

TECHNICAL REVIEWERS' RATING SUMMARY

R008-D

Energy Beet Research

Green Vision Group

Principal Investigators: Maynard Helgaas

Request for \$165,000; Total Project Costs \$330,000

<u>Rating Category</u>	<u>Weighting Factor</u>	<u>Technical Reviewer</u>			<u>Average Weighted Score</u>
		<u>2A</u>	<u>2B</u>	<u>2C</u>	
1. Objectives	9	3	2	5	30.00
2. Achievability	9	2	2	4	24.00
3. Methodology	7	3	3	3	21.00
4. Contribution	7	2	2	4	18.67
5. Awareness	5	3	2	3	13.33
6. Background	5	4	2	4	16.67
7. Project Management	2	3	2	4	6.00
8. Equipment Purchase	2	5	5	0	6.67
9. Facilities	2	4	4	4	8.00
10. Budget	2	3	3	4	6.67
Average Weighted Score		145	119	189	151.00
Maximum Weighted Score					250.00

OVERALL RECOMMENDATION

FUND

FUNDING MAY BE CONSIDERED

x

x

DO NOT FUND

x

R008-D
Energy Beet Research
Submitted by Green Vision Group
Principal Investigators: Maynard Helgaas
Request for \$165,000; Total Project Costs \$330,000

- 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 2A (Rating: 3)

The objectives were clearly described. The project attempted to have an integrated approach to develop a new energy industry in ND. The proposed objectives included agronomic field testing of sugar beets, burn trials, juice storage and educational efforts. While the attempt is to pull all the efforts together in one project, the reviewer found the project to be fragmented in its approach. The overall goal is well aligned with the NDIC/REP goals. However, the review struggled to see the four specific objectives (four subcontracts) to be cohesive.

Reviewer 2B (Rating: 2)

Objectives are poorly integrated. The 4 objectives given appear to be separate projects that are loosely interrelated. Project does not involve tapping into a new source of energy for North Dakotans, but would support a new alternative bioenergy feedstock for the production of bioethanol. It would require the use of valuable farmland and the possible replacement of food-producing crops with sugar beets. The beet as a feedstock for biofuels appears to be in an early stage of research and development, and would not provide many new jobs for North Dakotans in the near term.

Reviewer 2C (Rating: 5)

Sugar beet is one of the most important biomass in the State of North Dakota. Unlike other technologies on cellulosic biomass ethanol production, sugar ethanol production is a well-established and has been commercialized in some countries. Sugar beet ethanol industry is suitable in North America too. The proposal aims at development of an energy beet biofuel industry in North Dakota which supports the mission of the Renewable Energy Council that to promote the growth of North Dakota's renewable energy industry through research, development, marketing, and education. The proposed research and commercialization plan meet the goals and purposes of North Dakota industrial commission on renewable energy program in terms of biofuel production, creating new jobs, growing renewable energy industry and promoting public awareness (education program). The objectives of this proposed project are consistency with North Dakota Industrial Commission/Renewable Energy Council 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 2A (Rating: 2)

The reviewer thinks that the specific objectives are achievable but has doubt on how these objectives will advance the beet fuel industry in ND.

Reviewer 2B (Rating: 2)

Objective 1, the combustion of stillage to produce biorefinery heat, appears to be feasible. For the field trials (Objective 2), there has not been a lot of research (as mentioned in the proposal). It is not clear if the trials will be successful. Alternatively, if they are successful, it is not clear if the researchers will learn “why” the success occurred. The proposal does not discuss what was learned from the previous trials in other states, and what will be learned from the new trials. The investigations involving juice storage (Objective 3) appear to be fundamental research. I did not see anything in the research plan about the effect of the storage conditions on the yield and quality of the bioethanol that would be produced. Education Program objective (Objective 4) appears to be adequate. This objective would be a great means of integrating the above-mentioned proposals is prepared creatively.

Reviewer 2C (Rating: 4)

Disposal of stillage from sugar beet ethanol plant is going to be a problem, which burn the spray dried stillage is a feasible what to dispose it is still not clear. But, the multi-disciplinary team including scientists from University and engineers and scientists from industry has a capability and experiences on the proposed research.

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 2A (Rating: 3)

The description of methodology is very sketchy and needs a lot of details on experimental design and technical approach. Realizing the expertise of conducting these experiments is with the subcontractors instead of the PI, the subcontractor need to supply the PI with more details. Stating the experiments will be carried with established procedure is not good enough, unless it is correctly cited.

