bow Lake Wind Farm covers an area of approximately 18km^2 and has the potential for an installed capacity in excess of 80MW. The proposal is for the wind farm to be constructed in two phases (Phase 1: 12 turbines 2012, and Phase 2: up to 25 turbines 2013). The turbines proposed will have installed capacity of around 2MW, and of between 80 and 100 metre hub height and with a rotor diameter in the range 90 to 100metre.

Environment Canada's Montreal River Weather Radar (Site Identifier: WGJ located at 47/14/52N 84/35/45W) lies immediately to the North-west of the proposed development

The Phase 1 project consists of 12 wind turbine generators and associated roads and electrical infrastructure with a scheduled build of 2012. Environmental assessment works for the Phase 1 project have been undertaken over the course of the last 3 years and are substantially complete.



Figure 1 – Bow Lake Wind Farm Phase 1

Bow Lake Phase 2 consists of up to 25 turbines with a projected build date of 2013 and environmental assessment works are currently ongoing.

The project as a whole will be a Class 4 wind facility as defined in *Ontario Regulation 359/09.* Both project phases (up to a total installed capacity of 60MW's) are in receipt of contracts under the Ontario Power Authorities (OPA) Feed in Tariff programme (FIT).

Turbines of this size are typically spaces around 500-700metres apart to avoid significant interturbine wake losses, but as is clear from the figures the terrain is rugged and much of the turbine siting design is also heavily dictated by physical topographic constraints as well as yield and environmental setbacks. The topography restricts the ability to make significant movements without significant impacts on yield and constructability.

A preliminary drawing of the complete site is shown in Figure 2.



Figure 2 - Bow Lake Wind Farm Phases 1 and 2

3.0 Weather Radar Concerns – EC Consultation

3.1 Environment Canada

A preliminary design based on a 9 Turbine layout (based on the pre FIT Standard Offer Process) was submitted to Environment Canada (EC) in 2009. In an email response (11th September 2009) the Meteorological Services of Canada (MSC) noted:

"... we have significant concerns that even a small wind farm this close to a radar will create signal blockage and interference."

The email further noted the specific area of concern:

"The signal blockage in this direction will likely result in data loss over Highway 556 (Ranger Lake) and 129 (Thessalon to Chapleau) which are subject to snow squalls in stiff west to northwest flows."

Following the provision of a revised Phase 1 layout (based on the OPA FIT rather than the Standard Offer Process) and a draft turbine layout for Phase 2 of the project, EC made the following written response in a letter ⁽²⁾ dated March 26th 2010:

"This analysis indicates that the blockage of and interference with radar data that will be caused by the wind farm construction in the area will significantly impede the issuance of timely and accurate snow squall warnings for the Superior East forecast region, in particular, the sub-region of Searchmont-Montreal River-Batchewana Bay."

The letter makes the further comment that:

"Winter precipitation is a low-altitude phenomenon, monitored by the radars at low elevation scans. It is these low-level scans which will be blocked and rendered useless by the construction of a wind farm close to the radar (generally defined as within 7-10 km).

With the current design proposals, all phase 1 and 2 turbines are within 10 km of the radar, the majority within 7 km and several closer than 4 km. This is a significantly more disruptive layout than the original Phase 1 plan about which we voiced concerns."

3.2 Technical Information and Co-ordination Process Between Wind Turbines and Radiocommunication and Radar Systems – V8.0 (Draft 1)⁽³⁾.

These recently issued guidelines confirm that there is potential for weather radar interference from wind turbines and identify EC as the mandatory contact for consultation with regard to weather radars.

4.0 Baseline Assessment

4.1 Weather Radar Coverage

Radar has been used for a number of years to provide regular weather forecasts and severe weather warnings. In Canada this is done through Environment Canada's weather service "The Meteorological Service of Canada" (MSC).

The new Doppler Radar network which was developed under the National Radar Program from 1998 to 2004 comprises 28 Environment Canada radars and 2 Department of National Defence radars (C Band). Additional data is also obtained from the Marshall radar Observatory at the Sainte-Anne-de-Bellevue campus of McGill University on the outskirts of Montréal (S Band).

With the addition of data from McGill, the network provides radar coverage for much of southern Canada and over 98% of the Canadian population and their primary purpose is the early detection of developing precipitation, thunderstorms and high impact weather.

This network illustrated in Figure 3 below, comprises 28 Environment Canada radars and 2 Department of National Defence radars. With the addition of data from McGill, the network provides radar coverage for much of southern Canada and over 98% of the Canadian population. Their primary purpose is the early detection of developing precipitation, thunderstorms and high impact weather.

MSC's weather radars have an effective circular coverage area that is approximately 256 km in diameter when operating in Doppler mode, and 512 km diameter in conventional mode ⁽⁴⁾.



Figure 3 – Weather Radar Coverage

4.2 Local Radar Coverage

There are four radar sites around the proposed Bow Lake Wind Farm as shown in Figure 4. Also shown is the wind farm location and, from correspondence with EC $^{(1)}$, sections of Highways 129 and 556 where bad weather forecasting is required.



Figure 4 – Ontario Radar Coverage

Specific Locations ⁽⁴⁾ are identified in the following table:

Name	Location: Lat L	ong (WGS84)	Height (ASL)	Max & min Distance over Target Area Required (km)		
BLWF – P1	47 ⁰ 13` 33.30N	84 ⁰ 33` 30.61W	620 (max hub)	n/a		
BLWF – P1 & 2	47 ⁰ 12`52.15N	84 ⁰ 31`24.33W	644 (max hub)	n/a		
Montreal River	47° 14` 52.01N	84°35`44.99W	541	130 & 70		
Britt (Sudbury)	45 [°] 47` 35.41N	80°32`01.86W	499	290 & 230		
Timmins	49º 16` 53.26N	81 ⁰ 47`38.62W	260	280 & 360		
Gaylord (USA)	44° 54` 07.29N	84°42`53.91W	466	260 & 175		
Table 1: Weather Padar and Wind Farm Location Information						

The MSC units such as that at Montreal River are C band Radars, have a power of 250kW and understood to have a main beam width of around 1.1degrees. The lowest scan elevation angle is noted to be around 0.2 degrees.

The US NWS Gaylord WSR-88D unit is an S band Radar, has a power of 750kW and a beam width of around 0.95degrees. The lowest scan elevation angle is noted to be 0.5 degrees. The WSR-88D currently provides reflectivity data at 1 km by 1 degree to 460

km range, and Doppler data at 0.25 km by 1 degree to a range of 230 km. It is understood that plans to introduce Super Resolution to the NEXRAD network will enable the WSR-88D to provide data with a sample size of 0.25 km by 0.5 degree, and increase the range of Doppler data to 300 km from the current 230 km.

4.3 Local Radar Coverage Below 3000ft (914m)

As referenced in EC response ⁽⁵⁾, the main concern with respect to snow squall forecasting is loss of radar visibility below 3000ft. It was therefore important to confirm existing radar coverage visibility at this level.

Assuming earths curvature based on a radius of 6371km which is increased by 4/3 to allow for bending ("Radar Design Principles" Fred E Nathanson), the actual radar visibility below 3000ft from the three adjacent radar stations is as follows.

4.3.1 Montreal River Radar

The Montreal River radar at a height of 541m is able to provide cover down to 3000ft at ranges up to 142km assuming a typical intervening terrain height of 400m as shown in Figure 5.



Figure 5 - Distance at which Montreal River can see down to 3000ft

4.3.2 Britt (Sudbury)

The radar at Britt is at a height of 499m and lies between 230km and 290km from the target area requiring visibility (southern and northern parts of Highways 129 and 556). Between Britt and the target area there is intervening terrain of around 230m, depending on angle which affects low cover.

In terms of its ability to provide low cover, the range at which it can see down to 3000ft is shown in Figure 6 below.



Figure 6 - Distance at which Britt can see down to 3000ft

At the range covering the target area (Maximum 290km and Minimum 230km), Britt is unable to provide low level coverage down to 3000ft. This is shown in Figure 7.



4.3.3 Gaylord Radar

The radar at Gaylord is a powerful WSR-88D and part of the US Weather Service NEXRAD system ⁽⁶⁾. It has a 750Kw S-band transmitter and a 45.5dB gain antenna. It's coverage is dependent on the selected mode and defined as 470km for reflectivity measurements and 230km for Doppler.

The distance from Gaylord to the wind farm is 275km which is well within the coverage envelope of the radar. The radar should have sufficient sensitivity to see weather effects below 10dBz.

The radar is situated at a height of 466m. The curvature of the earth will determine the minimum height which the radar the radar can see and this is shown in Figure 8 for two situations. One where there is little in terms of intervening terrain between the radar and the wind farm and the second shows ground of 170m on the horizon. Dependent on angle there is some high ground up to 170m between Gaylord and the wind farm so the 170m height profile gives a more conservative estimate and shows that the radar can see down to about 2600m. This includes an allowance for the radar signals bending around the earth's curvature.



Figure 8 - Minimum Height Cover from Gaylord to Windfarm

With respect to coverage of the target area, the minimum height cover from Gaylord in the ranges of 175km and 260km are shown in Figure 9 below. This indicates that Gaylord has some very limited cover below 3000ft in the southern sector of Highway 129. The 3000ft level is broken from Gaylord at 183km.



4.3.4 Summary of Local Radar Coverage below 3000ft (914m)

The following map in Figure 10 illustrates the extent of radar coverage to 3000ft from Montreal River, Britt and Gaylord radar stations with reference to the target area (Highways 556 and 129).



Note: The above map provides illustrative information only with respect to line of sight between radar station and target area. Intervening terrain will serve to distort the assumed radii and therefore should only be used in the context of the corridor between the radar and the target area.

Figure 10 - Extent of Radar Coverage to 3000ft (915m)

5.0 Potential Wind farm Interaction with Montreal River Radar Station

5.1 Phase 1 Development

In order to consider the potential impacts of the Phase 1 development on the Montreal River Radar Station aspects of blockage and interference were reviewed separately.

The necessary arc of horizontal coverage required to cover the target area to include Aubrey Falls on Highway 129 to the north and Thessalon on Highway 129 to the south has been defined and included on the turbine layout maps. These have been then related to the horizontal line of sight (LOS) required through the wind farm to identify the level of potential blockage, at what distance that blockage was occurring and also to identify any possible clear corridors. The defined main beam width of 1.1 degrees was used to as the parameter for defining potentially clear corridor routes. As shown in the following figures, physical blockage includes the rotor assuming the worst case scenario where the turbines are providing their largest aspect i.e. that the rotor plane is perpendicular to the beam. This was carried out for three Phase 1 turbine layouts:

- RADAR 1: 9T layout reviewed by EC and opinion provided in e-mail of 11th September 2009;
- RADAR 2: 12T updated layout reviewed by EC in conjunction with phase 2 and forming part of EC opinion response of 26th March 2010; and
- RADAR 5: 12T modified layout.

5.1.1 RADAR 1: Phase 1 (9 Turbines)

The following Figures 11 and 12 show the extent of horizontal coverage required by the Montreal River Radar to adequately cover Highways 129 and 556 across the Wind Farm (orange bounding lines). Possible inter-turbine corridors are also shown in degrees.



Figure 11 – RADAR 1: Horizontal Extent and Inter-turbine Corridors



Figure 12 - RADAR 1: View from Montreal River Radar Station

5.1.2 RADAR 2: Phase 1 (12 Turbines)

The following Figures 13 and 14 shows the extent of horizontal coverage required by the Montreal River Radar to adequately cover Highways 129 and 556 across the wind farm along with the possible inter-turbine corridors.



Figure 13 - RADAR 2: Horizontal Extent and Inter-turbine Corridors



Figure 14 - RADAR 2: View from Montreal River Radar Station

5.1.3 RADAR 5: Phase 1 (12 Turbines)

The following Figures 15 and 16 shows the extent of horizontal coverage required by the Montreal River Radar to adequately cover Highways 129 and 556 across the wind farm along with the possible inter-turbine corridors.



Figure 15 - RADAR 5: Horizontal Extent and Inter-turbine Corridors



Figure 16 - RADAR 5: View from Montreal River Radar Station

5.2 Phases 1 and 2 Development

In order to assess potential impacts of the combined phase 1 and 2 developments on the Montreal River Radar Station, the same exercise was undertaken as described above. Additional information relating to the distance of individual turbines of phase 2 from the weather radar station have also been presented. This was carried out for two turbine layouts:

- RADAR 4: 36T the layout reviewed by EC in conjunction with phase 1 and forming part of EC opinion response of 26th March 2010; and
- RADAR 6: 39T updated layout featuring the modified 12T layout for phase 1 (as reviewed in RADAR 5) and the current layout for phase 2.

5.2.1 RADAR 4: Phases 1 and 2 (36 Turbines)

The following Figures 17 and 18 shows the extent of horizontal coverage required by the Montreal River Radar to adequately cover Highways 129 and 556 across the wind farm (orange lines). Inter-turbine corridors are not shown as the layout is based on Phase 1 as highlighted in 5.1.2 above with a maximum corridor gap of 3.0⁰.



Figure 17 - RADAR 4: Horizontal Extent and Inter-turbine Corridors





5.2.2 RADAR 6: Phases 1 and 2 (39 Turbines)

The following Figures 19 and 20 shows the extent of horizontal coverage required by the Montreal River Radar to adequately cover Highways 129 and 556 across the wind farm. Inter-turbine corridors are also shown as are approximate distances in km from the weather station to each individual turbine.



Figure 19 - RADAR 6: Horizontal Extent and Inter-turbine Corridors



Figure 20 - RADAR 6: Horizontal Extent, Phase 1 Inter-turbine Corridors and Distances

In RADAR 6 the furthest north turbine has been removed reducing the overall extent of the arc, however, this lies north of the target area and defined area of concern.

5.3 Potential Blockage and Interference – Case Studies

A significant number of studies have been conducted evaluating the impacts of wind turbines on air traffic radar, particularly in the UK in respect of Ministry of Defence (MoD) radar, National Air Traffic Services (NATS) en-route radar, and airport radar. Less work has been undertaken on weather radar impacts although it is understood that a number of studies are underway in the US.

Although there are significant differences in the usage of air traffic and weather radar with the former related to identification and tracking of small fast moving targets there is commonality in relation to the radar science.

Some studies undertaken in the USA include the following:

- "Real Time Clutter Identification and Mitigation For Nexrad John C. Hubbert, Mike Dixon and Cathy".
- "Impacts Of Wind Farms On Wsr-88d Operations And Policy Considerations' Richard. J. Vogt, John Rex Reed, Tim Crum, John T. Snow, Robert Palmer, Brad Isom Donald W. Burgess".

- "An Update On Policy Considerations Of Wind Farm Impacts On Wsr-88d Operations, Richard. J. Vogt, Tim Crum, John T. Snow, Robert Palmer, Brad Isom Donald W. Burgess, Mark S. Paese".
- "Wind farms interfering with weather radar in N.Y. William Kates, (Associated Press)".

These studies have shown that the potential for clutter caused by the turbines can have a significant effect on weather predictions. They also indicate that there may be some effects which extend beyond the wind farm but no indication of the extent, cause or analysis is carried out. A number of these papers investigate signal processing techniques to mitigate the problem but these are aimed at the near turbine effects and are unlikely to be applicable to beyond turbine effects. There is little information on the effect when the area of interest is looking through but well beyond the farm. However, there is some work on the detection of ships and aircraft and the effect on radio links. This at least provides circumstantial evidence that it is possible to see through a wind farm and the effects may not be as significant on the radar's performance as feared.

A. Results of the electromagnetic investigations and assessments of marine radar, communications and positioning systems undertaken at the North Hoyle wind farm by QinetiQ and the Maritime and Coastguard Agency, Martin Howard and Colin Brown, QINETIQ/03/00297/1.1, MCA MNA 53/10/366, 22 November 2004

This report looks at boats and ships operating close to and behind wind farms.

The report states:-

"MCA's programme was intended to assess the effect of the wind farm structures on marine systems in operational scenarios. The trials assessed all practical communications systems used at sea and with links to shore stations, shipborne and shore-based radar, position fixing systems, and the Automatic Identification System (AIS). The tests also included basic navigational equipment such as magnetic compasses."

The boat trial stated:

"It was found that the depth of shadow at a distance of 1000m behind a turbine was approximately 14.4dB".

This will however reduce with range.

In summary, the report stated that:

"The QinetiQ radar shadowing trials provided very little evidence that shadowing of targets would present any significant problems".

B. Wind Farms Impact On Radar Aviation Interests - Final Report, FES W/14/00614/00/Rep, DTI Pub Urn 03/1294, QinetiQ, September 2003

This report is a theoretical study into wind turbines. It assesses the likely radar cross-section of turbines. It also looks at the shadow causes by turbines and in particular shows how the Fresnel effect causes the radar waves to bend back around the turbine to reduce the shadow. The report states:

"For typical distances of (say) 10km, and a radar wavelength of 10cm, the Fresnel zone diameter is $Lf = \sqrt{(5000 \times 0.1)} \approx 22$ metres. We see that this is much wider than the width of a turbine, but shorter than its length. This has the consequence that a turbine blade (or tower) does not obscure the whole of the width of the Fresnel zone, and so it does not cast a completely ``black" shadow behind it".

Repeating the calculations for weather radar frequency and a turbine at 4km, that the Fresnel Zone diameter is about 14m diameter which is smaller than a tower or blade diameter so that it is still true to say that the shadow cast is not totally black."

"The obstacle length does not enter provided it is longer than the Fresnel zone diameter"

The report concludes:-

"In summary, because of the wave nature of radar energy, the shadow behind a wind turbine is only dark to a distance of a few hundred of metres. This shadowing exists only for a width of a few metres, directly behind the turbine. This can only prevent the detection of a target if the target is no more than a few metres in size, positioned directly behind a turbine, and stationary so that it stays in the shadow. This is unlikely to be a problem in practice for realistic aircraft. Beyond this there is some reduction of the radar power, and a time-variation, but these will not prevent detection except possibly for very small targets."

An important finding of this work is that the size of the shadow area depends on the width of the turbine tower not its length. Similarly it is the width of the blade which determines the extent of the shadow rather than the blades length.

C. Fixed-link wind-turbine exclusion zone method, D F Bacon, 28 Oct '02, Version: 1.1

This work has been carried out for fixed radio links to see how close a link can become to a turbine before it degrades the link performance. This uses a slightly more conservative equation. Figure 17 shows the distance R_{f2} which the line of sight between the transmitter and receiver must be from the turbine to have minimal effect. For a turbine at 4km and the receiver at 100km, this separation only needs to be about 20m which is typical for the scenario under consideration. While this work was carried out for line of sight communications it shows that the vast majority of sky is unaffected by the existence of the turbine.





When considering the relationship between a fixed link and a radar which is illuminating an extended area, the extended area can be thought of as an infinity of points. Each point in the extended area will be affected slightly differently due to the difference in the line of sight to the radar. When considering a large area like weather only a small number of the points will be affected by the presence of the turbine, so the overall affect should be small.

D. The Effects Of Wind Turbine Farms On ATC Radar, AWC/WAD/72/665/Trials, 10 May 05

This study was carried out by the UK MoD to assess the impact of aircraft flying over and around wind farms.

This report states:-

"The presence of a large physical obstruction (with a large resultant Radar Cross Section (RCS)) in the path of the radar beam is known to result in a shadow notwithstanding the relationship between the short-range auxiliary beam and the medium-range main beam region behind the object. However, the radar beam rapidly reforms behind wind turbines due to diffraction, limiting the range of the shadow. The extended depth of shadow regions observed during previous trials is believed to be linked to how individual radar systems process clutter. It was expected that during this Trial there would be a region immediately behind the wind turbines within which the PD of an aircraft was significantly reduced. Previous experience suggested that this region would be 2-3 kms deep".

"The presence of a large physical obstruction in the path of the radar beam had previously resulted in a shadow region behind the object. The shadow region extended beyond the range within which diffraction would be expected to reform the beam. This was believed to be related to the process by which individual radar systems process radar clutter (both general background noise and false alarms). This was observed during this Trial but occurred both behind and in front of the turbines, The loss of detection in front of the turbines, relative to the radar, was not the result of conventional shadowing as would be experienced when an object blocks a light beam." E. The Effects Of Wind Turbine Farms On Air Defence Radars AWC/WAD/72/652/Trials 6 Jan 05

This study was carried out by the UK MoD to assess the impact of aircraft flying over and around wind farms.

This report states:-

"Previous research had predicted a shadow region behind the wind turbines within which primary radar responses would be masked; this was confirmed by this Trial. Clutter due to the wind turbines was displayed throughout the Trial. During this Trial the observed effect was not operationally significant; however, as many variables (including: radar type, turbine parameters, location and weather) impact on levels of displayed clutter, this observation does not automatically read across to other situations."

"The presence of a physical obstruction with a large Radar Cross Section (RCS) in the path of the radar beam was expected to create a region behind the turbine farm within which aircraft would be masked from detection. Theoretical modelling suggested that this region would only be a few km deep."

"However, given that the shadow effect is bounded to a few km and assuming that it is only present at low-level, it can be mitigated through the employment of overlapping radars, limits on size and location of wind farms and the long range detection of targets using other assets."

5.4 Experiences from Operational Weather Radar

In the US the impact of turbines on weather radar appears to be largely one of the operator (or algorithm within the radar processor) mistakenly identifying the wind farm return as an intense storm or tornado event. The US NWS cites the case of the Buffalo (Cheektowaga), NY radar and wind farms in Wyoming County Upstate New York (<u>www.erh.noaa.gov/buf/windfarm.htm</u>), and also the trigger of a false Tornado warning in Dodge City, Kansas in 2009.

Some Lake Effect Snow issues have been noted by the NWS station at Buffalo in relation to wind farms in Upstate NY (USA Today 13 Oct 2009: William Kates, Wind farms interfering with weather radar in N.Y.). The Tug Hill Plateau in Lewis County is prone to heavy lake effect snow off Lake Erie and also home to the 195 turbine Maple Ridge wind farm (amongst others). The article quotes Bill Hibbert, a meteorologist at Buffalo as stating "It's more of an annoyance than a critical issue" and we have tried to contact Mr Hibbert in an attempt to better understand the NWS experience but have been unsuccessful so far.

6.0 End user Consultation

In order to assess the potential significance of any impacts, consultation has been undertaken with the users of the weather radar system identified by EC as potentially having concerns, these included:

- Ministry of Transportation Ontario (highways) MTO;
- Ontario Provincial Police (OPP); and
- Any private snow clearing operators who have access to the weather radar data.

During consultation with the MTO, they were also asked about other parties that could rely on data from the Montreal River weather radar station and that might have concerns. The following additional party was suggested:

• Ministry of Natural Resources, Ranger Lake Fire Base – MNR.

6.1 Ministry of Transportation (MTO) – Sault Ste Marie District Office

Catherine Taylor Hell of MK Ince spoke with the MTO, and subsequently wrote an email confirming her understanding of key points from that telephone conversation (repeated below) and received a response email of 26th April 2010 with a correction to the second observation that:

"One minor correction would be that class 2 is not the highest service level we have, all our 400 series hwys and other freeways are a class 1 but that has no bearing on the issue of the EC radar imagery at Montreal River."

The key points of the conversation were that:

- 1. Environment Canada weather radar imagery is used by MTO to obtain snowfall information for Highway 17, but not for the sections of Highways 129 and 556 that we discussed. This is because Highways 129 and 556 are too far from the weather radar station for accurate low-level snowfall information to be depicted. (Note for those copied on this email that Environment Canada has not predicted any impacts from the wind farm on their data over Highway 17.)
- 2. Highway 17 is a Level 2 highway, the highest service level for MTO when it comes to snow clearing. Highways 129 and 556 are Level 5, the lowest service level. MTO's highest concern related to snow squalls is on Highway 17.
- 3. MTO has roadside weather stations and cameras on Highway 17 which provide snowfall information, but there are no such installations on secondary highways like Highways 129 and 556, due to budget limitations and the lower service level.
- 4. In addition to the Environment Canada weather radar imagery, several other tools are used by MTO to detect snow squalls and snowfall activity on all Highways. These include Environment Canada satellite images, several other web-based sources of information, and Ministry of Transportation patrols of all Highways 24 hours a day and 7 days a week during winter conditions. For Highways 129 and 556 specifically, these patrols are the main source of information currently used to determine when snow clearing is required.
- 5. Other parties that could have concerns about impacts from the wind farm on the EC weather radar: We discussed an appropriate contact at OPP (Wes Moore, OPP Detachment Commander in Sault Ste. Marie). Re. private snow clearing
companies, Ken mentioned that the private contractors engaged by MTO to clear snow do not themselves use the EC weather radar data, but rely on the MTO for direction on where snow clearing is needed.

As explained by MTO, private snow clearing companies do not themselves have access to weather radar data but instead rely on MTO for this information. Therefore no private snow clearing contractors were contacted.

6.2 Ministry of Natural Resources (MNR).

Catherine also followed through the suggestion from MTO to speak with the employees of MNR regarding the Ranger Lake Fire Base, and it was confirmed that they do use information from this weather radar as a planning tool related to weather system tracking in summer months to predict fire starts and fire behaviour. However, they have no concerns about impacts on the ability of the weather radar to monitor snowfall rates from snow squalls (they only use the weather radar data in summer months). Nor are they concerned with prediction of rainfall rates, only weather system tracking. As a follow-up based on discussions with Environment Canada, confirmation will be sent to the MNR Ranger Lake Fire Base management that no impacts are expected to the radar's tracking of summer weather systems. This is to be confirmed with Environment Canada.

6.3 Ontario Police

In addition Catherine spoke with representatives of the OPP and following this consultation the following statement was issued by OPP in an e-mail dated 27th April 2010.

