APPENDIX E
ECONOMIC BENEFIT STUDY

Economic Benefit Study

Chaplin Wind Farm
Rural Municipality of Chaplin, Saskatchewan
CCS Project No. 2078

November 2014

Prepared for: Algonquin Power
Prepared by: Clark Consulting Services

1. Introduction

In response to the Government of Saskatchewan's initiative to develop renewable energy projects in Saskatchewan, Windlectric Inc. was selected to develop, construct, and operate the 177 megawatt (MW) Chaplin Wind Farm in the Rural Municipality of Chaplin in southern Saskatchewan.

The Project consists of between 58 and 88 wind turbine generators. The manufacturer of the turbines has not been selected yet. The rated capacity of the turbines will be between 1.5 and 3.0 MW, with a rotor diameter between 80 and 113 m, located at 80 to 100 m above ground level.

In accordance with Section 2(d) of The Environmental Assessment Act 1980 the Saskatchewan Ministry of Environment deemed the project to be a 'Development' and the proponent has prepared a Project Proposal which will provide sufficient data and analysis to facilitate a thorough understanding of the project and its impacts. The proponent has prepared a series of technical documents for the Proposal to determine how it will affect a wide range of activities and aspects of the project environs.

Algonquin Power & Utilities Corp. ("Algonquin") is a respected and socially responsible participant in the renewable energy and sustainable infrastructure sectors. Algonquin owns and operates over 70 assets across North America including wind energy and hydroelectric facilities. The Chaplin Wind-Energy Project is being developed by Windlectric Inc., a subsidiary of Algonquin.

1.1 Study Objective

Clark Consulting Services (CCS) was retained by Algonquin to prepare an Economic Benefit Study. Established in 1994, CCS is a leading consulting firm that has a rich history in providing sound analysis and strategy for planning and economic development applications. A CV of qualifications

for Bob Clark and CCS can be found in Appendix "A".

The purpose of this study is to describe and quantify the benefits of the Project on the local economy. In addition to documenting these direct economic benefits, an estimate of other economic benefits on the local economy is provided. The Study will quantify the employment and expenditures directly related to the Project including those expenditures related to such aspects of the Project as property tax, royalties and other payments. In addition, based on a review of employment trends in the study area and a literature review of economic benefits of developments in similar rural settings, the benefits of both employment and expenditures on the local economy have been estimated. The references for this literature review are attached as Appendix "B".

1.2 Study Area

The term Local Area, as it is used in this Study, includes the Census Division No. 7 and its member municipalities including the Rurall Municipalities of Chaplin, Enfield and Morse. This area was chosen to capture those local workers and businesses that are well located for involvement in the Project.

2. Local Context

In order to estimate the Economic Benefit, an overview of the local economy is required as well as an understanding of the Project and how it will be realized. This section provides a review of the Project setting for the development of the Wind Energy Project.

2.1 The Rural Municipality of Chaplin

According to the Statistics Canada 2006 and 2011 Census[3], the Rural Municipality of Chaplin had a population of 138 and 147 respectively. The land area is 802 sq. km. (309 sq. miles). The production of sodium sulphate is a major economic industry combined with grain and livestock production. The increased economic activity and the potential for modest permanent job creation as a result of this Project is seen (according to the surveys conducted as part of the community consultation) as a positive impact to this community.

2.2 The Rural Municipality of Enfield

The population of the Rural Municipality of Enfield was 270 in 2011 according to the 2011 Census. This was a loss of 31 people from the 2006 Census. It encompasses 1,014 sq. km. (391 sq. miles).

2.3 The Rural Municipality of Morse

According to the Statistics Canada 2006 and 2011 Census[3] the Rural Municipality of Morse had a population of 435 and 401 respectively. It encompasses 1,244 sq. km. (480 sq. miles).

2.4 Census Division No. 7

This Census Division includes the RM of Chaplin, Enfield and Morse. It is located in the south central part of Saskatchewan and includes the City of Moose Jaw. The largest employer was Farming followed by Retail Trade and Public Administration.

