1. **OBJECTIVES**

The objectives or goals of the proposed project with respect to clarity and consistency with North Dakota Industrial Commission/Lignite Research Council goals are: 1 – very unclear; 2 – unclear; 3 – clear; 4 – very clear; or 5 – exceptionally clear.

**Reviewer 31-01 (Rating: 3)** The proposal states the objective of project one is "to develop 3D printer filaments using at least two of the most common coal waste materials – bituminous coal fines and fly ash". Although a goal that support the US coal industry the goal of the ND LRP is to demonstrate a path to commercial applications with ND lignite. It later does state that ND lignite will be used but it’s not clear where and how much and to what end the ND lignite will be used. I would hope that the proposers will use their presentation to the Lignite Research Council to enlighten the voting members on the answers to these questions. With the right answers this reviewer would potentially offer a higher score but since that information was not available at the time of this review the goals presented are clear but not demonstrated to be consistent with NDIC.

**Reviewer 31-02 (Rating: 5)** Objects are clear and consistent with LRC goals. Adding 55% by weight of coal to building materials will provide a substantial market opportunity for North Dakota lignite.

**Reviewer 31-03 (Rating: 4)** The objective of this project is to increase the use of coal and coal-based materials beyond an energy source for power plants. Two goals are identified. The first goal is to develop the use of coal waste in filaments suitable for use in additive manufacturing (3D printing). The second goal is to demonstrate incorporation of coal-based materials into building materials. The objective and goals are consistent with NDIC & LRC objectives.

2. **ACHIEVABILITY**

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 31-01 (Rating: 2)** The proposals objectives will likely be achieved but this reviewer is looking at the potential for the project to meet the objectives of the NDIC as well as the proposer, when considered from that perspective it is questionable if that will be achieved.

**Reviewer 31-02 (Rating: 4)** There is not enough information provided in the proposal to adequately evaluate this criterion. Since the proposal has been reviewed by DOE and selected for award, I will assume the proposed approach is adequate, and therefore I have given this a high score. If this proposal had not been reviewed by DOE, the
rating would be much lower. The proposer should give a brief overview of the approach during their presentation to the council.

**Reviewer 31-03 (Rating: 3)** Given the time and budget identified, the objectives are likely achievable. The two goals are quite diverse and present challenges. The overall objective and two goals are separately challenging and combined are uniquely challenging.

3. **METHODOLOGY**

   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 31-01 (Rating: 3)** The methodology to be used by the team is not well defined in the proposal as submitted.

   **Reviewer 31-02 (Rating: 4)** Same comment as above. If not for the DOE award, this criterion would be rated 1 due to lack of information.

   **Reviewer 31-03 (Rating: 4)** Activities are identified to accomplish the two goals. More information would be helpful to evaluate the methodology involved for the two separate goals. However, the quality of the methodology displayed is above average.

4. **CONTRIBUTION**

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

   **Reviewer 31-01 (Rating: 3)** This reviewer very much agrees that the proposed work as the potential to significantly benefit the US coal industry but the value to the ND lignite industry is questionable as it’s not clear how and to what extent the ND lignite resources will be used. Again, if the proposers use their presentation to the voting members of the LRC to outline and demonstrate their use the members could decide to support this activity more than this reviewer is able to do at this time.

   **Reviewer 31-02 (Rating: 4)** This technology has the potential to open up new markets for North Dakota lignite. It would be interesting to see a projection of how many tons of coal might be used annually to meet this market. Such a projection would be useful to give during the presentation to give the council members a better quantitative idea for the potential market size.

   **Reviewer 31-03 (Rating: 3)** The scientific contribution of the proposed work could be significant to specifically address NDIC/LRC goals. The work could resolve or identify limits in the use of coal based material in the two diverse areas.
5. **AWARENESS**
The principal investigator’s awareness of other 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 31-01 (Rating: 3)** No additional research is referenced in this proposal.

**Reviewer 31-02 (Rating: 3)** Same comment as 2 and 3. I am assuming a review of the literature was required for the DOE proposal, and that it was at least adequate to meet the requirements of DOE.

**Reviewer 31-03 (Rating: 3)** The background of the PI’s as related to activity and publications is adequate. With the limited use of or reference to published and unpublished materials it is difficult to evaluate the PI’s awareness to current activities.

6. **BACKGROUND**
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 31-01 (Rating: 4)** The team assembled have the experience required to successfully complete the proposed work.

**Reviewer 31-02 (Rating: 5)** Both the key personnel and the company have a long history of developing and commercializing products in this industry. There is a high degree of confidence that if the technique is successful that the company can convert this into a commercial venture.

