DIRECTION DES ÉVALUATIONS ENVIRONNEMENTALES

Northland Power inc.

Projet éolien Saint-Ulric / Saint-Léandre

Avis de projet

Juin 2004

Québec
Ministère
de l'Environnement

INTRODUCTION

La section IV.1 de la Loi sur la qualité de l'environnement (L.R.Q., c. Q-2) oblige toute personne ou groupe à suivre la *Procédure d'évaluation et d'examen des impacts sur l'environnement* et à obtenir un certificat d'autorisation du gouvernement, avant d'entreprendre la réalisation d'un projet visé par le Règlement sur l'évaluation et l'examen des impacts sur l'environnement (R.R.Q., c. Q-2, r. 9). Entrée en vigueur le 30 décembre 1980, cette procédure s'applique uniquement aux projets localisés dans la partie sud du Québec. D'autres procédures d'évaluation environnementale s'appliquent aux territoires ayant fait l'objet de conventions avec les Cris, les Inuits et les Naskapis.

Depuis l'entrée en vigueur, le 18 juin 1993, de la Loi sur l'établissement et l'agrandissement de certains lieux d'élimination de déchets (chap. 44), tout projet d'établissement ou d'agrandissement d'un lieu d'enfouissement sanitaire ou de dépôt de matériaux secs, au sens du Règlement sur les déchets solides, est aussi assujetti à la procédure prévue à la section IV.1 de la Loi sur la qualité sur l'environnement.

Le dépôt de l'avis de projet constitue la première étape de la procédure. Il s'agit d'un avis écrit par lequel l'initiateur informe le ministre de l'Environnement de son intention d'entreprendre la réalisation d'un projet. Il permet aussi au Ministère de s'assurer que le projet est effectivement assujetti à la procédure et, le cas échéant, de préparer une directive indiquant la nature, la portée et l'étendue de l'étude d'impact que l'initiateur doit préparer.

Le formulaire avis de projet sert à décrire les caractéristiques générales du projet. Il doit être présenté d'une façon claire et concise et se limiter aux éléments pertinents à la bonne compréhension du projet et de ses impacts appréhendés. Ce formulaire et tout document annexé doivent être fournis en trente copies. Comme prévu à la procédure, l'avis de projet doit être mis à la disposition du public pour information et consultation publique du dossier.

Dûment rempli par le promoteur ou le mandataire de son choix, l'avis de projet est ensuite retourné à l'adresse suivante :

Ministère de l'Environnement
Direction des évaluations environnementales
Édifice Marie-Guyart, 6e étage
675, boul. René-Lévesque Est, boîte 83
Québec (Québec) G1R 5V7
Téléphone : (418) 521-3933
Télécopieur : (418) 644-8222

Février 2000

À l'usage du ministère de l'Environnement	Date de réception Numéro de dossier

1. Promoteur

Nom :	Northland Power Inc
Adresse :	30 St. Clair Ave West, 17th Floor Toronto Ontario M4V 3A2
Téléphone :	(416) 962-6262
Télécopieur :	(416) 962-6266
Courriel :	
Responsable du projet :	Contact : Mr. Jonathan Sandler Directeur – Développement d'affaires

Northland Power inc est un important développeur et opérateur de projets énergétiques de l'Ontario. Northland Power est actif dans le domaine de l'éolien, notamment par sa participation dans la coentreprise Énergie Éolienne du mont Miller inc. qui développe actuellement le projet éolien de 54 MW du Mont Miller à Murdochville. Northland Power a également développé plusieurs projets de biomasse dont ceux de Kirkland Lake et Cochrane, ainsi que le projet de cogénération de Iroquois Falls. Northland Power est aussi partenaire majoritaire dans un projet de chauffage urbain en Ukraine ainsi que partenaire dans un projet de cogénération à Kingston en Ontario.

Northland Power Inc is a significant developer and operator of energy projects from Ontario. Northland Power is active in the field of wind power, in particular by its participation in the joint venture Wind power project of the mount Miller Inc, which currently develops the wind project of 54 MW of the Miller Mount in Murdochville. Northland Power also developed several projects of biomass like those of Kirkland Lake and Cochrane, as well as the project of cogeneration of Iroquois Falls. Northland Power is also majority partner in a project of urban heating in Ukraine and also partner in a project of cogeneration at Kingston in Ontario.

2. Consultant mandaté par le promoteur (s'il y a lieu)

Nom :	SNC-LAVALIN INC.
Adresse :	5410, boulevard de la Rive-Sud
	Local 80
	Lévis (Québec) G6V 4Z2
Téléphone :	418 837-3621
Télécopieur :	418 837-2089
Courriel :	demer@igeq.com
Responsable du projet :	Robert Demers

3. Titre du projet

Parc éolien de St-Ulric/St-Léandre

Wind Power Farm of St-Ulric/St-Léandre

4. Objectifs et justification du projet

Mentionner les principaux objectifs poursuivis et faire ressortir les raisons motivant la réalisation du projet.

Le projet d'aménagement du parc éolien de St-Ulric/St-Léandre consiste en l'installation d'un parc d'éoliennes jusqu'à une puissance installée de 150MW dans le but de la production d'électricité. Ce projet vise à répondre à l'appel d'offres A/O 2003-02 d'Hydro-Québec émis le 12 mai 2003 pour 1000 MW de production d'énergie éolienne. L'appel d'offres découle de l'adoption par le Gouvernement du Québec, le 5 mars 2003, du décret numéro 352-2003, édictant *le Règlement sur l'énergie éolienne et sur l'énergie produite avec de la biomasse* et du décret numéro 353-2003 concernant les *préoccupations économiques, sociales et environnementales indiquées à la Régie de l'énergie à l'égard de l'énergie éolienne et de l'énergie produite avec de la biomasse.*

La région de St-Ulric/St-Léandre possède un bon potentiel pour un développement éolien d'envergure en raison de la qualité des vents du secteur, de la présence à proximité de lignes de transport d'électricité et d'un réseau routier bien élaboré favorisant l'accès facile au projet.

The project of the wind park of St-Ulric/St-Léandre consists in the installation of wind turbines farm working to an installed capacity of 150MW with an aim of electricity production. This project was presented at answering to call for tenders A/O 2003-02 from Hydro-Quebec emitted on May 12, 2003 per 1000 MW of wind energy production. The call for tenders rises from adoption by the Government of Quebec, March 5, 2003, of decree number 352-2003, enacting Regulation respecting wind energy and biomass energy and decree number 353-2003 concerning the economic, social and environmental concerns indicated to the Régie de l'Énergie with concern to wind energy and energy produced with biomass.

The area of St-Ulric/St-Léandre has a good potential for an important wind power development because of the quality of the winds of the sector, of the presence near of electricity transport lines and an elaborated road network giving an easy access to the project installations.

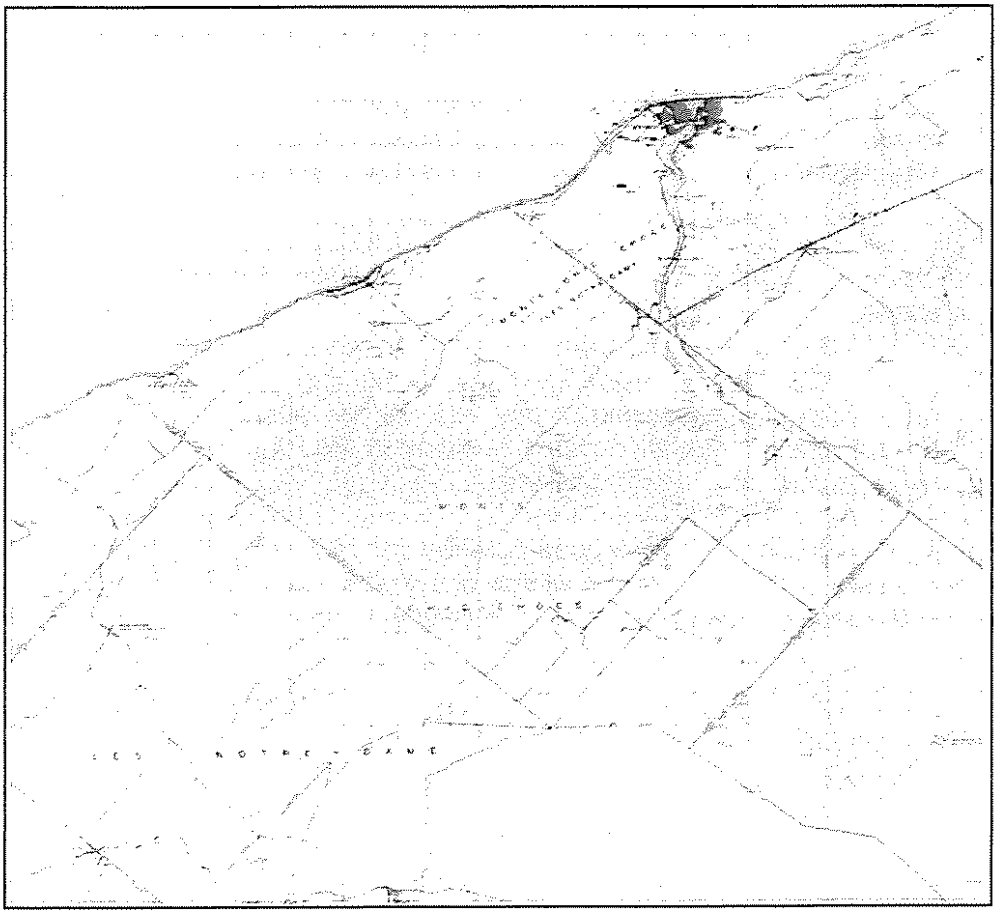
5. Localisation du projet

Mentionner l'emplacement ou les emplacements où le projet est susceptible de se réaliser et inscrire, si connus les numéros cadastraux (en terme de lot, rang, canton et municipalités touchés). Ajouter en annexe une carte topographique ou cadastrale de localisation du projet.

Le projet est situé dans les municipalités de St-Ulric, St-Léandre et de Matane dans la MRC de Matane. La carte ci-bas présente le détail des informations cadastrales du projet à ce jour. La microlocalisation n'étant pas finalisée, celle-ci pourra être appelée à changer ou à se préciser.

The project is located in the municipalities of St-Ulric, St-Léandre and Matane in the MRC of Matane. Cadastral information available until know is presented on the figure 1. Microlocalisation of the project is not completed yet, information will be provided when the exact zone of the project will be finalized.

Figure 1 : Localisation du projet d'éoliennes de St-Ulric/St-Léandre



6. Propriété des terrains

Indiquer, s'il y a lieu, le statut de propriété des terrains où la réalisation du projet est prévue. Fournir ces renseignements sur une carte si possible.

Plus de 60% de la superficie requise pour l'implantation du projet a déjà été sécurisée sous la forme d'ententes d'options pour l'installation des éoliennes et des chemins d'accès. La liste ci-jointe présente l'ensemble des propriétés ayant fait l'objet d'une telle entente d'option. Les lots sur les terres du domaine public font l'objet d'une lettre d'intention du Ministère des Ressources naturelles.

La propriété finale des terrains requise pour le projet sera fournie lorsque l'aire et la microlocalisation du projet seront finalisées.

Tableau 1 : Tableau des lots touchés par le projet et identification des lots faisant l'objet d'une entente d'option

Figure 2 : Carte cadastrale avec identification des lots signés (en brun) et des lots sur les terres du domaine public (en bleu)

More than 60% of the surface necessary for implantation of the project was already protected on the form of option agreement for the installation of the wind turbines and the access paths. The list presented at attached presents the properties concerned by such agreement option. The lands of the public domain make the object of an intention letter of Minister of the Natural Resources.

The final property of the lands will be provided when the exact zone and the microlocalisation of the project will be finalized.

Table 1: Table of the lands touched by the project and identification of the lands making object of an agreement option

Figure 2: Cadastral chart with identification of the lands signed (brown) and of the lands on the grounds of the public domain (in blue).

