

November 30, 2007

Ms. Karlene Fine, Executive Director

North Dakota Industrial Commission

State Capitol – 14th Floor

600 East Boulevard Ave, Dept. 405

Bismarck, North Dakota 58505-0840

Dear Ms. Fine:

Attached are copies of Lake Region State College's application for funding under the *Renewable Energy Grant Program*. LRSC embarked on the journey to reduce its carbon footprint and make greater use of renewable wind energy during the first part of this decade. It is now poised to take the next steps toward integration of wind turbine generating capability into the campus power grid and develop and implement North Dakota's only authorized wind turbine technician associate in arts training program.

Lake Region State College is committed to complete the proposed initiative as depicted in the enclosed narrative and in the time frames outlined. Obviously, some proposed aspects are dependent upon timely delivery of wind generation components and favorable construction weather. However, we have endeavored to propose an entirely realistic initiative which capitalizes upon the burgeoning growth of the wind energy industry, thereby enhancing high value job development and growth within our state .

Please contact me should questions emerge across the review process. I may be reached at (701) 662-1500, by fax at (701) 662-1570, or by email at Sharon.Etemad@lrsc.nodak.edu. Thank you for consideration of our request for support of an exciting renewable energy capability within North Dakota's higher education system.

Sincerely Yours,

Sharon L. Etemad, Ed.D

President

Abundant Energy: A Proposal for Wind Power Development and Technical Education

Lake Region State College

1801 College Drive North, Devils Lake, North Dakota 58301-1598

Principal Investigator: Dr. Sharon L. Etemad, President

November 30, 2007

Amount of Request: \$500,000

Table of Contents

Abstract 2

Project Description

 Introduction 3

 Project Objectives. 3

 Project Methodology - Background 4

 Project Methodology – Phases 4

 Anticipated Results 6

 Facilities, Resources, & Techniques 7

 Environmental & Economic Impacts during Construction and Initial Implementation 7

 Ultimate Technological & Economic Impacts 7

 Why Is the Project Needed? 8

Standards of Success 9

Background & Qualifications of Applicant, Principal Investigator, and Other Participants 9

Management of the Proposed Project 10

Timetable for the Project 11

Budget for the Project 11

References..... 13

Abstract

Lake Region State College (LRSC) embarked on a journey in 2001 to reduce the carbon footprint of the institution and begin the task of harnessing renewable energy for campus-wide use. Having completed such initial stages as phased energy conservation improvements, greater use of renewable products in dormitories, classrooms, offices, and cafeterias, legislative endorsement of the future use of wind power for powering its heating plant, and initial design of a wind turbine technician training program, the LRSC is poised to capitalize upon the burgeoning wind energy industry within North Dakota by placing wind tower technology on its campus and implementing an associate in arts technician training program. Accordingly, LRSC is requesting partial funding for both activities, thereby (1) responding to an emerging need for trained wind turbine maintenance technicians (high value jobs) by creating a new wind turbine technician training program, (2) providing a roadmap for public sector institutions of higher education who wish to integrate wind tower technology into their campus power grid, (3) assisting in maximizing the market potential for renewable wind energy by demonstrating its use within a public sector infrastructure, and (4) developing researchable questions for future public sector wind tower integration projects. Fused to this effort are three private sector entities whose total commitment to this initiative is still under review; they are Northern States Power which presently provides electricity to the campus grid, Florida Power and Light Energy, LLC., and Sequoia Energy, Inc. The two latter firms are involved in wind farm construction across the northern half of North Dakota, presently poised to erect in excess of 350+ wind turbine towers which shall need more than 1,000 trained wind turbine technicians for maintenance and routine upkeep. En-route, the LRSC will (1) request an appropriation from the Legislative Council – Budget Section, (2) backfill the required initial funding with a privately-financed note secured by future energy savings, (3) recruit full technician training classes which generate tuition resources, and (4) provide interim reports at logical intervals to the Industrial Commission of N.D.

Project Description-Introduction

As the state with the most wind energy potential within the United States, North Dakota is poised to capitalize upon the emerging potential for wind energy development. Investments by in- and out-of-state utilities have spiraled rapidly upward, propelling need for trained technicians who can maintain this capacity. And, Lake Region State College has embarked on a “green college initiative” which addresses sustainable energy use, operational enhancements, and change in personal use of consumer and institutional products.