"The information contained on the Env Can weather radar site is primarily used just for casual information as are the weather alerts. Ongoing patrols drive our deployment rather than pre emptive staffing based on alerts. This is of course a broad generalization which could change if an alert was of an extreme nature outside of the norm. From time to time we will download weather information after the fact for investigative purposes."

The following email was sent to OPP as minutes of a phone discussion held on the topic of weather radar impacts and snow squalls:

From our conversation just now by phone, I understand that:

- 1. The OPP does access and view the Montreal River weather radar imagery, and does currently receive Environment Canada alerts about snow squalls and snowfall rates. This information is useful in advising OPP of major storms, but information on specific locations and snowfall rates are not used by OPP.
- 2. The OPP does not use information from Environment Canada watches and warnings or the weather radar imagery to direct their operations or planning. Rather, when OPP encounters stretches of snow-covered highway during their on-the-ground operations, they let MTO know where snow clearing is required.

3. OPP does not have serious concerns about impacts to data from the Montreal River weather radar over the sections of Highways 129 and 556 described above.

7.0 Discussion

7.1 Weather Radar Coverage

Following an assessment of radar coverage below 3000ft and with reference to Figure 10 above, it is clear that there is no suitable alternative radar station capable of providing radar coverage over and to the west of the target area. Higher elevation weather patterns between 807m(2650ft) and 2274m(7458ft) would be visible from the Gaylord Radar Station over the target area with Doppler processing available to 1660m(3280ft) at 230km at the southern end of the road.

Relocating the Montreal River Radar to higher ground might resolve the problem and there are several regions, especially east of the present radar position where the ground is higher. However, this would be disruptive, take some considerable time and would also potentially affect the radar coverage over the lake and more importantly over Highway 17. Any deterioration of performance over Highway 17 would also certainly cause the MTO some concern.

7.2 Physical Blockage and Corridors

7.2.1 Phase 1

Given that it is distance from the radar which appears to be the most important factor in the potential level of impact and therefore the Phase 1 turbines which appear to be the most problematic, we have assumed that providing clear corridors through Phase 1 should provide some level of mitigation without the requirement to look at operational controls. Whether this is strictly necessary in the light of the observations made above is unclear but it was a principle suggested within the US NWS 'possible wind turbine clutter (WTC) mitigation actions for developers' (Radar Operations Centre www.roc.noaa.gov/WSR88D/WindFarm/Actions.aspx).

Based on the assessment undertaken in 5.1 above for Phase 1, the transition from RADAR 1 (9T) through RADAR 2 (12T) to the current layout RADAR 5 (12T), the following table highlights the design progression to providing potential clear corridors for radar signal transmission and receivals.

		Corridor (degrees)			
Layout	Turbines	1	2	3	4
RADAR 1	9	3.9	3.87	3.4	2.75
RADAR 2	12	3.0	2.29	1.87	
RADAR 5	12	5.8	3.6	3.3	2.2

Table 2: Summary Corridor Spacing for Phase 1 Layouts

Based on Figures 11 and 12 and with specific reference to Phase 1 (12 turbines) it is clear that although the closest turbines T1 and T2 lie at around 3km, the turbines are

have been arranged in rows aligned to the direction of the beam enabling distinct corridors to be established between turbine rows.

Corridors clearly don't facilitate full viewing of all sections of the 129 road but would provide data over discrete stretches of the road, and would also enable streamers to be identified approaching the road as they cross the corridors. (The worst case scenario of course would be streamers exactly aligned with the corridors and consideration would need to be given to the frequency of occurrence).

These clear angles vary from 5.8° to 2.2° and result in low level visibility at 2.5km to 6.6km cross range width at the closest part of the target road (65km) and 4.8km to 12.8km at the furthest section (126km). However, it should also be noted that these angles are based on the assumption that the blocked angle is the width of the turbine including the blade length. The work discussed above suggests that this is a pessimistic approach and the blocked angle is likely to be considerably less.

It is also probably worth noting that in this case when considering a target area beyond the turbine, high ground between the turbine and target area may also help to reduce the effect of the turbine. For example, in Figure 16 turbine 6 is located such that only the blades protrude above the horizon beyond the turbine so one would assume the effect of the tower which will be the main source of blockage would be virtually removed since it would form part of the ground clutter. As noted in 5.3 above, the tower will create a greater blockage than the blade.

This is potentially an area where detailed consideration of clutter suppression capability within the radar software might be of some value and the implication of the findings on the air traffic radar suggests that some detailed evaluation of the radar software may be an area that should be looked at further.

7.2.2 Phases 1 and 2

The proposed Bow Lake Phase 2 turbines extend the Phase 1 layout in two main groups – one lying immediately east of Phase 1 and one separated cluster lying to the south east.

The addition of the Phase 2 turbines does have the effect of filling in the Phase 1 corridors albeit with turbines at a greater distance with T14 at 5.37km up to T38 at 9.9km and T39 at 10.2km. Whether this is will be problematic is unclear.

It is probably also worth observing that, (as discussed in 7.2.1) and with specific reference to comments related to turbines with terrain behind them Figure 18 shows many of the turbines are close to the horizon where the tower is effectively 'backdropped' by the down range terrain. In these instances there should be no potential for the tower to provide shadowing over the area of interest.

The RADAR 4 layout is based on a Phase 1 12 turbine layout already reviewed which does not enable corridor gaps to the same extent as for RADAR 6, and hence the potential corridors are less pronounced.

Distance clearly helps Phase 2 but some operational control of specific machines could also be applied to 'corridor' machines if this proved necessary although clearly this would be a blade movement effect rather than an overall tower effect. Operational considerations are discussed later.

7.3 Radar Blockage and Interference

Further and with specific reference to section 5.3 above and previous experience, in summary:

- The QinetiQ work shows that the Fresnel effect causes the energy to bend back in behind the turbine. It is important to note that the size of the shadow area depends on the width of the turbine tower not its length. Similarly it is the width of the blade which determines the extent of the shadow rather than the blades length. This means that even when the blade is perpendicular to the line of sight, energy can still travel under and over the blade so the blade does not create a total blockage;
- The work on point-to-point radio links shows that the line of sight only needs to be a few tens on metres from the tower for the effect to be negligible;
- A radar signal travels both directions. However since all processes which affect the signal are linear, the principle of reciprocity applies to the return signal will be affected in the same way as the transmitted signal. In a simple case if the signal is reduced by 10% on the way out it will be reduced by 10% on the way back. When considering the turbine, the wave going out sees a relatively large obstruction because the turbine is close to the radar but the effect is reduces because the area of interest is a long way away. The returning wave sees only a small obstruction as the turbine only subtends a small angle due to the large distance, however as the radar receiver is relatively close to the turbine the effect is not mitigated as much as in the outgoing case. Hence the overall effect is the same in both directions; and
- The trials by the MoD have found that a blind zone behind the wind farm is small and much of it can be explained by the way the radar processes data rather than the wind farm itself.

There appears to be circumstantial evidence based on the studies considered that when looking beyond a wind farm the presence of the farm only has a small effect. However, although the above analysis suggests that the wind farm should not result in serious degradation to the weather radar performance it is not possible to fully predict the effect of any installation due to the following potential issues:

- The effect of multiple turbines, with the scattering effects between turbines and scattering off terrain cannot be predicted; and
- The blade movement may modulate returns and dependent on the weather radar measurement being performed this may degrade performance.

With specific reference to interference effects, it is acknowledged that radar returns from the turbines will be displayed on the radar image but that this will be in close proximity to the radar station and not beyond the wind farm. As the target area lies in excess of 65km beyond the wind farm the only detrimental effect of interference should be to the weather patterns above and immediately beyond the wind farm that will suffer spurious imaging. It is considered that these images which fall over remote unpopulated area can be ignored.

7.4 Operational Controls

If blade Doppler returns were critical, shutting down specific turbines for a period to enable radar feedback during potential weather events might be possible but would clearly affect energy production and wind farm income. (Winter is peak energy production period). If this could be limited to specific machines (for example enabling the Phase 2 corridors to be opened up) and time controlled to short periods necessary for streamer identification this might be achievable.

Technically this would be effective if in critical conditions the blade modulation is causing measurement degradation. If the modulation resulting from the turbines is the primary cause of problems rather than their presence, then the position in which the turbines are stopped will be unimportant.

7.5 Indirect solutions

Many of the Canadian Provinces utilize road side weather stations and cameras to monitor both weather and traffic. This could provide an alternative to direct radar or wind farm modification to facilitate monitoring of these road systems.

7.6 Summary for Discussion

The development area and any potential radar shadowed areas immediately behind it are remote and devoid of significant population. Since Tornado's are not a key event in this area whether false returns cause the prediction of precipitation over the wind farm is largely academic since the area isn't populated. The only indicated areas of potential EC concern (along Roads 129 and 556) lie some considerable distance behind the wind farm itself.

During consultation the MTO have indicated that their primary interest in this area is in weather predictions over Highway 17 and they would have concerns over any serious impacts on that service. However, Road 129 and 556 are only of limited concern and being Level 5 roads they are also their lowest service level. The MTO have also indicated that radar is only one of the tools they use in making judgments about road conditions and that when they do have concerns over possible snow squall activity and potential issues they will have road crews out driving these sections on a regular basis.

Technically although it is reasonable to assume there will be an impact, it is uncertain what level of blockage would be introduced by the presence of the wind farm, or to what degree the Fresnel effect would facilitate viewing snow activity behind the turbines. If the studies for air traffic radar on target identification behind wind farms are correct the actual effects may be relatively small. However, it seems likely that understanding how the radar software actually deals with the presence of the wind farm signal maybe as big a part of understanding the impacts and possible mitigation measures as understanding the physics.

The closest turbines within the Phase 1 layout have been modified to facilitate clear view corridors based on the defined beam width, and evaluating selective machine shut could be considered during snow squall events to determine what if any benefits that might produce. At an overall level there is an opportunity to do some detailed evaluation of wind turbine and radar interaction which might form a baseline for further radar software modification and also to develop wider guidance. Obviously subject to commercial and time pressures we would be very open to discussing that.

We would certainly be happy to participate in post construction data gathering or research related to interference mitigation measures. This could include pre and post construction radar characterisation, further and more detailed discussion with weather radar operators in some of the USA wind farm sites referenced in recent studies and include taking specific turbines off line for a limited period at the request of EC to enable potential impacts to be assessed.

8.0 References

- 1 E-mail Friday 11th September 2009 from Lillian Yao of The Meteorological Service of Canada.
- 2 Letter 26th March 2010 from Christine Best, Manager, National Radar Program.
- 3 Technical Information and Co-ordination Process Between Wind Turbines and Radiocommunication and Radar Systems – V8.0 (Draft 1).
- 4 National Radar Program Website Frequently Asked Questions
- 5 E-mail 16th April 2010 from Christine Best, Manager, National Radar Program.
- 6 NOAA National Weather Service, Radar Operations Website.

CURRICULUM VITAE FOR Norman Stewart

Name:Norman StewartDate of Birth:19.08.1946

KEY ATTRIBUTES/QUALIFICATIONS

- Bsc,PhD in Electronic Engineering
- Fellow IEE and Chartered Engineer
- Working in Radar System Design since 1976

EXPERIENCE Radar Design 1976-Retirement 2010

- 1987 to date Consulting engineer with BAE Systems with responsibilities to provide consultation to all radars designed by the company. Present specific activities include SIMPLE, MORSE and Korrigan Eurofinder studies. These studies are multi-company European wide studies which look at the way radars may develop in the next 20 years. I was the company's point of contact for Gallium Nitride. Also consultant to radar studies and technical support to marketing for radar bids. Included in the studies were investigations into the effect of windfarms on Air Traffic Control radars (in particular the Watchman radar) and the preparation of evidence for UK windfarm enquiries.
- 1981 to 1987 Systems Design Authority for the Rapier Field Standard C radar, the surveillance radar for the UK MoD Rapier system. Negotiated design specification and performance for the long range Routeman radar with the CAA. This radar was installed at Lowther Hill and Perwinnes Hill and was operational until recently.
- 1976 to 1981 Radar designer for a number of radars, in particular System Design Authority for the Watchman radar with special emphasis on design and modelling of the signal processing. The Watchman radar became the main air traffic control radar used by both the MoD and the CAA. The radar is still in service at many UK and foreign airfields.

EXPERIENCE Prior ro 1976

- 1974 to 1976 CSIRO Division of Radiophysics, Australia. Design and mathematical modelling of The Microvave landing system.
- 1974 to 1976 AWA Australia. Digital design Engineer.
- 1970 to 1974 Marconi Research Great Baddow. Digital Design Engineer.

Terella, Andrea

From:	Best,Christine [Ontario] <christine.best@ec.gc.ca></christine.best@ec.gc.ca>
Sent:	Wednesday, June 09, 2010 6:17 PM
То:	simondepietro
Cc:	Blair Marnie; Holden, Stephen [Ontario]; Wartman, Dave [Dartmouth]
Subject:	FW: BOW LAKE - RADAR MEETING - Presentations (6MB)
Attachments:	Donaldson-WGJ-BowLake.ppt; CMOS09-1C_303-3013-Donaldson-WindFarms.ppt

Simon,

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The agreement reached regarding next steps was that you would look at the flexibility you may have in the layout to leave "corridors" for the radar beam - likely by clustering turbines along radials where possible. This is particularly important to us within the first 7 km from the radar. After about 7 km we believe the blockage of the signal would be less.

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Sent: June 9, 2010 5:21 PM
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Cc: Holden,Stephen [Ontario]; Wartman,Dave [Dartmouth]; Yao,Lillian [Ontario]
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Sent: June 9, 2010 11:15 AM
To: Best,Christine [Ontario]
Cc: Holden,Stephen [Ontario]; Wartman,Dave [Dartmouth]; Yao,Lillian [Ontario]; Donaldson,Norman [Ontario]
Subject: BOW LAKE - RADAR MEETING

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Best Regards

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From: simondepietro To: 'Best,Christine [Ontario]' Cc: 'blair marnie'; 'Holden,Stephen [Ontario]'; 'Wartman,Dave [Dartmouth]'; 'Yao,Lillian [Ontario]'; 'Donaldson,Norman [Ontario]' Sent: Monday, May 31, 2010 1:20 PM Subject: RE: Discussion paper

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In meantime if you've any additional information or reports that you've come across that might be worth our radar chap reviewing so he could brief me before that'd be great. As you know I'm a mechanical engineer and no radar expert or meteorologist but believe I at least understand the technical issues.

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Manager, National Radar Program 416-739-4292

From: simondepietro [mailto:simon.depietro@dpenergy.com] Sent: May 31, 2010 7:19 AM **To:** Best, Christine [Ontario] Cc: blair marnie Subject: Discussion paper Importance: High Christine I'm actually in the Soo at moment...here until Tuesday evening/Wednesday then notionally flying to Boston briefly for a wake on friday – back to Canada 6th. I've asked Blair to put together discussion paper on what we've found out from MTO etc (through Catherine at MKInce) and from our radar chap Norman plus what we've gleaned from talking to people and seeing what's published. It's a bit rough and ready but I'd hope would be useful to talk around.....I'm hoping that will be with you by end of today. Would you be available sometime maybe early/middle next week? I've meeting with 1st Nations on Tuesday 8th but Monday or Wednesday might work..... alternatively I could delay trip south and drive to Toronto Wednesday and meet you this week? Can you let me know what your availability might be please Regards Simon Simon De Pietro **DP Energy Ireland Ltd** Registered Office: Mill House, Buttevant, Co Cork Registered in Ireland no 345411 Tel: + 353 (0) 22 23955 Fax: + 353 (0) 22 23027 Mobile: +353 (0) 879722399 email:simon.depietro@dpenergy.com www.dpenergy.com

Terella, Andrea

From:	simondepietro <simon.depietro@dpenergy.com></simon.depietro@dpenergy.com>
Sent:	Tuesday, June 15, 2010 3:57 AM
То:	'Best,Christine [Ontario]'
Cc:	'Blair Marnie'; 'Holden,Stephen [Ontario]'; 'Wartman,Dave [Dartmouth]'
Subject:	RE: BOW LAKE - RADAR MEETING - Presentations (6MB)

Christine

Sorry for slightly belated reply and give my thanks to everyone for the meeting. As you can probably imagine my 'competing priority' has been a bit preoccupying and I'm still not sure we can make the race....Friday!....and yet we still have the mast outwe are short of all instruments....and to top it all we've just found out we have some more exit/entry marks on the hull.....where she was supported by the boat stands....we had just moved them to paint the antifoul under them....I'd thought about it before but guess I'd just hoped for the best...

Anyway we are looking at the layout and keeping the corridors open with turbines out to 7km and hope to have something to feedback to you fairly soon. One of our guys is up on the hill most of this week looking at the ground conditions etc

Will come back to you, and as you suggest will direct to Stephen and copy you

Regards

Simon

From: Best, Christine [Ontario] [mailto:Christine.Best@ec.gc.ca]
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To: simondepietro
Cc: Blair Marnie; Holden, Stephen [Ontario]; Wartman, Dave [Dartmouth]
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Cc: blair marnie
Subject: Discussion paper
Importance: High

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Can you let me know what your availability might be please

Regards

Simon

Simon De Pietro DP Energy Ireland Ltd Registered Office: Mill House, Buttevant, Co Cork Registered in Ireland no 345411 Tel: + 353 (0) 22 23955 Fax: + 353 (0) 22 23027 Mobile: +353 (0) 879722399 email:simon.depietro@dpenergy.com www.dpenergy.com

Pelino Colaiacovo

From:Holden, Stephen [Ontario] [Stephen.Holden@ec.gc.ca]Sent:September 20, 2010 3:21 PMTo:simon.depietro@dpenergy.comCc:Blair Marnie; Wartman, Dave [Dartmouth]; Best, Christine [Edm]Subject:RE: Bow Lake WF: Follow up and Proposed Phase 2 layout

Hello Simon.

Based on feedback from both Lillian and Norman, there is nothing substantive that has changed that would trigger a need for a follow-up meeting or cause any concerns that have not previously been discussed. Bow Lake continues to be a learning opportunity for us both to assess the impacts with hard data as the project develops. Please continue to keep us informed of future developments.

Regards, Stephen

Stephen x.4103

From: simondepietro [mailto:simon.depietro@dpenergy.com]
Sent: Tuesday, September 07, 2010 9:09 PM
To: Holden,Stephen [Ontario]
Cc: 'Blair Marnie'; Wartman,Dave [Dartmouth]; Best,Christine [Edm]
Subject: RE: Bow Lake WF: Follow up and Proposed Phase 2 layout

Hi Stephen,

We've had the results back for the LIDAR topographic survey and although we've made some detail changes to the Phase 2 b cluster (i.e. the southern machines) because of local gradients etc we've not moved any of the Phase 2a turbines since my last note to you. All of the Phase 2b turbines are >7km from the radar so hopefully shouldn't have any bearing on your existing review.

(I should have drawings through for this design shortly and will send on as soon as I do).

Have your guys been able to look at the Phase 2 proposal we sent through and formulate a view or need to discuss?

Regards

Simon

From: Holden, Stephen [Ontario] [mailto:Stephen.Holden@ec.gc.ca] Sent: Sunday, August 15, 2010 9:20 PM To: simon.depietro@dpenergy.com Cc: Blair Marnie; Wartman, Dave [Dartmouth]; Best, Christine [Edm] Subject: RE: Bow Lake WF: Follow up and Proposed Phase 2 layout

Yes, it was received. I passed it along to the Lillian and Norman last week for another look.

From: simondepietro [mailto:simon.depietro@dpenergy.com]
Sent: Friday, August 13, 2010 12:53 PM
To: Holden,Stephen [Ontario]
Cc: 'Blair Marnie'; Wartman,Dave [Dartmouth]; Best,Christine [Edm]
Subject: RE: Bow Lake WF: Follow up and Proposed Phase 2 Jayout

Stephen

Don't expect you would have had time to have look at this yet but could you drop me an email just to let me know it landed ok.

Regards

Simon

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Sent: Wednesday, August 11, 2010 11:18 AM
To: 'Holden,Stephen [Ontario]'
Cc: 'Blair Marnie'; 'Wartman,Dave [Dartmouth]'; Best,Christine [Edm]
Subject: Bow Lake WF: Follow up and Proposed Phase 2 layout
Importance: High

Hi Stephen

Took a while but we've finally got a layout we are reasonably comfortable with for Phase 2. We've worked on principle of keeping the Phase 1 corridors open to 7km as best we can and hope what we have come up with will work from your perspective. Obviously any questions or problems or discussions needed please come back to me and we can set up a telecon.

As regards the note attached much of it (i.e. Appendix 1) you will have seen before since that's simply the discussion document from our previous meeting.

You'll also see from the note we still need to do some work on contour mapping and ground conditions (LIDAR and core drilling) but we won't get all the results of this for a while and whilst it might have some significant effect on access track routing it shouldn't result in anything more than minor movement of machines. Clearly if there is anything that changes significantly I'll come back to you to discuss.

Let me know how your radar/forecasting guys feel about the proposal and we can take it from there.

Regards

Simon

PS I've not included the met tower locations on here – I know you can see the telecoms masts which are within couple of hundred meters of the radar but I've assumed that at the distances we are talking about you will hardly see the met towers.

Simon De Pietro DP Energy Ireland Ltd Registered Office: Mill House, Buttevant, Co Cork Registered in Ireland no 345411 Tel: + 353 (0) 22 23955 Fax: + 353 (0) 22 23027 Mobile: +353 (0) 879722399 email:simon.depietro@dpenergy.com www.dpenergy.com

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To: 'Blair Marnie'
Cc: Holden, Stephen [Ontario]; Wartman, Dave [Dartmouth]; Yao, Lillian [Ontario]; Donaldson, Norman [Ontario]
Subject: RE: BOW LAKE - RADAR MEETING

Thanks for the information. We will gather at 1400 as planned and we will be ready to go when Simon arrives.

Christine Best RD MSC Operations PNR | DR des opérations du SMC RPN Environment Canada | Environnement Canada Telephone | Téléphone 416-739-4292 or 416-605-5539 (c) June 21 / 21 juin Telephone | Téléphone 780-951-8847 & 780-951-2847

From: Blair Marnie [mailto:blair.marnie@dpenergy.com]
Sent: June 9, 2010 11:15 AM
To: Best, Christine [Ontario]
Cc: Holden, Stephen [Ontario]; Wartman, Dave [Dartmouth]; Yao, Lillian [Ontario]; Donaldson, Norman [Ontario]
Subject: BOW LAKE - RADAR MEETING

Christine, Simon has asked me to send his apologies. He was booked on the 08:50 flight out of Boston which was cancelled. He is now on the 10:50 which has been delayed 1/2 an hour. He expects to arrive now at 13:10. He may still make it in time for the 14:00 meeting but is likely to be running around 1/2 an hour late. I hope this doesnt cause too much inconvenience.

Best Regards

Blair Marnie

DP Energy Ireland Ltd Mill House Buttevant Co Cork Ireland UK Mobile +44 (0) 7775 846039

CONFIDENTIALITY

The information in this E-Mail is confidential and may be legally privileged.

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----- Original Message -----

From: simondepietro To: 'Best,Christine [Ontario]' Cc: 'blair marnie'; 'Holden,Stephen [Ontario]'; 'Wartman,Dave [Dartmouth]'; 'Yao,Lillian [Ontario]'; 'Donaldson,Norman [Ontario]' Sent: Monday, May 31, 2010 1:20 PM Subject: RE: Discussion paper

Hi Christine....

Ok I'll work around 9th. The afternoon might be easier for me if that's possible....after lunch 14:00?...I'll need to get to the Soo for the 8th and come back and it's a fair way!

In meantime if you've any additional information or reports that you've come across that might be worth our radar chap reviewing so he could brief me before that'd be great. As you know I'm a mechanical engineer and no radar expert or meteorologist but believe I at least understand the technical issues.

Regards

Simon

From: Best, Christine [Ontario] [mailto:Christine.Best@ec.gc.ca]
Sent: Monday, May 31, 2010 12:39 PM
To: simondepietro
Cc: blair marnie; Holden, Stephen [Ontario]; Wartman, Dave [Dartmouth]; Yao, Lillian [Ontario]; Donaldson, Norman [Ontario]
Subject: RE: Discussion paper

Thank you Simon. I look forward to seeing what has been learned.

If at all possible it would be best to aim for Wednesday June 9. I will be out of the country from June 3 to June 8, then on annual leave before starting in a new position June 21. However, I could easily meet with you on the 9th and my replacement may also be available. Although I will be staying in touch with the Radar Program for a while to help with the transition, I will not be nearly as involved in individual projects.

Effective June 1, Stephen Holden (<u>stephen.holden@ec.gc.ca</u>, 416-739-4103) will be taking over as Manager, National Radar Program. There will be a transition period, but I suspect that by mid-July the hand-off will be complete.

If you could suggest a time on the 9th, I could organize some meeting space here in our building. I will also see if I can bring together the people involved in the turbine/radar analysis.

Christine Best

Manager, National Radar Program 416-739-4292

From: simondepietro [mailto:simon.depietro@dpenergy.com] Sent: May 31, 2010 7:19 AM To: Best,Christine [Ontario] Cc: blair marnie Subject: Discussion paper Importance: High

Christine

I'm actually in the Soo at moment...here until Tuesday evening/Wednesday then notionally flying to Boston briefly for a wake on friday – back to Canada 6th.

I've asked Blair to put together discussion paper on what we've found out from MTO etc (through Catherine at MKInce) and from our radar chap Norman plus what we've gleaned from talking to people and seeing what's published. It's a bit rough and ready but I'd hope would be useful to talk around.....I'm hoping that will be with you by end of today.