Projet St-Ulric/St-Léandre

Tableau 1 **Liste de Lots touchés ou potentiellement touchés par le projet**

Secteur	LOT	Propriétaire	Superficie
St-Ulric	Rg 2, lot 14-C, 14-C-2, 14-C-3	Jocelyn Sirols	15.16
St-Ulric	Rg 2, lot 13-R	Serge Sirois	9.41
St-Ulric	Rg 2, lot 13-Q-P	L Dion, A Ouellet	7.52
St-Ulric	Rg 2, lot 13-Y	Ferme de la Tour	22.58
St-Ulric	Rg 2, lot 13-D-P,12-I-1-P, 12-I-2-P, 12-E-P, 12-A-P, 11-F	Denis, Rolande, Jocelyn, Michel Si	56.31
St-Ulric	Rg 2, lot 12-E-P, 12-A-P, 11-F-P	Serge Sirois	6.20
St-Ulric	Rg A, lot 11-D2, 11-E-2	Siméon Sénéchal	13.74
St-Ulric	Rg A, lot 11-A-10-F	Raymond Pelletier	45.2
St-Ulric	Rg A, lot 10-E, 9-E, 9-F, 9-D-2	Ranch Danclau	40
St-Ulric	Rg 3, lot 15-EP, 16-FP	Certi Grains Inc.	76.31
St-Ulric	Rg 3, lot 18-A-P, 17-D-P	Madonne Desrosiers	41.1
St-Ulric	Rg 3, lot 18-B-P	Armand Coulombe	20.03
St-Ulric	Rg 3, lot 18-C-1	Carole Michaud	7.94
St-Ulric	Rg 3, lot 19-D-1-P	Gisèle Charest	19.48
St-Ulric	Rg 3, lot 19-D-1	Berthier et Gervais Sirols	32.21
St-Ulric	Rg 3, lot 19-C-1	Gervais Sirois	30.35
St-Ulric	Rg 3, lot 25-1	Jocelyn Collin	21.57
St-Ulric	Rg 3, lot 25-2	Dolorès Fournier	21.57
St-Ulric	Rg 3, lot 25-3-1	Martine Béland & als	6
St-Ulric	Rg 3, lot 25-3-2	Martine Béland & als	6
St-Ulric	Rg 3, lot 25-4	R. Lepage (Marie-Rose Lévesque)	30
St-Ulric	Rg 3, lot 26-1	Ghislain Desrosiers	29.87
St-Ulric	Rg 3, lot 26-2, 26-2P	Roberto Ouellet	21
St-Ulric	Rg 3, lot 26-3, 27-A	Michel Caron	13.42
St-Ulric	Rg 3, lot 27-A	Ange-Marie Pelletier	34.84
St-Ulric	Rg 3 lot 27-B	Jean-Louis Roy	43.14
St-Ulric	Rg 3, lot 28-1	Jean-Marie Gauthier	24.89
St-Ulric	Rg 4, lots 19-B-P, 19A-P, 18-D-P, Rg 3 lot 19-D-2, 18D-2	Marxc-André Larrivée	114.14
St-Ulric	Rg 4, lot 19-CP, 19DP		**20.50**
St-Ulric	Rg 4, lot 20-P		20.50
St-Ulric	Rg 4, lot 21-P, 22-P	Magella Gagné	143.4
St-Ulric	Rg 4, lot 22	Ghislain Marquis	40.47
St-Ulric	Rg 4, lot 23-P	Pierre Lagacé	79.60
St-Ulric	Rg 4, lot 23-P, 24-P	R. Beaulieu	45.3
St-Ulric	Rg 4, lot 24-P	Magelle Gagné	52.8
St-Ulric	Rg 4, lot 25-P, 25-P2	Adrien Morin	91.46
St-Ulric	Rg 4, lot 26	Gilbert Otis	75.00
St-Ulric	Rg 4, lot 27	Gilbert Otis	75.00
St-Ulric	Rg 4, lot 28	Gilbert Otis	75.00
St-Ulric	Rg 5, lot 19-B-P		39.60
St-Ulric	Rg 5, lots 20-P, 21-P	Léonard Desrosiers	110.47
St-Ulric	Rg 5, lot 21-P	Marc Joncas	29.15
Saint-Léandre	Rg 6, lots 9-A, 9-B	Ferme Jeany & Fils inc	30.35
Saint-Léandre	Rg 6, lots 9-C, 9-D	Ferme Jeany & Fils inc	30.35
Saint-Léandre	Rg 6, lot 9-E-P, 10-AP, 10-BP	Serge Liard	31.11
Saint-Léandre	Rg 6, lot 10-BP, 10-CP	Roger Bernier	15
Saint-Léandre	Rg 6, lots 11-A, 11-B	Ferme Jeany & Fils inc	40.5
Saint-Léandre	Rg 6, lots 11-C, 11-D, 12-A, 12-B	Ferme Jeany & Fils inc	40.5
Saint-Léandre	Rg 6, lots 12 DP, 12 CP	Rachel Bernier	17.50
Saint-Léandre	Rg 6, lots 13 BP, 13 AP	Ernest Ouellet et Als	42.17
Saint-Léandre	Rg 6, lots 14-AP, 13 DP, 13CP	Richard Durette	63.27
Saint-Léandre	Rg 6, lots 14-CP, 14-B	Brigitte Desrosiers	42.20
Saint-Léandre	Rg 6, lots 14-D-P, 15-A-P, 15-BP	Pierrette Bélanger	62.24
Saint-Léandre	Rg 6, lot 15-C	Réal Bérubé	21.08
Saint-Léandre	Rg 6, lot 15-D, 16-A, 16-B	Gilles Therrien	45.61
Saint-Léandre	Rg 6, lot 15-D, 16-A, 16-B	Bernard Michaud	25.18
Saint-Léandre	Rg 6, lot 16-CP	Bertrand Tremblay	1.62
Saint-Léandre	Rg 6, lot 16-C, 16-D	Blaise Barrette, Yvan Barrette, Nic	40.87
Saint-Léandre	Rg 6, lot 17-AP, 17-B	André Caron	34.35
Saint-Léandre	Rg 6, lot 17-C, 17-D, 18-A	Gérard Lévesque, Jean-Baptiste Le	63.74
Saint-Léandre	Rg 6, lot 19-B	Bruno Ouellet	21.275
Saint-Léandre	Rg 6, lot 19-CP	René Tremblay	9.975
Saint-Léandre	Rg 6, lot 19-CP	Robert Tremblay	9.975
Saint-Léandre	Rg 6, lot 19 D, 20-A	René Tremblay, Marie Chantal The	26.397

Saint-Léandre	Rg 6, lot 20-A, 20-B	Lise Beaudoin, Rolland Jones	3.87
Saint-Léandre	Rg 6, lot 20-A, 20-B	Robert Tremblay, Paula McKeown	28.381
Saint-Léandre	Rg 6, lot 20-C, 20-D, 21	Entreprises Forestières Réjean Sa	127.48
Saint-Léandre	Rg 6, lot 22	Gov. of Québec	84.99
Saint-Léandre	Rg 6, lot 23	Gov. of Québec	84.99
Saint-Léandre	Rg 6, lot 24	Gov. of Québec	84.99
Saint-Léandre	Rg 6, lot 25-P	Gov. of Québec	42.49
Saint-Léandre	Rg 6, lot 25-P	Anne Côté	42.49
Saint-Léandre	Rg 6, lot 26	Gov. of Québec	84.99
Saint-Léandre	Rg 7, lot 14-C	Ferme Jeany & Fils inc	21.87
Saint-Léandre	Rg 7, lots 14-C, 15-A, 15-B	André Michaud	57.04
Saint-Léandre	Rg 7, lot 15-C	Réjean Bélanger	13.63
Saint-Léandre	Rg 7, lot 15-D	Ferme Jeany & Fils inc	26.71
Saint-Léandre	Rg 7, lot 16-P	Roger Bernier	54.62
Saint-Léandre	Rg 7, lot 16-P	Bernard Michaud	18
Saint-Léandre	Rg 7, lots 17-AP, 17-BP	Réjean Bélanger	26.51
Saint-Léandre	Rg 7, lots 17-AP, 17-BP	Bernard Otis	20.19
Saint-Léandre	Rg 7, lots 17-B, 17-C, 18-A	Claude Bernier	73.80
Saint-Léandre	Rg 7, lot 18-B, 18-C	Christian Fortin	34.09
Saint-Léandre	Rg 7, lots 18-B, 18-C	Gérard Côté	10.00
Saint-Léandre	Rg 7, lot 19-P	Micheline Soucy	84.49
Saint-Léandre	Rg 7, lots 20-P		42.49
Saint-Léandre	Rg 7, lot 20-P, 21-P		63.79
Saint-Léandre	Rg 7, lot 22-P		33.34
Saint-Léandre	Rg 7, lots 22-P, 23, 24-P	Réjean Deschênes	126.19
Saint-Léandre	Rg, 8 lot 3A, 3B, 4A	Roger Bernier	40.18
Saint-Léandre	Rg, 8 lot 4-B	Nicole Blouin	36.98
Saint-Léandre	Rg, 8 lot 5-A	Ferme Maridel	37.00
Saint-Léandre	Rg 8, lot 5-B, 6-P	Bernard Michaud	103.00
Saint-Léandre	Rg 8, lot 7	Doria Bernier	97.68
Saint-Léandre	Rg 8, lot 8-P, 9P (1/2 lot)	Réjean Murray	66.59
Saint-Léandre	Rg 8, lot 9-P, 10, 11-P	André Bélanger	140.00
Saint-Léandre	Rg 8, lot 11-P	H. Desrosiers	40.3
Saint-Léandre	Rg 8, lot 11-P, 12-P	André Bélanger	42.23
Saint-Léandre	Rg 8, lot 12-P-13-P	André Caron	43.98
Saint-Léandre	Rg 8, lot 13-P	Antoine Bérubé	16.11
Saint-Léandre	Rg 8, lot 13-P	Houvette Desjardins	13.27
Saint-Léandre	Rg 8, lot 13-P	Qc 9001-5561 Inc (Roberto Ouellet	10.99
Saint-Léandre	Rg 8, lot 13-P	Frédéric Saucier	21.7
Saint-Léandre	Rg 8, lot 14-P	Denis Lamarre	84.8
Saint-Léandre	Rg 8, lot 15-P	Réjean Gagné	61.98
Saint-Léandre	Rg 8, lot 15-P, 16-P	Bruno Côté	66.52
Saint-Léandre	Rg 8, lot 20	Doris Guillot	85.47
Saint-Léandre	Rg 8, lot 21	Doris Guillot	85.47
Saint-Léandre	Rg 8, lot 22	Doris Guillot	85.47
Saint-Léandre	Rg 8, lot 23	Jacques Grenier	92.58
Saint-Léandre	Rg 8, lot 24	Jacques Grenier	92.58
Saint-Léandre	Rg 8, lot 25	Gov. of Québec	84.99
Saint-Léandre	Rg 9, lot 11,	S Fortin	42.49
Saint-Léandre	Rg 9, lot 12	90203019 Quebec Inc (S.Fortin)	40.17
Saint-Léandre	Rg 9, lot 13-P	Daniel Gauthier	20.59
Saint-Léandre	Rg 9, lot 13-P	Raynald Dionne	20.77
Saint-Léandre	Rg 9, lot 14	Jean-Louis Saucier	42.49
Saint-Léandre	Rg 9, lot 15	Jean-Yves Desrosiers	44.31
Saint-Léandre	Rg 9, lot 16	G. Ouellet	41
Saint-Léandre	Rg 9, lot 17	Marcel Tremblay & Michèle Lapierr	39.35
Saint-Léandre	Rg 9, lot 18-P	Richard D' Auteuil	20.24
Saint-Léandre	Rg 9, lot 18-P	Réjean Deschênes	6.48
Saint-Léandre	Rg 9, lot 19-P	Raymond Tremblay	22.3
Saint-Léandre	Rg 9, lot 26	Denis Bélanger	42.49
Saint-Léandre	Rg 9, lot 27	Daniel Fortin	42.49
Saint-Léandre	Rg 9, lot 28	Daniel Fortin	42.49
Saint-Léandre	Rg 9, lot 29	Maria Fortin et Als.	40.47
Saint-Léandre	Rg 9, lot 30	Gov. of Québec	42.49
Saint-Léandre	Rg 9, lot 31	Gov. of Québec	42.49
Saint-Léandre	Rg 9, lot 36	Louiselle Bérubé	42.49
Saint-Léandre	Rg 9, lot 37	Paul-Omer Levasseur, Viateur Lev	42.49