3. Project Overview[1]

The Project is in the preliminary stages. A detailed site layout and the final type, number and capacity of the Wind Turbines has not been finalized. The basic components of the proposed Project include between 58 and 88 wind turbine generators. The turbines will utilize pad locations and access roads. The final layout will result in a maximum installed nameplate capacity of 177MW. The proposed Project will also include the following components:

- permanent pad foundations and permanent crane pads,
- an underground and/or overhead electrical power line collector system,
- fibre optic data lines from each turbine and/or wireless technology for the communication of data,
- a transmission line,
- an operations and maintenance building and storage facilities,
- a substation,
- switching stations,
- meteorological tower(s),
- access road (s) to the met tower site(s), and
- turbine access roads with culvert installations, as required, at associated watercourse crossings.

Temporary components during construction may include staging areas for the turbines, access roads, met tower(s), collector lines and transmission line as well as crane paths, site office(s), batch plant and central staging areas. The electrical power line collector system would transport the electricity generated from each turbine to the substation and then to a switching station located near the Sask-Power transmission line.

A detailed site location plan has not been prepared yet.

4. Direct Economic Benefits

This section outlines the direct economic benefits of the Chaplin Wind Project, namely:

- The job creation associated with the Project (Section 4.1); and
- The Project expenditures, tax, lease payments and other impacts which capture the revenue flowing to the community and individual landowners (Section 4.2).

The employment and expenditures associated with the Project will be divided into the construction and operations stages. The estimates for the construction stage have a relatively short-term effect for the duration of the pre-construction and construction phases while the operational employment and expenditures occur for the Project Life and are estimated on an annual basis.

4.1 Direct Employment Benefits

i. Construction

The Construction is anticipated to take 12 - 18 months. A typical list of construction activities with durations is as follows:

Table 4.1 Construction Activities

Phase Details	Approximate Schedule
Surveying	3-7 weeks
Delivery of construction materials, storage materials, site preparation construction of access roads, staging areas	5-9 months
Installation of tower foundations	4-5 months
Tower/turbine delivery and erection	4-5 months
Installation of collector lines and transmission line	2-3 months
Installation of substation	4-7 months
Installation of operations and maintenance building	1-3 months
Installation of temporary batch plant	1-2 months
Installation of temporary site office	1-2 months
Reclamation of temporary work areas, final grading, topsoils replacement	4-7 months
Project Testing/Commission	1-2 months

The construction activities are expected to generate between 45 and 90 person-years of direct employment. A person year of employment allows comparison of employment and is measured as the equivalent of one person employed for 250 days (5 days per week for 50 weeks) This estimate was provided by the proponent. It compares closely to other similar projects[12]. Of this, approximately 33 to 70 person years would be expected to be local employment. Other construction related activities may also draw on qualified local employees. This number takes into consideration the fact that some jobs, such as highly specialized construction workers, may only be

contracted for relatively short periods of time while other positions may be needed for longer durations.

There is also employment related to the manufacture of the materials and equipment used in the Construction Stage. This labour component is not included in the local employment estimate as much of it will occur outside the Local Area.

ii. Operational Activities

Operation activities include daily monitoring of the wind turbines, maintenance of the operations and maintenance building, turbine maintenance and monitoring of meteorological data.

During pre-operational mobilization, Windlectric and/or the operations and maintenance contractor would develop an operations and maintenance program. The program would be designed in consultation with the appropriate authorities to ensure compliance with any applicable requirements. As appropriate, the program would cover staff training, predictive/preventive maintenance, routine maintenance, unscheduled maintenance (including appropriate environmental mitigation measures), annual overhauling, inspection of equipment and components, and procurement of spare parts. It would also include a schedule for regular inspections of the Project's facilities.

The maintenance of the turbines will be the responsibility of Windlectric and/or the operations and maintenance contractor. The maintenance staff will be able to monitor the performance of all turbines on-line on a real time basis. Monitoring of the turbines will occur 24 hours a day/7 days a week within the operations and maintenance building and remotely. The on-line system will identify any potential problems so that pro-active inspection and maintenance can be undertaken. Potentially damaged turbines will be shut down until maintenance staff can perform a site inspection. Regular maintenance of Project equipment will be a key method of mitigating potential effects such as equipment failure. Scheduled maintenance will likely cover the following:

- Visual inspection;
- Inspection of mechanical components, stormwater management, high voltage systems;
- Inspection of electrical components; and
- Greasing and general maintenance.

