Environment and Natural Resources Trust Fund

2027 Request for Proposal

General Information

Proposal ID: 2027-356

Proposal Title: Improving Industrial Milling Technology for Scalable Biofuel Production

Project Manager Information

Name: Keivan Davami

Organization: University of Alabama

Office Telephone: (415) 994-8107

Email: kdavami@eng.ua.edu

Project Basic Information

Project Summary: Research, optimize, and implement an improved Szego Mill to enhance conversion of Minnesota corn stover—including stalks, leaves, and cobs—into renewable biofuels in partnership with the University of Minnesota.

ENRTF Funds Requested: $867,000

Proposed Project Completion: June 30, 2030

LCCMR Funding Category: Energy (E)

Project Location

What is the best scale for describing where your work will take place?

Region(s): Metro

What is the best scale to describe the area impacted by your work?

Statewide

When will the work impact occur?

During the Project and In the Future

Narrative

Describe the opportunity or problem your proposal seeks to address. Include any relevant background information.

Most rural Minnesotans are familiar with the limitations in how corn stover—the stalks, leaves, and cobs remaining after grain harvest—is currently utilized. After harvest, stover often blows into yards and ditches or is baled for low-value uses such as cattle bedding, where much of its potential value is lost. Because these uses generate limited economic return, farmers lack strong incentives to collect and utilize the non-grain portions of the corn plant. This represents a missed opportunity in a state that is consistently among the top four corn-producing states in the United States. Minnesota generates roughly 35 million dry tons of corn stover annually, with an estimated 7–12 million tons potentially available for biofuel production, representing roughly $1 billion in potential economic value.

A key barrier to better stover utilization is affordable and reliable pre-treatment. Deacetylation and Mechanical Refining (DMR) can significantly improve biomass conversion efficiency, but only if mechanical refining is reliable. Current pre-treatment Szego mill configurations lack long-term mechanical reliability, remain unoptimized for biomass comminution, and experience accelerated roller wear when processing abrasive corn stover. Design, materials, and manufacturing innovations are required to optimize the Szego Mill for biomass comminution and DMR scale-up.

What is your proposed solution to the problem or opportunity discussed above? Introduce us to the work you are seeking funding to do. You will be asked to expand on this proposed solution in Activities & Milestones.

This project will engineer a next-generation Szego milling system that addresses a critical reliability barrier in DMR pretreatment. The work will enable more durable, energy-efficient processing of Minnesota corn stover, unlocking more reliable and affordable biofuel production.

We will:

1) Engineer an optimized Szego milling system that improves mechanical reliability and efficiency for DMR processing of Minnesota corn stover.

2) Redesign roller contact surfaces and milling geometries to improve biomass comminution while reducing peak stresses responsible for accelerated roller wear.

3) Develop and compare advanced manufacturing approaches including advanced metallurgy, surface engineering (laser/shot peening and abrasion-resistant coatings), and additively manufactured multi-material rollers enabled by UMN's CAMMP.

4) Construct and implement a pilot-scale Szego Mill (0.5–1 tonne/day) incorporating improved machine design, advanced materials, and optimized roller geometries.

5) Conduct pilot-scale milling trials on Minnesota feedstocks to measure throughput, specific energy (kWh/ton), vibration behavior, roller wear, and downstream DMR performance.

6) Demonstrate operational reliability through 100 hours of continuous operation and 500 hours of cumulative operation.

7) Perform system-level analysis of reliability, consistency, and energy consumption using operational data.

8) Develop a commercialization pathway for deploying improved Szego-DMR systems at commercial biorefineries in Minnesota.

What are the specific project outcomes as they relate to the public purpose of protection, conservation, preservation, and enhancement of the state's natural resources?

Advancing the Szego milling system will enable efficient conversion of Minnesota corn stover into renewable biofuels while reducing agricultural waste. Outcomes include: (1) a novel Szego Mill with 0.5–1 ton/day capacity to produce fermentable sugars; (2) demonstrated reliability through 100 hours continuous and 500 hours cumulative operation; (3) improved machine design and roller technologies that reduce wear and maintenance; (4) quantified improvements in milling efficiency and DMR sugar yields for Minnesota feedstocks; and (5) economic, environmental, and workforce benefits, including lower emissions, reduced oil dependence, and potential generation of over $1B annually from Minnesota stover utilization.

