September 22, 2020

Ms. Karlene Fine
Executive Director
ATTN: Lignite Research Program
North Dakota Industrial Commission
600 East Boulevard Avenue
State Capitol, 14th Floor
Bismarck, ND 58505-0840

Dear Ms. Fine:

Subject: Semplastics Proposal Entitled "Systematically Applied Research to Develop High Value Products From Coal"

Semplastics is pleased to submit an original and one copy of the subject proposal. Also enclosed is the $100 application fee. Semplastics is committed to completing the project as described in the proposal if the Commission makes the requested grant.

If you have any questions, please contact me by telephone at (407) 353-6885 or by e-mail at bhopkins@semplastics.com.

Sincerely,
Barbara Hopkins
Barbara Hopkins
Business Manager

Approved by:

Mr. William Easter, CEO
Semplastics

Enclosures

Lignite Research, Development and Marketing Program
North Dakota Industrial Commission Application

Systematically Applied Research to Develop High-Value Products from Coal

Applicant: Semplastics EHC LLC and Affiliates
Principal Investigators: Walter J. Sherwood, Ph.D., and William G. Easter

Amount of Request: $300,000
Total Amount of Proposed Program: $3,279,756
Duration of Program: 2 Years

Point of Contact: Barbara Hopkins
Semplastics EHC LLC
269 Aulin Avenue, Suite 1003
Oviedo, Florida 32765
Telephone: (407) 353-6885
Email: bhopkins@semplastics.com

30 September 2020

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Program Abstract

Objective. This program will increase the use of coal and coal-based materials beyond the traditional primary use as an energy source for power generation. This objective will be accomplished through four related projects in which coal and coal-based materials provide higher-performance market solutions targeting lower cost points. In Project 1, coal combustion residuals (CCR, or fly ash) will provide both higher-performance fillers for plastics and higher-strength building columns. In Project 2, composite coal-based facade panels and architectural components will be developed. In Project 3, high-strength, lightweight, fireproof materials will be developed from coal as the basis for walls and foundations for buildings. Finally, in Project 4, a fireproof house made from coal-based building materials such as those produced in the three projects above will be designed to meet both insurance standards (e.g., seismic, fire, wind resistance) and the standards of the International Building Code (IBC). All coal-derived building materials (CDBM) used in the construction of this home will contain at least 55% coal by weight.

Expected Results. Project 1: A CCR product to replace talc and calcium carbonate as a mineral filler in polyolefins, a 9”-diameter column that is five times stronger than current products, and demonstration of a 95% reduction in leaching of toxic elements from CCR. Project 2: An insulation panel that is stronger, lighter, and more insulating than current products. Project 3: Fireproof coal-based bricks and blocks that are lighter and stronger than current building materials. Project 4: CDBM building design and a gap analysis identifying the requirements to meet IBC standards and enable market adoption.

Duration. Project 1: 24 months. Project 2: 18 months. Project 3: 18 months. Project 4: 12 months.

Total Program Cost. $3,279,756 for all four projects.

Participants. Semplastics EHC LLC, University of North Dakota Energy and Environmental Research Center (EERC), Lignite Energy Council, Center for Applied Research and Technology (CART), and Clemson University.

Program Summary

This program is designed to provide additional markets for lignite outside of traditional power generation. There are four distinct but related projects associated with this program.

Project 1: High-Strength, Encapsulated, Commercially Useful Components and Particles Made from Coal Combustion Residuals

The objectives of this project are to seal particles of coal combustion residuals (CCR, or fly ash) within a film of inorganic polymers. The sealing process will reduce the leaching of toxic elements from the CCR by 95%. The coated CCR particles will be used to in the development of two products: (1) a mineral filler for polyolefins which will improve the strength and modulus of polypropylene by 30-50%, and (2) after ceramitization, as the base material for a 9”-diameter structural column which will demonstrate five to ten times the flexural strength of concrete.

Project 2: High-Performance Coal-Based Commercial Facade Panels and Architectural Components

The objectives of this project are to develop, test, and prove as viable for commercialization a new class of building components that use coal as the primary constituent. When compared to commercial alternatives, these panels will display far superior mechanical strength (three to five times stronger), significant weight savings (30-50% lower density) and better insulating ability (at least three times the R value) at a competitive cost.

Project 3: Low-Weight, High-Strength Coal-Based Building Materials for Infrastructure Products

The objectives of this project are to develop and prove the viability of a new class of composite infrastructure components that use coal as the primary component. Property improvements include far superior mechanical strength (three to five times stronger), lower weight, greater hardness, improved toughness, greater abrasion resistance, and greater chemical resistance when compared to concrete.

Project 4: Modular, Manufactured Homes from Coal-Based Building Materials

The objectives of this project are (1) to design a dwelling structure built primarily from coal-derived building materials (CDBM) and capable of meeting International Building Code standards and insurance requirements to enable market adoption, (2) to conduct a market analysis to quantify the market potential for CDBM dwelling structures across various commercial channels and coal types, and (3) to develop a financial model with theoretical production costs to verify the commercial viability of the business model.

Program Description

Objectives

The objectives for each of the four projects that make up this program are as described immediately above in the Program Summary section.

Methodology

For Project 1, leachate, coal, and CCR assay tests will be performed at the EERC. Mechanical testing (e.g., flexural strength and density) will be performed primarily at Semplastics using a Universal Testing Machine. Extrusion plastic testing will be performed at Semplastics. The 9”-diameter CCR columns will be developed and demonstrated at CART. Semplastics will work with the EERC to produce lignite-based parts with the highest performance possible.

For Project 2, development and production of both rigid-board building panels and architectural composite wall panels will be performed at Semplastics using small plate form sizes for screening. CART will assist in the development of full-size rigid-board insulation panels (16” × 32” × 1”) and full-size architectural composite wall panels (8” × 12”) for scale-up and testing. EERC will analyze sections of panels to show that toxic material leaching remains well below allowable limits. Semplastics will work with the EERC to produce lignite-based parts with the highest performance possible.

For Project 3, Semplastics will refine our proprietary process to produce coal-based aggregate components; screening experiments informed through in-house testing will result in a mature process to produce plates and rods with desired mechanical properties (flexure strength, compressive strength, and toughness). The EERC will help characterize the microstructure and will provide leach testing on specimens to guarantee that these products meet the allowable limits. Twenty full-size bricks and ten full-size blocks will be produced to demonstrate the technology as down-selected from the screening experimentation. Semplastics will work with the EERC to produce lignite-based parts with the highest performance possible.

For Project 4, Semplastics will stand up an Advisory Council of major stakeholders (prime contractors, builders, architects, and regulators) to provide feedback on building design elements. CART will define the key assumptions for the CDBM design using coal type, mechanical performance of the previously established formulations, and prospective CDBM structures within the building design. The EERC will work with Semplastics on fastening technology. Semplastics will determine the optimal business model and build a financial model using the inputs of the Advisory Council. Semplastics will work with the EERC to use lignite as extensively as possible in the building space.

Anticipated Results

Project 1 will result in the production of prototype 9”-diameter structural columns which will exhibit five to ten times the strength of concrete, sealed CCR particles which reduce the leaching of toxic elements by 95%, and CCR-loaded polypropylene samples with 30-50% increased flexure strength of polypropylene.

Project 2 will result in test panel samples meeting the strength and leaching requirements after 12 months. Full-size panels will meet the strength and leaching requirements by the end of the program.

Project 3 will produce the process for making coal-based bricks and blocks with a reduction in toxic element leaching of 80% or more. Test samples will show flexure strengths four to five times and compressive strengths three to four times that of brick and concrete block after 12 months of development. The full-size bricks and blocks will exhibit mechanical properties and leaching behavior comparable to or better than commercial equivalents.

By the end of 12 months of development, Project 4 will produce a CDBM dwelling structure conceptual design. Fastening methodology for adjoining CDBM with foundations and other traditional building materials will be established. The technology gap and economic analysis will be completed.

Facilities

The facilities that are available at the EERC, Semplastics, and CART will be utilized on all four projects.

Resources

Lignite coal from North Dakota and lignite fly ash from North Dakota will be used in all four projects.

Techniques to Be Used and Their Availability and Capability

Leaching tests, scanning electron microscopy (SEM), and optical microscopy will be used by the EERC to characterize test samples and to measure the success of technology development. The EERC analytical lab will provide assay data as well. Semplastics will use TGA (Thermogravimetric Analyzer), FTIR (Fourier Transform Infrared Spectrometer), DSC (Differential Scanning Calorimeter), and viscosity instrumentation as well as mechanical measurements from the Universal Testing Machine. Both CART and Semplastics will use ovens, furnaces, CNC equipment, and mixing equipment to produce the coal-core composites. The capabilities current available from the program participants will be adequate to complete these projects.

