Minutes of the

RENEWABLE ENERGY COUNCIL

Monday, July 20, 2015 – 12:00 p.m. (CDT)
Icelandic Room
North Dakota Department of Commerce
Bismarck, ND

CALL TO ORDER

Members Present: Al Anderson, Rod Holth, Randy Schneider, Mark Nisbet (phone), Kyle Bahls, Al Christianson, Terry Goerger

Members Absent: None

Others Present:
Andrea Pfennig, Department of Commerce
Karlene Fine, Industrial Commission (phone)
Denise Faber, Department of Commerce
Patrick Sweeney, Fargo Jet Center
Rob Walter, Naval Research Laboratory
Terri Zimmerman, Packet Digital LLC
Mike Ehresmann c2renew
Corey Kratcha, c2renew
Bruce Folkedahl, UND EERC
Charles Smith, Epcot Crenshaw
Tim Brown, American Refinery Group
Jacek Chmielewski, BioMass Solution
Aaron Bjerke, American Crystal
Keshaw Rajpal, BioMass Solution

Al Anderson, Chairman, called the Renewable Energy Council meeting to order.

WELCOME AND OPENING COMMENTS

Anderson welcomed everyone.

APPROVAL OF MINUTES

April 20, 2015 meeting minutes were reviewed.

Schneider moved to approve the minutes as presented. Holth seconded the motion. All in favor. Motion carried.

PRESENTATION OF FINANCIAL SUMMARY

Fine presented the financial summary, which was also posted on the website. Uncommitted dollars available for projects as of May 31, 2015, is $2,464,758.73 available for this grant round. We also have the additional $3 million in revenues from the Resources Trust Fund for the *2015-2017* biennium.

CONSIDERATION OF GRANT ROUND 25 APPLICATIONS

R025-C: "Soaring Solar Power Manager Phase II"; Submitted by Packet Digital; Principal Investigator: Andrew Paulsen; Project Duration: 9 months; Total Project Costs: $1,000,000; Request for: $350,000.

Pfennig gave an overview of the project. The project's objectives are to create a solar soaring power management system for Unmanned Aircraft Systems (UAS) to initially double fly times and ultimately provide unlimited endurance powered by solar energy. The tasks include: solar cell development; update power system to support Altavian UAS, hybrid smart battery, optimized torque motor control, and implement solar soaring algorithms. The overall reviewer's recommendations are as follows: Fund (178) and Funding May Be Considered (158 and 145). The Average Weighted Score was 160 out of 250. Some of the reviewer's had reservations regarding the achievability. They were surprised that it could be done in nine months. The applicant agrees that it's aggressive, but feels that prior performance demonstrates that it is achievable. A reviewer also stated that Objective 1 has been met, so why not have a more challenging goal, and was skeptical that an efficiency close to 40% is achievable. The applicant responded that they achieved individual solar cells at about 32.5% in Phase I. NRL reported a value of about 36% in June 2015, and they have design improvements planned to increase this

value further. They are confident they will achieve a solar cell with efficiency of approximately 40%. There were also reservations from a reviewer regarding achievability and they didn't feel the team should be working with solar cell development. The applicant responded that the solar cell development efforts at NRL are also funded by NRL. ND REP will benefit from the extensive PV expertise of the NRL team, and when the team is successful in achieving the proposed solar cell technologies, North Dakota will the direct beneficiary. Reviewers had concerns regarding the methodology. One reviewer commented the modifications to the SBXC airframe were listed as a prior achievement, changing to using a new airframe will require design and integration work to be re-accomplished. The techniques to be used for power management were vague. The applicant responded the prior goal was to demonstrate the most challenging key aspects, using a commercially available aircraft to simplify the effort. The goal was achieved. Prototyping a well-designed airframe is the next step in Phase II that will enable SUAS capability and establish a new manufacturing effort in ND. One reviewer was confused regarding the methodology and felt more detail was needed and commented "…40% efficient PV cells would enable eternal endurance flights, elsewhere it is noted that to achieve eternal flight a 50% airframe weight reduction is required along with 50% more area of the solar array. Neither of these is being addressed by the project. It's unclear how or when such developments will be undertaken…" Reliance on finding a new storage technology outside of the project team is concerning. The applicant responded that increased solar cell efficiency, increased battery capacity, and reduced airframe weight are all interrelated aspects that can be tuned to achieve the goal of persistent endurance. If weight is reduced by 50%, more batteries can be added at the same capacity. Alternatively, if higher capacity batteries with higher efficiency solar cells are included, then we may be able to remain at the present airframe weight. In the proposal, general goals were stated, but a more specific set of performance parameters will come from our continued work into Phase II. The applicant also stated that they are moving forward with battery technology that is readily available. However, emerging technologies are continuously explored. If a more viable technology becomes apparent, it would be explored. Another reviewer commented regarding the methodology that there is no reference to cost. If a UAS can fly twice as long, but costs more than two times as much, is it worth it? The applicant responded that they are targeting no more than a 25% increase in the cost of the airplane over presently available battery or fuel powered systems. The airframe, batteries, and power system are not expected to have any major cost drivers that would raise the price. The solar array, however, may increase the cost. Phase II will work to establish a path to allow cost effective manufacturing of these arrays, which adds the extra potential benefit of increased manufacturing jobs in North Dakota.