Activities and Milestones

Activity 1: Minnesota needs assessment, baseline performance, and workplan setup

Activity Budget: $130,050

Activity Description:
This activity defines Minnesota-specific project needs and establishes how success will be measured. The University of Alabama will use its existing Szego mill for DMR pretreatment testing. In partnership with the University of Minnesota, the collaborative team will identify representative Minnesota corn stover feedstocks and define realistic ranges for key material characteristics, including moisture, ash, and field-to-field variability. Testing conditions will be aligned with likely Minnesota operating scenarios so results are relevant to in-state deployment. Baseline milling trials will be conducted using the current Szego mill configuration to quantify throughput, specific energy (kWh/ton), noise and vibration, roller wear, and downtime during corn stover processing. These results will support a structured failure-mode assessment to determine what fails, why it fails, and how early warning signs can be identified. The findings will then be used to set clear, measurable performance targets for improved roller designs and operating conditions. Outputs will include a Minnesota corn stover requirements memo, a baseline performance dataset, and pass/fail criteria tied to public benefits such as lower energy use, reduced noise, improved reliability, and maintained or improved downstream conversion performance.

Activity Milestones:

Description	Approximate Completion Date
Finalize detailed work plan, roles, reporting schedule, and success metrics	July 31, 2027
Select and procure Minnesota-relevant corn stover and define target operating envelope	August 31, 2027
Complete baseline milling campaigns and document current wear/noise/vibration/downtime	September 30, 2027
Complete failure-mode review and establish pass/fail criteria for improved roller concepts	October 31, 2027
Issue baseline + requirements memo for Minnesota deployment	November 30, 2027

Activity 2: Failure analysis of the current mills and selection of new design, materials and fabrication processes that will enhance mechanical reliability

Activity Budget: $173,400

Activity Description:
This activity begins with a failure analysis of the current Szego mill system used for corn stover processing. Operational data, wear patterns, vibration signatures, and component degradation will be analyzed to identify key causes of reduced reliability, including roller wear, excessive contact stresses, structural vibration, and fatigue in critical components. The results will guide redesign of key milling system elements, including roller geometry, contact surfaces, internal clearances, and structural features influencing load distribution, vibration behavior, and energy efficiency during biomass comminution.

Building on this analysis, the team will develop and evaluate new machine and roller design concepts optimized for abrasive Minnesota corn stover. Candidate roller geometries and surface designs will reduce peak contact stresses and limit vibration, chatter, and rapid wear. Candidate materials and durability strategies will also be evaluated, including abrasion-resistant alloys, hardfacing or coatings, and surface-engineering treatments using screening tests that replicate corn stover abrasion and cyclic loading.

The University of Minnesota's additive manufacturing capabilities, including multi-material Laser Powder Bed Fusion, will be used to explore advanced component designs and manufacturing routes that improve wear resistance and

reparability. Using pass/fail criteria from Activity 1, the team will down-select machine and roller designs balancing performance, manufacturability, and cost.

Activity Milestones:

Description	Approximate Completion Date
Generate and document candidate roller geometries/material options (shortlist)	October 31, 2027
Complete lab screening of candidate materials/coatings (wear resistance + durability)	December 31, 2027
Downselect to top 2–3 roller concepts for prototype build (with rationale and data)	January 31, 2028
Finalize prototype drawings/specs, manufacturing plan, and QC acceptance checks	March 31, 2028
Finalize reports and publications related to roller selections	June 30, 2028

Activity 3: Prototype fabrication and installation on the Szego mill

Activity Budget: $260,100

Activity Description:
This activity implements the design, materials, and manufacturing solutions identified in Activity 2 by fabricating and integrating an improved Szego mill configuration for validation prior to extended pilot testing on Minnesota corn stover. Based on the root-cause analysis and design selections, the team will manufacture the selected machine components, including rollers, cases, and other critical elements that influence load distribution, vibration behavior, wear progression, and overall mechanical reliability. Components will be produced using the fabrication routes identified in Activity 2, including conventional machining, advanced metallurgy, surface-engineering treatments, and additive manufacturing capabilities at the University of Minnesota's Center for Advanced Manufacturing & Material Processing (CAMMP) where appropriate.