Saint-Léandre	Rg 9, lot 38	Gov. of Québec	42.49
Saint-Léandre	Rg 9, lot 39	Gov. of Québec	42.49
Saint-Léandre	Rg 9, lot 40	Gov. of Québec	42.49
Saint-Léandre	Rg 9, lot 41	Gov. of Québec	38.45
Saint-Léandre	Rg 9, lot 42	Gov. of Québec	38.45
Saint-Léandre	Rg 9, lot 43	Gov. of Québec	39.05
Saint-Léandre	Rg 9, lot 44	Gov. of Québec	40.57
Saint-Léandre	Rg 9, lot 45	Jacques Grenier	42.49
Saint-Léandre	Rg 9, lot 46	Jacques Grenier	42.49
Saint-Léa			
Saint-Léandre	Rg 10, lot 11	Réginald Gauthier	42.49
Saint-Léandre	Rg 10, lot 12	Bertrand Murray	42.49
Saint-Léandre	Rg 10, lot 25	Gov. of Québec	42.49
Saint-Léandre	Rg 10, lot 26	Gov. of Québec	42.49
Saint-Léandre	Rg 10, lot 31	Gov. of Québec	38.15
Saint-Léandre	Rg 10, lot 32	Gov. of Québec	42.49
Saint-Léandre	Rg 10, lot 33	Gov. of Québec	42.49
Saint-Léandre	Rg 10, lot 34	Gov. of Québec	42.49
Saint-Léandre	Rg 10, lot 35	Gov. of Québec	42.49
Saint-Léandre	Rg 10, lot 36	Gov. of Québec	42.49
Ste-Paule	Rg 10, lot 37	Gilbert Rioux	42
Saint-Jérôme-d	Rg Riv. Matane, lots 1, 2, 2-A, 2-B, 2-C	9096-2168 Qc inc.(Mme Claude G	
Saint-Jérôme-d	Rg Riv. Matane, lots 3, 4, 5, 6	9	
Saint-Jérôme-d	Rg Riv. Matane, lots 7, 8, 9	R	
Saint-Jérôme-d	Rg Riv. Matane, lot 10	R	
Saint-Jérôme-d	Rg Riv. Matane, lot 11	A	

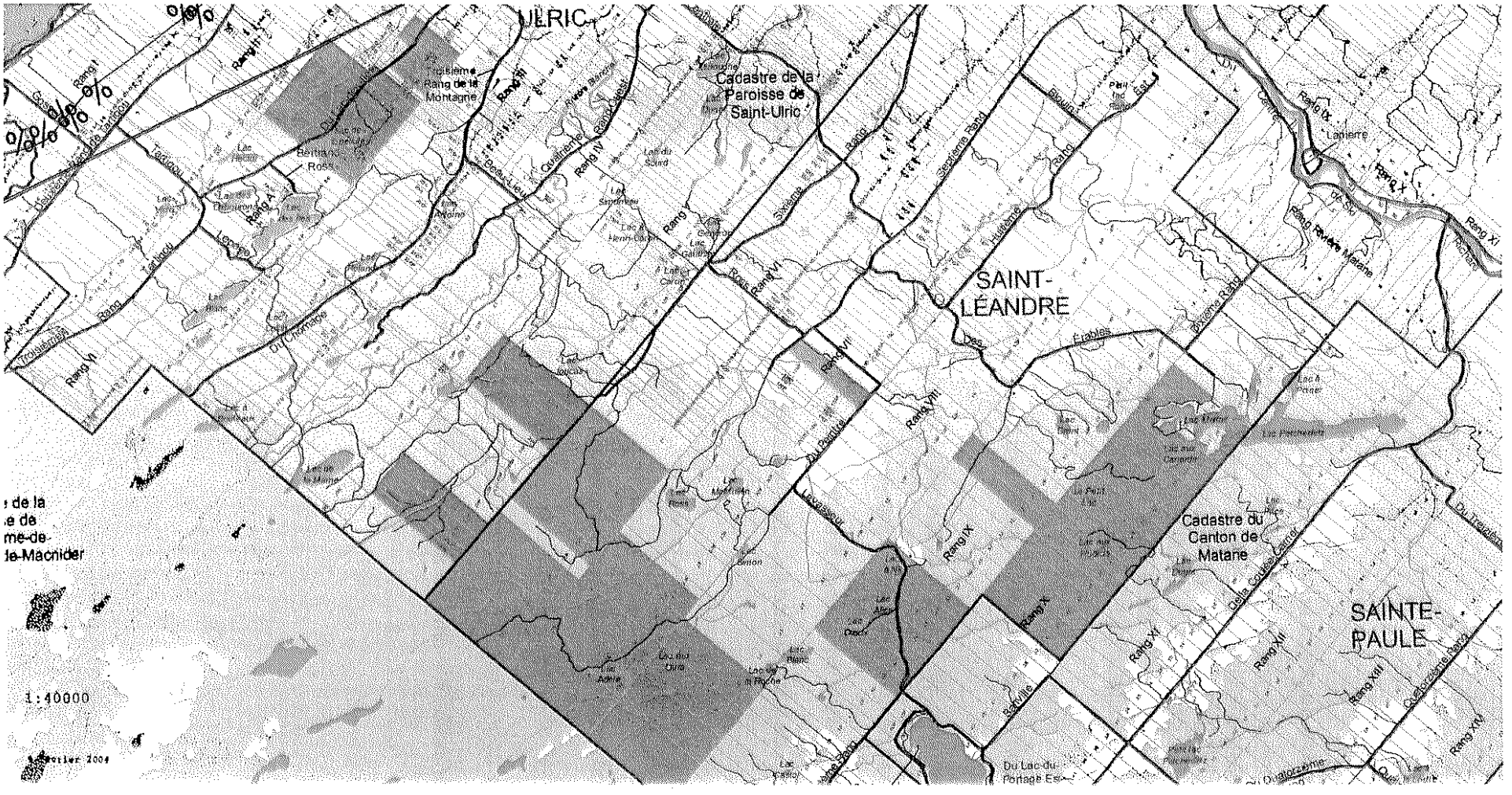


Figure 2 Carte cadastrale

Figure 2 Cacastral chart

7. Description du projet et de ses variantes

Pour chacune des phases (aménagement, construction et exploitation), décrire les principales caractéristiques associées à chacune des variantes du projet, incluant les activités, aménagements et travaux prévus (déboisement, expropriation, dynamitage, remblayage, etc.). Décrire sommairement les modalités d'exécution, les technologies utilisées, les équipements requis, les matières premières et matériaux utilisés, etc. Ajouter en annexe tous les documents permettant de mieux cerner les caractéristiques du projet (plan, croquis, vue en coupe, etc.).

Les principales composantes du projet sont présentées sur le plan ci-joint. Le projet consiste en l'implantation de :

- 100 éoliennes GE 1.5 sle (voir spécifications ci-jointes)
- un réseau de chemins d'accès d'environ 40 kilomètres
- Une sous-station équipée de 2 transformateurs de 230/34.5 kV
- Une ligne de transmission jusqu'au lieu d'interconnection à la ligne de 230 kV d'HQ

The principal components of the project are presented on the plan attached. The project consists in the implantation of:

- 100 wind turbines GE 1.5 sle (see specifications attached)
- a network of access paths of about 40 kilometers
- a sub-station equipped with 2 transformers of 230/34.5 Kv
- a transmission line until the interconnection to the line of 230 Kv of HQ

L'aménagement des sites

L'aménagement des sites comprendra des activités de construction des chemins d'accès et de déboisement dans les secteurs forestiers et de chemins d'accès seulement dans les secteurs agricoles. Par la suite, les emprises des éoliennes ainsi que les aires d'assemblage et de travail nécessaires pour l'installation des éoliennes et des infrastructures seront déboisées(si requis) et adaptées aux caractéristiques requises pour permettre les travaux.

Development of the sites will include construction of the access roads and clearing in the forest sectors and construction of access road only in the agricultural sectors. Thereafter, the wind turbines paths as well as the work surfaces necessary for the installation of the wind turbines and other infrastructures will be cleared (if necessary) and adapted to the characteristics required to allow works.

Construction

Les activités de construction comprendront notamment la préparation des fondations des éoliennes. Celles-ci seront des fondations en béton de type « spread footed » d'environ 2,5 mètres de profondeur et de 17 mètres de largeur.

The construction will include in particular the preparation of the foundations of the wind turbines. Those will be concrete foundations, which could be of spread-footed type of about 2,5 meters depth and 17 meters width.

Les activités de construction comprendront également l'implantation d'un réseau de communication par fibre optique et d'un réseau de collecte d'électricité. Ce réseau sera partiellement souterrain et partiellement aérien. Les portions souterraines seront présentes dans les secteurs de plus forte densité des éoliennes ainsi que dans les secteurs à forte sensibilité visuelle. Le réseau de collecte aérien prédominera dans les secteurs de moindre visibilité et en forêt.

The activities of construction will also includes implantation of communication network per optical fiber and electricity collecting system. This network will be partially underground and partially overhead. The underground portions will be present in the sectors of stronger density of the wind turbines like in the sectors with strong visual exposure. The overhead collecting system will prevail in the sectors of less visual exposure and in forest.

L'installation des éoliennes en tant qu'unités énergétiques autonomes se fera par l'érection des pièces composant la tour, la nacelle et les pales des éoliennes à l'aide de grues. Celles-ci seront installées sur des aires spécialement aménagées selon les spécifications de portance et de type de sol adaptées à l'équipement.

Le projet comprendra également la construction d'une sous-station électrique qui permettra de recueillir en un seul lieu toute l'énergie générée par le projet et d'augmenter le voltage afin de relier le projet à la ligne à haute tension de 230KV passant à proximité du projet.

Le raccordement du projet via la sous-station se fera par une ligne à haute tension de 230 KV jusqu'à la ligne de 230 kV à proximité du site.

Erecting the parts composing the tower, the nacelle and the blades of the wind turbines by cranes will do installation of the wind turbines as autonomous energy unities. Those will be installed on surfaces especially arranged according to specifications of ground pressure and type of ground adapted to equipment.

The project will also include the construction of a sub-station which will make it possible to collect in only one place all the energy generated by the project and to augment the voltage in order to connect the project to the high-tension line of 230KV passing near the project area.

The connection of the project via the sub-station will be made by a high-tension line of 230 Kv up to the line of 230 Kv near the site.

Exploitation

Les activités associées à la phase d'exploitation du site seront minimes et reliées à l'entretien et le remplacement de composantes de façon normale pour un projet éolien. L'entretien préventif prévoit des vérifications régulières à tous les trois mois lors de la première année d'exploitation, et de façon bi-annuelle par la suite.

Activities associated with the exploitation of the site will be minimal and will be related to maintenance and replacement of components in a normal way for a wind project. Preventive maintenance expects regular checks in every three months at the time of the first year of exploitation, and a biannual way thereafter.

Les activités d'entretien comprendront le remplacement des huiles et le graissage des équipements, la vérification et la calibration des équipements, les tests diagnostics du fonctionnement et l'usure des composantes de l'éolienne. Celles-ci comprennent les pales, l'arbre de transmission principal, la boîte de vitesse, les divers moteurs servant à diriger les pales et l'orientation de l'éolienne, le système de refroidissement, la génératrice et le transformateur. Ce dernier sera installé à la base de l'éolienne dans une armoire de protection équipée d'une contenance en cas de déversement et permettant de recueillir plus que la capacité du transformateur en huile de refroidissement.

