

TECHNICAL REVIEWERS' RATING SUMMARY

R001-G

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

Submitted by Lake Region State College
Principal Investigators: Sharon L. Etemad
Request for \$500,000; Total Project Costs \$3,299,900

<u>Rating Category</u>	<u>Weighting Factor</u>	<u>Technical Reviewer</u>		<u>Average Weighted Score</u>
		<u>1</u>	<u>4</u>	
Objectives	9	4	2	27.00
Achievability	9	2	2	18.00
Methodology	7	3	2	17.50
Contribution	7	3	3	21.00
Awareness	5	3	2	12.50
Background	5	3	3	15.00
Project Management	2	3	2	5.00
Equipment Purchase	2	3	2	5.00
Facilities	2	3	3	6.00
Budget	2	3	3	6.00
Average Weighted Score		150	116	133.00
Maximum Weighted Score				250.00

OVERALL RECOMMENDATION

Fund

Funding May Be Considered

X

X

Do Not Fund

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Abundant Energy: A Proposal for Wind Power
Development and Technical Education
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- 1. The objectives or goals of the proposed project with respect to clarity and consistency with North Dakota Industrial Commission/Renewable Energy Council goals are: 1 – very unclear; 2 – unclear; 3 – clear; 4 – very clear; or 5 – exceptionally clear.**

Reviewer 1 (Rating: 4)

There are two stated project objectives: 1) to purchase and install a 1.65 MW wind turbine in the proximity of the LRSC to provide electricity to heat and power the campus facilities; and 2) to create and operate a wind turbine technician program to supply workers for North Dakota's burgeoning wind energy development. The proposal does address a number of the Renewable Energy Council's goals & objectives. It could be argued that the project would generate information and knowledge (through the training of workers) which would attract more industry investment to ND; it would create new renewable energy jobs, wealth and tax revenues; it would preserve and enhance jobs and production levels; help to maximize the market potential for wind energy development; and would develop baseline information on the feasibility of a single, large turbine application to an institutional (and possibly industrial) setting.

Reviewer 4 (Rating: 2)

Although the basic goal is in line with the REC, i.e. Promote efficient, economic.....wind energy, the objectives of the applicant seems to be a bit understated. It is apparent that a wind generator is involved and that there is electric boilers involved for which the exact interaction between the two are not clearly laid out. Additionally, there is a standby generator referenced to which one can not exactly identify needs nor operational performance. If the standby generator is operated on gasoline (?) to power the electric boilers when the wind is not available through the wind generator then there seems to be a disconnect in the renewable goals.

- 2. With the approach suggested and time and budget available, the objectives are: 1 – not achievable; 2 – possibly achievable; 3 – likely achievable; 4 – most likely achievable; or 5 – certainly achievable.**

Reviewer 1 (Rating: 2)

Obviously a big question mark on the project financing is whether or not the Emergency Commission and Legislative Budget Commission would approve the \$1.8 million sought from them. The 2007 legislative session did authorize the project but did not provide funding. The proposal also states under Phase I. a-Financing that LRSC would use savings of an estimated \$140,000 per year to pay off a million dollar note over a 10 to 15 year span. Yet in the project budget, a figure of \$305,000 in annual energy savings is used. It could be that the proposal is suggesting that only a portion of the annual savings would be used for the 10 year note, with the remainder used to offset the turbine and wind technician program operational costs. In the

section on design and implementation of the wind technician program, the proposal refers to discussions with FPL Energy and Sequoia Energy, but is somewhat vague on what their role would be. The budget section, under cash match, also refers to \$250,000 of turbine components from those same companies, but no further detail was provided. On the other hand, assuming the budget numbers are achievable, the project objectives are certainly laudable and achievable.

