
Parc éolien Saint-Cyprien à
Saint-Cyprien-de-Napierville

PR8.1

6211-24-075

ÉNERGIES DURABLES KAHNAWÀ:KE INC.
KAHNAWÀ:KE SUSTAINABLE ENERGIES INC.

C.P. 1110, 2 River Road, 3e étage
Kahnawà:ke (Québec) J0L 1B0

KAHNAWÀ:KE T: 450 638-4280
ST-CYPRIEN-DE NAPIERVILLE T: 450 245 3444

Le 8 avril 2015,

Mme. Carole Doucet,

Object : Réponse à la demande de renseignement dans le cadre du mandat d'information du BAPE - Projet de parc éolien de Saint-Cyprien

Mme. Doucet,

Suite à votre demande de renseignement adressée à Énergies Durables Kahnawà:ke (EDK) lors de la soirée d'information tenue le 31 mars dernier, EDK a réalisé une recherche de littérature sur le sujet des impacts potentiels des infrasons produits par les éoliennes sur la santé des enfants.

La recherche n'a pas permis d'identifier d'études ayant portée spécifiquement sur ce sujet. Par ailleurs, l'Institut national de santé public du Québec a récemment publié une synthèse des connaissances au sujet des impacts des éoliennes sur la santé publique. Cette synthèse tient compte de 50 textes retenus pour leur qualité et leur pertinence. Bien qu'aucune mention ne soit faite spécifiquement au sujet des infrasons produits par les éoliennes sur la santé des enfants, la synthèse conclue qu'il n'existe aucune preuve faisant un lien entre les basses fréquences et les infrasons émis par les éoliennes et des effets sur la santé.

Nous vous prions de recevoir, Madame, l'expression de nos sentiments les meilleurs.

Stéphane Poirier
Coordonnateur de projet

c. c. M. Luc Nolet, Conseiller en communication, Bureau d'audiences publiques en environnement

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KAHNAWÀ:KE
T: 450 638-4280

ST-CYPRIEN-DE-NAPIERVILLE
T: 450 245-3444

Le 8 avril 2015,

M. Serge Desbois
13, rang Double
Saint-Cyprien-de-Napierville
QC J0J 1L0

Object : Réponse à la demande de renseignement dans le cadre du mandat d'information du BAPE - Projet de parc éolien de Saint-Cyprien

M. Desbois,

Suite à votre demande de renseignement adressée à Énergies Durables Kahnawà:ke (EDK) lors de la soirée d'information tenue le 31 mars dernier, EDK confirme que son bureau de liaison, situé au 603C Montée Douglas à Napierville, a été mis en fonction en janvier 2015.

EDK invite toutes parties intéressées désirant obtenir de l'information en lien avec le Projet à communiquer avec nous afin de prendre rendez-vous. Vous pouvez nous joindre aux numéros : 450 245-3444 ou 438 985-6110

Nous vous prions de recevoir, Monsieur, l'expression de nos sentiments les meilleurs.

Stéphane Poirier
Coordonnateur de projet

c. c. M. Luc Nolet, Conseiller en communication, Bureau d'audiences publiques en environnement

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KAHNAWÀ:KE T: 450 638-4280
ST-CYPRIEN-DE-NAPIERVILLE T: 450 245-3444

Le 8 avril 2015,

M. Werner Van Hyfte

Object : Réponse à la demande de renseignement dans le cadre du mandat d'information du BAPE - Projet de parc éolien de Saint-Cyprien

M. Van Hyfte,

La présente fait suite à votre demande de renseignement adressée à Énergies Durables Kahnawà:ke (EDK) lors de la soirée d'information tenue le 31 mars dernier, au sujet des distances exprimées à la section 1.4 du volume 1 de l'étude d'impact sur l'environnement (ÉIE).

EDK confirme que les distances entre le Projet et les municipalités avoisinantes, telle que décrites à la section 1.4 du volume 1 de l'ÉIE sont appropriées dans la mesure où leur objectif est de positionner l'aire du Projet de façon générale dans son environnement locale. À cette fin, les mesures représentent la distance entre le centre approximatif de l'aire du Project et le centre approximatif des noyaux urbanisés des municipalités.

Par ailleurs, le tableau suivant présente les distances précises des éoliennes du Projet avec les périmètres urbains des municipalités avoisinantes.

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Périmètre urbain	Distance d'une éolienne	
	(m)	Numéro d'identification de l'éolienne
Saint-Bernard-de-Lacolle	2481	5
Lacolle	2517	3
Saint-Cyprien-de-Napierville	7483	1
Napierville	5811	6

Également, Énergies Durables Kahnawà:ke (EDK) désire donner suite à un autre commentaire que vous avez fait lors de la soirée d'information tenue le 31 mars dernier, selon lequel une piste d'atterrissage serait située à proximité de l'aire du Projet.

L'analyse a démontré l'existence d'une piste privée localisé environ 880 m à l'est de l'éolienne 8, aux coordonnées suivantes :

Longitude : 73° 23' 05.52 "
Latitude : 45° 04' 42.30 "

L'absence de cette piste d'atterrissage dans l'étude d'impact sur l'environnement s'explique d'une part par le fait que la piste ne figure dans les bases de données des aérodromes enregistrés ou certifiés de Transport Canada. D'autre part, la consultation effectuée jusqu'à présent, autant auprès de la population que des instances gouvernementales comme NAV CANADA, n'avait pas mené à son identification.

Lors de son évaluation de l'étude d'impact sur l'environnement, le Ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques s'est intéressé à l'impact que pourrait avoir la présence d'éolienne sur l'arrosage aérien dans la zone d'étude. Les propriétaires producteurs en lien avec le Projet ont indiqué que peu ou aucun arrosage n'était effectué dans le secteur et particulièrement à l'intérieur des limites du projet en raison du type de culture (principalement des cultures céréales commerciales et maraichère pour la conserverie). EDK s'est néanmoins engagé à aviser les producteurs ayant des terres dans un rayon de 1 km autour du Projet de sorte que d'éventuels vols d'arrosage aérien soient faits de façon sécuritaire.

EDK a contacté le propriétaire terrien où est située la piste d'atterrissage ainsi qu'un utilisateur de la piste identifié par le propriétaire terrien. La piste serait utilisée par le propriétaire pour des épandages sur ses terres et par un autre pilote pour de l'épandage commerciale, majoritairement dans le secteur de Ste-Clothilde et ses environs et principalement durant les mois de juillet et août.

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Selon l'information actuellement disponible, aucune éolienne ne se situe dans les aires d'approches de la piste, ni dans leur prolongement. Des discussions auront lieux avec les utilisateurs de la piste au cours des semaines à venir afin de mieux comprendre les détails de son utilisation (période de l'année, conditions et horaires de vol habituelles, etc.), afin d'assurer que l'utilisation de la piste se fasse en toute sécurité.

De plus, lors d'une conversation avec les parties intéressées, il a été mentionné qu'une étude décrivant les risques causés par les éoliennes pour les petits avions avaient été la base des craintes ayant menées à la question. Nous serions intéressés à prendre connaissance de cette étude.

Nous vous prions de recevoir, Monsieur, l'expression de nos sentiments les meilleurs.

Stéphane Poirier
Coordonnateur de projet

c. c. M. Luc Nolet, Conseiller en communication, Bureau d'audiences publiques en environnement

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KAHNAWÀ:KE
T: 450 638-4280

ST-CYPRIEN-DE-NAPIERVILLE
T: 450 245-3444

Le 8 avril 2015,

M. Roland-Luc Béliveau
1, rue de l'église sud
Lacolle
QC J0J 1J0

Object : Réponses aux demandes de renseignement dans le cadre du mandat d'information du BAPE - Projet de parc éolien de Saint-Cyprien

M. Béliveau,

Suite à vos demandes de renseignement adressées à Énergies Durables Kahnawà:ke (EDK) lors de la soirée d'information tenue le 31 mars dernier, EDK a étendu l'analyse des bâtiments afin d'inclure à l'étude d'impact sur l'environnement certaines sections de routes de la municipalité de Lacolle situées à plus de 1 500m, plus spécifiquement sur la Montée Richard, le Petit rang et le Chemin de la Grande Ligne.

L'analyse a permis d'identifier six résidences, un bâtiment servant de dortoir pour travailleurs saisonniers et d'autres bâtiments et structures. Parmi les résidences, la plus proche se trouve à environ 1 773 m d'une éolienne. Le tableau suivant présente les coordonnées des résidences identifiées et la carte ci-attachée présente leur localisation.

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Récepteur	Description	Coordonnée en UTM Zone 19		Éolienne la plus proche	
		Longitude (m)	Latitude (m)	ID	(m)
122	Résidence	626049.2	4994432.7	3	1776
123	Commerce avec dortoir	626570.9	4994413.2	3	1916
124	Résidence	627553.8	4994770.1	3	2202
125	Résidence	627550.1	4995096.5	3	2002
126	Résidence	627554.1	4995615.1	3	1773
127	Résidence	627549.4	4995510.0	3	1805
128	Résidence	627556.0	4995581.0	3	1786

Tel qu'illustré par la carte jointe, la modélisation des niveaux sonores indique que ces résidences se trouvent à une distance suffisante pour que le niveau de bruit calculé soit en dessous de 30 dBA.

Vous désiriez également obtenir des simulations visuelles à partir de trois points de vue spécifiques, notamment 1) de la Route 221 à la hauteur du Camping Grégoire, 2) d'une vue parallèle au Rang Double par temps clair et 3) de l'intersection de la Rue Boissonneault et de la Rue Bouchard. Une demande a également été faite durant la soirée pour une simulation visuelle à partir de la Montée Richard. Ces quatre simulations visuelles sont jointes au présent envoi.

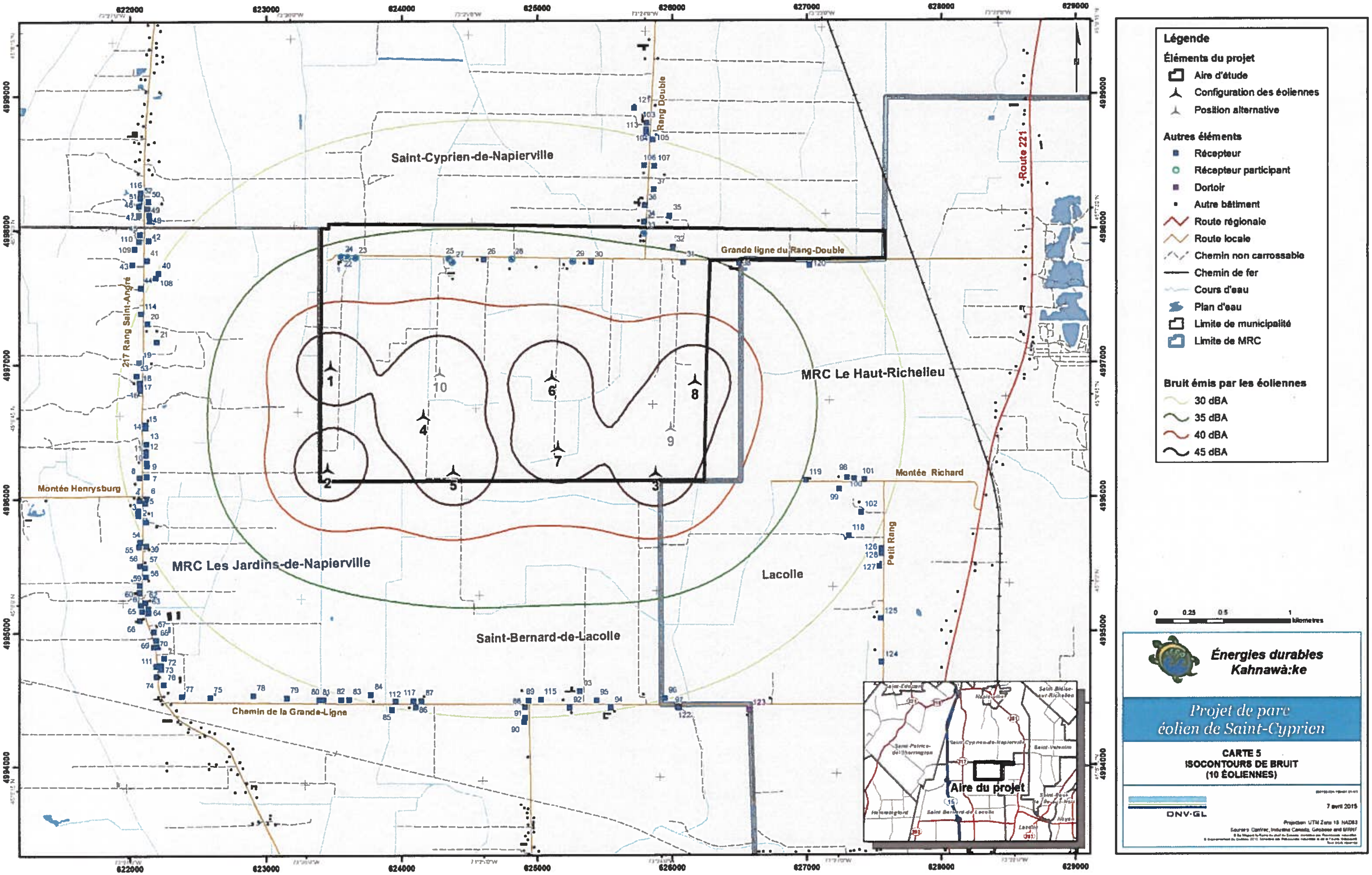
Finalement, EDK désire spécifier que l'image présentée à la Figure 3-10 du volume 1 de l'étude d'impact sur l'environnement avait uniquement pour but d'illustrer un milieu typique de l'unité de paysage villageois. En aucun cas, la photo n'était destinée à être utilisée dans une simulation visuelle, par conséquent, l'orientation de la photo est pertinente par rapport à l'utilisation qui en est faite dans le cadre de l'analyse visuelle.

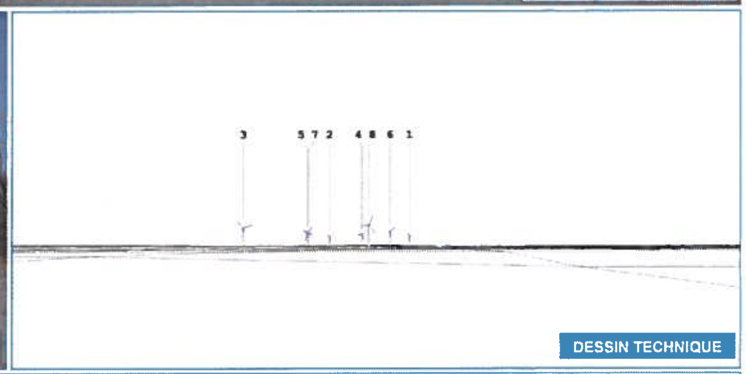
Nous vous prions de recevoir, Monsieur, l'expression de nos sentiments les meilleurs.