A defined quality-control protocol will verify dimensional tolerances, dynamic balance, surface condition, and material or coating integrity prior to installation. After installation, the upgraded Szego mill will undergo controlled shake-down testing to evaluate vibration stability, acoustic behavior, power draw, temperature rise, alignment, and early wear performance.

Where needed, corrective adjustments will be implemented, including balance refinement, alignment improvements, mounting modifications, and minor geometry updates to reduce resonance and instability. By the end of this activity, the project will deliver a fully integrated prototype Szego mill configuration ready for extended pilot-scale testing on Minnesota corn stover.

Activity Milestones:

Description	Approximate Completion Date
Fabricate first prototype roller set(s) and complete QC/acceptance documentation.	January 31, 2028
Complete installation and controlled shake-down runs; capture noise/vibration and power baselines	March 31, 2028
Implement corrective actions (balance/alignment/fit) and lock "pilot-test configuration"	July 31, 2028
Complete second prototype iteration (if needed) and finalize maintenance/inspection procedures	October 31, 2028
Issue prototype readiness memo for extended pilot validation	December 31, 2028

Activity 4: Pilot validation and extended testing on Minnesota corn stover

Activity Budget: $173,400

Activity Description:
This activity demonstrates the real-world value of the improved Szego mill configuration for processing Minnesota corn stover. A novel pilot-scale Szego Mill (0.5–1 tonne/day) incorporating improved machine design, advanced materials, and optimized roller geometries will be constructed and implemented for validation testing. During a structured extended pilot campaign, we will quantify throughput, particle-size outcomes, specific energy (kWh/ton), vibration/noise behavior, component wear progression, and downtime or maintenance events.

We will also link milling outputs to downstream DMR performance to ensure that reliability improvements do not compromise conversion, tracking indicators such as refining quality and fermentable sugar yield. Reliability targets will be demonstrated through 100 hours of continuous operation and 500 hours of cumulative operation with maintained, superior performance, with careful documentation of stoppages and their causes.

Results will be compared against the baseline established in Activity 1 to quantify improvements in energy consumption, noise, downtime, throughput, and yield consistency. The deliverable will be an experimentally validated operating envelope for Minnesota feedstocks, including recommended operating setpoints, acceptable ranges, and "do-not-operate" conditions that increase wear or instability, reducing adoption risk for Minnesota biorefineries and supporting future scale-up decisions.

Activity Milestones:

Description	Approximate Completion Date
Complete pilot campaign with Minnesota corn stover and analyze energy/noise/downtime + conversion metrics	January 31, 2029
Demonstrate sustained operation target (continuous run) and cumulative-hours target; document results	July 31, 2029
Quantify improvements vs baseline (kWh/ton reduction, noise reduction, downtime reduction, yield/throughput gains)	October 31, 2029
Produce validated operating envelope for MN feedstocks (setpoints + troubleshooting guide)	December 31, 2029

Activity 5: Minnesota deployment package, dissemination, and closeout

Activity Budget: $130,050

Activity Description:
This activity ensures project results translate into actionable benefits for Minnesota. The University of Minnesota will perform additional material characterization on selected components, including wear surface condition, microstructure, hardness, and related durability measures, to explain performance differences and strengthen design guidance. The project team will compile a public-facing dataset and methods summary that Minnesota stakeholders can use in future techno-economic and lifecycle analyses. An operator-oriented implementation package will be developed that includes a design brief, inspection and maintenance checklist, recommended operating ranges for Minnesota corn stover, and practical guidance on sourcing, fabrication, and repair options. Dissemination will include at least one Minnesota-focused workshop or webinar with biorefineries, stover suppliers, manufacturers, and academic stakeholders to review outcomes and identify adoption barriers. The team will also prepare a scale-up roadmap describing the steps needed to move from pilot validation to larger demonstration-scale deployment relevant to Minnesota. Finally, all ENRTF and LCCMR closeout requirements will be completed, including final reporting, public archiving of project materials, and required acknowledgment language. The focus of this activity is to maximize Minnesota impact by making results understandable, accessible, and directly usable by in-state decision-makers and operators.