Wind resources are abundant across the greater Devils Lake Basin area. A study conducted by Lake Region State College in 2006, and another by the city of Devils Lake in 2003, confirmed that ample wind resources existed that could be harnessed for power generation. Both studies indicated that wind averaged an annual 14 miles per hour year-around at expected hub height for a utility-scale turbine (EAPC, 2006; EERC, 2003). Depending on the turbine selected, the estimated net annual energy output ranged from 1,695 to 5,673 megawatts (EAPC, 2006). In 2007 the North Dakota Legislature approved a request from Lake Region State College to erect a wind turbine with sufficient capacity to provide power for heating the entire college campus and function as a technician training facility. Included in that request were resources for additional energy conservation measures, a wind turbine, other infrastructure investments, interconnection facilities to existing utilities, other construction costs, and educational enhancements. LRSC believed that this initiative buttressed the state’s comprehensive energy plan (Empower ND, 2002, 2007). Unfortunately, the 2007 Legislature did not appropriate funding for this initiative.

Project Objectives. The following objectives will be pursued within this proposed initiative:

1. To site and erect an operating 1.65 MW wind turbine with step up and down transformers, interconnection facilities, standby capacity, retrofit boilers, and education/training use capacity.

2. To design and implement a wind turbine technician training program.

Project Methodology - Background. Lake Region State College (LRSC) proposes to replace existing natural gas-fired boilers with electric boilers and integrate a wind turbine on the campus to provide the necessary electricity, and develop a Wind Energy Turbine Technician training program. LRSC owns a suitable site which is in close proximity to its main electrical interconnection, possesses the requisite wind velocity and duration (EAPC, 2006), and has completed a feasibility study which documents the cost, payback, and environmental benefit (EAPC, 2006). Such replacement also significantly augments LRSC's current effort to "go green" and to develop the only wind turbine technician training program authorized to date by the N.D. State Board of Higher Education.

There are no standard methods for integrating a wind turbine into a higher education campus environment (Johnson, 2006). A few private institutions have developed such energy potential; however such projects are rare in the public sector of higher education. To date, the most successful integration has been within the University of Minnesota- Morris Campus, however, that campus has not integrated an A.A. training program into its "green power initiative"

Project Methodology – Phases. Moving forward, LRSC proposes to engage in the following development and operation methodology, using a phased approach.

Phase I. a - Financing. LRSC will pursue (1) private financing of \$1,000,000, and (2) an appropriation from the Legislative Budget Commission for \$1.8 million. The total project is currently estimated to cost \$3,300,000. Private financing for a portion of the total cost is under exploration, using savings of an estimated \$140,000 per year which will pay off the note over a 10-15 year span. Given that the project was authorized during the 2007 Legislative session, the request to the Emergency Commission and the Legislative Budget Commission is already under preparation. And, initial exploratory activity with N.D.'s

Congressional delegation relative to a federal investment in the project has begun. All three activities are expected to be completed by the end of June, 2008.

Phase I.b – Design and Implementation of the Wind Turbine Technician Training Program. Separately from Phase I.a, above, another phase shall be implemented wherein the authorized 2-year Associate in Arts Wind Turbine Technician Training Program is placed in a final design stage, private sector collaborators are engaged, classroom facilities and equipment are secured via contractual arrangements, and program curricula and instructional capability are identified and recruited. Two curriculum models are under review and exploratory discussions with both Florida Power and Light Energy, LLC., (Juno Beach, Florida) and Sequoia Energy, Inc. (Manitoba, Canada) have begun, focused upon needed employee skills, training center needs, and use of appropriately credentialed private-sector employees as program faculty. Both firms are currently engaged in siting wind power farms within N.D., totaling an estimated 350+ turbines by 2011. Such activity shall need at least 700-1,000 trained wind turbine technicians to maintain and repair emerging capacity. Development of the A.A. training program is expected to be complete by September, 2008.