Stéphane Poirier
Coordonnateur de projet

c. c. M. Luc Nolet, Conseiller en communication, Bureau d'audiences publiques en environnement

p. j. Carte 5 - Isocontours de bruit
Simulation visuelle 7
Simulation visuelle 8
Simulation visuelle 9
Simulation visuelle 10


Légende
Éléments du projet
Aire d'étude
Configuration des éoliennes
Position alternative
Autres éléments
Récepteur
Récepteur participant
Dortoir
Autre bâtiment
Route régionale
Route locale
Chemin non carrossable
Chemin de fer
Cours d'eau
Plan d'eau
Limite de municipalité
Limite de MRC
Bruit émis par les éoliennes
30 dBA
35 dBA
40 dBA
45 dBA
Saint-Cyprien-de-Napierville
MRC Le Haut-Richelieu
MRC Les Jardins-de-Napierville
Lacolle
Saint-Bernard-de-Lacolle
Rang Double
Grande ligne du Rang-Double
Route 221
Montée Richard
Petit Rang
217 Rang Saint-André
Montée Henrysburg
Chemin de la Grande-Ligne
Aire du projet
0 0.25 0.5 1 kilomètres
Énergies durables Kahnawà:ke
Projet de parc éolien de Saint-Cyprien
CARTE 5
ISOCONTOURS DE BRUIT
(10 ÉOLIENNES)
7 avril 2015
Projection: UTM Zone 18 NAD83
DNV·GL

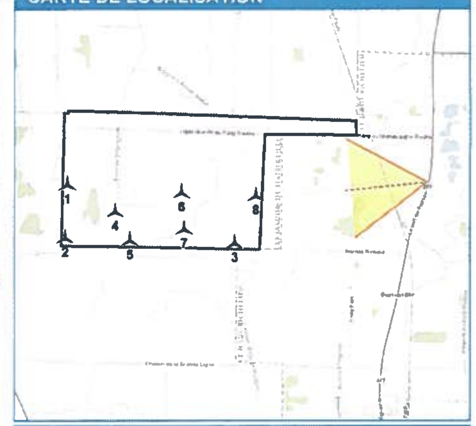


Notes:
* Le dessin technique ne tient pas compte de la végétation. Il est donc possible que des éoliennes soient visibles sur celui-ci et non sur la simulation visuelle.

DONNÉES TECHNIQUES

PHOTOGRAPHIE - POINT DE VUE		
No de la photo		3051
Coordonnées (UTM 18 NAD83)	628655 E	4997135 N
Élévation p/r niveau moyen de la mer		53 m
Date de prise de photo		3 avril 2015
Direction		265 degrés N T
Longueur focale (format 35 mm)		27 mm
Champ de vision		67 degrés
Élévation de prise de photo p/r sol		1,8 m
ÉOLIENNES UTILISÉES		
Modèle		Enercon E92
Hauteur du centre de la nacelle		98 m
Diamètre du rotor		92 m
SIMULATIONS		
No de photomontage		PM10-600152 L02-E92-HH98M-AN WFV
No de configuration		L02-600152-KSE_STCYPRIEN.WFL
Nombre total d'éoliennes pour le projet		8
Nombre d'éoliennes visibles sur la simulation visuelle		2
Éolienne visible la plus proche		T8 à 2,5 km
Éolienne visible la plus éloignée		T6 à 3,5 km

CARTE DE LOCALISATION



Préparé pour : Énergies Durables Kahnawà:ke

Réalisé par : DNV·GL

Date : 10 avril 2015
Version : 00

SIMULATION VISUELLE 7
Point de vue:
Route 221, devant le Camping Grégoire

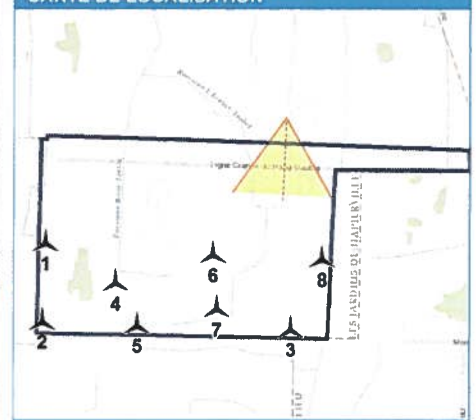
Parc éolien Saint-Cyprien

Notes:
* Le dessin technique ne tient pas compte de la végétation. Il est donc possible que des éoliennes soient visibles sur celui-ci et non sur la simulation visuelle.

DONNÉES TECHNIQUES

PHOTOGRAPHIE - POINT DE VUE		
No de la photo		3067
Coordonnées (UTM 18 NAD83)	625816 E	4998206 N
Élévation p/r niveau moyen de la mer		58 m
Date de prise de photo		3 avril 2015
Direction		183 degrés N T
Longueur focale (format 35 mm)		27 mm
Champ de vision		67 degrés
Élévation de prise de photo p/r sol		1,8 m
ÉOLIENNES UTILISÉES		
Modèle		Enercon E92
Hauteur du centre de la nacelle		98 m
Diamètre du rotor		92 m
SIMULATIONS		
No de photomontage		PM11-600152-L02-E92-HH98M-AN.WFV
No de configuration		L02-600152-KSE_STCYPRIEN.WFL
Nombre total d'éoliennes pour le projet		8
Nombre d'éoliennes visibles sur la simulation visuelle		2
Éolienne visible la plus proche		T8 à 1,4 km
Éolienne visible la plus éloignée		T3 à 2,0 km

CARTE DE LOCALISATION



Préparé pour :
Énergies Durables Kahnawà:ke

Réalisé par :
DNV·GL
Date : 10 avril 2015
Version : 00

SIMULATION VISUELLE 8
Point de vue:
Rang Double, au nord de la Grande Ligne du Rang Double

Parc éolien Saint-Cyprien


SIMULATION VISUELLE


PHOTO ORIGINALE

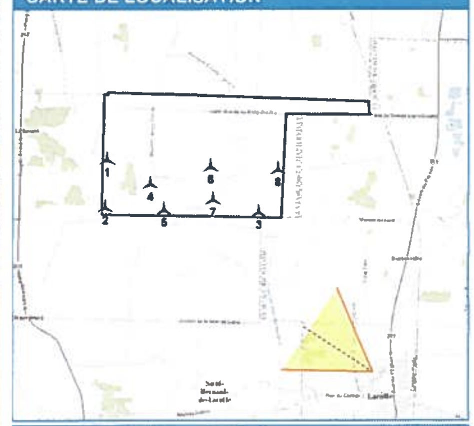
DESSIN TECHNIQUE

Notes:
* Le dessin technique ne tient pas compte de la végétation. Il est donc possible que des éoliennes soient visibles sur celui-ci et non sur la simulation visuelle.

DONNÉES TECHNIQUES

PHOTOGRAPHIE - POINT DE VUE		
No de la photo		5435
Coordonnées (UTM 18 NAD83)	627756 E	4993686 N
Élévation p/r niveau moyen de la mer		53 m
Date de prise de photo		1 avril 2015
Direction		304 degrés N T
Longueur focale (format 35 mm)		26 mm
Champ de vision		69 degrés
Élévation de prise de photo p/r sol		1,8 m
ÉOLIENNES UTILISÉES		
Modèle		Enercon E92
Hauteur du centre de la nacelle		98 m
Diamètre du rotor		92 m
SIMULATIONS		
No de photomontage		PM13-600152-L02-E92-HH98M-AN.WFV
No de configuration		L02-600152-KSE_STCYPRIEN.WFL
Nombre total d'éoliennes pour le projet		8
Nombre d'éoliennes visibles sur la simulation visuelle		3
Éolienne visible la plus proche		T7 à 3,8 km
Éolienne visible la plus éloignée		T1 à 5,4 km

CARTE DE LOCALISATION



Préparé pour :
Énergies Durables Kahnawà:ke

Réalisé par :
DNV·GL
Date : 10 avril 2015
Version : 00

SIMULATION VISUELLE 9
Point de vue:
Rue Boissonneault, coin Rue Bouchard

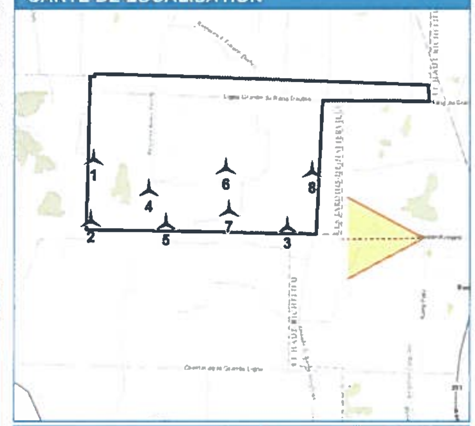
Parc éolien Saint-Cyprien

Notes:
* Le dessin technique ne tient pas compte de la végétation. Il est donc possible que des éoliennes soient visibles sur celui-ci et non sur la simulation visuelle.

DONNÉES TECHNIQUES

PHOTOGRAPHIE - POINT DE VUE		
No de la photo		3071
Coordonnées (UTM 18 NAD83)	627593 E	4996112 N
Élévation p/r niveau moyen de la mer		55 m
Date de prise de photo		3 avril 2015
Direction		270 degrés N T
Longueur focale (format 35 mm)		33 mm
Champ de vision		57 degrés
Élévation de prise de photo p/r sol		1,8 m
ÉOLIENNES UTILISÉES		
Modèle		Enercon E92
Hauteur du centre de la nacelle		98 m
Diamètre du rotor		92 m
SIMULATIONS		
No de photomontage		PM12-600152-L02-E92-HH98M-AH.WFV
No de configuration		L02-600152-KSE_STCYPRIEN.WFL
Nombre total d'éoliennes pour le projet		8
Nombre d'éoliennes visibles sur la simulation visuelle		1
Éolienne visible la plus proche		T3 à 1,7 km
Éolienne visible la plus éloignée		T3 à 1,7 km

CARTE DE LOCALISATION



Préparé pour :

Énergies Durables Kahnawà:ke

Réalisé par :

DNV·GL

Date : 10 avril 2015
Version : 00

SIMULATION VISUELLE 10
Point de vue:
Montée Richard, coin Petit Rang

Parc éolien Saint-Cyprien

ÉNERGIES DURABLES KAHNAWÀ:KE INC.
KAHNAWÀ:KE SUSTAINABLE ENERGIES INC.

C.P. 1110, 2 River Road, 3e étage
Kahnawà:ke (Québec) J0L 1B0

KAHNAWÀ:KE
T: 450 638-4280

ST-CYPRIEN-DE-NAPIERVILLE
T: 450 245-3444

Le 8 avril 2015,

Mme. Louise Gagnon
1218, Chemin 4e ligne
Saint-Valentin
QC J0J 2E0

Object : Réponse à la demande de renseignement dans le cadre du mandat d'information du BAPE - Projet de parc éolien de Saint-Cyprien

Mme. Gagnon,

Suite à votre demande de renseignement adressée à Énergies Durables Kahnawà:ke (EDK) lors de la soirée d'information tenue le 31 mars dernier, EDK confirme que le Règlement 478 de la Municipalité régionale de comté du Haut-Richelieu n'a pas été, et ne sera pas, considéré dans le développement du Projet. EDK tient à rappeler que le Projet est conforme aux lois, règlements et normes applicables sur le territoire de la municipalité de Saint-Cyprien-de-Napierville, où il serait implanté.

Nous prenons également note des informations que vous nous avez communiqué concernant le territoire d'intérêt historique de Saint-Bernard-de-Lacolle. Tel que défini au Schéma d'aménagement et de développement révisé de la municipalité régionale de comté des Jardins-de-Napierville (27 août 2014), ce territoire représente un ensemble harmonieux offrant un paysage typique d'un petit village et inclue l'Église Saint-Bernard et son presbytère. Ce territoire d'intérêt historique est situé environ 2,5 à 3,3 km au sud de l'éolienne 5.

Finalement, tel que demandé, nous vous joignons des copies des avis publics concernant la séance d'information du BAPE qui ont été publiés dans les journaux de la communauté de Kahnawà:ke.

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Nous vous prions de recevoir, Madame, l'expression de nos sentiments les meilleurs.

Stéphane Poirier
Coordonnateur de projet

c. c. M. Luc Nolet, Conseiller en communication, Bureau d'audiences publiques en environnement

p.j. Avis publics publiés dans les journaux de la communauté de Kanhawà:ke

Next week's community meeting features host of topics

JESSICA DEER
THE EASTERN DOOR

Updates on the Sault St. Louis Seigneury (SSSL) land claim, changes to the election law and a presentation by Kahnawake's health and social service agency will the be the focus of the Mohawk Council of Kahnawake's winter community meeting next week.

In addition to the usual land allotments, Tuesday's meeting will kick off with an update on the seigneury consultations. "Mike [Delisle] is going to give an update on the community consultation meetings that took place over the past couple of months, some preliminary finding and report that to the community," said MCK chief Lloyd Phillips.

The consultations on the land component of the grievance began on December 2 and wrapped up in mid-February. The next phase of the consultation process includes collecting feedback on legal issues surround the grievance.

The seigneury update will be followed by a presentation from representatives of Onkwata'karitáhtshera. Last week, the Kahnawake's health and social services agency announced that it would be participating in the First Nations Regional Health Survey to collect valuable data regarding the state of health in the community. The surveys will begin at the end of March.

Onkwata'karitáhtshera has until March 31, 2016 to complete their target sample size of no less than 616 people.

"They feel that the information will be very valuable to us. They're going to be surveying a bunch of people, so it is good for people to know what the information is for, why it is being done, who is going to maintain the information they gather, etc," said Mohawk Council chief Lloyd Phillips.

Phillips said the opportunity for other organizations to present at community meetings is always open.

The meeting will also include an update on the recently approved amendments to the Kahnawake Election Law (see story page 5).

"We're going to give a quick overview of what the changes are, just so the people who are not aware what changes were done to the election law, and, very briefly what the next steps are for the upcoming election," said Phillips.

The meeting will conclude with an open discussion. Phillips said they expect the issue of membership to be brought up by concerned community members.

"We want to leave adequate time for open discussion. We are well aware that membership concerns are still quite alive in the community and we are expecting people to want to know various information on membership issues, so we're prepared to address those issues," said Phillips.

The meeting will take place on Tuesday at the Golden Age Club beginning at 7 p.m.

The following community meeting is scheduled to take place on May 12.

jessicad@easterndoor.com

Hereditary hunting rights case delayed

DANIEL J. ROWE
THE EASTERN DOOR

Ahkwhwesahsró:non Harvey Thompson will have to wait to argue his Aboriginal right to hunt and gather before a New York State judge.

Thompson was scheduled to appear before a judge in a Massena courthouse Monday, but was told for the second time his case would be postponed to April 14.

"Judge cancelled it on me again," said Thompson. "If he cancels three times he's supposed to throw it out - his tactic of not dealing with the problem."

Thompson and his cousins were hunting on Barnhart Island in December and were stopped by New York State Department of Environment Conservation and border patrol agents, who ticketed the two men for hunting out of season.

They had no meat on them at the time.

The island is west of Akwesasne on the U.S. side of the border and contains the Robert Moses State Park.

A first hearing before a judge was scheduled for January 14, but postponed.

Thompson was prepared to challenge the ticket on his Aboriginal right to hunt, and feels the issue remains one for those in Akwesasne.

"I'll be the one to challenge him and he knows it," said Thompson. "When I wore my kustowa in his house, he knew who I was."

danielr@easterndoor.com

PUBLIC NOTICE
Saint Cyprien Wind Farm PROJECT
in Saint-Cyprien-de-Napierville

Kahnawà:ke Sustainable Energies plans to develop and operate a wind farm which would have a nominal capacity of 18.8 MW, deployed by 8 wind turbines of 2.35 MW each. The wind farm would be located on private land in the municipality of Saint-Cyprien-de-Napierville in the MRC of the Jardins-de-Napierville. It would require the construction of access roads, an underground electrical network, a switchyard, and a meteorological mast of 100m. The wind farm would be connected directly to the Hydro-Québec grid on the edge of the Grande Ligne du Rang Double road and would not require any transmission lines. Commissioning is scheduled for December 2016.