Commerce's recommendation is to fund the project. We believe this proposal offers a tangible step forward toward the advancement of UAS and solar energy utilization in North Dakota. It provides a pathway for new manufacturing possibilities for state businesses and subsequent job creation. The reviewers point out some concerns that should be carefully considered along with the clarification provided from the applicant. The Naval Research Lab's involvement as a partner adds credibility to the proposal and would considerably leverage the REP's funds. The applicant's results from the first phase of the project will help demonstrate the potential success of the second phase. There are no suggested contingencies if funded.

Zimmerman presented an overview of the project, introduced the team members involved with the project, reviewed the overall project

plan, and Phase I and Phase II, and discussed the value to REC and North Dakota. The project will bring solar UAVs to the commercial markets and renewable energy manufacturing to North Dakota to enable endless endurance in unmanned aircraft. The partners include Packet Digital, LLC, Naval Research Lab, ComDel Innovation in Wahpeton, the Northern Plains Unmanned Systems Test Site, NDSU and UND.

Our project goal is to enable endless endurance with a low altitude unmanned air system. We are looking at about 20 hours with what we have achieved today. Our goal is to get to 24/7. We are combining a number of different technologies to do this. We are autonomously seeking, acquiring, and exploiting thermal to get lift with aircraft to give us extended endurance; we are developing 40% efficient solar cells in a flexible solar array to be put on a UAV wing; and, developing a solar soaring power management system at Packet Digital to integrate all of these technologies together.

Schneider asked if the 20 hours is flight time. Zimmerman replied yes. The ultimate goal is to have the device fly 24/7.

The project development phases were shown. The first phase was in a laboratory setting to create the discrete components of the power management system, and also then to work on advancements on the solar cells to gain efficiency to get this endless endurance. Then we will work on the solar soaring algorithm into a micro-controller. Then our goal is for Phase II of this project, to get to a 36% efficiency of solar with a stretch goal of 40%. We will then implement the solar soaring algorithm into a prototype so that it can be commercially feasible project. Phase III would be to take this further and more extensive testing, and start to produce this in low quantities for production.

FINAL REPORT

R022-031 "Soaring Solar Power Manager Phase I."

Zimmerman presented the final report. On Phase I, we produced a 37.8% efficient solar cell. We have been working with commercial partners in California, and companies around the world. We initiated the manufacturing of a 22% silicin and 27% solar rays from two different manufacturers, so we will have two aircraft with two different solar rays on them to do test flights with. We produced a flight endurance model that I refer to where we are calculating the number of hours, and in our calculations, we are seeing between 19-23.5 hours. We've produced Maximum Power Point Tracking hardware, and we have also produced a smart battery with approximately 440 watt hour capacity. We produced the power manager which integrates all of these components at 95%, and we also created a lab bench setup so that we can test these. The entire Navy team is coming in this week and we're going to be demonstrating it. We are translating soaring algorithms to a c-code so it could be used in a real commercial application, and we are delivering the hardware to NRL.

Schneider asked what is a "c-code"? Zimmerman replied it is basically a computer code, because right now the algorithms are not in a usable format for commercial applicability.

At this point, which is through July 8, there are just over $1 million from various investors in Phase I.

CONSIDERATION OF GRANT ROUND 25 APPLICATIONS continued

R025-C: "Soaring Solar Power Manager Phase II " continued

Walters reviewed the energy generation and technology involved with Phase I, Phase II, and Phase III.