Environmental and Economic Impacts While Program is Underway

While the program is underway, the environmental impacts will be benign. The money spent by the Lignite Council will provide funding for the activities of the EERC in all four projects. Letters of commitment from EERC to participate in each of the projects that make up this program are included as Appendix A.

Ultimate Technological and Economic Impacts

The ultimate technological impact is to provide new improved building materials out of lignite-based resources. The culminating technological achievement would be to produce an entire building comprised primarily of coal-derived building materials. The economic impact is to provide additional markets for lignite-based resources. Ultimately, the goal is to produce products worth over $1 per pound from resources that cost pennies per pound.

Why the Program is Needed

This program is needed due to the drastic reduction of coal being utilized for power generation. Economic communities that have traditionally relied on coal need new markets for coal-based products, which can be developed using the technologies that will result from this program.

Standards of Success

Success will be ultimately determined by whether we can meet the metrics as stated in the objectives using North Dakota lignite. Meeting the program objectives will involve making polymer fillers, structural columns, bricks, blocks, architectural panels, facade panels, and even whole buildings out of coal-derived materials which have higher performance and, in many cases, lower costs than comparable commercially available building materials. This program will use the talent and resources of the EERC. Success means the creation of new jobs in North Dakota to make economically advantaged products. The plan is to put the manufacturing jobs near the point of extraction. This meets the North Dakota model as we understand it.

Background

Semplastics has been in business for the last 20 years providing-precision engineered plastic components for semiconductor manufacturing. This is a multi-million-dollar business, with customers like Texas Instruments, NXP (Motorola spinoff), Infineon, Analog Devices, and Global Foundries. Bill Easter is a co-founder of Semplastics. Bill has over 35 years industrial experience with a focus on materials, which has resulted in 62 US patents issued. In 2012, as Bill became the CEO of Semplastics, the company formed an advanced materials division called X-MAT, which is focused on polymer-derived ceramics (PDCs). Semplastics' Chief Scientist, Dr. Walt Sherwood, has over 30 years of experience in PDCs, and this technology is being leveraged for the currently proposed development of novel coal-based materials. Semplastics has successfully completed a NASA project making large diameter space mirrors using PDCs

and has also completed three research projects with Space Florida, to include the 3D printing of PDCs. Semplastics has recently completed a Phase I SBIR project with the DOE (NETL) to make coal-based roof tiles, and is currently executing Phase II of the project, which will culminate in the production of two "squares" of coal-based roof tiles by the summer of 2021.

Qualifications

The following brief résumés represent the proposed management and technical staff members who form the Semplastics team for this program.

Name:	**Dr. Walter J. Sherwood**
Years of Experience:	30
Position:	Chief Scientist, Semplastics
Education:	Ph.D. in Material Science, Rensselaer Polytechnic Institute (1986) Bachelor of Science in Physics, Rensselaer Polytechnic Institute (1980).
Role:	Co-Principal Investigator.
Experience:	Walt has over 30 years of polymer design and development experience. He holds more than 14 patents covering the development of pre-ceramic polymers and high-temperature resins. Walt founded the company that developed SMP-10, and he co-developed the process for scaling up and lowering the cost of the polymer. He also produced some of the first SiC-based ceramic composites and joint specimens to go into irradiation testing while at Knolls Atomic Power Laboratory.

Name:	**Mr. William (Bill) Easter**
Years of Experience:	37

Position: Chief Executive Officer, Semplastics

Education: Master of Engineering in Engineering Science, Penn State University (1994), Bachelor of Science in Chemical Engineering, Drexel University (1983).

Role: Co-Principal Investigator**.**

Experience: Bill initiated material development activities with Polymer-Derived Ceramics. He set up and funded an industrial laboratory for producing prototypes and developmental bulk silicon oxycarbide structures. Bill is an established inventor with over 62 U.S. patents issued. As an MTS at Bell Labs, he performed research and development on CMP consumables such as pads, slurries, CMP rings and conditioning disks. At AT&T, Bill set up bonded wafer SOI development and then production line. He had project management responsibility for SOI wafers from inception to product maturity.

Name: **Mr. Brent W. York, PMP**

Years of Experience: 25

Position: Program Manager, Semplastics

Education: Master of Engineering in Aerospace Engineering, Virginia Tech (1993), Bachelor of Science in Physics, Tennessee Technological University (1991).

Role: Project Manager.

Experience: Brent has managed many different efforts in his career, ranging from on-site coordination of an Unmanned Aerial Vehicle development team to serving as director of a large international firm's simulation department. Brent's experience leading teams both large and small will enhance the effectiveness of the team and ensure schedules are met. He has held a Project Management Professional (PMP) certification from the Project Management Institute since 2010 (PMP #1366621).

Value to North Dakota

By taking a resource (lignite) that costs pennies per pound and turning it into products that have values greater than $1 per pound, this work would provide tremendous value to North Dakota. The technologies described herein will transform coal from a mineral resource to a component in value-added products such as polymer fillers, structural columns, bricks, blocks, architectural panels, facade panels, and even whole buildings. During Semplastics' trip to North Dakota and visit to the Freedom mine, the outstanding ability of North Dakota people in operations was emphasized. Wouldn't it be great to take this expertise and apply it to manufacturing lignite-based value-added products!

Both BNI Energy and North American Coal Corporation have provided letters of support for this program. In addition, letters of support have been received from Senator Hoeven and Senator Cramer (Appendix B).

Management

Semplastics has a long history of successful management of complex technical program. Key individuals for this program include the Co-Principal Investigators (co-PIs) and the Project Manager (PM) for Semplastics, as well as specific personnel for the other organizations that make up our team.

Dr. Walt Sherwood, a co-PI for this program, has over 20 years of experience in technical management of similar research projects. He has served as the PI for four recent successful Small Business Innovative Research (SBIR) grants for Semplastics from various agencies and is well versed in the roles and responsibilities of the PI position. Mr. Bill Easter, the other co-PI for this program, has over 20 years of experience in technical management of similar research projects. He has served as the PI for Phase I and II Small Business Innovative Research (SBIR) grants and is well versed in the responsibilities of the PI position.

Mr. Brent W. York, the PM for this program, has provided technical, schedule, and cost management of projects over the past 20 years varying from a few direct reports to dozens, from $250K to several million dollars. He has managed SBIR projects for Semplastics, technical teams during his tenure with the Department of the Navy, and an entire department while employed as a Director with a large multinational company. He is currently managing Semplastics' SBIR Phase II effort to produce coal-based roof tiles for DOE, which is over 50% complete and is on track from both schedule and cost standpoints.

The work to be performed under this program is governed by Statements of Work which have already been arranged and agreed between Semplastics and each other participant organization. These agreements include considerations for intellectual property and data rights. They are executed by the CEO of Semplastics and appropriate signatories for each team member and will be used by the PM to manage the team and individual team members' contributions throughout the program.

Important aspects of project management include risk management and project health monitoring. Risk management is actively pursued on all Semplastics programs and include the creation and tracking of a risk register for management and mitigation of perceived risks. Each of the four projects listed in this proposal has an existing risk register which will be tracked throughout the life of the project.

The health of the program will be evaluated at regular intervals by comparing progress against expectations at set Evaluation Points. These milestones are delineated for each project below.

Evaluation Points

Project 1

End of Year 1: Milestone (M) 1 – It will be demonstrated that encapsulation reduces particle toxic element leaching by 80% or more, and that bulk part test samples show flexure and compressive strengths five times that of concrete.

End of Year 2: M2 – Material properties demonstrated will include 9”-diameter columns with strengths five to ten times that of concrete and polypropylene with 30% to 50% increased strength and modulus. A predictive model for both materials systems will be provided.

Project 2

End of Budget Period 1 (Months 1-12): M1 – It will be demonstrated that samples cut from small scale panels will meet established strength requirements. Leach test results on panel sections will demonstrate effective encapsulation of impurities. Failure to meet either of these expectations or a candidate formulation that tests below 49% coal content would be a “no-go” indication.

End of Budget Period 2 (Months 13-18): M2 – Material properties will be demonstrated through testing of full-size panels to meet mechanical property requirements and impurity leaching targets.

Project 3

End of Budget Period 1 (Months 1-12): M1 – It will be shown that the process for making coal-based bricks and blocks reduces toxic element leaching by 80% or more. Test samples will exhibit flexure strengths four to five times and compressive strengths three to four times that of brick and concrete block.

End of Budget Period 2 (Months 13-18): M2 – The full-size X-BRIX and X-BLOX will exhibit mechanical properties and leaching behavior comparable to or better than commercial equivalents.

Project 4

End of Month 9: M1 – The fastening methodology for adjoining CDBM with foundations and other traditional building materials will be established.

End of Month 12: M2 – The CDBM dwelling structure conceptual design will be completed. The gap life cycle analysis will be completed.