Would you be available sometime maybe early/middle next week? I've meeting with 1st Nations on Tuesday 8th but Monday or Wednesday might work..... alternatively I could delay trip south and drive to Toronto Wednesday and meet you this week?

Can you let me know what your availability might be please

Regards

Simon

Simon De Pietro DP Energy Ireland Ltd Registered Office: Mill House, Buttevant, Co Cork Registered in Ireland no 345411 Tel: + 353 (0) 22 23955 Fax: + 353 (0) 22 23027 Mobile: +353 (0) 879722399 email:simon.depietro@dpenergy.com www.dpenergy.com

Pelino Colaiacovo

From:	simondepietro [simon.depietro@dpenergy.com]
Sent:	September 21, 2010 10:03 AM
To:	'Holden, Stephen [Ontario]'
Cc:	'Blair Marnie'; 'Wartman.Dave [Dartmouth]'; 'Best.Christine [Edm]'
Subject:	RE: Bow Lake WF: Follow up and Proposed Phase 2 layout

Hi Stephen

Thank you for that and as we discussed I confirm we are happy to work with you to in relation to understanding the interaction between Bow Lake turbines and the weather radar so that the experience might be useful elsewhere.

I'll keep you posted as project progresses, and we should certainly talk before commencement of build since I think we discussed evaluating effects during build out so that you could get a measure of progressive impact/effect on the radar.

Any questions in meantime please let me know

Regards

Simon

From: Holden, Stephen [Ontario] [mailto:Stephen.Holden@ec.gc.ca]
Sent: Monday, September 20, 2010 8:21 PM
To: simon.depietro@dpenergy.com
Cc: Blair Marnie; Wartman, Dave [Dartmouth]; Best, Christine [Edm]
Subject: RE: Bow Lake WF: Follow up and Proposed Phase 2 layout

Hello Simon.

Based on feedback from both Lillian and Norman, there is nothing substantive that has changed that would trigger a need for a follow-up meeting or cause any concerns that have not previously been discussed. Bow Lake continues to be a learning opportunity for us both to assess the impacts with hard data as the project develops. Please continue to keep us informed of future developments.

Regards, Stephen

Stephen x.4103

From: simondepietro [mailto:simon.depietro@dpenergy.com]
Sent: Tuesday, September 07, 2010 9:09 PM
To: Holden,Stephen [Ontario]
Cc: 'Blair Marnie'; Wartman,Dave [Dartmouth]; Best,Christine [Edm]
Subject: RE: Bow Lake WF: Follow up and Proposed Phase 2 layout

Hi Stephen,

We've had the results back for the LIDAR topographic survey and although we've made some detail changes to the Phase 2 b cluster (i.e. the southern machines) because of local gradients etc we've not moved any of the Phase 2a turbines since my last note to you. All of the Phase 2b turbines are >7km from the radar so hopefully shouldn't have any bearing on your existing review.

(I should have drawings through for this design shortly and will send on as soon as I do).

Have your guys been able to look at the Phase 2 proposal we sent through and formulate a view or need to discuss?

Regards

Simon

From: Holden, Stephen [Ontario] [mailto:Stephen.Holden@ec.gc.ca]
Sent: Sunday, August 15, 2010 9:20 PM
To: simon.depietro@dpenergy.com
Cc: Blair Marnie; Wartman, Dave [Dartmouth]; Best, Christine [Edm]
Subject: RE: Bow Lake WF: Follow up and Proposed Phase 2 layout

Yes, it was received. I passed it along to the Lillian and Norman last week for another look.

Stephen x.4103

From: simondepietro [mailto:simon.depietro@dpenergy.com]
Sent: Friday, August 13, 2010 12:53 PM
To: Holden,Stephen [Ontario]
Cc: 'Blair Marnie'; Wartman,Dave [Dartmouth]; Best,Christine [Edm]
Subject: RE: Bow Lake WF: Follow up and Proposed Phase 2 layout

Stephen

Don't expect you would have had time to have look at this yet but could you drop me an email just to let me know it landed ok.

Regards

Simon

From: simondepietro [mailto:simon.depietro@dpenergy.com]
Sent: Wednesday, August 11, 2010 11:18 AM
To: 'Holden,Stephen [Ontario]'
Cc: 'Blair Marnie'; 'Wartman,Dave [Dartmouth]'; Best,Christine [Edm]
Subject: Bow Lake WF: Follow up and Proposed Phase 2 layout
Importance: High

Hi Stephen

Took a while but we've finally got a layout we are reasonably comfortable with for Phase 2. We've worked on principle of keeping the Phase 1 corridors open to 7km as best we can and hope what we have come up with will work from your

perspective. Obviously any questions or problems or discussions needed please come back to me and we can set up a telecon.

As regards the note attached much of it (i.e. Appendix 1) you will have seen before since that's simply the discussion document from our previous meeting.

You'll also see from the note we still need to do some work on contour mapping and ground conditions (LIDAR and core drilling) but we won't get all the results of this for a while and whilst it might have some significant effect on access track routing it shouldn't result in anything more than minor movement of machines. Clearly if there is anything that changes significantly I'll come back to you to discuss.

Let me know how your radar/forecasting guys feel about the proposal and we can take it from there.

Regards

Simon

PS I've not included the met tower locations on here – I know you can see the telecoms masts which are within couple of hundred meters of the radar but I've assumed that at the distances we are talking about you will hardly see the met towers.

Simon De Pietro DP Energy Ireland Ltd Registered Office: Mill House, Buttevant, Co Cork Registered in Ireland no 345411 Tel: + 353 (0) 22 23955 Fax: + 353 (0) 22 23027 Mobile: +353 (0) 879722399 email:simon.depietro@dpenergy.com www.dpenergy.com

From: Best, Christine [Ontario] [mailto:Christine.Best@ec.gc.ca]
Sent: Wednesday, June 09, 2010 11:17 PM
To: simondepietro
Cc: Blair Marnie; Holden, Stephen [Ontario]; Wartman, Dave [Dartmouth]
Subject: FW: BOW LAKE - RADAR MEETING - Presentations (6MB)

Simon,

We want to thank you for traveling to Toronto to discuss the Bow Lake wind farm. It is greatly appreciated particularly due to the competing priority you described (chuckle, chuckle). Attached are the presentations used at our meeting today.

The agreement reached regarding next steps was that you would look at the flexibility you may have in the layout to leave "corridors" for the radar beam - likely by clustering turbines along radials where possible. This is particularly important to us within the first 7 km from the radar. After about 7 km we believe the blockage of the signal would be less.

We also believe that the mitigating measure of ceasing operations during specific weather conditions would not have much relevance in this particular case. We are concerned about low-level, winter convective activity that is reasonably well defined and bounded in space. Any signal "turbulence" created by moving blades has very low potential to confuse algorithms or impair forecasters - unlike in summer severe weather where storm microdynamics are often early signs of rapid storm development.

Note that while we have no doubt we will lose some data to to blockage, the fact that this is a low population and low infrastructure area reduces the impact on the safety of the public. Additionally, since the concerns are for winter convective weather that tends to be much less dynamic than summer convection, any impacts on forecasting are much more manageable. This is to say that recommendations made for this particular case are not necessarily transferable to other wind farm / radar locations and configurations.

The participants in our meeting today were:

Dave Wartman: Director, Atmospheric Monitoring Division Stephen Holden: acting Manager, National Radar Program Marie Macphee: Manager, Forecast Operations for Ontario Region Norman Donaldson: Research Scientist, Cloud Physics and Severe Weather Bryan Tugwood: Senior Forecaster, Ontario Storm Prediction Centre Lillian Yao: Engineer with the Observing Systems and Engineering Section Christine Best: former Manager, National Radar Program.

As discussed, you should use Stephen Holden as your primary contact. I suggest you keep me on the cc list for a little while as a continuity measure.

Christine Best

RD MSC Operations PNR | DR des opérations du SMC RPN Environment Canada | Environnement Canada Telephone | Téléphone 416-739-4292 or 416-605-5539 (c) June 21 / 21 juin Telephone | Téléphone 780-951-8847 & 780-951-2847

From: Donaldson,Norman [Ontario]
Sent: June 9, 2010 5:21 PM
To: Best,Christine [Ontario]; 'Blair Marnie'
Cc: Holden,Stephen [Ontario]; Wartman,Dave [Dartmouth]; Yao,Lillian [Ontario]
Subject: RE: BOW LAKE - RADAR MEETING - Presentations (6MB)

From: Best, Christine [Ontario] Sent: Wednesday, June 09, 2010 12:08 PM To: 'Blair Marnie' Cc: Holden, Stephen [Ontario]; Wartman, Dave [Dartmouth]; Yao, Lillian [Ontario]; Donaldson, Norman [Ontario] Subject: RE: BOW LAKE - RADAR MEETING

Thanks for the information. We will gather at 1400 as planned and we will be ready to go when Simon arrives.

From: Blair Marnie [mailto:blair.marnie@dpenergy.com]
Sent: June 9, 2010 11:15 AM
To: Best, Christine [Ontario]
Cc: Holden, Stephen [Ontario]; Wartman, Dave [Dartmouth]; Yao, Lillian [Ontario]; Donaldson, Norman [Ontario]
Subject: BOW LAKE - RADAR MEETING

Christine, Simon has asked me to send his apologies. He was booked on the 08:50 flight out of Boston which was cancelled. He is now on the 10:50 which has been delayed 1/2 an hour. He expects to arrive now at 13:10. He may still make it in time for the 14:00 meeting but is likely to be running around 1/2 an hour late. I hope this doesn't cause too much inconvenience.

Best Regards

Blair Marnie

DP Energy Ireland Ltd Mill House Buttevant Co Cork Ireland UK Mobile +44 (0) 7775 846039

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----- Original Message -----

From: simondepietro To: 'Best,Christine [Ontario]' Cc: 'blair marnie'; 'Holden,Stephen [Ontario]'; 'Wartman,Dave [Dartmouth]'; 'Yao,Lillian [Ontario]'; 'Donaldson,Norman [Ontario]' Sent: Monday, May 31, 2010 1:20 PM Subject: RE: Discussion paper

Hi Christine....

Ok I'll work around 9th. The afternoon might be easier for me if that's possible....after lunch 14:00?...I'll need to get to the Soo for the 8th and come back and it's a fair way!

In meantime if you've any additional information or reports that you've come across that might be worth our radar chap reviewing so he could brief me before that'd be great. As you know I'm a mechanical engineer and no radar expert or meteorologist but believe I at least understand the technical issues.

Regards

Simon

From: Best, Christine [Ontario] [mailto: Christine.Best@ec.gc.ca]
Sent: Monday, May 31, 2010 12:39 PM
To: simondepietro
Cc: blair marnie; Holden, Stephen [Ontario]; Wartman, Dave [Dartmouth]; Yao, Lillian [Ontario]; Donaldson, Norman [Ontario]
Subject: RE: Discussion paper

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If at all possible it would be best to aim for Wednesday June 9. I will be out of the country from June 3 to June 8, then on annual leave before starting in a new position June 21. However, I could easily meet with you on the 9th and my replacement may also be available. Although I will be staying in touch with the Radar Program for a while to help with the transition, I will not be nearly as involved in individual projects.

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If you could suggest a time on the 9th, I could organize some meeting space here in our building. I will also see if I can bring together the people involved in the turbine/radar analysis.

Christine Best

Manager, National Radar Program 416-739-4292

From: simondepietro [mailto:simon.depietro@dpenergy.com] Sent: May 31, 2010 7:19 AM To: Best,Christine [Ontario] Cc: blair marnie Subject: Discussion paper Importance: High

Christine

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I've asked Blair to put together discussion paper on what we've found out from MTO etc (through Catherine at MKInce) and from our radar chap Norman plus what we've gleaned from talking to people and seeing what's published. It's a bit rough and ready but I'd hope would be useful to talk around.....I'm hoping that will be with you by end of today.

Would you be available sometime maybe early/middle next week? I've meeting with 1st Nations on Tuesday 8th but Monday or Wednesday might work..... alternatively I could delay trip south and drive to Toronto Wednesday and meet you this week?

Can you let me know what your availability might be please

Regards

Simon

Simon De Pietro DP Energy Ireland Ltd Registered Office: Mill House, Buttevant, Co Cork Registered in Ireland no 345411 Tel: + 353 (0) 22 23955 Fax: + 353 (0) 22 23027 Mobile: +353 (0) 879722399 email:simon.depietro@dpenergy.com www.dpenergy.com From: simondepietro [mailto:simon.depietro@dpenergy.com]
Sent: May 25, 2011 10:15 AM
To: 'Holden,Stephen [Ontario]'
Cc: 'Abraham,Jim [Dartmouth]'; 'Wartman,Dave [Dartmouth]'; 'leslie.welsh@ec.gc.ca'; 'Fell,Denise [Burlington]'; 'bob.johnston@ontario.ca'; 'erin.nixon@ontario.ca'; 'carrie.hutchison@ontario.ca'; 'sandra.guido@ontario.ca'; 'eaabgen.moe@ontario.ca'
Subject: RE: Bow Lake Proposal - Phase 2 concerns

Dear Stephen

I note the comment in your email that this was a 'final' review but to be fair the Phase 2 layout has been with Environment Canada for 10months now and we have not had any communication from you since September 2010.

In relation to the attachment I have drafted a response to your Phase 2 Assessment of 6 May 2011, and obviously included the same circulation list.

As I have said before, and reiterated in the attached note, we are very open to working with EC to quantify and evaluate what any actual (as opposed to perceived) impacts there might be in order to help limit impacts. We are also happy to work with EC to use this experience in order to help inform its position on any future proposals which might have more significant effects. Given the lack of population and limited transport infrastructure Bow Lake would seem to be the ideal location to develop that experience and learning.

Regards

Simon

Simon De Pietro DP Energy Ireland Ltd Registered Office: Mill House, Buttevant, Co Cork Registered in Ireland no 345411 Tel: + 353 (0) 22 23955 Fax: + 353 (0) 22 23027 Mobile: +353 (0) 879722399 email:simon.depietro@dpenergy.com www.dpenergy.com

From: Holden, Stephen [Ontario] [mailto: Stephen. Holden@ec.gc.ca]
Sent: Friday, May 06, 2011 9:25 PM
To: simon.depietro@dpenergy.com
Cc: Abraham, Jim [Dartmouth]; Wartman, Dave [Dartmouth]; leslie.welsh@ec.gc.ca; Fell, Denise [Burlington]; bob.johnston@ontario.ca; erin.nixon@ontario.ca; carrie.hutchison@ontario.ca; sandra.guido@ontario.ca; eaabgen.moe@ontario.ca
Subject: Bow Lake Proposal - Phase 2 concerns

Good afternoon, Simon.

I have finally gathered all of the information together for a final review, and completed our response for the Phase 2 changes. Please see the attached word document, which I will also print and physically mail to you at the address in Ireland. If you have another/different address you would like me to send the physical letter to, please let me know.

Please acknowledge when you have received this message with the attached document.

Stephen.

<<Bow lake wind farm response - May 2011.doc>>

Stephen Holden, P.Eng. Manager, National Radar Program, Weather and Environmental Monitoring Directorate, Meteorological Service of Canada, Environment Canada Ph: (416) 739-4103 Cel: (416) 464-2798



Bow Lake Phase 1 (& Phase 2) Wind Farm Limited Mill House, Buttevant, Co Cork, Ireland Tel: (+353) (0) 22 23955 Fax:(+353) (0) 22 23027 E-mail: bowlake@dpenergy.com

25th May 2011

Dear Stephen,

I was very disappointed in your letter (6th May2011) since it appears to reverse what we had agreed and suggests Environment Canada (EC) is reverting to its original September 2009 position based on the pre FIT 9 turbine proposal and ignoring all the subsequent discussions and agreements reached. It also creates an impression that we have entirely ignored and shown disregard for EC concerns which is certainly not the case. Your letter states "....*In fact, the latest layout has added 2 new turbines at even closer proximity than previous designs*" and this is not correct. The Phase 2 proposal (layout 089) which I sent through to you in August last year incorporates <u>3 fewer</u> turbines than the combined Phase 1/2 layout (RADAR 6) discussed in our June 2010 meeting (note: the numbering to 39 has been retained to avoid confusion). Two of these turbines were dropped specifically to meet the 7km radar corridor blockage distance EC requested.

When we met with the radar team in Toronto in June 2010 we presented a 12 turbine phase 1 FIT layout incorporating radar corridors and mutually agreed that we would essentially maintain that Phase 1 layout with those corridors and we would seek to leave these corridors open in designing Phase 2. This was recorded in the EC email June 2010 "*The agreement reached regarding next steps was that you would look at the flexibility you may have in the layout to leave "corridors" for the radar beam - likely by clustering turbines along radials where possible. This is particularly important to us within the first 7 km from the radar. After about 7 km we believe the blockage of the signal would be less.*" And I reiterated this agreement 10months ago in my email (13th July 2010) to Erin Nixon at the OMNR on which you were copied. I outlined to the MNR in that email what had been agreed and specifically requested you respond if you had a different understanding.

I understand EC has concerns about the possible impacts on its ability to predict low level snow events and in particular the effects on Highways 129 and 556 which were raised in your original letter but as you know we have spoken with the principle end users, both the Ministry of Transport (MTO) and the OPP who are directly responsible for road safety and their comments were as follows:

MTO: "Environment Canada weather radar imagery is used by MTO to obtain snowfall information for Highway 17, but not for the sections of Highways 129 and 556 that we discussed. This is because Highways 129 and 556 are too far from the weather radar station for accurate low-level snowfall information to be depicted".

Registered Office: 200 Bay Street, Royal Bank Plaza, South Tower, Suite 3800, Toronto, Ontario, M5J 224 Registered in Toronto No. 699322-2 Directors: Maureen De Pietro ~ Peter Harte ~ Paul Loughnane "In addition to the Environment Canada weather radar imagery, several other tools are used by MTO to detect snow squalls and snowfall activity on all Highways. These include Environment Canada satellite images, several other web-based sources of information, and Ministry of Transportation patrols of all Highways 24 hours a day and 7 days a week during winter conditions. For Highways 129 and 556 specifically, these patrols are the main source of information currently used to determine when snow clearing is required".

OPP: "The information contained on the Env Can weather radar site is primarily used just for casual information as are the weather alerts. Ongoing patrols drive our deployment rather than pre emptive staffing based on alerts. This is of course a broad generalization which could change if an alert was of an extreme nature outside of the norm. From time to time we will download weather information after the fact for investigative purposes."

I think it would be fair to make the observation, that not only have they not indicated concerns but they have indicated for the roads in question 129 and 556 they do not use the EC radar as the main source of information.

In relation to the forecast area to east and south east of the Bow Lake project this area has no permanent population and the two highways mentioned 129 and 556 in your September 2009 letter are of the lowest service level. We seem to agree on this and previous correspondence from EC notes that "*the fact that this is a low population and low infrastructure area reduces the impact on the safety of the public*", and "*since the concerns are for winter convective weather that tends to be much less dynamic than summer convection, any impacts on forecasting are much more manageable*". If we had any significant impact on major highways such as Highway 17 or on more populated areas I am sure the MTO, OPP and others would certainly have had more concerns even in this case. There are no impacts on Highway 17.

I also note the EC comment that "*This is to say that recommendations made for this particular case are not necessarily transferable to other wind farm / radar locations and configurations*". We accept that this may be a particular circumstance for the Bow Lake radar and may not be representative of other EC Radar with different forecast areas. In respect of the blockage I note your comment about "*the low level scans being blocked and rendered useless by the construction of a wind farm close to the radar (generally defined as within 10km radius"*) but our specialist radar consultant advice has been that the size of the shadow area depends on the width of the turbine tower not its length and whether it will be sufficient to render the scans useless is certainly not proven. As we had suggested in our June discussion document the QinetiQ work referenced shows that the Fresnel effect causes the energy to bend back in behind the turbine but notes that the degree to which this effect would facilitate viewing low level snow activity behind the turbines is uncertain. However, if the studies for air traffic radar on target identification behind wind farms are correct the actual effects may be relatively small.

To summarise, the closest turbines within the Phase 1 layout have been modified to facilitate clear view corridors based on the defined beam width, and we have removed Phase 2 turbines and relocated others to keep the radar corridors open to nominally 7km as we agreed. [One turbine was located at just over 6km which was difficult to move but your email seems to suggest it was immaterial].

We are still very willing and happy to participate in post construction data gathering or research related to interference mitigation measures. We would also agree there is opportunity to do some detailed evaluation of wind turbine and radar interaction which might form a baseline for further radar software modification and also to facilitate developing wider guidance for other projects. As I said previously subject to commercial and time pressures we would be very open to discussing this further.

Yours sincer

Simon De Pietro

Registered Office: 200 Bay Street, Royal Bank Plaza, South Tower, Suite 3800, Toronto, Ontario, M5J 2Z4 Registered in Toronto No. 699322-2 Directors: Maureen De Pietro ~ Peter Harte ~ Paul Loughnane

Terella, Andrea

From:	Weather Radars Contact, National Radar Program [Ontario] <weatherradars@ec.gc.ca></weatherradars@ec.gc.ca>
Sent:	Wednesday, September 05, 2012 11:41 AM
То:	Tyler Jans; Weather Radars Contact, National Radar Program [Ontario]
Subject:	RE: Bow lake Wind Farm

Dear Mr. Tyler Jans,

Thank you for contacting the Meteorological Service of Canada, a branch of Environment Canada, regarding your wind energy intentions.

We apologize for the delay in response primarily due to summer holidays. We would appreciate from now on that all wind farm related correspondence be sent to our <u>weatherradars@ec.gc.ca</u> email account.

The information you have provided will be analyzed and discussed as some of our analysis methods have been updated since we were last in contact. Once completed we will endeavor a response to you as soon as possible.

We will aim to complete our analysis within 2-3 weeks.

If you require any additional information or clarification in the meantime please do not hesitate to contact us at <u>weatherradars@ec.gc.ca</u>.

Best Regards,

Carolyn Rennie

National Radar Program Meteorological Service of Canada Environment Canada 4905 Dufferin Street Toronto, Ontario M3H 5T4 Office : 3N-WS12 <u>Carolyn.Rennie@ec.gc.ca</u> Phone : 416-739-4931

Carolyn Rennie Le Programme Nationale de Radar Service météorologique du Canada Environnement Canada 4905, rue Dufferin Toronto, Ontario M3H 5T4 Bureau : 3N-WS12 Carolyn.Rennie@ec.gc.ca Téléphone : 416-739-4931

From: Tyler Jans [mailto:tyler@bluearth.ca]
Sent: Friday, August 31, 2012 4:05 PM
To: Weather Radars Contact, National Radar Program [Ontario]
Subject: RE: Bow lake Wind Farm

Our project had been dealing with Mr. Holden with regards to our project over the last couple years however; I have been unable to solicit a response by neither email or phone.

Please see below and attached for reference and would appreciate input and response.

With regards,

 TYLER JANS, P.Biol., SR/WA | LEAD, REGULATORY

 DIRECT:
 403.668.1575 EXT 414

 MOBILE:
 403.880.1065

 EMAIL:
 tyler@bluearth.ca

From: Tyler Jans Sent: August-29-12 9:21 AM To: 'Stephen.Holden@ec.gc.ca' Subject: RE: Bow lake Wind Farm

Stephen,

Following up message below.

Your input and response is appreciated.

 TYLER JANS, P.Biol., SR/WA | LEAD, REGULATORY

 DIRECT:
 403.668.1575 EXT 414

 MOBILE:
 403.880.1065

 EMAIL:
 tyler@bluearth.ca

From: Tyler Jans Sent: August-08-12 3:09 PM To: 'Stephen.Holden@ec.gc.ca' Subject: Bow lake Wind Farm

Hi Stephen,

We have become the developer of this project and are currently working to move forward the consultation with regards to the Environment Canada Radar. The turbine layout has been updated since last correspondence with DPEnergy/Vortex.

I've attached a map of the turbine layout (which includes the previous iterations for reference, as referenced in previously provided reports). Also, enclosed is an updated report based on the turbine layout with regards to the Radar System.

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The files are fairly large so appreciate if you could confirm they go through.

Should you have any questions please feel free to contact me anytime. Regards,

TYLER JANS, P.Biol., SR/WA | LEAD, REGULATORY

DIRECT: 403.668.1575 EXT 414 MOBILE: 403.880.1065 EMAIL: tyler@bluearth.ca

BOW LAKE PHASE 1 WIND FARM LTD. &
BOW LAKE PHASE 2 WIND FARM LTD. C/O BLUEARTH RENEWABLES INC. SUITE 200, 4723 – 1ST STREET S.W. CALGARY, ALBERTA T2G 4Y8 BLUEARTHRENEWABLES.COM/BOWLAKEWIND

Terella, Andrea

From:	Weather Radars Contact, National Radar Program [Ontario] <weatherradars@ec.gc.ca></weatherradars@ec.gc.ca>
Sent:	Wednesday, October 03, 2012 1:12 PM
То:	Tyler Jans; Weather Radars Contact, National Radar Program [Ontario]
Cc:	Young,Jim [Ontario]; Holden,Stephen [Ontario]; Rennie,Carolyn [Ontario]
Subject:	RE: Bow lake Wind Farm

Hello Tyler,

We appreciate your prompt response and the details of your project status. The manager of the National Radar Program will be contacting you within the next week regarding responses to your questions and report.

With regards to a meeting, some of our subject matter experts are on course during the week of the 15th.Looking into our schedule we cannot meet earlier than the week of the 22nd.

Here are some available meeting dates and times: Monday October 22, 2012: possible meeting between 1pm and 4pm EST Friday October 26, 2012: possible meeting between 9:30am and 12pm EST

I'm not sure of where you are located but we would be willing to hold the meeting at our Environment Canada Downsview location, or could host a WebEx and teleconference.