Occasional maintenance of the turbines or related infrastructure could be expected during the life of the proposed project. Unscheduled maintenance of the turbines would be carried out by Windlectric and/or an operations and maintenance contractor. Other unscheduled maintenance activities will include ongoing upkeep of other Project facilities including repairs to electrical infrastructure, operations and maintenance building, snow removal, and landscaping.

During the operational stage of the proposed project, it will employ up to 15-20 employees. These positions would include well paid technicians and managers. It is expected that many of these

employees could live in the local area. We estimate this would be provided on a part-time or contract basis and would involve an additional 2-4 people. These employment positions may also be filled by qualified candidates from the local area.

4.2 Direct Project Expenditure

i. Pre-Construction and Construction

The total capital cost of the Chaplin Wind Project is estimated to be $258 million. A high level breakdown of the total Project costs is as follows:

- Approximately $3.0 million for pre-construction activities, including engineering, planning and environmental screening; and
- Approximately $255.0 million for construction activities, including labour, equipment and materials.

Table 4.2 shows a breakdown of the construction capital cost by location of supplier. Census Division No. 7 is treated as a single local labour market.

Table 4.2 Capital Cost Breakdown - Construction Stage

	Local	Other Saskatchewan	Outside Saskatchewan	Total	Percent Total
Pre-construction Activity	$50,000	$1,570,000	$ 1,400,000	$3,020,000	1.2%
Turbines and Related Machinery	$0	$0	$165,000,000	$165,000,000	63.9%
Construction Materials and Equipment	$26,250,000	$9,910,000	$ 23,100,000	$59,260,000	23.0%
Construction Labour	$13,050,000	$11,190,000	$6,500,000	$30,740,000	11.9%
TOTAL	$39,350,000	$22,670,000	$196,000,000	$258,020,000	100.0%
Percent of Total	15.3%	8.8%	76.0%	100.0%	

Notes:

- Pre-construction activities include all consulting and exploratory site works fees.
- Construction Labour includes all trades, engineering and consulting fees.
- The distribution of employment between local communities will vary dependent upon the availability of trained and qualified labour and services.
- It is assumed that major electrical equipment will be purchased outside the province, but the labour for installation is assumed to come primarily from within the province.
- Crane costs coming from outside the province. Foundation materials and labour will primarily come from within the province. Small cranes may be available locally.

- Majority of labour costs will come from within the province. Some supervision may come from outside the province.
- There is a provincial tax component in addition to the above which is estimated as $10,700,000.00

The local impact reflects the capital-intensive nature of the wind plant development. According to these estimates up to 63.9% of the capital costs are associated with purchase of the turbines and related machinery. Labour and engineering account for 11.9% of the construction budget and an estimated $39.4 million dollars are anticipated to be spent with persons and businesses in the Local Area for Construction Materials and Equipment.

The construction activities likely to involve local area people and businesses include:

- access road construction;
- gravel and sand supply;
- construction of concrete foundations for the turbines and transformers;
- electrical installations including:
  - subsurface and overhead electrical cabling
  - electrical substation construction
- construction of the operations and maintenance building;
- security and fencing
- accommodation/lodging/food service.

The allocation between Local Area and Other Saskatchewan cannot be precise as some firms from outside the local area may purchase/rent equipment and materials locally and some local contractors may rent equipment and materials from outside the local area.

ii. Annual Operating Expenditures

Table 4.3 presents a breakdown of the estimated operations expenditures by type and geographic area in which they will occur. Annual operational expenditures are expected to be in the order of $7.9 million. Of these 52.8% or $4,160,000 are expected to accrue to the local area. As with construction expenditures, the geographic distribution will depend on the local availability of trained labour and services. It should be noted that labour is a major portion of the operating cost. These figures are subject to change as the project operations gain experience. A major portion of the labour cost will relate to employees of the operating company. This could be 22.8%. The remainder will be maintenance contractors many of whom could be locally based. Turbine replacement parts make up a minor portion of the operation costs estimated at 3.6% of the annual expenditures.