In summary, Zimmerman stated that in Phase II we are going to continue our effort to improve the efficiency of solar and bring this changing technology to the market, not only for the potential for UAVs but other applications. We are going to implement the solar soaring algorithms into a commercial product, we are going to design the MPPT and the PMAD that we passed around into the aircraft we have been using, and also into Altavian's aircraft that is being manufactured at ComDel. We are going to continue with our optimization of the smart battery to get more graph of it, and we are going to optimize the motor control, and then we are going to bring all those systems together in the lab, do more testing, and then we have our first test flights scheduled for November. This project will be applicable to many industries: agriculture, pipeline management, search and rescue, media communications.

With this project, we are creating an unprecedented capability in the commercial space with UAS. This would be the first time in the world that unlimited endurance will be brought to the unmanned aircraft system at an affordable price, and we can do this in North Dakota, so it's creating an opportunity to have renewable energy and bring some of this technology to North Dakota, and the potential to possibly have direct access to this next generation's solar technology and potentially manufacture some of this in North Dakota.

Schneider asked if the Naval Research Laboratory is comfortable doing that type of manufacturing in North Dakota. Walters replied yes. It would be a great opportunity for them.

Schneider stated that it sounds like Naval Research Lab has a good relationship with Packet Digital and an immense amount of respect for what they can do and their capabilities. Any comments to that? Walters replied without a doubt. We have already taken delivery of technology from Packet Digital. They have demonstrated the capability of the technology. They have already created a very solid reputation based on their success that they are taking advantage of.

Schneider asked if there any capabilities of this technology behind an aircraft. Zimmerman replied absolutely. They see that this technology could be used for many different kinds of industries. Walters replied the electronics side is huge, and the solar side is huge.

Zimmerman stated that some the work for this project could be completed in Dunseith. There is a manufacturing facility there that could be a possibility. Benchmark is moving out of there next year. They are very impressed with the capability there. We are creating jobs in North Dakota. Since we have had this project and been involved with NRL, and through the ND REC we are taking the capabilities of our company and going into a vertical market with UAVs, and as a result, we've started a new company called Botlink. We formed it with another company, Aerobotic Innovations. We opened up in June with 8 new jobs. We currently have about 20 people on this initiative. We expect this could go beyond 100. We see this as a huge opportunity to create jobs in North Dakota. We are leveraging the expertise of North Dakota universities, and we've been in discussions with UND and NDSU as we move into the testing phase. We've also been working with the test site.

FINAL REPORT

R018-028 "Development for Industrial and Consumer Products"

Kratcha presented the final report. Chad Ulva is in Copenhagen. We develop biocomposites by hydrodizing different waste streams into a broad range of waste streams. We then provide a stabilization of a pretty volatile plastics

market. In addition, we sort of classify ourselves as a compounder. We are the state's only compounder in North Dakota. We can custom compound and we provide those to match the engineering specs of what the customer wants. The objective of the project that we started off was we were to work with developing and translating the industrial trials with Earth-Kind, Bobcat, John Deere, Toshiba, and sort of advocate around bio and bring in some new customers centered around bio and biocomposites. With Kari (Earth-Kind), we developed a repellent. With Toshiba, we developed ink toner cartridges. For John Deere, we developed a drop-in replacement for their lawn tractor. We are the only biocomposite manufacturer that has made it to PT. For Bobcat, we developed a biocomposite drop-in replacement for an under the hood component. We worked with Aparreo to develop a *c-vargous* monitor that they were having some warpage issues with, and were looking at lowering the costs of the product. We worked with them to develop the material and provide them a low cost alternative. This led to engineering services with working on some new combine sensors to bring about a cleaner seed that you bring to market. These sensors are going to commercialization.

We started with 3 people, and we currently have 8 people. We are looking to grow. We are about 525,000 production. We are focused on job creation and growth. We offer high wage employment. They are currently located at the Technology Park, and would like to move production to Colfax, ND.

R025-D: "Pilot Scale Facility for Biocomposite Development for Industrial and Consumer Projects"; Submitted by c2renew; Principal Investigator: Chad Ulven; Project Duration: 18 months; Total Project Costs: $1,250,000; Request for: $500,000.