Timetable

The proposed high-level schedule for execution of the program is shown below. Milestones were presented in the Evaluation Points section above.

	Project 1	Project 2	Project 3	Project 4
Start Date	10/1/2020	12/1/2020	12/1/2020	12/1/2020
End Date	9/30/2022	5/30/2022	5/30/2022	11/30/2021
Milestone 1	9/30/2021	11/30/2021	11/30/2021	6/1/2021
Milestone 2	9/30/2022	5/30/2022	5/30/2022	11/30/2021
Interim Reports	Quarterly	Quarterly	Quarterly	Quarterly

Costs

The budgeted cost for this program is $3,279,756 as shown in Table 1. Semplastics requests $300,000 from the Lignite Research, Development and Marketing Program. The remaining $2,979,756 will be provided as cost share as outlined in Table 1. Budgets for each project are shown in Table 2. Without the requested funding, the coal-based products cannot be developed in a timely manner.

Table 1. Summary of budgets for all projects.

Project	NDIC Share (Cash)	DOE Share (Cash)	Semplastics Share (Cash)	Semplastics Share (In Kind)	Other Project Sponsor Share (In Kind)	Total
Project 1	$100,000	$998,585	$182,000	$0	$127,000	$1,407,585
Project 2	$50,000	$498,699	$12,000	$40,842	$22,500	$624,041
Project 3	$100,000	$497,688	$0	$26,000	$0	$623,688
Project 4	$50,000	$498,422	$8,400	$27,600	$40,000	$624,442
Total	$300,000	$2,493,414	$202,000	$94,442	$189,500	$3,279,756

Table 2. Individual project budget breakdowns by expense category.

Expense Category	Project 1	Project 2	Project 3	Project 4
Labor	$195,880	$131,282	$131,282	$94,947
Travel	$8,400	$4,200	$3,150	$11,550
Supplies	$20,000	$27,708	$53,500	$6,000
Subcontracts / Consultants	$636,995	$172,494	$139,444	$407,871
Other Direct Costs	$0	$31,400	$0	$0
Total Direct Costs	$861,275	$367,084	$366,876	$520,368
Indirect Costs	$546,310	$256,958	$256,812	$104,074
Total	$1,407,585	$624,042	$623,688	$624,442

Matching Funds

Matching funds are estimated at $2,979,756, which is 91% of the total program budget. Table 3 identifies matching funds by organization and project.

Table 3. Matching funds by organization and project.

Organization	Project 1	Project 2	Project 3	Project 4
Semplastics – Cash	$182,000	$12,000	$0	$8,400
Semplastics – In-Kind	$0	$40,847	$26,000	$27,600
U.S. DOE – Cash	$998,585	$498,699	$497,688	$498,442
Clemson – In-Kind	$75,000	$0	$0	$0
CART Inc. – In-Kind	$50,000	$22,500	$0	$40,000
Mosser Consulting – In-Kind	$2,000	$0	$0	$0
Total	$1,307,585	$574,046	$523,688	$574,442

The DOE has already selected Semplastics for award of Project 1. The letter announcing selection for award is provided in Appendix C. Semplastics has submitted proposals to DOE for Projects 2, 3, and 4, and selection announcements are expected in October 2020.

Semplastics' cash and in-kind contributions are in the form of indirect costs, testing services, and volunteer time. CART's in-kind services are in the form of travel, equipment, and supplies. Mosser Consulting will provide CCR samples as a contribution. Clemson University will provide salary as a contribution. Cost share commitment letters are included in Appendix D.

Tax Liability

Semplastics has no tax liability owed to North Dakota or any of its political subdivisions. See Appendix E for Affidavit.

Confidential Information

There is no confidential information in this proposal.

Appendix A: Letters of Support from EERC

EERC Energy & Environmental Research Center

April 15, 2020

Mr. Bill Easter
CEO
Semplastics, LLC
269 Aulin Avenue Suite 1003
Oviedo, FL 32765

Dear Mr. Easter:

Subject: EERC Proposal No. 2020-0172 Entitled "High Strength, Encapsulated, Commercially Useful Components and Particles Made from Coal Combustion Residuals"; Submitted in Response to DE-FOA-0002190

Introduction

The University of North Dakota (UND) Energy & Environmental Research Center (EERC) is pleased to submit this proposal to Semplastics to support the above-mentioned project that Semplastics is preparing to submit to the U.S. Department of Energy (DOE). In support of this project, the EERC proposes to complete the following work as outlined in the scope of work in response to DE-FOA-0002190.

Scope of Work

Year 1 (EERC Task 1)

The EERC will work with Semplastics to identify potential coal combustion residual (CCR) materials that can be utilized in the Semplastics X-Mat process to develop new composite materials that are environmentally friendly and less expensive than the traditional materials they are replacing. The EERC will focus on selection of low-rank coal (LRC) CCR materials that can be applied in this application. Once the CCR materials have been selected, the EERC will perform characterization and analysis of the CCR materials as follows:

1. X-ray fluorescence (XRF) – bulk ash chemistry
2. Scanning electron microscopy (SEM) – particle size and chemistry analysis
3. Loss on ignition (LOI) – determination of carbon in ash
4. Hg digestion and CVAA (cold-vapor atomic absorption) – mercury
5. Trace element digestion of ash
6. Inductively coupled plasma (ICP) – analysis for barium (Ba)
7. ICP–mass spectrometry (ICP–MS) – analysis for arsenic (As), cadmium (Cd), chromium (Cr), lead (Pb), mercury (Hg), selenium (Se), and silver (Ag)

UND UNIVERSITY OF NORTH DAKOTA

Mr. Easter/2
April 15, 2020

A report detailing the analytical results will be prepared and delivered to Semplastics. This report will serve as a basis for further discussions and interpretation of final product properties once Semplastics has prepared the composite materials.

In addition to the analysis of the CCR materials as described above, the EERC will also characterize the leaching potential of up to three composite samples prepared using the CCR materials. The EERC will perform U.S. Environmental Protection Agency (EPA) SW-846 Method 1311, Toxicity Characteristic Leaching Procedure (TCLP) on the composite CCR encapsulated materials to determine environmental impact. The TCLP is a leaching procedure designed for the evaluation of leaching of wastes when codisposed in a sanitary landfill. The procedure employs one of two extraction fluids depending on the final alkalinity of the sample extracts. Extraction Fluid 1 is made with dilute acetic acid and dilute sodium hydroxide with a final pH of 4.93 ± 0.05, and Extraction Fluid 2 is made with dilute acetic acid only with a final pH of 2.88 ± 0.05. The appropriate fluid is determined by measuring the pH of the solid mixed with dilute HCl. If the pH is <5.00, then Extraction Fluid 1 is used. If the pH is >5.00, then dilute HCl is added, and the pH is taken again. If the pH is <5.00, then Extraction Fluid 1 is used; if it is >5.00, then Extraction Fluid 2 is used.

After the appropriate extraction fluid is determined, a representative subsample of the waste is weighed into a suitable extraction vessel, and the extraction fluid is added to obtain a final liquid-to-solid ratio of 20:1. The extraction vessel is secured in an end-over-end rotator and rotated at 30 rpm ± 2 rpm for 18 hours ± 2 hours. At the end of 18 hours, the liquid and solid components are separated by filtering through a 0.6–0.8-µm filter, and an aliquot of the extract is preserved to pH <2 with nitric acid. The preserved extract will be measured for the eight Resource Conservation and Recovery Act (RCRA) metals: As, Ba, Cd, Cr, Pb, Hg, Se, and Ag. The analytical results will be interpreted and reported to Semplastics.

Year 2 (EERC Task 2)

In Year 2, the EERC will conduct up to nine additional TCLP analyses of Semplastics-produced composite CCR encapsulated material. The resultant analyses will be compiled into a report for Semplastics. The EERC will assist Semplastics in the data reduction and interpretation of the results. There will be a significant amount of data to reduce given the number of samples and test conditions that are proposed. The EERC and Semplastics will work together to develop consistent data reduction protocols that ensure that all data are scientifically evaluated in a consistent manner. Data review and interpretation will be ongoing throughout the project and will be used to further refine the data presented to DOE in a project report in sufficient detail and with sufficient transparency to enable techno-economic modeling and analysis to be completed.

Mr. Easter/3
April 15, 2020

Budget

To support the scope of work described herein, the EERC has provided a budget of $100,000. Expenses will be invoiced monthly on a cost-reimbursable basis. A detailed project budget is attached via an Excel spreadsheet in the format requested. Initiation of the proposed work is contingent upon the execution of a mutually negotiated agreement between our organizations.

The EERC very much looks forward to working with Semplastics and DOE on this exciting and relevant project. Should you have any questions, please call me at (701) 777-5243 or by e-mail at bfolkedahl@undeerc.org.