The maintenance activities will include the replacement of oils and the lubrification of the equipment, the checking and the calibration of the equipment, the tests diagnoses of operation and the wear of the components of wind turbines. Those include the blades, the main transmission shaft, the gearbox, the various engines being used to direct the blades and orientation of wind turbines, the cooling system, the generator and the transformer. This last will be installed at the base of wind turbine in a protection room equipped with a retention tank in case of event of discharge and making it possible to collect more than the transformer capacity of cooling fluids.

Des activités de maintien des accès seront également réalisées au cours de la période d'exploitation. Celles-ci comprendront le déneigement en hiver et le re-surfaçage au besoin pour les chemins d'accès principaux.

Maintenance of the access paths will be also carried out during the exploitation period. Those will include the snow clearance in winter and the patching, when necessary, of the principal access roads.

8. Composantes du milieu et principales contraintes à la réalisation du projet

Pour l'emplacement envisagé, décrire brièvement les milieux naturel et humain tels qu'ils se présentent avant la réalisation du projet, ainsi que les principales contraintes prévisibles (zonage, espace disponible, milieux sensibles, compatibilité avec les usages actuels, disponibilité des services, topographie, présence de bâtiments, préoccupations majeures de la population, etc.).

Description du territoire et du milieu

Le territoire de la zone d'étude se compose de deux entités distinctes : la côte du fleuve Saint-Laurent et le massif des Appalaches. La zone côtière du fleuve Saint-Laurent est formée de plateaux et de terrasses. Cette zone présente généralement un relief peu accidenté. Seules les dénivellations entre les plateaux et les terrasses de même que les petites vallées encaissées dans les dépôts meubles comme celle de la rivière Matane font exception au relief plutôt vallonné. Plus au sud, le territoire regroupe à la fois des caractéristiques naturelles typiques au littoral et au massif des Appalaches. À l'extérieur de la vallée de la rivière Matane et de quelques autres cours d'eau, l'altitude dépasse 200 mètres et la température moyenne annuelle est légèrement inférieure à ce qui est observé le long de la côte.

La zone d'étude est touchée par deux bassins hydrographiques, soit celui de la rivière Matane et celui de la rivière Blanche. À noter que la zone d'étude comporte également plusieurs lacs.

Le territoire est fréquenté par plusieurs espèces fauniques dont certaines présentent un grand intérêt pour la collectivité. À titre d'exemple, il est clairement démontré que l'orignal, le saumon et l'omble de fontaine sont fortement convoités par les chasseurs et les pêcheurs. On retrouve également le cerf de Virginie dans la région.

La rivière Matane dont une partie du bassin versant est située dans la zone d'étude est une excellente rivière à saumon. Le territoire de la MRC de Matane est également reconnu pour son excellent potentiel de production d'ombles de fontaine.

Description of the territory

The territory of the study area is formed of two distinct entities: the coast of the St. Lawrence River and the massif of the Appalachian Mountains. The coast of the St. Lawrence River is formed by plateaus and terraces. This zone is a fairly flat region except a few small valleys between plateaus and terraces and the valleys formed by rivers like Matane River. More in the south, the territory is characterized both by natural typical at the littoral and the massif of the Appalachian Mountains. Outside the Matane river's valley and of some other rivers, altitude is over 200 meters and the annual average temperature is colder compared to the coastal zone.

Two catchment's areas, the Matane river basin and the Blanche river basin touch the area study. The study area comprises also several lakes.

The territory is frequented by several species of which some present large interest for the collectivity. For example, the moose, the salmon, the brook trout and the white tail deer are species much sought after by hunters and fishers.

The Matane river of which part of the catchments area is located in the study area is an excellent salmon river. The territory of the RCM of Matane is also recognized for its excellent potential of brook trout.

Le couvert forestier

Pour la partie sud de la zone d'étude les peuplements mélangés dominent dans une proportion d'environ 40%. Les peuplements de feuillus et de résineux se retrouvent en proportions à peu près égales, constituant chacune environ 30% de la population totale. Pour la partie plus au nord de la zone d'étude, les peuplements sont dominés par les peuplements mélangés à près de 60%, suivi par les peuplements résineux à près de 25% et les peuplements feuillus à 15%.

Notons une concentration de tourbières dans la municipalité de Saint-Ulric sur une superficie de 400 hectares. Ces tourbières figurent parmi les plus importantes de l'est du Québec en terme de capacité de production.

Forest cover

For the southern part of the study area the mixed stands dominate in a proportion of 40%. Hardwood stands and softwood stands are both found in approximately 30% of the total population. For the northern part of the study area, mixed stands dominate at 60%, followed by the softwood stands at 25% and the hardwood stands at 15%.

There is a concentration of peat lands in Saint-Ulric, covering a superficies of 400 hectares. These peat lands are considered as the most important in term of production capacity in eastern Quebec.

Utilisation du territoire

La majeure partie du territoire de la zone d'étude est située en zone d'affectation forestière. Par ordre décroissant de superficie on retrouve ensuite en zone d'affectation agricole composée d'un secteur agro-forestier et d'un secteur agricole dynamique, une zone d'affectation récréative et enfin une zone d'affectation urbaine.

On retrouve plusieurs lacs possédant un potentiel pour le développement de la villégiature. Certains de ceux-ci sont situés dans la zone d'étude (lac Malfait et lac aux Canards) tandis que d'autres sont situés à proximité de celle-ci (lac des îles, lac Blanc, lac Petchedetz et lac du Portage).

Le schéma d'aménagement de la MRC de Matane identifie plusieurs attraits touristiques tant dans la zone d'étude qu'à proximité de celle-ci : centre de ski alpin, pistes de ski de fond, chutes, auberge.

On retrouve deux sentiers de motoneige faisant partie du réseau provincial qui traversent une partie de la zone d'étude, soit les sentiers 5 et 591. Un sentier de quad est également en développement entre Sainte-Paule et Saint-Ulric.

Notons la présence d'une tour de télécommunication (micro-ondes) de la compagnie Telus située à Saint-Ulric et d'un aéroport situé à quelques minutes de la ville de Matane sur le territoire de la municipalité de Petit-Matane

Territory use

The major part of the study area is located in a zone of forestry affectation. In decreasing order of surface one then find agricultural affectation zone composed by an agro-forestry sector and a dynamic agricultural sector, a recreational affectation zone and finally an urban affectation zone.

One finds several lakes with a potential for resort development. Some of these are located in the study area (lac Malfait and lac aux Canards) while others are located very close from the study zone (lac des Îles, lac Blanc, lac Petchedetz and lac du Portage).

The development plan of the RCM of Matane identifies several tourist attractions directly in or close of the study area : alpine skiing center, cross-country skiing trails, falls, inn.

Two snowmobile paths belonging to the provincial network (# 5 and # 591) are located in the study area. A path of quad is in development between Sainte-Paule and Saint-Ulric.

Let us note finally the presence of a communication tower (microwaves) of Telus company erected in Saint-Ulric, and an airport located in the municipality of Petit-Matane at the east of the town of Matane.

Portrait agricole

Pour l'ensemble de la MRC, la superficie agricole en vertu de la Loi sur la protection du territoire et des activités agricoles (L.R.Q.,c.P-41.1) constitue 14% du territoire. La superficie cultivée correspond à 9.3% seulement du territoire. Les activités agricoles sont concentrées surtout dans les municipalités bordant le fleuve Saint-Laurent, tel Saint-Ulric. C'est la production laitière qui domine les activités agricoles de la région.

Agriculture

RCM agricultural surface under the terms of the Act respecting the preservation of agricultural land and agricultural activities. (L.R.Q., c.P-41.1) represents 14% of the lands. Cultivated lands correspond to 9.3% only of the territory. Agricultural activities are concentrated especially in the municipalities bordering the river St. Lawrence, like Saint-Ulric. Milk production dominates the agricultural activities of the region.

9. Principaux impacts appréhendés

Pour les phases d'aménagement, de construction et d'exploitation du projet, décrire sommairement les principaux impacts (milieux naturel et humain) susceptibles d'être causés par la réalisation du projet.

Pour la phase construction, des impacts mineurs sont appréhendés au niveau de la végétation qui devra être enlevée pour la mise en place des chemins et des éoliennes. Quelques ruisseaux seront traversés par les chemins d'où des impacts potentiels sur l'habitat du poisson et la qualité de l'eau. Des impacts résultant de l'accroissement de la circulation en période de construction sont anticipés et feront l'objet d'une coordination spécifique.

Au niveau économie régionale, des retombées positives très importantes sont anticipées. La construction des chemins incluant la traversée des cours d'eau se feront en conformité avec le *Règlement sur les normes d'intervention en milieu forestier* (RNI).

Pour la phase exploitation, selon la littérature, des impacts peuvent être appréhendés au niveau visuel et du bruit, l'importance de ces impacts anticipés devra l'objet d'une attention particulière près des secteurs de villégiature. Un facteur d'atténuation important est l'aménagement du projet sur plusieurs kilomètres ainsi que le recours à une technologie de grande puissance réduisant la densité du projet. Toujours selon la littérature et l'expérience californienne, des impacts sont appréhendés au niveau de la faune avienne. Par contre, l'importance de cet impact doit être pondérée, lorsqu'on considère l'expérience européenne et si l'on se réfère aux observations faites à partir du suivi des projets de Matane et de Cap-Chat. Sur le plan récréo-touristique, des impacts positifs peuvent être appréhendés. Généralement, ce type de projets suscite l'intérêt des touristes. Au niveau économique des retombées positives sont anticipés pour la communauté par les emplois directs et indirects que le projet apportera.

For the construction phase, minor impacts are apprehended on the level of the vegetation which will have to be removed for the installation of the roads and the wind turbines. Some rivers will be crossed by the roads which will create potential impacts on fish habitat and the quality of water. Some impacts resulting from vehicle traffic augmentation during the construction period are anticipated and they will be the object of a specific coordination.

For regional economy, very significant positive repercussions are anticipated.
The construction of the roads (including the crossing of the rivers) will be done in conformity with the *Règlement sur les normes d'intervention dans les forêts du domaine public* [public forest operation standards regulations].

For the exploitation phase, according to the literature, some visual and noise impacts can be apprehended, the importance of these anticipated impacts will be the object of a special attention particularly close to the sectors of resorts. An important attenuation factor is development of the project on several kilometers as well as the recourse to a technology of great power reducing the density of the project. Always according to the literature and Californian experience, some impacts are apprehended on the level of the avifauna. On the other hand, the importance of these impacts must be balanced, if we consider European experience and if we refer to the observations made from the follow-up of the projects of Matane and Cape-Cat. On the tourism level, positive impacts can be apprehended. Generally, this type of project will enhance tourists interest. On the economic level, positive repercussions are anticipated for the community by direct and indirect employment that the project will bring.