Pfennig gave an overview of the project. The project objectives are to expand production from 520,000 pounds of material to 6 million pounds per year. To do this, they are purchasing the following equipment: 75 mm twin screw extender; large polymer dryer; and air compressor, dust collector, and chiller. The overall reviewers' recommendations are as follows: Fund (201 and 185) and Funding May Be Considered (161). The Average Weighted Score was 182 out of 250. The reviewer's felt the project is achievable. They have been successful to date, the objectives aren't very challenging, and a reviewer stated the approach is straight forward and the budget is reasonable and highly leveraged. The reviewers felt the methodology is adequate; however, a couple of them felt that it lacked detail. Another wanted an estimation and quantification of the expected cost reductions in the biocomposite formulations. The applicant responded that they didn't feel they needed to focus on describing the technology in great detail because it is the second phase of a project, and the same reviewers saw the first phase. One reviewer commented that as the scientific contribution as the only material compounder in ND, there is significant benefit in establishing the technical and engineering know-how. One reviewer felt that the PI's awareness of current research activity was limited; however one reviewer felt that this is more industrial processing than any type of academic breakthrough. The reviewers felt that the investigators have a strong background in this area. The project management plan was sound, the equipment to be purchased was justified, and the budget was highly leveraged. The team has a good track record of executing their plans.

Commerce's recommendation is to fund the project. This proposal is a firm step forward in developing a biocomposite industry in the state. It is a North Dakota business with a pathway to large scale commercialization. It utilizes technology developed by NDSU. It ultimately

could offer another revenue stream for agricultural producers that experience fluctuating commodity prices. There are no suggested contingencies if funded.

Kratcha presented the project. The project's objectives are: develop pilot scale facility to assess the scalability of additional extruder lines; understand unit economics of expanded production projects; assess personnel growth; and ERP system integration.

The focus on this project is to bring in equipment: the 75 mm twin screw extruder, a large polymer dryer, and an air compressor, dust collector, and driller.

Schneider asked about how much raw material they have on hand, and how to they source that. Kratcha replied that right now a lot of their material comes from processors. They do not keep a lot material on hand because of moisture and spoilage concerns.

Schneider asked if they source any raw material in North Dakota. Kratcha replied yes.

The results of the purchasing of equipment would be quicker cycle times, which lowers production costs. This allows us to expand compounding capabilities, and allows us to get into other materials. It is also going to allow new customers and market growth.

We would like to move production to Colfax, ND.

The budget is a total $1,250,000; REC - $500,000 ($350,000 equipment purchase; $150,000 operating). C2renew - $750,000.

Holth asked about the $750,000 c2renew is putting in. Does that have to be personally guaranteed? Kratcha replied that because of rural infrastructure, it's a hard asset and good collateral.

Anderson had a question regarding the full range products to the commodity side, and that there is an estimate to reduce costs by a third. How much will that open it up on the commodity side? How far away are you from just a petroleum-based? Kratcha responded they have one product where they are getting close to petroleum. They are mindful of the commodity piece.

Break at 2:30.

Opened at 2:45.

R025-B: "Biomass to Refinery Feedstock-Grade Liquids"; Submitted by EERC; Principal Investigator: Bruce Folkedahl; Project Duration: 12 months; Total Project Costs: $609,086; Request for: $304,543.

Pfennig gave an overview of the project. The project objective is to optimize a gasification Fischer-Tropsch-based biomass-to-liquids (BTL) technology, and develop a preliminary engineering design for a demonstration-scale BTL system capable of converting manure and other low-value biomass resources to hydrocarbon mixtures suitable for direct use as petroleum refinery feedstocks.

The overall reviewer's recommendations follow: Fund (192 and 199) and Funding May Be Considered (163). The Average Weighted Score was 185 out of 250.

The reviewers felt the project is likely achievable. However, more information regarding the catalyst should have been provided. Some technical issues that were not fully addressed in the proposal that may involve additional cost. These include energy cost in drying manure feedstock; temperature distribution of the gasifier as affected by the moisture content in manure; and purification/conditioning of the producer gas to syngas. The methodology was adequate; however, one reviewer felt Task 1 should have

already been completed, and one commented that this is a process development project versus scientific research. Regarding the scientific contribution, this project offers a technology to overcome several factors currently limiting in the economic and technical feasibility of converting biomass into chemicals that can replace petroleum. Applicants have a long way to go to verify the overall system will integrate the various unit operations, that a demonstration scale operation will be economically viable, that a reliable feedstock supply system can be put in place, and that commitments from buyers can be procured. Two reviewers felt that the PI's awareness of current research activity appeared to be limited; however, two reviewers also felt that the PI has a strong background in this area. A reviewer felt the weakness of this proposal was the absence of economic viability data, a reliable feedstock supply, and a reliable buyer of the finished product. Another reviewer commented that the energy needed to bring the moisture of manure (85%) down to a level of gasification (8-10%) may not break even. One reviewer felt that the proposal was strong, but had a concern regarding the lack of details on the catalyst since it is critical to a successful project.