Sincerely,

Dr. Bruce C. Folkedahl

Bruce C. Folkedahl, Ph.D.
Senior Research Engineer, Critical Materials

Approved by:

Charles D. Gorecki

Charles D. Gorecki, CEO
Energy & Environmental Research Center

BCF/bjr

Attachments

EERC Energy & Environmental Research Center
[illegible] • Grand Forks, ND 58202-9018 • [illegible]
www.undeerc.org

July 8, 2020

Mr. Bill Easter
CEO
Semplastics, LLC
269 Aulin Avenue, Suite 1003
Oviedo, FL 32765

Dear Mr. Easter:

Subject: EERC Proposal No. 2021-0001 Entitled "High-Performance Coal-Based Commercial Façade Panels and Architectural Components"; Submitted in Response to DE-FOA-0002185 Area of Interest 1 (AOI1)

Introduction

The University of North Dakota (UND) Energy & Environmental Research Center (EERC) is pleased to submit this proposal to Semplastics to support the above-mentioned project that Semplastics is preparing to submit to the U.S. Department of Energy (DOE). In support of this project, the EERC proposes to complete the following work as outlined in the scope of work in response to DE-FOA-0002185.

Scope of Work

Year 1 (EERC BP1 [Budget Period 1])

The EERC will work with Semplastics to identify potential low-rank coal (LRC) that can be utilized in the Semplastics X-Mat process to develop new composite materials that are environmentally friendly and less expensive than the traditional materials they are replacing. The EERC will focus on selection of LRC that can be applied in this application. Once the LRC materials have been selected, the EERC will perform characterization and analysis of the LRC materials as follows:

1. X-ray fluorescence (XRF) – bulk ash chemistry
2. Scanning electron microscopy (SEM) – particle size and chemistry analysis
3. Malvern particle analysis – particle sizing
4. Proximate/ultimate analysis
5. Toxicity characteristic leaching procedure (TCLP)
6. Resource Conservation and Recovery Act (RCRA) for coal
7. Inductively coupled plasma–mass spectrometry (ICP–MS) – analysis for six as yet to be determined metals

TCLP is U.S. Environmental Protection Agency (EPA) SW-846 Method 1311. The EERC will perform TCLP and RCRA on the LRC and composite LRC-encapsulated materials to determine environmental impact. TCLP is a leaching procedure designed for the evaluation of leaching of wastes when codisposed in a sanitary landfill. The procedure employs one of two extraction fluids depending on the final alkalinity of the sample extracts. Extraction Fluid 1 is made with dilute acetic acid and dilute sodium hydroxide with a final pH of 4.93 ± 0.05, and Extraction Fluid 2 is made with dilute acetic acid only with a final pH of 2.88 ± 0.05. The appropriate fluid is determined by measuring the pH it is added

Mr. Easter/2
July 8, 2020

to obtain a final liquid-to-solid ratio of 20:1. The extraction vessel is secured in an end-over-end rotator and rotated at 30 ± 2 rpm for 18 ± 2 hours. At the end of 18 hours, the liquid and solid components are separated by filtering through a 0.6–0.8-µm filter, and an aliquot of the extract is preserved to pH <2 with nitric acid. The preserved extract will be measured for the eight RCRA metals: As, Ba, Cd, Cr, Pb, Hg, Se, and Ag. Analysis results will be interpreted and reported to Semplastics.

Once the LRC material has been analyzed, Semplastics will produce composite LRC material which the EERC will then analyze using the TCLP RCRA methods described above. The EERC will also perform ICP–MS on the composite samples for an additional, yet to be determined, six metals.

A report detailing the analysis results will be prepared and delivered to Semplastics. This report will serve as a basis for further discussions and interpretation of final product properties once Semplastics has prepared the composite materials.

Year 2 (EERC BP2)

In Year 2, the EERC will conduct up to five additional TCLP analyses of Semplastics-produced composite LRC material. The EERC will also perform ICP–MS on the composite sample leachate derived from the TCLP RCRA for coal analysis for an additional, yet to be determined, six metals. The resultant analysis will be compiled into a report for Semplastics.

Budget

To support the scope of work described herein, the EERC has provided a budget of $49,995. Expenses will be invoiced monthly on a cost-reimbursable basis. A detailed project budget is attached via an Excel spreadsheet in the format requested. Initiation of the proposed work is contingent upon the execution of a mutually negotiated agreement between our organizations.

The EERC very much looks forward to working with Semplastics and DOE on this exciting and relevant project. Should you have any questions, please call me at (701) 777-5243 or by e-mail at bfolkedahl@undeerc.org.

Sincerely,

DocuSigned by:
Bruce Folkedahl
2F1968DA8AF648C...

Bruce C. Folkedahl, Ph.D.
Senior Research Engineer, Critical Materials

Approved by:

DocuSigned by:
...

Charles D. Gorecki, CEO
Energy & Environmental Research Center

BCF/rlo
Attachments

EERC Energy & Environmental Research Center
[illegible]

July 8, 2020

Mr. Bill Easter
CEO
Semplastics, LLC
269 Aulin Avenue Suite 1003
Oviedo, FL 32765

Dear Mr. Easter:

Subject: EERC Proposal No. 2021-0003 Entitled "Low-Weight, High-Strength Coal-Based Building Materials for Infrastructure Products"; Submitted in Response to DE-FOA-0002185 Area of Interest 2 (AOI2)

Introduction

The University of North Dakota (UND) Energy & Environmental Research Center (EERC) is pleased to submit this proposal to Semplastics to support the above-mentioned project that Semplastics is preparing to submit to the U.S. Department of Energy (DOE). In support of this project, the EERC proposes to complete the following work as outlined in the scope of work in response to DE-FOA-0002185.

Scope of Work

Year 1 (EERC BP1 [Budget Period 1])

The EERC will work with Semplastics to identify potential low-rank coal (LRC) that can be utilized in the Semplastics X-Mat process to develop new composite materials that are environmentally friendly and less expensive than the traditional materials they are replacing. The EERC will focus on selection of LRC that can be applied in this application. Once the LRC materials have been selected, the EERC will perform characterization and analysis of the LRC materials as follows:

1. X-ray fluorescence (XRF) – bulk ash chemistry
2. Scanning electron microscopy (SEM) – particle size and chemistry analysis
3. Malvern particle analysis – particle sizing
4. Proximate/ultimate analysis
5. Toxicity characteristic leaching procedure (TCLP)
6. Resource Conservation and Recovery Act (RCRA) for coal
7. Inductively coupled plasma–mass spectrometry (ICP–MS) analysis for six as yet to be determined metals

TCLP is U.S. Environmental Protection Agency (EPA) SW-846 Method 1311. The EERC will perform TCLP and RCRA on the LRC and composite LRC-encapsulated materials to determine environmental impact. The TCLP is a leaching procedure designed for the evaluation of leaching of wastes when codisposed in a sanitary landfill. The procedure employs one of two extraction fluids depending on the final alkalinity of the sample extracts. Extraction Fluid 1 is made with dilute acetic acid and dilute sodium hydroxide with a final pH of 4.93 ± 0.05, and Extraction Fluid 2 is made with dilute

acetic acid only with a final pH of 2.88 ± 0.05. The appropriate fluid is determined by measuring the pH of the solid mixed with dilute HCl. If the pH is <5.00, then Extraction Fluid 1 is used. If the pH is >5.00, then dilute HCl is added, and the pH is taken again. If the pH is <5.00, then Extraction Fluid 1 is used; if it is >5.00, then Extraction Fluid 2 is used. After the appropriate extraction fluid is determined, a representative subsample of the waste is weighed into a suitable extraction vessel, and the extraction fluid is added to obtain a final liquid-to-solid ratio of 20:1. The extraction vessel is secured in an end-over-end rotator and rotated at 30 ± 2 rpm for 18 ± 2 hours. At the end of 18 hours, the liquid and solid components are separated by filtering through a 0.6–0.8-µm filter, and an aliquot of the extract is preserved to pH <2 with nitric acid. The preserved extract will be measured for the eight RCRA metals: As, Ba, Cd, Cr, Pb, Hg, Se, and Ag. Analysis results will be interpreted and reported to Semplastics.

Once the LRC material has been analyzed, Semplastics will produce composite LRC material samples. These samples will be analyzed by the EERC as follows:

- SEM and microstructural analysis (pore size and distribution)
- % open porosity (absorption/desorption or mercury porosimetry)
- Elemental analysis of samples including major impurities – XRF

The EERC will then analyze the composite LRC material using the TCLP and RCRA methods described above. The EERC will also perform ICP–MS on the composite sample leachate derived from the TCLP and RCRA for coal analysis for an additional, yet to be determined, six metals.

A report detailing the analysis results will be prepared and delivered to Semplastics. This report will serve as a basis for further discussions and interpretation of final product properties once Semplastics has prepared the composite materials.