10. Calendrier de réalisation du projet

Voir Figure 3

See figure 3

11. Phases ultérieures et projets connexes

Aucun

None

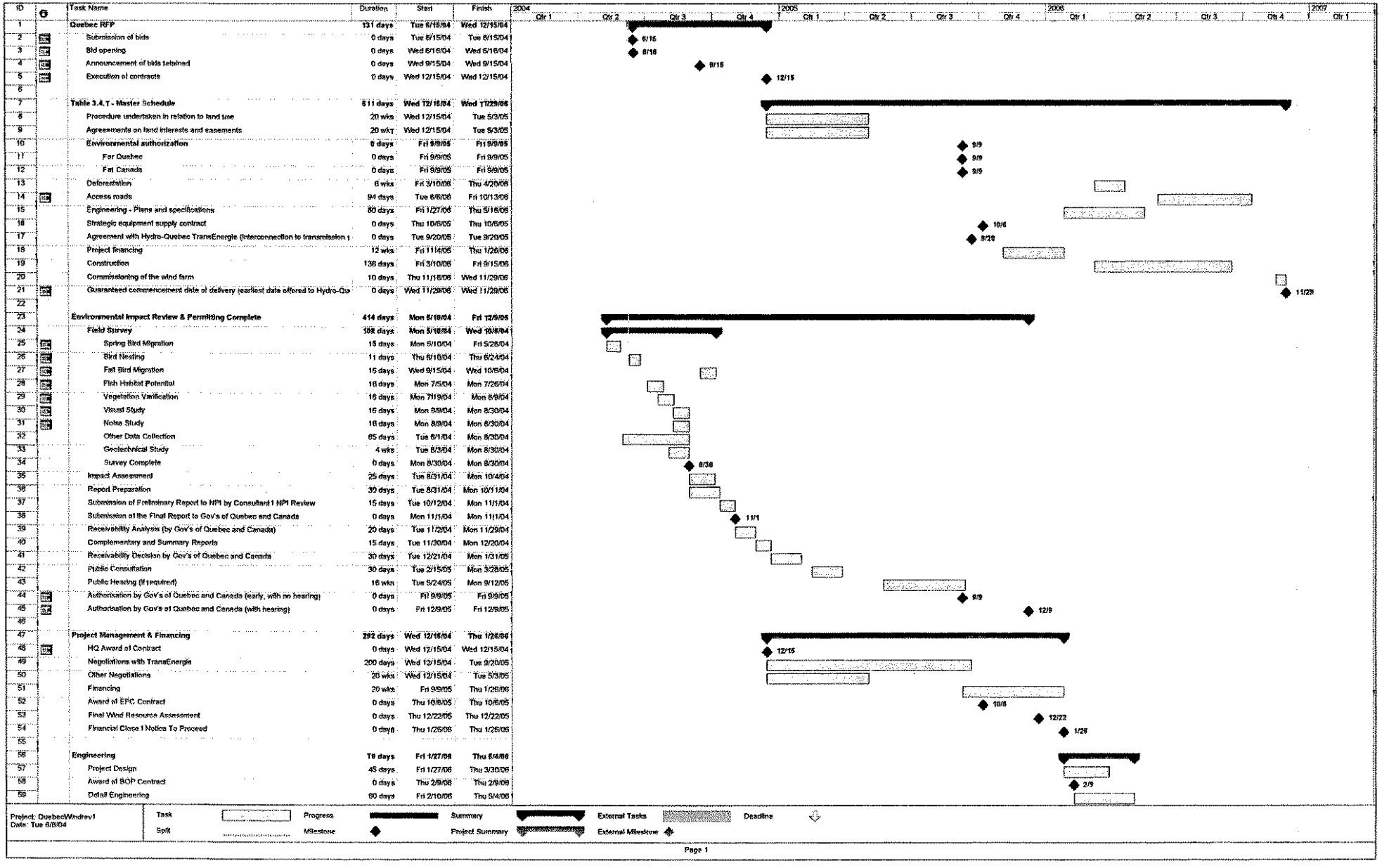
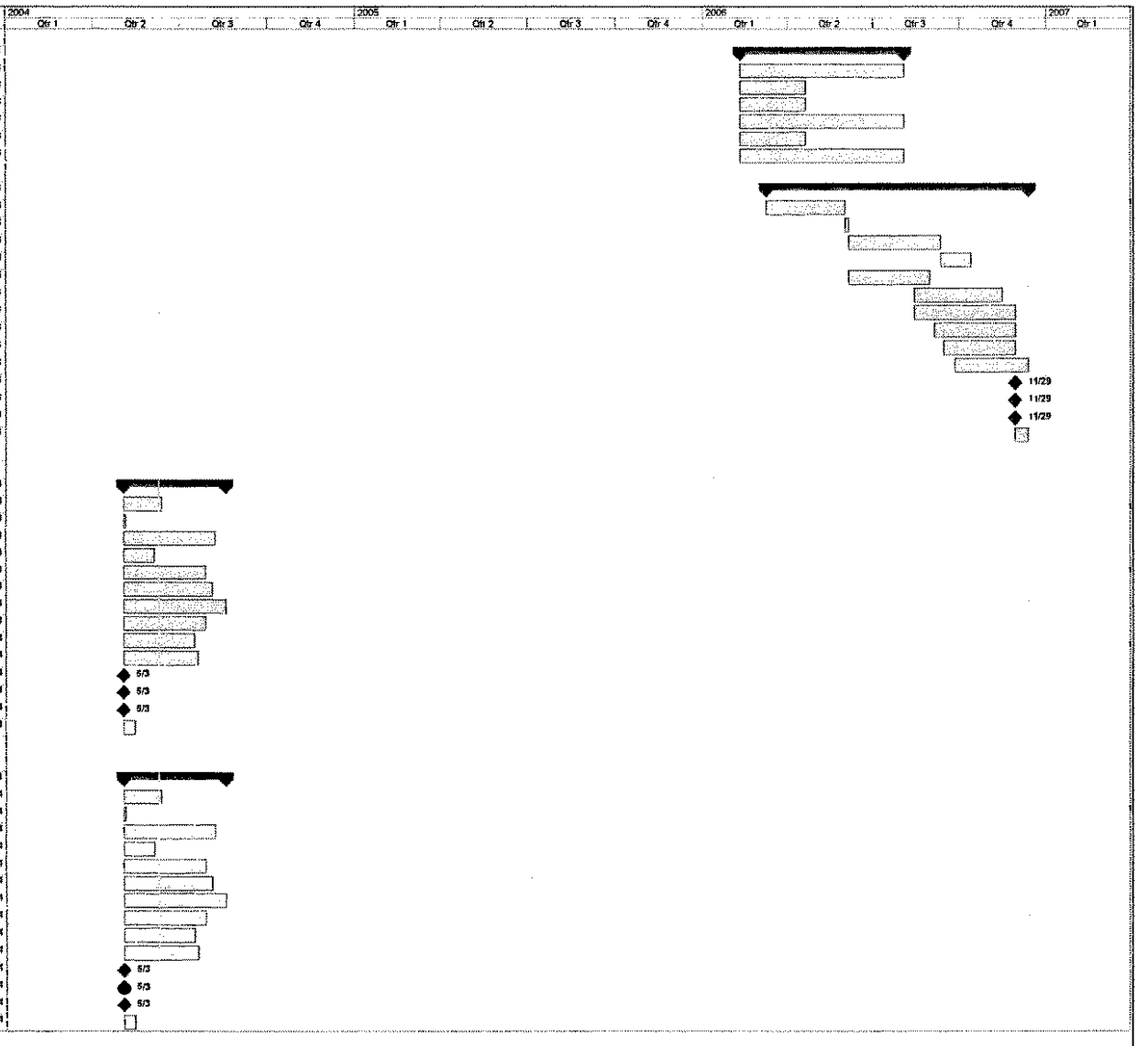


Figure 3 Calendrier de réalisation

Figure 3 Calendar of realization

ID	Task Name	Duration	Start	Finish
60				
61	**BOP Procurement**	**125 days**	**Fri 2/10/06**	**Thu 8/3/06**
62	Main Transformer	25 wks	Fri 2/10/06	Thu 8/3/06
63	Breaker	10 wks	Fri 2/10/06	Thu 4/20/06
64	Cable	10 wks	Fri 2/10/06	Thu 4/20/06
65	Steel Structures	25 wks	Fri 2/10/06	Thu 8/3/06
66	Communications	10 wks	Fri 2/10/06	Thu 4/20/06
67	Buildings	25 wks	Fri 2/10/06	Thu 8/3/06
68				
69	**Construction - Phase 1**	**199 days**	**Fri 3/10/06**	**Wed 12/13/06**
70	Deforestation	12 wks	Fri 3/10/06	Thu 6/1/06
71	Site Mobilisation	2 days	Fri 6/2/06	Mon 6/5/06
72	Roads and Pads	70 days	Tue 6/6/06	Mon 9/11/06
73	Final Road Grading	24 days	Tue 9/12/06	Fri 10/13/06
74	Foundations	82 days	Tue 6/6/06	Wed 8/30/06
75	Electrical Collection System	67 days	Tue 8/15/06	Wed 11/15/06
76	Substation	77 days	Tue 8/15/06	Wed 11/29/06
77	Towers and Turbines Delivered	62 days	Tue 9/5/06	Wed 11/29/06
78	Erect Turbines	54 days	Fri 9/15/06	Wed 11/29/06
79	Mechanical Completion / Precommissioning	56 days	Wed 9/27/06	Wed 12/13/06
80	Energise Substation	0 days	Wed 11/29/06	Wed 11/29/06
81	Utility Interconnection	0 days	Wed 11/29/06	Wed 11/29/06
82	Substantial Completion	0 days	Wed 11/29/06	Wed 11/29/06
83	Clean-up and Land Restoration	10 days	Thu 11/30/06	Wed 12/13/06
84				
85				
86	**Construction - Phase 2**	**77 days**	**Mon 5/3/04**	**Tue 8/17/04**
87	Deforestation	6 wks	Mon 5/3/04	Fri 6/11/04
88	Site Mobilisation	2 days	Mon 5/3/04	Tue 5/4/04
89	Roads and Pads	70 days	Mon 5/3/04	Fri 8/6/04
90	Final Road Grading	24 days	Mon 5/3/04	Thu 6/3/04
91	Foundations	62 days	Mon 5/3/04	Tue 7/27/04
92	Electrical Collection System	67 days	Mon 5/3/04	Tue 8/3/04
93	Substation	77 days	Mon 5/3/04	Tue 8/17/04
94	Towers and Turbines Delivered	62 days	Mon 5/3/04	Tue 7/27/04
95	Erect Turbines	54 days	Mon 5/3/04	Thu 7/15/04
96	Mechanical Completion / Precommissioning	56 days	Mon 5/3/04	Mon 7/19/04
97	Energise Substation	0 days	Mon 5/3/04	Mon 5/3/04
98	Utility Interconnection	0 days	Mon 5/3/04	Mon 5/3/04
99	Substantial Completion	0 days	Mon 5/3/04	Mon 5/3/04
100	Clean-up and Land Restoration	10 days	Mon 5/3/04	Fri 5/14/04
101				
102				
103	**Construction - Phase 3**	**77 days**	**Mon 5/3/04**	**Tue 8/17/04**
104	Deforestation	6 wks	Mon 5/3/04	Fri 6/11/04
105	Site Mobilisation	2 days	Mon 5/3/04	Tue 5/4/04
106	Roads and Pads	70 days	Mon 5/3/04	Fri 8/6/04
107	Final Road Grading	24 days	Mon 5/3/04	Thu 6/3/04
108	Foundations	62 days	Mon 5/3/04	Tue 7/27/04
109	Electrical Collection System	67 days	Mon 5/3/04	Tue 8/3/04
110	Substation	77 days	Mon 5/3/04	Tue 8/17/04
111	Towers and Turbines Delivered	62 days	Mon 5/3/04	Tue 7/27/04
112	Erect Turbines	54 days	Mon 5/3/04	Thu 7/15/04
113	Mechanical Completion / Precommissioning	56 days	Mon 5/3/04	Mon 7/19/04
114	Energise Substation	0 days	Mon 5/3/04	Mon 5/3/04
115	Utility Interconnection	0 days	Mon 5/3/04	Mon 5/3/04
116	Substantial Completion	0 days	Mon 5/3/04	Mon 5/3/04
117	Clean-up and Land Restoration	10 days	Mon 5/3/04	Fri 5/14/04



Project: QuebecWindrev1
Date: Tue 6/8/04

Task | Split | Progress | Milestone | Summary | Project Summary | External Tasks | External Milestone | Deadline

12. Modalités de consultation du public

Mentionner, s'il y a lieu, les diverses formes de consultation publique prévues au cours de l'élaboration de l'étude d'impact. Le cas échéant, inclure le plan de communication envisagé.