Phase II – Construction of the Wind Turbine. Construction of wind turbines within the continental U.S. is backlogged. The LRSC campus will not be able to enter the cue for wind tower and turbine purchase until 2009, at the earliest (Bonham, 2007). Accordingly, the construction activity is expected to employ the following sequence and timing:

- Completion of turbine plans, specifications, and permitting. This activity should be complete by December, 2008.
- Let bids for final excavation, site preparation, tower foundation/base construction, and construction of access roads. This activity should be completed by March, 2009.

- Let bids for construction of a new maintenance building to house retrofitted boilers, other associated outdoor equipment, the standby generator, all switching equipment, and educational materials and tools associated with the turbine technician training program. This activity should also be completed by March, 2009.
- Construction of tower site, access roads, tower foundation, and new maintenance building. This activity should be complete by October, 2009.
- Let bids for final erection of the tower itself. This activity should be completed by December, 2009, with construction slated for sometime in 2010-2011, given the current backlog in manufacture of turbine components.
- Let other bids for (1) placement of the underground and above ground electricity collection system, (2) interconnection to the existing Northern States Power service transformer, and (3) moving and retrofitting of LRSC's existing boilers. This activity should be completed by December, 2009, with construction slated for calendar year 2010.

Anticipated Results. Five outcomes will result from completion of the proposed initiative. First, LRSC will possess a working wind tower which generates needed "green" power for all campus heating activity. As a corollary, LRSC will move toward greater compliance with its internal desire to become an essentially "green campus." Third, a training program (A.A. Wind Technician) will exist with requisite facilities, staff, and faculty. The program is expected to produce 20 highly trained workers per year for North Dakota's labor force. The annual payroll contribution could be in excess of \$800,000 per year...and those workers will stay in the state, having been recruited from within its borders! Fourth, significant annual energy savings will accrue (an estimated \$140,000 per year). Fifth, LRSC shall possess a credible instructional role in this nation's newly emerging renewable energy sector, credibility which shall augment its Center of Excellence (Dakota Center for

Technology-Optimized Agriculture) since wind towers are invariably sited on agricultural premises within the state.

Facilities, Resources, & Techniques. LRSC is situated on a 70 acre campus located within the northwestern sector of the city of Devils Lake, N.D. The campus encompasses adequate agricultural acreage for siting the wind tower and ancillary equipment and transmission lines, yet is proximate to Northern States Power's service transformer and positioned three miles distant from the Devils Lake Regional Airport. Space for the wind technician training program is currently available in a hanger at Devils Lake Regional Airport and arrangements for final curriculum choice and instructional equipment and faculty are pending.

Environmental and Economic Impacts during Construction and Initial Implementation. The environmental impact of the proposed initiative during construction constitutes a very "light footprint," consisting of an access road, 300 square meters of topsoil disturbance, and placement of 400 meters of underground transmission wire via soil slicing techniques. However, the post-construction impact will be environmentally significant and positive. LRSC shall generate "green" energy to power its campus heating boilers. And, through its training program, it shall be producing turbine technicians capable of maintaining and repairing N.D.'s substantive capacity to generate electricity through the harnessing of wind power. Economically, the construction activity will contribute to the Lake Region's economic climate since construction workers and engineers will be housed within the area and construction material will be locally sourced.

Ultimate Technological and Economic Impacts. The technological impact accruing from this proposed initiative largely results from the contribution the initiative makes to (1) identifying methods for integrating wind turbines into a public-sector higher education campus environment, and (2) the workforce contribution of the proposed wind turbine technician program. Both key private sector wind

turbine electric generation partners (Florida Power and Light Energy, LLC., and Sequoia Energy, Inc.) possess the turbine designs, technical acumen, and management capability sufficient to site, build, and sustain electric wind power farms, but both firms need trained wind turbine technicians for the intermediate and long hauls. And, Northern States Power already serves LRSC with power through its grid delivery system, however integrating wind power into the campus grid presents technological challenges different from that of other potential installations. The economic impact upon the LRSC's ongoing costs to heat and power its campus will be significant, as substantial savings are expected to accrue over time. Additionally, the placement of competent numbers of wind turbine technicians within the energy workforce of the state shall result in salary/benefit revenue, thus positively impacting local rural community economies over time.