Reviewer 4 (Rating: 2)

The timeline appears to be achievable but aggressive, with the unknowns of legislative funding overshadowing successful completion. The budget appears to be understated from the standpoint of delivery (wires to campus), interconnection to utility substation (switches), builders risk insurance, spare parts for the major equipment and balance of plant. I am unable to identify adequacy or in-adequacy of funding for the deployment of the Wind Technician Training Program but it appears also light from the standpoint of curriculum development. One might assume that a technical curriculum development for a new program would cost in excess of the \$35,000 as stated.

- 3. The quality of the methodology displayed in the proposal is: 1 – well below average; 2 – below average; 3 – average; 4 – above average; or 5 – well above average.**

Reviewer 1 (Rating: 3)

The outlined methodology seemed fairly well thought out and spelled out in the proposal. However, it is greatly dependent on favorable action by the Legislative Budget Committee and Emergency Commission. Additional information could have been provided on exactly what the EAPC wind study conclusions were, how a 1.65 MW turbine would match up with the campus's electricity load, how many wind technician programs are in existence in the upper Great Plains states, how are wind energy companies doing with filling technician jobs, etc. It seemed as if more detail could have been provided in the proposal.

Reviewer 4 (Rating: 2)

The application contains a description of the project but is lacking in a method, technique or procedure to accomplish the project. Drawings or sketches of how this would be accomplished would have been valuable. Engineering recommendations and technical description of the interaction between the electrical production and usage, either heat or direct electrical consumption, should have been included. This information would have been invaluable for calculation of needed sizes of equipment, utilization, and economic analysis.

- 4. The scientific and/or technical contribution of the proposed work to specifically address North Dakota Industrial Commission/Renewable Energy Council goals will likely be: 1 – extremely small; 2 – small; 3 – significant; 4 – very significant; or 5 – extremely significant.**

Reviewer 1 (Rating: 3)

The proposal is for a deployment project and will only marginally add to scientific knowledge base of wind energy development in North Dakota. However, the implementation of a wind

technician program that can supply workers to North Dakota and upper Great Plains wind energy developments could be a very positive step for the state and the industry.

Reviewer 4 (Rating: 3)

The project is intriguing from the standpoint that wind energy can and will be stored in the form of heat within the boiler and infrastructure. Storage of renewable energy is the hurdle that those promoting intermittent wind have yet to solve economically. This project appears to do that with the heating of the water in the boiler yet the economics of such need to be tried. The description of the project does not directly point to energy storage but one can assume that same storage can be utilized through the use of chillers attached to the heating boilers during the summer months.

Less technical contribution would be the use of the standby generator during periods of intermittent supply from the wind generator as well as utilization of the electric energy on demand from an external grid.

- 5. The principal investigator's awareness of current research activity and published literature as evidenced by literature referenced and its interpretation and by the reference to unpublished research related to the proposal is: 1 – very limited; 2 – limited; 3 – adequate; 4 – better than average; or 5 – exceptional.**

Reviewer 1 (Rating: 3)

As stated previously, this is a deployment program rather than a research effort. As current President of LRSC, the principal investigator certainly has keen awareness of what is entailed in developing and implementing new programs and curricula for the college. She is also knowledgeable of the campus wind energy study completed by EAPC Engineering out of Grand Forks, which did indicate the potential for a cost-effective wind energy application at LRSC. It would have been helpful if the proposal would have had more information on similar wind technician programs in the general area (upper Great Plains states, for example) and there were a couple places in the narrative that greatly overstated the number of technicians needed for wind energy projects. However, it stands to reason that with all the projects developed, under development, or announced in North Dakota alone, there will continue to be a need for a significant number of trained technicians.

Reviewer 4 (Rating: 2)

It is my understanding that the principal investigator as indicated in the proposal will not be available during the implementation phases of this project. However, that position within the Lake Region State College is scheduled for a replacement. It would be unfair to comment on either administrator at this juncture. That being said, I fully trust either could successfully implement the administration of this project. The application however casts private sector participants as key players as well as members of the college administration all of whom have respectable and adequate backgrounds. Although these might be key players, it is not directly indicated to whom or for what part of this project each is responsible. Without clear lines of responsibility, the direction of the project is in jeopardy. Additionally, this project will need considerable engineering input. That position(s) does not appear in the proposal either internally filled nor externally with a consultant.

