

TECHNICAL REVIEWERS' RATING SUMMARY

R025-D

Biocomposite Development for Industrial and Consumer Projects - Phase II

C2renew Corporation

Principal Investigator: Chad Ulven

Request for \$500,000; Total Project Costs \$1,250,000

<u>Rating Category</u>	<u>Weighting Factor</u>	<u>Technical Reviewer</u>			<u>Average Weighted Score</u>
		<u>1D</u>	<u>2D</u>	<u>3D</u>	
1. Objectives	9	5	4	3	36.00
2. Achievability	9	4	5	4	39.00
3. Methodology	7	4	3	3	23.33
4. Contribution	7	3	3	2	18.67
5. Awareness	5	3	2	1	10.00
6. Background	5	4	4	4	20.00
7. Project Management	2	4	4	4	8.00
8. Equipment Purchase	2	5	4	5	9.33
9. Facilities	2	4	4	5	8.67
10. Budget	2	5	4	5	9.33
Average Weighted Score		201	185	161	182.33
Maximum Weighted Score					250.00

OVERALL RECOMMENDATION

FUND	X	X	
FUNDING MAY BE CONSIDERED			X
DO NOT FUND			

R025-D
Biocomposite Development for Industrial and Consumer Projects – Phase II
Submitted by C2renew Corporation
Principal Investigator: Chad Ulven
Request for \$500,000; Total Project Costs \$1,250,000

- 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 1D (Rating: 5)

A lot of good alignment with NDIC goals, from job creation to new business opportunities for agricultural waste. The goal to further scale production should only accelerate the benefits already provided by what would appear to be a successful phase 1 grant awardee.

Reviewer 2D (Rating: 4)

The major objective of the proposed project is to set-up a pilot scale facility mainly a 75mm twin screw extruder to measure and validate its expansion. It matches with the NDC/REC goals in terms of impacting local economy and boost job market. Several potential products and customers were discussed on the proposal.

Reviewer 3D (Rating: 3)

The project team plans to use the funding to support the purchase of equipment and capability for scaling up their polymer/bio-composite formulations in order to increase production rate and reduce cost. They also plan to use the scale-up facilities to analyze the difference in the cost/economics of the process. Unfortunately, the proposal fails to adequately describe their current technology, and lacks clarity about the products/process that they aim to improve with the funding from NDIC.

- 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 1D (Rating: 4)

Scaling these types of processes can be difficult, but the team has been successful to date and provides a sober plan of attack for the >10x scale-up contemplated here (which while large, is in line with what other new industrial processes aim to achieve moving from one stage to another). More time will likely be needed for testing, trials and eval, but that is always the case.

Reviewer 2D (Rating: 5)

The objectives of this project are certainly achievable as they are not very challenging.

Reviewer 3D (Rating: 4)

The approach seems very straight forward, and therefore achievable, and the budget is reasonable and highly leveraged. Thus, it seems that the funding will enable the company to expand their production capacity as suggested.

- 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 1D (Rating: 4)

By better / more efficient equipment and then you can produce more. It's not a breakthrough idea, but the methodology is still thorough. The team already knows this well, but these types of industrial processes can be fickle, and it will take some time to fine tune the higher throughput equipment, but overall the plan is sound.

Reviewer 2D (Rating: 3)

The proposal has mainly discussed about the equipment and products, but lack of details on the technology. What kinds of renewable feedstocks will be used for the testing? What are the major technical challenges for the proposed technology? Support letters from the customers will also be helpful.

Reviewer 3D (Rating: 3)

The research teams plan to “validate the scalability” of the pilot scale production seems somewhat misplaced. An estimation and quantification of the expected cost reductions in the biocomposite formulations should have been included in the analysis. Overall, the proposal failed to give sufficient detail as to the technology to allow for adequate evaluation of the methodology by external reviewers.

- 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 1D (Rating: 3)

As the only material compounder in ND, there is significant benefit in establishing the technical/engineering know-how, which as noted can become a profitable opportunity to utilize an otherwise under-utilized agricultural waste stream.

Reviewer 2D (Rating: 3)

The scientific/technical contribution may be significant in terms of economic impact as the proposed pilot scale facility will produce products for customers. The broader scientific and/or technical contribution is limited.