Please let us know the most convenient method, date and time for a meeting.

Thank you,

Carolyn Rennie

Carolyn Rennie

National Radar Program Meteorological Service of Canada Environment Canada 4905 Dufferin Street Toronto, Ontario M3H 5T4 Office : 3N-WS12 Carolyn.Rennie@ec.gc.ca Phone : 416-739-4931

Carolyn Rennie

Le Programme Nationale de Radar Service météorologique du Canada Environnement Canada 4905, rue Dufferin Toronto, Ontario M3H 5T4 Bureau : 3N-WS12 Carolyn.Rennie@ec.gc.ca Téléphone : 416-739-4931

From: Tyler Jans [mailto:tyler@bluearth.ca]
Sent: Wednesday, October 03, 2012 10:56 AM
To: Weather Radars Contact,National Radar Program [Ontario]
Cc: Young,Jim [Ontario]; Holden,Stephen [Ontario]; Rennie,Carolyn [Ontario]
Subject: RE: Bow lake Wind Farm

Hi Carolyn,

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We are completing our draft Renewable Energy Approval Application documents which we expect to post for the required 60 day public review at the beginning of October. We are planning to hold our final public meeting before the end of the year, and file our REA application with the MOE in January 2013. Should the project receive the necessary environmental and regulatory approvals, we expect to start construction in the fall of 2013, with commercial operation targeted for the first half of 2014.

We have been continuing to work and consult with stakeholders, including Environment Canada, throughout the project, and will continue to do so in the coming months. We would be pleased to meet with you at your earliest possible convenience – you mentioned late October or early November however in light of our project timelines we suggest that mid-October would be more appropriate. In the interim, in order to assist us in conducting fulsome public consultation, we would greatly appreciate it if you could direct us to any user groups that you are aware of who access or relay on the low-level coverage for which you are concerned about potential interference. We have spoken with the OPP, MTO, and MNR, but would like to ensure we speak with all other known users or user groups. In order to keep to our project timelines, we would appreciate any user information you can provide no later than the 9th of October, 2012, so that can try to contact and engage with these potential project stakeholders.

Appreciate your response with regards to your availability for meeting within the next couple weeks.

Regards,

 TYLER JANS, P.Biol., SR/WA | LEAD, REGULATORY

 DIRECT:
 403.668.1575 EXT 414

 MOBILE:
 403.880.1065

 EMAIL:
 tyler@bluearth.ca

From: Weather Radars Contact, National Radar Program [Ontario] [mailto:weatherradars@ec.gc.ca]
Sent: September-26-12 12:01 PM
To: Tyler Jans; Weather Radars Contact, National Radar Program [Ontario]
Cc: Young, Jim [Ontario]; Holden, Stephen [Ontario]; Rennie, Carolyn [Ontario]
Subject: RE: Bow lake Wind Farm

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Thank you for contacting the Meteorological Service of Canada, a branch of Environment Canada, regarding your wind energy intentions.

Our processes of analysis, knowledge base and impact concerns have changed considerably since our last correspondence (June 2011). We have significant concerns with the Bow Lake Wind Farm project and believe that it

would be beneficial to arrange a meeting to discuss the expected interference issues and possible mitigation strategies moving forward.

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We would like to arrange a meeting in late October, early November. Please let us know your availability and we can work towards organizing the discussion.

If you have any additional questions or concerns before the meeting, please contact us at: weatherradars@ec.gc.ca

Best Regards,

Carolyn Rennie National Radar Program Meteorological Service of Canada Environment Canada 4905 Dufferin Street Toronto, Ontario M3H 5T4 Office : 3N-WS12 Carolyn.Rennie@ec.gc.ca Phone : 416-739-4931

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From: Tyler Jans [mailto:tyler@bluearth.ca]
Sent: Friday, August 31, 2012 4:05 PM
To: Weather Radars Contact, National Radar Program [Ontario]
Subject: RE: Bow lake Wind Farm

Our project had been dealing with Mr. Holden with regards to our project over the last couple years however; I have been unable to solicit a response by neither email or phone.

Please see below and attached for reference and would appreciate input and response.

With regards,

 TYLER JANS, P.Biol., SR/WA | LEAD, REGULATORY

 DIRECT:
 403.668.1575 EXT 414

 MOBILE:
 403.880.1065

 EMAIL:
 tyler@bluearth.ca

From: Tyler Jans Sent: August-29-12 9:21 AM **To:** 'Stephen.Holden@ec.gc.ca' **Subject:** RE: Bow lake Wind Farm

Stephen,

Following up message below.

Your input and response is appreciated.

 TYLER JANS, P.Biol., SR/WA | LEAD, REGULATORY

 DIRECT:
 403.668.1575 EXT 414

 MOBILE:
 403.880.1065

 EMAIL:
 tyler@bluearth.ca

From: Tyler Jans Sent: August-08-12 3:09 PM To: 'Stephen.Holden@ec.gc.ca' Subject: Bow lake Wind Farm

Hi Stephen,

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Terella, Andrea

From:	Weather Radars Contact, National Radar Program [Ontario] < weatherradars@ec.gc.ca>
Sent:	Tuesday, October 30, 2012 11:44 AM
То:	Tyler Jans; Weather Radars Contact, National Radar Program [Ontario]
Cc:	Young,Jim [Ontario]; Holden,Stephen [Ontario]; MacPhee,Marie [Ontario]
Subject:	RE: Bow lake Wind Farm
Attachments:	20121029_BluEarth_EC_ResponseLetter.pdf

Hello Tyler,

We apologize for the delay in response, please see the attached formal response letter from the manager of the National Radar Program.

The letter in hard copy will be sent to the following address:

Bow Lake Wind Farm Ltd. c/o BluEarth Renewables Inc. Suite 200, 4723-1st Street S.W. Calgary, Alberta 72G 4Y8

Once you have a chance to look it over please us at <u>weatherradars@ec.gc.ca</u> to arrange a meeting within the next couple of weeks.

Your patience and cooperation has been greatly appreciated.

Best Wishes,

Carolyn Rennie

Carolyn Rennie National Radar Program Meteorological Service of Canada Environment Canada 4905 Dufferin Street Toronto, Ontario M3H 5T4 Office : 3N-WS12 Carolyn.Rennie@ec.gc.ca Phone : 416-739-4931

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From: Tyler Jans [mailto:tyler@bluearth.ca]Sent: Monday, October 22, 2012 3:41 PMTo: Weather Radars Contact, National Radar Program [Ontario]

Cc: Young, Jim [Ontario]; Holden, Stephen [Ontario]; MacPhee, Marie [Ontario]; Rennie, Carolyn [Ontario] **Subject:** RE: Bow lake Wind Farm

Carolyn,

Environment Canada has been aware and consulted on the current turbine layout for over two years so to imply we are "now proposing 36 turbines" is inaccurate. With regards to outstanding concerns by Environment Canada, agreed to mitigation was implemented including removing 2 turbines specifically to meet the 7km radar corridor blockage distance as proposed by EC as well as incorporating radar corridors (see May 25, 2011 letter from Simon De Pietro to Stephen Holden).

In order to ensure we are consulting all the potentially known users, while we await your legal review of correspondence, we would ask that you provide a list of those stakeholders to afford us the opportunity to engage them.

Regards,

 TYLER JANS, P.Biol., SR/WA | LEAD, REGULATORY

 DIRECT:
 403.668.1575 EXT 414

 MOBILE:
 403.880.1065

 EMAIL:
 tyler@bluearth.ca

BLUEARTH RENEWABLES INC.

From: Weather Radars Contact, National Radar Program [Ontario] [mailto:weatherradars@ec.gc.ca]
Sent: October-18-12 6:39 AM
To: Tyler Jans; Weather Radars Contact, National Radar Program [Ontario]
Cc: Young, Jim [Ontario]; Holden, Stephen [Ontario]; MacPhee, Marie [Ontario]; Rennie, Carolyn [Ontario]
Subject: RE: Bow lake Wind Farm

Hello Tyler,

Thank you for your e-mail received on October 11, 2012.

We understand BluEarth Renewables Inc.'s time constraints pertaining to the proposed Bow Lake wind project and appreciate your patience and cooperation with us.

As it has been many years since the first proposal was received by our department, further issues have arisen. The first proposal we received included a 6 turbine wind farm proposal, which we had concerns with but they were not very serious given the size of the project. The project has evolved over time, now proposing 36 turbines. With the increase in turbines comes a more severe cumulative impact. The initial issues had still not been resolved since our last contact with DP Energy in May, 2011. While working with additional wind farm proposals and gaining experience, we have also been developing and enhancing our analysis tools and believe the Bow Lake wind farm is more detrimental that initially conveyed in our responses.

Since there is new information, in terms of potential interference, we would like to delay rescheduling a meeting until we have sent the response letter so that BluEarth Renewables Inc. has had a chance to review it prior to a discussion. We are working diligently to have a response sent out as soon as we are able. We have many competing pressures for our time and wind farms are only one of many aspects of network operations we deal with on a daily basis.

Best Wishes,

Carolyn Rennie

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From: Tyler Jans [mailto:tyler@bluearth.ca]
Sent: Thursday, October 11, 2012 7:45 PM
To: Weather Radars Contact, National Radar Program [Ontario]
Cc: Young, Jim [Ontario]; Holden, Stephen [Ontario]; MacPhee, Marie [Ontario]
Subject: Re: Bow lake Wind Farm

Carolyn,

As you are aware, the Bow Lake Wind Farm has been under development since 2007, and discussions with Environment Canada related to the Montreal River Weather Radar have been underway for over 4 years. The concern initially identified by Environment Canada was related to potential interference with the ability to predict low level snow squalls in the vicinity of portions of Highway 129 and Highway 556. As a result, we undertook multiple detailed studies, and have moved turbine locations in an effort to minimize any potential for interference. Those studies were initially provided to EC in 2009, however since that time some further turbine movements were made related to required setbacks from environmental features. As a result the radar studies were updated with the final turbine locations and sent to you earlier this year, and we have been actively seeking your feedback since that time. Continued postponement of your feedback is hampering our ability to engage in meaningful dialogue with you to work towards addressing your concerns.

The Project has posted its draft REA documents and provided public notice of 60 days prior to the Final Public Meeting, which is scheduled for <u>December 13, 2012</u>. Subsequent to the Final Public Meeting, the Project is planning to submit its REA application to the MOE in January 2013, and is hoping to have completed the REA process and be in a position to start construction by summer 2013. In light of these timelines, postponement of the proposed <u>October 22</u> meeting by "several weeks" will further impede our ability to address any concerns you may have, and may result in overall schedule implications for the project. We request that we please hold the <u>October 22</u> meeting date if at all possible.

A further reason for maintaining our current meeting date relates to potential identification of "new" issues which have not been raised in the the past, which you reference in your email. At this very late stage in the project development process, if there are new issues to be discussed, we would need to be made aware of those sooner rather than later in order to have an opportunity to work with you to address them within the project schedule. As we await your written response as outlined below, we would greatly appreciate if you could, in the interim and as soon as possible, provide us with your information on radar user groups so that we have the opportunity to meaningfully engage with them.

With regards,

Tyler Jan's

On 2012-10-09, at 8:26, "Weather Radars Contact, National Radar Program [Ontario]" <<u>weatherradars@ec.gc.ca</u>> wrote:

Dear Mr. Tyler Jans,

We apologize for the delay in response. Given the proximity of the proposed Bow Lake wind farm to our Montreal River weather radar, we continue to have a number of concerns. We have drafted a response detailing our concerns, and we are currently waiting for our in-house counsel to review it. Management would also prefer a postponement of the meeting by several weeks.

Our letter will include:

- 1. A response to the Spectrum Expert report
- 2. Discussion of various issues that have not been discussed in the past, such as:
 - a. Doppler Contamination
 - b. Multi-Path Reflections
 - c. Quantitative Precipitation Estimations
 - d. Impacts to aviation forecasting and briefing
- 3. Identification of radar user groups

Thank you for your cooperation and patience as we await the review from our in-house counsel. Once received, we will send out the response letter and coordinate an alternative meeting date.

Best Regards,

Carolyn Rennie

Carolyn Rennie

National Radar Program Meteorological Service of Canada Environment Canada 4905 Dufferin Street Toronto, Ontario M3H 5T4 Office : 3N-WS12 <u>Carolyn.Rennie@ec.gc.ca</u> Phone : 416-739-4931

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Sent: Wednesday, October 03, 2012 10:56 AM
To: Weather Radars Contact, National Radar Program [Ontario]
Cc: Young, Jim [Ontario]; Holden, Stephen [Ontario]; Rennie, Carolyn [Ontario]
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 MOBILE:
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Sent: September-26-12 12:01 PM
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 MOBILE:
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 EMAIL:
 tyler@bluearth.ca

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Stephen,

Following up message below.

Your input and response is appreciated.

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BOW LAKE PHASE 1 WIND FARM LTD. & BOW LAKE PHASE 2 WIND FARM LTD.

C/O BLUEARTH RENEWABLES INC. SUITE 200, 4723 – 1ST STREET S.W. CALGARY, ALBERTA T2G 4Y8 BLUEARTHRENEWABLES.COM/BOWLAKEWIND



Environment Environnement Canada Canada December 11, 2012

Dear Mr. Tyler Jans,

RE: Bow Lake Wind Project Renewable Energy Application

The document attached indicates Environment Canada's concerns with the Bow Lake wind project with respect to the Montreal River weather radar. This document is being submitted to BluEarth Renewables Inc. as an official comment made during the 60 day public review period of the draft REA submission documents.

Sincerely, Lonard Szalla

Leonard Szarko, P.Eng. Acting Manager, National Radar Program, Weather and Environmental Monitoring Directorate, Meteorological Service of Canada, Environment Canada Office: (416) 739-4508 NRP Hotline: (416) 739-4555







Bow Lake Wind Project Renewable Energy Approval Public Comment Period Submission

Regarding Weather Radar Data Contamination

National Radar Program Weather and Environmental Monitoring Meteorological Service of Canada Environment Canada December 11, 2012



Executive Summary

This report is being provided to express Environment Canada's concerns with the Bow Lake Wind Project in relation to the Montreal River weather radar. The submission is being made to both the Ontario Ministry of the Environment and the proponent of the project, BluEarth Renewables Inc.

Environment Canada (EC) has a mandate to provide meteorological services to Canadians. These services include providing daily weather forecasts, issuing warnings, and providing detailed current meteorological information to help to ensure the safety of all Canadians. Weather radar is an effective tool (sometimes the only tool) used by forecasters for the early detection of developing thunderstorms and other hazardous weather. The current (2012) weather radar network of 31 radars is strategically distributed across Canada. Weather radars operate by sending pulses of radio energy from the antenna and receiving the reflected energy back from a target. Targets may be precipitation (rain, snow, etc.) or birds and insects. Wind turbines are highly visible to weather radar and will intercept, scatter and reflect the radio wave, causing numerous impacts as detailed in Section 2.

Canada's weather radar network is too sparse to allow any single radar to be significantly blocked or contaminated. Both distance and the number of turbines contribute to the severity of impact to the weather radar. EC needs to perform an analysis of all wind turbines proposed within a radar's coverage area to assess impacts (see Section 5). Uncontaminated Canadian weather radar data are imperative for many user groups.

EC Weather Radar User Groups:

- Weather forecasters
- NAV CANADA (Air Navigation Service Provider)
- Department of National Defence (DND)
- Emergency Responders (e.g. traffic accidents, floods, forest fires)
- Municipalities, City Planners, etc.
- Academics and Researchers
- General Public

Potential Mitigation Solutions (see Section 6):

- 1. Remove from line-of-sight (either move the turbines or the weather radar)
- 2. Identification and filtering by the signal processor
- 3. Stealth turbine blades (energy absorbing paint)
- 4. Infill radars (additional radars to fill in the contaminated area)
- 5. Curtailment (stopping the operation of turbines during severe weather)

Date	Communication
July 13, 2009	Proposal of 6 turbines
January 28, 2010	Proposal of 12 turbines
March 22, 2010	Proposal of Phase II (combined total of 36 turbines)
June 9, 2010	Meeting between DP Energy and Environment Canada
August 9, 2010	Report written by DP Energy mitigating only turbines within
	7 km of the Montreal River EC weather radar
May 6, 2011	EC letter of concern sent to DP Energy
2012	BluEarth takes over Bow Lake Project
August 8, 2012	Report received by EC, authored by Spectrum Expert on 36
	turbines
October 29, 2012	EC comment on Spectrum Expert report with user impacts

Bow Lake Wind Project and Environment Canada Consultation History:

Given the proximity of the Bow Lake Wind Project to the Montreal River weather radar there are many impacts expected (see Section 7):

- 1. Partial blockage of radar beam
- 2. Reflectivity data contamination
- 3. Velocity data contamination
- 4. Multi-path scattering
- 5. Inaccurate estimations of precipitation in quantitative radar products

The contamination of radar data at the Montreal River weather radar will impact forecasters at the Ontario Storm Prediction Centre and the Aviation Forecast Centre, along with other users. Local weather forecasts and severe weather warnings will be affected. The Montreal River area is prone to lake-effect snow squalls. These narrow bands of weather are very shallow and the lowest radar scans, nearest to the ground, are used to track their evolution. If the low level data is contaminated, the radar would be unable to monitor the accumulation of snow in regions beyond the wind farm. The accuracy of weather forecasts in the Montreal River area impacts the general public in terms of work, recreation, and transportation. The Ministry of Transportation, the Ontario Provincial Police, NAV CANADA, and the Department of National Defence will also be impacted as they directly utilize weather forecasts and weather radar observations for briefing and decision making purposes.

Environment Canada is of the opinion that the Bow Lake Wind Project, as currently proposed, and the Montreal River weather radar will be unable to coexist without negative impact on weather radar users.

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1. Introduction to Environment Canada's Weather Radar Network

Environment Canada (EC) has a mandate to provide meteorological services to Canadians, which includes providing daily weather forecasts, issuing warnings, and providing detailed meteorological information for all of Canada. Accurate and timely warnings help to ensure the safety of Canadians. Every year, EC issues, on average, 1.5 million public forecasts, 15 000 severe weather warnings, 500 000 aviation forecasts, and 200 000 marine, ice and sea-state forecasts. EC receives over 55 million calls to its weather information telephone line and averages over half a billion individual visits to its comprehensive weather website: www.weatheroffice.ec.gc.ca.

Environment Canada's weather forecasters operate out of regional prediction centres, covering large regions of Canada. Weather radar is an effective tool (sometimes the only tool) used by forecasters for the early detection of developing thunderstorms and other hazardous weather.

The current (2012) weather radar network of 31 radars consists of:

- 28 radars owned and operated by Environment Canada
- 2 radars owned and operated by the Department of National Defence
- 1 radar owned and operated by McGill University

Weather radars collect information about targets in the atmosphere, such as precipitation (rain, snow, etc.) or birds and insects. These targets are found in relation to the radar via pulses of radio energy that are sent from the antenna. Once the energy reaches the targets, some of the energy is reflected back to the radar. Through this method, not only can the position of the target be found, but also, based on the magnitude of the returned signals, one can determine the intensity of the targets. The radars used in Canada have Doppler capability which means they can measure the velocity of the target relative to the radar.

EC and DND radars operate in the C-band frequency (5 cm wavelength) while the McGill University radar operates in the S-band frequency (10 cm wavelength). The map depicted in Figure 1 shows the conventional (non-Doppler) and the Doppler coverage of the weather radar network. The outer rings depict conventional coverage, and the smaller inner rings represent the Doppler coverage area. EC's C-band radars have a conventional coverage radius of about 250 kilometres and a Doppler radius of about 113 kilometres. The majority of the network does not have any overlap coverage with respect to Doppler velocity measurement. This makes the data collected by each radar that much more important.



Figure 1: Map of the Canadian weather radar network where the inner rings represent Doppler coverage and the outer rings represent conventional coverage. The red, green and blue colours represent different radar antenna models. The yellow and purple radars are not owned by Environment Canada. (2012)



Figure 2: Weather radar energy scattering and reflecting off objects. (Image from Environment Canada's website: <u>http://www.ec.gc.ca/meteo-</u> weather/default.asp?lang=En&n=2B931828-1)

There are many things that can affect the quality of the data received by the radar. Objects such as buildings, trees, towers and terrain can block energy travelling to and from desired targets. These objects could result in the loss of meteorological information (such as the intensity of a storm located behind the object). In addition these objects will themselves cause undesired reflections back to the radar. Stationary objects can be filtered out of the data by using the Doppler capability to measure motion. However, wind turbines present different challenges to weather radars (see Section 2).

2. Wind Turbine Contamination to Weather Radar

Wind turbines are composed of two main parts: the tower (hub) and the blades. The tallest Canadian weather radar tower transmits energy from approximately 30 meters above the ground, while wind turbine blade tips sweep at typical heights of about 150 meters above the ground (Figure 3). Wind turbines are commonly composed of materials that strongly reflect energy transmitted by the radar. In extreme situations the reflection could be strong enough to damage the radar receiver. Wind turbines visible to weather radar will intercept, scatter and reflect the microwave energy causing numerous impacts.





If the wind turbine tower is close enough to the radar, then radar beam blockage can occur. Blockage is radar data contamination which refers to the interception of most (or all) of the energy transmitted from the radar. The energy cannot reach its intended target (e.g. rain, snow) because it is being blocked by another object (e.g. turbine tower). Terrain features, such as mountains, can cause blockage to the lower levels of some Canadian weather radar (Figure 4). In cases of partial blockage, the beam may reform, but it will have reduced energy. The reduction in signal strength may cause heavy precipitation to be interpreted as light precipitation and can hinder precipitation forecasting (Figure 5). Depending on their proximity to the weather radar, turbines can cause total and partial blockage. Any form of blockage will prevent accurate collection of weather data at all ranges beyond the turbine.



Figure 4: Blockage created by hills and mountains. (Image from Environment Canada's website: http://www.ec.gc.ca/meteo-weather/default.asp?lang=En&n=2B931828-1)



Figure 5: 24 hour precipitation accumulation radar product from Val d'Irene weather radar in Quebec (located in the centre of the circles). A mountain to the southwest causes total blockage of the radar signal while a hill to the northeast causes partial blockage. Radar data is then contaminated for these regions.

Since the turbines are highly reflective, strong echoes are received by the radar. Numerous strong echoes (from many turbines in a wind farm) cause a

signature that looks indicative of a thunderstorm cell: where stronger reflectivity indicates heavier rain (Figure 6). In Doppler scans, the reflectivity returns from the towers can be filtered out because the towers are stationary. However, if the turbine blades are moving, the Doppler filter cannot remove the returned signals and thus the strong false echoes would contaminate the data. Rotating turbine blades, relative to the weather radar's location, will register velocities either toward or away from the radar. This measured velocity from turbine blades can cause false warnings in radar algorithms designed to detect rotation in storms (Figure 7).



Figure 6: Reflectivity radar image which shows two wind farms in Nova Scotia outlined with green boxes (Nuttby Wind Project: 22 turbines ~62 km from Gore weather radar and Dalhousie Mountain Wind Project: 34 turbines ~75 km from Gore weather radar) and a severe weather system to the south of them. The data from the wind farm are similar to those from the storms. When the storm passes over the wind farm, it is difficult for forecasters to monitor the storm's evolution.



Figure 7: Radar image of relative velocity where cool (blue) colours are moving toward the radar and warm (red) colours are moving away. The velocity signatures from wind turbines (Nuttby Wind Project: 22 turbines ~62 km from Gore weather radar and Dalhousie Mountain Wind Project: 34 turbines ~75 km from Gore weather radar) are extremely variable and may include rotation. The data in the purple circle are biological targets.

The intensity of an energy return can be converted to provide estimates of precipitation rates. This quantitative measure can allow forecasters to get a realtime sense of the precipitation being accumulated in an area. Commonly, radar data are accumulated over a period of hours, days or weeks to obtain precipitation accumulation images. Wind farm areas contaminate the quantitative measurement data with overestimations of precipitation by amplifying the errors (Figure 8). Removing these errors causes loss of data and cannot easily be corrected by algorithms.



km from Gore weather radar) show 168 hour accumulation measurements of up to 250 millimetres while in uncontaminated areas measurements are 40 millimetres. Blockage from a communication tower nearby the radar can also be seen to the southeast.

Another impact caused by wind turbines is multi-path scattering. When wind turbines are close to one another, a radar signal can be reflected between multiple turbines before it returns back to the radar. The radar processor determines the location of a target by how long it takes the signal to return. The extra reflected targets from the turbine blades cause the radar processor to become confused and false echoes are created. These multiple reflections appear as radial spikes of reflectivity on a radar image and can cause data contamination many kilometres past the wind farm itself (Figure 9). Multi-path scattering can also occur when the radar signal bounces off turbine hubs or the ground and then reflects back from weather in the area. The location of the weather will be inaccurate and provide a distorted view of the storm for forecasters.



3. Impact of Proximity and Number of Wind Turbines to Weather Radars

The Radio Advisory Board of Canada indicates that any wind farms within 50 km of a weather radar should be submitted to EC for analysis. A survey of the literature indicates that various meteorological organizations suggest slightly different impact zones in proximity to weather radars (Table 1). The National Oceanic and Atmospheric Administration (NOAA) operates a network of S-band weather radars in the United States. The World Meteorological Organization (WMO) is an agency of the United Nations and comprises 190 member states and territories. The WMO member states use weather radars operating mostly in C-band and S-band frequencies. The Operational Programme for the Exchange of Weather Radar Information (OPERA) is a European based organization which includes about 30 member states.