Table 4.3 - Operations Expenditures

	Local	Other Saskatchewan	Outside Saskatchewan	**Total**	Percent Total
Labour	$1,300,000	$300,000	$200,000	**$1,800,000**	22.8.7%

Turbine Replacement Parts	$60,000	$25,000	$200,000	**$285,000**	3.6%
Non-specialized parts/ Equipment	$300,000	$500,000	$2,000,000	**$2,800,000**	35.5%
Other (taxation, agreements, fees, etc.)	$2,500,000	$500,000	$0	**$3,000,000**	38.0%
TOTAL	**$4,160,000**	**$1,325,000**	**$2,400,000**	**$7,885,000**	100%
Percent of Total	52.8%	16.8%	30.4%	100%	

At the local level, this will diversify the local economy both through direct and indirect employment and through support for suppliers of goods and services.

The operation of the proposed Wind Project will result in estimated total expenditures as outlined above, including labour of $7,885,000 annually of which it is estimated that $4,160,000 will be spent locally.

iii. Other Expenditures

While, as noted earlier in this study, it is difficult to precisely predict locations of all expenditures, in the case of the "*Other*" category in Table 4.3 these expenditures will be directed locally. For confidentiality this category is an aggregate of two main expenditures as outlined below.

a) Property Taxation Estimates

The assessment of the Project for property taxes is determined in accordance with a formula established by the Province.

For all residents, the revenue from property taxes is essentially new net revenue. We note that the Project has a small footprint and thus a very small impact on the agricultural assessment base and does not generate notable demand for municipal or educational services. In this context, the Project is much more efficient than construction of new homes. Not only would it require several hundred homes to create similar municipal revenues, these houses would generate service costs and thus municipal expenditure implications.

b) Landowner Payments/Royalties

Landowners that have signed leases to allow infrastructure on their properties will share in royalties of the Project. Along with the turbines themselves, there will also be payments for other Project related infrastructure such as roads, transformer stations and operation and maintenance building, payments for turbines based on the production can vary from year to year.

The majority of land to be optioned by Algonquin for the construction of the Project is currently in agricultural use. The Project is not expected to have a significant impact on agricultural production

as the footprint devoted to the Project in the form of turbines, transformers and access roads is small.

The Project is expected to generate more income per acre for the individual farmer than keeping the land in crop or livestock production. In contrast, with a relatively small leased area for the wind turbine, an agricultural landowner can make a significantly higher net income from lease payments, which will broaden the landowner's revenue sources making the farming operation more economically stable.

The operation of the proposed Wind Project will result in estimated local expenditures as outlined above, including labour, of $4.16 million annually.

5. Indirect and Induced Benefits

In addition to the direct benefits of expenditures outlined above including increased public, individual and business income, rent payments, employment and the local revenue from the agreements and local taxes, the Project will also yield other indirect benefits to individuals and businesses in the community. For example, a specialized contractor located outside the local area will make expenditures locally during the construction and operation of the Project such as the purchase of goods and services while working on and visiting the Project site. Indirect economic benefits result from the purchases by those individuals and companies directly involved in the construction and operation of the Project for goods and services related to their involvement required to complete their work. Induced economic benefits happen when the revenue generated from the direct expenditures are re-spent in the local community on goods and services only indirectly related to the service or materials being provided to the project such as rent, food, lodging and personal services.

For purposes of this analysis, we have used the historic employment ratio between Basic Employment and Export Related Employment as an indication of the effect of each additional job on overall employment. A regression analysis based on the Census Employment information for the Census No. 7 area was prepared to compare the growth in overall employment with the growth in community based employment. Our analysis indicates that each job created in sectors such as electricity generation, results in 1.48 jobs in the local economy. This employment multiplier compares favourably with the employment multipliers used or developed from other Wind Farm projects[12]. These jobs will be filled by residents willing to commute to the job site. In this way the project will provide employment for individuals either living in the local area or relocating to the area.

Other Wind Projects report an increase in tourism attributable to the Wind Energy Project and its ability to draw attention to a place based on an addition to its already unique character[15,16,17]. Tourists are attracted by the presence of the turbines and come not only to see this new technology but also to experience a community with a long and unique history. In this regard, the Wind Project adds to the uniqueness of the place. Increased tourism has not been included in the calculation of indirect or induced benefits.