Reviewer 2B (Rating: 3)

Methodology appears to be suitable. As mentioned above, I believe the investigation of beet juice storage would be strengthened if the yield and quality of the biofuels produced were tested.

Reviewer 2C (Rating: 3)

In general, the proposed methodology to achieve the objectives 1 is relative weak and lack of detailed information. The proposal did not show the application # of burn technology. The proposal did not show any details of possible methods. The methodology is kind of generic. Burn ethanol co-product from beet wastes is a good idea and direct burn is more efficiency. However, spray drying is energy cost and also for low concentration solutions. The investigators did not give the solid content in the broth waste. So I have no idea if the spray drying method is suitable based on energy efficiency.

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 2A (Rating: 2)

The only objective that might be considered new is the burned test portion. However, the reviewer thinks that an investor will not rely on this data alone to make their investment decision. The other three specific objectives might contribute a little but not significantly to science and technology. Sugar beet fuel should be a mature bio fuel approach. The reviewer thinks that the hurdle might be in business or policy, not so much technical.

Reviewer 2B (Rating: 2)

I think the level of technology contained in this proposal is modest. I believe there is a lot more fundamental research on the utilization of sugar beets that is needed before farmers and biorefinery operators will gain interest.

Reviewer 2C (Rating: 4)

The proposal aims at development of an energy beet biofuel industry in North Dakota which support the mission of the Renewable Energy Council that to promote the growth of North Dakota's renewable energy industry through research, development, marketing, and education. The proposed research and commercialization plan meet the goals and purposes of North Dakota industrial commission on renewable energy program in terms of biofuel production, creating new jobs, growing renewable energy industry and promoting public awareness (education program). The objectives of this proposed project are clear and consistency with North Dakota Industrial Commission/Renewable Energy Council goals.

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 2A (Rating: 3)

While the PI is aware of the big picture issue related with the industry, his subcontractors might be more aware in each of their areas. However, the reviewer did not think that they contribute much details in the proposal development process.

Reviewer 2B (Rating: 2)

The proposal does not give a complete picture of the advantages and disadvantages of sugar beets relative to corn and other lignocellulosic-based bioethanol feedstocks or oleochemical feedstocks grown in North Dakota, which raises concerns.

Reviewer 2C (Rating: 3)

I believe the principal investigators have industrial experiences on biofuels, but did not show any published literature as evidence or at least not mentioned.

Dr. Cole Gustfson and Dr. Dennis Wiesenborn are well known scientist and engineer in the field.

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 2A (Rating: 4)

The PI has business background and the subcontractors have expertise in each of their area.

Reviewer 2B (Rating: 2)

I performed a literature search on The PI and the leaders of the objectives as listed on pp. 9-10 and found a very limited publication record for each.

Reviewer 2C (Rating: 4)

The proposed research brings together a multi-disciplinary team including scientists from University and engineers and scientists from industry through partnership. The team has a capability and experiences on the proposed research. NDSU has strong research program on sugar beet research. Dr. Dennis Wiesenborn, Dr. Blainen Schatz, and Dr. Dr. Cole Gustfson are good scientist and engineer in the field.

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 2A (Rating: 3)

The management plan is adequate. Again, as commented on the method section, more details might be helpful.

Reviewer 2B (Rating: 2)

Milestones for the individual objectives are ok. There is little offered on the way of integrating the 4 objectives.

Reviewer 2C (Rating: 4)

Management plan is justified

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 2A (Rating: 5)

No equipment is requested.

Reviewer 2B (Rating: 5)

No equipment will be purchased

Reviewer 2C (Rating: N/A)

No equipment required in this proposal.

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 2A (Rating: 4)

It looks that the subcontractors have more than adequate facility to contract the experiments proposed.

Reviewer 2B (Rating: 4)

Appears facilities needed for the investigations are available.

Reviewer 2C (Rating: 4)

Yes.

10. The proposed budget “value”¹ 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 2A (Rating: 3)

If the reviewer was convinced that the specific objectives were closed tied with the overall goal, I might have rated it higher. The proposed budget seemed appropriate for the work proposed.

Reviewer 2B (Rating: 3)

I believe the budget is suitable to complete the objectives. I believe the “value” of the results relative to the investment to be made is modest.

Reviewer 2C (Rating: 4)

The budget is reasonable.

¹ “Value” – The value of the projected work and technical outcome for the budgeted amount of the project, based on your estimate of what the work might cost in research settings with which you are familiar.