6. The background of the investigator(s) as related to the proposed work is: 1 – very limited; 2 – limited; 3 – adequate; 4 – better than average; or 5 – exceptional.

Reviewer 1 (Rating: 3)

In her role as college President, the principal investigator and other members of the project management team appear well equipped to deal with the proposed work. A wind turbine application at an institution of higher learning would be breaking new ground, but colleges are logical places to try innovative approaches. Outside expertise will likely be needed to assist with placement, installation and operation of a large wind turbine.

Reviewer 4 (Rating: 3)

See #5 above.

7. The project management plan, including a well-defined milestone chart, schedule, financial plan, and plan for communications among the investigators and subcontractors, if any, is: 1 – very inadequate; 2 – inadequate; 3 – adequate; 4 – very good; or 5 – exceptionally good.

Reviewer 1 (Rating: 3)

The proposal lays out a fairly detailed and complete project schedule with milestone dates, and includes a budget plan to accomplish both phases of the project within a reasonable time span. There are issues related to the budget that are somewhat unclear – for example it includes \$63,900 of LRSC in-kind, but this reviewer is unsure what that includes. Under the annual cash flow model, it appears that two dollar figures were reversed; to make the stated savings figures come out, the tuition revenue should be \$70,000 and the operating expense of the turbine should be \$65,900 (as indicated earlier in the proposal narrative). The proposal describes a fairly strong project management team consisting of several administrative and faculty personnel at the college.

Reviewer 4 (Rating: 2)

There is very little information on the project management plan. Also, there are not metrics for evaluation for success or failure of the plan. It appears that the electric utility has not been contacted nor allowed to review the plan as the proposal even indicates the incorrect utility. Without coordination with the existing utility, it would be hard if not impossible to calculate a payback time period as espoused in the application. Without knowing which electrical tariff the college would subscribe, be it acting as standby, intermittent supplier, or net purchaser, would drastically effect the revenue requirements and offsets.

8. The proposed purchase of equipment is: 1 – extremely poorly justified; 2 – poorly justified; 3 – justified; 4 – well justified; or 5 – extremely well justified. (Circle 5 if no equipment is to be purchased.)

Reviewer 1 (Rating: 3)

The equipment needed for installation of a 1.65 MW wind turbine is quite clear as it's been done many times over in North Dakota. It is less clear what equipment is needed in a wind technician program and the proposal could have provided more detail. As mentioned previously, reference is made to contributions of turbine components from FPL and Sequoia Energy, but no detail is provided.

Reviewer 4 (Rating: 2)

The proposed purchase of major equipment consists of a maintenance building, wind turbine, standby generator, boilers, transformers and balance of plant to accomplish the installation of the renewable energy devices. This list does not include however, switching necessary for the interconnect nor protective relaying which will be a significant investment. Coordination with the local electric utility which might require additional coordination with the independent system operator (ISO) will be mandatory and should have been accomplished to better define interconnection costs.

9. The facilities and equipment available and to be purchased for the proposed research are: 1 – very inadequate; 2 – inadequate; 3 – adequate; 4 – notably good; or 5 – exceptionally good.

Reviewer 1 (Rating: 3)

Again, this is a deployment rather than a research project. More detail is needed on the equipment and facilities needed for the wind technician program.

Reviewer 4 (Rating:3)

Timing of purchase will be of the essence in the project. Wind generator manufactures are now reporting that single purchase of machines will not be available until the 2010 plus timeframe assuming commitment through down payment is made immediately. Transformer and electrical switchgear manufacturers are quoting up to one year for small electrical gear such as that necessary for this project. Again, timing of the purchase will be critical to the success of the project. Without significant engineering having been completed on this project including a complete equipment list other than some major equipment, it is very hard to analyze this project completely.