Table 1: Classification of impact zones in proximity to weather radars

The guidance statements provided by the organizations only address radar contamination due to blockage and inaccurate velocity measurements at varying distances. Multi-path scattering contamination was not addressed. Unlike the United States or Europe, where overlap coverage from adjacent weather radars may mitigate coverage contamination, Canada's weather radar network is too sparsely located to allow any single radar to be significantly blocked or contaminated. Both distance and the number of turbines contribute to the severity of impact to the weather radar. The impact of a single turbine is significantly different from the impact of multiple turbines. For example, a single turbine at 5 km away from the radar has a completely different impact than 30 turbines (or 100+ turbines) at 5 km away from the radar. Subjectively, every wind farm proposal is different and a formal analysis (as outlined in Section 5) with a turbine layout must be performed by EC to verify the severity of the impact. EC wishes to be informed of all proposed and existing wind energy projects in Canada regardless of distance from any EC weather radar.

4. User Groups Impacted

Weather radar information is used directly and in-directly by numerous user groups. The main users of radar data are meteorologists (forecasters) who utilize radar as a tool to observe, monitor the growth of, and predict weather. They also provide warnings when severe weather is anticipated or occurring. Through consecutive radar images (radar loops), forecasters are able to examine the development of weather. Presently, Canada's weather radars produce images every 10 minutes and in a severe weather scenario a warning may be issued from a single static radar image. Most meteorological data is updated on an hourly, or longer, basis which makes radar data one of the few rapidly updated sources of near real-time information of the state of the atmosphere. In these situations, uncontaminated radar data are crucial, as a delayed or missed warning due to wind farm contamination risks public safety. Forecasters also use radar data to estimate precipitation intensity for flash flood warnings, accumulation forecasts, and weather model comparisons.

Weather forecasts and warnings are developed through the use of radar data and any contamination to the data can affect their timeliness and accuracy. In addition to severe weather warnings for the public, marine warnings are also issued using radar. Marine reports impact local fishing, recreation and boating. Weather forecasts and warning information are then used by public user groups such as media, public decision makers, agriculture, transportation, and emergency management services. Wind farm contamination will force weather warnings areas to be less precise in both time and area. Warnings over wider areas and with more frequent occurrence, due to lack of clear data, will reduce the effectiveness of those warnings to the public.

The general public rely on weather forecasts produced by forecasters utilizing weather radar. In severe weather situations, forecasters provide

warnings for public safety. Severe weather can cause damage to buildings, vegetation, property, and ultimately loss of life (Figure 10). The degradation of radar data could affect the general public by reducing the accuracy and timeliness of weather forecasts and warnings issued by Environment Canada. The public may also be misled by media outlets that use and interpret Environment Canada's weather radar data such as television, radio and newspapers. Radar contamination can also impact public decision makers.



Figure 10: Devastation caused by a F3 tornado which stuck Goderich, Ontario on August 21, 2011, in which one person was killed. (<u>http://originalweatherblog.blogspot.com/2011/08/large-tornado-strikes-goderich-ontario.html</u>)

Public radar users may track impending storms for their own safety, commuting, research or work related purposes. Many industries can only operate in certain weather conditions and thus track weather conditions daily or hourly. Weather can impact construction workers, movie producers, local farmers and other industry workers that operate outdoors. In terms of agriculture, weather determines daily operations on the farm and the viability of crops in growing seasons. The transportation sector frequently utilizes forecasts, as more traffic accidents occur in extreme weather such as heavy downpours and lake-effect snow squalls (Figure 11). Emergency management officers (e.g. fire, police etc.), protecting the public, need to respond to severe weather situations and thus rely on timely warnings and forecasts. Groups such as forest fire management, and electrical hydro companies also rely on these forecasts. City planners use precipitation accumulation data to plan sewer systems and control run-off. They also plan daily snow removal operations based on forecasts and radar data feeds.



Figure 11: CTV news - "Snow blamed for several crashes across GTA on Thursday, January 19, 2012."

Degraded weather radar data directly impacts research, aviation, national defence, hydrology, and climate models. NAV CANADA is Canada's civil air navigation service which provides weather briefings and airport advisories. NAV CANADA uses the Canadian weather radar network to ensure flight safety from weather hazards. Having accurate radar data allows efficient briefing to pilots. The Department of National Defence (DND) also utilizes Environment Canada's weather radars for operations. In fact, two weather radars in the Canadian weather radar network are currently owned and operated by DND.

Scientific weather research is necessary to obtain a better understanding of the country Canadians live in. Archived radar data can be utilized by hydrologists, climate modellers, students and migratory bird biologists. Hydrologists use quantitative precipitation data collected from weather radar to be integrated into flood and drainage models. Climate modellers and weather prediction modellers use archived and real-time radar data for validation. These models are then used by forecasters to aid in long-range forecasting. Climate scientists use precipitation accumulations to assess and model precipitation. Wind data collected from Doppler velocity measurements is used by many researchers. Radar images are archived and used in case studies for research scientists, professors, and students. Clear-air radar data, where no weather is occurring, may also pick up biological targets like insects and birds. Migratory bird biologists use consecutive clear-air radar images to determine the movement of birds.

5. Weather Radar Contamination Consultation and Analysis

Wind energy proponents are advised by the Canadian Wind Energy Association (CanWEA) and the Radio Advisory Board of Canada (RABC) to contact Environment Canada (EC) for consultation on potential impacts to weather radar. Since it is at the discretion of the proponents, sometimes EC is not advised about projects in close proximity to Canadian weather radar. An Environment Canada webpage, containing radar visibility maps, is in development to provide proponents with tools to determine impacts within the preliminary stages of their project. It is important for Environment Canada to have knowledge of all proposed and existing wind farms in Canada for future planning purposes.

When a proponent contacts Environment Canada for consultation, they are asked to provide the turbine coordinates of a preliminary layout, along with the turbine hub height and blade diameter. Once this information is received, the expected impact of the wind farm is determined using in-house line-of-sight software. The line-of-sight software uses a digital elevation map (currently SRTM03 – Shuttle Radar Topography Mission) to relate the wind turbines to the nearest weather radar. Due to the curvature of the Earth, the further the radar beam travels from the antenna the higher off the ground it will be. This would indicate that without terrain consideration, the further away a wind farm is from the radar, the less of an impact it will have (Figure 12).





Generally, the closer a wind turbine is to the weather radar the greater the impact, however this is not always the case as local terrain needs to be considered. Some radars are positioned in areas where radar beam blockage due to terrain already exists. If a wind farm is placed on or behind a mountain which already caused contamination to the radar data, this would lessen the impact. The radar beam is a cone shaped beam that scans at many elevation angles to detect weather. The more radar scans in which the turbines are visible to the radar, the more of an impact the wind farm will have.

A further consideration is the number of turbines in the wind farm. Multipath scattering contamination is proportional to the number of turbines. However, the impact can change based on the layout of the wind farm. The most preferable, and least detrimental, layout would be where the turbines are lined up in a radial with respect to the radar (i.e. one behind the other). The line of turbines would then only cause impacts to that radial, limiting the amount of blockage and limiting the span of contamination. The line-of-sight software also provides an output of azimuthal extent (representing the horizontal spread of the wind farm with respect to the radar). In terms of contamination, the larger the azimuthal extent of the wind farm, the greater the impact on the radar will be.

In summary, the main technical considerations which determine the impact of a wind farm on weather radar are the following: proximity to weather radar, local terrain elevation, and the number of turbines. More socioeconomic impacts are then taken into account such as population, severe weather climatology, transportation routes, and neighbouring wind farms. If significant impacts are expected, Environment Canada's meteorologists are consulted to determine the likelihood of severe weather in the area. A wind farm located in an area where severe weather commonly occurs may impede the ability of the forecasters to issue warnings. The cumulative impact of multiple wind farms needs to be determined in context (Figure 13). For less severe impacts, a conditional acceptance is sent to the proponent based on only the present layout, where any additional changes will warrant a revised analysis. However, if the impact is expected to be severe, a non-concurrence ("severe impacts") letter is sent to the proponent.



Figure 13: Three separate wind farms that have a larger impact that the individual wind farm.

6. Mitigation Strategies

The ultimate solution for wind turbine clutter suppression would be an upgrade to the radar signal processor. Ideally, the wind turbine clutter signature would be separated from the weather data and filtered out without removing the weather data. Promising research has been produced from the University of Oklahoma (OK, USA); however, an operational solution will not be available for a number of years. In the short-term, there are a few mitigation solutions possible, such as: re-location of turbines or radar, additional infill radars, modification to turbine blade reflectivity or curtailment of wind turbines in severe weather.

Every mitigation strategy is dependent on each specific wind farm project. Since radar contamination occurs when a wind turbine is within radar line-ofsight, a strategy may be to move the turbines or the radar itself. By adjusting the relative locations, the contamination could be eliminated. However, physically moving a radar station, finding land, and satisfying radar siting preferences would be a long and costly process. The relocation of the weather radar may only delay the problem with potential future wind farm developments.

Another medium-term mitigation solution may be the implementation of additional radars in the area. These supplementary radars would be located to allow a clear view of the incoming weather behind the wind farm that would have been contaminated (Figure 14). Additional infill radars could be costly for integration and ongoing maintenance within the weather radar network. This mitigation suggestion still leaves contaminated data over the wind farm itself, which will mask any weather in those areas, including phenomenon such as tornadoes.



Figure 14: Potential infill radar strategy: The wind turbine area is outlined in pink. The red pin represents the existing radar and the shaded white area indicates a sector of Doppler radar data that could be contaminated (assuming 113 kilometre range). The infill radars are positioned to provide coverage behind the contaminated area (over the lake) with a smaller range of 56.5 kilometres. *Note: This range is used to illustrate an X-band radar and effective radar ranges may vary.

Further mitigation strategies are being developed in relation to the wind turbines themselves. The wind turbine company Vestas Wind Systems has been working on stealth blades. Stealth blades, with frequency specific paint, are made to absorb the specific wavelength energy instead of returning it back to the radar. However, stealth blades may not be a viable solution when radars of different frequencies are in the network.

A potential short-term strategy for co-existence is curtailment. Curtailment is an agreement between weather forecasters and wind farm operators in which the forecasters will notify the operators to stop the turbine blades during severe weather situations. The letter of intent (LOI) would contain duration limits and frequency agreed upon by both parties. The curtailment process timelines would be based on historical warning data, radar coverage availability, the general movement of weather in the area, and the extent of the wind farm. Curtailment would not be mandatory but a voluntary practice accepted by the proponents as a workable short-term mitigation solution. However, curtailment would only work in certain circumstances (e.g. if blockage exists, shutting off the turbine blades would not help). In conclusion, there are some mitigation strategies which may allow wind turbines and weather radar to co-exist. However, these strategies cannot be applied to all wind projects and an assessment must be under taken in each case before any mitigation solution is suggested.

7. Bow Lake Wind Project and Montreal River Weather Radar

The proposed Bow Lake Wind Project is located in close proximity to Environment Canada's Montreal River weather radar. It is expected to cause severe radar data contamination. Montreal River weather radar is located at 47.24773° latitude and -84.59652° longitude. The radar is a C-band radar which transmits energy from its antenna at 23.1 meters above the ground. BluEarth Renewables Inc. is proposing a wind farm of 36 turbines having a tower height of 96 meters and a rotor diameter of 100 meters, for a total height of 146m to the tip of the blades. The nearest wind turbine is located approximately 3 kilometres away from the Montreal River weather radar. All wind turbines will be in line-ofsight of the weather radar. The project's turbines will impact ~12.2% of Montreal River weather radar's scanning view.



Figure 15: Location of the Bow Lake Wind Project turbines (in purple) and the Montreal River weather radar in yellow.

Environment Canada (EC) was first notified about the project in 2009. At that time, the project consisted of only 6 turbines and the proponent was Vortex Wind Power. Although the wind farm was relatively small, the main concern was

potential blockage of the radar signal from the turbines. In January 2010, a consultant contacted EC indicating the number of turbines had changed from 6 to 12. Correspondence was then sent to the proponent indicating that the additional turbines would create more interference. In March 2010, EC was notified about Bow Lake Phase II in which another 24 turbines would be added. EC was asked to respond to the analysis for the first phase, however with the additional turbines, the cumulative impact had to be taken into account. After meetings and mitigation discussions in June 2010, DP Energy was brought in to consult on the potential radar interference.

DP Energy drafted a report on August 9, 2010 attempting to mitigate Environment Canada's concerns by aligning the turbines into radials. Only turbines within 7 kilometres of the radar were taken into account. On May 6, 2011, Environment Canada sent the consultants a formal letter outlining some of their concerns with the project. BluEarth Renewables Inc. initiated consultation in August of 2012 as they became the project proponents of the consolidated Bow Lake Phase 1 and Phase 2 Wind Farms. A report prepared by Spectrum Expert was included by the proponents for comment. The report was reviewed EC and comments were sent to the proponent. Further analysis was completed on the proposed 36 turbine layout and the proponent was informed of additional impacts in a formal letter sent on October 29, 2012.

Given the proximity of the Bow Lake Wind Project to the Montreal River weather radar there are many impacts expected. The radar scans at 24 elevation angles during a conventional volume scan. The turbines will be in direct line-ofsight for the 9 lowest radar scans. There are 4 Doppler scans at separate elevations and the turbines will impact 3 of them. The lower scans of the radar are important to detect meteorological targets close to the ground. All areas behind the severe radar contamination will be impacted. The expected impacts are listed below:

- Partial blockage
- Reflectivity data contamination
- Velocity data contamination
- Multi-path scattering
- Inaccurate estimations of precipitation in quantitative radar products

The contaminated radar data at the Montreal River weather radar will impact forecasters at the Ontario Storm Prediction Centre and the Aviation Forecast Centre. Thus, local weather forecasts and severe weather warnings will be affected. The Montreal River area is prone to lake-effect snow squalls. These narrow weather bands are very shallow and the lowest radar scans, nearest to the ground, are used to track the evolution. With contaminated radar data, the radar would be unable to detect the accumulation of snow in regions beyond the wind farm. The accuracy of weather forecasts indirectly impacts the general
public in terms of work, recreation, and transportation. The Ministry of Transportation, the Ontario Provincial Police, NAV CANADA, and the Department of National Defence will also be impacted as they directly utilize weather forecasts and weather radar observations for briefing and decision making purposes. Additional user groups may also be impacted by the contaminated radar data from the Bow Lake Wind Project.

8. Recommendations and Conclusions

Environment Canada is of the opinion that the Bow Lake Wind Project, as currently proposed, and the Montreal River weather radar will be unable to coexist without significant impact on users of weather information. One option would be to relocate the Montreal River weather radar. Siting a new location for the weather radar would be a challenging, long and expensive process, with the potential that any new site may face future wind farm encroachment. Curtailment would not be applicable in this case because the wind turbine hubs will be visible to the radar and contamination would still occur due to blockage. An infill radar could aid in recovering lost data behind the wind turbines, however the range would have to be similar to the existing Montreal River weather radar. An additional C-band radar could help to recover data behind the turbines. Moving forward, it is our hope that a solution can be found that allows uncontaminated radar coverage for the Montreal River area in an effort to protect the safety of Canadians. If a workable solution cannot be found, we believe the impact will be too severe and recommend the Bow Lake Wind Project not be built.

Terella, Andrea

From:	Weather Radars Contact, National Radar Program [Ontario] <weatherradars@ec.gc.ca></weatherradars@ec.gc.ca>
Sent:	Tuesday, December 11, 2012 4:16 PM
То:	Tyler Jans
Cc:	Weather Radars Contact, National Radar Program [Ontario]
Subject:	Draft REA Submission Comments
Attachments:	BowLake_REA_Submission.pdf

Importance: High

Dear Mr. Tyler Jans,

<<BowLake_REA_Submission.pdf>>

Please see attached letter and document.

Best Wishes,

Carolyn Rennie

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Coexistence of Wind Farms and Weather Radars

Draft - for discussion prepared for Nodin Kitagan Limited Partnership and Nodin Kitigan 2 Limited Partnership.

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1-Conceptual considerations

From the standpoint of weather radar data quality wind farms are part of the ground clutter landscape which includes orography rising above the horizon, trees and man-made objects such as buildings, electricity towers and power lines, bridges and so on. The addition of wind turbines is another element to be dealt with, although this is the new kid-in-the-block that a-priori looks scarier because two characteristics differentiate wind farms from other ground targets: their height is dominant with the exception of hills and mountains, and most important the rotating blades. Because of the latter, wind turbines will produce a radar signal of greater complexity that other ground targets. They are usually distributed in relatively small clusters and are of low density (hundreds of meters between units). They are reflecting targets that affect reflectivity measurements as well as the Doppler signal produced by the rotating blades. The question that must be considered is whether wind farms hinder the use of weather radar to a serious degree above all the other present elements of uncertainty.

Reflectivity: the dielectric constant of the pedestals (towers) is determined by the covering paint that likely limits the reflectivity. The cylindrical shape also is a limiting factor as compared to corner reflectors. The pedestals are around 5 meters in diameter. This size sets them in the Mie, or even likely in the geometric, back-scattering region. The blades are made of material of low dielectric constant (wood, composite, covered in fiberglass), a fact that limits their reflectivity and its dependence on blades shape and orientation. Thus, compared to power-line towers and communication towers, with their naked metal structures full of corners, it is likely that wind power generators are the weaker targets. Surrounded by a forest it is likely that reflectivity of trees is dominant given the density of targets, except above the canopy because of the taller height of turbine pedestals. If the turbines become wet their reflectivity will certainly increase, although the rotating blades will tend to shed most of the water and minimize wetness effect.

Doppler: the plane of turbine rotation is perpendicular the direction of the wind. When the orientation of the plane of rotation is tangential to the radar beam (orientation produced by wind in the radial direction) there is no Doppler signal whatsoever (wind along the radial is not contaminated). If the wind aligns the plane of the blades along the radar beam (wind tangential to radar) the rotation of the blades is maximally detectable. Hence, it is interesting that when the wind is tangential to the radar (zero Doppler velocity from weather) the plane of rotation of the blades is radially oriented to the radar giving a maximum radial velocity from turbines; inversely, when the wind is radially oriented to the radar giving a maximum Doppler velocity from weather, the plane of rotation is tangentially oriented and turbines produce zero radial velocity. This facilitates the identification of rotating blades. Furthermore, when one rotating blade moves toward the radar the other two move away, compensating to some extent the average Doppler shift. The effect on the mean Doppler velocity could be also affected by the change in shape of the blades as seen by the radar. Given the low dielectric constant of the blades this effect is not likely to be pronounced. If several turbines contribute to a pixel measurement they will tend to further cancel out the mean Doppler signal since the orientation of the blades in the plane of rotation of each turbine is independent of the others. Thus, we should expect that main effect on Doppler signal is spectral broadening rather than a contamination of the mean Doppler velocity of weather targets. The resulting Doppler spectrum will be strongly non-Gaussian. Clutter suppression algorithms based on the assumptions of Gaussian spectrum will be less effective in the presence of turbines.

Polarization diversity: As with Doppler velocity, rotating blades may introduce fluctuations in differential reflectivity (Z_{DR}) at time-scales comparable to the rotation frequency but it is not a-priori clear whether a net effect would be discernable. The turbines should not reduce the ability of identification of ground clutter by algorithms of polarimetric Target Identification (TID) implemented in the McGill radar.

Beam blocking: The far field for cylinder of 5 m diameter and for a Cband radar is of the order of 800 meters. Thus, effects of turbines at different rages are not simply additive. However, if at ranges where the turbines are above the horizon the distance between turbines is of the order of the beam-width or larger, as it appears to be the case, beam blocking should be negligible even at the lower elevations; most of the energy will pass between turbines and many azimuths could be totally unaffected. At 15 km range a combined section of 125 meters is needed to block half a 1°-beam! Quite a number (depending on range) of turbines aligned along a beam-width would be required to block half of the beam and reduce the power by 3 dB. For comparison, a wet radome on a C-band radar produces an attenuation of ~5 dB. If beam blockage of fixed obstacles is known it can be compensated by software at the data processing stage. However, the loss of sensitivity at far ranges due to blockage cannot be compensated.

Multiple reflections: Very likely second order effects, due to the considerations on reflectivity above, leading to weak echoes below the strength of any significant precipitation. It should be possible to adapt the clutter suppression algorithm in the signal processing to eliminate the effect of multiple reflections.

Dependence on radar distance to turbines: Beyond ~40 km wind generators are already mostly below horizon. This is highly dependent on the height of the radar antenna and topography. Under conditions of anomalous propagation turbines could produce radar echoes at much further ranges. At very short distances (few kilometers) the radar beam is in the tenths of meters in width and hence there should be many azimuths where all energy passes between turbines allowing for weather detection unaffected by the turbines (assuming that the inter-turbine distance is always in the hundreds of meters). At very short distances the turbines intercepting the radar beam will affect all antenna elevations and adapted signal processing is more necessary.

These simple, "back-of-the-envelope" considerations are not substitutes for a quantitative assessment of the effect of wind farms on radar signal. Nevertheless, it is necessary to have a qualitative idea of the possible problems when we analyze complex data of different possible interpretations.

These considerations suggest that only under special circumstances wind farms could be serious nuisance. Their presence could require an adapted signal processing if artifacts are to be avoided. Some of these artifacts may be produced by existing limitations of signal processing. For example, if ground clutter suppression is done by a narrow notch-filter around zero Doppler velocity, as commonly presently done, the broadening of the Doppler spectrum produced by the rotating blades could result in poor suppression leading to a residual signal standing out from the rest of the background of well suppressed ground clutter (such signal processing would thus act as an artificial visual enhancer of the contamination by wind turbines). Even if FFT clutter suppression is used, as in Environment Canada (EC) radars (except the McGill radar), with the limited resolution and bandwidth of Doppler spectrum and the assumption of a Gaussian, spectrum the same problem could arise.

2- The McGill experience

During the summer of 2012 three clusters of wind farms were installed on both sides of route 221 (see Fig. 1). Since beginning of November 2012 most of the turbines were rotating.



Fig. 1 Left: The location of the wind farms with respect to the radar. The turbines are located roughly between 20 and 35 km from the radar covering and azimuth between 130° and 110°.

Middle: layout of the farms as per web site of SNC-Lavalin environmental study. At present only the two northern clusters are installed but do not follow the planned layout.

Bottom: A photograph taken from the tower of the McGill radar in the direction of the turbines (courtesy of F. Fabry). The closest turbines are prominent thanks to the high McGill radar tower.



In Fig. 1 the approximate location of turbines is shown. The final layout seems different from the original plan of SNC-Lavalin (middle panel): some turbines can be seen a few hundred meters close to Route 221 and on both

sides. There are three clusters of 13 turbines each in the location indicated in Fig. 1. Turbines are located in flat farmland with patches of forest here and there. The spacing between turbines is of 100 meters or more.

The photo in Fig. 3 Bottom covers close to 7 degree in azimuth. It clearly shows 13 turbines and what appears to be three communication towers. With the radar beam-width of less than 500 meters at these ranges one can expect that the beam intercepts at most two to three turbines at any degree of azimuth. Thus, beam blockage should be negligible. Important power-lines are running in the region, particularly along the route 221 and can be also discerned in the photo.

When observing radar data, after signal and data processing (optimized for quantitative and operational use of radar data) we did not notice any eyecatching change in our residual ground clutter contamination of reflectivity or Doppler velocity after the installation of the turbines. The forecasters in the Quebec Region did not express any concern after the installation, although there was some apprehension before installation. All this seemed consistent with the consideration in Section 1. For the purpose of this report a more careful but preliminary data analysis was done.

McGill radar is an S-band system forming an integral part of EC network (in fact, it was the first unit of the network) and EC forecasters use its data operationally. The signal and data processing of this radar differs from the rest of the network and was designed to satisfy both, the requirement of forecasters and of McGill researchers. Clutter suppression is not done at the stage of signal processing but during the second stage, that of data processing. Two clutter suppression algorithms are applied: with and without use of polarization diversity. Research effort is continuously made to improve clutter suppression in particular and target identification in general. Figure 2 shows a historical image of ground clutter from data taken on the 4th of July 2002. This is an example of the one of the severe situations of contamination from ground returns in the EC network. The most prominent echoes are from orography (Laurentians, Adirondacks, Mont Royal, etc.). The urban environment of Montreal and surrounding towns adds to the problem. Finally, there is a network of Hydro-Quebec power lines crisscrossing the landscape.



Fig. 2- The historical pattern of ground clutter as seen by the McGill radar at an elevation of 0.5°. The reflectivity scale here goes from the range dependent minimum detectable signal to 60 dBZ, (light blue to black)

The white circle indicates the region where wind farms were installed recently. Hence, strong ground echoes predate the wind farms.

The radar is regularly calibrated. Moreover, at the time of data collection for this study an automatic procedure for calibration was operational, using redundancy in polarization diversity. The sensitivity of the radar, after signal processing by coherent integration, is close to -5 dBZ @ 100 km.

Two data sets were analyzed: one in precipitation-free period and another in a day with precipitation. The reason for the latter is to see whether wetness of the targets changes the results. As mentioned before, after data underwent our operational data processing no indication of the appearance of the turbines was noticed. Thus, the only treatment in the data used here, done at the stage of signal processing, is the coherent integration over one degree in azimuth and eight pulse gates (one kilometer in range) needed for damping of Raleighdistributed fluctuations in the radar signal originating from weather targets and no additional averaging beyond 1°x1km.

3- Results

The following Figures 3a, 3b, 3c have the same layout: bottom left is a zoom on the conical cross-section at 0.3° elevation of the beam (PPI) with the region of interest at the center (a transparency mask highlights the region of interest). The two black arrows indicate the position of the **R**ange vs. **H**eight cross-sections (RHIs) shown above. To the left is a series of cylindrical cross-sections of **H**eight vs. **A**zimuth at the indicated **R**anges (HARPIs). Thus, data are depicted in the radar's natural coordinates. Data pixels show the closest 1°x1km datum, without any additional beatifying interpolation or smoothing.