Activity Milestones:

Description	Approximate Completion Date
UMN material characterization summary completed and integrated into final design rationale	January 31, 2030
Draft public-facing performance dataset + methods note	March 31, 2030
Host Minnesota stakeholder workshop/webinar (biorefineries, stover suppliers, manufacturers, agencies)	May 31, 2030
Finalize “Minnesota Implementation & Scale-Up Package”	June 30, 2030
Submit final report and all required LCCMR/ENRTF closeout materials	June 30, 2030

Project Partners and Collaborators

Name	Organization	Role	Receiving Funds
Dr. Keivan Davami	University of Alabama (UA)	UA PI, lead laser peening, wear testing, and machine design modifications. In charge of providing the Szego mill to conduct research on and quantifying the system improvements that lead to increased biofuel refining efficiency.	Yes
Dr. Behzad Rankouhi	University of Minnesota (UMN)	UMN Co-PI receiving a majority of project funds via a sub-award, coordinating material testing at UMN's Characterization Facility, and utilizing the recently added Center for Advanced Manufacturing & Material Processing (CAMMP) at UMN to test the multi-material laser powder bed fusion system as a manufacturing solution to improve Szego mill rollers.	Yes
Dr. Luke N. Brewer	University of Alabama (UA)	UA Co-PI, lead failure analysis, materials selection, and cold spray deposition.	Yes
Dr. Cory R. Otto	University of Alabama (UA)	Remote UA Post-doctoral residing in Minnesota, will be focused on failure analysis, steel selection, and testing. Point of contact for collaborating with the University of Minnesota for testing.	Yes
Dr. Yudong Li	National Renewable Energy Laboratory (NREL)	Department of Energy consultant receiving a service contract to assess the improvements made to the DMR process by the integration of the optimized Szego Mill refining technique into the downstream DMR process.	Yes

Dissemination

Describe your plans for dissemination, presentation, documentation, or sharing of data, results, samples, physical collections, and other products and how they will follow ENRTF Acknowledgement Requirements and Guidelines.
We will share data, results, and products to ensure Minnesota entities can use the outcomes to improve management and deployment decisions. Dissemination products will include:

(1) peer-reviewed and/or conference publications where appropriate, with ENRTF acknowledgement.
(2) a one-page public infographic describing why reliable biomass milling matters for Minnesota renewable fuels and natural-resource outcomes.
(3) a practitioner-focused design-and-operations guide with inspection intervals, maintenance thresholds, and recommended operating envelopes.
(4) short educational outreach segments broadcast on WVUA-23, a commercial television station owned by the University of Alabama.
(5) Hosting workshops at the University of Minnesota to demonstrate the machine, disseminate project findings, and discuss implementation pathways with stakeholders.

We will host two Minnesota-focused webinars/workshops and invite ethanol plants, corn stover suppliers, UMN/DNR technical staff, and regional manufacturers. Materials will be posted in an accessible format and archived for longevity. If physical samples (e.g., worn components) are retained for educational purposes, they will be stored with labeling and metadata so they can be referenced in future Minnesota technology transfer activities. Outreach will emphasize how converting corn stover to biofuels can reduce fossil fuel dependence and expand renewable energy production. A short, non-technical summary will be shared with Minnesotans through partner newsletters and social media using ENRTF tags.

Long-Term Implementation and Funding

Describe how the results will be implemented and how any ongoing effort will be funded. If not already addressed as part of the project, how will findings, results, and products developed be implemented after project completion? If additional work is needed, how will this work be funded?