10. The proposed budget “value” relative to the outlined work and the financial commitment from other sources is of: 1 – very low value; 2 – low value; 3 – average value; 4 – high value; or 5 – very high value. (See below)

Reviewer 1 (Rating: 3)

The funding level sought (\$500,000) is slightly greater than 15 percent of the total estimated project costs (\$3,298,900). However, another \$1.8 million is being requested of the Emergency Commission and Legislative Budget Committee. There is no commitment of resources from the private sector, although reference is made to possible contributions from FPL and Sequoia Energy.

Reviewer 4 (Rating: 3)

Utility scale investment is generally very cash intense. As an example, installation of a 1.65 MW wind turbine alone can be in excess of \$4 million. But such an investment might be required to allow “hands on” for educational purposes. It might also be required to allow research for heat storage such as that proposed with the use of heating boilers. On the other hand, such an investment is not “research” for replacement of existing electrical infrastructure.

Financial commitment from other sources – A minimum of 50% of the total project must come from other sources to meet the program guidelines. Higher priority is to be given if the application has private industry investment equal to or at least 50% or more of total cost.

The minimum 50% cash match is demonstrated.

Section C. Overall Comments and Recommendations:

Please comment in a general way about the merits and flaws of the proposed project and make a recommendation whether or not to fund.

Reviewer 1 (Funding May Be Considered)

Recommendation: In its present state, I would recommend against funding. However, in my opinion, both phases of the proposal have merit and a reworking of the proposal with more details worked out might be worthy of reconsideration.

Merits

- Lake Region State College did have a wind energy study completed by EAPC Engineers which indicated a positive feasibility for installation of a utility-scale wind turbine to provide electricity to their facilities. They do have a good wind regime and are located somewhat on the outskirts of the community, which lends itself to placement of a turbine.
- While the proposal overstates the number of technicians needed for wind energy development, it does make a strong case for the need of a wind technician program in North Dakota. The proposal would train individuals for jobs in a growing North Dakota industry and retain more young people in the state. The two phases of the proposal certainly complement each other.
- The college has a goal of being a “green” institution and they have implemented a number of steps in that direction. Included are two energy efficiency “performance contracts” which are estimated to save the college significant energy costs. The proposal furthers their efforts in reducing their carbon footprint.
- There would appear to be real prospects for working hand-in-hand with the private sector on both phases of this proposal.

Flaws

- The budget information could have been better presented. One item that was not addressed at all was the federal production tax credit. While a non-profit institution

would not qualify for the credit, has the institution explored the possibility of partnering with a private sector firm to allow the use of the credit and reduce the college's expense.

- The cash match indicated does not all relate to the proposal or is not firmed up. Earlier energy efficiency campus projects were included, along with a previously funded wind energy study (which may have been paid with state energy office funds). It also includes \$275,000 of private sector donations of turbine components, which doesn't appear to be firmed up. However, the financing of \$1,000,000 over a ten-year period would seem to qualify as sufficient match.
- More information could have been provided on exactly what the EAPC study determined, and how a 1.65 MW turbine would match up with the current and proposed campus electrical loads.
- A major issue is the potential for funding of \$1.7 to \$1.8 million of the project from the Legislative Budget Committee or Emergency Commission. Without that the project appears to not be feasible.

Reviewer 4 (Funding May be Considered)

The intriguing part of this proposal from the research angle is the utilization of a heating system to store intermittent energy. The development of a wind turbine technician training program is a necessity from the standpoint that it does bring value to the college and state but is really not a research project. The replacement of the electrical infrastructure does nothing from a research standpoint and without exact tariff and usage load curves it is almost impossible to determine payback or value. The proposal lacks engineering information on the interconnection and equipment required. As utility equipment costs including wind turbines and installation costs are rising much faster than inflation, the proposal very likely has an understated budget. It would be advantages to have a description of the management responsibility of each party involved to insure that all bases of the installation and metrics of success can be identified. Carving out costs and benefits from a research standpoint would help.

I am recommending that the project be given consideration for funding pending a clearer view of the project through amendments as listed above.