

TECHNICAL REVIEWERS' RATING SUMMARY

R011-B

Pilot-Scale Testing to Evaluate the Effects of Biomass Cofiring Combustion on CMMs at Low Mercury Concentrations

Energy & Environmental Research Center

Principal Investigator: John Pavlish

Request for \$247,000; Total Project Costs \$494,000

<u>Rating Category</u>	<u>Weighting Factor</u>	Technical Reviewer			<u>Average Weighted Score</u>
		<u>2A</u>	<u>2B</u>	<u>2C</u>	
1. Objectives	9	4	2	4	30.00
2. Achievability	9	5	5	4	42.00
3. Methodology	7	3	4	3	23.33
4. Contribution	7	2	1	4	16.33
5. Awareness	5	3	2	4	15.00
6. Background	5	4	5	4	21.67
7. Project Management	2	3	4	4	7.33
8. Equipment Purchase	2	5	5	5	10.00
9. Facilities	2	4	5	5	9.33
10. Budget	2	3	3	3	6.00
Average Weighted Score		181	167	195	181.00
Maximum Weighted Score					250.00

OVERALL RECOMMENDATION

FUND	x
FUNDING MAY BE CONSIDERED	x
DO NOT FUND	x

R011-B
Pilot-Scale Testing to Evaluate the Effects of Biomass Cofiring
Combustion on CMMs at Low Mercury Concentrations
Submitted by Energy & Environmental Research Center
Principal Investigators: John Pavlish
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- 1. The objectives or goals of the proposed project with respect to clarity and consistency with North Dakota Industrial Commission/Renewable Energy Council goals are: 1 – very unclear; 2 – unclear; 3 – clear; 4 – very clear; or 5 – exceptionally clear.**

Reviewer 2A (Rating: 4)

The goal of this project is to **test** two instruments to see if they detect the levels of mercury continuously in flue gas when biomass is co-fired with coal.

The goal is clearly set. The objectives are consistent and integrated with the goal. The consistency of the goal with the NDIC/REC's goals, however, is indirect due to the nature of such a project – the project is to test instruments that may serve as a monitoring tool for projects that involve biomass/ bioenergy.

The significance of such a project is not well justified, except mentioning that the data will be used for policy/ regulation purpose.

Reviewer 2B (Rating: 2)

The objective is very clearly stated: to evaluate instrumentation for measuring mercury emissions while co-firing coal and biomass. The consistency with the NDIC/RE Council is less evident. Biomass has inherently low mercury content and to the extent it is co-fired with coal, mercury emissions from a power plant will decrease. The success of the stated objectives will not impact the greater use of biomass in power generation.

Reviewer 2C (Rating:4)

The project proposes to provide analytical information on the accuracy of CMM's during biomass gasification. This will provide baseline information for new technologies or methodologies.

- 2. With the approach suggested and time and budget available, the objectives are: 1 – not achievable; 2 – possibly achievable; 3 – likely achievable; 4 – most likely achievable; or 5 – certainly achievable.**

Reviewer 2A (Rating: 5)

The project's nature is instrumentation testing and the objectives are achievable with high certainty.

The outcome of the project will be reporting the applicability of the instruments tested. The project itself does not propose to work with the instrument manufacturers for possible re-

tuning, re-calibrating, or re-designing if the machines fail to detect the expected levels of mercury or if the accuracy is not met.

Reviewer 2B (Rating: 5)

The objectives will clearly be obtainable as there is no “stretch goals” or research questions being investigated. The PI’s have built an excellent facility for investigating toxic metal emissions from coal combustion and gasification and will be able to perform the promised objectives.

Reviewer 2C (Rating: 4)

The equipment, instrumentation and resources are available to complete the proposed objectives.

3. The quality of the methodology displayed in the proposal is: 1 – well below average; 2 – below average; 3 – average; 4 – above average; or 5 – well above average.

Reviewer 2A (Rating: 3)

There is a lack of details on how exact the testing will be done and how the data will be analyzed/ interpreted. There are no details on how the machines or data detected by the machines are to feed back to the system for improving co-firing for mercury control purpose. It is just to test “what it is” situation.

It seems that the project team has done similar work previously. How this proposed work is different from their previous work is not clearly stated. The proposal does not show data of the mercury levels in the coal and/or biomass, nor justifications on how such levels will affect mercury levels in flue gas and thus the monitoring by the machines.

No industry partners are involved, which are said to be benefited from this project. To this reviewer, the to-be-benefited industry by this project would be the mercury machines manufacturers, not the biomass co-firing companies because the applicability of such machines is limited by the machines themselves, not how the co-firing is conducted.

Reviewer 2B (Rating: 4)

Accurate measurement of mercury emissions is notorious difficult. The co-PI’s have developed methodologies for accomplishing these measurements, for which I give them high marks. I am a little disappointed that what is promised, though, is little more than routine data collection.

Reviewer 2C (Rating: 3)

Could have more detailed information on PTC operating conditions during the mercury emission testing.

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

Reviewer 2A (Rating: 2)

The project is to test the tools for monitoring the co-firing system. The findings from this project would provide information for instrumentation manufacturers rather than the biomass co-firing companies.

Reviewer 2B (Rating: 1)

Demonstrating that mercury emission measurement methodologies developed for coal combustion will also work for co-firing will do virtually nothing toward increasing the use of biomass in electric power generation. The bottlenecks for co-firing involve feedstock logistics, co-feeding of coal and biomass, and particulate emissions.