Year 2 (EERC BP2)

In Year 2, the EERC will conduct up to four additional sample analysis of the Semplastics LRC composite material by SEM, porosimetry, and elemental analysis. Additionally, the EERC will perform TCLP and RCRA for coal analyses of Semplastics-produced composite LRC material. The EERC will also perform ICP–MS on the composite samples leachate derived from the TCLP and RCRA for coal analysis for an additional, yet to be determined, six metals. The resultant analysis will be compiled into a report for Semplastics.

Budget

To support the scope of work described herein, the EERC has provided a budget of $99,444. Expenses will be invoiced monthly on a cost-reimbursable basis. A detailed project budget is attached via an Excel spreadsheet in the format requested. Initiation of the proposed work is contingent upon the execution of a mutually negotiated agreement between our organizations.

Mr. Easter/3
July 8, 2020

The EERC very much looks forward to working with Semplastics and DOE on this exciting and relevant project. Should you have any questions, please call me at (701) 777-5243 or by e-mail at bfolkedahl@undeerc.org.

Sincerely,

DocuSigned by:
Bruce Folkedahl
2F1968BA8AE648C...

Bruce C. Folkedahl, Ph.D.
Senior Research Engineer, Critical Materials

Approved by:

DocuSigned by:
...

Charles D. Gorecki, CEO
Energy & Environmental Research Center

BCF/rlo

Attachments

EERC
Energy & Environmental Research Center
15 North 23rd Street, Stop 9018 • Grand Forks, ND 58202-9018 • P. 701.777.5000 • F. 701.777.5181
www.undeerc.org

July 8, 2020

Mr. Bill Easter
CEO
Semplastics, LLC
269 Aulin Avenue Suite 1003
Oviedo, FL 32765

Dear Mr. Easter:

Subject: EERC Proposal No. 2021-0002 Entitled "Modular, Manufactured Homes from Coal-Based Building Materials"; Submitted in Response to DE-FOA-0002185 Area of Interest 5 (AOI5)

Introduction

The University of North Dakota (UND) Energy & Environmental Research Center (EERC) is pleased to submit this proposal to Semplastics to support the above-mentioned project that Semplastics is preparing to submit to the U.S. Department of Energy (DOE). In support of this project, the EERC proposes to complete the following work as outlined in the scope of work in response to DE-FOA-0002185.

Scope of Work

The EERC will work with Semplastics to identify potential low-rank coal (LRC) that can be utilized in the Semplastics X-Mat process to develop new composite materials that are environmentally friendly and less expensive than the traditional materials they are replacing. The EERC will focus on selection of LRC that can be applied in this application. Once the LRC materials have been selected, Semplastics will produce structural building components. These LRC composite materials will then be subjected to traditional building procedures involving cutting and drilling. The residual "sawdust" from these activities will be subject to analysis by the EERC as follows:

1. X-ray fluorescence (XRF) – bulk ash chemistry
2. Scanning electron microscopy (SEM) – particle size and chemistry analysis
3. Toxicity characteristic leaching procedure (TCLP)
4. Resource Conservation and Recovery Act (RCRA) for coal

TCLP is U.S. Environmental Protection Agency (EPA) SW-846 Method 1311. The EERC will perform TCLP and RCRA on the LRC and composite LRC-encapsulated materials to determine environmental impact. The TCLP is a leaching procedure designed for the evaluation of leaching of wastes when codisposed in a sanitary landfill. The procedure employs one of two extraction fluids depending on the final alkalinity of the sample extracts. Extraction Fluid 1 is made with dilute acetic acid and dilute sodium hydroxide with a final pH of 4.93 ± 0.05, and Extraction Fluid 2 is made with dilute acetic acid only with a final pH of 2.88 ± 0.05. The appropriate fluid is determined by measuring the pH of the solid mixed with dilute HCl. If the pH is <5.00, then Extraction Fluid 1 is used. If the pH is >5.00, then dilute HCl is added, and the pH is taken again. If the pH is <5.00, then Extraction Fluid 1 is used; if it is >5.00, then Extraction Fluid 2 is used. After the appropriate extraction fluid is determined, a representative subsample of the waste is weighed into a suitable extraction vessel, and the extraction fluid is added to obtain a final liquid-to-solid ratio of 20:1. The extraction vessel is secured in an end-over-end

rotator and rotated at 30 ± 2 rpm for 18 ± 2 hours. At the end of 18 hours, the liquid and solid components are separated by filtering through a 0.6–0.8-µm filter, and an aliquot of the extract is preserved to pH <2 with nitric acid. The preserved extract will be measured for the eight RCRA metals: As, Ba, Cd, Cr, Pb, Hg, Se, and Ag. Analysis results will be interpreted and reported to Semplastics.

Once the LRC composite material has been analyzed, Semplastics will produce composite LRC material joining/mortar materials. These samples will be analyzed by the EERC as follows:

- SEM and microstructural analysis (pore size and distribution)
- % open porosity (absorption/desorption or mercury porosimetry)
- Elemental analysis of samples including major impurities – XRF

The EERC will then analyze the composite LRC composite sawdust from cutting and drilling and the joining/mortar material using the TCLP and RCRA methods described above. The EERC will also perform inductively coupled plasma–mass spectroscopy (ICP–MS) on the composite sample leachate derived from the TCLP and RCRA for coal analysis for an additional, yet to be determined, six metals.

A report detailing the analysis results will be prepared and delivered to Semplastics. This report will serve as a basis for further discussions and interpretation of final product properties once Semplastics has prepared the composite materials.

Budget

To support the scope of work described herein, the EERC has provided a budget of $49,871. Expenses will be invoiced monthly on a cost-reimbursable basis. A detailed project budget is attached via an Excel spreadsheet in the format requested. Initiation of the proposed work is contingent upon the execution of a mutually negotiated agreement between our organizations.

The EERC very much looks forward to working with Semplastics and DOE on this exciting and relevant project. Should you have any questions, please call me at (701) 777-5243 or by e-mail at bfolkedahl@undeerc.org.

Sincerely,

DocuSigned by:
Bruce Folkedahl

Bruce C. Folkedahl, Ph.D.
Senior Research Engineer, Critical Materials

Approved by:

DocuSigned by:

Charles D. Gorecki, CEO
Energy & Environmental Research Center

BCF/rlo
Attachments

Appendix B: Other Letters of Support

PHONE (701) 355-5500

www.bnienergy.com

AN ALLETE COMPANY

September 25, 2020

Vice President Research and Development
Lignite Energy Council
1016 Owens Avenue, PO Box 2277
Bismarck, ND 58503

Dear Mr. Holmes:

Subject: Semplastics Proposal entitled "*Systematically Applied Research to Develop High Value Products from Coal*"

BNI Energy is pleased to provide this letter of support for the above referenced Semplastics proposed project. This project will explore the potential use of coal and coal combustion residuals (CCR) in producing composite materials for use in a variety of high value end-use applications.

BNI Energy is committed to the development, testing, and commercial deployment of technologies that promote the sustainable use of lignite coal. The development of technologies to increase the use of CCR, while creating high value products from material that would otherwise be landfilled or placed in impoundments is highly desirable.

On behalf of BNI Energy Inc., I would like to express our support for and commitment to participation in this Semplastics proposed project.

Sincerely,

Wade Boeshans

President & General Manager
Wade Boeshans

BNI Energy
1637 Burnt Boat Dr. Bismarck, ND 58503

NORTH AMERICAN COAL CORPORATION

September 25, 2020

Mr. Mike Holmes
Vice President Research and Development
Lignite Energy Council
1016 Owens Avenue, PO Box 2277
Bismarck, ND 58503

Re: Semplastics Proposal entitled "*Systematically Applied Research to Develop High Value Products from Coal*"

Dear Mr. Holmes:

The North American Coal Corporation is pleased to provide this letter of support for the above referenced Semplastics proposed project. This project will explore the potential use of coal combustion residuals (CCR), as well as North Dakota coal to produce composite materials for use in a variety of high value end-use applications. We met directly with Semplastics and EERC earlier this summer, have looked at and held prototypes that they've already produced, and are excited about the possibilities that this technology presents.

North American Coal is committed to supporting the development, testing, and commercial deployment of technologies that promote the continued use of coal-fired power generation, but also completely new uses by exploring the idea Semplastics is bringing forward. The development of technologies that would increase the use of CCR, while creating high value products from material that may be otherwise be disposed, is highly desirable. New, innovative ideas to use North Dakota coal in new ways is another benefit of exploring this technology.

On behalf of The North American Coal Corporation, I would like to express our support for and commitment to participation in this Semplastics proposed project.