This notice is to inform the public that they can refer to the Environmental Impact Assessment (EIA) study and other documents regarding the project from February 26th to April 13th, 2015. These documents are available for review at the following locations:

Napierville Library
290 Saint-Alexandre Rd.
Napierville, QC J0J 1L0
Tel.: 450 245-0030

Hours:
Tuesday and Thursday: 2 PM - 5 PM, 7 PM - 9 PM
Wednesday and Friday: 2 PM – 5 PM
Sunday: 10 AM - Noon

Kahnawà:ke Economic Development Commission
2 River Road, 3rd Floor
P.O. Box 1110
Kahnawà:ke, QC J0L 1B0
Tel.: 450 638-4280

Hours:
Monday to Friday: 8:30 AM - 4 PM

The documents will also be available at the following BAPE documentation centers:

University of Quebec in Montreal (UQAM)
Legal Library
Hubert-Aquin Pavilion
Government and international publications Dept
400 Sainte-Catherine Street
Montreal, QC H2X 2C3
Tel.: 514 987-6184
The library will be open from 11 AM to 5 PM on April 4th and 6th, 2015.
The library will be closed on April 5th, 2015.

Hours:
Monday to Friday: 8:30 AM - 10 PM
Saturday: 11 AM – 5 PM
Sunday: 11 AM - 5 PM

Office of Environmental Public Hearings (BAPE)
Lomer-Gouin Building
575, rue Saint-Amable, bureau 2.10
Québec, QC G1R 6A6
The center will be closed on April 3rd and 6th, 2015.

Hours:
Monday to Friday: 8:30 AM - Noon, 1 PM – 4:30 PM

Additional information can be obtained at the numbers (418) 643-7447 or toll free 1 800 463-4732, as well as on the BAPE website www.bape.gouv.qc.ca.

INFORMATION SESSION
The Office of Environmental Public Hearings will hold an information session on:
March 31st at 7:30 PM
at the Napierville Community Centre
262 de l'Église Rd.
Napierville, QC

Any person, group or municipality may request a public hearing on this project, in writing, to Mr. David Heurtel the Minister of Sustainable Development, Environment and the Fight against Climate Change (MDDELCC). This request must be made no later than April 13th, 2015 at the following address: Marie-Guyart Building, 675 Blvd. René-Lévesque Est, 30th Floor, Quebec, QC, G1R 5V7.

March 6th, 2015

This notice is published by Kahnawà:ke Sustainable Energies and in accordance with the Regulation respecting environmental impact assessment and review (RLRQ 1981 c Q 2, r.23.).

BAPE holds public public consultation on March 31

Dan Rosenburg
danr@kahnawakenews.com
Iori:wase

The Bureau of Public Hearings on the Environment (BAPE) will be holding a public consultation March 31 at 7:30 p.m. at the Napierville Community Centre, 262 rue de l'Eglise in Napierville, on the impact study of the St. Cyprien windmill park projected for Saint-Cyprien de Napierville by the Kahnawake Sustainable Energies Inc. company.

Information will be provided that evening about the public consultation process, the role of the BAPE, the evaluation procedure, the examination of impacts on the environment, and the entire file regarding the project.

People wishing to obtain more information on the BAPE's role, the role of citizens and the project are invited to call BAPE communications counsellor Luc Nolet at 418-643-7447 or toll-free at 1-800-463-4732, extension 535 or send an email to eolien-saint-cyprien@bape.gouv.qc.ca. Or one could also consult the BAPE website at www.bape.gouv.qc.ca.

The information and consultation period of the file by the public, which began on February 26, is scheduled to wind up on April 13. During this 45-day period, any citizen, group, municipality or organization can make a request for a public hearing from David Heurtel, the Minister of Sustainable Development, and of the Environment and fight against climatic changes. If need be, a BAPE commission could be charged with investigating the project and consulting the population to that effect.

Documents on the project can be consulted at the following regional centres until April 13: the Tewatohnhi'saktha in Kahnawake; and the Napierville Municipal Library at 290 St-Alexandre street.

The entire dossier is also available at the BAPE office at 575 Saint-Amable street, suite 2.10, in Montreal; at the library of legal sciences at the University of Quebec at Montreal; at the Hubert-Aquin Pavilion at 400 Ste-Catherine street East, office A-M 100, and on the BAPE website listed above.

The project promoter, Kahnawake Sustainable Energies Inc., would like to set up a windmill park including eight windmills of 2.35 megawatts each for a power total of 18.8 megawatts. These windmills would be installed on private agricultural land occupying an area of 5.7 square

continued on page 19

PUBLIC NOTICE
Saint Cyprien Wind Farm PROJECT in Saint-Cyprien-de-Napierville

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INFORMATION SESSION

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Any person, group or municipality may request a public hearing on this project, in writing, to Mr. David Heurtel the Minister of Sustainable Development, Environment and the Fight against Climate Change (MDDELCC). This request must be made no later than April 13th, 2015 at the following address: Marie-Guyart Building, 675 Blvd. René-Lévesque Est, 30th Floor, Quebec, QC, G1R 5V7.

March 12th, 2015 - This notice is published by Kahnawà:ke Sustainable Energies and in accordance with the Regulation respecting environmental impact assessment and review (RLRQ 1981 c Q 2, r.23.).

ÉNERGIES DURABLES KAHNAWÀ:KE INC.
KAHNAWÀ:KE SUSTAINABLE ENERGIES INC.

C.P. 1110, 2 River Road, 3e étage
Kahnawà:ke (Québec) J0L 1B0

KAHNAWÀ:KE T: 450 638-4280
ST-CYPRIEN-DE-NAPIERVILLE T: 450 245-3444

Le 8 avril 2015,

M. Pierre Couture

Object : Réponse à la demande de renseignement dans le cadre du mandat d'information du BAPE - Projet de parc éolien de Saint-Cyprien

M. Couture,

Suite à votre demande de renseignement adressée à Énergies Durables Kahnawà:ke (EDK) lors de la soirée d'information tenue le 31 mars dernier, EDK vous fait parvenir l'étude de vent qui a permis à EDK de conclure à la non- faisabilité d'un projet éolien commercial sur le territoire de Kahnawà:ke.

Nous vous prions de recevoir, Monsieur, l'expression de nos sentiments les meilleurs.

Stéphane Poirier
Coordonnateur de projet

c. c. M. Luc Nolet, Conseiller en communication, Bureau d'audiences publiques en environnement

p. j.

« Wind Project Pre-feasibility Study Kahnawake »

Ce document est disponible en anglais seulement.

Wind Project Pre-feasibility Study
Kahnawake

FINAL REPORT

Submitted to:

Kahnawake Economic Development Commission
and Kahnawake Environment Office
Kahnawake, Quebec

CONFIDENTIAL

September 2004

GPCo Inc.
1471 Lionel-Boulet Blvd., Suite 26, Varennes, Québec J3X 1P7, Canada
Telephone : (450) 929-0062 Fax : (450) 929-1271 E-mail : info@gpco.ca

Disclaimer

Due diligence and attention was employed in the preparation of this final report. However, GPCo Inc. cannot guarantee the absence of typographical, calculation or any other errors that may appear in the following results. GPCo Inc. will not be responsible for any damages or financial or other losses, direct or indirect, as a result of conclusions obtained from the information in this report.

SUMMARY

The Kahnawake Economic Development Commission (Tewatohnhi'saktha) and Kahnawake Environment Office have commissioned this prefeasiblity study to investigate the potential use of wind energy to benefit the Kahnawake community.

Based on an extensive, year-long wind resource assessment in Kahnawake, the following main project scenarios were analyzed using RETScreen® International software:

A. Residential scale: one 10 kW turbine at the Kanata 2000 House
B. Community-scale: one 50 kW turbine at the Sports Complex
C. Utility scale: one 1.5 MW turbine at the Marina (Tekakwitha Island)

It was found that the wind resource at the Kanata House and Sports Complex is not sufficient for cost-effective utilization of wind energy using small and medium size wind turbines (30 m hub heights) even considering best case scenarios for wind speed, project cost and avoided cost of energy. Such wind turbines will operate at these sites and produce significant amounts of electrical energy, but the purchase and installation of such systems would need to be justified on other, not financial grounds.

The wind resource at the Marina on Tekakwitha Island however is strong enough to allow for a potentially cost-effective implementation of at least one and possibly more large wind turbines for the purpose of generating and selling electricity to Hydro Quebec on a commercial basis.

Some of the main results of the study are summarized in the following two tables:

Table S-1: Cost estimates

	10 kW	**50 kW**	**1,500 kW**
Total installed cost	$64, 000	$160,000	$2,734,000
Total annual cost	$400	$2,500	$79,600
Major overhaul cost (year 15)	$7,500	$22,000	included in annual cost

Table S-2: RETScreen analysis results

	"Best case" scenarios		
	A 10 kW at Kanata	**B 50 kW at the Sports Complex**	**C 1.5 MW at the Marina**
Hub height	30 m	30 m	80 m
Avg. annual wind speed at hub height	4.0	4.5	6.7
Renewable energy delivered	5 MW	56 MW	4,129 MW
Turbine capacity factor	6%	13%	31%
Avoided cost of energy	¢ 7.8 /kWh	¢ 6.0 /kWh	¢ 8.0 /kWh
IRR / ROI	< 0	< 0	11.8%
Simple payback	n/a	183 yrs	11 yrs
Net Present Value (NPV)	$ -66,900	$ -153,156	$ 1,158,862
Value of electricity	$396/yr	$3,377/yr	$330,307/yr
Energy production cost	¢95/kWh	¢24/kWh	¢6/kWh

TABLE OF CONTENTS

1 INTRODUCTION

The use of wind to generate electricity is increasingly being recognized and utilized as a non-polluting, environmentally sustainable source of energy. Wind power is the fastest growing energy source in the world and dramatic growth is also beginning to be seen in Canada. Wind turbine technology has matured over the past two decades and is rapidly becoming cost competitive with conventional electricity generation in many regions.

The Kahnawake Economic Development Commission (Tewatohnhi'saktha) and Kahnawake Environment Office have commissioned this prefeasiblity study to investigate the potential use of wind energy to benefit the Kahnawake community.

This report follows upon and complements a one-year campaign to assess the wind resource at three different locations in Kahnawake: the Kanata 2000 Healthy House, Sports Complex and Marina. The detailed results of this campaign have been presented in separate reports. The most relevant findings are summarized in the following section.

Wind energy technology exists in many configurations and sizes and can serve a variety of objectives. This report considers the following three main categories of wind energy systems:

Residential-scale generation: This typically implies the use of small turbines (400 W to 10 kW) of the type often used in off-grid homes and cottages in remote locations. These systems usually supply only part of, not all, the electricity needs of a house.

Community-scale generation: This refers to electricity generation that is primarily intended to supply larger power users in the community. One particular application that has been proposed is to power a cluster of about 16 homes in the Kanata House neighbourhood. Other potential large energy users include the school, hospital and sports complex. This objective can likely be met with wind turbines in the 50 kW range.

Utility-scale power generation: This refers to the generation of electricity from wind on a sufficiently large scale to sell it to the electric utility (Hydro Quebec) as a commercial venture, thus creating a long-term income stream for the community. This may also include an arrangement where the community itself will consume some of the "green power". Typically, this entails one or more large wind turbines, each with an installed capacity of around 1MW[1] or more.

Subsequent sections of this report summarize the most relevant findings of the preceding wind resource assessment (WRA), describe the technical and financial modelling that was performed with RETScreen International software and provide an overview of other implementation issues for such wind energy projects.

[1] One Megawatt (MW) = 1000 kilowatts (kW). As an indication of scale, one 1 MW wind turbine will typically provide enough electricity for 200 to 300 homes (fewer if the homes are electrically heated).

2 WIND RESOURCE

The assessment of the local wind resource is the single most important element in projecting the power output and thus financial performance of a wind turbine.

The wind resource at Kahnawake was measured at three different locations over the course of one year. These locations are at the Kanata 2000 Healthy House, Sports Complex and Marina and are indicated on the map in Figure 2-1.

Wind resource studies can be conducted in a number of ways and at different levels of effort and accuracy, depending on what purpose the results are to be used for. For example, if the objective is to evaluate the potential for a utility-scale wind farm, then the wind resource assessment (WRA) must meet the standards of the wind power industry and the accuracy requirements of project financiers. For smaller-scale wind projects, a simpler and less expensive approach is usually sufficient. Consequently, a full WRA was conducted at the Marina (site 1114), where a utility-scale wind project may be considered. The two other sites are more appropriate for smaller wind turbines and therefore simplified wind measuring approaches were used there. The instrument configurations used at the three sites are summarized in Table 2-1.

Table 2-1: Instrument Configuration

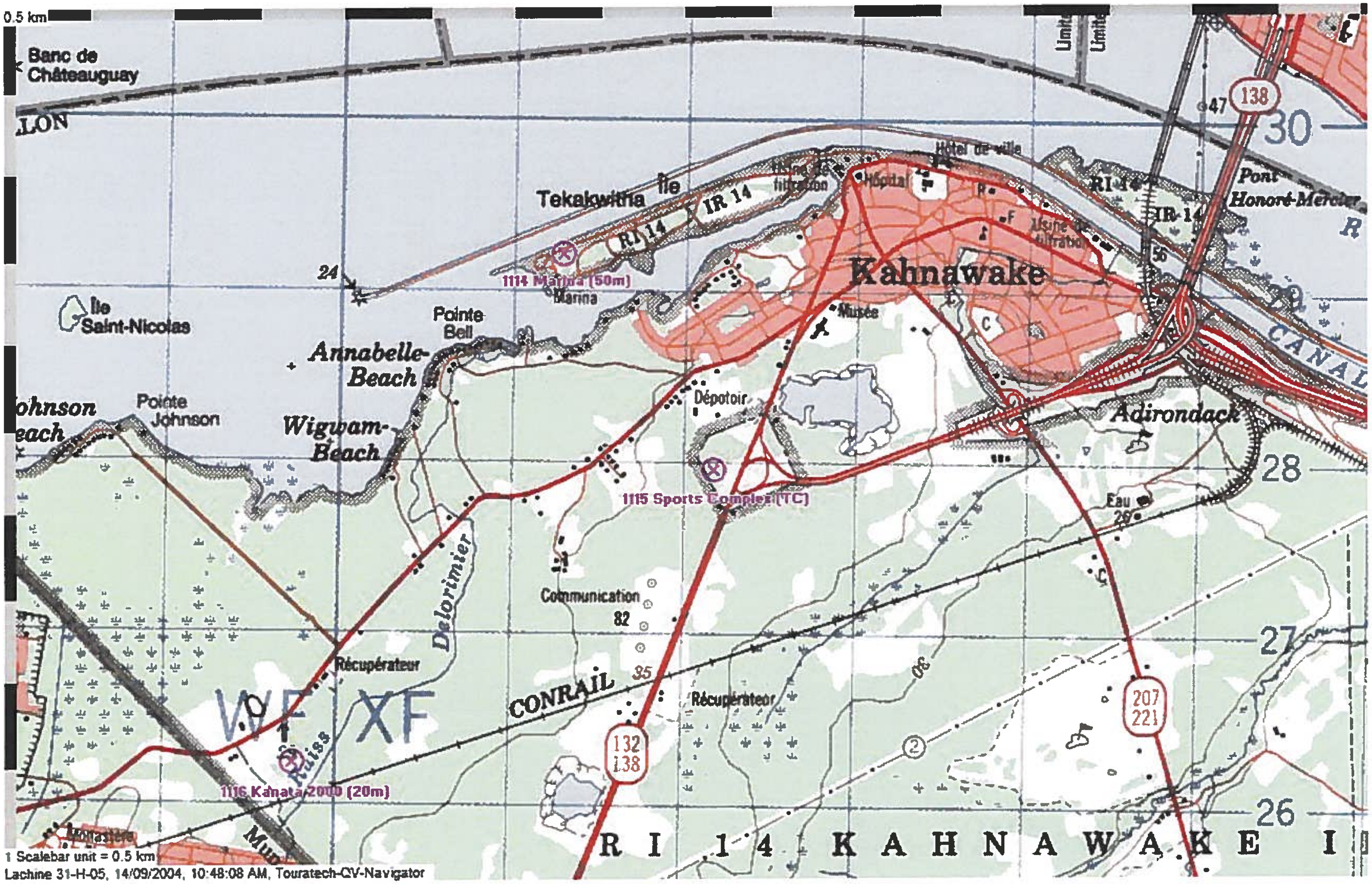
Site Name	Site No.	Tower type	Top anemometer height	Instruments	Data logger
Marina	1114	Guyed pipe	49.2 m	4 anemometers; 2 wind vanes; 1 temperature probe	NRG Symponie
Sports Complex	1115	Communications tower	45.0 m	1 anemometer; 1 wind vane	NRG Wind Explorer
Kanata 2000	1116	Guyed pipe	20.0 m	1 anemometer; 1 wind vane	NRG Wind Explorer

The data analysis period for each WRA is as follows:

Site 1114: July 2, 2003, 4:00 p.m. to July 2, 2004, 3:50 p.m.
Site 1115: June 27, 2003, 2:00 p.m. to June 27, 2004, 1:50 p.m.
Site 1116: September 9, 2003, 2:30 p.m. to July 24, 2004, 11:40 a.m. (to be completed)

The detailed results of this campaign have been presented in separate reports. The most relevant findings are summarized in the following section.

