



Parc éolien de l'Anse-à-Valleau

Description sommaire du programme d'entretien et d'opération

*(extrait intégral de la soumission de Cartier énergie éolienne dans le cadre
de l'appel d'offres d'Hydro-Québec)*

MAINTENANCE AND OPERATING PLAN

Maintenance Program Description

The Project will have a full-time operation and maintenance staff, and will be controlled by use of a computer, the SCADA software, and a fiber optic communication system linking each wind turbine generator installation and each substation, enabling the staff to continuously monitor 24 hours per day. The SCADA System can be accessed remotely and allows for remote reset of minor fault conditions, access to data for fault analysis and the operational adjustment of each turbine. With additional software it is possible to control the output from the site to meet the needs of the Utility with respect to planned curtailment or total shutdown if necessary. The site staff will be supported by a technical and management team to plan routine service, monitor staff and site performance, provide training as required, supervise safety issues and provide technical back up through liaison with the turbine manufacturer.

Wind generation projects require little maintenance relative to fossil-fueled plants. A fulltime crew of four (4) to eight (8) trained wind technicians, working in teams of two (2) for safety reasons, will be adequate to maintain each Project. Wind turbines are typically maintained twice a year to reduce mechanical or electrical problems. This includes replacement of any degraded parts that could reduce turbine performance.

Scheduled maintenance will be carried out, where practicable, during times of low wind, minimizing the affect on annual production. The first service usually takes place after approximately 100 to 500 hours of service following commissioning. This generally takes 2 to 3 days per turbine and consists of the 100% torquing of all bolts, plus diagnostic testing of all electrical and control systems and the changing of hydraulic filters when hydraulic operation systems are utilized in the design. Thereafter, planned service is usually at 6 month intervals during commercial operation. The half-year service generally takes 1 to 2 days and consists of greasing, hydraulic filter changes where applicable, visual inspection and some diagnostic testing, including a rotor over speed test. The annual service generally takes 2 to 4 days and consists of all the 6 month items, plus full system tests, 10 % bolt torquing, and gear oil filter changes. Usually, every third year the gear oil and hydraulic oil, where applicable, are flushed and renewed to maintain

optimum lubrication, to provide protection for these expensive main components and enhance longevity. Part of each and every planned service is a strictly controlled and monitored regime of gear and hydraulic oil sampling for independent analysis. The laboratory results will show any signs of component breakdown, reduction in lubricant viscosity or increases in particulate contamination. The results will either trigger a resample and turbine inspection, resulting in no action, an oil change or possibly a planned precautionary component change.

Comprehensive monthly reporting of site activity, individual turbine performance, site availability and output is essential to provide the owner with the information necessary to assess the ongoing effectiveness of the equipment and O&M provider.

A precise, planned and effective maintenance program is the key to protecting the overall project investment, turbine availability and site productivity.

Maintenance Program – Division of Work

Project O&M will be carried out by the turbine manufacturer during the warranty period which is anticipated to be five years. During the OMW period the turbine manufacturer will optimize the performance of the turbines to suit the site conditions and carry out a planned program of adjustments and whatever retrofits may become necessary. Cartier Wind will undertake the operations and maintenance for the remaining term of the energy sales contract by either directly hiring the appropriate O&M staff or by contracting O&M out to an experienced wind farm operator under a long-term contract. RES is a possible candidate for such a contract.

RES's affiliates have considerable experience in wind farm operations and maintenance, with tried and tested safety procedures, environmental management and proven control practices. RES's affiliates can provide a complete O&M management and reporting package covering the wind turbines, electrical HV and computer systems and civil works, with superior technical and management experience, safety and quality. An ever expanding database of information from various sites and diverse turbines around the world, in a variety of climatic and wind conditions, is providing RES with an invaluable

tool to support and benefit their own sites and those of O&M clients. The close liaison and working relationship with the major wind turbine manufacturers around the world, as an EPC contractor and client, provides RES with a huge resource of additional information and technical support that will be a continuing benefit for the future.

O&M Training: Training for O&M personnel is primarily on-the-job with the turbine manufacturer and in their purpose built training facilities, with more targeted and specialized training supported by the turbine manufacturer's sub-suppliers. Planned and periodic class time training includes such items as safety, analytical performance overview, electrical systems, electronics, mechanical systems and hydraulics. Based on the regional experience of the labor force, management broadens each training exercise to fully enhance the performance of the plant staff to optimize the project's performance. In the event that subcontracted labour becomes necessary, each experienced tradesman will be supported and supervised by a fully trained and knowledgeable wind turbine technician following an appropriate site induction and orientation.

Spare Parts Considerations: In general, spare parts held in inventory are a matter of site-specific conditions, including geographical location of the project, ownership structure, and the contractual warranty arrangement with the turbine supplier. A small inventory of tactical spare parts and central inventory of strategic components will be determined prior to commercial operations. Tactical spares should be housed at the project location, whilst strategic spares will be maintained in the operations and maintenance center(s), if there are multiple projects or at the manufacturer's facility if that is appropriate. The inventory will include a variety of turbine system components, an agreed level of major components (Main Generators, Main Gearbox and Blades, items with a long manufacturing lead time), site electrical infrastructure components like splice kits, fuses, PAD transformers, breakers, wire, and other required items for the optimization of the project performance. The PAD transformers are not normally inventoried but are available for an expedient replacement if ever required. The maintenance of the project includes routine inspections of the electrical components' operating ranges, with all the required preventive maintenance inspections performed to ensure optimal component performance.