

TECHNICAL REVIEWERS' COMMENTS

LRC-LXXVII(77)-C:

“Validation of the Multielement Sorbent Trap (MEST) Method for Measurement of HCl and Metals”

Submitted by: Energy & Environmental Research Center (EERC)

Request for: \$245,000; Total Project Costs: \$860,000;

Principal Investigator: John H. Pavlish, Senior Research Manager

1. OBJECTIVES

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

Reviewer 14-07 (Rating: 2)

The proposed validation of the Multielement Sorbent Trap (MEST) testing method has the potential to bring down the cost to demonstrate compliance with the U.S. Environmental Protection Agency (EPA) Mercury and Air Toxics Standards (MATS) Rule. The proposed project will meet the goal of helping “preserve jobs involved in the production and utilization of North Dakota Lignite” by lowering the cost associated with lignite utilization by electric generating units. However, the majority of the cost of compliance with EPA’s MATS Rule will occur from meeting the standard itself by achieving greater removal of the pollutants in the flue gas. Therefore since the proposal only helps to reduce the demonstration of compliance relative to an existing more exhaustive process, it does not necessarily ensure economic stability and growth of the lignite industry.

Reviewer 14-08 (Rating: 2)

Page 2 of the report suggests that “M26 and M29 sampling may be needed as often as every 3 months”. On page 17 the saving between M29 and MEST-M is about \$1,300 per test. The savings between M26A and MEST-H is about \$1,100 per test. Therefore assuming these tests are performed four times a year the expected savings is $4 \times (1,300 + 1,100) = \$9,600/\text{yr}$. This is small in comparison to the costs required to install emission control technology and small compared to the costs required to operate emission control technologies. Given the other significant cost challenges facing the coal industry related to emission control, the cost reductions proposed here will be quite small. The cost of this project is \$860,000. The cost of this project is comparable to the costs savings expected for 90 years’ worth of tests on a single plant. I don’t see how this is a good use of Commission funds given the small savings in costs expected. I may have missed something. The project does appear to have significant industry support.

Reviewer 14-09 (Rating: 3)

The proposal’s goals are clear with respect to attempting to have a sorbent trap method (MEST-H) approved by EPA for the measurement of HCL emissions. The goal of the project concerning an approved method for the measurement of metals (MEST-M) is less clear.

2. ACHIEVABILITY

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

Reviewer 14-07 (Rating: 3)

The timeline in the proposal shows that the data reduction and statistical analysis of the test results will be completed by November of 2015 with reporting to be completed by the end of calendar year 2015. The generators will have to show compliance no later than April 16, 2015.

Reviewer 14-08 (Rating: 3)

Very little information was provided on the test schedule and what they proposed to test when.

Reviewer 14-09 (Rating: 2)

Although the time frame and budget for the project appear feasible, EPA has a history of requiring significant time before approving any changes to existing methods. I believe the fact the EPA's approval is ultimately what is needed for this project adds some risk to the proposal.

3. METHODOLOGY

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

Reviewer 14-07 (Rating: 3)

For the lignite fired utilities which will be required to demonstrate compliance with the HCl emission standards through quarterly emission testing which is not a part of their current compliance regime, the MEST-H testing will offer simplicity, safety and cost savings over EPA's Method M26 or M26A. Facilities which can meet the surrogate standard of 0.2 lb/MMBtu SO₂ and choose to do so, currently require SO₂ CEMS under Part 75 and will not incur any additional costs associated with demonstrating compliance with the HCl MATS.

It is my understanding that most North Dakota lignite plants can currently meet the nonmercury metal standard by demonstrating compliance with the surrogate particulate matter standard utilizing existing pollution control equipment and will not be forced to demonstrate compliance using EPA's Method M29 or the proposed MEST-M Method. If generators choose to demonstrate compliance through the particulate matter surrogate, they can demonstrate compliance through quarterly testing using EPA Method 5 which is currently being done once a year.

Reviewer 14-08 (Rating: 5)

Presumably the methodology to be employed is sufficient to convince the EPA that their sampling approach and data measurement are appropriate for use to measure various emissions. The use of performance monitors is also a good idea.

Reviewer 14-09 (Rating: 4)

The methodology explained concerning the research that supports the proposal, as well what is planned going forward appears to be well thought out and scientifically defensible.

4. CONTRIBUTION

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

Reviewer 14-07 (Rating: 2)

The proposed testing method will provide value to the generators that are required to use them in the form of reduced compliance demonstration costs which will help the industry stay competitive. However, the magnitude of the cost savings will be small in comparison to meeting the actual emission standards themselves. In that regard, the proposed validation of the test methods will have a small effect on the overall sustainability of lignite fired generating units in North Dakota.

Reviewer 14-08 (Rating: 2)

As stated above it is hard to conceive that saving of less than \$10,000 per year at a coal plant will have much of an impact on the economic fortunes of the coal industry.

Reviewer 14-09 (Rating: 3)

If a simplified method can be approved for the measurement of HCL, the cost to the industry for the emissions testing should be reduced which may further the efficiency of burning lignite to produce electricity.