Commerce's recommendation is that funding may be considered. The proposal is a step forward in developing a biochemical industry in the state. It utilizes technology developed by the EERC. It ultimately could offer another revenue stream for agricultural producers. It has a strong industry partner. However, in addition to the catalyst information and economic information mentioned by the reviewers, the proposal would be strengthened by more information regarding the feedstock potential. It appears that manure is the main feedstock for the process, but it is unclear how much of this feedstock is required, if that amount is readily available in the state, and what costs would be associated with collection and transportation. The applicant has indicated that they are working with Singularity Energy Technologies to develop a business strategy for AFBG commercialization. They may already have economic feasibility information available to share with the Council. There are no suggested contingencies if funded.

Folkedahl presented the project. Folkedahl stated the partners for this project are Epcot Crenshaw Corporation, American Refining Group, and Singularity Energy Technology.

They are trying to develop an integrated biomass-to-liquids system at the pilot scale, demonstrate that it can be operated reliably for more than just a day or hours at a time, and then to optimize that to a certain degree, and integrate an advanced fixed-bed gasification system that we developed at the energy center with a gas cleanup system to produce a clean syngas that can be fed to a Fisher-Tropsch reactor that will catalytically convert that gas to a liquid hydrocarbon stream that would be acceptable for a refinery feedstock input.

Project objectives involve a couple of different things. One of the major concerns of the reviewers is that there wasn't enough information about the catalyst. Our intention is not to develop a catalyst in this project, as it does take a long time and other people have already done it. Our intention is, with the help of Epcot Crenshaw and American Refining Group, to secure a commercial catalyst and they are working on that now. We will then take that commercial catalyst and do a quick screening of it in a bench scale Fisher-Tropsh reactor system that we developed under a different project for the Department of Defense that we have utilized in over 50 tests for screening of catalysts. We will screen those catalysts to make sure that they are what we asked for, and then we are heating a carbon distribution chain that is acceptable to American Refining Group as the off-take of buyer of the product. Once we screen the catalyst, we will go to work optimizing that

advanced fixed-bed gasification system that was developed at the EERC. This system was designed with manures in mind. This is not the only feedstock that will be utilized in this gasification system. We are concentrating on manures on this particular project because manures are the most recalcitrant to gasification for reasons mentioned by some of the reviewers. Manure does have a high moisture content and they tend to generate an ash that is susceptible to clinkering. This gasifier was designed with that feedstock in mind to alleviate some of those concerns. We will then integrate all of these systems and start producing with our commercial catalyst in our FT reactor. We will start producing a liquid hydrocarbon, and submit those samples to American Refining Group. They will analyze and inform us if there are things that need to be addressed, and we will adjust our process until we get to the point where it is an acceptable feedstock. After generating all the data for weeks at a time, we will take that information and do a preliminary design, or specifically a front-end loading stage 2 design, which is a design layout with components.

Schneider asked if the cost estimate is for commercialization. Folkedahl replied yes, that would be to the targeted commercial scale. In this case, it is a 25 barrel per day facility. That size is what Epcot Crenshaw and American Refining Group are targeting for a couple of different reasons. The size alleviates any transportation issues. With that size, it can be placed near an ag production facility, food processing plant, or a large dairy farm, and enough input in feedstock that you don't have to worry about trucking feedstock long distances.

Schneider asked that this is at 25 barrels a day, would there be a system that would stop at each of these locations to pick up the barrels. Folkedahl responded no, you would be producing 25 barrels a day of oil at this facility which you would essentially store and load up and send off to the buyer, which in this case would be at the facility that Epcot Crenshaw and American Refining Group are targeting, and it would go straight to American Refining Group.

Folkedahl believes this project is the first step to getting Singularity Energy Technology off the ground. They would like to produce in Grand Forks. If we can prove this for Epcot Crenshaw and American Refining Group, then it provides a nice basis for placing these types of systems around the states, not in the least of which is North Dakota.