Reviewer 3D (Rating: 2)

The proposal has insufficient technical detail to indicate that there will be a significant scientific and/or technical contribution.

- 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 1D (Rating: 3)

No research is really referenced, and I would normally ding the application more, but the “commercialization” component involved here is more industrial processing than any type of research / academic breakthrough. This is more learning by doing.

Reviewer 2D (Rating: 2)

The current research activity and published literature were not discussed. The proposed technology other than equipment was not well discussed either.

Reviewer 3D (Rating: 1)

The proposal contains no references to published literature or discussion of current research activity or reference to unpublished research. I assume that the PI's are aware of the relevant research issues, but there is no evidence in the proposals of that apart from the Background/Qualifications summary.

- 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 1D (Rating: 4)

Who better to scale this type of process than the people who are already producing at smaller quantities?! Kidding aside, the team is obviously well-positioned to accelerate production. Although it's not mentioned here, there were undoubtedly several significant lessons learned in Phase 1 that will prove valuable in phase 2. If problems arise that do reach beyond the current team's skill-set, they can and should consult with the equipment manufacturers.

Reviewer 2D (Rating: 4)

The investigators have the capability to conduct the proposed work. They have expertise required for this project.

Reviewer 3D (Rating: 4)

The team seems to be well qualified. Dr. Ulven has a PhD and has done extensive work in the field. Mr. Ehresmann has an MS degree and has worked with Dr. Ulven on research focused on biocomposite materials.

- 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 1D (Rating: 4)

As noted above, the likely testing, trial and eval phase will likely take longer than anticipated.

Reviewer 2D (Rating: 4)

Detailed plan for the installation and testing of the pilot scale facility were provided. Mitigation of risks should be discussed in the project management plan. For example, what will happen if the test is failed or the equipment deliver is delayed?

Reviewer 3D (Rating: 4)

Yes, the project management plan is reasonable, and key tasks are assigned to the relevant project team members. It would have been helpful to identify in more detail the “key performance indicators” discussed in the management section.

- 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 1D (Rating: 5)

Very detailed layout of equipment needs. The twin screw extruder is obviously the big ticket item, and the benefits of the new equipment is clearly identified.

Reviewer 2D (Rating: 4)

The proposed purchase of equipment is well discussed.

Reviewer 3D (Rating: 5)

The equipment is the crux of the proposal. By purchasing, installing, and using this equipment the companies capacity for making larger amounts of material will increase significantly.

- 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 1D (Rating: 4)

Not much information is provided about the additional location, but presumably the major requirement is simply more space, which is obviously accomplished.

Reviewer 2D (Rating: 4)

Both the key equipment and accessories are included and discussed.

Reviewer 3D (Rating: 5)

Yes the equipment and facilities are excellent.

- 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 1D (Rating: 5)

Great to see the applicant supply more than the anticipated NDIC award. Part of that would appear to come from a USDA loan, but that only further validates the overall project.

Reviewer 2D (Rating: 4)

C2renew will provide \$750,000 match which is a 60% matching.

Reviewer 3D (Rating: 5)

The proposal is highly leveraged, with \$750,000 coming as match from the company, which is a 60 percent match.

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.

²Financial 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.

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 1D (Fund)

Keep up the good work! I read the Phase 1 application and it would appear that the team has a good track record of actually executing on their plans. Introducing new materials into consumer and industrial products is no small feat. They’ve done a good to date and are well-positioned to scale the production processes and business further.

Reviewer 2D (Fund)

The purpose and plans for the purchasing of the equipment were well discussed. With the aligned customers, this project has great potential to impact the ND economy. However, the completion of technology and products was not well discussed in the proposal.

Reviewer 3D (Funding May Be Considered)

This proposal did not do a good job of providing the necessary background into the technology of the company. It was not clear what the company’s product is, and what the scientific/technological contribution of the project will be. It is clear from the proposal that the purchase and installation of the requested equipment will significantly increase the capability of the company to produce bio-composite materials cheaper and in larger quantities to their customers and potential customers. For that reason, I think it has the potential to result in significant economic income for the ND-based company. Therefore, my recommendation is to fund if possible.