Project results will be implemented through a transferable Szego Mill design guide, validated manufacturing methods, and publicly available performance datasets that enable adoption by Minnesota biomass processors, equipment manufacturers, and biorefineries. Industry stakeholders will be engaged throughout the project to support in-state deployment and commercialization planning. After completion, scale-up, extended durability testing, and integration with commercial DMR systems will be pursued through industry cost-shares and direct partnerships. Additional development will also be supported through federal commercialization programs such as SBIR and STTR, enabling technology transition to manufacturers and accelerating deployment of corn stover–to–biofuel processing systems across Minnesota.

Project Manager and Organization Qualifications

Project Manager Name: Keivan Davami

Job Title: Associate Professor

Provide description of the project manager's qualifications to manage the proposed project.

Dr. Keivan Davami will serve as the Project Manager and Principal Investigator for the proposed project in partnership with Dr. Behzad Rankouhi from the University of Minnesota. He is an Associate Professor in the Department of Mechanical Engineering at the University of Alabama and Director of the Manufacturing Laboratory. Dr. Davami's research program focuses on advanced manufacturing, surface engineering, high strain-rate mechanics, and materials characterization. His work integrates experimental mechanics, additive manufacturing, and advanced microstructural characterization techniques to address complex challenges in materials processing and structural performance.

Dr. Davami has extensive experience managing multidisciplinary research projects involving graduate students, postdoctoral researchers, and external collaborators from academia, industry, and national laboratories. He has led several externally funded research programs and has successfully coordinated complex experimental efforts requiring advanced instrumentation, including high-speed mechanical testing systems, laser-based surface processing equipment, and electron microscopy facilities. His experience includes developing project timelines, overseeing research budgets, coordinating collaborative tasks across institutions, and ensuring that project milestones and reporting requirements are met.

As director of a research laboratory that supports multiple funded projects, Dr. Davami regularly manages shared experimental infrastructure, supervises research personnel, and oversees laboratory safety and operational protocols. He has established structured workflows for experimental planning, data management, and student training to ensure efficient project execution and high-quality research outcomes.

Through his combined expertise in technical leadership, research program management, and team coordination, Dr. Davami is well positioned to successfully manage the proposed project and ensure that all objectives, milestones, and deliverables are completed on schedule and to a high standard.

Organization: University of Alabama

Organization Description:

This project will be conducted in collaboration with researchers at the University of Minnesota (UMN) and the University of Alabama (UA). The partnership combines the research capabilities and expertise of both institutions, enabling complementary strengths in experimental research, materials characterization, and environmental technology

development. Through this collaboration, the project will leverage the facilities, technical expertise, and regional engagement of both universities to effectively achieve the proposed research objectives and maximize the broader impact of the work.

UA is a flagship public research university founded in 1831 and classified as a Carnegie R1 institution with very high research activity. UA's mission is to advance knowledge through research, education, and service while addressing critical societal, technological, and environmental challenges. The university supports a broad portfolio of interdisciplinary research programs and maintains extensive laboratory infrastructure and shared research facilities.

The proposed work will be conducted within the Department of Mechanical Engineering in the College of Engineering. The department hosts a wide range of research activities in advanced manufacturing, materials science, experimental mechanics, and energy systems. Faculty within the department collaborate extensively with industry partners, government agencies, and academic institutions to develop innovative engineering solutions and translate scientific discoveries into practical technologies.

Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	$ Amount
Personnel								
Principal Investigator - Dr. Keivan Davami		UA employee, lead laser peening, wear testing, and machine design modifications. In charge of providing the Szego mill to conduct research on and quantifying the system improvements that lead to increased biofuel refining efficiency.		X	23.47%	0.24		$64,317
Co-Principal Investigator - Dr. Luke N. Brewer		UA employee, lead failure analysis, materials selection, and cold spray deposition.		X	23.77%	0.12		$31,119
Post-Doctoral Research Specialist - Dr. Cory R. Otto		Remote UA Post-doctoral residing in Minnesota, will be focused on failure analysis, steel selection, and testing. Point of contact for collaborating with the University of Minnesota for testing and additive manufacturing.		X	14.01%	1.5		$104,670
PhD Student 1 - To Be Hired		A full-time doctoral student focused on laser peening, cold spray deposition, and wear testing roller design. Also will work on contact mechanics and stress modelling in the Szego Mill.		X	7.16%	3		$101,870
Undergraduate Student - To Be Hired		Part-time student aiding in conducting testing.		X	0%	0.75		$22,698
							Sub Total	**$324,674**
Contracts and Services								
National Renewable Energy Laboratory (NREL)	Service Contract	Consulting with the Department of Energy at NREL to provide input on the DMR process.		X		0.12		$22,500
University of Minnesota	Subaward	Providing additive manufacturing, testing, development, and characterization of multi-material Szego rollers at the Center for Advanced Manufacturing & Material Processing (CAMMP) and UMN's Characterization Facility.				6		$450,000

							Sub Total	**$472,500**
Equipment, Tools, and Supplies								
	Tools and Supplies	Corn stover from Minnesota and machining/prototyping services in Minnesota. Chemicals for the corn stover refining process.	The corn stover is to be used to quantify improvements made to Szego milling system. Machining services are to produce components needed to update the Szego mill machine design to make the mill suitable for Minnesota corn stover. The consumable chemicals and supplies are used to support the milling process. The budget includes: $10,000 for year 1, $10,000 for year 2, and $9,209 for year 3.					$29,209
							Sub Total	**$29,209**
Capital Equipment								
							Sub Total	**-**
Acquisitions and Stewardship								
							Sub Total	**-**
Travel In Minnesota								
							Sub Total	**-**
Travel Outside Minnesota								
							Sub Total	**-**
Printing and Publication								
							Sub Total	**-**
Other Expenses								

		Tuition	Tuition is requested for one PhD graduate student at the University of Alabama at the current institutional rate, with projected increases in subsequent years for the duration of the project. This full-time doctoral student will be focused on laser peening, cold spray deposition, and wear testing roller design. Also will work on contact mechanics and stress modelling in the Szego Mill.	X				$40,617
							Sub Total	**$40,617**
							Grand Total	**$867,000**

Classified Staff or Generally Ineligible Expenses

Category/Name	Subcategory or Type	Description	Justification Ineligible Expense or Classified Staff Request
Personnel - Principal Investigator - Dr. Keivan Davami		UA employee, lead laser peening, wear testing, and machine design modifications. In charge of providing the Szego mill to conduct research on and quantifying the system improvements that lead to increased biofuel refining efficiency.	The University of Alabama owns and operates the Szego milling system that will be utilized for testing the improved rollers that are manufactured at the University of Minnesota's Center for Advanced Manufacturing & Material Processing (CAMMP). UA will also lead ensuring that the design of the Szego milling system is modified to improve the refining process to better utilize Minnesota corn stover. Dr. Davami will oversee the overall project coordination, supervise the experimental activities conducted at the University of Alabama, and guide the design and modification of the milling rollers and overall system. Please refer to the attached budget justification "LCCMR 2027-356 Budget Justification UA & UMN".
Personnel - Co-Principal Investigator - Dr. Luke N. Brewer		UA employee, lead failure analysis, materials selection, and cold spray deposition.	The University of Alabama owns and operates the Szego milling system that will be utilized for testing the improved rollers that are manufactured at the University of Minnesota's Center for Advanced Manufacturing & Material Processing (CAMMP). UA will also lead ensuring that the design of the Szego milling system is modified to improve the refining process to better utilize Minnesota corn stover. Dr. Brewer will contribute to the materials selection and surface engineering of the rollers and assist in the interpretation of experimental results related to biomass milling performance and material behavior when implemented on the Szego mill. Please refer to the attached budget justification "LCCMR 2027-356 Budget Justification UA & UMN".
Personnel - Post-Doctoral Research Specialist - Dr. Cory R. Otto		Remote UA Post-doctoral residing in Minnesota, will be focused on failure analysis, steel selection, and testing. Point of contact for collaborating with the University of Minnesota for testing and additive manufacturing.	Dr. Otto is a remote post-doctorate working with Dr. Davami at the University of Alabama. Dr. Otto resides in Minnesota and will be the local point of contact for the collaboration between the University of Minnesota and the University of Alabama. Please refer to the attached budget justification "LCCMR 2027-356 Budget Justification UA & UMN".
Personnel - PhD Student 1 - To Be Hired		A full-time doctoral student focused on laser peening, cold spray deposition, and wear testing roller design. Also will work on contact mechanics and stress modelling in the Szego Mill.	Please refer to the attached budget justification "LCCMR 2027-356 Budget Justification UA & UMN".
Personnel - Undergraduate Student - To Be Hired		Part-time student aiding in conducting testing.	Please refer to the attached budget justification "LCCMR 2027-356 Budget Justification UA & UMN".