Schneider asked that from the manure standpoint and it being an asset, could you take out what comes out of a garbage truck on a daily basis and do what you are looking at doing. Folkedahl replied yes, you can, but it would require separation. They have done some of that preliminary work. Out east, manure is no longer an asset as they have to dispose of it in other ways, and they can't land apply it, or they are limited in the amount they can land apply.

Schneider stated he had a concern with picking up the material from different sites, and how that was going to be done.

Brown responded that they are a very small refinery so they are leaning towards smaller loads. This concept is similar. The benefit of the product that they are targeting will be a fairly stable product versus a very light fuel. At any given variation point, they can have a tank that they can keep the product in until the point they would either like to truck it out or rail out, or whatever logistics would apply. You would want to have some type of hub and spoke model that would have individual sites if they are not able to ship directly a refiner. They could get to a central distribution or holding point, and then have it shipped from there.

Goerger asked since waste isn't a problem in North Dakota, but it is on the east coast, are you involved with this so that you can take the information and utilize this information to be used on the east coast in the refineries. Brown replied that for them, this is a matter of finding alternative sourcing for taking types of waste streams. This is deployable in North Dakota because we can get the gas stream clean and converted to the gas to liquid concept, and that is something that North Dakota is dealing with.

Anderson asked about Singularity Energy Technologies. Are they looking to license their technology or looking into getting into manufacturing? What are they looking to do as far as their business plan? Folkedahl stated that right now it is to manufacture these systems in Grand Forks. It depends on the financial outcome of our licensing agreements with Epcot Crenshaw and American Refining Group.

Goerger asked who owns Singularity? Folkedahl replied it is the inventor of the gasification system. He invented it, and we developed it into multiple projects at EERC. He is on the patent and is the one who started the start-up company of Singularity. His name is Dr. Nikhil Patel.

R025-A: "Sugar Beet Tailings to Advanced Ethanol"; Submitted by Biomass Solution; Principal Investigator: Jacek Chmielewski; Project Duration: 5 months; Total Project Cost: $1,000,000; Request for: $500,000.

Pfennig gave an overview of the project. The project objective is to develop a small-scale distributed advanced ethanol plant that will be located in Grand Forks. The plant will utilize Sugar Beet Tailings (SBT) from four American Crystal plants as feedstock for the production of fuel grade ethanol. The plant will also produce high quality animal feed as a by-product. The project to be funded includes: front end engineering and design (FEED); detail design and engineering; environmental permitting, property surveying, insurance reviews; and development work, including legal and accounting work association with the project. REP funds will only be used for engineering.

The overall reviewers' recommendations follow: Fund (220) and Funding May Be Considered (167 and 156). The Average Weighted Score was 181 out of 250.

A reviewer commented that the proposal did not provide adequate information to demonstrate awareness of current research. The applicant responded that literature citations can be added; however, empirical data will be generated during parallel testing processes that will be conducted in conjunction with the FEED activities. Another reviewer commented that with roundup ready beets, the make-up of the SBTs is the same as the sugar beet, so they've already been aggregated and cleaned by American Crystal Sugar (ACS) making the business model viable. If the project were using whole beets, the model wouldn't work. Two reviewers felt that the objectives were achievable. One reviewer was less confident, and commented "the rest of the submission still falls short on the overall funding pathway. If this is to be funded, it should be done a milestone basis. The FEL 1 results should reveal the viability of the process, and the estimated production cost on a dollar per gallon basis." The reviewers had some concerns about economic viability. One reviewer commented "Two (2) main concerns remain: 1) the proposed feedstock will only be available for part of the year; and, 2) the limitation of feedstock supply restricts the size of the facility to 10 mgy, which is 5-10 times smaller than the corn ethanol biorefineries they will be competing with. While the low or potentially negative feedstock cost is very attractive, the CapEx on this project in relation to annual production are very unattractive. How these balance out will determine whether this project

