

TRADE-MATCHED
Application Number: T1

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Entity NAICS Code

2211

2. Buyer Information

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Entity NAICS Code

9119

3. Project Information

Title

Green Power Procurement.

Locations

- All Alberta facilities of Environment Canada and Natural Resources
- Canada Belly River wind turbine site of Vision Quest Windelectric Inc., near Hill Spring, Alberta.
- Castle River wind turbine site of Vision Quest Windelectric Inc., near Pincher Creek, Alberta.

Type

fuel switching for electricity generation, transmission and distribution (code:113).

Start Date

November 8, 1997.

Projected Life of Project

10 years plus optional 5 year extension.

Greenhouse Gas Reduced

CO₂ and N₂O.

Projected Total Tonnes of CO₂-equivalent Reduced

31,104.

Project associated with voluntary programs

- Voluntary Challenge and Registry.
- Green Power Procurement.

Written Project Description

Vision Quest Windelectric Inc. (VQ) installed two 600-kW capacity Vestas wind turbines in Alberta, one at Belly River (near Hill Spring) and one at Castle River (near Pincher Creek), in the autumn of 1997. The turbines are connected to the Alberta Interconnected Electric System by separate interconnection facilities with separate metering. VQ began selling the electricity in November 1997 to the Power Pool of Alberta on a non-dispatchable basis at established prices.

The City of Calgary entered into a contract on November 7, 1997 with VQ for the purchase of "Green Power". The contract was later assigned to Enmax Power Corporation, a subsidiary of Enmax

Corporation, the City of Calgary's reorganized municipal electrical utility, in early January 1998. Green Power was defined in the contract as:

"... a form of non-fossil fuel source electricity generation having the following characteristics:

- (i) originating from Renewable Energy Sources coming into production, or yielding incremental production, subsequent to June 1, 1997;
- (ii) originating from a facility maintaining EcoLogo™ "alternative source electricity generation" certification under the Environmental Choice Program of Environment Canada;
- (iii) which incrementally displaces, from time to time, fossil-fuel electricity generation on the Interconnected Electric System which would otherwise have supplied Alberta electricity purchasers, including Government Canada with electrical energy; and
- (iv) which results in air pollution Emission Reduction Credits, through its displacement of fossil-fuel electricity generation for which ownership accrues to the Green Power purchaser."

The Green Power delivery under the Enmax/VQ contract began at 12:01 AM November 8, 1997, and was contracted to continue for 10 years.

Also on November 7, 1997, Her Majesty the Queen in right of Canada (as represented by the Minister of the Environment, and referred to henceforth as "EC") entered into a contract with the City of Calgary for a purchase of Green Power (similarly defined as above), commencing at 12:01 AM November 8, 1997 for a 10-year period. The Green Power was to originate from the Belly River and Castle River VQ facilities, be deemed to be delivered for the use of all Environment Canada facilities in Alberta, and include the ownership of Emission Reduction Credits. Enmax and EC recognized in the contract that both electricity generators and consumers share responsibility for the emissions arising from the production of electricity used by the consumer.

On January 8, 1998, Her Majesty the Queen in right of Canada (as represented by the Minister of Natural Resources, and referred to henceforth as "NRCan"), entered into a contract for Green Power, defined somewhat similarly as above, for a period of 10 years commencing on January 8, 1998. Under the Enmax/NRCan agreement, the ownership of the Emission Reduction Credits is not assigned or transferred to NRCan. However, NRCan retains interest in the Credits by retaining entitlement to any monetary proceeds which Enmax may accrue through any disposition of the Credits associated with the NRCan Green Power purchase.

Quantification of Electrical Energy

The electricity generated by the VQ turbines is separately metered with records maintained by the Power Pool of Alberta in accordance with provincial requirements. Electricity production from the two turbines is expected to be in excess of 3,587 MWh per year over the duration of the VQ/Enmax and Enmax/NRCan/EC contracts. In November and December 1997, electricity production was measured to be greater than 522,800 kWh.

Enmax has contracted to purchase a calendar-year annual amount of Green Power from VQ which will vary according to demand for Green Power from Enmax by EC and NRCan, except for calendar years 1997 and 1998 when it is fixed at 3,587,000 kWh (which, when pro-rated, is 530,679 kWh for the contract period November 8-December 31, 1997).

NRCan demand is fixed at 1,400,000 kWh per calendar year, pro-rated by whole days for partial years, and thus amounts to 1,373,151 kWh for 1998. EC demand is set for a calendar year to be equal to the electrical consumption for all its Alberta facilities for the immediately preceding fiscal year. This calendar

year amount was determined to be 2,423,000 kWh for 1997 (prorated to 358,471 kWh for the period November 8-December 31, 1997), and to be 2,187,000 kWh for 1998.

An annual reconciliation invoice is to be provided by VQ to Enmax, and similarly from Enmax to NRCan and EC, after the end of each calendar year. The first such invoices (from VQ to Enmax, and Enmax to EC), stated that Enmax's demand of VQ was not fully satisfied, and instead of the contracted amount of 530,679 kWh, 522,800 kWh of Green Power was provided. Enmax's reconciliation invoice reported sufficient Green Power to provide for EC's full demand of 358,471 kWh.