Pour favoriser l'acceptation du projet par le milieu, il est prévu d'avoir une approche en deux temps. En début de processus, dès que le projet sera suffisamment avancé, il y aura diverses réunions et contacts d'établis avec les principaux intervenants gouvernementaux œuvrant dans le milieu. Nous prévoyons dès cette étape une séance d'informations et de consultation publique avec la population concernée par le projet. Puis, une fois que les impacts seront déterminés, une réunion avec les municipalités, MRC, autres intervenants identifiés et la population concernée sera effectuer afin de présenter l'ensemble du projet, avec notamment les modifications apportées suites aux consultations effectuées en début de processus. L'ensemble des commentaires reçus fera l'objet d'une analyse détaillée et sera intégré à l'étude d'impacts s'il y a lieu.

To favorise the acceptation of the project by the population, it is envisaged to have an approach in two steps. At the beginning of process, as soon as the project is sufficiently known, there will be various meetings and presentations with the principal governmental departments eventually implied in this project. Later, once the impacts will be determined, a meeting with the municipalities, MRC and other speakers identified will be to carry out in addition to a public presentation in order to inform about the project, particularly with the modifications made after the consultations carried out at the beginning of process. The whole of the received comments will be the subject of a detailed analysis and will be integrated into the impact study if it is necessary.

13. Remarques

Inscrire tout autre renseignement jugé nécessaire à une meilleure compréhension du projet et au besoin, annexer des pages supplémentaires.

Plus particulièrement, ce projet est prévu pour la première année du programme. Il doit donc entrer en fonction dès décembre 2006. En conséquence, afin de joindre cet objectif, l'étude d'impact sur l'environnement doit être enclenchée dès 2004. Northland Power Inc. a d'ailleurs débuté les inventaires de la faune avienne en période de migration printanière et en nidification sur l'ensemble du territoire à l'étude. Des inventaires complémentaires seront réalisés dans les prochaines semaines. Afin de réaliser une étude d'impacts le plus conforme aux attentes du MENV, Northland Power désire obtenir une directive dans les meilleurs délais.

More particularly, this project is planned for the first year of the program. It must thus be operational in December 2006. Consequently, in order to join this objective, the environmental impact assessment must be engaged as soon as 2004. Northland Power Inc has already begun some inventories of avifauna in period of spring migration and nesting on the whole of the study area. Complementary inventories will be carried out in the next weeks. In order to make the environmental impact assessment in conformity with requests of the MENV, Northland Power wishes to obtain a directive as soon as possible.

Je certifie que tous les renseignements mentionnés dans le présent avis de projet sont exacts au meilleur de ma connaissance.

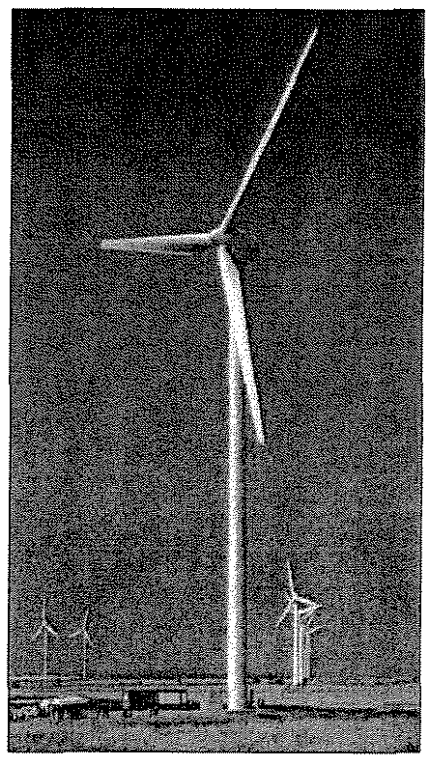
Signé le 11 juin 2004

par Robert Demers, SNC-LAVALIN INC.

ANNEXES

TECHNICAL DESCRIPTION
AND SPECIFICATIONS

Wind Turbine Generator System
GE Wind Energy 1.5sle 60 Hz



All technical data are subject to possible alteration due to advancing technical development!

Manufacturer: GE Wind Energy GmbH
Holsterfeld 16
D-48499 Salzbergen

1 Introduction

This document summarizes the technical description and specifications of the GE Wind Energy (GEWE) 1.5sle 60Hz wind turbine generator system. GE Wind Energy (GEWE), a subsidiary of GE Power Systems (GEPS), manufactures this system. The specification is for the model GE Wind Energy 1.5sle 60Hz and is based on the data given in section 3 – Technical Description.

2 Overview multi generation product map

See product map document:
1.5serie_GD_allComp_prodmapx

3.1 Rotor

The rotor on the GE Wind Energy 1.5sle 60Hz wind turbine is designed to operate in an upwind configuration (blades positioned upwind of the turbine tower) and is comprised of three blades mounted to a cast ductile iron hub.

The rotor diameter is 77 m, resulting in a swept area of 4,657 m^2, and is designed to operate between 10 and 20 revolutions per minute (rpm). Rotor speed is regulated by a combination of blade pitch angle adjustment and generator / converter torque control. The rotor spins in a clock-wise direction under normal operating conditions when viewed from an upwind location..

Full blade pitch angle range is approximately 90 degrees, with the zero degree position being with the airfoil chord line flat to the prevailing wind. The blades being pitched to a full feather pitch angle of approximately 90 degrees accomplishes aerodynamic braking of the rotor; whereby the blades "spill" the wind thus limiting rotor speed.

To give greater clearance between the rotor and the tower, the rotor is tilted upward and away from the tower by approximately 4 degrees and the blades have an effective coning angle of 1.25 degrees.

3.2 Blades

There are three rotor blades used on each GE Wind Energy 1.5sle 60Hz wind turbine. The blades are manufactured from fiberglass epoxy resin and with a smooth layer of gel coat on the outer surface that is designed to provide UV protection and blade color.

The rotor blades use a custom, proprietary family of airfoils that were designed specifically for use on wind turbines. The airfoils are designed to reduce sensitivity to blade-surface roughness caused by insect and dirt build-up seen during normal operation.

The airfoils transition along the blade span with the thicker airfoils being located in-board towards the blade root (hub) and gradually tapering to thinner cross sections out towards the blade tip.

3.3 Blade Pitch Control System

The GE Wind Energy 1.5sle 60Hz rotor utilizes three (one for each blade) independent electric pitch motors and controllers to provide adjustment of the blade pitch angle during normal operation. Blade pitch angle is adjusted by an electric drive that is mounted inside the rotor hub and is coupled to a ring gear mounted to the inner race of the blade pitch bearing (see Fig. 3.2).

GEWE's active-pitch controller enables the wind turbine rotor to regulate speed, when above rated wind speed, by allowing the blade to "spill" excess aerodynamic lift. Energy from wind gusts below rated windspeed is captured by allowing the rotor to speed up, transforming this gust energy into kinetic which may then be extracted from the rotor.

Three independent back-up battery packs are provided to power each individual blade pitch system to feather the blades and shut down the machine in the event of a grid line outage or other fault. By having all three blades outfitted with independent pitch systems, redundancy of individual blade aerodynamic braking capability is provided.

3.4 Hub

The hub is manufactured from cast ductile iron and is used to connect the three rotor blades to the turbine main shaft. The hub also houses the three electric blade pitch systems and is mounted directly to the main shaft. Access to the inside of the hub is provided through a hatch for inspection and service of the electric pitch system and blade mounting hardware.

3.5 Gearbox

The gearbox in the GEWE 1.5sle 60Hz wind turbine is designed to function as a speed increaser and transmit power between the low-rpm turbine rotor and high-rpm electric generator. The gearbox for the 60 Hz version of the GEWE 1.5sle 60Hz is a three-stage planetary/helical gear design with a ratio of gear 1:72. The gearbox is mounted to the machine bedplate with elastomeric elements that are designed to provide vibration damping and noise reduction between the gearbox and bedplate. The gearbox housing is cast from ductile

iron and is designed to house the drive train gearing. The gearing is designed to transfer torsional power from the wind turbine rotor to the electric generator. A parking brake is mounted on the high-speed shaft of the gearbox.

3.6 Bearings

The blade pitch bearing is a dual, four-point ball bearing designed to allow the blade to pitch about a span-wise pitch axis. The inner race of the blade pitch bearing is outfitted with a blade drive gear that enables the blade to be driven in pitch by an electric gear-driven motor/controller.

The main shaft bearing on the GEWE 1.5sle 60Hz is a double-row spherical roller bearing mounted in a pillow-block housing arrangement.

The bearings used inside the gearbox are of the cylindrical, spherical and tapered roller type. These bearings are designed to provide bearing and alignment of the internal gearing shafts and accommodate radial and axial loads.

3.7 Gearbox Lubrication System

The gearbox has a forced-lubrication system (driven by an electric pump). The fluid capacity of the gearbox is approximately 300 liters (L).

The bearings are force-lubricated by cross flow from individual spray nozzles. Before the oil is pumped through the oil lines, it passes through a filter, a heat exchanger and a pressure reduction valve designed to provide clean oil at the correct pressure to the bearings.

3.8 Brake System

The electrically actuated individual blade pitch systems act as the main braking system for the wind turbine. Braking under normal operating conditions is accomplished by feathering the blades out of the wind. Any single feathered rotor blade is designed to slow the rotor, and each rotor blade has its own back-up battery bank to provide power to the electric drive in the event of a grid line loss.

The turbine is also equipped with a mechanical brake located at the output (high-speed) shaft of the gearbox. This brake is only applied immediately on certain emergency-stops (E-stops). This brake also prevents rotation of the machinery as required by certain service activities.

3.9 Generator

The generator is a doubly fed induction-generator with wound rotor and slip rings. The generator synchronous speed is 1200 rpm, and a variable frequency power converter tied to the generator rotor allows the generator to operate at speeds ranging from 870 rpm to 1600 rpm. Nominal speed at 1.5 MW power output is 1440 rpm.

The generator meets protection class requirements of the International Standard IP 54 (totally enclosed) and is air-cooled. The generator housing is grounded and an air-to-air thermal exchanger cools the windings under normal operating conditions.

The generator is mounted to the bedplate on elastomeric foundations to reduce vibration and associated noise.

Temperature sensors are built into the generator windings to provide a temperature reading to the wind turbine controller. In the event the generator temperature is outside of the normal operating range, an automatic shutdown of the turbine is initiated if the generator is on-line. Additionally the machine will be unable to start if the windings are below their acceptable operating temperature limit.

3.10 Flexible Coupling

Designed to protect the drive train from excessive torque loads, a flexible coupling is provided between the generator and gearbox output shaft this is equipped with a torque-limiting device sized to keep the max. allowable torque below the 3 times limit of the drive train.

3.11 Yaw System

A roller bearing attached between the nacelle and tower facilitates yaw motion. Four planetary yaw drives (with brakes that engage when the drive is disabled) mesh with the outside gear of the yaw bearing and steer the machine to track the wind in yaw. The automatic yaw brakes engage in order to prevent the yaw drives from seeing peak loads from any turbulent wind.

A wind vane sensor mounted on top of the nacelle sends a signal to the turbine controller to evaluate the position of the nacelle with respect to wind direction. Within a specified time interval, the controller activates the yaw drives to align the nacelle to the average wind direction. The yaw drives require electric power to operate.

On the underside of the yaw deck, a cable twist sensor is mounted to provide a record of nacelle yaw position and cable twisting. After the sensor detects 900-degree rotation in one direction (net), the controller automatically brings the rotor to a complete stop, untwists the cable by counter yawing of the nacelle, and restarts the wind turbine.

3.12 Tower

The GE Wind Energy 1.5sle 60Hz wind turbine is mounted on top of a tubular tower, putting the wind rotor hub height at 64.7 m, 80 m and 85 m depending on the configuration.The tubular tower is tapered and manufactured in three or four sections from steel plate. Access to the turbine is through a lockable steel door at the base of the tower. Service platforms are provided. Access to the nacelle is provided by a ladder and a fall arresting safety system is included. Interior lights are installed at critical points from the base of the tower to the tower top.

3.13 Nacelle

The nacelle of the GEWE 1.5sle 60Hz turbine is constructed of fiberglass and lined with sound-insulating foam (see Fig. 3.2). This sound insulating foam helps reduce acoustic emissions from the wind turbine.