10a. 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 2A (Funding May Be Considered)

The PI should be commended for his attempt to approach this issue with the integrated manner. His business success showed his abilities to make a significant contribution to the ND sugar beet energy industry. The team that he pulled together is very impressive. However, the reviewer is not convinced that the technical hurdles are the key ones. In other words, achieving all the four specific objectives will not significantly move the industry forward. The reviewer has the following suggestion to advance the industry. First, if the capitalization is the problem, then the state needs to approach the issue with business or policy solution. The reviewer personally thinks that the industry is more than technically feasible. The lack of funding for an actual plant might be just the reflection of the timing of the economic cycle. Secondly, the technical issues can be addressed separately and each needs to be stand on their own merit. For example, the juice storage might not be an issue depending on the processing model. If it becomes an issue, existing technologies are readily available. The proposed burning approach required rethinking or recalculation. Spray drying consumed energy itself due to extremely high water content and the liquid yeast product should have higher feed value than beet pulp, especially for mono-gastric animals. Energy and economic models are needed to ask the question “what to burn: yeast or pulp?” If the program decides to fund the work because of its overall importance, it should ask for revision for the proposal to focus one particular area.

Reviewer 2B (Do Not Fund)

This proposal reads as four separate projects bundled together under the umbrella “sugar beet bioenergy.” There is very little offered in the research plan for the integration of these objectives to allow for the advancement of sugar beet-based biofuels in North Dakota. Moreover, this proposal is not very well focused.

The first objective, relating to the potential ability to combust a waste product stream for the production of heat for the biorefinery, is funded nearly 100% by cost sharing monies. Cost sharing is involved only modestly with the other 3 objectives. Therefore it appears that the first objective is contained in the proposal solely to meet the cost sharing requirements of this Call for Proposals. This hypothesis is supported by the lack of integration of this objective with the 3 others, as stated above.

Sugar beets certainly possess some desirable qualities as a bioethanol feedstock, as mentioned in the proposal. However, there are also some concerns, which were not discussed. Primarily, the

growth of sugar beets would compete with the growth of foods on North Dakota farms. The sustainability of sugar beets relative to other feedstocks is not clear.

I noted from an on-line article by the USDA that “it is far more costly to convert U.S. refined sugar to ethanol than to convert corn” [“Ethanol from Sugar: What are the prospects for U.S. sugar co-ops?”, James Jacobs (http://findarticles.com/p/articles/mi_m0KFU/is_5_73/ai_n27014218/)]. If molasses is used as a feedstock form rather than refined sugar, it “is bulky and costly to transport, limiting the feasibility of drawing supplies from multiple sugar processing facilities.” (Jacobs article). In addition, the sugar beet as biorefinery feedstock has not been very well studied to date. There are no current sugar beet biorefineries in the US. There is a lot more fundamental study that is required before the widespread use of sugar beets would be used on a significantly large scale. Therefore, I believe the use of sugar beets as a source of biofuels feedstock would be several years away from being a practical alternative for farmers and biorefineries.

A minor concern was that a couple of the letters of support were written to Dr. Gustafson of NDSU, who appears to be playing only a minor role in the proposal, as a consultant on an advisory board (p. 8).

Reviewer 2C (Funding May Be Considered)

Strength:

Sugar beet is one of the most important biomass in the State of North Dakota. Unlike other technologies on cellulosic biomass ethanol production, sugar ethanol production is a well-established and has been commercialized in the some countries. Sugar beet ethanol industry is suitable in North American too. The proposal aims at development of an energy beet biofuel industry in North Dakota which support the mission of the Renewable Energy Council that to promote the growth of North Dakota’s renewable energy industry through research, development, marketing, and education. The proposed research and commercialization plan meet the goals and purposes of North Dakota industrial commission on renewable energy program in terms of biofuel production, creating new jobs, growing renewable energy industry and promoting public awareness (education program). The objectives of this proposed project are consistency with North Dakota Industrial Commission/Renewable Energy Council goals.

Utilization of co-products from beet ethanol production and storage of beet jounce are important issues to beet ethanol industry, especially, increase storability of beet jounce for year-round use is extremely important and has to be studied.

NDSU has strong research program on sugar beet research. Dr. Dennis Wiesenborn, Dr. Blainen Schatz, and Dr. Dr. Cole Gustafson are good scientists and engineer in the field. The involvement of NDSU is critical to insure the project successful.

Weakness:

The spray drying of low solid content solution is energy consuming. The feasibility of burn study is not clear. The methods mentioned in the proposal are kind of generic.

From industry side, most of the investigators are at presidents or top administrative level. Therefore, the research capability from industrial side is kind of weak.

Overall, my suggestion is that the proposal is fundable but has some weakness.