Why is the proposed project needed? First, LRSC desires to move as expeditiously as possible toward reduction in its overall carbon footprint, and en-route, practice good stewardship of its facility and environmental resources. Faculty, staff, and students are united with the principal investigator in desire to endorse the "American College & University President's Climate Commitment," and increase institutional sustainability. Endorsement of the proposed initiative by the N.D. Legislature during its 2007 session was helpful, however the LRSC cannot proceed without a funding appropriation and other initial revenue covering at least a portion of the total project's cost. Second, LRSC desires to contribute toward North Dakota's energy development sector by producing well trained wind turbine technicians for the state's workforce. Both wind power partners have indicated keen interest in recruiting technicians from within the state since current dependency on technicians recruited largely from the southern Gulf States results in excessive technician turnover and absenteeism once cold weather arrives on the northern high plains.

Standards of Success. The public sector use of this initiative is of two types: 1) power consumed by the LRSC campus and 2) development of a northern high plains Associate in Arts Wind Turbine Technician training program. Both will benefit the LRSC campus and potentially relieve the public sector of some expense. Clearly, this initiative will, if successfully launched, enhance the state's use of renewable energy within its public infrastructure, provide a road-map to other public sector higher education institutions for integration of "green energy sources", and produce curricula, educational facilities, and faculty for training technicians to service renewable energy installations. The latter is a substantial enhancement of the state's educational capability within the renewable energy sector. The private sector stands to gain on two fronts: (1) linkage with the proposed training program through provision of part-time faculty, training sites, and prototypical energy generation components, resulting in a two-way technical information flow, and (2) access to highly-qualified wind turbine technicians who shall stay the course as viable employees across time. Commercial use of the project's trained technicians and faculty across time shall be a significant success, in itself, for new wind turbine technician jobs will emerge at a rate of 2 employees per tower installation as such facilities rise on the high plains.

Background & Qualification of Applicant, Principal Investigator, and Other Participants. A substantial amount of prior work has already occurred. LRSC began its movement toward a "greener" carbon footprint early in the decade by launching two energy conservation projects, both of which are now complete. Both were formal *Energy Services Agreements* which used internal funding to invest in energy improvements and operational enhancements. Together the two projects will generate over \$1,600,000 in savings by 2015, with verified utility and operating cost savings currently accruing 22% ahead of initial estimates (ESG, 2007). In addition, LRSC has already completed a number of initial phases, including: (1) efficiency analysis of the existing heating plant, (2) analysis of present and future electricity needs by the campus, including costs, (3) analysis of

proposed tower site (topography, soil and substrate stability, required setbacks, compliance with FAA airport regulations regarding air space, wind velocity and duration, air density, icing simulation, shadow “flicker” of turbine blades, turbine noise, and aesthetics), development of power curves and other technical specifications for the proposed wind turbine, and (5) completion of a cost-benefit analysis. Legislatively, authorization and appropriation language was prepared as a part of the state’s higher education funding package for the 2007-2008 biennium. On the training program side, job performance skill sets have been identified, curriculum review is complete, site visits to two campuses with potentially comparable training programs have been completed, and exploration of faculty resources with both private sector electric wind power generation entities has occurred. The principal investigator, as president of LRSC, is capable of directing the proposed project toward a successful outcome and empowered by her position to execute all project phases. She has already assembled the LRSC key project team. The private sector participants include Florida Power and Light Energy, LLC., Sequoia Energy, Inc., and Northern States Power. Each is a seasoned long-term provider of power, and each has made substantial investments in electric power generation within the state’s borders. Each is capable of performing its tasks on time and within budget parameters for the relevant sectors of this proposed initiative.

Management of the Proposed Project. The proposed project will be directed and managed by Sharon L. Etemad, Ed.D., president of LRSC. Other members of the key management team include Mr. Corry Kenner, Vice President – Administrative Services, Mr. Doug Darling, Vice President of Instructional Services, and Mr. Donald Jorgenson, Physical Plant Director. Ms. Holly Mawby, LRSC Workforce Training Director, and Dr. Paul Gunderson, Director of the Dakota Center for Technology-Optimized Agriculture will augment the team’s effort at select project junctures. Progress on the project will be monitored using the milestones identified in the timetable depicted below.

Project Timetable.