Figure 2-1: Map of the Kahnawake showing locations of meteorological masts.



2.1 Annual Average Wind Speed

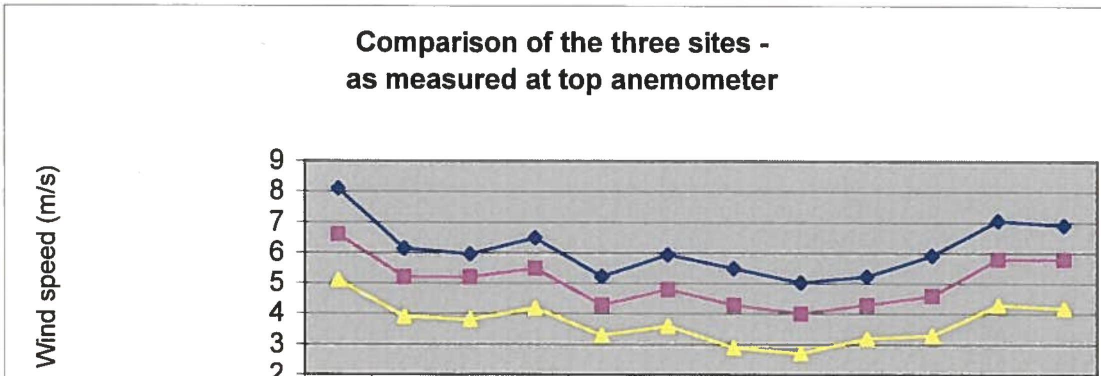
Monthly and annual average wind speeds for the three monitored sites are summarized in the charts and tables below. Figure 2-2 shows that the highest wind speeds were measured at the Marina (site 1114) while the lowest were at the Kanata House (1116), with the wind speeds at the Sports Complex (1115) being in between.

Wind speed typically increases with increasing height from the ground. This increase in speed with height is referred to as wind shear and quantified in terms of a wind shear exponent. This exponent reflects the extent to which the surface slows the flow of air; "rougher" surfaces, such as trees and buildings, have a more pronounced effect than smooth surfaces such as snow or short grass.

To provide an equal basis for comparison, all wind speed results were therefore also extrapolated to one common height (50 m) using a shear exponent of 0.22. This shear exponent was calculated based on data from site 1114 (Marina). Shear at the other two sites is assumed to be similar. The extrapolated values are presented in Figure 2-3. The annual average wind speeds that correspond to the monthly values in the two charts are presented in Table 2-2.

It should be noted that as of the writing of this report, a full year of data collection had not yet been completed for site 1116 (Kanata House): data for the month of August 2004 is still missing. In the Figures below, the wind speed value for this one missing month has been extrapolated based on the two other complete data sets. This estimate is reflected in all subsequent discussion of wind speed for site 1116.

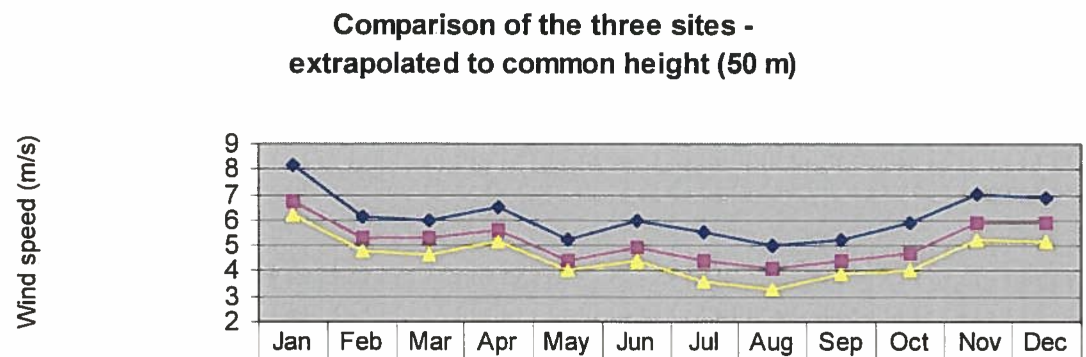
Figure 2-2



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1114 (49.2 m)	8.11	6.14	5.97	6.48	5.23	5.94	5.48	5.01	5.22	5.91	7.05	6.9
1115 (45.0 m)	6.6	5.2	5.2	5.5	4.3	4.8	4.3	4	4.3	4.6	5.8	5.8
1116 (20.0 m)	5.1	3.9	3.8	4.2	3.3	3.6	2.9	2.7	3.2	3.3	4.3	4.2

Month

Figure 2-3



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1114 (50 m)	8.142	6.163	5.986	6.5	5.246	5.962	5.5	5.031	5.236	5.929	7.074	6.925
1115 (50 m)	6.755	5.322	5.322	5.629	4.401	4.913	4.401	4.094	4.401	4.708	5.936	5.936
1116 (50 m)	6.239	4.771	4.649	5.138	4.037	4.404	3.548	3.303	3.915	4.037	5.26	5.138

Table 2-2: Average annual wind speeds

	Measured		Extrapolated to common height	
	Height	Wind speed (m/s)	Height	Wind speed (m/s)
Marina	49.2	6.1	50.0	6.1
Sports complex	45.0	5.0	50.0	5.2
Kanata house	20.0	3.7	50.0	4.5

To further compare the three sites, correlation equations were established between the data from site 1114 and that from the other two sites. The correlations compared each 10 min measurement of wind speed. The coefficient of determination (R^2) between sites 1114 and 1115 was 0.897, whereas the coefficient of determination between 1114 and 1116 was 0.836. These results indicate that despite the differences in the magnitude of wind speeds, all three towers were "seeing" the same variation in the wind.

Finally, the wind roses (graphs of wind direction distribution) for all three sites were relatively similar, with the dominant wind coming from the west for sites 1115 and 1116 and from west-southwest for site 1114.

2.2 Projection of wind speeds to long-term conditions

Annual average wind speeds vary from year to year; variations can be as high as 20% in some cases. To forecast energy production from a wind power plant at a given location, wind data that represent the average long-term (historical) wind conditions at the site are required. Long-term conditions are derived by averaging ideally ten or more years of wind data. Such long-term data are usually only available from a limited number of long-standing weather stations, such as Environment Canada's network of weather stations.

In the wind industry, wind resource assessments are usually conducted for a minimum of one-year period. To extrapolate these results to long-term conditions, the one-year data from the wind resource assessment site is compared to the same year of data from one or more nearby weather stations (e.g. Environment Canada) for which long-term data are available. If a good correlation is established between the WRA site and the reference station, then this indicates that the two sites are "seeing" the same wind and the long-term data from the reference station can therefore be used to project long-term average wind speeds at the WRA site. In this study, projections of the long-term average wind speed at Kahnawake were calculated by means of a correction factor or "climatological adjustment" (see Final WRA Report for Site 1114 for more details).

Trudeau International Airport is the closest weather station to Kahnawake that collects long-term wind data. However, the Trudeau Airport data indicates that the long-term (10 year) average wind speed at that site is about 14% lower than the past year's average. This is a significant difference that would indicate that the wind speeds measured in the past year at Kahnawake have to be adjusted downward by about 14% to reflect long-term conditions.

Because this difference in current year vs. long-term wind speeds at Trudeau is so high and because such a significant difference has not been observed at other GPCo monitoring sites in that general period, it was decided to obtain and analyse long-term wind data from two other EC weather stations: one at the Ste-Anne-de-Bellevue campus of McGill University (west tip of Montreal Island) and one at St.-Hubert Airport.

The results of the three different correlations between site 1114 and the EC reference stations are presented in Table 2-3 below (all correlations are hourly, without differentiation for wind direction). Also shown is the impact of using the different adjustment factors to arrive at a projected long-term wind speed at site 1114.

Table 2-3

Reference station	R^2	Long-term avg. wind speed (m/s at 10 m)	Climatological adjustment factor	Projected long-term wind speed at Site 1114 (m/s at 49.2 m)
Trudeau Int'l. Airport	0.704	4.2	-13.65%	5.3
Ste-Anne-de-Bellevue	0.686	3.4	-4.77%	5.8
St. Hubert Airport	0.646	4.3	-0.90%	6.0

The results shown in the table above reflect a narrow but significant range of uncertainty in regard to the determination of the long-term average wind speed at Kahnawake. Using the Ste-Anne-de-Bellevue reference station to calculate long-term wind speeds is considered to yield the most credible results because a.) its wind rose is the most similar to the wind rose at site 1114 and b.) its climatological adjustment is near the mid point of the other two possible values.

The Ste-Anne-de-Bellevue climatological adjustment is thus used to determine the "base case" long-term average wind speeds at Kahnawake. The climatological adjustment factors derived from the two other EC sites are used to define "high" and "low" wind speed scenarios. These scenarios, for all three Kahnawake sites, are derived in Table 2-4 below.

Table 2-4

Site	Anemometer height	Measured avg. wind speed (m/s)	Shear	Modeled hub height (m)	Wind speed at hub height (m/s)	Scenarios: long-term avg. wind speed (m/s)		
						High	Base case	Low
Marina	49.2	6.1	0.22	80	6.8	6.7	6.5	5.9
Sports	45	5.0	0.22	30	4.6	4.5	4.4	3.9
Kanata	20	3.7	0.22	30	4.0	4.0	3.9	3.5

3 METHODOLOGY

Pre-feasibility studies for a number of different technology options and operating scenarios were undertaken using the Wind Energy module of the RETScreen® International software, an analysis tool developed jointly by Natural Resources Canada and GPCo Inc. This software tool models the technical performance and financial costs and benefits of various wind energy systems. It should be noted that this is a simplified and approximate tool intended for pre-feasibility and feasibility studies only. While the approximate nature of the results may be sufficiently accurate for making decisions regarding small, residential-sized wind installations, larger systems (especially commercial and utility-scale installations) require additional detailed analyses and an often lengthy project development process.

The following project scenarios were modeled:

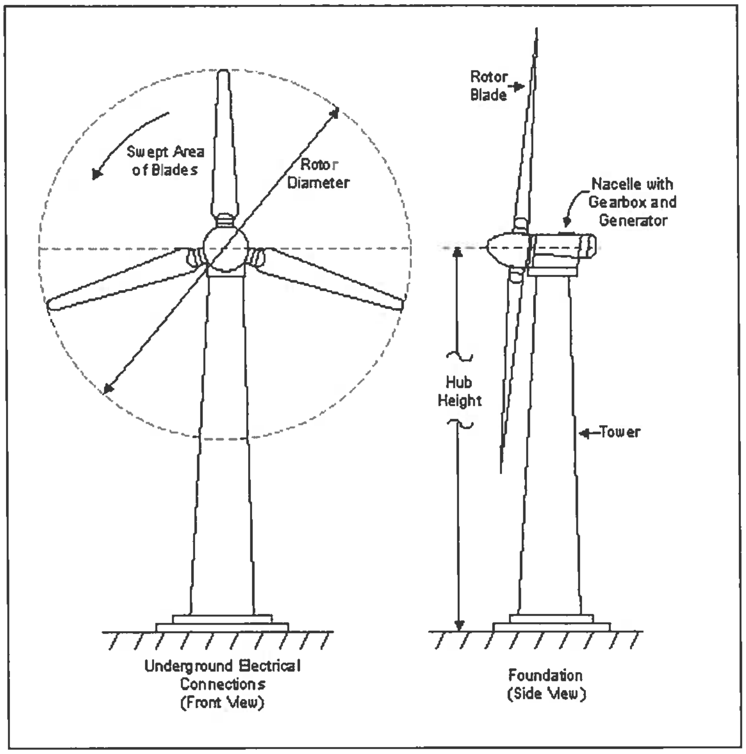
- Residential scale: one 10 kW turbine at the Kanata 2000 House
- Community-scale: one 50 kW turbine at the Sports Complex
- Utility scale: one 1.5 MW turbine at the Marina (Tekakwitha Island)

The following sections present some technical background and a discussion of the key inputs to the RETScreen modelling process.

4 TECHNOLOGY OVERVIEW

4.1 Typical Wind Turbine

The type of wind turbine considered in this analysis is a modern "Horizontal Axis Wind Turbine" or HAWT. This is the most common commercially available and proven turbine configuration.



Source: RETScreen® International

The major components of modern wind energy systems typically consist of the following:

- rotor which converts the kinetic energy in the wind into mechanical energy and delivers it to the rotor shaft;
- tall tower which supports the rotor and nacelle assembly high above the ground to capture the higher wind speeds;
- nacelle which contains the electric generator and gearbox (the latter is used to match the slower rotation speed of the rotor shaft to the generator; direct drive systems do not require a gearbox);
- control system to start and stop the wind turbine and to monitor proper operation of the machinery;
- solid foundation to anchor the turbine and resist high winds and/or icing conditions;
- transformer to match the turbine's output voltage to that of the distribution grid;
- switching systems, power meter and other controls to connect the electrical output of the turbine to the grid.

4.2 "On-grid" configuration

All technology scenarios evaluated in this report assume that the wind turbine will be connected to the main electrical grid in a "grid-connected" or "on-grid" configuration.

A house or other load that is powered by an on-grid wind turbine will typically get its electricity both from the wind turbine (when wind is available) and from the grid (whenever supplemental or backup power is needed). Any excess generation from the wind turbine is typically sent back to the grid. In the case of a utility-scale wind project, the whole purpose of the project is to generate electricity exclusively for sale to the grid.

For the residential and community-scale systems, the on-grid scenarios and system costs are defined in such a way as to represent "best case scenarios" that maximize the potential for financial success of the project. The reasoning for this is that if the "best case scenarios" do not pass financial screening, then there is no point in analyzing any other configurations.