Fig. 3a. - Reflectivity data from a weather-free day. The operational elevations of the radar beam are shown in the RH's. The azimuths of the RHI's are indicated by the vertical lines on the HARPI sections and by the arrows on the PPI section.

The Doppler velocity (not shown) is zero everywhere (within the noise level, to be precise).

Comparison of the PPI in Figure 3a to the 10 years old equivalent image of Fig. 2 does not indicates any obvious degradation of clutter conditions or a clear increase of intensity of the clutter. More detailed analysis would be required to confirm this because the McGill signal processing improved appreciably in this period as well, and data have now less residual noise. The very strong returns are from orography: Mont Royal, the closest to the East, Mont St. Bruno, Mont St. Halaire, Rougemont further to the East and so on. The line of strong echo to the SW is the southern coastal line of the St. Laurence River (the very weak echo region toward the radar is the river at one of its wider points). The other medium and low strength echoes are the usual panoply of targets present in an urbanized region: power lines and their towers, communication towers, tall buildings, elevated roads and so on.

We will focus now our attention on a small region, delineated by the white square in the PPIs of Fig. 3, from 25 to 30 km range and 117° to 126° azimuth (~25 km²) containing turbines from the clusters on both sides of route 221 in Fig.1-middle. This subdomain of the wind farm has operating turbines as confirmed by visual observation while driving on the roads around the turbines. Visual inspection shows that the cluster further to the West has turbines of appreciably lower height.

It is interesting to note that both, the region of 22 to 32 dBZ at 126° azimuth and the adjacent pixels with reflectivity of 9 to 19 dBZ just to the south contain wind turbines (at 117° azimuth). If anything, the weaker reflectivity pixels visually appear to have a greater density of turbines. In any case the turbines do not appear to be the main contributor to the strength of the ground echo. These data suggest that upper limit of the strength of returns from these turbines is below 20 dBZ, and likely much less since other ground targets also contribute to the observed echoes strength. This puts the upper limit of echo from these

turbines at the level of returns from rain of \sim 0.5 mm/h or snow of \sim 1 mm/h or less.

Side lobe contamination of ~1-3 dBZ is seen in the vertical sections of Fig. 3a at heights up to 10 km. It is not appreciable stronger in the region of the turbines than in the adjacent sectors. There is no indication that the side lobe contamination is associated with the turbines and in fact, it seems to be caused by the strong targets East of the radar. In any case, maximum ground clutter contaminations above 1.5 km height of ~3 dBZ, which is below the strength of the signal from snow of 0.1 mm/h.

No indication of multiple reflections is evident in these strong clutter conditions, at least at reflectivity levels relevant for weather detection. The corresponding Doppler images (not shown) indicate mean Doppler velocity was within the noise level everywhere, near ground and in the side-lobe contaminations.



Fig. 3b. - Reflectivity data from a day with shallow (below 6km depth) precipitation. The melting layer at ~ 2km is clearly seen in the RHI sections. Vertical lines on the HARPI sections and the arrows on the PPI section indicate he azimuths of the RHI's. The melting layer can be seen just above 1.2 km height.



Fig. 3c. – Doppler velocity data corresponding to reflectivity data in Fig. 3b. Some velocity folding is present in the 126° RHI and the 25 km HARPI at ~ 1 km height.

Figures 3b (reflectivity) and 3c (Doppler) correspond to conditions of shallow light rain, sufficient to wet all ground targets, including the turbines, but not to totally dominate the received signal in all pixels. At azimuths between the RHIs precipitation clearly dominates with a mean of ~26 dBZ as compared to ~10 dBZ in precipitation free conditions (some of the increase is caused by the wetness of ground targets). The low level wind on that day was from SE, which orients the blades of the turbines radially to the radar and maximizes the Doppler contamination by wind turbines. But the expected fluctuations in radial velocity associated with rotating turbines could not be observed in the time sequence of these data in spite of McGill rapid update cycle of 5 minutes. This could due to a low reflectivity of the blades or to the canceling effect of several turbines contributing to each 1°x1km pixel of data, or both. The depression of Doppler velocity by the zero velocity of ground targets is obvious (the same Doppler pattern as the pattern of reflectivity). There are some pixels with zero Doppler velocity. This is also the case in regions of strong ground clutter but free of turbines. The strong ground targets dominate the velocity in this very weak precipitation. But there is no hint of any pixels with Doppler velocity bias attributable to rotating wind turbines.

Inspection of a time sequence of reflectivity does not indicate any clear shadows of reflectivity at ranges beyond 40 km (range beyond wind turbines and of all other ground targets) that would indicate significant beam blocking associated with the wind farms.



Fig. 4- PPIs of reflectivity and doppler velocity at elevation of 0.3°, 0. 7°, 0. 9° and 10.3° elevations in moderately heavy rain (~10 mm/)

Figure 4 shows the same complex situation of strong ground clutter situation under moderately heavy rain of ~10 mm/h. A comparison of the 0.3° Doppler PPI to the corresponding on in Fig. 3c shows that in the region of the turbines most of the zero-Doppler pixels have disappeared: radial velocity is already dominated by returns from rain. There is no clear indication of any contamination of turbine rotation although the orientation of the plane of rotation is optimal for detection of contamination. With increasing elevation there is no sign of side-lobe effects. At the 10.3° elevation toward S-E of the radar there is indication of side-lobe contamination from weather in the East and South: the circular 10m/s traces (blue) on 14m/s region (light blue).

Figure 4 illustrates that in severe weather precipitation easily dominated the turbines in the analyzed situation. It is difficult to imagine that the turbines of this network could affect severe weather detection. Mean Hourly Precipitation (Dec 2011) Mean Hourly Precipitation (Dec 2012)



Fig. 5- One-month accumulations before (Dec 2011) and after (Dec 2012) installation of turbines. The white circles identify turbines (courtesy of Aldo Bellon).

The presence of the wind farm only becomes convincingly detectable when long term accumulations are made, as seen in Fig. 5. Note that these accumulations are of raw data. That is, without any mitigation of ground clutter.

4- Discussion

If weather radars were a perfect instruments operating in ideal conditions the addition of wind farms within radar range would turn a perfect instrument into an imperfect one. However, this is not the case, and the question that must be asked is: what is the importance of the contamination by wind farms in relative terms, that is, in their addition to all other existing limitations of weather radars. Thus, the answer to the question is not unique. It depends on the particular conditions and use of the radar.

The above is a very preliminary analysis of McGill radar data aimed at addressing this question in the situation of this radar. More detective work would be needed to thoroughly investigate the effect of turbines on radar signal in general. It would be interesting to stop the antenna rotation, point it to one turbine and collect pulse-by-pulse (I/Q) data in clear air conditions. This is possible and highly desirable but way beyond the scope of this report. However, the results shown here confirm most of the conceptual considerations from Section 1. They explain why McGill radar personnel (the team with the longest experience in this domain) totally failed to notice the deployment of the turbines while looking at the operational data outputs practically daily. The McGill algorithms for clutter suppression effectively dealt with the modification of the clutter the previously existing landscape containing man-made targets such as communication towers, power lines, and natural ground targets: trees, shorelines and hills. Efficient radar data collection of an operational network must effectively deal with these targets.

So far the impression given by the McGill experience is that wind turbines are only a minor additional nuisance under the methodology of data collection and data processing adopted at the McGill Radar Observatory.

It is possible that under different conditions of the landscape, of flat terrain with vegetation of limited height and little man-made constructions, the presence of wind farms will be more noticeable. Different strategies of data collection and processing could result in more prominent effect of turbines.

Turbines at a very close range of 3 km of the radar will produce backscattering signal 100 times (20 dB) stronger than at 30 km. But the returns from other ground targets will be stronger in the same proportion. More importantly, the strength of echoes from precipitation will keep the same proportion. Multiple reflections will be stronger in absolute terms but will keep the proportion to the competing weather. Thus, the McGill experience in this respect is still relevant: the turbines are not very efficient competitors of weather.

Blockage at 3 km is more important: the beam-width is roughly only ten times the diameter of the pedestals of turbines. Hence, the interception of five turbines per beam-width is required to reduce the strength of returns by 3 dB from targets at further ranges. With the normal spacing between turbines it is likely that many azimuths will be not affected. Given the great azimuthal density of information at short ranges, and consequently some redundancy, the presence of turbines at short ranges may be less of a problem than expected.

EC's concerns generated by the Bow Lake project appear to be mainly related to lake breeze effects and associated snow of low intensity. For this it is critical the efficient filtering out of those parts Doppler spectrum related to ground targets. Whether the rotating blades produce a relatively serious contamination of mean Doppler wind depends on the orientation of the lake breeze. Will the wind align the plane of blades rotation radially or tangentially to the radar? To answer this we need more information on the meteorology. In any case, at these short ranges only some azimuths should be affected by the turbines, and in this respect the exact deployment of the location of turbines should insure that a sufficient number of unaffected azimuths exist. Best strategy is to align the turbines radially with respect to the radar in order to minimize blockage and maximize the number of unaffected azimuths.

Mitigation of the presence of the turbines would require a careful selection of unaffected azimuths and/or apply a signal processing designed for

the presence of turbines in the affected azimuths. Given that the location of turbines is known data selection should suffice as a first step.

Most important of all, we should remember that from the onset of weather radars Canada was, and still is, a leader in the field of radar meteorology. Environment Canada has a healthy research group in the field and there is a very strong academic radar meteorology community. The conditions under which the Canadian radar network operates were designed locally not so long ago. The task of mitigating the impact of wind farms on weather radar is an addition to past efforts well within the capabilities of existing resources and can be accomplished at the same time as the farms are deployed. Research on improving signal processing is one of the current efforts at McGill. All this is to say that we do not need to wait for the problems to be solved elsewhere before we design and implement our solutions at the same time as the production of clean and renewable energy grows unhindered.

In the attached paper "Radar and Wind farms – mitigating negative effects through signal processing" by Bachmann et al there is a description one road to solving the problem. This paper was presented at the last European radar conference and won an award. It may take sometime before this is implemented in commercial systems such as the SIGMET processor used by EC. It would be useful to contact SIGMET and find out what are the plans and timetable. In the meantime simpler mitigation techniques could be implemented.

Terella, Andrea

From: Sent: To: Cc: Subject: Attachments: Tyler Jans <tyler@bluearth.ca> Thursday, January 10, 2013 5:15 PM weatherradars@ec.gc.ca Bryan Tripp; Scott Hossie Bow Lake Wind Project and Montreal River Radar Turbines&Radars.pdf

Hi Carolyn,

We appreciate the time all at Environment Canada ('EC") took yesterday to meet with us. As a matter of course, I just wanted to summarize our takeaways from the meeting given that, as discussed, it was productive in laying a path on working together going forward.

General agreement was that there were two heads, one being radar data and the second being public safety with regards to weather forecasts and warnings. Specific to radar data mitigation, both parties are in general agreement that given the stage of the project, moving turbines or the radar were not feasible. Curtailment was also not feasible as it would not aid in managing forecasts or warnings with regards to low level squalls. The project layout in the REA being submitted in January 2013 does incorporate the "corridors" within 7km of the Montreal River radar as agreed in June, 2010.

Based on discussions during the meeting the concerns that remain for EC with regards to the Bow Lake Wind project are Blockage, Doppler Contamination and Multi-path Reflections. As EC has not completed analysis specific to the Bow Lake project due to resourcing, BluEarth committed to complete a more accurate assessment of actual impact to the radar data. This commitment requires EC to provide radar data from the Montreal River Radar as EC agreed. Once EC provides the data, BluEarth will outline the proposed study and solicit EC comment to ensure consistency in any analysis and assumptions made with EC standards. This assessment is to quantify actual impact and because of the stage of the project, allow the implementation of mitigation of actual effect on end users as opposed to mitigating effects on data.

In addition to quantifying actual effect, the following commitments were made:

Environment Canada

- Consult with forecasters and modellers to assess the measured effect based on potential effects from the project
- Complete assessment in line with HC Safety Code 6

BluEarth

- Complete additional consultation with public safety sensitive users (ie OPP and MTO) to evaluate if mitigation measures such as a highway camera would be feasible.
- Share analysis by Professor Zawadski and Geoff Blackman once complete

Finally, as committed, please find attached draft discussion paper prepared by Professor Zawadski for your review.

Again, we appreciate Environment Canada's time and should you have any questions please contact me anytime.

With regards,

 DIRECT:
 403.668.1575 EXT 414

 MOBILE:
 403.880.1065

 EMAIL:
 tyler@bluearth.ca

BLUEARTH RENEWABLES INC. SUITE 200, 4723 – 1ST STREET S.W. CALGARY, ALBERTA T2G 4Y8 BLUEARTHRENEWABLES.COM



* Please consider the environment before printing this email.

Terella, Andrea

From: Jane.Zhang@HydroOne.com [mailto:Jane.Zhang@HydroOne.com] Sent: October-15-12 10:11 AM To: BowLakeWind Cc: w.d.kloostra@HydroOne.com; ierullo@HydroOne.com Subject: Bow Lake Wind Farm Class EA

Dear Mr Kozak,

In our initial review, we can confirm that there are no Hydro One Transmission Facilities in the subject area.

Please be advised that this is only a <u>preliminary assessment</u> based on current information. No further consultation with Hydro One Networks Inc. is required if no changes are made to the current information.

If you have any further questions or concerns, please feel free to contact me.

Regards,

Thanks Jane Zhang *Transmission Lines Sustainment, System Investment Asset Management, Hydro One Networks Inc. 483 Bay Street, 15th Floor Toronto, Ontario M5G 2P5 Phone: 416-345-4251 Jane.Zhang@HydroOne.com*

Terella, Andrea

From:	Nixon, Erin (MNR) <erin.nixon@ontario.ca></erin.nixon@ontario.ca>
Sent:	Tuesday, July 13, 2010 4:23 PM
То:	simondepietro; Kevin O Donovan
Cc:	Green, Emily (MNR); Mihell, Kim (MNR)
Subject:	RE: Bow Lake final turbine layout

Hi Kevin and Simon,

Thanks for your quick replies. That helps to clarify from my end. We will continue with the NHA review, and will also let EC know that the final layout is incorporated in the documents. Simon – I don't think I need anything further from you on this. I and/or Emily will be talking with EC about the documents, and will provide them with the confirmation as to final layout if there are any questions remaining at their end.

Regards,

Erin.

Erin Nixon

Renewable Energy Planner Sault Ste. Marie District 64 Church Street Sault Ste. Marie, ON

Tel: 705-941-5128 Eml: 705-949-6450

From: simondepietro [mailto:simon.depietro@dpenergy.com]
Sent: July 13, 2010 6:21 AM
To: 'Kevin O'Donovan'; Nixon, Erin (MNR)
Cc: 'Peter Harte'; Holden,Stephen [Ontario]; Best,Christine [Edm]; blair marnie
Subject: RE: Bow Lake final turbine layout
Importance: High

Erin

I think we are talking Phase 1 and Phase 2....

I'm in office now if you want to chat but what I'd agreed with EC was that we would maintain the radar corridors we'd managed to achieve on the revised and final Phase 1 layout (i.e. that currently proposed and that which I'd presented in the report tabled with EC in last meeting)and said that when we added the Phase 2 turbines we would work to keep those radar corridors clear out to 7km i.e. no corridor blocking phase 2 turbines within 7km. So it's the Phase 2 layout with revisions to keep corridors clear that I was proposing to go back to EC for review.

Essentially I'd locked the revised with corridor Phase 1 design after the EC meeting...... We are working on that Phase 2 layout now but obviously I'm waiting for other inputs particularly the site roads and environmental.

Do you need something more than this? A letter from me to EC confirming layout and a reply?

Regards

Simon

PS Stephen (or Christine) please feel free to shout if you have a different understanding....

From: Kevin O'Donovan [mailto:kevin.odonovan@vortexwind.ca]
Sent: Monday, July 12, 2010 9:41 PM
To: 'Nixon, Erin (MNR)'
Cc: 'Peter Harte'; 'simondepietro'
Subject: RE: Bow Lake final turbine layout

Hi Erin,

I am back at work now. Hope you had a nice break.

Yes the layout in the NHA report is the final layout which was also agreed with the EC weather radar people. Simon De Pietro has been dealing with EC on this issue and is discussing the Phase 2 layout with them also so perhaps that is what is being referred to in your discussions. I have cc'd Simon in this email in case you have any further queries on the weather radar.

I am glad to hear that you are starting the NHA review as we had not expected this additional step of requiring the MNR letter of acceptance on the NHA reports prior to issue of the draft REA docs, in the REA process. We hope that the review will not take too long given the MNR have reviewed the NHA docs previously and that we have incorporated the MNR comments in this latest version. If there is anything we can do to assist in expediting the review process then please let us know.

Regards,

Kevin O'Donovan Vortex Wind Power Ltd

T:011 353 8682 11764

From: Nixon, Erin (MNR) [mailto:erin.nixon@ontario.ca]
Sent: 12 July 2010 19:57
To: Kevin O Donovan
Cc: Peter Harte
Subject: R: Bow Lake final turbine layout

Hi Kevin,

I'm wondering if you could clear up something for me. I'm planning to start reviewing the Natural Heritage Assessment for the Bow Lake – Phase 1 project that was provided by David Barrie last week. I'm of the understanding that the NHA contains the final layout of the Bow Lake Wind Farm. However, I've been hearing some discussion from Environment Canada about a final turbine layout to be provided to the Meteorological Society of Canada following a meeting in June re: potential impacts to the Montreal River weather radar site. Would you mind confirming that the layout in the NHA is, in fact, the final layout? I want to ensure that we're all looking at the same product so as to avoid any confusion.

Peter – not sure if Kevin is on his honeymoon, so am copying you on this as well.

Regards,

Erin.

Erin Nixon

Renewable Energy Planner Sault Ste. Marie District 64 Church Street Sault Ste. Marie, ON

Tel: 705-941-5128 Eml: 705-949-6450





Ministry of Natural Resources Ministère des Richesses naturelles

Visit us at our website http://www.mnr.gov.on.ca

Call any MNR Office in Ontario for information at -1-800-667-1940 (English) ... or ... 1-800-667-1840 (French) 8:30 am to 4:30 pm - Monday to Friday

64 Church Street Sault Ste. Marie, Ontario P6A 3H3 Telephone: (705) 941-5132 Facsimile: (705) 949-6450 steve.acorn@Ontario.ca

REGISTERED MAIL

March 29, 2011

Tulloch Engineering Inc. 1942 Regent St. Unit L Sudbury, Ontario P3E 5V5

Attention: Mr. Gary MacKay P. Eng.

Subject: Aggregate Permit Applications – Category 9 and Category 11. Smilsky and Peever Twps, located within the Territorial District of Algoma

I have reviewed the above mentioned Aggregate Permit Applications and have deemed the applications complete. However, this is not to say that the Ministry of Natural Resources (MNR) does not have any objections to this application. The MNR will advise you on these objections through the Notification portion of the Application Approval Process. As such, you may now begin the Notification stage of the permit application process as specified within the Aggregate Resources of Ontario Provincial Standards Version 1.0 for Category 9 and 11 Permit Applications as per Section 7 of Ontario Regulation 244/97 (Amended to O.Reg. 499/06) of the Aggregate Resources Act.

Enclosed are the following documents:

- 4.0 Notification and Consultation Standards for Category 9 and 11 Applications which includes:
 - 4.1 Notification
 - 4.2 Resolution of Concerns
- Aggregate Permit Application Process Flow Chart

As part of 4.1.1 (Notification) these projects have been determined to have significant environmental impact, and as such further public notification is required. Due to the Freedom of Information and Protection of Privacy Act, we cannot give out personal information or addresses

related to people who have an interest in these projects. Please provide this office with a letter containing the information required in Provincial Standard 4.1.2, including a deadline date for comments to be received. And 14 return addressed and postage paid envelopes to be labeled and sent out by this office.

As part of 4.1.2 (Notification) it is required that you include all landowners within 120m of the boundaries of each application site.

As part of 4.1.3 (Notification) I strongly advise that you include the following Ministries and Agencies in this process, (Which is to send a complete application pkg. [Application form, Site Plan and all technical reports - Summary Statement, Natural Environmental Level 1 and or 2, Cultural Heritage Stage 1 Report] for their review):

- The Ontario Ministry of the Environment
- The Ontario Ministry of Transportation
- The Ontario Ministry of Northern Development, Mines and Forestry
- Clergue Forest Management Inc.

You must include this letter with the package being sent to these Ministries and Agencies.

Please be advised, to facilitate the additional consultation requirements of these projects the minimum notification period will be 30 days.

At this time I am aware of the following First Nation or Aboriginal Communities that may have an interest in the project. I strongly advise that you contact them directly and send them a complete application package as noted above.

- Batchewana First Nation of Ojibways
- Garden River First Nation
- Michipicoten First Nation
- Chapleau Ojibwe First Nation
- Historic Sault Ste. Marie Metis Council

If you have any questions or concerns regarding the above information, please give me a call. I can be reached at (705) 941-5132.

Yours truly,

Steve Acorn A/Aggregate Specialist - Inspector Sault Ste. Marie District

Ministry of Natural Resources

Sault Ste. Marie District Office 64 Church Street Sault Ste. Marie, ON P6A 3H3 Tel.: 705-949-1231 Fax.: 705-949-6450 Ministère des Richesses naturelles

Bureau du district de Sault Ste. Marie 64, rue Church Sault Ste. Marie, ON P6A 3H3 Tél.: 705-949-1231 Téléc.: 705-949-6450



April 15, 2011

Tulloch Engineering Inc. 1942 Regent St. Unit L Sudbury, Ontario P3E 5V5 APR 2/0 2011

Attention: Mr. Gary MacKay P. Eng.

Subject: Aggregate Licence Application – Category 3 Class A Licence. Radon Resources Inc. Peever Township, located within the Territorial District of Algoma

I have reviewed the above mentioned Aggregate Licence Application and have deemed the application complete. However, this is not to say that the Ministry of Natural Resources (MNR) does not have any objections to this application. The MNR will advise you on these objections through the Notification and Consultation part of the Application Approval Process. As such, you may now begin the Notification and Consultation stage of the licence application process as specified within the Aggregate Resources of Ontario Provincial Standards Version 1.0 for a Category 3 Licence Application as per Section 7 of Ontario Regulation 244/97 (Amended to O.Reg. 499/06) of the Aggregate Resources Act.

Enclosed are the following documents:

- 4.0 Notification and Consultation Standards for Category 3 Applications which includes:
 - 4.1 Notification
 - 4.2 Consultation
 - 4.3 Resolution of Objections
- LICENCE APPLICATION PROCESS UNDER THE AGGREGATE RESOURCES ACT – CATEGORIES 1 TO 8 (chart 1 and 2);
- > Form 1 (Notice of Application for a Licence) (French and English); and
- Form 2 (Notice of Public Information) (French and English).

As part of 4.1.3 (Notification) I strongly advise that you include the following Ministries and Agencies in this process:

- The Sault Ste. Marie North Planning Board
- The Ontario Ministry of the Environment
- The Ontario Ministry of Transportation

You must include this letter with the package being sent to these Ministries and Agencies.

At this time I am aware of the following First Nation or Aboriginal Communities that may have an interest in the project. I strongly advise that you contact them directly and send them a complete application package including all technical reports and site plans.

- Batchewana First Nation of Ojibways
- Garden River First Nation
- Michipicoten First Nation
- Chapleau Ojibwe First Nation
- Historic Sault Ste. Marie Metis Council

The District of Algoma is designated under the French Language Services Act and therefore public notices must be in both French and English or the following statement must be included at the bottom of both of the above notices (Form 1 and Form 2). "Pour renseignements en français: MaryAnn Kendrick, tél. (705) 941 – 5100." In addition the above statement in French must appear at the bottom of any sign posted on site.

<u>Note:</u> Please be advised, you must notify this office of the date that Form 1 and Form 2 will be published in the local newspaper, 30 days in advance of the publishing date so the Ministry of Natural Resources can ensure the comment period on the Environmental Bill of Rights registry coincides with the 45-day comment period.

If you have any questions or concerns regarding the above information, please give me a call. I can be reached at (705) 941-5132.

Yours truly,

Steve Acorn A/Aggregate Specialist/Inspector Sault Ste. Marie District

Terella, Andrea

From: Nixon, Erin (MNR) [mailto:erin.nixon@ontario.ca]
Sent: August-17-12 1:09 PM
To: Scott Hossie; Kelly Matheson
Cc: Boothby, Jim (MNR); Rudzki, Joanie (MNR); Santos, Narren (ENE)
Subject: I: Bow Lake request to utilize REA process for multi-purpose roads

Hi Scott,

I have an update for you on our discussions around the use of the Class EA RSFD to screen the Bow Lake multi-purpose roads. Specifically, BluEarth has expressed an interest in amalgamating phase 1 and 2 of the Bow project into a single project, which would impact upon the Class EA RSFD process currently underway to screen the multi-purpose roads associated with phase I of the project. The company's stated intent is to terminate the Class EA process and migrate the multi-purpose roads currently being evaluated under the Class EA to the REA process as permitted through a recent amendment to O'Regulation 334.

In speaking with BluEarth representatives, it is understood that the changes to the project screening process (ie. Roads to be evaluated under REA) are due in part to a recent amendment to O'Reg. 334, which permits for the consideration of multi-purpose roads through the REA process. It is the company's understanding that the screening of the multi-purpose roads under the REA process will lead to a more seamless consideration of the roads, will be less confusing to the public, and will also be more timely. The company has also suggested that, due to the amalgamation of phase 1 and 2, the Class EA project has been significantly altered and as such should be considered to be a new project.