Access from the tower into the nacelle is through a manhole in the bedplate, which is located beneath the wind rotor main shaft.

The nacelle is ventilated and illuminated with electric lights and a skylight hatch.

A hatch at the front end of the nacelle provides access to the blades and hub. When the rotor is stopped and secured in position with a hydraulic rotor lock, the interior of the hub can be accessed through one of three hatches located in the rotor spinner.

3.14 Anemometer, Wind Vane, and Lightning Rod

An anemometer, wind vane, and lightning rod are mounted on top of the nacelle housing. Access to these sensors is accomplished through a hatch in the nacelle roof.

3.15 Lightning Protection

The rotor blades are equipped with a strike sensor mounted in the blade tip. Additionally a solid copper conductor from the blade tip to root provides a grounding path that leads to the grounding system at the base of the tower foundation (see Fig. 9.1). The turbine is grounded and shielded to protect against lightning, however, lightning is an unpredictable force of nature, and it is possible that a lightning strike could damage various components notwithstanding the lightning protection deployed in the machine.

3.16 Wind Turbine Control System

The GEWE 1.5sle 60Hz wind turbine machine can be controlled automatically or manually from either the control panel located inside the nacelle or from a personal computer (PC) located in a control box at the bottom of the tower. Control signals can also be sent from a remote computer via a Supervisory Control and Data Acquisition System (SCADA), with local lockout capability provided at the turbine controller.

Using the tower top control panel, the machine can be stopped, started, and turned out of the wind. Service switches at the tower top prevent service personnel at the bottom of the tower from operating certain systems of the turbine while service personnel are in the nacelle. To override any machine operation, Emergency-stop buttons located in the tower base and in the nacelle can be activated to stop the turbine in the event of an emergency.

Under partial load, the blade pitch angle is held constant and the rotor speed is controlled by the generator/converter control system. Once the rated wind speed is reached, the rotor blades operate in a servo mode whereby turbine power output and rotor speed are controlled by varying the blade pitch angle in combination with the generator/converter torque/speed control system.

3.17 Power Converter

The GEWE 1.5sle 60Hz wind turbine uses a power converter system that consists of a converter on the rotor side, a DC intermediate circuit, and a power inverter on the grid side. Altogether this complete system functions as a pulse-width-modulated converter in 4-quadrant operation.

The converter system consists of an insulated gate bipolar transistor (IGBT) power module and the associated electrical equipment. Variable output frequency of the converter allows a rotational speed-module operation of the generator within the range of 870 rpm to 1600 rpm.

3.18 Grid Connection Requirements

See Electrical Grid Data Document:
1.5serie_60Hz_EGD_allComp_xxxxxxxx

3.19 Electrical Configuration

The electrical configuration for the GE Wind Energy 1.5sle 60Hz wind turbine generator is given in Fig. 3.3 below:

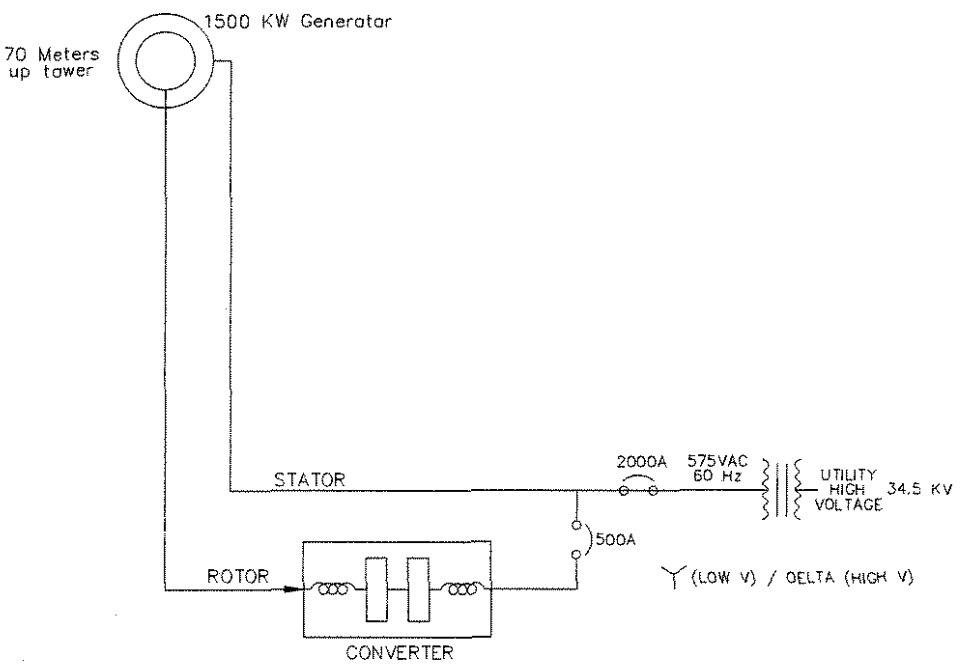


Fig. 3.3: Electrical Configuration

4 Technical Data GE Wind Energy 1.5sle 60Hz Wind Turbine

See Technical Data Document:
1.5sle60H_TD_allComp_xxxxxxxx

5 Operational limits

5.1 Operational Temperature Range

GEWE 1.5sle – Standard (former CWL version)	GEWE 1.5sle – Cold Weather Extreme Option (CWE)
+45° to –20° C	+45° to –30° C

Table 5.1: Operational Temperature Range

5.2 Survival Temperature

GEWE 1.5sle – Standard (former CWL version)	GEWE 1.5sle – Cold Weather Extreme Option (CWE)
+50° to –20° C	+50° to –40° C

Table 5.2: Survival Temperature

5.3 Survival Extreme Wind Velocity

GEWE 1.5sle – Standard (former CWL version)	GEWE 1.5sle – Cold Weather Extreme Option (CWE)
@ -10° = 55 m/s @ -20° = 52.5 m/s	@ –10° C = 55 m/s @ –40° C = 52.5 m/s

Table 5.3: Survival Extreme Wind Velocity

6 Powerperformance and Cut in / out wind speed

See Power Curve Document:
1.5sle_PCD_allComp_GE37cxxx

7 Acoustic Performance

104.0 dB(A) according to: IEC 61400-11: 1998 Wind Turbine Generator Systems – Part 11: Acoustic Noise Measurement Techniques

1.5s 50 Hz document is also relevant for the 1.5sle 60 Hz turbines since the blade tip speed are identical on both turbine variants. The blade tip speed is the key driver concerning noise emission.

See Sound Capacity Document:
1.5s_SCD_allComp_slpxxxxx

8 Electrical Interconnect Specifications

Section 8 provides information intended to assist in evaluating how the GEWE 1.5sle 60Hz wind turbine integrates with the grid electrical system.

8.1 GEWE 1.5 MW Turbine Generator Configuration

The GEWE 1.5sle 60Hz turbine has the capability of operating at leading or lagging power factor and is equipped with a doubly fed (wound rotor) asynchronous (induction) generator with slip rings and an AC-DC-AC electronic power converter.

8.2 Selectable Power Factor

The Standard GEWE 1.5sle 60Hz Wind Turbine is designed with a selectable power factor. At 1.0 pu voltage (575 V) and full power (1500 kW), a power factor of 0.95 overexcited (reactive power delivered by the wind turbine) to 0.90 underexcited (reactive power absorbed by the wind turbine) is possible. The power factor is settable at each WTG or by the wind farm SCADA system.

8.3 WINDVAR

Dynamic voltage control, commonly referred to as WindVAR, controls the wind plant's power factor or voltage. WindVAR is a high-speed closed loop controller that adjusts each WTG's reactive power output to control either the collective power factor or overall voltage at the wind farm. WindVAR optimizes local system conditions to improve plant reliability and availability. WindVAR can be customized to meet the local utility demands.

8.3.1 Closed Loop VAR Regulator

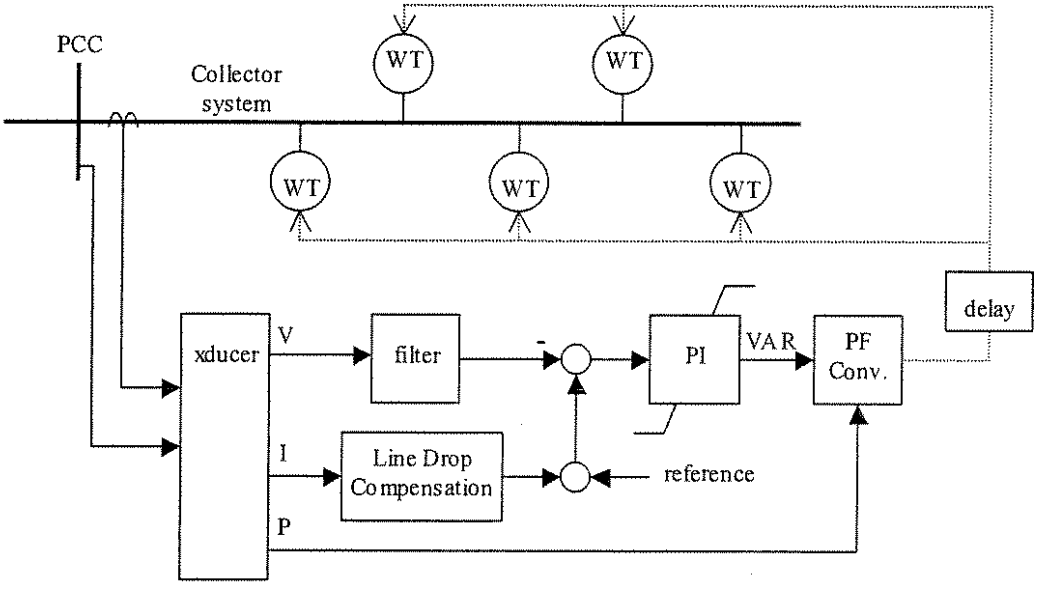


Fig. 8.1: Closed Loop VAR Regulator

A closed loop voltage regulator is implemented at the point of coupling (PCC) with the utility. Measured voltage is compared with a reference signal and the error is applied to a non-windup PI regulator. The desired windfarm VAR output is converted to a power factor set point communicated to the individual wind turbines (WT). Optional additional features include line drop compensation based on measured current at the PCC and a VAR boost function implemented at each WT. VAR boost will override watts production to deliver more VARs during emergency under-voltage conditions.

Document: 1.5sle60H_GD_allComp_xxxxxxxx
Originator: Ulrich Uphues
Revision: 00

Filter	Measurement and I/O delay. Represent as simple 10ms lag.
PI – regulator	Lead term set to cancel the regulator delays roughly 40ms. Gain set for a closed loop response to meet utility needs. One-second response is common.
Delay	Communication, I/O and turbine response. Represent as simple 40 – 60 ms lag.
Line-drop comp.	Typically I*X (reactive current times system reactance) where X is provided by the utility.

Table 8.1: Closed Loop Voltage Regulator Parameters

Filter: Power Serve Power meter measures at ¼ cycle

PI Regulator: Gains Kp Ki, to be determined based on Transmission system characteristics.

Delay: 40 to 60 ms

Line Drop Compensation: To be determined, based on transmission system parameters. Power factor command is sent in terms of Phi. Phi command is sent to Wind turbine generator Converter Control Unit (CCU). The CCU measures the real power and uses the commanded phi signal to compute Q. Q = tan (phi)*P. Internal CCU computation is at 4800 Hz.

8.3.2 Open Loop VAR Regulator

An open loop regulator is implemented at the point of coupling (PCC) with the utility. The objective is to generate VARs that follow a specified VAR/Watt curve. The curve is calculated off-line to provide a desired voltage profile at some point in the utility system. The desired wind farm VAR output is converted to a power factor set point communicated to the individual wind turbines (WT). In addition a VAR boost function can be implemented at each WT. VAR boost will override watts production to deliver more VARs during emergency under voltage conditions.