Contracts and Services - National Renewable Energy Laboratory (NREL)	Service Contract	Consulting with the Department of Energy at NREL to provide input on the DMR process.	Funds are requested for consulting services from the National Renewable Energy Laboratory (NREL). The consultant will provide expertise in biomass processing and assist with interpretation of experimental results and materials characterization data. Please refer to the attached budget justification "LCCMR 2027-356 Budget Justification UA & UMN".
Other Expenses		Tuition	Please refer to the attached budget justification "LCCMR 2027-356 Budget Justification UA & UMN".

Non ENRTF Funds

Category	Specific Source	Use	Status	Amount
State				
			State Sub Total	**-**
Non-State				
			Non State Sub Total	**-**
			Funds Total	**-**

Total Project Cost: $867,000

This amount accurately reflects total project cost?

Yes

Attachments

Required Attachments

Visual Component

File: 1c0c472d-b51.pdf

Alternate Text for Visual Component

This graphical abstract shows a project to improve Szego mill technology for scalable biofuel production from Minnesota corn stover. It integrates optimized machine design, additive manufacturing, and surface engineering to increase throughput, reduce wear, noise, and downtime, and enable more reliable deacetylation mechanical refining with stronger economic and environmental benefits....

Supplemental Attachments

Capital Project Questionnaire, Budget Supplements, Support Letter, Photos, Media, Other

Title	File
Budget Justification UA & UMN	08a4761f-d92.pdf
Single Audit Report	27a92d1c-626.pdf
IRS determination letter	a4cec909-4b7.pdf
Authorization Letter	af89819e-694.pdf

Administrative Use

Does your project include restoration or acquisition of land rights?

No

Do you understand that travel expenses are only approved if they follow the "Commissioner's Plan" promulgated by the Commissioner of Management of Budget or, for University of Minnesota projects, the University of Minnesota plan?

N/A

Does your project have potential for royalties, copyrights, patents, sale of products and assets, or revenue generation?

No

Do you understand and acknowledge IP and revenue-return and sharing requirements in 116P.10?

N/A

Do you wish to request reinvestment of any revenues into your project instead of returning revenue to the ENRTF?

N/A

Does your project include original, hypothesis-driven research?

Yes

Does the organization have a fiscal agent for this project?

Yes, University of Alabama

Does your project include the pre-design, design, construction, or renovation of a building, trail, campground, or other fixed capital asset costing $10,000 or more or large-scale stream or wetland restoration?

No

Do you propose using an appropriation from the Environment and Natural Resources Trust Fund to conduct a project that provides children's services (as defined in Minnesota Statutes section 299C.61 Subd.7 as "the provision of care, treatment, education, training, instruction, or recreation to children")?

No

Provide the name(s) and organization(s) of additional individuals assisting in the completion of this proposal:

Keivan Davami (UA); Cory Otto (UA); Behzad Rankouhi (UMN)

Do you understand that a named service contract does not constitute a funder-designated subrecipient or approval of a sole-source contract? In other words, a service contract entity is only approved if it has been selected according to the contracting rules identified in state law and policy for organizations that receive ENRTF funds through direct appropriations, or in the DNR's reimbursement manual for non-state organizations. These rules may include competitive bidding and prevailing wage requirements

Yes, I understand