MNR can offer the following:

MNR agrees that the geographic scope and location of the project have changed significantly. As such, the information provided in the Notice of Commencement issued prior to the July 1, 2012 transition date of O'Reg. 334 would be inadequate for the project. If the company were to proceed with the Class EA process, MNR would advise that the first public notice be re-issued due to significant alterations to the project, and that the project screening essentially start over.

MNR does not have concerns about the migration of the multi-purpose roads to the REA process, but will defer to MOE as to whether the company is able to meet the transition provisions for the roads as set out in the amendments to O'Reg. 334.

The Class EA RSFD document provides no direction on the process to terminate the screening of a project. However, in speaking with MNR's Senior Environmental Planning Advisor, we would advise the company to take the following actions should they determine to screen the multi-purpose roads under REA:

- an email should be sent to MNR Sault Ste. Marie District outlining the company's intent to terminate the Class EA, which will be appended to the EA file.
- to avoid confusion moving forward, the company should clearly communicate their intent and reasoning to the public and aboriginal communities, and describe the new process to be used to evaluate the roads
- the public and aboriginal communities should be informed as to any additional opportunities they may have to comment on the roads currently being screened under the Class EA

I hope this is helpful. Please contact me should you have any further questions.

Regards,

Erin

Erin Nixon Renewable Energy Planner

Ministry of Natural Resources 64 Church Street Sault Ste. Marie, ON P6A 3H3 Tel: 705-941-5128 Fax: 705-949-6450 erin.nixon@ontario.ca

Terella, Andrea

From: Nixon, Erin (MNR) [mailto:erin.nixon@ontario.ca]
Sent: September-20-12 8:03 AM
To: Kelly Matheson
Cc: Rudzki, Joanie (MNR)
Subject: RE: Bow Lake Wind Project - Termination of Phase 1 Class EA

Hi Kelly,

Thank you for informing MNR of your intent to terminate the Class EA and migrate consideration of the Bow Lake multipurpose roads into the REA process as per the July 1, 2012 amendments to O.Reg. 359/09 and O.Reg. 334. MNR has no concerns with this approach given that: 1) public and aboriginal communities will be informed of the process changes; and, 2) comments received to date in regards to the Class EA Notice of Commencement will be considered by the company and incorporated into the REA process where appropriate. As the company has provided a process to meet these requirements, we will consider the Class EA terminated.

Regards,

Erin

Erin Nixon Renewable Energy Planner

Ministry of Natural Resources

64 Church Street Sault Ste. Marie, ON P6A 3H3 Tel: 705-941-5128 Fax: 705-949-6450 <u>erin.nixon@ontario.ca</u>

From: Kelly Matheson [mailto:Kelly@bluearthrenewables.com]
Sent: September 19, 2012 5:40 PM
To: Nixon, Erin (MNR)
Cc: Scott Hossie; Bryan Tripp; Garry Perfect; Geoff Carnegie
Subject: Bow Lake Wind Project - Termination of Phase 1 Class EA

Hello Erin,

I am writing on behalf of Bow Lake Phase 1 Wind Farm Ltd. ("Bow Lake") to notify yourself and the MNR of our decision to terminate the Class EA for Resource Stewardship and Facility Development ("Class EA") process currently underway to screen the multi-purpose roads associated with Phase 1 of the proposed Bow Lake Wind Project. Bow Lake still intends to proceed with the multi-purpose road works as a part of the Project, however in light of the recent changes to O.Reg. 359/09 and O.Reg. 334, Bow Lake proposes to migrate the environmental assessment of these multi-purpose road works over to the Renewable Energy Approval ("REA") process.

Bow Lake feels that this is an appropriate course of action because:

 The amalgamation of the former Phase 1 and Phase 2 of the Project into one Project materially changes the geographic scope and location of the project initially contemplated in the Class EA Project Description for Phase 1, and

- 2. Completing the environmental assessment of the multi-purpose road works under the amalgamated REA process represents the most streamlined approvals process given the recent O. Reg. 359/09 and O. Reg 334 changes.
- 3. Including the multi-purpose roads under the REA process will make it easier for the public to access and understand comprehensive Project information focused on a single in depth review process.

Comments from the public have been received in response to the *Public Notice for a Category B Project Evaluation* issued under Class EA process on February 29, 2012. Bow Lake has considered this feedback and will include and incorporate these comments, as well as Bow Lake's responses, into the REA assessment and documentation.

Bow Lake proposes to publicly communicate this change in process via a newsletter that will be distributed simultaneously with the Notice of Final Public Meeting that is anticipated to be distributed in accordance with the REA rules to stakeholders and aboriginal communities at the beginning of October. This notice and information on the change in process will also be posted on the Project website. Environmental assessment information related to the (former) Phase 1 Class EA works will be included in the Draft Natural Heritage Assessment and other Draft REA documents that will be posted for public review in October. Through these documents and the public consultation requirements of the REA process, the public will be able to comment on the (former) Class EA road works and their assessment leading up to and during the final REA Public Meeting, currently expected to occur in early December.

Please let me know if you require anything further from us in order to terminate the Class EA process for Phase 1 of the Bow Lake Wind Project.

Kind regards,

Kelly

KELLY MATHESON | VICE PRESIDENT REGULATORY & COMMUNICATIONS

MAIN: 403.668.1575 EXT 405 DIRECT: 403-214-2564 EMAIL: <u>kelly@BluEarth.ca</u>

BOW LAKE PHASE 1 WIND FARM LTD. & BOW LAKE PHASE 2 WIND FARM LTD. C/O BLUEARTH RENEWABLES INC. SUITE 200, 4723 – 1ST STREET S.W. CALGARY, ALBERTA T2G 4Y8 BLUEARTHRENEWABLES.COM/BOWLAKEWIND

Terella, Andrea

From: Garry Perfect [mailto:garry@bluearth.ca]
Sent: Tuesday, October 09, 2012 3:19 PM
To: erin.nixon@ontario.ca; 'derek.goertz@ontario.ca'; Keable, Lisa (MNR) (Lisa.Keable@ontario.ca)
Cc: Kozak, Mark; Bryan Tripp
Subject: Bow Lake NHA/EIS and EEMP

Good afternoon Erin, Derek and Lisa:

For your review and comment, the Draft Bow Lake NHA/EIS and the EEMP is accessible through the FTP site below. If you require hard copies of the reports to facilitate your review please let me know.

These documents, along with other required REA reports, will be posted on the Project website this coming Friday, starting the formal 60-day public review period. The final public open house has been scheduled for December 13, 2012. We anticipate that based on this schedule we will be submitting the formal REA submission to MOE in January 2013. Should you have questions during your review please do not hesitate to contact me. Regards,

Automatic Login

FTP site link: ftp://s1023071811:4904920@ftptmp.stantec.com

By clicking on the link above (or pasting the link into Windows Explorer) you will be automatically logged into your FTP site.

Manual Login

FTP link: ftp://ftptmp.stantec.com Login name: s1023071811 Password: 4904920 Disk Quota: 2GB Expiry Date: 10/23/2012

GARRY PERFECT | SENIOR ENVIRONMENTAL SPECIALIST

 OFFICE:
 519.821.5314

 MOBILE:
 519.803.8967

 EMAIL:
 garry@bluearth.ca

BLUEARTH RENEWABLES INC. 34 HARVARD ROAD GUELPH, ON N1G 4V8 BLUEARTH.CA



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Ministry of the Environment

Environmental Assessment and Approvals Branch

2 St. Clair Avenue West Floor 12A Toronto ON M4V 1L5 Tel.: 416 314-8001 Fax: 416 314-8452

April 30, 2010

Ministère de l'Environnement

Direction des évaluations et des autorisations environnementales

2, avenue St. Clair Ouest Étage 12A Toronto ON M4V 1L5 Tél. : 416 314-8001 Téléc. : 416 314-8452



MOE File #: NW-10-WF-0010

Mr. Kevin O'Donovan Vortex Wind Power Limited c/o Catherine Taylor-Hell M.K. Ince and Associates Ltd. PO Box 650 35 Main Street North, Unit 32 Waterdown, ON LOR 2H0

Dear Mr. O'Donovan:

<u>RE</u>: Director's Aboriginal Communities List – Bow Lake Wind Project

The Ontario Ministry of Environment has reveiwed the information provided in the draft of the Project Description Report (PDR) received for the Bow Lake Wind Project. We have reviewed the anticipated negative environmental effects of the project (as described in the PDR) relative to our current understanding of the interests of aboriginal communities in the area.

In accordance with section 14 of the *Renewable Energy Approval Regulation* (O.Reg. 359), please find below the list of Aboriginal Communities that:

i) have or may have constitutionally protected aboriginal or treaty rights that may be adversely impacted by the project; or

ii) otherwise may be interested in any negative environmental effects of the project. (O. Reg 359/09 s14(b)(i) and (ii))

Aboriginal Community
Reserve Name:
Contact Information:
Michipicoten First Nation
Gros Cap 49
P.O. Box 1, Site 8, RR 1
Wawa, ON P0S 1K0
Phone (705) 856-1993
Fax (705) 856-1642
Batchewana First Nation
Ojibiways of Batchewana
Goulais Bay 15A
236 Frontenac Street
Sault Ste, Marie, ON P6A 5K9
Phone (705) 759-0914
Fax (705) 759-9171
Garden River First Nation
Ketegaunseebee

Garden River 14	
7 SHINGWAUK STREET, RR 4.	
Garden River, ON P6A 6Z8	
Phone (705) 946-6300	
Fax (705) 945-1415	
Chapleau Ojibway First Nations	
Chapleau 74	
522 HIGHWAY 129, PO BOX 279	
Chapleau, ON P0M 1K0	
Phone (705) 864-2910	
Fax (705) 864-2911	
Historic Sault Ste Marie Métis Council	
26 Queen Street East	
Sault Ste. Marie, ON P6A 1Y3	
Phone (705) 254-1768	
Fax (705) 254-3515	
mno-ssmcouncil@shaw.ca	
Métis Nation of Ontario	
Consultation Unit	
500 Old St. Patrick St, Unit 3	
Ottawa, ON K1N 9G4	

NOTE: None of the foregoing should be taken to imply approval of this project or the contents of the draft of the PDR. This response only addresses the requirement of the Director to provide a list of aboriginal commuties to you as required in s. 14 of O. Reg. 359/09. You should also be aware that information upon which the above comments are based is subject to change. Aborginal communities can make assertions at any time, and other developments can occur that might require additional communities to be notified. Should this happen, the ministry will contact you. Similarly, if you recieve any feedback from any aboriginal communities not included in this list as part of your public consultation, we would appreciate being notified.

Please contact Narren Santos at (416) 314-8442 should you have any questions or require additional information.

Sincerely,

Manvoe Mahureood Doris Dumais

Director Environmental Assessment and Approvals Branch Ministry of Environment

cc: Mansoor Mahmood, Renewable Energy Team, Ministry of the Environment Joe de Laronde, Aboriginal Affairs Branch, Ministry of the Environment

Ministry of the Environment

Environmental Assessment and Approvals Branch

2 St. Clair Avenue West Floor 12A Toronto ON M4V 1L5 Tel.: 416 314-8001 Fax: 416 314-8452

April 30, 2010

Ministère de l'Environnement

Direction des évaluations et des autorisations environnementales

2, avenue St. Clair Ouest Étage 12A Toronto ON M4V 1L5 Tél. : 416 314-8001 Téléc. : 416 314-8452



MOE File #: NW-10-WF-0010

Mr. Kevin O'Donovan Vortex Wind Power Limited c/o Catherine Taylor-Hell M.K. Ince and Associates Ltd. PO Box 650 35 Main Street North, Unit 32 Waterdown, ON LOR 2H0

Dear Mr. O'Donovan:

RE: Director's Aboriginal Communities List - Bow Lake Wind Project

The Ontario Ministry of Environment has reveiwed the information provided in the draft of the Project Description Report (PDR) received for the Bow Lake Wind Project. We have reviewed the anticipated negative environmental effects of the project (as described in the PDR) relative to our current understanding of the interests of aboriginal communities in the area.

In accordance with section 14 of the *Renewable Energy Approval Regulation* (O.Reg. 359), please find below the list of Aboriginal Communities that:

i) have or may have constitutionally protected aboriginal or treaty rights that may be adversely impacted by the project; or

ii) otherwise may be interested in any negative environmental effects of the project. (O. Reg 359/09 s14(b)(i) and (ii))

Aboriginal Community
Reserve Name:
Contact Information:
Michipicoten First Nation
Gros Cap 49
P.O. Box 1, Site 8, RR 1
Wawa, ON P0S 1K0
Phone (705) 856-1993
Fax (705) 856-1642
Batchewana First Nation
Ojibiways of Batchewana
Goulais Bay 15A
236 Frontenac Street
Sault Ste, Marie, ON P6A 5K9
Phone (705) 759-0914
Fax (705) 759-9171
Garden River First Nation
Ketegaunseebee

Garden River 14 7 SHINGWAUK STREET, RR 4. Garden River, ON P6A 6Z8 Phone (705) 946-6300 Fax (705) 945-1415 Chapleau Ojibway First Nations Chapleau 74 522 HIGHWAY 129, PO BOX 279 Chapleau, ON P0M 1K0 Phone (705) 864-2910 Fax (705) 864-2911 Historic Sault Ste Marie Métis Council 26 Queen Street East Sault Ste. Marie, ON P6A 1Y3 Phone (705) 254-1768 Fax (705) 254-3515 mno-ssmcouncil@shaw.ca Métis Nation of Ontario Consultation Unit 500 Old St. Patrick St. Unit 3 Ottawa, ON K1N 9G4

<u>NOTE:</u> None of the foregoing should be taken to imply approval of this project or the contents of the draft of the PDR. This response only addresses the requirement of the Director to provide a list of aboriginal commutities to you as required in s. 14 of O. Reg. 359/09. You should also be aware that information upon which the above comments are based is subject to change. Aborginal communities can make assertions at any time, and other developments can occur that might require additional communities to be notified. Should this happen, the ministry will contact you. Similarly, if you recieve any feedback from any aboriginal communities not included in this list as part of your public consultation, we would appreciate being notified.

Please contact Narren Santos at (416) 314-8442 should you have any questions or require additional information.

Sincerely,

Marrow Maturood Doris Dumais

Director Environmental Assessment and Approvals Branch Ministry of Environment

cc: Mansoor Mahmood, Renewable Energy Team, Ministry of the Environment Joe de Laronde, Aboriginal Affairs Branch, Ministry of the Environment

Ministry of the Environment

Environmental Assessment and Approvals Branch

2 St. Clair Avenue West Floor 12A Toronto ON M4V 1L5 Tel.: 416 314-8001 Fax: 416 314-8452

Ministère de l'Environnement

Direction des évaluations et des autorisations environnementales

2, avenue St. Clair Ouest Étage 12A Toronto ON M4V 1L5 Tél. : 416 314-8001 Téléc. : 416 314-8452



July 14, 2011

MOE File #: NE-11-WF-0016

Kevin O'Donovan

Bow Lake Phase 2 Wind Farm Ltd. 3 Ardfield Lawn Douglas, Co. Cork Ireland LOR 2H0

Dear Mr. O'Donovan:

<u>**RE</u>: Director's Aboriginal Communities List - Bow Lake Wind Farm, Phase 2</u></u>**

The Ontario Ministry of the Environment (Ministry) has reviewed the information provided in the Draft of the Project Description Report (PDR) received for the *Bow Lake Wind Farm, Phase 2.* The Ministry has reviewed the anticipated environmental effects of the project (as described in the PDR) relative to its current understanding of the interests of aboriginal communities in the area.

In accordance with section 14 of Ontario Regulation 359/09 "Renewable Energy Approvals under Part V.0.1 of the Act" (O. Reg. 359/09) made under the *Environmental Protection Act*, please find below the list of aboriginal communities who, in the opinion of the Director:

 i) have or may have constitutionally protected aboriginal or treaty rights that may be adversely impacted by the project (s.14(b)(i)):

Aboriginal Community
Common Name:
Reserve Name:
Contact Information:
Batchewana First Nation
Ojibiways of Batchewana
Goulais Bay 15A
236 Frontenac Street
Sault Ste, Marie, ON P6A 5K9
Phone: (705) 759-0914
Fax: (705) 759-9171

Garden River First Nation Ketegaunseebee Garden River 14 7 Shingwauk Street

RR 4

Garden River, ON P6A 6Z8 Phone: (705) 946-6300 Fax: (705) 945-1415

Michipicoten First Nation Gros Cap 49 P.O. Box 1, Site 8, R.R. #1 Wawa, ON P0S 1K0

Phone: (705) 856-1993 Fax: (705) 856-1642
Chapleau Ojibway First Nation Chapleau 74 522 Highway 128 P.O. Box 279 Chapleau, ON POM 1K0 Phone: (705) 864-2910 Fax: (705) 864-2911
Historic Sault Ste Marie Métis Council 26 Queen Street East Sault Ste. Marie, ON P6A 1Y3 Phone: (705) 254-1768 Fax: (705) 254-3515

OR

•

ii) otherwise may be interested in any negative environmental effects of the project (s.14(b)(ii)):

- 2 -

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Métis Nation of Ontario Consultation Unit 500 Old St. Patrick Street Unit 3 Ottawa, ON K1N 9G4

NOTE: None of the foregoing should be taken to imply approval of this project or the contents of the PDR. This letter only addresses the requirement of the Director to provide a list of aboriginal commuties to you as required pursuant to section 14 of O. Reg. 359/09. You should also be aware that information upon which the above list of aboriginal communities is based is subject to change. Aborginal communities can make assertions at any time, and other developments, for example the discovery of Aboriginal archaeological resources, can occur that may require additional aboriginal communities to be notified. Should this happen, the Ministry


will contact you. Similarly, if you recieve any feedback from any aboriginal communities not included in this list, as part of your consultation, the Ministry would appreciate being notified.

Please contact Narren Santos at (416) 314-8442 should you have any questions or require additional information.

Sincerely, \mathcal{O}

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Doris Dumais Director – Approvals Program Environmental Assessment and Approvals Branch

Acc: Mansoor Mahmood, Renewable Energy Team, Ministry of the Environment Joe de Laronde, Aboriginal Affairs Branch, Ministry of the Environment

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From:	Kozak, Mark
Sent:	Tuesday, September 04, 2012 3:11 PM
То:	Terella, Andrea
Subject:	FW: Bow Lake Wind Farm: Michipicoten First Nation
Attachments:	BL - Mich FN Letter of Concern [31 July 2012].pdf

From: Bryan Tripp [mailto:bryan@bluearth.ca]
Sent: Monday, August 13, 2012 9:39 AM
To: Nadolny, Rob; Kozak, Mark
Subject: FW: Bow Lake Wind Farm: Michipicoten First Nation

For your records.

Bryan

From: Scott Hossie
Sent: August-03-12 2:27 PM
To: 'doris.dumais@ontario.ca'
Cc: Kelly Matheson; Geoff Carnegie; Bryan Tripp; Narren Santos (<u>narren.santos@ontario.ca</u>); Sarah Raetsen (<u>sarah.raetsen@ontario.ca</u>)
Subject: Bow Lake Wind Farm: Michipicoten First Nation

Hello Ms. Dumais,

As you will recall, on 05 July 2012 representatives of Bow Lake Phase 1 Wind Farm Ltd. and Bow Lake Phase 2 Wind Farm Ltd. met with the MOE, MNR and the Renewable Energy Facilitation Office to discuss certain regulatory and first nations challenges the Bow Lake Wind Farm (the "Project") is currently addressing.

One specific concern discussed was the then recent statement by the Michipicoten First Nation ("MFN") that their Nation had an interest in the Project. This stated interest was not raised during the previous 4 years of engagement with this first nation by the Project (including a letter of no-interest), and on which basis the Batchewana First Nation is now a significant equity partner in the Project. Subsequent to our 04 July meeting, the Batchewana First Nation and Project representatives did meet with the MFN and during that meeting the MFN maintained that the Project is located within their traditional territory. Today, the attached letter from the MFN was received by the Project, addressed to the Minister of Natural Resources, indicating the MFN's concern with the consultative approach by the government.

During our meeting of 04 July you also indicated you would be discussing the Project and MFN's interest therein with the Ministry of Aboriginal Affairs to seek their insights as to whether Crown involvement is warranted at this stage. We would welcome any insights gained from that discussion if available. As discussed during our meeting, and considering the content of the attached letter, we are requesting that, if the Crown feels consultation with the MFN or other aboriginal groups is warranted, that it is carried out proactively, rather than later in the approvals process.

Thanks for your continued attention to this matter, and please feel free to contact me directly to discuss.

Best Regards, Scott

SCOTT HOSSIE | LEAD, PROJECT DEVELOPMENT

 DIRECT:
 519.821.7315

 MOBILE:
 519.803.7315

 EMAIL:
 scott@bluearth.ca

BLUEARTH RENEWABLES INC. 34 HARVARD ROAD GUELPH, ON N1G 4V8 BLUEARTH.CA



* Please consider the environment before printing this email.

Subject:

FW: Bow Lake request to utilize REA process for multi-purpose roads

From: Santos, Narren (ENE) [mailto:Narren.Santos@ontario.ca]
Sent: August-27-12 5:56 AM
To: Kelly Matheson
Cc: Scott Hossie; Bryan Tripp; Raetsen, Sarah (ENE)
Subject: RE: Bow Lake request to utilize REA process for multi-purpose roads

Hi Kelly:

If MNR is of the view that the proposed amalgamation of Phase 1 and Phase 2 of the Bow Lake Wind Farm into a single project would result in a different undertaking being carried out by the Minister of Natural Resources in respect of the roads that provide access to the wind facility than the one for which the notice was already given, MOE agrees that the new undertaking would be exempt from the EAA under ss. 15.0.2(1) of Reg. 334. Where the roads are associated with or ancillary to the provision of access to the facility during the construction, installation, use, operation, etc. of the facility (see ss. 1(4) of O. Reg. 160/99 under the Electricity Act, 1998), they must be considered in the REA process as part of the wind facility.

Regards,

Narren Santos | Senior Program Support Coordinator | Environmental Approvals Access & Service Integration Branch | Ministry of the Environment | 2 St. Clair Avenue West, 12a Floor Toronto, ON M4V 1L5 | Phone: 416.314.8442 | Fax: 416.314.6810 | Email: narren.santos@ontario.ca

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Ministry of the Environment

Environmental Approvals Access and Service Integration Branch

2 St. Clair Avenue West Floor 12A Toronto ON M4V 1L5 Tel.: 416 314-8001 Fax: 416 314-8452 Ministère de l'Environnement



Direction de l'accès aux autorisations environnementales et de l'intégration des services

2, avenue St. Clair Ouest Étage 12A Toronto ON M4V 1L5 Tél. : 416 314-8001 Téléc. : 416 314-8452

October 10, 2012

MOE File #: SW-12WF-0032

Mr. Scott Hossie BlueEarth Renewables Inc. on behalf of Bow Lake Phase 1 Wind Farm Ltd. and Bow Lake Phase 2 Wind Farm Ltd. 200, 4723 – 1 Street SW Calgary AB T2G 4Y8

Dear Mr. Hossie:

RE: Director's Aboriginal Communities List - Bow Lake Wind Farm

In April 2010 and July 2011, the Ontario Ministry of the Environment (Ministry) provided Vortex Wind Power Limited and Bow Lake Phase 2 Wind Farm Ltd. with lists of Aboriginal communities who, in the opinion of the Director, have or may have constitutionally protected aboriginal or treaty rights that may be adversely impacted by the Bow Lake Wind Farm Phase 1 and Phase 2 Wind Farms (Project) (now referred to as the Bow Lake Wind Farm) or otherwise may be interested in any negative environmental effects of the Project.

In August 2012, you requested the Ministry to provide you with an updated list of Aboriginal communities as a result of changes made to the scope of your Project.

The Ontario Ministry of the Environment (Ministry) has reviewed the updated information provided in the Draft of the Project Description Report (PDR) received for the *Bow Lake Wind Farm*. The Ministry has reviewed the anticipated environmental effects of the project (as described in the PDR) relative to its current understanding of the interests of aboriginal communities in the area.

In accordance with section 14 of Ontario Regulation 359/09 "Renewable Energy Approvals under Part V.0.1 of the Act" (O. Reg. 359/09) made under the *Environmental Protection Act*, please find below the list of aboriginal communities who, in the opinion of the Director:

i) have or may have constitutionally protected aboriginal or treaty rights that may be adversely impacted by the project (s.14(b)(i)):

Aboriginal Community Common Name: Reserve Name: Contact Information: Batchewana First Nation Ojibiways of Batchewana Goulais Bay 15A 236 Frontenac Street Sault Ste, Marie, ON P6A 5K9 Phone: (705) 759-0914 Fax: (705) 759-9171

Michipicoten First Nation Gros Cap 49 P.O. Box 1, Site 8, R.R. #1 Wawa, ON POS 1K0 Phone: (705) 856-1993 Fax: (705) 856-1642

Garden River First Nation Ketegaunseebee Garden River 14 7 Shingwauk Street RR 4 Garden River, ON P6A 6Z8 Phone: (705) 946-6300 Fax: (705) 945-1415

Chapleau Ojibway First Nation Chapleau 74 522 Highway 128 P.O. Box 279 Chapleau, ON P0M 1K0 Phone: (705) 864-2910 Fax: (705) 864-2911

Historic Sault Ste Marie Métis Council 26 Queen Street East Sault Ste. Marie, ON P6A 1Y3 Phone: (705) 254-1768 Fax: (705) 254-3515

Métis Nation of Ontario Consultation Unit 500 Old St. Patrick Street Unit 3 Ottawa, ON K1N 9G4

OR

ii) otherwise may be interested in any negative environmental effects of the project (s.14(b)(ii)):

There are no communities identified for this project that may be interested in any negative environmental effects of the project

NOTE: None of the foregoing should be taken to imply approval of this project or the contents of the PDR. This letter only addresses the requirement of the Director to provide a list of aboriginal commutities to you as required pursuant to section 14 of O. Reg. 359/09. You should also be aware that information upon which the above list of aboriginal communities is based is subject to change. Aborginal communities can make assertions at any time, and other developments, for example the discovery of Aboriginal archaeological resources, can occur that may require additional aboriginal communities to be notified. Should this happen, the Ministry will contact you. Similarly, if you recieve any feedback from any aboriginal communities not included in this list, as part of your consultation, the Ministry would appreciate being notified.