Phase 1.a – Financing.....	February – June, 2008
Interim Financing Summary Report.....	July 15, 2008
Phase 1.b Turbine Technician Program Design & Implementation.....	February –August, 2008
Interim Technician Program Summary Report.....	September 15, 2008
Phase II – Construction of Wind Turbine.....	December, 2008 – December, 2010
Completion of Specifications & Bid letting.....	December, 2008 – March, 2009
Construction of Tower Site, etc.....	March – December, 2009
Interim Project Summary Report.....	December, 2009
Construction of Wind Turbine.....	January – December, 2010
Final Project Report.....	July 15, 2011

Total Project Budget.

<u>Project Capital Costs</u>	<u>Total</u>	
Financing (in kind)	\$7,900	\$2,412,900
Wind Turbine	\$2,405,000	
Balance of Wind Plant		\$367,400.00
Access Road	\$11,000.00	
Tower Foundation	\$141,400.00	
Turbine Erection	\$165,000.00	
Transformer & Transmission	\$50,000.00	
Interconnection to Campus Utility		\$70,000.00
Transformer	\$10,000.00	
Engineering Evaluation	\$30,000.00	
Interconnector	\$30,000.00	
Other		
Maintenance Building	\$100,000.00	\$282,600.00
Construction Insurance	\$10,000.00	
Fees (legal, etc.)	\$40,000.00	
Contingency	\$132,600.00	
Deployment of A.A. Wind Technician Training Program		
Completion of Curriculum	\$35,000.00	\$166,000.00
Recruitment of Faculty	\$21,000.00	
Acquisition of Instructional Equip.	\$110,000.00	

Annual Direct Operational Cost - 2010 & Beyond

Wind Turbine Maintenance		\$50,900.00
Warranty Cost	\$15,000.00	
Annual Maintenance	\$15,000.00	
Insurance (property, liability, etc.)	\$20,000.00	
Road Maintenance	\$900.00	
Replacement Reserve	\$15,000.00	\$15,000.00
Wind Turbine Technician Training Program		\$84,000.00
Faculty	\$55,000.00	
Instructional Supplies & Equip.	\$15,000.00	
Classroom rental & utilities	\$14,000.00	

Annual Cash Flow Model - 2010 & Beyond

Energy Savings	\$305,000.00
Tuition for A.A. Wind Turbine Program	\$65,900.00
Operating Expense of Turbine	\$70,000.00
Operating Expens of A.A. Program	\$84,000.00
Debt Service on \$1,000,000 Note	\$155,000.00
Years 01-10: Net Savings Per Year	\$70,000.00
Years 11-20: Net Savings Per Year	\$225,100.00

Project Analysis by Source of Funds

Renewable Energy Grant Support	\$500,000.00	
Proposed N.D. Legislative Council Budget Section Appropriation	\$1,736,000.00	
LRSC In-Kind	\$63,900.00	
10-Year Note - Privately Financed	\$1,000,000.00	
TOTAL		\$3,299,900.00

Cash Match by Source

LRSC Phase II Energy Enhancements	\$1,007,726.00	
LRSC - Commissioned EAPC Wind Energy Study	\$15,000.00	
LRSC - New Standby Power Generator	\$99,000.00	
Florida Power & Light Energy, LLC., & Sequoia Energy, Inc. - Donation of Wind Turbine Components	\$275,000.00	
TOTAL		\$1,396,726.00

References

Bonham, K. "Powering the prairie." *AGWEEK*. Monday, June 11, 2007. Pages 1 & 10.

EAPC Architects Engineers. *Lake Region State College Wind Energy with Boiler Conversion Feasibility Study*. Grand Forks, ND: EAPC Architects Engineers. September, 2006. 32 pages.

EERC. *Wind Resource Assessment Report – City of Devils Lake, ALP Site 0102*. Grand Forks, ND: University of North Dakota – Energy & Environmental Research Center. December, 2003. 13 pages.

ESG. *Annual Verification Report: Year 2 – Lake Region State College*. Minneapolis, MN: Energy Services Group. September, 2007. 9 pages.

Office of the Governor. *Empower North Dakota: A Multi-Resource Energy Strategy*. N.D. Governor's Office – 2007 State of the State Address. January 2007. 37 pages.

Johnson, MA. *University & Community College Partnerships – Intermountain Harvesting Energy Summit*. Loveland, CO: Intermountain Harvesting Energy Network. March, 2006. 8 pages.