The following assumptions are thus made in modeling the residential and community-scale wind energy systems:

- On-grid systems eliminate the need for costly batteries;
- There is no need for backup power systems;
- Excess wind energy can be sold back to the grid at retail rates (i.e. an ideal net-metering arrangement).

4.3 Turbine Options

The following wind turbines were selected to represent the modeled scenarios:

- ➢ Residential scale: BWC EXCEL; 10 kW turbine manufactured by Bergey Windpower;
- ➢ Community scale: AOC 15/50; 50 kW turbine manufactured by Atlantic-Orient (AOC).
- ➢ Utility scale: GE 1.5sle; 1.5 MW turbine manufactured by GE Wind Energy.

GPCo does not endorse these turbines or manufacturers over any others. Other manufacturers may have equally good products for these applications. These particular manufacturers were selected for this study for the following reasons:

- They are some of the most commonly used turbine options for the given applications;
- All have significant track records and experience, with numerous wind turbine installations internationally;
- All are active in the Canadian market.

Final selection of turbines, especially at the community and utility scale, has to be done in close coordination with the turbine manufacturer.

The main characteristics of the modeled turbines are summarized in Table 4-1 below.

Table 4-1

	BWC EXCEL	AOC 15/50	GE 1.5sle
Rated power	10 kW	50 kW	1,500 kW
Number of blades	3	3	3
Rotor diameter	7 m	15 m	77 m
Generator	Permanent Magnet Alternator, 3-phase 240 V	Asynchronous 3-phase generator, 480V	Asynchronous 3-phase generator
Drivetrain type	Direct drive	Gearbox	Gearbox
Available tower heights (m)	18 – 37	18.3, 24.4, 30.5, 36.6	61.4, 64.7, 80, 85
Tower type	Guyed lattice tower	Self-supporting lattice tower	Self-supporting tubular tower
Cut-in wind speed	3.1 m/s (11.2 km/h)	4.6m/s (16.6 km/h)	3.5 m/s (12.6 km/h)
Shut-down wind speed	14.6 m/s (52.6 km/h)	22.4m/s (80.6 km/h)	25-30 m/s (90-108 km/h)

5 OTHER ANALYSIS INPUTS

Following are comments on some of the most important input parameters to this analysis (other than the wind resource values discussed previously):

5.1 Turbine Power Curves

For a given turbine model, the power curve indicates the power output at various wind speeds. The power curves used in this analysis were obtained from the respective turbine manufacturers. The projected annual energy output of the turbine was then calculated by RETScreen based on the specific power curve and a Weibull frequency distribution of wind speeds. The later was adjusted by means of a "shape factor" to correspond to the actual distribution of wind speeds that was measured at the Marina site.

5.2 Project Costs

Most project costs are generic (not site-specific) estimates and subject to changes at the tendering / quotation stage. Costs of individual system components are based on general reference sources and past experience. The costs represent typical installations. In general, the overall system cost should be taken as more accurate than the itemized cost components.

The following subsections provide comments on selected cost items and categories that are used in the attached RETScreen analyses.

5.2.1 Feasibility Study, Development and Engineering

The costs shown for these categories are the estimated costs of the remaining project development tasks which may go beyond the services that turbine vendors normally provide "free of charge". This is particularly the case for the large utility-scale turbines, which typically require a significant amount of planning and project development work before turbines can be installed. These tasks are discussed in some more detail in Section 7 of this report.

5.2.2 Balance of Plant Costs

Many of the cost items in this category (e.g. turbine foundations, substation, electrical interconnection, power line extension) may vary significantly depending on local conditions and utility requirements.

5.2.3 Annual O&M Costs

The annual O&M costs are expressed as the estimated annual average cost of keeping the turbine running. It is expected that actual O&M costs will be lower in some years and higher when more significant repairs are required. Different manufacturers offer different service contracts and warranty arrangements which can help reduce the risk associated with O&M expenses.

Standard warranty terms also vary widely. Based on preliminary information, two of the manufacturers considered in this study, Bergey and AOC, offer warranties of 5 and 1 year(s), respectively. A customized warranty arrangement can be negotiated with GE Wind.

It is strongly recommended that at the tendering stage of the project, vendors be asked to provide cost estimates for O&M for their turbines as well as full information about service contracts and warranty options.

5.2.4 Periodic Costs

Periodic costs consist of major overhauls such as replacing blades, gearbox and/or components such as controls or inverters. This cost is estimated roughly in proportion to the cost of the new turbine. In the case of the 1.5 MW turbine, periodic costs have been annualized and are included as part of the annual costs.

5.3 Value of Wind-generated Electricity

This discussion refers to the "avoided cost of energy" input in RETScreen. Depending on the project, this can be either the retail price (¢/kWh) of the electricity that is displaced by generating one's own power from the wind or it can be the price paid by the utility (e.g. Hydro Quebec) for the electricity from a commercial wind power installation. In all cases, this modeling input represents the monetary value of the electricity generated by the turbines and is one of the most important inputs in the analysis.

The avoided cost of energy was derived differently for the three different sites and turbine scenarios:

5.3.1 Residential-scale application (10 kW wind turbine)

The avoided cost of energy for this scenario is based on the residential rate "D" of Hydro Quebec. Assuming an electricity consumption of 8,000 kWh/yr and including sales tax and GST, the overall average price of electricity under this rate is ¢7.8/kWh. This is a "best case" scenario because Hydro Quebec does not yet have a "net metering" policy, so any excess wind electricity that has to be sent to the grid will not be paid for.

5.3.2 Community-scale application (50 kW wind turbine)

The avoided cost of energy for this scenario is based on the reported usage and cost of electricity at the Sports Complex in 2002-2003. For most of the months, this averages out to about ¢6.0/kWh.

This is also considered to be a high and "best case" estimate because of the same net metering issue described previously but also because the reported total costs for the Sports Complex may include demand charges ($/kW). The price of the energy alone therefore is likely lower. The business rate "G" of Hydro Quebec indicates a price of ¢4.8/kWh (with tax) for the level of consumption reported for the Sports Complex (about 1,800,000 kWh/yr).

Demand or capacity charges ($/kW) are not taken into account in this analysis. Any demand or capacity savings that may result from the presence of a wind turbine are assumed to be minimal.

5.3.3 Utility-scale application (1.5 MW wind turbine)

If a utility-scale wind turbine is to be built in Kahnawake, a power purchase agreement (PPA) will most likely need to be negotiated with Hydro Quebec that will spell out the price that the wind project will receive for its electricity. For the purpose of this study, and as a "best case" scenario, it is assumed that it may be possible to negotiate a rate that is as high as the average rate that is being asked by wind project developers under the current Hydro Quebec RFP for 1000 MW of power in the Gaspe. That average is ¢8.1/kWh.

5.4 General Financial Assumptions

The table below summarizes the financial assumptions that were used as the basis for all scenarios:

Parameter	**Assumed Value**
Energy cost escalation rate	3.5%
Inflation	2.5%
Discount rate	8%
Project life	25 years
Debt financing	Not included
Tax analysis	Not included

6 ANALYSIS RESULTS

The following main project scenarios were analyzed:

A. Residential scale: one 10 kW turbine at the Kanata 2000 House
B. Community-scale: one 50 kW turbine at the Sports Complex
C. Utility scale: one 1.5 MW turbine at the Marina (Tekakwitha Island)

Printouts of the main RETScreen scenarios for all three options are included in Annex A and show all detailed inputs and results of the RETScreen modeling.

Overall cost estimates for the three scenarios are presented in Table 6-1. Cost figures are rounded and in Canadian dollars.

Table 6-1: Cost estimates

	10 kW	**50 kW**	**1,500 kW**
Total installed cost	$64, 000	$160,000	$2,734,000
Total annual cost	$400	$2,500	$79,600
Major overhaul cost (year 15)	$7,500	$22,000	included in annual cost

An initial round of RETScreen modelling focused on the "best case scenarios" for each of the three applications. Key results and parameters of this analysis are summarized in Table 6-2 below:

Table 6-2: RETScreen analysis results (round 1)

	"Best case" scenarios		
	A 10 kW at Kanata	**B 50 kW at the Sports Complex**	**C 1.5 MW at the Marina**
Hub height	30 m	30 m	80 m
Avg. annual wind speed at hub height	4.0	4.5	6.7
Renewable energy delivered	5 MWh	56 MWh	4,129 MWh
Turbine capacity factor	6%	13%	31%
GHG emissions reduction (CO_{2equiv})*	2 t_{co2}	25 t_{co2}	1,865 t_{co2}
Avoided cost of energy	¢ 7.8 /kWh	¢ 6.0 /kWh	¢ 8.0 /kWh
IRR / ROI	< 0	< 0	11.8%
Simple payback	n/a	183 yrs	11 yrs
Net Present Value (NPV)	$ -66,900	$ -153,156	$ 1,158,862
Value of electricity	$396/yr	$3,377/yr	$330,307/yr
Energy production cost	¢95/kWh	¢24/kWh	¢6/kWh

*Note: the greenhouse gas (GHG) emissions reduction values only serve as a reference of the potential GHG impact of these scenarios. The GHG reductions are based on the assumption that the electricity displaced is generated by burning natural gas. In Quebec, most electricity is generated from hydro facilities, which are generally considered not to emit any GHGs.

The above scenarios represent the "best case" for each application. Since only the 1.5 MW scenario is showing potential to be cost-effective, several variations to that scenario were considered. These are:

C1. Lower wind speed: due to the uncertainty of projecting long-term wind speeds in this study, this scenario considers the impact of reducing the average annual wind speed entered in the RETScreen model from 6.7 m/s to 5.9 m/s. This lower figure corresponds to the climatological adjustment of –13.65% that was calculated based on long-term data from Trudeau International Airport.

C2. Lower electricity purchase rate: this scenario considers the effect of reducing the electricity purchase price (the "avoided cost of energy" input in RETScreen) for the project. The price is reduced from a flat ¢8.0/kWh to ¢6.0/kWh plus WPPI payments of ¢1.0/kWh over 10 years.

C3. Debt financing: all scenarios in Table 6-2 do not include debt financing, which can have a significant impact on project economics. To demonstrate this impact, this scenario assumes that 70% of the project is debt financed at an interest of 6% and a debt term of 15 years.

The results of these scenario variations are summarized in Table 6-3. Please note that the variations are NOT cumulative. Each change to the base case analysis (scenario "C" in Table 6-2) is applied individually.

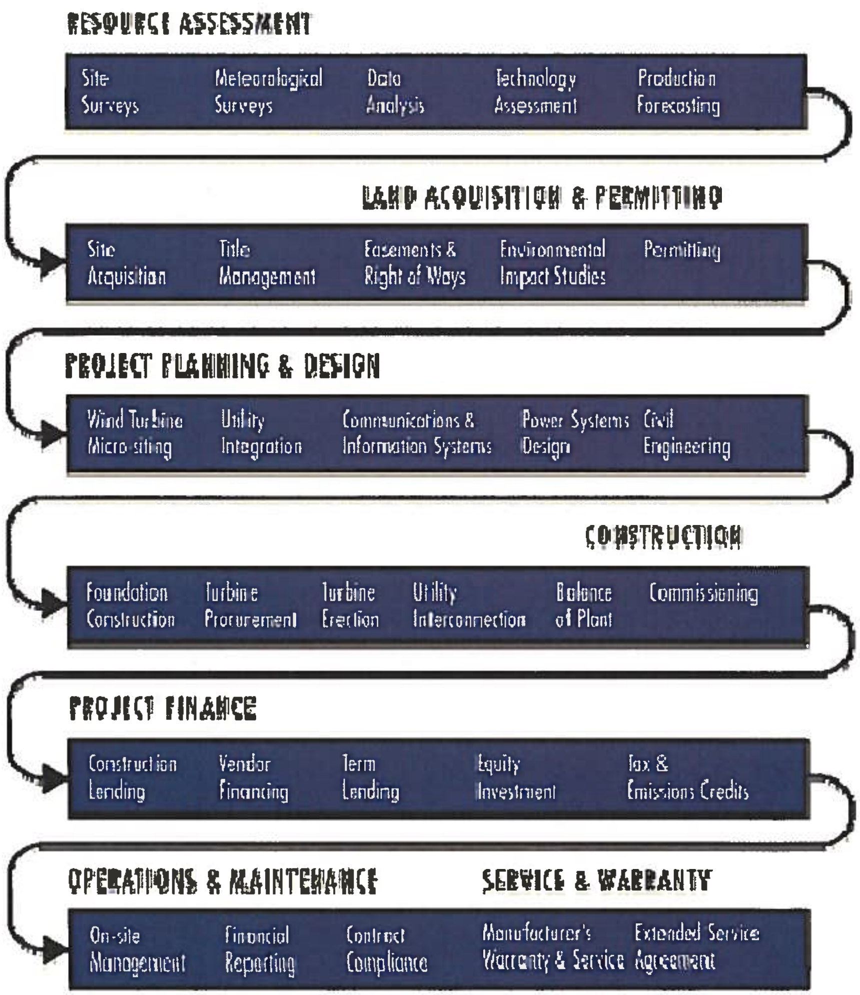
Table 6-3: RETScreen analysis results (round 2)

	Variations on scenario C (1.5 MW at the Marina)		
	C1	**C2**	**C3**
Avg. annual wind speed at hub height	5.9	6.7	6.7
Renewable energy delivered	3,084	4,129 MW	4,129 MW
Turbine capacity factor	23	31%	31%
GHG emissions reduction (CO_{2equiv})	1,393	1,865 t_{co2}	1,865 t_{co2}
Debt financing	no	no	yes
Avoided cost of energy	¢ 8.0 /kWh	¢ 6.0 /kWh + WPPI	¢ 8.0 /kWh
IRR / ROI	8.2 %	8.7%	17%
Simple payback	15.4 yrs	13 yrs	11 yrs
Net Present Value (NPV)	$ 47,656	$ 192,037	$ 1,386,024
Value of electricity	$ 246,740	$ 289,018 /yr	$330,307/yr

7 REMAINING PROJECT DEVELOPMENT AND IMPLEMENTATION TASKS

This section presents a summary overview of the major tasks and issues that still remain to be addressed (beyond the scope of this study) to further develop and implement the project. The focus is on the utility-scale project proposed for Tekakwitha Island (site 1114).

Even after the wind resource assessment is completed, the process of developing a utility-scale wind project can by quite lengthy (1-2 years), depending on the size of the project, the various local requirements (e.g. grid interconnection, permitting, environmental assessments, land rights) and financing and business plan issues. The flowchart below presents some of the main task categories of a generic wind energy project development process. Tasks and their sequence can vary significantly from case to case.



The following sub-sections describe some of the more important issues that may need to be considered for the Kahnawake project in particular. It is not intended to be a comprehensive list.

The task categories “Feasibility Study”, “Development” and “Engineering” correspond to the sub-sections of the same name on the Cost Analysis worksheet of the attached RETScreen runs.

7.1 Feasibility Study

Preliminary environmental assessment: identify potential environmental concerns (e.g. vicinity to migratory bird flight paths) and specific regulations that need to be complied with.

Utility interconnection & billing: determine the physical requirements and terms for connecting the proposed turbine to the local electrical grid; identify the required permitting process.

Project partners: identify the key project partners (e.g. financiers, developers, gov’t. agencies, key consultants) that may be required to realize the project.

7.2 Development

Environmental assessment: conduce environmental studies and address environmental impacts if required.

Permitting: obtain all necessary permits (e.g. NAV Canada, Transport Canada, utility interconnection permits, municipal building permits, provincial permits)

Project finance: ensure funding is in place.