Please contact Narren Santos at (416) 314-8442 should you have any questions or require additional information.

Sincerely,

Doris Dumais Director Environmental Approvals Access and Service Integration Branch

cc: Vic Schroter, Renewable Energy Team, Ministry of the Environment Katherine Klose, Environmental Approvals Access and Service Integration Branch, Ministry of the Environment

Attachments:

Bow Lake Wind Farm 2012 Oct 10.PDF

From: Santos, Narren (ENE) [mailto:Narren.Santos@ontario.ca]
Sent: October-11-12 12:30 PM
To: Scott Hossie
Cc: Dumais, Doris (ENE); Schroter, Vic (ENE); Connolly, Gemma (ENE); Raetsen, Sarah (ENE)
Subject: AB List for Bow Lake Wind Farm

Good afternoon Mr. Hossie:

In April 2010 and July 2011, the Ministry of the Environment (Ministry) provided Vortex Wind Power Limited and Bow Lake Phase 2 Wind Farm Ltd. with lists of Aboriginal communities who, in the opinion of the Director, have or may have constitutionally protected aboriginal or treaty rights that may be adversely impacted by the Bow Lake Wind Farm Phase 1 and Phase 2 Wind Farms (Project) (now referred to as the Bow Lake Wind Farm) or otherwise may be interested in any negative environmental effects of the Project.

In August 2012, you requested the Ministry to provide you with an updated list of Aboriginal communities as a result of changes made to the scope of your Project.

Please find enclosed the section 14 Aboriginal list for the Project.

Regards, Narren

From:	Catherine Taylor-Hell <catherine@mkince.ca></catherine@mkince.ca>
Sent:	Monday, April 26, 2010 3:24 PM
Subject:	Bow Lake wind farm and impacts to weather radar snow squall warnings

Hello Ken and Kevin,

Ken, thank you for your time by phone today to clarify some questions I had about Kevin's email below. I'm wondering if you could respond to this email confirming that these notes from our conversation today are accurate:

- Environment Canada weather radar imagery is used by MTO to obtain snowfall information for Highway 17, but not for the sections of Highways 129 and 556 that we discussed. This is because Highways 129 and 556 are too far from the weather radar station for accurate low-level snowfall information to be depicted. (Note for those copied on this email that Environment Canada has not predicted any impacts from the wind farm on their data over Highway 17.)
- Highway 17 is a Level 2 highway, the highest service level for MTO when it comes to snow clearing. Highways 129 and 556 are Level 5, the lowest service level. MTO's highest concern related to snow squalls is on Highway 17.
- 3. MTO has roadside weather stations and cameras on Highway 17 which provide snowfall information, but there are no such installations on secondary highways like Highways 129 and 556, due to budget limitations and the lower service level.
- 4. In addition to the Environment Canada weather radar imagery, several other tools are used by MTO to detect snow squalls and snowfall activity on all Highways. These include Environment Canada satellite images, several other web-based sources of information, and Ministry of Transportation patrols of all Highways 24 hours a day and 7 days a week during winter conditions. For Highways 129 and 556 specifically, these patrols are the main source of information currently used to determine when snow clearing is required.
- 5. Other parties that could have concerns about impacts from the wind farm on the EC weather radar: We discussed an appropriate contact at OPP (Wes Moore, OPP Detachment Commander in Sault Ste. Marie). Re. private snow clearing companies, Ken mentioned that the private contractors engaged by MTO to clear snow do not themselves use the EC weather radar data, but rely on the MTO for direction on where snow clearing is needed.

Ken, could you please confirm that the above statements are accurate?

Thanks again very much for your time.

Catherine Taylor-Hell

Catherine Taylor-Hell, P.Eng.

M.K. Ince and Associates Ltd. Phone: 604-677-0788 Cell: 604-817-3433 e-mail: <u>catherine@mkince.ca</u> http://www.mkince.ca Morphet, Kevin (MTO) wrote: Hi Catherine;

I just spent some time with Ken Seabrook to review our needs with respect to weather forecasts from Env Canada.

We appreciate being consulted in your assessment.

Our understanding is the concern regarding the quality (preciseness) of data in forecasts for Hwy 556 and the southern portion of Hwy 129 as could be impacted by the weather station at Montrel River as influence by the proposed wind farm.

Our reliability on the information is primarily related to winter operations and accurate information on radar weather images in one tool used forecasting winter operations. The level of detail does not typically rely on predicted snowfall rates.

Another Ministry that may have an interest in this is Ministry of Natural Resources which operate a fire base at Ranger Lake. I do not have a contact but their number is 1-800-667-1940.

Kevin Morphet P.Eng. Area Contracts Engineer

70 Foster Dr. Suite 420 Roberta Bondar Building Sault Ste. Marie, ON P6A 6V4

Tel: (705) 945-5796 or 1-877-366-0669 Fax: (705) 942-5225 kevin.morphet@ontario.ca

Please consider our environment before printing this email

From: Catherine Taylor-Hell [mailto:catherine@mkince.ca]
Sent: April 21, 2010 12:37 PM
To: Morphet, Kevin (MTO)
Subject: Re: Bow Lake wind farm and impacts to weather radar snow squall warnings

Hello again Kevin,

Thanks for your time by phone today and also for your commitment to provide a response this week. One thing I forgot to ask you by phone was for your opinion re. other parties that might have concerns about the impacts we're discussing on Highways 556 and 129.

Environment Canada mentioned the OPP in particular might have concerns, but they thought MTO might guide us to the appropriate person at OPP that would deal with snowfall/snow clearing on Highways. Is there an OPP contact that comes to mind on this? EC also mentioned independent snow clearing companies (Pioneer Construction?), but Janet from your radio office told me that in this region the snow clearing is performed directly by MTO. If you could share any thoughts about these or other parties you feel should be made aware of this issue, it would be very much appreciated.

Many thanks, Catherine

Catherine Taylor-Hell, P.Eng.

M.K. Ince and Associates Ltd. Phone: 604-677-0788 Cell: 604-817-3433 e-mail: <u>catherine@mkince.ca</u> http://www.mkince.ca

Catherine Taylor-Hell wrote: Hello Kevin,

I spoke with Janet Ramsay of your office yesterday about the issue described below, Janet recommended I email you the particulars and then give you a call on Monday to discuss this with you.

M.K. Ince and Associates are performing an Environmental Assessment for a proposed wind farm between Sault Ste. Marie and Wawa. Because of the proximity of this wind farm to the Environment Canada weather radar station at Montreal River, this wind farm is expected to impact certain segments of this radar signal and consequently the accuracy of weather watches and warnings relating to snow squalls in certain locations. To be more specific, Environment Canada expects that there will be signal loss or loss of accuracy of **snowfall accumulation rate information for the section of Highway 556 between Searchmont and Ranger Lake, and the section of Highway 129 between Thessalon and Aubrey Falls Provincial Park**. Environment Canada will still have the ability to forecast and track snow squalls over these areas using their satellite data, but may not be able to issue accurate information about snowfall rates. We've been advised by Environment Canada that the Ministry of Transportation (as well as potentially the OPP) may have significant concerns about such impacts and we would like to discuss this with you.

Would you be available to discuss these potential impacts and the concerns MTO may have? I will give you a call on Monday to discuss this at a high level, and anticipate that we may want to plan for a more detailed conversation with the proponents of this wind farm as well.

If by chance there is someone else at MTO I should be contacting on this matter please let me know.

Thanks, and I hope to speak with you on Monday.

Catherine Taylor-Hell

Catherine Taylor-Hell, P.Eng.

M.K. Ince and Associates Ltd. Phone: 604-677-0788 Cell: 604-817-3433 e-mail: <u>catherine@mkince.ca</u> http://www.mkince.ca

From:	Catherine Taylor-Hell <catherine@mkince.ca></catherine@mkince.ca>
Sent:	Monday, April 26, 2010 4:19 PM
Subject:	Bow Lake wind farm impacts to Environment Canada Montreal River weather radar

Hello Wes,

Thank you for your time by phone just now. As we discussed, I was calling in regards to the proposed Bow Lake Wind Farm near the Environment Canada weather radar station at Montreal River. Environment Canada predicts that the wind farm would impact certain segments of this radar signal and consequently the accuracy of weather watches and warnings relating to **snowfall accumulation rate on the section of Highway 556 between Searchmont and Ranger Lake, and the section of Highway 129 between Thessalon and Aubrey Falls Provincial Park**. Environment Canada will still have the ability to forecast and track snow squalls over these areas using their satellite data, but may not be able to issue accurate information about snowfall rates. No impacts are predicted to data over Highway 17.

>From our conversation just now by phone, I understand that:

- 1. The OPP does access and view the Montreal River weather radar imagery, and does currently receive Environment Canada alerts about snow squalls and snowfall rates. This information is useful in advising OPP of major storms, but information on specific locations and snowfall rates are not used by OPP.
- 2. The OPP does not use information from Environment Canada watches and warnings or the weather radar imagery to direct their operations or planning. Rather, when OPP encounters stretches of snow-covered highway during their on-the-ground operations, they let MTO know where snow clearing is required.
- 3. OPP does not have serious concerns about impacts to data from the Montreal River weather radar over the sections of Highways 129 and 556 described above.

We are also consulting with MTO on this issue to ensure that any impacts to their ability to plan snow clearing activities on Highways 129 and 556 will be minimized. I have copied Ken Seabrook of MTO on this email.

Wes, could you please reply to this email to confirm that the numbered statements above are correct from the OPP's perspective?

Many thanks, if you have any follow-up questions in the future feel free to contact me at the numbers below.

Catherine Taylor-Hell

--

Catherine Taylor-Hell, P.Eng. M.K. Ince and Associates Ltd. Phone: 604-677-0788 Cell: 604-817-3433 e-mail: <u>catherine@mkince.ca</u> http://www.mkince.ca

From:	Janice Christian <jchristianpb@shaw.ca></jchristianpb@shaw.ca>
Sent:	Monday, July 09, 2012 3:30 PM
То:	Dryden-Cripton, Stephanie
Subject:	Local Roads Boards in Smilsky and Peever Townships, District of Algoma, Ontario

Dear Ms. Dryden-Cripton:

Thank you for your recent inquiry about Local Roads Boards in the vicinity of the proposed Bow Lake Wind Farm, specifically the geographic townships of Peever and Smilsky.

As far as the Sault Ste. Marie North Planning Board is aware, there are no Local Roads Boards in either of those townships.

Sincerely,

Janice Christian General Manager Sault Ste. Marie North Planning Board 669 Wellington St. E. Sault Ste. Marie, ON P6A 2M6 Phone: 705-254-6649 Fax: 705-946-4286 Email: jchristianpb@shaw.ca For General Inquires: saultnorthpb@shaw.ca

From:	Dryden-Cripton, Stephanie
Sent:	Friday, July 27, 2012 4:12 PM
То:	jchristianpb@shaw.ca
Cc:	Kozak, Mark
Subject:	Draft Project Description Report and Notice of Public Meeting - Bow Lake Wind Farm

Hello Janice,

I spoke with reception at your office and left a message but am also sending this email to notify you that we are sending today, via courier to your attention, a paper copy of the Draft Project Description Report and a copy of the Notice of a Proposal and Public Meeting. We respectfully request that your office display these for public viewing at least up to the September 6th, 2012 date of the Public Meeting. If you have any questions about this please do not hesitate to contact either myself or Mark Kozak (mark.kozak@stantec.com).

Regards,

Stephanie

Stephanie Dryden-Cripton, M.A. Project Manager - Assessment, Permitting & Compliance Stantec 70 Southgate Drive Suite 1 Guelph ON N1G 4P5 Ph: (519) 836-6050 Ext. 206 Fx: (519) 836-2493 sdrydencripton@stantec.com Stantec.com

stantec.com

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Please consider the environment before printing this email.

From:	Janice Christian <jchristianpb@shaw.ca></jchristianpb@shaw.ca>
Sent:	Monday, September 17, 2012 3:56 PM
То:	Bryan Tripp
Subject:	Sault North Planning Board Official Plan & Zoning By-law
Attachments:	1999_OP_chap4-8scheds_001.pdf; 1999_OP_chap3_001.pdf; 1999_OP_chap1_2_001.pdf;
	zoning bylaw.pdf; Peever.pdf; Smilsky.pdf

Bryan,

Thank you for your phone call today. Here is the information as promised.

Janice Christian General Manager Sault Ste. Marie North Planning Board 669 Wellington St. E. Sault Ste. Marie, ON P6A 2M6 Phone: 705-254-6649 Fax: 705-946-4286 Email: jchristianpb@shaw.ca For General Inquires: saultnorthpb@shaw.ca

From: Sent: To: Subject: Bryan Tripp Tuesday, September 25, 2012 11:43 AM 'jchristianpb@shaw.ca' RE: Sault North Planning Board Official Plan & Zoning By-law

Hi Janice,

Thank you for the sending this information over, it is very helpful. I've had a chance to review the OP and ZBL and I did not see any specific requirements with respect to renewable energy or wind power projects. I noted that electricity generation is a permitted use on Rural zoned lands, which according to the maps you provided is the Zoning classification for all lands in the Smilsky and Peever Townships.

As you may know, the Project is located predominantly on Crown Land, which based on our review does not fall under the SNPB Official Plan and Zoning bylaw as Crown land is administered by the MNR, whom we are already engaged with in the planning of this Project. In addition, the Green Energy and Green Economy Act has exempted Renewable energy Projects from the Planning Act including Official Plans, Zoning by-laws, Development permit system by-laws etc., as all setbacks and planning requirements are now prescribed under the applicable REA regulations.

As I indicated at the open house and on our call we are willing to work with the SNPB to get you information you need to review and understand the project. I recall at the open house you mentioned you may be looking for us to work towards a letter of conformance from the SNPB. I was hoping you can provide some additional information on the letter of conformance or other process you wish us to follow.

Bryan Tripp, P.Eng, M.A.Sc. | Lead Regulatory - East

 DIRECT:
 519.821.7319

 MOBILE:
 519.803.4947

 EMAIL:
 bryan@bluearth.ca

BLUEARTH RENEWABLES INC. 34 HARVARD ROAD GUELPH, ON N1G 4V8 BLUEARTH.CA



* Please consider the environment before printing this email.

From: Janice Christian [mailto:jchristianpb@shaw.ca]
Sent: September-17-12 3:56 PM
To: Bryan Tripp
Subject: Sault North Planning Board Official Plan & Zoning By-law

Bryan,

Thank you for your phone call today. Here is the information as promised.

Janice Christian General Manager Sault Ste. Marie North Planning Board 669 Wellington St. E. Sault Ste. Marie, ON P6A 2M6 Phone: 705-254-6649 Fax: 705-946-4286 Email: jchristianpb@shaw.ca For General Inquires: saultnorthpb@shaw.ca

From: Sent: To: Cc: Subject: Bryan Tripp Monday, November 05, 2012 3:30 PM 'jchristianpb@shaw.ca' Joy DeCourcy RE: Bow Lake Wind Farm - Consultation with Sault North Planning Board

Hi Janice,

Thanks for your reply. We would be willing to share copies of the surveys with the SNPB. We are still working out the timelines for completion of site surveys with MNR, which may not be completed until after MNR approval and site construction. Please let me know if this timing is suitable. We have provided you with the most recent site plan showing the proposed layout in the draft REA documents, and while we do not anticipate major changes to the layout, there will likely be some minor changes incorporated into the layout as we move through the approvals and public consultation process.

Bryan Tripp, P.Eng, M.A.Sc. | Lead Regulatory - East

 DIRECT:
 519.821.7319

 MOBILE:
 519.803.4947

 EMAIL:
 bryan@bluearth.ca

BOW LAKE PHASE 1 WIND FARM LTD. & BOW LAKE PHASE 2 WIND FARM LTD. C/O BLUEARTH RENEWABLES INC. SUITE 200, 4723 – 1ST STREET S.W. CALGARY, ALBERTA T2G 4Y8 BLUEARTHRENEWABLES.COM/BOWLAKEWIND

From: Janice Christian [mailto:jchristianpb@shaw.ca]
Sent: October-30-12 10:40 AM
To: Bryan Tripp
Cc: Joy DeCourcy
Subject: RE: Bow Lake Wind Farm - Consultation with Sault North Planning Board

Bryan,

I apologize for the delay in responding.

I understand the renewable energy projects are exempt from Planning Act approval. Normally when buildings or structures are constructed in our Planning Area we ask proponents/property owners to obtain letters of conformity. We need to ensure that we know what and where buildings and structures are built in the Planning Area. If possible, we would like the same information from you. I'm not sure what the MNR will be requiring for their lease but I suspect copies of a survey or surveys. If so, that should be sufficient for the Planning Board's purposes.

I will be leaving the Planning Board as of November 9, 2012. Any future email correspondence should be sent to <u>saultnorthpb@shaw.ca</u> to ensure that it is received by the Board.

Sincerely,

Janice Christian General Manager Sault Ste. Marie North Planning Board 669 Wellington St. E. Sault Ste. Marie, ON P6A 2M6 Phone: 705-254-6649 Fax: 705-946-4286 Email: jchristianpb@shaw.ca For General Inquires: saultnorthpb@shaw.ca

From: Bryan Tripp [mailto:bryan@bluearth.ca]
Sent: October 24, 2012 1:42 PM
To: 'jchristianpb@shaw.ca'
Subject: Bow Lake Wind Farm - Consultation with Sault North Planning Board

Dear Janice,

Further to my September 25 email, we are looking to better understand the concerns of the SNPB and work together to address your questions or concerns regarding the proposed Bow Lake Wind Farm project. We continue to advance through the Renewable Energy Approval process and have scheduled the final public open house for December 13, 2012.

We have posted the draft REA documents for the 60 day public review and comment period. In addition to the hardcopies sent to your office for public review, the documents are available on the project website <u>http://www.bluearth.ca/bowlakewind/</u>. We appreciate you assistance in making the hardcopies of these documents available to the public.

We request that you outline your questions or concerns to us in writing by November 31. Alternatively we would be willing to set up a conference call or attend a meeting at your office on a date and time that is convenient for you.

And of course please feel free to call me anytime regarding this project.

Sincerely,

Bryan Tripp, P.Eng, M.A.Sc. | Lead Regulatory - East

 DIRECT:
 519.821.7319

 MOBILE:
 519.803.4947

 EMAIL:
 bryan@bluearth.ca

Bow Lake Wind Farm

34 HARVARD ROAD GUELPH, ON N1G 4V8 BLUEARTH.CA From: Bryan Tripp
Sent: September-25-12 11:43 AM
To: 'jchristianpb@shaw.ca'
Subject: RE: Sault North Planning Board Official Plan & Zoning By-law

Hi Janice,

Thank you for the sending this information over, it is very helpful. I've had a chance to review the OP and ZBL and I did not see any specific requirements with respect to renewable energy or wind power projects. I noted that electricity generation is a permitted use on Rural zoned lands, which according to the maps you provided is the Zoning classification for all lands in the Smilsky and Peever Townships.

As you may know, the Project is located predominantly on Crown Land, which based on our review does not fall under the SNPB Official Plan and Zoning bylaw as Crown land is administered by the MNR, whom we are already engaged with in the planning of this Project. In addition, the Green Energy and Green Economy Act has exempted Renewable energy Projects from the Planning Act including Official Plans, Zoning by-laws, Development permit system by-laws etc., as all setbacks and planning requirements are now prescribed under the applicable REA regulations.

As I indicated at the open house and on our call we are willing to work with the SNPB to get you information you need to review and understand the project. I recall at the open house you mentioned you may be looking for us to work towards a letter of conformance from the SNPB. I was hoping you can provide some additional information on the letter of conformance or other process you wish us to follow.

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* Please consider the environment before printing this email.

From: Janice Christian [mailto:jchristianpb@shaw.ca]
Sent: September-17-12 3:56 PM
To: Bryan Tripp
Subject: Sault North Planning Board Official Plan & Zoning By-law

Bryan,

Thank you for your phone call today. Here is the information as promised.

Janice Christian General Manager Sault Ste. Marie North Planning Board 669 Wellington St. E. Sault Ste. Marie, ON P6A 2M6 Phone: 705-254-6649 Fax: 705-946-4286 Email: jchristianpb@shaw.ca For General Inquires: saultnorthpb@shaw.ca

From:	Sault North PB <saultnorthpb@shaw.ca></saultnorthpb@shaw.ca>		
Sent:	Tuesday, November 06, 2012 10:31 AM		
То:	Bryan Tripp		
Subject:	Rural Zone Requirements & Letter of Conformity Application		
Attachments:	LofC Appl.pdf; pg 50-52 Rural Zone.docx		

Here you go.

From: Sent: To: Subject: Attachments: BowLakeWind Friday, November 16, 2012 2:26 PM 'jchristianpb@shaw.ca'; 'saultnorthpb@shaw.ca' RE: Bow Lake Wind Farm Bow Lake AAR Oct 5 2012 Draft.pdf

Hi Bill,

Further to your November 13 email request and our telephone conversation today, I have attached the draft Environmental Noise Impact Assessment Report prepared by HGC Engineering for the Bow Lake Wind Project. This report is also available in Appendix B of the draft Design and Operations report for the project.

The noise sensitive receptors (including residential dwellings, cottages, camps) in the vicinity of the Bow Lake Wind Project are identified in the HGC report. For the information you requested, please refer to figure 2 and table A4, which provide the location of the receptors and distance to the closest turbine. As you are aware, noise levels for wind power projects are regulated by the Ministry of Environment. In their report, HGC concludes the operation of the proposed wind farm will comply with the requirements of the MOE publication NPC-232 *Sound Level limits for Stationary Sources in Class 3 Areas (Rural)* for all identified receptor locations.

Sincerely,

Bryan Tripp, P.Eng, M.A.Sc. | Lead Regulatory - East

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 519.821.7319

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 519.803.4947

 EMAIL:
 bryan@bluearth.ca

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From: Janice Christian [mailto:jchristianpb@shaw.ca] Sent: November-13-12 2:13 PM To: BowLakeWind Subject: Bow Lake Wind Farm

I have recently become the planner for the Sault North Area. With respect to the Bow Lake Wind Farm I have reviewed the material and see no indication that there are any residential or recreational dwelling (camps, cottages, etc.) shown in the area. Can you please confirm that there are none in the area. If there are any within a 5 mile radius can you supply their location (in map form) with a notation showing the distance to the nearest turbine?

Sault Ste. Marie North Planning Board 669 Wellington St. E. Sault Ste. Marie, ON P6A 2M6 Phone: 705-254-6649 Fax: 705-946-4286 Email:wierzbicki@shaw.ca For General Inquires: <u>saultnorthpb@shaw.ca</u>

From:JanicSent:TuesTo:BowSubject:Bow

Janice Christian <jchristianpb@shaw.ca> Tuesday, November 13, 2012 2:13 PM BowLakeWind Bow Lake Wind Farm

I have recently become the planner for the Sault North Area. With respect to the Bow Lake Wind Farm I have reviewed the material and see no indication that there are any residential or recreational dwelling (camps, cottages, etc.) shown in the area. Can you please confirm that there are none in the area. If there are any within a 5 mile radius can you supply their location (in map form) with a notation showing the distance to the nearest turbine?

Bill Wierzbicki, MCIP, RPP General Manager Sault Ste. Marie North Planning Board 669 Wellington St. E. Sault Ste. Marie, ON P6A 2M6 Phone: 705-254-6649 Fax: 705-946-4286 Email:wierzbicki@shaw.ca For General Inquires: saultnorthpb@shaw.ca

Telephone Conversation Record

Date: January 16, 2013			
Who initiated contact (circle one):	participant	host	referred by fellow host
Method of contact (If written include copy of correspondence):	Telephone conversation		
Host name: Bryan Tripp	NKLP and NK2LP		

Stakeholder Informat	ion (if provided):		
Name: Bill Wierzbick	i, General Manager, Saul	t North Planning Board	
Mailing Address: 669 Wellington St. E			
Town/City:	Province:	Postal Code:	
Phone: 705 254 6649	Fax:	Email:	

Subjects Discussed / Issues of Concern: (use additional space if required):

- Update provided on status of REA application and NKLP intent to file REA application with MOE by end of January
- Asked Bill if SNPB intended to submit any further questions or comments on the Bow Lake Wind Farm REA application
- Bill Indicated that the SNPB would not be submitting further comment on the Bow Lake Wind Farm REA application.

Response / Follow-up Required (what, by whom, when and how):

• None Required

Telephone Conversation Record

Date: January 16, 2013			
Who initiated contact (circle one):	participant	host	referred by fellow host
Method of contact (If written include copy of correspondence):	Telephone conversation		
Host name: Bryan Tripp	NKLP and NK2LP		

Stakeholder Informat	ion (if provided):		
Name: Bill Wierzbick	i, General Manager, Saul	t North Planning Board	
Mailing Address: 669 Wellington St. E			
Town/City:	Province:	Postal Code:	
Phone: 705 254 6649	Fax:	Email:	

Subjects Discussed / Issues of Concern: (use additional space if required):

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Response / Follow-up Required (what, by whom, when and how):

• None Required