Sincerely,

The North American Coal Corporation

David J. Straley
Director, External Affairs

2000 Schafer Street, Bismarck, North Dakota 58501 - 701-258-2200 - www.NACoal.com

JOHN HOEVEN
NORTH DAKOTA
338 RUSSELL SENATE OFFICE BUILDING
TELEPHONE: (202) 224-2551
FAX: (202) 224-7999
hoeven.senate.gov

United States Senate
WASHINGTON, DC 20510

COMMITTEES:
AGRICULTURE
APPROPRIATIONS
ENERGY AND NATURAL RESOURCES
INDIAN AFFAIRS

July 7, 2020

Mr. John Harju, Vice President for Strategic Planning
Energy & Environmental Research Center
15 North 23rd Street, Stop 9018
Grand Forks, ND 58202-9018

Subject: Support for Semplastics/EERC Application to DE-FOA-0002185

Dear Mr. Harju:

I am writing to express my support for the application submitted by the University of North Dakota's Energy & Environmental Research Center (EERC) to the Advanced Processing Technologies Initiative. Thank you for your consideration.

North Dakota's universities have long served as important engines of innovation and economic opportunity, which we have leveraged to establish our state as a hub of technological development. Such efforts have empowered us to expand into new, dynamic sectors while also adding value to our state's traditional industries of agriculture and energy production. The EERC's application, which seeks to advance additional uses for our state's abundant reserves of lignite coal, aligns closely with these ongoing initiatives.

Specifically, in collaboration with Semplastics, Inc., the EERC is proposing to develop new, high value building materials made from North Dakota lignite. The process chemically bonds lignite with Semplatics' patented X-MAT polymer-derived ceramic to produce lightweight and strong construction bricks and blocks. These materials have the potential to be used in a variety of infrastructure applications, including roads, bridges, pipes, and building supports, and will help address domestic supply issues, reduce our reliance on imports, and provide a sequestered and environmentally-safe use for carbon. Given coal's continued challenges within our domestic power portfolio, this is a timely and welcome effort to support a crucial industry in North Dakota.

Accordingly, I hope this application receives favorable consideration from the Department of Energy's Office of Fossil Energy. Thank you for your time and attention to this important matter. Please keep me informed of the review process, and feel free to contact my office should you need any further assistance.

Sincerely,

John Hoeven

John Hoeven
U.S. Senator

10:44

KEVIN CRAMER
NORTH DAKOTA

SUITE 400
RUSSELL BUILDING
WASHINGTON, DC 20510
202-224-2043

United States Senate

COMMITTEES
ARMED SERVICES
BANKING, HOUSING, AND URBAN AFFAIRS
THE BUDGET
ENVIRONMENT AND PUBLIC WORKS
VETERANS' AFFAIRS

July 1, 2020

The Honorable Dan Brouillette
U.S. Department of Energy
Office of the Secretary
1000 Independence Ave SW
Washington DC 20585

Dear Secretary Brouillette,

For decades, lignite coal has been a tremendous economic stabilizing force and job creator for North Dakota. As you know, current and future conditions for coal and coal power generation continue to face headwinds. However, extraordinary infrastructure, know-how, and workforce are in place to continue using our country's vast coal resources in the 21st Century.

This is why I support ongoing Department of Energy research and development activities and a new initiative underway with the University of North Dakota Energy & Environment Research Center (UNDEERC) and Semplastics, Inc., a Florida-based engineering and materials company. They are developing coal-core building materials under the DOE NETL "Advanced Coal Processing Technologies." This joint effort will develop new, high value products made from North Dakota lignite in the form of next generation structural, brick and block building materials.

Utilizing Semplastics' patented X-MAT polymer-derived ceramic chemically bonded with North Dakota lignite, Semplastics has demonstrated a non-burning, sequestered and environmentally safe use of carbon to develop construction bricks and blocks. These lightweight, extremely strong, coal-core building materials have the potential to be used in multiple infrastructural applications. In fact, the uses of lignite combined with X-MAT could include road, bridge, pipe, and building supports – materials often imported or in short supply.

As your Department evaluates various investments for DE-FOA-0002185, I hope you will consider this proposal under area of interest 2. Thank you for your consideration and please reach out to Micah Chambers or Chris Marohl, should you have questions.

Sincerely,

Kevin Cramer
United States Senator

Appendix C: Award Notification Letter for Project 1

U.S. DEPARTMENT OF ENERGY

NATIONAL ENERGY TECHNOLOGY LABORATORY
Albany, OR • Morgantown, WV • Pittsburgh, PA

NATIONAL ENERGY TECHNOLOGY LABORATORY

July 22, 2020

SENT VIA ELECTRONIC MAIL

Barbara Hopkins
Semplastics EHC LLC
269 Aulin Avenue
Oviedo, Florida 32765-4806
bhopkins@semplastics.com

SUBJECT: Selection of Application for Negotiation Under Funding Opportunity Announcement Number DE-FOA-0002190, "Research for Innovative Emission Reduction Technologies Related to Coal Combustion Residuals".

Dear Ms. Hopkins:

We are pleased to provide this update on your application. The Office of Fossil Energy within the Department of Energy (DOE) has completed its evaluation of your application submitted in response to the subject Funding Opportunity Announcement (FOA). The application below has been recommended by the Office of Fossil Energy for negotiation of a financial award (**Note: This notification does not guarantee Federal Government funding, as funding will only be obligated upon completion of successful negotiations**):

Application: "High Strength, Encapsulated, Commercially Useful Components and Particles made from Coal Combustion Residuals" William Easter, GRANT13075565

DOE intends to make a public announcement of the selections in the near future requests that your organization not make any announcement of your selection prior to the DOE announcement. You will be informed of the announcement and provided a link there-to, via subsequent email.

Receipt of this letter does not authorize the applicant to commence with performance of the project. DOE makes no commitment to issue an award and assumes no financial obligation with the issuance of this letter. Applicants do not receive an award until award negotiations are complete and the Contracting Officer executes the funding agreement. Only an award document signed by the Contracting Officer obligates DOE to support a project.

The award negotiation process may take up to 60 days. The applicant must be responsive during award negotiations (i.e., provide requested documentation) and meet the stated negotiation deadlines. Failure to submit the requested information and forms by the stated due date, or any failure to conduct award negotiations in a timely and responsive manner, may cause DOE to cancel award negotiations and rescind this selection. DOE reserves the right to terminate award negotiations at any time for any reason.

3610 Collins Ferry Road, P.O. Box 880, Morgantown, WV 26507 • 626 Cochrans Mill Road, P.O. Box 10940, Pittsburgh, PA 15236

Please complete the following items and submit to DOE no later than July 29, 2020

- Pre-Award Information Sheet (available at https://netl.doe.gov/node/5719)
- Data Management Plan (reference requirements for DMP in Appendix E)
- Copy of indirect rate agreement(s) for you and any sub-recipient(s) as applicable.
- Updated environmental questionnaire(s), as applicable. The environmental questionnaire is available at: http://www.netl.doe.gov/File%20Library/Business/forms/451_1-1-3.pdf .

If your organization proposed a foreign national (in any capacity) on the project, your organization is required to complete NETL F142.1-1A "Request for Unclassified Foreign National Access (Short Form)" for each foreign national. *A copy of NETL F 142.1-1A is located at https://www.netl.doe.gov/business/business-forms/financial-assistance under Post Selection Forms/Information.* You will then send an email directly to the Contract Specialist notifying them that you are ready to submit a request. The email should identify the award number, the Recipient's name, the name of the proposed foreign national, as well as his/her country of citizenship and employer. This email should not include the NETL F 142.1-1A, any of the required supporting documents, or any other personal identifiable information (PII). You will be contacted with instructions on how to proceed with submitting the foreign national information after emailing the Contract Specialist.

Please provide the requested documents to the attention of Patrick Mayle, who is the Contract Specialist from the Acquisition group handling the administrative portion of your application. Patrick Mayle can be reached at 304-285-4454 or Patrick.Mayle@NETL.DOE.GOV. Mark Render is the NETL Project Manager from the Project Management Division handling the technical portion of your application and can be reached at 304-285-1621 or Mark.Render@netl.doe.gov.