Emission Factors

The quantification of the Emission Reduction Credits (or potential Registered Emission Reductions, "RERs") for which ownership is assigned and transferred to Enmax and EC, has been performed using an emission reduction factor in tonnes of CO₂-equivalent per MWh of Green Power purchased. The rationale for this is that it is sensible to average, in some sense, the effective displacement of fossil fuel generation in Alberta by the Green Power source, as it is impossible to accurately measure all emissions from all plants owned by Alberta utilities, and project what the emissions would have been had the Green Power not been provided. Further, instead of estimating baseline emissions, only the change (reduction) in emissions from the unknown baseline is estimated. This enables a per MWh emission factor to be used. This approach is consistent with the use of an Historic Reference Case, but avoids the explicit subtraction of two large emission figures (Alberta utility emissions before and after the Green Power production) which would produce a highly uncertain answer.

Several alternatives exist to calculate these emission factors, although only one method was initially adopted in the VQ/Enmax/EC/NRCan contracts, using best currently available data from the 1995-1997 period. This initial method used 1995 data on total electricity consumption in Alberta; and 1995 utility-owned fossil-fuel plant-specific CO₂ emissions and electricity production. An average emission factor for each of all utility-owned coal-fired plants; natural gas-fired plants; and oil-fired (diesel) units were developed. These are easily averaged to produce an overall per kWh CO₂ emission factor, where only emissions from Alberta utility-owned plants are considered but where all electricity consumption is included. The 1995 Alberta utility CO₂ emission factor for electricity on the Alberta Interconnected Electric System is 0.9081595 tonnes/MWh. Sufficiently reliable data for N₂O emission factors were not available. The Government of Canada Green Power purchase then yields emission reductions as follows:

YEAR	Green Power (MWh)		CO ₂ (tonnes)
	Natural Resources Canada	Environment Canada	
Registered Emission Reductions applied for in this application:			
1997	0	358,471	325,549
Projected Emission Reductions under the Green Power Procurement contracts:			
1998	1,373.151	2,187.000	3,233
1999-2006	1,400.000 per annum	2,000.000 per annum	24,702 (3,087 per annum)
2007	1,400.000	1,704.110	2,819
2008	26.849	0	24
1997-2008 Total:			31,104

An adjustment will be made for each calendar year as the Green Power purchases are realized and actual amounts become known, in order to establish RERs. The 1997 subsequent annual applications for RERs should also be adjusted to account for contemporary overall calendar-year Alberta utility emission and electricity production information, with N₂O to be included as reliable information becomes available.

Additional Informaiton

The emission reduction calculation approach adopted in the VQ/Enmax/NRCan/EC contracts is perhaps the simplest method of establishing displaced CO2 emissions, and it is consistent with an Historic Reference Case approach. However, since it uses an average of emissions, production, and consumption over all utility-owned and Green Power plants, and Alberta consumption, and the averages are taken over a calendar year, it could be argued that an accurate representation is not being made of the true displacement of fossil-fuel generation by Green Power sources.

The applicants will be exploring other means of establishing displaced CO2 and N2O emissions, including using aggregated hour-by-hour and plant-by-plant production and dispatch information held by the Power Pool of Alberta in combination with average plant emission factors. It may be possible to determine which plant is displaced for each hour and what quantity of Green Power production resulted in the displacement during that hour, and aggregate this information to yield a marginal displacement-based emission reduction. Another possibility is to calculate average hourly per MWh emission factors for Alberta utility-owned generation, combine these with hourly Green Power production, and aggregate to a full year emission reduction quantity. Other calculation scenarios are envisaged and may be attempted for submission in the more detailed project documentation to follow. All such scenarios are equivalent to usage of Dynamic Projected Reference Cases, but as in the initial method used they avoid the need for subtraction of two large emission numbers.

Enmax Power Corporation has also retained ownership of emission reductions through its purchase in 1997 of an additional 164,329 kWh of Green Power from Vision Quest Windelectric Inc. beyond the 358,471 kWh which Enmax supplied to Environment Canada. Application for RERs for these reductions, and as well for reductions arising from another Green Power purchase by Enmax from Whitecourt Power Limited Partnership, may be the subject of another application by Enmax and its supplier(s) at a later date.

Indirect impacts of the project on GHG emissions have not been quantified for this application. Such indirect impacts as emissions from vehicles used during installation and operation of the turbines; or emissions from electricity generation, space-heating and metallurgical processes used in the turbine manufacture; were considered to be small and irrelevant to this application. Furthermore, ownership of such emissions were not assigned and transferred during the trade which is being conducted; ownership of these therefore remains with VQ and its suppliers. If life-cycle CO2 analysis is worthwhile to consider in quantifying the RERs, it is clear that other generating units also have similar emissions which could, in principle, offset any emissions from the manufacture and operation of the turbines. Such calculations are extraordinarily complex and do not address the main factors affecting both emissions and emission reductions, and therefore have been neglected.

The Green Power Procurement contracts have also involved the assignment and transfer of Emission Reduction Credits for many other pollutants aside from GHGs. Over the lifetime of the contracts, base on emission factor information available from 1995, the following Emission Reduction Credits are involved in the Enmax/Canada contracts:

POLLUTANT	EMISSION REDUCTION
SO ₂ (sulphur dioxide)	91 tonnes
NO _x (nitrogen oxides)	58 tonnes
(particulates)	6.7 tonnes
Hg (mercury)	not available
Cr (hexavalent chromium)	47 kg
Cd (inorganic cadmium)	123kg
Pb (lead)	493 kg
Ni (nickel compounds)	937 kg
As (inorganic arsenic)	257 kg

Third Party Review

None