Tenders and contracting: Identify contractors (e.g. mechanical, civil, electrical) and start turbine selection process.

Project management: define responsibilities; assign tasks, set schedules, etc.

7.3 Engineering

Some engineering tasks (e.g. project planning & design, utility integration, civil engineering) will require specialized engineering services. In most utility-scale projects, the relevant engineering firms are hired and coordinated by the project developer, in coordination with the turbine vendor (e.g. for turbine foundation, turbine transportation logistics) and the local electrical utility (e.g. for grid interconnection).

7.4 Construction

Construction activities (e.g. foundation construction, turbine procurement, turbine erection, balance of plant, commissioning) are also typically coordinated by the project developer and the turbine vendor's staff.

7.5 Operations & Maintenance

On-site management: establish clear responsibility for the on-site management of the turbine (e.g. inspections, fault reporting, coordination of service, enforcement of contract compliance, administrative tasks, etc.).

Routine maintenance: O&M tasks are defined by the turbine vendor and may vary depending on service arrangement and budgets. Maintenance staff requirements have to be addressed.

Repairs and overhauls: establish warranty & service arrangements, make administrative provisions for O&M budget / account, stock replacement parts, etc.

7.6 Other

Land acquisition, including related issues such as easements or right of ways, are not listed because it is assumed that these issues are within the control of the community of Kahnawake and do not require significant action for the project to proceed.

8 POTENTIAL FEDERAL FUNDING SOURCES

There are few federal funding sources specifically for wind energy projects. No provincial or other funding sources were investigated for this study. A number of key federal programs that may be relevant especially to a utility-scale project are listed below:

Wind Power Production Incentive (WPPI)[2]: This federal program provides a production-based incentive (currently about ¢1/kWh for a duration of 10 years) for utility-scale wind projects.

Canadian Renewable and Conservation Expenses (CRCE) and Class 43.1[3] are two mechanisms under the Income Tax Act that can provide significant tax benefits for wind energy projects, including an accelerated rate of write-off (30% per year on declining balance basis) for renewable energy equipment and "flow-through share" mechanism that is often used to attract large investors to commercial wind energy projects.

"Green Funds" of the Federation of Canadian Municipalities (FCM)[4]: This is a large source of project-specific funding for feasibility studies and project implementation for Canadian communities, for climate change related projects including wind energy.

Aboriginal and Northern Climate Change Program (ANCCP)[5]

Started in 2001, funding for this program was extended in August 2003 to cover a total of $30.7 million during 2004-2007 for climate change initiatives to be taken related to Aboriginal and northern communities. The program is managed by the Department of Indian and Northern Affairs Canada (INAC) in partnership with Natural Resources Canada (NRCan). The ANCCP program objectives related to this study include:

Grovernment Purchase of Electricity from Renewable Resources (PERR)[6]: the objective of this initiative of Natural Resources Canada and Environment Canada is for federal facilities (e.g. office buildings, etc.) to procure some of their electricity from qualifying "green" sources at premium prices, if necessary. These price premiums have been used to successfully leverage wind projects in Alberta and PEI. The program's focus however has been on regions where electricity is produced from greenhouse-gas intensive sources (i.e. not Quebec).

CETC-Varennes and/or CETC-Ottawa offices of Natural Resources Canada: these offices support the deployment of renewable energy systems in Canada and may be able to provide some limited project support or advice for the right kind of demonstration project.

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[2] http://www.canren.gc.ca/programs/index.asp?CaId=107&PgId=622
[3] http://www2.nrcan.gc.ca/es/erb/erb/english/View.asp?x=469&oid=111
[4] http://kn.fcm.ca/ev.php?URL_ID=2825&URL_DO=DO_TOPIC&URL_SECTION=201&reload=1043178382
[5] http://www.ainc-inac.gc.ca/clc/prg/ovw_e.html
[6] http://www2.nrcan.gc.ca/es/erb/erb/english/View.asp?x=464

9 CONCLUSIONS

The wind resource at the Kanata House and Sports Complex is not sufficient for cost-effective utilization of wind energy using small and medium size wind turbines (30 m hub heights) even considering best case scenarios for wind speed, project cost and avoided cost of energy. Such wind turbines will still operate at these sites and produce significant amounts of electrical energy, but the purchase and installation of such systems would need to be justified on other, not financial grounds.

The wind resource at the Marina on Tekakwitha Island however is strong enough to allow for a potentially cost-effective implementation of at least one and possibly more large wind turbines for the purpose of generating and selling electricity to Hydro Quebec on a commercial basis.

The main reasons for why a utility-scale turbine at the Marina could be significantly more cost effective than the other sites and scenarios are as follows:

- The wind resource at the Marina site is significantly better than at the other two monitored locations, as was expected due to it's lake-side location (extrapolated to the same height of 50 m, the measured average annual wind speed at the Marina is 6.1 m/s as compared to 5.2 m/s at the second-windiest site, the Sports Complex).
- A large utility-scale wind turbine will use a much taller tower than the smaller residential and community-scale turbines (80 m vs. 30 m in this study), it will thus operate in significantly higher wind speeds.
- The utility-scale turbines are typically more effective at generating electricity from the wind.
- Certain models of utility-scale wind turbines are especially optimized for slower wind regimes, an option which is generally not available in smaller turbines.
- The cost of large turbines is proportionately lower than that of smaller ones.

Large wind turbines however require a very significant capital investment. To successfully realize a large wind energy project will therefore require significant planning and project development work beyond what has already been accomplished with this study and the preceding wind resource assessment.

ANNEX A

Scenario A: 10 kW at Kanata House

(Best-case scenario)

RETScreen® Energy Model - Wind Energy Project

Training & Support

Units: Metric

Site Conditions		Estimate	Notes/Range
Project name		10 kW	See Online Manual
Project location		Kahnawake - Kanata House	
Wind data source		Wind speed	
Nearest location for weather data		Montreal, QC	See Weather Database
Annual average wind speed	m/s	3.7	
Height of wind measurement	m	20.0	3.0 to 100.0 m
Wind shear exponent	-	0.22	0.10 to 0.40
Wind speed at 10 m	m/s	3.1	
Average atmospheric pressure	kPa	101.1	60.0 to 103.0 kPa
Annual average temperature	°C	6	-20 to 30 °C

System Characteristics		Estimate	Notes/Range
Grid type	-	Central-grid	
Wind turbine rated power	kW	10	Complete Equipment Data sheet
Number of turbines	-	1	
Wind plant capacity	kW	10	
Hub height	m	30.0	6.0 to 100.0 m
Wind speed at hub height	m/s	4.0	
Wind power density at hub height	W/m²	73	
Array losses	%	0%	0% to 20%
Airfoil soiling and/or icing losses	%	2%	1% to 10%
Other downtime losses	%	2%	2% to 7%
Miscellaneous losses	%	3%	2% to 6%

Annual Energy Production		Estimate Per Turbine	Estimate Total	Notes/Range
Wind plant capacity	kW	10	10	
	MW	0.010	0.010	
Unadjusted energy production	MWh	5	5	
Pressure adjustment coefficient	-	1.00	1.00	0.59 to 1.02
Temperature adjustment coefficient	-	1.03	1.03	0.98 to 1.15
Gross energy production	MWh	5	5	
Losses coefficient	-	0.93	0.93	0.75 to 1.00
Specific yield	kWh/m²	145	145	150 to 1,500 kWh/m²
Wind plant capacity factor	%	6%	6%	20% to 40%
Renewable energy delivered	MWh	5	**5**	
	kWh	5,073	5,073	

Complete Cost Analysis sheet

Version 3.0

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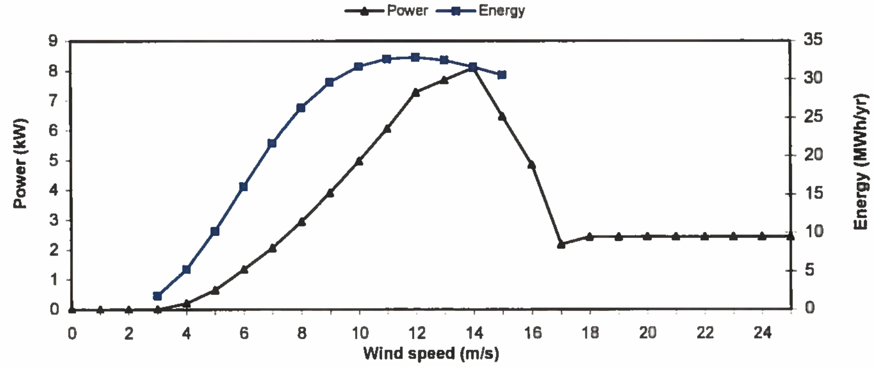
RETScreen® Equipment Data - Wind Energy Project

Wind Turbine Characteristics		Estimate	Notes/Range
Wind turbine rated power	kW	10	*See Product Database*
Hub height	m	30.0	6.0 to 100.0 m
Rotor diameter	m	7	7 to 80 m
Swept area	m²	35	35 to 5,027 m²
Wind turbine manufacturer		Bergey Windpower	
Wind turbine model		BERGEY BWC EXCEL	
Energy curve data source	-	Custom	Weibull wind distribution
Shape factor	-	2.1	1.0 to 3.0

Wind Turbine Production Data

Wind speed (m/s)	Power curve data (kW)	Energy curve data (MWh/yr)
0	0.0	-
1	0.0	-
2	0.0	-
3	0.0	1.8
4	0.2	5.2
5	0.7	10.2
6	1.3	16.1
7	2.1	21.7
8	3.0	26.3
9	3.9	29.6
10	5.0	31.7
11	6.1	32.7
12	7.3	32.9
13	7.7	32.5
14	8.1	31.6
15	6.5	30.5
16	4.9	-
17	2.2	-
18	2.4	-
19	2.4	-
20	2.4	-
21	2.4	-
22	2.4	-
23	2.4	-
24	2.4	-
25	2.4	-

Power and Energy Curves



Return to Energy Model sheet

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RETScreen® Cost Analysis - Wind Energy Project

Type of project: Standard — Currency: $

Initial Costs (Credits)	Unit	Quantity	Unit Cost	Amount
Feasibility Study				
Feasibility study	Cost	0	$ -	$ -
Sub-total:				$ -
Development				
Development	Cost	0	$ -	$ -
Sub-total:				$ -
Engineering				
Engineering	Cost	0	$ -	$ -
Sub-total:				$ -
Energy Equipment				
Wind turbine(s)	kW	10	$ 3,750	$ 37,500
Spare parts	%	0.0%	$ 37,500	$ -
Transportation	turbine	1	$ -	$ -
	Cost			$ -
Sub-total:				**$ 37,500**
Balance of Plant				
Balance of plant	Cost	1	$ 26,500	$ 26,500
Sub-total:				**$ 26,500**
Miscellaneous				
Contingencies	%	0%	$ 64,000	$ -
Interest during construction	0.0%	12 month(s)	$ 64,000	$ -
Sub-total:				$ -
Initial Costs - Total				**$ 64,000**

Annual Costs (Credits)	Unit	Quantity	Unit Cost	Amount
O&M				
O&M	Cost	1	$ 400	$ 400
Contingencies	%	0%	$ 400	$ -
Annual Costs - Total				**$ 400**

Periodic Costs (Credits)	Unit	Period	Unit Cost	Amount
Major overhaul	Cost	15 yr	$ 7,500	**$ 7,500**
				$ -
				$ -
End of project life	Credit	-	$ -	**$ -**

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RETScreen® Financial Summary - Wind Energy Project

Annual Energy Balance

Project name		10 kW			
Project location		Kahnawake - Kanata House			
Renewable energy delivered	MWh	5	Net GHG reduction	t_{CO2}/yr	2
Excess RE available	MWh	-			
Firm RE capacity	kW	-			
Grid type		Central-grid	Net GHG emission reduction - 25 yrs	t_{CO2}	57

Financial Parameters

Avoided cost of energy	$/kWh	0.0780	Debt ratio	%	0.0%
RE production credit	$/kWh	-			
GHG emission reduction credit	$/$t_{CO2}$	-	Income tax analysis?	yes/no	No
Energy cost escalation rate	%	3.5%			
Inflation	%	2.5%			
Discount rate	%	8.0%			
Project life	yr	25			

Project Costs and Savings

Initial Costs				**Annual Costs and Debt**		
Feasibility study	0.0%	$	-	O&M	$	400
Development	0.0%	$	-			
Engineering	0.0%	$	-			
Energy equipment	58.6%	$	37,500	**Annual Costs and Debt - Total**	**$**	**400**
Balance of plant	41.4%	$	26,500			
Miscellaneous	0.0%	$	-	**Annual Savings or Income**		
Initial Costs - Total	100.0%	**$**	**64,000**	Energy savings/income	$	396
				Capacity savings/income	$	-
Incentives/Grants		$	-			
				Annual Savings - Total	**$**	**396**
Periodic Costs (Credits)						
Major overhaul		$	7,500	Schedule yr # 15		
		$	-			
		$	-			
End of project life - Credit		$	-			

Financial Feasibility

			Calculate energy production cost?	yes/no	Yes
Pre-tax IRR and ROI	%	#DIV/0!	Energy production cost	$/kWh	0.9535
After-tax IRR and ROI	%	#DIV/0!	Calculate GHG reduction cost?	yes/no	No
Simple Payback	yr	(14,891.7)			
Year-to-positive cash flow	yr	more than 25	Project equity	$	64,000
Net Present Value - NPV	$	(66,900)			
Annual Life Cycle Savings	$	(6,267)			
Benefit-Cost (B-C) ratio	-	(0.05)			

Yearly Cash Flows

Year #	Pre-tax $	After-tax $	Cumulative $
0	(64,000)	(64,000)	(64,000)
1	(0)	(0)	(64,000)
2	4	4	(63,997)
3	8	8	(63,989)
4	13	13	(63,976)
5	17	17	(63,959)
6	23	23	(63,936)
7	28	28	(63,908)
8	34	34	(63,875)
9	40	40	(63,835)
10	46	46	(63,789)
11	53	53	(63,736)
12	60	60	(63,676)
13	67	67	(63,608)
14	75	75	(63,533)
15	(10,779)	(10,779)	(74,312)
16	92	92	(74,219)
17	102	102	(74,118)
18	111	111	(74,007)
19	121	121	(73,885)
20	132	132	(73,754)
21	143	143	(73,610)
22	155	155	(73,456)
23	167	167	(73,289)
24	180	180	(73,108)
25	194	194	(72,915)