Sincerely,

Angela Bosley

Angela Bosley
Contracting Officer
Finance and Acquisition Center

cc: FOA File
wgeaster@semplastics.com
Mark.Render@NETL.DOE.GOV
Patrick.Mayle@NETL.DOE.GOV

Appendix D: Cost Share Commitment Letters

Project 1

7 April 2020

Semplastics EHC, LLC
269 Aulin Avenue, Suite 1003
Oviedo, FL 32765
Attn: William Easter

RE: U.S. Department of Energy (U.S. DOE) Fossil Energy CCR Research & Development (DE-FOA-0002190)

Dear Mr. Easter:

The Center for Applied Research and Technology, Inc. (CART) hereby certifies our commitment as a subcontractor to provide all labor, materials, equipment, facilities, technical expertise and $50,000.00 cost sharing in-kind, necessary to serve in the manner and to the extent described in the Work Plan, and the detailed Research and Related Budget sections of the Semplastics U.S.DOE-FE-CCR application as follows:

Proposal Due Electronically:	20 April 2020
Proposed Start Date:	1 October 2020
Total Research & Related Budget Period 1:	$75,000.00
Total Research & Related Budget Period 2:	$75,000.00
Period of Performance:	1 October 2020 through 30 September 2022
FEIN:	20-0173258
Dun & Bradstreet:	152953753
www.sam.gov:	System for Award Management (SAM) Registered
Program Director:	Bruce V. Mutter bmutter@cartinc.com

CART is an independent, non-stock, 501(c) (3) non-profit, corporation organized exclusively for educational and scientific purposes that operates industrial design studios and laboratories in Bluefield, West Virginia (WV). As a subcontractor to Semplastics, CART is committed to provide technical assistance that includes 3D design modeling services for larger-format commercially-useful component prototype panels and columns, pilot-line designs, CCR industry supply chain contact development, and other design for manufacturing, consulting, and technical assistance to the company.

Thank you for your consideration of CART as a subcontractor in Semplastic's U.S. DOE-FE-CCR. CART is prepared to continue its partnership with Semplastics to commercialize *High Strength, Encapsulated, Commercially Useful Components and Particles made from Coal Combustion Residuals (CCR)*. Should you have any questions, please contact us.

Sincerely,

Bruce V Mutter

Bruce V. Mutter, CEO
bmutter@cartinc.com
TEL: 304.327.4220

P.O. Box 2182 – Bluefield, WV 24701 – TEL (304)327-4220 FAX (888) 998-CART – www.cartinc.com

CLEMSON
SPONSORED PROGRAMS

Letter of Intent to Establish a Consortium Agreement

Clemson University as Subrecipient

Clemson University PI:	Dr. Rajendra Bordia	Prime Applicant Organization:	Semplastics EHC LLC
CU PI Department:	Materials Science & Engr.	Prime Applicant PI:	William Easter
Sponsor Name:	US DOE		
Proposal Title:	High Strength, Encapsulated, Commercially Useful Components and Particles made from Coal Combustion Residuals		
Proposed Project Period:	10/01/20 to 09/30/22	Proposed Project Amount:	$299,995

Attached Subcontract Proposal Documents

- ☑ Scope of Work (required)
- ☑ Budget and Budget Justification (required)
- ☐ Biosketches and Other Support for all Key Personnel – in agency required format (if applicable)
- ☐ Federally negotiated F&A Costs Rate Agreement (required for Federal sponsors)

Project/Performance Site Location

Organization Name:	Clemson University	County:	
Street 1:	230 Kappa Street	Country:	
Street 2:		Province:	
City:	Clemson	Congressional District:	SC-003
State:	SC	DUNS #	042629816
Zip/Postal Code:	29634-5702	EIN #	57-6000254

REQUESTED Budget		COST SHARE Budget	
Direct Costs	$196,718	Direct Costs	$49,180
F&A Costs	$103,277	F&A Costs	$25,820
Total Costs	$299,995	Total Costs	$75,000

Are Animals Applicable to this Proposed Project? ☐ Yes ☑ No
Are Human Subjects Applicable to this Proposed Project? ☐ Yes ☑ No

The appropriate programmatic and administrative personnel of each institution involved in this grant application are aware of the pertinent Federal regulations and policies and are prepared to establish written inter-organizational agreements that will ensure compliance with all such policies.

Clemson University will provide cost share at 20% of total project costs as required by the FOA. Total cost share provided = $75,000

The appropriate programmatic and administrative personnel of each institution involved in this grant application are aware of the pertinent Federal regulations and policies and are prepared to each establish written inter-organizational agreements that will ensure compliance with all such policies.

Clemson University's Conflict of Interest in Research Policy complies with the U.S. Department of Health and Human Services, "Objectivity in Research," 42 CCFR Part 50 and "Responsible Prospective Contractors," 45 CFR Part 94 requirements.

This letter certifies that all project personnel are compliant with Clemson University's Financial Conflict of Interest Policy.

Jerry H Ringle 04/10/2020
Signature of Authorized Clemson University Official Date

Office of Sponsored Programs
Clemson University
230 Kappa Street - Clemson, SC 29634-5702
Phone: 864.656.2424 - Fax: 864.656.0881
Email: cuosp@clemson.edu

OSP-3
Revised 5/15/13

Lignite Energy Council

April 3, 2020

Semplastics EHC LLC
269 Aulin Avenue, Suite 1003
Oviedo, FL 32765
Attn: William Easter

Dear Mr. Easter,

Subject: Semplastics proposal entitled "High Strength, Encapsulated, Commercially Useful Components and Particles made from Coal Combustion Residuals" in Response to DE-FOA-0002190

This letter is in response to the Energy & Environmental Research Center's request for the Lignite Research Council's participation in the subject proposed project for which a proposal is being submitted to the U.S. Department of Energy (DOE).

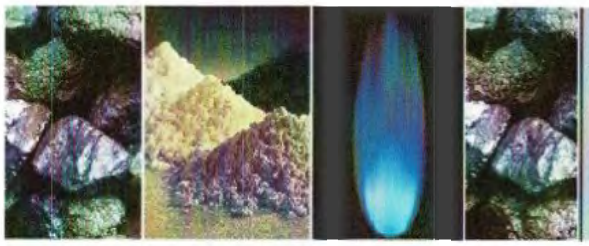
The Lignite Energy Council (LEC), and the closely aligned Lignite Research Council are committed to the development, testing, and commercial deployment of technologies that promote the continued use of coal-fired power generation. The development of technologies to increase the use of coal combustion residuals (CCR) while creating high value products from material that would otherwise be landfilled or placed in impoundments is highly desirable. As such, the Lignite Research Program under the North Dakota Industrial Commission (NDIC) will provide $100,000 cash to the project proposed by Semplastics, pending award from the DOE, submission of an acceptable proposal, and approval by the Lignite Research Council and the NDIC.

We hope that DOE gives careful consideration to this project, as there is a significant need for projects that promote the continued use of coal. Again, we express our interest in and support of the proposed project and look forward to working with the project team on this project.

Sincerely,

Mike Holmes
Vice President of Research & Development
Lignite Energy Council

701.258.7117 | www.lignite.com | 1016 E. Owens Ave. | Bismarck, ND 58502



Mosser Resource Consulting, LLC

Morgan (Mike) Mosser

1 Delrose Drive
Morgantown, WV 26508
Cell 304.685.9126
mmosser72@comcast.net

March 13, 2020

Semplastics
c/o Mr. William Easter
269 Aulin Avenue, Suite 1003
Oviedo, FL 32765-4806

Dear Mr. William Easter,

Re: Proposal for cost-shared research and development (R&D) projects under the funding opportunity announcement (FOA) DE-FOA-0002190: "*High Strength, Encapsulated, Commercially Useful Components and Particles made from Coal Combustion Residuals*"

I am aware of the importance to our nation to reducing the volume of coal combustion residuals (CCRs) consisting primarily of fly ash, bottom ash, boiler slag, flue gas desulfurization (FGD) gypsum and other FGD-solid by-products, as well as fluidized bed combustor ash from pulverized coal-fired power plants and other combustion-based coal power plants. CCRs constitute one the largest classes of industrial by-products generated in the United States. R&D under this FOA aims to economically increase the beneficial use and advance the management of CCRs, thereby reducing the volume of CCRs needed to be disposed of in impoundments while protecting the environment and the health and safety of the public.

I believe that Mosser Resources Consulting LLC as a consultant to Semplastics can play an important role in advancing this initiative. So, in response to the above FOA, we endorse your application titled "*High Strength Encapsulated, Commercially Useful Components and Particles made from Coal Combustion Residuals.*" In addition, we will provide additional support by committing $2,000 of in-kind services as mutually agreed upon to further the project and to advise the Semplastics research team with regard to providing Coal Combustion residuals needed to successfully complete the objectives of the project.

Sincerely,

Morgan Mosser
Member

Project 2

Center for Applied Research and Technology, Inc.