Reviewer 2C (Rating: 4)

The proposed work meets the criteria of the NDIC objectives to provide baseline information that could help the advancement of biomass/coal combustion. The information will provide utilities the instrumentation resources to comply with mercury emission levels standards.

- 5. The principal investigator's awareness of current research activity and published literature as evidenced by literature referenced and its interpretation and by the reference to unpublished research related to the proposal is: 1 – very limited; 2 – limited; 3 – adequate; 4 – better than average; or 5 – exceptional.**

Reviewer 2A (Rating: 3)

The proposal does not provide a thorough literature review on the development of similar mercury detecting machines. This reviewer is unclear but assumes that their awareness is adequate.

Reviewer 2B (Rating: 2)

Only one reference is provided to the literature.

Reviewer 2C (Rating: 4)

- 6. The background of the investigator(s) as related to the proposed work is: 1 – very limited; 2 – limited; 3 – adequate; 4 – better than average; or 5 – exceptional.**

Reviewer 2A (Rating: 4)

The PIs have strong background in conducting similar testing. The expertise and capability of the PIs' institution are outstanding.

Reviewer 2B (Rating: 5)

John Pavlish, Senior Research Advisor and Director of EERC's Center for Air Toxic Metals program is well qualified to lead the project and he has assembled a good team.

Reviewer 2C (Rating: 4)

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

Reviewer 2A (Rating: 3)

Besides the PI and co-PIs, there are at least five technical personnel involved in this project as indicated by the budget. However, their roles are not discussed at all.

Reviewer 2B (Rating: 4)

The North Dakota EERC has notable experience in managing research projects in the energy field.

Reviewer 2C (Rating: 4)

The project management plan is clear for the proposal.

- 8. The proposed purchase of equipment is: 1 – extremely poorly justified; 2 – poorly justified; 3 – justified; 4 – well justified; or 5 – extremely well justified. (Circle 5 if no equipment is to be purchased.)**

Reviewer 2A (Rating: 5)

No equipment is proposed.

Reviewer 2B (Rating: 5)

Reviewer 2C (Rating: 5)

- 9. The facilities and equipment available and to be purchased for the proposed research are: 1 – very inadequate; 2 – inadequate; 3 – adequate; 4 – notably good; or 5 – exceptionally good.**

Reviewer 2A (Rating: 4)

The facilities at the PIs' institution are exceptionally good. The capabilities of the mercury detecting machines, however, are uncertain in terms of accuracy and variability which are proposed to be tested in this project.

Reviewer 2B (Rating: 5)

EERC has excellent facilities for this work.

Reviewer 2C (Rating: 5)

The EERC facilities have the capabilities to complete the proposed project.

10. The proposed budget “value”¹ relative to the outlined work and the financial commitment from other sources is of: 1 – very low value; 2 – low value; 3 – average value; 4 – high value; or 5 – very high value. (See below)

Reviewer 2A (Rating: 3)

It seems inappropriate to this reviewer that the proposal intends to support a whole team with significant amount of hours out of a small machines testing project. The budget requested does not reflect the actual work to be accomplished.

The requested match is not secured.

Major matching is said to be from DOE in a future proposal with the condition that this proposal be funded by NDIC/REC. This reviewer is highly in doubt that DOE would fund such a project as it is proposed in this project.

Reviewer 2B (Rating: 3)

Pilot plant work is significantly more expensive than bench top studies. Nevertheless, one half million dollars to determine whether methodologies developed for measuring mercury emissions during coal combustion will also work for co-firing does not strike me as much return on investment in renewable technologies.

Reviewer 2C (Rating: 3)

The budget seems reasonable for the requested project.

¹ “Value” – The value of the projected work and technical outcome for the budgeted amount of the project, based on your estimate of what the work might cost in research settings with which you are familiar.

10a. Financial commitment from other sources – A minimum of 50% of the total project must come from other sources to meet the program guidelines. Higher priority is to be given if the application has private industry investment equal to or at least 50% or more of total cost.

The minimum 50% cash match is demonstrated.

Section C. Overall Comments and Recommendations:

Please comment in a general way about the merits and flaws of the proposed project and make a recommendation whether or not to fund.

Reviewer 2A (Funding May Be Considered)

- (1) This is a machine testing project, which has an application in biomass-coal co-firing facilities. The machines do not feedback for reducing mercury levels in biomass co-firing.
- (2) The project will not lead to significant outcomes in the areas of bioenergy, biofuels, and bioproducts as expected in the NDIC/REC's goals.
- (3) Successful accomplishment of the proposed work may provide useful information for making policy and regulations in mercury control/ monitoring, but not definitely necessary.

This reviewer recommends that the proposal be funded depending the availability of funds. However, it is suggested that the budget be revised to reflect the actual work.

Reviewer 2B (Do Not Fund)

Although the co-PI's are well qualified to do the work and EERC has the facilities to successful meet the project objectives, I cannot support this proposal. North Dakota has only limited resources to seed renewable energy technologies in the state. Evaluating instrumentation to measure a pollutant emission that is not a problem for biomass feedstocks is a poor use of these limited funds. If the goal is to promote co-firing, then support projects that address biomass logistics for power plants, feeding of biomass into boilers, or particulate emissions from biomass combustion.

Reviewer 2C (Fund)

The proposed project is critical for future EPA mercury emission requirements to reduce environmental impacts for biomass/coal fired combustion. The study will also provide instrumentation accuracies to manufactures of CMM analyzers. Overall the project will provide valuable information/ data to utilities that are currently utilizing coal-biomass blends. The projected should be funded.