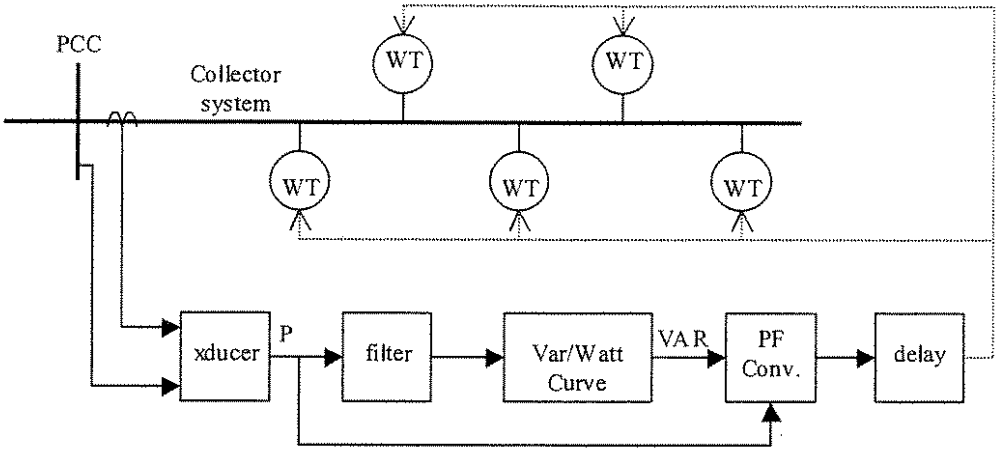


Fig. 8.2: Open Loop VAR Regulator

Filter	Measurement and I/O delay. Represent as simple 10ms lag.
Var/Watt Curve	Desired profile determined by the utility in off-line studies.
Delay	Communication, I/O and turbine response. Represent as simple 30ms lag.

Table 8.2: Open Loop VAR Regulator Parameters

8.4 Harmonics & IEEE-519

The GEWE 1.5sle 60Hz wind turbine is designed to produce power with current harmonics (based on the full load current) that are below the standard set forth in IEEE-519.

8.5 Input Parameters for Power System Studies

GEWE will assist customers and utilities in the electrical modeling of the GEWE 1.5sle 60Hz wind turbine generator system to determine the impact on utility power systems.

9 Lightening Protection/Grounding

9.1 System Grounding Requirements

The grounding system installed, as part of the wind turbine foundation pad must be designed to meet local conditions and regulations. The same grounding system is utilized for lightning protection.

A resistance to neutral earth of 2 ohms or less is preferred, and a 50 kA surge protector is provided as standard equipment in the low voltage distribution cabinet of the GEWE 1.5sle 60Hz wind turbine.

If the ground resistance is between 2-5 ohms, the addition of a 100 kA (min) surge protector at the low voltage side of the transformer is strongly recommended as part of the Owner's balance of plant obligation.

If ground resistance is more than 5 ohms, GEWE requires the addition of a 100 kA surge protector at the low voltage side of the transformer.

9.2 1.5 MW WTG and 1750 kVA Transformer Grounding System

The grounding system of the wind turbine generator must be connected to the grounding system of the transformer.

Local soil conditions and resistivity must be considered in the installation of the grounding system as noted in section 9.1 above. The ground grid must be made of closed ring conductor and connected to ground rods using CadWeld connectors. If ground resistance is not sufficiently low, the grounding system must be improved. In many cases this improvement may be accomplished by adding two ground rods at a time and spaced equally around the perimeter of the ring conductor.

The grounding system, at a minimum, is made of 250 kCM bare copper and 5/8" diameter-8' ground rods. Ring conductor must be installed 30" below ground level and approximately 18" from the foundation. Ground rods must be equally spaced around the perimeter of the ring conductor at approximately

24" from it. The 250 kCM ground conductor must be extended to the transformer at approximately 12" from the transformer pad. Two ground rods must be connected to the ground conductor at 26" apart. The H0 and X0 terminals of the transformer must be connected to the ground through the grounding pad at the high-voltage and low-voltage compartments respectively.

The lightning protection/grounding for the GE Wind Energy 1.5s 60Hz turbine is a function of site specific requirements and local state, federal electrical codes and requirements.

GEWE provides the lighting protection / grounding hardware from the blade tips to the base of the tower (Fig. 9.1). The grounding system from the transformer and tower foundation is the Owner's obligation.

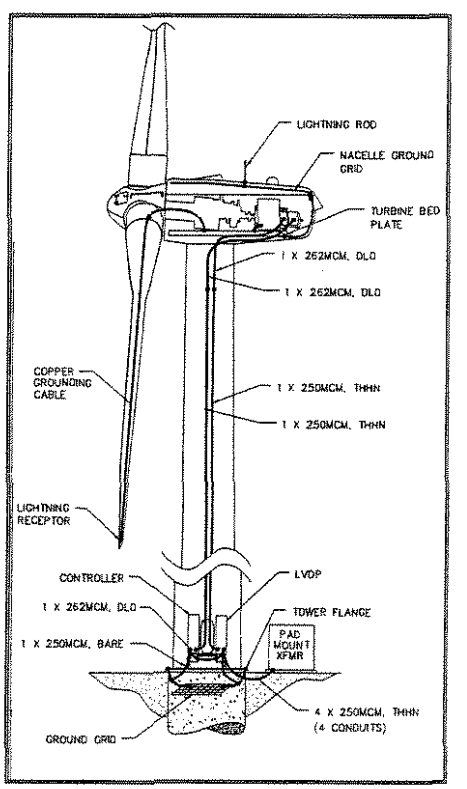


Fig. 9.1: Lightning Protection and Grounding Illustration

Document: 1.5sle60H_GD_allComp_xxxxxxxx
Originator: Ulrich Uphues
Revision: 00

10 Dynamic Model

The GEWE wind turbine should not be modeled as a synchronous generator. Additionally, the generator acts as a traditional induction generator only when the crowbar operates thus short circuiting the converter.

The generator is a doubly-fed induction generator with a power converter interfacing the rotor to the grid.
A detailed dynamic model of the GEWE 1.5 MW, 60 Hz wind turbine is currently available in PSLF V.13/14 (from GE Power Systems Energy Consulting, PSEC) and PSS/E V.28/29 (from Power Technologies, Inc., PTI). Users with current licenses of the respective software should have access to this model.
The model characterizes the prime mover (turbine, blade pitch and shaft) and the generator, converter, controls and protection.

11 Special optional features

11.1 Cold weather adaptations

See Cold weather adaptations document:
1.5serie_GD_allComp_CWxxxxxx

11.2 LVRT – Low Voltage ride through

See Low Voltage ride through document:
1.5serie_60Hz_GD_allComp_LVRTxxxx

11.3 Condition monitoring

See Condition monitoring document:
1.5serie_GD_CMS_xxxxxxxx

Change List

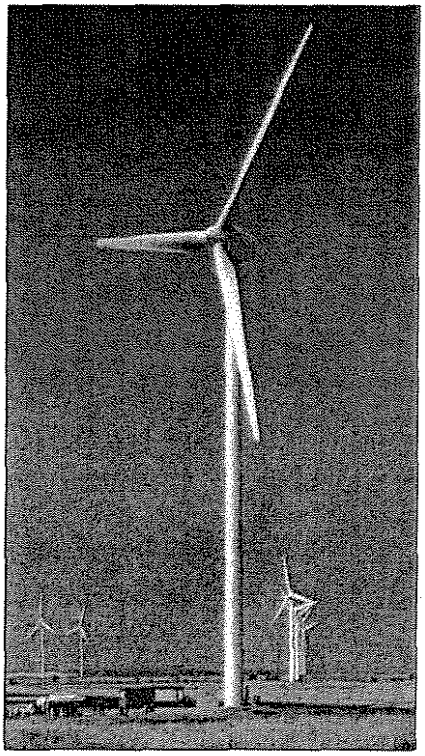
Document	Rev.	Release Date (d/m/y)	Affected Pages	Change
1.5sle60H_GD_allComp_xxxxxxxx	00	10/10/2003	all	New document

Prepared by:	10/10/2003	Christoph Rex	
	Date (d/m/y)	Name	Signature
Approved by:	10/10/2003	Ulrich Uphues	
	Date (d/m/y)	Name	Signature (system integration leader)

TECHNICAL DATA

Wind Turbine Generator System

GE Wind Energy 1.5sle 60 Hz



All technical data are subject to possible alteration due to advancing technical development!

Manufacturer: GE Wind Energy GmbH
Holsterfeld 16
D-48499 Salzbergen

Table of Contents

page no.

Tables

1 Rotor

Diameter	77 m
Number of blades	3
Swept area	4657 m^2
Rotor speed range	10 – 20 rpm
Rotational direction	Clockwise looking downwind
Nominal tip speed	73.8 m/s
Orientation	Upwind
Speed regulation	Pitch control
Aerodynamic brakes	Full feathering
Rotor shaft uptilt	4 degrees

Table 1: Rotor

2 Blades

Airfoils	GEWE design and LM 37
Material	Fiberglass and epoxy resin

Table 2: Blades

3 Pitch System

Principle	Independent blade pitch control
Actuation	Individual electric drive
Back up	Battery pack
Pitch drives	Planetary gearbox, DC motor
Pitch Bearing	Dual 4-point ball bearing

Table 3: Pitch System

4 Hub

Material	Cast ductile iron
Type	Rigid
Corrosion protection	Sandblasted & multi-layer coated

Table 4: Hub

5 Drivetrain

Three-stage planetary helical gear combination	
Mechanical power	1660 kW
Gear ratio	1:72
Cooling	Oil pump with oil cooler
Fluid capacity	300 Liters (approx.)
Operation speed	800 – 1600 rpm
Operation speed at rated power	1440 rpm

Table 5: Drivetrain

6 Generator

Doubly fed asynchronous generator with slip rings	
Rated power	1500 kW
Rated Speed	1440 rpm
Rated voltage	575 V
Rated frequency	60 Hz
Power factor	0.95 overexcited (reactive power delivered by the wind turbine) to 0.90 underexcited (reactive power absorbed by the wind turbine) at 1.0 pu voltage (575 V) and full power (1500 kW).
Protection class	Totally enclosed, IP54
Insulation class	F
Synchronous speed	1200 rpm
Cooling system	Air-to-air cooled
Protection Class	IP 54

Table 6: Generator

7 Converter

Type	2 x 4 Q with DC voltage bus bar
Control	pulse width modulation
Power stacks	IGBT 1700 V
Protection Class	IP 54

Table 7: Converter

8 Tower

Type	Tubular steel
Sections	3 (for 64.7m), 4 (for 80 m); 4 (for 85m)
Heights (hub height)	64.7 m, 80.0 m and 85 m

Table 8: Tower

9 Brake System

Primary brake system	Individual blade pitch (battery backup)
Emergency brake	Hydraulic-applied disc brake mounted on the gearbox high-speed shaft

Table 9: Brake System

10 Yaw System

Number of yaw drives	4
Actuation	Electrical
Yaw rate	0.5 degree / sec
Motor type	Asynchronous, 6 pole, and 1200 rpm
Voltage / frequency	575 VAC / 60 Hz

Table 10: Yaw System

11 Wind turbine control

Type	Bachmann integrated controller
Protection Class	IP 20

Table 11: Wind turbine control

12 Operational Limits

Height above sea level	max. 1000 m
Minimum temperature operational / survival	-20°C / -20°C
Minimum temperature with CWE option operational / survival	-30°C / -40°C
Maximum ambient operation / survive temperature	+45°C / +50°C
Wind conditions acc. IEC s	8.5 @ 18% turbulence
Maximum extreme gust (3 s)	55 m/s

Table 12: Operational limits

Change List

Document	Rev.	Release Date (d/m/y)	Affected Pages	Change
1.5sle60H_TD_allComp_xxxxxxxx	00	10/10/2003	all	New document

Table 13: Change List

Prepared by:	10/10/2003	Christoph Rex	
	Date (d/m/y)	Name	Signature
Approved by:	10/10/2003	Ulrich Uphues	
	Date (d/m/y)	Name	Signature (system integration leader)