Taken together, these indirect and induced impacts are referred to as multiplier effects. Studies[10,12] have shown that, on average, for every dollar spent in construction activities, $1.16 is generated through spin-offs by these multiplier effects.

5.1 Local Employment

The 2006 and 2011 Census of Labour Force provided information on trends in employment. Based on these trends, CCS calculated an employment multiplier of 1.48 additional employees for every additional employee working in export based employment by comparing total employment growth between 2006 and 2011 with the growth in Export based employment during the same period. On this basis the 33-70 person years of local employment required for the construction stage of the Project would generate an additional 49 to 104 person years of employment locally.

Similarly the operational employment of 15 to 20 local employees would generate at least 7 to 15 additional person years of local employment annually. This is comparable to the larger employment estimate of total jobs to be created by the Project.

Over 25 years this would equate to a total of 375 to 450 person years of employment locally or 2.54 to 4.35 person years per MW of generating potential. This compares favourably with the estimate of total local and non-local job creation prepared by ClearSky Advisors estimate of total employment benefits per megawatt of generating capacity in the Wind Energy Sector[12].

5.2 Expenditures

The expenditures estimated for construction and operation of the Project will create indirect and induced benefits. For purposes of this report only the local component of the expenditures has been considered. This produces a conservative estimate as the expenditures made to suppliers and contractors outside the local area may also produce indirect and induced benefits locally as these suppliers deliver items and services locally. Local services which may benefit from these expenditures include transport and delivery services, travel related services such as accommodations and restaurants and local suppliers such as construction contractors and other service providers. Based on a review of other employment multipliers developed for both Wind Farms and other Rural based economic activities[10,12], an expenditure multiplier of 2.18 has been selected as an output multiplier for expenditures. This multiplier was developed from recent Statistics Canada Input-Output models of the Canadian Economy and is related to direct, induced and indirect benefits for those expenditures made for firms in Electric Power Generation, Transmission and Distribution industries. The range of multipliers considered included a high of 4.26 for Transportation Services and a low of 1.40 for residential dwellings[10]. The selected multiplier of 2.18 is representative of multipliers used in similar economic studies. It is noted that labour costs have been included in order to provide an appreciation of the economic benefit of wages earned when they are spent in the local economy.

Using this multiplier, the direct local expenditures of $4.16 million dollars is estimated to generate

$9.07 million dollars annually in additional direct, indirect and induced benefits for the local economy. This compares favourably with other estimates prepared for a recent review of economic impact[12].

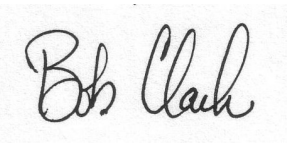
An example of a sector that is in a prime position to capitalize on the activity particularly during construction is the accommodation and lodging sector. During construction, any employment positions that cannot be filled locally will be brought in from other areas. These employees will need accommodations. Similarly, it is expected that food services in the local area will also see increased sales from the increased construction activity generated by the project. .

6. Conclusions

The Chaplin Wind Energy Project is a significant construction project designed to provide electricity to the provincial grid from wind, a renewable source of energy. The construction of the project will involve construction costs of some $258 million dollars. It will require 12-18 months to complete and will generate some 33-70 person years of local employment directly and over 45-90 person years indirectly. In addition, the local expenditures on goods, services and accommodation will generate a significant impact on the local economy estimated at almost $39.35 million dollars in direct economic benefit and over $58.2 million dollars in direct, indirect and induced economic benefits.

During operation, the Wind Energy Project is expected to employ 15-20 persons directly and will require local goods and services estimated to provide some $4,160,000 of direct benefit to the local economy inclusive of wages and other payments. Included in the annual expenditures would be property taxes, lease payments to landowners and an annual payment as part of a Community Benefits Agreement and Road Use Agreement. These direct expenditures are estimated to have an indirect and induced benefit of $9.1 million when all expenditures are considered. In addition, the Project will provide another source of revenue to local farmers and land owners and draw attention to the unique community of Chaplin as another aspect to the local tourist economy.

Sincerely,



Bob Clark, P.Eng., P.Ag., MCIP, RPP, OLE
President

Appendices
A - CV of Robert Clark
B - List of Referenced Documents

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Appendix A

CV Robert Clark

Appendix B

List of References

The following documents have been used in the preparation of this report:

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