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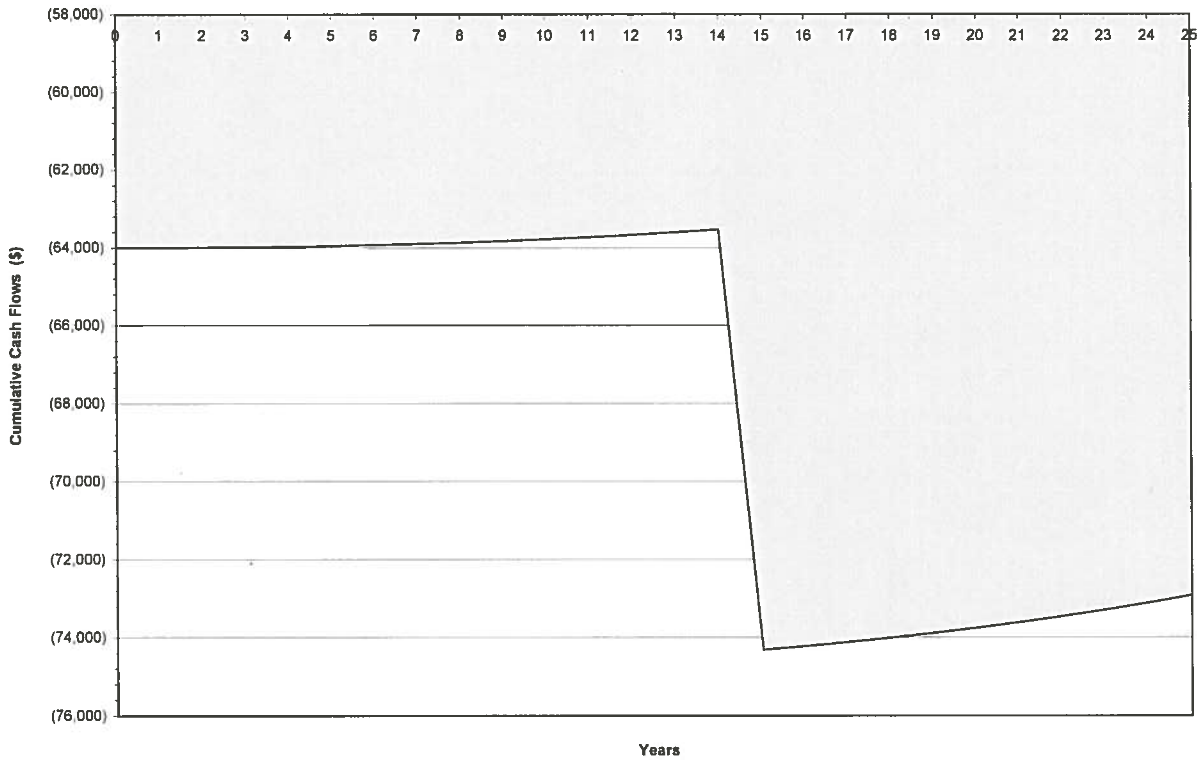
Cumulative Cash Flows Graph

Wind Energy Project Cumulative Cash Flows
10 kW, Kahnawake - Kanata House

Renewable energy delivered (MWh/yr): 5 **Total Initial Costs: $ 64,000** **Net GHG emissions reduced (t_{CO2}/yr): 2**



Year-to-positive cash flow: more than 25 yr **Net Present Value: $ -66,900**

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ANNEX B

Scenario B: 50 kW at Sports Complex

(Best-case scenario)

RETScreen® Energy Model - Wind Energy Project

Training & Support

Units: Metric

Site Conditions		Estimate	Notes/Range
Project name		50 kW	See Online Manual
Project location		Kahnawake - Sports Complex	
Wind data source		Wind speed	
Nearest location for weather data		Montreal, QC	See Weather Database
Annual average wind speed	m/s	5.0	
Height of wind measurement	m	45.0	3.0 to 100.0 m
Wind shear exponent	-	0.22	0.10 to 0.40
Wind speed at 10 m	m/s	3.6	
Average atmospheric pressure	kPa	101.1	60.0 to 103.0 kPa
Annual average temperature	°C	6	-20 to 30 °C

System Characteristics		Estimate	Notes/Range
Grid type	-	Central-grid	
Wind turbine rated power	kW	50	Complete Equipment Data sheet
Number of turbines	-	1	
Wind plant capacity	kW	50	
Hub height	m	30.0	6.0 to 100.0 m
Wind speed at hub height	m/s	4.5	
Wind power density at hub height	W/m²	105	
Array losses	%	0%	0% to 20%
Airfoil soiling and/or icing losses	%	2%	1% to 10%
Other downtime losses	%	2%	2% to 7%
Miscellaneous losses	%	3%	2% to 6%

Annual Energy Production		Estimate Per Turbine	Estimate Total	Notes/Range
Wind plant capacity	kW	50	50	
	MW	0.050	0.050	
Unadjusted energy production	MWh	59	59	
Pressure adjustment coefficient	-	1.00	1.00	0.59 to 1.02
Temperature adjustment coefficient	-	1.03	1.03	0.98 to 1.15
Gross energy production	MWh	60	60	
Losses coefficient	-	0.93	0.93	0.75 to 1.00
Specific yield	kWh/m²	318	318	150 to 1,500 kWh/m²
Wind plant capacity factor	%	13%	13%	20% to 40%
Renewable energy delivered	MWh	56	**56**	
	kWh	56,282	56,282	
				Complete Cost Analysis sheet

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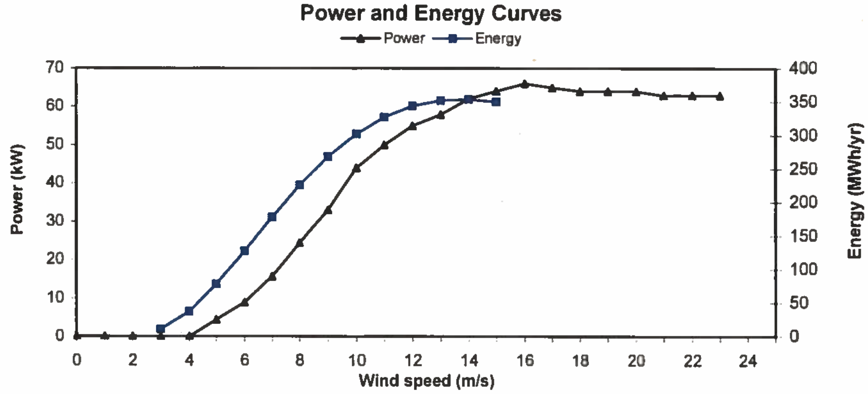
RETScreen® Equipment Data - Wind Energy Project

Wind Turbine Characteristics		Estimate	Notes/Range
Wind turbine rated power	kW	50	*See Product Database*
Hub height	m	30.0	6.0 to 100.0 m
Rotor diameter	m	15	7 to 80 m
Swept area	m²	177	35 to 5,027 m²
Wind turbine manufacturer		Atlantic Orient	
Wind turbine model		AOC 15/50	
Energy curve data source	-	Custom	Weibull wind distribution
Shape factor	-	2.1	1.0 to 3.0

Wind Turbine Production Data

Wind speed (m/s)	Power curve data (kW)	Energy curve data (MWh/yr)
0	0.0	-
1	0.0	-
2	0.0	-
3	0.0	10.4
4	0.0	36.8
5	4.4	77.9
6	8.9	127.1
7	15.6	178.0
8	24.4	225.9
9	33.0	267.8
10	44.0	301.9
11	50.0	327.2
12	55.0	343.7
13	58.0	352.1
14	62.0	353.8
15	64.0	350.1
16	66.0	-
17	65.0	-
18	64.0	-
19	64.0	-
20	64.0	-
21	63.0	-
22	63.0	-
23	63.0	-
24	-	-
25	-	-

Power and Energy Curves



Return to Energy Model sheet

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RETScreen® Cost Analysis - Wind Energy Project

Type of project: Standard | Currency: $

Initial Costs (Credits)	Unit	Quantity	Unit Cost	Amount
Feasibility Study				
Feasibility study	Cost	0	$ -	$ -
Sub-total:				$ -
Development				
Development	Cost	0	$ -	$ -
Sub-total:				$ -
Engineering				
Engineering	Cost	0	$ -	$ -
Sub-total:				$ -
Energy Equipment				
Wind turbine(s)	kW	50	$ 2,200	$ 110,000
Spare parts	%	0.0%	$ 110,000	$ -
Transportation	turbine	1	$ -	$ -
	Cost			$ -
Sub-total:				$ **110,000**
Balance of Plant				
Balance of plant	Cost	1	$ 50,000	$ 50,000
Sub-total:				$ **50,000**
Miscellaneous				
Contingencies	%	0%	$ 160,000	$ -
Interest during construction	0.0%	12 month(s)	$ 160,000	$ -
Sub-total:				$ -
Initial Costs - Total				$ **160,000**

Annual Costs (Credits)	Unit	Quantity	Unit Cost	Amount
O&M				
O&M	Cost	1	$ 2,500	$ 2,500
Contingencies	%	0%	$ 2,500	$ -
Annual Costs - Total				$ **2,500**

Periodic Costs (Credits)		Period	Unit Cost	Amount
Major overhaul	Cost	15 yr	$ 22,000	$ **22,000**
				$ -
				$ -
End of project life	Credit	-	$ -	$ -

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RETScreen® Financial Summary - Wind Energy Project

Annual Energy Balance

Project name		50 kW			
Project location		Kahnawake - Sports Complex			
Renewable energy delivered	MWh	56	Net GHG reduction	t_{CO2}/yr	25
Excess RE available	MWh	-			
Firm RE capacity	kW	-			
Grid type		Central-grid	Net GHG emission reduction - 25 yrs	t_{CO2}	636

Financial Parameters

Avoided cost of energy	$/kWh	0.0600	Debt ratio	%	0.0%
RE production credit	$/kWh	-			
GHG emission reduction credit	$/$t_{CO2}$	-	Income tax analysis?	yes/no	No
Energy cost escalation rate	%	3.5%			
Inflation	%	2.5%			
Discount rate	%	8.0%			
Project life	yr	25			

Project Costs and Savings

Initial Costs				**Annual Costs and Debt**		
Feasibility study	0.0%	$	-	O&M	$	2,500
Development	0.0%	$	-			
Engineering	0.0%	$	-			
Energy equipment	68.8%	$	110,000	**Annual Costs and Debt - Total**	**$**	**2,500**
Balance of plant	31.3%	$	50,000			
Miscellaneous	0.0%	$	-	**Annual Savings or Income**		
Initial Costs - Total	100.0%	**$**	**160,000**	Energy savings/income	$	3,377
				Capacity savings/income	$	-
Incentives/Grants		$	-			
				Annual Savings - Total	**$**	**3,377**
Periodic Costs (Credits)						
Major overhaul		$	22,000	Schedule yr # 15		
		$	-			
		$	-			
End of project life - Credit		$	-			

Financial Feasibility

			Calculate energy production cost?	yes/no	Yes
Pre-tax IRR and ROI	%	-9.9%	Energy production cost	$/kWh	0.2407
After-tax IRR and ROI	%	-9.9%	Calculate GHG reduction cost?	yes/no	No
Simple Payback	yr	182.5			
Year-to-positive cash flow	yr	more than 25	Project equity	$	160,000
Net Present Value - NPV	$	(153,156)			
Annual Life Cycle Savings	$	(14,347)			
Benefit-Cost (B-C) ratio	-	0.04			

Yearly Cash Flows

Year #	Pre-tax $	After-tax $	Cumulative $
0	(160,000)	(160,000)	(160,000)
1	933	933	(159,067)
2	991	991	(158,077)
3	1,052	1,052	(157,025)
4	1,116	1,116	(155,909)
5	1,182	1,182	(154,727)
6	1,252	1,252	(153,475)
7	1,325	1,325	(152,150)
8	1,401	1,401	(150,750)
9	1,480	1,480	(149,270)
10	1,563	1,563	(147,706)
11	1,650	1,650	(146,056)
12	1,741	1,741	(144,316)
13	1,835	1,835	(142,481)
14	1,934	1,934	(140,547)
15	(29,826)	(29,826)	(170,373)
16	2,144	2,144	(168,229)
17	2,256	2,256	(165,972)
18	2,373	2,373	(163,599)
19	2,495	2,495	(161,103)
20	2,623	2,623	(158,480)
21	2,756	2,756	(155,725)
22	2,894	2,894	(152,831)
23	3,038	3,038	(149,793)
24	3,189	3,189	(146,604)
25	3,346	3,346	(143,258)

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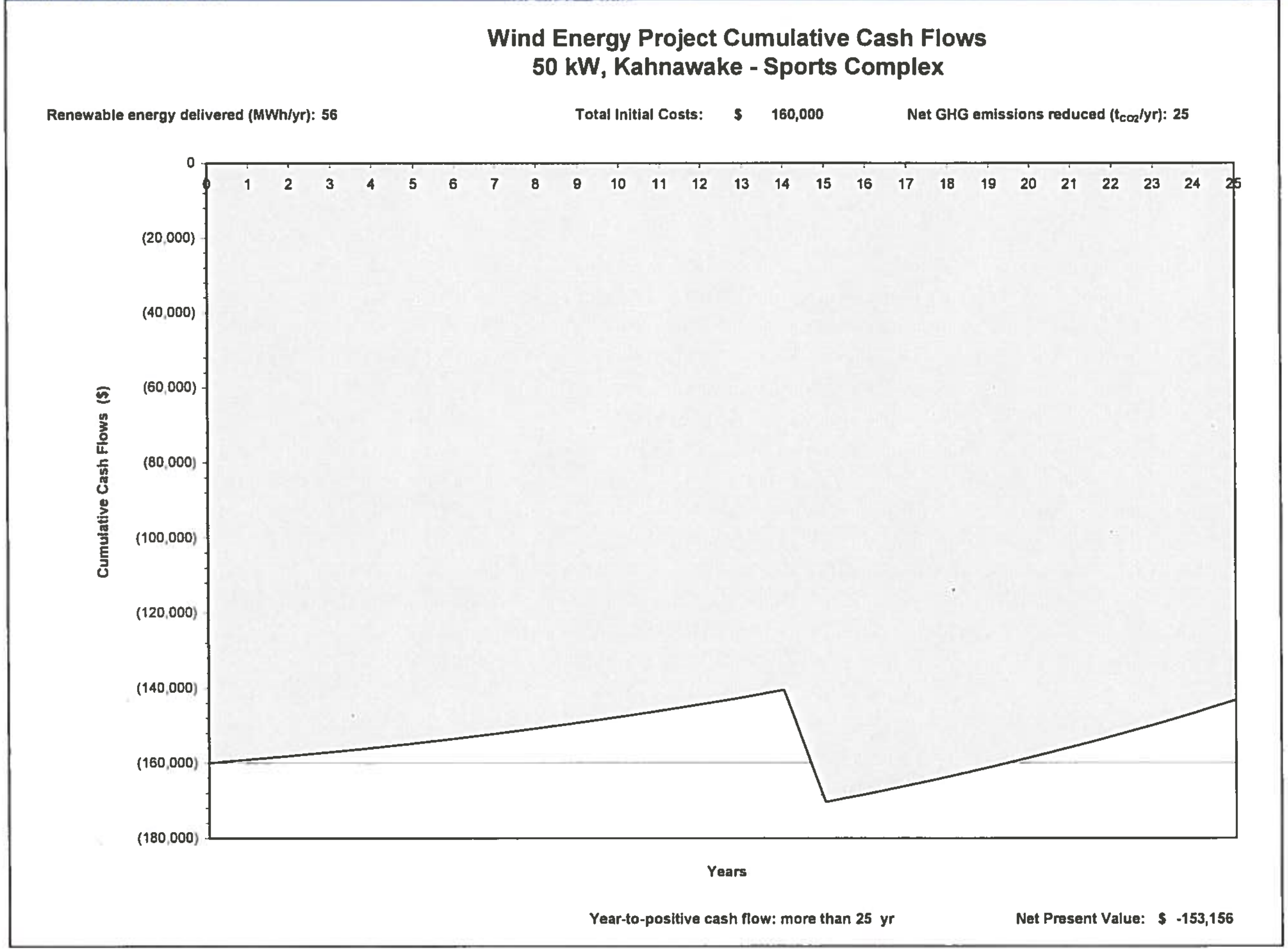
Cumulative Cash Flows Graph



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ANNEX C

Scenario C: 1.5 MW at Marina

(Best-case scenario)