is economically viable." The applicant responded that all of the financial analysis of the plant Opex is based on 270 days per year total run time, and the plant does perform well financially. BioMass Solutions (BMS) is in communications with additional food processing facilities in the area about utilizing their waste streams as a supplement during the remainder of the year. The large scale corn ethanol is due to the issues associated with high feedstock purchase prices, and high product solids that have to be dried to transport such large quantities of the solid by-products. The drying of this by-product exposes corn ethanol producers to high fossil fuel natural gas price fluctuations. The BMS plant uses very solid content sugar beet tailings, therefore the treatment of the solids (drying) is also severely diminished (at a ratio of 5:1). The cost of the BMS feedstock plus all of the Opex are lower than just the cost of corn purchase price. The difference in the CapEx versus Opex curve relatively early in the plant operation, making the BMS plant very attractive. One reviewer had questions on the methodology. The first question was what are the storage conditions for the SBT and unmarketable beets? The applicant responded in regards to the SBT storage, BMS will be continuously processed. The SBTs will be stored temporarily in a storage area as they are unloaded from the trucks and moved into a storage tank as the first step in processing. What is the fate of the wash water used to clean the SBTs and beets? The applicant responded that the wash water moves into the water recirculation and treatment loop. What is the polymer enhanced stratification process and what are its benefits? The applicant replied polymer processes unload requirements and energy costs for centrifugal separation. If solids are removed prior to distillation, how will ethanol be recovered from these solids? The applicant responded that solids will be removed prior to fermentation. Any solids that come from the fermentation process have very low levels of ethanol remaining, and can be blended with the solids at a very high dilution rate. The solids have been tested against the ACS specifications for animal feed and have passed. Why are the animal feeds to be pelleted? Corn DDGs isn't pelleted. The applicant responded the distribution channel established by ACS requires that it be pelletized. What is the advantage of the UV light photoelectrocatalytic water treatment process over biomethanators that are commonly used in ethanol plants? The benefits are in cost in throughput. Reviewers had comments regarding the PI's background. The project participant section just lists the roles of each of the participants, but does not describe any level of prior expertise in the ethanol industry. Another reviewer stated that this project appears to be the largest venture undertaken by the applicants and is ambitious. The applicant responded that there are five engineers that have ethanol experience. However, there was no more detail given. The applicant can provide resumes upon request. One reviewer had a comment regarding budget. $700,000 is a significant lump sum to exclusively fund engineering work. The applicant responded the FEED level sought falls right in line with industry benchmarks for this activity. The estimated cost for the facility is also in line with global benchmarks.

Commerce's recommendation is funding may be considered. This project would be a step towards the construction of a beet ethanol plant in North Dakota. An agreement with American Crystal Sugar is in place, and the plant would allow them an opportunity to create revenue from a waste product. However, the reviewers have some serious concerns regarding the achievability of the proposal. It is concerning that the reviewers were not very confident regarding the technical and economic feasibility of this proposal. Suggested contingencies, if funded, would be funding be provided for the FEL-1 tasks first ($400,000) with subsequent funding released if FEL-1 tasks find the project feasible.

Schneider made a motion to close the meeting pursuant to N.D.C.C. §54-53-02. Goerger seconded the motion. The motion carried. Meeting was closed at 3:33 p.m.

Anderson opened the meeting at 4:07 p.m.

ADMINISTRATIVE BUSINESS

Other Business

No other business.

COMPLETION OF BALLOTS

Discussion of projects followed.

R025-C: "Soaring Solar Power Manager Phase II"
There were no concerns with this project. REC felt this was a good project.

R025-D: "Pilot Scale Facility for Biocomposite Development for Industrial and Consumer Projects"
There were no concerns with this project. REC felt this was a good project. Goerger does have a conflict with this project, as he is invested in them with an Angel Fund.

R025-B: "Biomass to Refinery Feedstock-Grade Liquids"
There were concerns with this project. Overall, the Council could not see any benefit to North Dakota with this project. Some of the Council did not think the economics worked for this project. There were also concerns also with the investment with the manufacturing and building of equipment. The availability of the amount of manure needed and transportation cost was a concern.

R025-A: "Sugar Beet Tailings to Advanced Ethanol"
There were concerns with this project. The current cost of ethanol and RINS were of concern. The product being used is commodity driven and does not have a high margin. This project doesn't seem to work economically.

R025-C: "Soaring Solar Power Manager Phase II"
Fund: 7 No: 0

R025-D: "Pilot Scale Facility for Biocomposite Development for Industrial and Consumer Projects"
Fund: 7 No: 0

R025-B: "Biomass to Refinery Feedstock-Grade Liquids"
Fund: 0 No: 7

R025-A: "Sugar Beet Tailings to Advanced Ethanol"
Fund: 2 No: 5

ADJOURNMENT

Schneider moved to adjourn the meeting. Holth seconded the motion. Motion carried. The meeting was adjourned at 4:35 p.m.

Alan R. Anderson Date
Chairman

Denise Faber Date
Acting Recorder