**Reviewer 31-03 (Rating: 4)** The background of the PI’s as related to the proposed work is better than average for each diverse area. Footnotes and references to other work would better allow this reviewer to assess the PI’s background.

7. **PROJECT MANAGEMENT**
The project management plan, including a well-defined milestone chart, schedule, financial plan, and plan for communications among the parties involved in the project, is: 1 – very inadequate; 2 – inadequate; 3 – adequate; 4 – very good; or 5 – exceptionally good.

**Reviewer 31-01 (Rating: 2)** There are two milestones for each project. This is minimal discussion of this reviewer feels not enough for projects of this size.

**Reviewer 31-02 (Rating: 4)** The management team and plan are well defined. This is another area where the funded DOE proposal supplied confidence in meeting this criterion, since DOE requires a comprehensive project management plan including a risk management strategy.

**Reviewer 31-03 (Rating: 2)** The use of management tools is limited. The project management plan described is inadequate.
8. **EQUIPMENT PURCHASE**  
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 31-01 (Rating: 5) No equipment is purchased.
   
   Reviewer 31-02 (Rating: 3) Justification is not given in the proposal; however, DOE requires justification of all budgeted amounts. Therefore, I am assuming the proposed equipment is needed and justified.
   
   Reviewer 31-03 (Rating: 5) No comment

9. **FACILITIES**  
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 31-01 (Rating: 4) The facilities appear to be acceptable for the proposed work.
   
   Reviewer 31-02 (Rating: 3) Facilities and equipment related to the work are not discussed in the proposal. It is assumed that since the work on the current work is proceeding well, and the DOE has approved their proposal, that the required facilities and equipment are available.
   
   Reviewer 31-03 (Rating: 5) No comment

10. **BUDGET**  
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.

   Reviewer 31-01 (Rating: 3) The proposed work appears to have significant value to the high rank coal industry. The challenge for this reviewer is that the information provided does not demonstrate the value to the ND lignite industry. If there had been a clear statement of how the North Dakota lignite and lignite fly ash would be integrated into the work this work would have been rated differently.
   
   Reviewer 31-02 (Rating: 5) This proposal brings 80% cost share, making it a good value to the State
   
   Reviewer 31-03 (Rating: 4) No comment

**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 31-01 (Rating: FUNDING MAY BE CONSIDERED) This has been a very challenging review for me to complete. The level of detail provided was far less than what I would have expected for a request of this magnitude. I assume that the work can be well justified since it was reviewed and accepted by the US department of Energy but unfortunately the level of detail for this reviewer to have a favorable reaction to the proposed work was not forth coming. The end products that were expected for the team could have great value but the level of work with North Dakota resources is not called out in the project and in fact the only material noted in one project was bituminous coal fines and fly ash which does not address the goals of the ND NDIC program. If the missing details noted in this review are presented to the voting members of the lignite research council and they are satisfied that the proposed work is consistent with the goals and objectives of the NDIC they can consider funding, but I believe that should be required to accept the proposed work.

Reviewer 31-02 (Rating: FUND) This proposal does not contain the details required to make a fair assessment of its merits. However, the proposed work has been funded via a competitive proposal process with DOE. DOE has a very rigorous review process, and the fact they have selected this work for funding gives me confidence that the work has merit and is the basis of my recommendation to fund. If it were not for the DOE award, I would have recommended to not fund the work, based upon a lack of information provided in the proposal making it impossible to judge the proposed work.

It is strongly recommended that during their presentation to the Council that the proposers provide a review of the current work that is funded by the NDIC. The progress on the current work can be used as an indication of the potential success for the work proposed in this application. They should verify that the work will utilize North Dakota lignite (the abstract, under “Expected Results”, states that the project will utilize “bituminous coal fines” and does not mention lignitic coals). A brief overview of the methodology would also be warranted to provide the Council with some idea of the proposed work scope and approach. This will allow the Council to have an idea of the actual plans for the project, rather than relying totally on the DOE review and a “trust us we do good work” to justify funding the proposed work.

Reviewer 31-03 (Rating: FUNDING MAY BE CONSIDERED) The proposed work has the potential of expanding the use of coal-based materials beyond the currently existing market applications. There are a couple of areas of concern for this reviewer. The proposal consistently refers to “coal-based materials”. What happened to “lignite-based materials”? The following statement is of interest: “The work to be performed under this program is governed by Statements of Work which have already been arranged and agreed between Semplicastics and each other participant organization.”(page 12) If the Statement of Work exists, why isn’t the information contained in this proposal? Why is NDIC/LRC permitted to provide funding but not permitted to evaluate how the funds are spent? This reviewer would not fund work without the knowledge of how the funds were to be spent.