6 July 2020

Semplastics EHC, LLC
269 Aulin Avenue, Suite 1003
Oviedo, FL 32765
Attn: William Easter

RE: U.S. Department of Energy (U.S. DOE) Fossil Energy CDBM (DE-FOA-0002185)

Dear Mr. Easter:

The Center for Applied Research and Technology, Inc. (CART) hereby certifies our commitment as a subcontractor to provide all labor, materials, equipment, facilities, technical expertise and $22,500.00 cost sharing in-kind, necessary to serve in the manner and to the extent described in the Work Plan, and the detailed Research and Related Budget sections of the Semplastics U.S.DOE-FE-CDBM AOI #1 application as follows:

Proposal Due Electronically:	7 July 2020
Proposed Start Date:	1 December 2020
Total Research & Related Budget Period 1:	$81,667
Total Research & Related Budget Period 2:	$40,833
Period of Performance:	1 December 2020 through 31 May 2022
FEIN:	20-0173258
Dun & Bradstreet:	152953753
www.sam.gov:	System for Award Management (SAM) Registered
Program Director:	Bruce V. Mutter bmutter@cartinc.com

CART is an independent, non-stock, 501(c) (3) non-profit, corporation organized exclusively for educational and scientific purposes that operates industrial design studios and laboratories in Bluefield, West Virginia (WV). As a subcontractor to Semplastics, CART is committed to provide technical assistance that includes 3D design modeling services for larger-format commercially-useful component prototype panels and pilot-line designs, CDBM industry supply chain contact development, and other design for manufacturing, consulting, and technical assistance to the company.

Thank you for your consideration of CART as a subcontractor in Semplastic's U.S. DOE-FE-CDBM. CART is prepared to continue its partnership with Semplastics to commercialize "*High-Performance Coal-Based Commercial Façade Panels and Architectural Components.*" Should you have any questions, please contact us.

Sincerely,

Bruce V Mutter

Bruce V. Mutter, CEO
bmutter@cartinc.com
TEL: 304.327.4220
MOB: 304.425.6946

P.O. Box 2182 – Bluefield, WV 24701 – TEL (304)327-4220 FAX (888) 998-CART – www.cartinc.com

Lignite Energy Council

June 25, 2020

Semplastics EHC LLC
269 Aulin Avenue
Suite 1003
Oviedo, FL 32765

Attn: William Easter

Subject: Semplastics proposal entitled "High-Performance Coal-Based Commercial Façade Panels and Architectural Components" in Response to DE-FOA-0002185

Dear Mr. Easter,

This letter is in response to the Energy & Environmental Research Center's request for the Lignite Research Council's participation in the subject proposed project for which a proposal is being submitted to the U.S. Department of Energy (DOE).

The Lignite Energy Council (LEC), and the closely aligned Lignite Research Council are committed to the development, testing, and commercial deployment of technologies that promote the use of lignite for value-added products for the building industry. The development of technologies to increase the use of lignite to create high value products such as façade and architectural panels is highly desirable. As such, the Lignite Research Program under the North Dakota Industrial Commission (NDIC) will provide $50,000 cash to the project proposed by Semplastics, pending award from the DOE, and submission of an acceptable proposal, and approval by the Lignite Research Council and the NDIC.

We hope that DOE gives careful consideration to this project, as there is a significant need for projects that promote the continued use of lignite coal. Again, we express our interest in and support of the proposed project and look forward to working with the project team on this project.

Sincerely,

Mike Holmes
Vice President of Research & Development
Lignite Energy Council

701.258.7117 | www.lignite.com | 1016 E. Owens Ave. | Bismarck, ND 58502

Project 3

Lignite Energy Council

June 25, 2020

Semplastics EHC LLC
269 Aulin Avenue
Suite 1003
Oviedo, FL 32765

Attn: William Easter

Subject: Semplastics proposal entitled "Low Weight, High Strength Coal-Based Building Materials for Infrastructure Products" in Response to DE-FOA-0002185

Dear Mr. Easter,

This letter is in response to the Energy & Environmental Research Center's request for the Lignite Research Council's participation in the subject proposed project for which a proposal is being submitted to the U.S. Department of Energy (DOE).

The Lignite Energy Council (LEC), and the closely aligned Lignite Research Council are committed to the development, testing, and commercial deployment of technologies that promote the high value-added products produced from lignite. The development of technologies to increase the use of lignite to produce building materials such as bricks, blocks, and support structures is highly desirable. As such, the Lignite Research Program under the North Dakota Industrial Commission (NDIC) will provide $100,000 cash to the project proposed by Semplastics, pending award from the DOE, and submission of an acceptable proposal, and approval by the Lignite Research Council and the NDIC.

We hope that DOE gives careful consideration to this project, as there is a significant need for projects that promote the continued use of lignite coal. Again, we express our interest in and support of the proposed project and look forward to working with the project team on this project.

Sincerely,

Mike Holmes
Vice President of Research & Development
Lignite Energy Council

701.258.7117 | www.lignite.com | 1016 E. Owens Ave. | Bismarck, ND 58502

Project 4

Center for Applied Research and Technology, Inc.

7 July 2020

X-MAT CCC, LLC
1600 Bluefield Avenue
Bluefield, WV 24701
Attn: William Easter

RE: U.S. Department of Energy (U.S. DOE) Fossil Energy CDBM Research & Development (DE-FOA-0002185)

Dear Mr. Easter:

The Center for Applied Research and Technology, Inc. (CART) hereby certifies our commitment as a subcontractor to provide all labor, materials, equipment, facilities, technical expertise and $40,000.00 cost sharing in-kind, necessary to serve in the manner and to the extent described in the Work Plan, and the detailed Research and Related Budget sections of the X-MAT CCC U.S.DOE-FE-CDBM AOI #5 application as follows:

Proposal Due Electronically:	7 July 2020
Proposed Start Date:	1 December 2020
Total Research & Related Budget Period 1:	$160,000
Period of Performance:	1 December 2020 through 30 November 2021
FEIN:	20-0173258
Dun & Bradstreet:	152953753
www.sam.gov:	System for Award Management (SAM) Registered
Program Director:	Bruce V. Mutter bmutter@cartinc.com

CART is an independent, non-stock, 501(c) (3) non-profit, corporation organized exclusively for educational and scientific purposes that operates industrial design studios and laboratories in Bluefield, West Virginia (WV). As a subcontractor to X-MAT CCC, CART is committed to provide technical assistance that includes 3D design modeling services for larger-format commercially-useful component prototype panels, blocks, tiles and pilot-line designs, CDBM industry supply chain contact development, and other design for manufacturing, consulting, and technical assistance to the company.

Thank you for your consideration of CART as a subcontractor in X-MAT CCC's U.S. DOE-FE-CDBM AOI #5. CART is prepared to continue its partnership with X-MAT CCC to commercialize *"Modular, Manufactured Homes from Coal-Based Building Materials."* Should you have any questions, please contact us.

Sincerely,

Bruce V Mutter

Bruce V. Mutter, CEO
bmutter@cartinc.com
TEL: 304.327.4220
MOB: 304.425.6946

P.O. Box 2182 – Bluefield, WV 24701 – TEL (304)327-4220 FAX (888) 998-CART – www.cartinc.com

Lignite Energy Council

June 25, 2020

Semplastics EHC LLC
269 Aulin Avenue
Suite 1003
Oviedo, FL 32765
Attn: William Easter

Subject: Semplastics proposal entitled "Modular, Manufactured Homes from Coal-Based Building Materials" in Response to DE-FOA-0002185

Dear Mr. Easter,

This letter is in response to the Energy & Environmental Research Center's request for the Lignite Research Council's participation in the subject proposed project for which a proposal is being submitted to the U.S. Department of Energy (DOE).

The Lignite Energy Council (LEC), and the closely aligned Lignite Research Council are committed to the development, testing, and commercial deployment of technologies that promote the high value-added products produced from lignite. The development of technologies to increase the use of lignite to produce coal-derived building materials to make modular, manufactured houses is highly desirable. As such, the Lignite Research Program under the North Dakota Industrial Commission (NDIC) will provide $50,000 cash to the project proposed by Semplastics, pending award from the DOE, and submission of an acceptable proposal, and approval by the Lignite Research Council and the NDIC.

We hope that the DOE gives careful consideration to this project, as there is a significant need for projects that promote the continued use of lignite coal. Again, we express our interest in and support of the proposed project and look forward to working with the project team on this project.

Sincerely,

Mike Holmes
Vice President of Research & Development
Lignite Energy Council

701.258.7117 | www.lignite.com | 1016 E. Owens Ave. | Bismarck, ND 58502

Appendix E: Tax Liability Affidavit

AFFIDAVIT

Date 09/29/2020 County: SEMINOLE

PERSONALLY came and appeared before me, the undersigned Notary, the within named WILLIAM BASTEK, who is a resident of SEMINOLE County, State of FLORIDA, and makes his/her statement and General Affidavit upon oath and affirmation of belief and personal knowledge that the following matters, facts and things set forth are true and correct to the best of his/her knowledge:

"Semplastics EHC LLC does not have an outstanding tax liability owed to the State of North Dakota or any of its political subdivisions."

Notary Public, State of FLORIDA

Name, Typed or Printed: JAYESH PATEL

Notary Public State of Florida
Jayesh Patel
My Commission GG 189313
Expires 02/22/2022

My Commission Expires: 02/22/2022