RETScreen® Energy Model - Wind Energy Project

Training & Support

Units: Metric

Site Conditions		Estimate	Notes/Range
Project name		**1.5 MW**	*See Online Manual*
Project location		**Kahnawake - Marina**	
Wind data source		Wind speed	
Nearest location for weather data		Montreal, QC	*See Weather Database*
Annual average wind speed	m/s	6.0	
Height of wind measurement	m	49.2	3.0 to 100.0 m
Wind shear exponent	-	0.22	0.10 to 0.40
Wind speed at 10 m	m/s	4.3	
Average atmospheric pressure	kPa	101.1	60.0 to 103.0 kPa
Annual average temperature	°C	6	-20 to 30 °C

System Characteristics		Estimate	Notes/Range
Grid type	-	Central-grid	
Wind turbine rated power	kW	1,500	*Complete Equipment Data sheet*
Number of turbines	-	1	
Wind plant capacity	kW	1,500	
Hub height	m	80.0	6.0 to 100.0 m
Wind speed at hub height	m/s	6.7	
Wind power density at hub height	W/m²	341	
Array losses	%	0%	0% to 20%
Airfoil soiling and/or icing losses	%	3%	1% to 10%
Other downtime losses	%	3%	2% to 7%
Miscellaneous losses	%	3%	2% to 6%

Annual Energy Production		Estimate Per Turbine	Estimate Total	Notes/Range
Wind plant capacity	kW	1,500	1,500	
	MW	1.500	1.500	
Unadjusted energy production	MWh	4,392	4,392	
Pressure adjustment coefficient	-	1.00	1.00	0.59 to 1.02
Temperature adjustment coefficient	-	1.03	1.03	0.98 to 1.15
Gross energy production	MWh	4,524	4,524	
Losses coefficient	-	0.91	0.91	0.75 to 1.00
Specific yield	kWh/m²	887	887	150 to 1,500 kWh/m²
Wind plant capacity factor	%	31%	31%	20% to 40%
Renewable energy delivered	MWh	4,129	**4,129**	
	kWh	4,128,834	4,128,834	
				Complete Cost Analysis sheet

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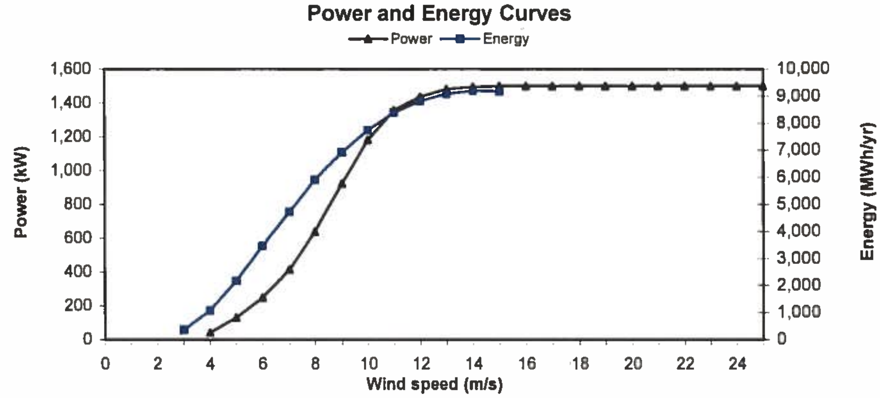
RETScreen® Equipment Data - Wind Energy Project

Wind Turbine Characteristics		Estimate	Notes/Range
Wind turbine rated power	kW	1,500	*See Product Database*
Hub height	m	80.0	6.0 to 100.0 m
Rotor diameter	m	77	7 to 80 m
Swept area	m²	4,657	35 to 5,027 m²
Wind turbine manufacturer		GE Wind	
Wind turbine model		1.5sle	
Energy curve data source	-	Custom	Weibull wind distribution
Shape factor	-	2.1	1.0 to 3.0

Wind Turbine Production Data

Wind speed (m/s)	Power curve data (kW)	Energy curve data (MWh/yr)
0	-	-
1	-	-
2	-	-
3	-	361.1
4	43.0	1,084.0
5	131.0	2,175.9
6	250.0	3,458.0
7	416.0	4,742.1
8	640.0	5,914.3
9	924.0	6,923.9
10	1,181.0	7,750.6
11	1,359.0	8,385.9
12	1,436.0	8,830.8
13	1,481.0	9,096.9
14	1,494.0	9,204.8
15	1,500.0	9,180.1
16	1,500.0	-
17	1,500.0	-
18	1,500.0	-
19	1,500.0	-
20	1,500.0	-
21	1,500.0	-
22	1,500.0	-
23	1,500.0	-
24	1,500.0	-
25	1,500.0	-

Power and Energy Curves



Return to Energy Model sheet

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RETScreen® Cost Analysis - Wind Energy Project

Type of project: Custom | Currency: $

Initial Costs (Credits)	Unit	Quantity	Unit Cost	Amount
Feasibility Study				
Site investigation	p-d	0.0	$ -	$ -
Wind resource assessment	met tower	0.0	$ -	$ -
Environmental assessment	p-d	0.0	$ -	$ -
Preliminary design	p-d	0.0	$ -	$ -
Detailed cost estimate	p-d	0.0	$ -	$ -
GHG baseline study and MP	project	0.0	$ -	$ -
Report preparation	p-d	0.0	$ -	$ -
Project management	p-d	0.0	$ -	$ -
Travel and accommodation	p-trip	0.0	$ -	$ -
Other - Feasibility study	Cost	0	$ -	$ -
Sub-total:				$ -
Development				
PPA negotiation	p-d	0.0	$ -	$ -
Permits and approvals	p-d	0.0	$ -	$ -
Land rights	project	0.0	$ -	$ -
Land survey	p-d	0.0	$ -	$ -
GHG validation and registration	project	0.0	$ -	$ -
Project financing	p-d	0.0	$ -	$ -
Legal and accounting	p-d	0.0	$ -	$ -
Project management	p-yr	0.0	$ -	$ -
Travel and accommodation	p-trip	0.0	$ -	$ -
All development	Cost	1	$ 100,000	$ 100,000
Sub-total:				$ 100,000
Engineering				
Wind turbine(s) micro-siting	p-d	0.0	$ -	$ -
Mechanical design	p-d	0.0	$ -	$ -
Electrical design	p-d	0.0	$ -	$ -
Civil design	p-d	0.0	$ -	$ -
Tenders and contracting	p-d	0.0	$ -	$ -
Construction supervision	p-yr	0.0	$ -	$ -
All engineering	Cost	1	$ 50,000	$ 50,000
Sub-total:				$ 50,000
Energy Equipment				
Wind turbine(s)	kW	1,500	$ 1,100	$ 1,650,000
Spare parts	%	2.0%	$ 1,650,000	$ 33,000
Transportation	turbine	1	$ 10,000	$ 10,000
	Cost	0	$ -	$ -
Sub-total:				$ 1,693,000
Balance of Plant				
Wind turbine(s) foundation(s)	turbine	1	$ 90,000	$ 90,000
Wind turbine(s) erection	turbine	1	$ 110,000	$ 110,000
Road construction	km	0.00	$ -	$ -
Transmission line	km	2.00	$ 55,000	$ 110,000
Substation	project	1	$ 250,000	$ 250,000
Control and O&M building(s)	building	1	$ 125,000	$ 125,000
Transportation	project	1	$ 10,000	$ 10,000
	Cost	0	$ -	$ -
Sub-total:				$ 695,000
Miscellaneous				
Training	p-d	1.0	$ 800	$ 800
Commissioning	p-d	2.0	$ 800	$ 1,600
Contingencies	%	5%	$ 2,540,400	$ 127,020
Interest during construction	5.0%	12 month(s)	$ 2,667,420	$ 66,686
Sub-total:				$ 196,106
Initial Costs - Total				$ 2,734,106

Annual Costs (Credits)	Unit	Quantity	Unit Cost	Amount
O&M				
Land lease	project	1	$ 7,000	$ 7,000
Property taxes	project	0	$ -	$ -
Insurance premium	project	1	$ 8,000	$ 8,000
Transmission line maintenance	%	3.0%	$ 360,000	$ 10,800
Parts and labour	kWh	4,128,834	$ 0.009	$ 37,160
GHG monitoring and verification	project	0	$ -	$ -
Community benefits	-	0	$ -	$ -
Travel and accommodation	p-trip	3	$ 2,000	$ 6,000
General and administrative	%	5%	$ 68,960	$ 3,448

RETScreen® Financial Summary - Wind Energy Project

Annual Energy Balance

Project name		1.5 MW			
Project location		Kahnawake - Marina			
Renewable energy delivered	MWh	4,129	Net GHG reduction	t_{CO2}/yr	1,865
Excess RE available	MWh	-			
Firm RE capacity	kW	-			
Grid type		Central-grid	Net GHG emission reduction - 25 yrs	t_{CO2}	46,634

Financial Parameters

Avoided cost of energy	$/kWh	0.0800	Debt ratio	%	0.0%
RE production credit	$/kWh	-			
GHG emission reduction credit	$/$t_{CO2}$	-	Income tax analysis?	yes/no	No
Energy cost escalation rate	%	3.5%			
Inflation	%	2.5%			
Discount rate	%	8.0%			
Project life	yr	25			

Project Costs and Savings

Initial Costs				**Annual Costs and Debt**		
Feasibility study	0.0%	$	-	O&M	$	79,648
Development	3.7%	$	100,000			
Engineering	1.8%	$	50,000			
Energy equipment	61.9%	$	1,693,000	**Annual Costs and Debt - Total**	**$**	**79,648**
Balance of plant	25.4%	$	695,000			
Miscellaneous	7.2%	$	196,106	**Annual Savings or Income**		
Initial Costs - Total	100.0%	**$**	**2,734,106**	Energy savings/income	$	330,307
				Capacity savings/income	$	-
Incentives/Grants		$	-			
				Annual Savings - Total	**$**	**330,307**
Periodic Costs (Credits)						
		$	-			
		$	-			
		$	-			
End of project life - Credit		$	-			

Financial Feasibility

			Calculate energy production cost?	yes/no	Yes
Pre-tax IRR and ROI	%	11.8%	Energy production cost	$/kWh	0.0614
After-tax IRR and ROI	%	11.8%	Calculate GHG reduction cost?	yes/no	No
Simple Payback	yr	10.9			
Year-to-positive cash flow	yr	9.0	Project equity	$	2,734,106
Net Present Value - NPV	$	1,158,862			
Annual Life Cycle Savings	$	108,561			
Benefit-Cost (B-C) ratio	-	1.42			

Yearly Cash Flows

Year #	Pre-tax $	After-tax $	Cumulative $
0	(2,734,106)	(2,734,106)	(2,734,106)
1	260,228	260,228	(2,473,877)
2	270,152	270,152	(2,203,725)
3	280,445	280,445	(1,923,281)
4	291,118	291,118	(1,632,163)
5	302,186	302,186	(1,329,977)
6	313,664	313,664	(1,016,313)
7	325,566	325,566	(690,747)
8	337,907	337,907	(352,840)
9	350,704	350,704	(2,136)
10	363,974	363,974	361,838
11	377,732	377,732	739,571
12	391,998	391,998	1,131,569
13	406,789	406,789	1,538,358
14	422,125	422,125	1,960,483
15	438,025	438,025	2,398,507
16	454,509	454,509	2,853,016
17	471,599	471,599	3,324,615
18	489,317	489,317	3,813,933
19	507,685	507,685	4,321,618
20	526,728	526,728	4,848,346
21	546,468	546,468	5,394,814
22	566,932	566,932	5,961,747
23	588,146	588,146	6,549,893
24	610,137	610,137	7,160,030
25	632,932	632,932	7,792,962

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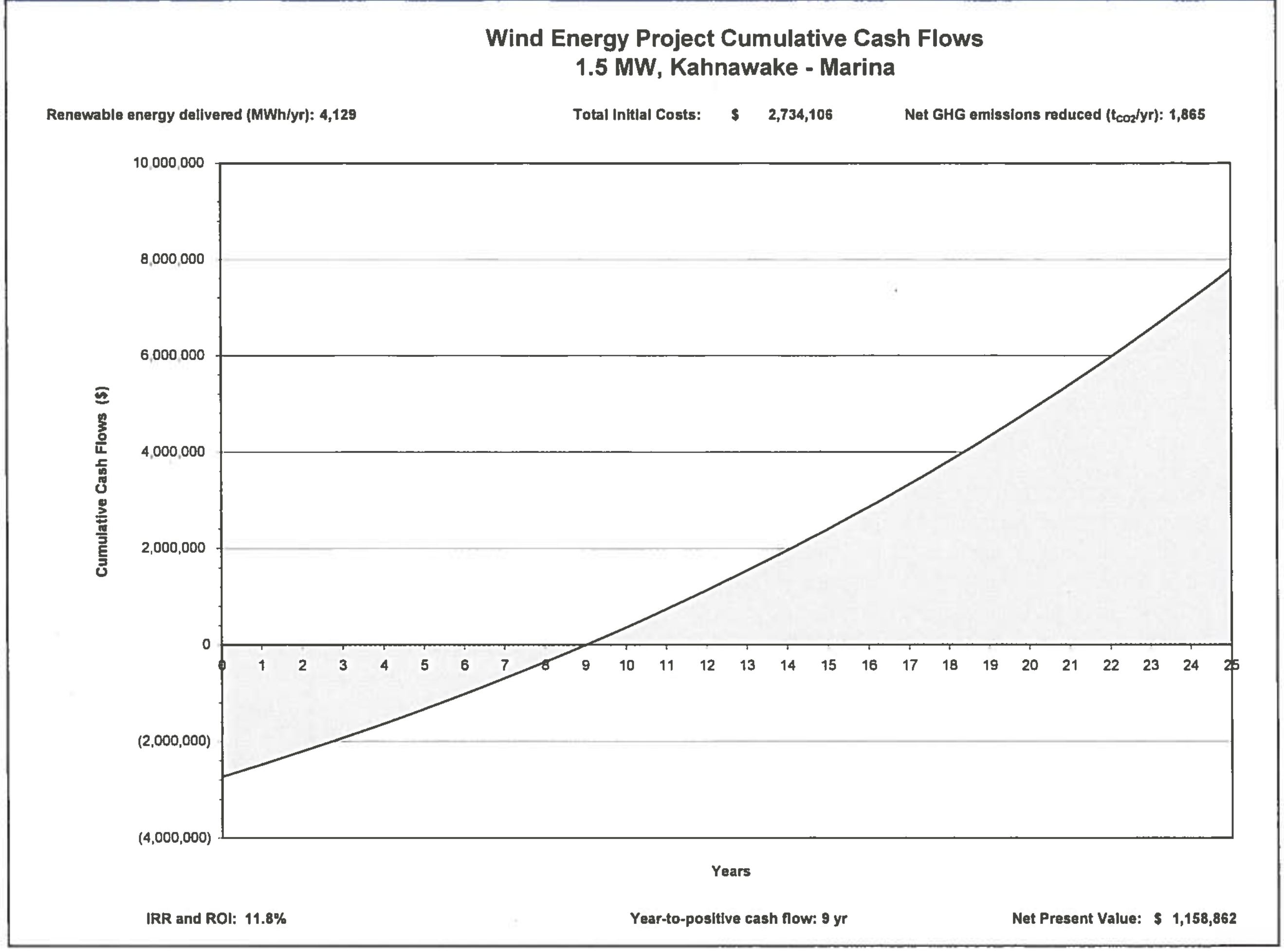
Cumulative Cash Flows Graph



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