5. AWARENESS

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 14-07 (Rating: 4)

Many of the references listed in the proposal are from previous work done by the investigators in this particular field of study leading up to the development of the MEST Method. The research team has substantial experience working with sampling and emission control of air toxic metals in a variety of industries and applications.

Reviewer 14-08 (Rating: 4)

It is clear that the proponents understand their competitors' technology and what standards are required by the EPA.

Reviewer 14-09 (Rating: 4)

Based on the proposal, it appears Mr. Pavlish and Mr. Dunham's experience in research concerning coal combustion and measuring emissions is above average.

6. **BACKGROUND**

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

Reviewer 14-07 (Rating: 5)

The investigators background is very thorough as shown in the proposal. The research team has substantial knowledge and experience developing and testing new technologies at North Dakota's lignite fired generating units. The resumes of key personnel highlight the many projects and years of research that has been done at the EERC by Mr. Pavlish and Mr. Dunham.

Reviewer 14-08 (Rating: 5)

They seem to have developed a good team of investigators at the EERC. In addition the inclusion of the performance monitors and the EPA is a good idea.

Reviewer 14-09 (Rating: 4)

See comment No. 5.

7. **PROJECT MANAGEMENT**

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 14-07 (Rating: 4)

The proposal illustrates the timeline and communication plan well and the team has a good understanding of what to expect from their previous round of testing done on site at MDU's Lewis & Clark Station located in Sidney, MT. A thorough financial plan is outlined in the proposal.

Reviewer 14-08 (Rating: 4)

The project schedule has some information in it. A detailed budget was provided. It did appear that significant communication between the stakeholders was planned for.

Reviewer 14-09 (Rating: 3)

With respect to getting EPA approval for the MEST-H plan for HCL, the plan appears adequate.

8. **EQUIPMENT PURCHASE**

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

Reviewer 14-07 (Rating: 5)

The EERC is fully equipped to conduct the proposed testing and validation.

Reviewer 14-08 (Rating: 5)

They plan to purchase 200 sorbent traps at a discount for the project. Beyond this no additional equipment appears to be required.

Reviewer 14-09 (Rating: 5)

N/A – based on the proposal, no additional equipment is to be purchased.

9. **FACILITIES**

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

Reviewer 14-07 (Rating: 4)

The EERC has been a leader in the development of new technologies currently in use or consideration by the North Dakota Lignite Industry and many other industries. The analytical research laboratory is well equipped and has a substantial amount of experience analyzing samples for mercury, HAPS, Metals and various biological samples. The pilot-scale test combustor has the capability to closely emulate the particulate matter pollution control equipment being used at lignite fire plants. However there is no mention of a dry or wet scrubber flue gas desulfurization system at the pilot plant which will be utilized to remove not only the SO₂ but the HCl. The proposal calls for utilizing low chlorine coals which may compensate or bring the levels into the desired range of the compliance testing.

Reviewer 14-08 (Rating: 5)

EERC has a significant suite of testing equipment well suited to testing this technology.

Reviewer 14-09 (Rating: 4)

The proposal demonstrates that EERC's research facilities and equipment are quite capable to perform research activities described within.

10. **BUDGET**

The proposed budget "value"¹ relative to the outlined work and the financial commitment from other sources² is of: 1 - very low value; 2 - low value; 3 - average value; 4 - high value; or 5 very high value.

Reviewer 14-07 (Rating: 4)

Of the two existing test methods which EPA requires at this time, M29 and M26, or M26A, M29 is the more expensive test to conduct and currently would be utilized by few if any operators in the state as they will likely use the surrogate particulate matter EPA Method 5 test to demonstrate compliance with the nonmercury metals MATS. The alternate test to M29 being validated, the MEST-M Method may never be needed and is not being validated as a replacement test through the M301 process at this time.

A cost comparison given in the proposal of demonstrate compliance for the HCl regulation with either the existing EPA M26A Method and the proposed MEST-H would be approximately \$12,480 per unit per year, assuming 3 samples are taken at each quarterly test.

Currently the project has \$125K committed from industry out of the minimum requirement of the matching \$245K, which has been asked of the North Dakota Industrial Commission. Three remaining sponsors have expressed interest although no official letters have been submitted with the current proposal. Should the three remaining sponsors whom have expressed interest, The Illinois Clean Coal Institute, EPRI, and The National Rural Electric Cooperative Association, commit just half the dollars they are considering the project would be funded above the required 50% threshold.

Reviewer 14-08 (Rating: 4)

The EERC has a good reputation for delivering good quality testing and results. There is also a high level of financial commitment and in-kind support from the other funders.

Reviewer 14-09 (Rating: 4)

If the project secures the entire \$860,000 budget and the research proves the MEST is a reliable method, resulting in EPA approval, then the \$245,000 requested from the NDIC appears to be a good value considering the total cost of the project and the estimated reduction in emission measurement costs for the industry.

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.

² Financial commitment from other sources – A minimum of 50% of the total project must come from other than Industrial Commission sources to meet the program guidelines. Support greater than 50% from Industrial Commission sources should be evaluated as favorable to the application.

OVERALL COMMENTS AND RECOMMENDATION:

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 14-07 (Rating: FUNDING MAY BE CONSIDERED)

The lignite industry requires diligent and well thought out innovation to meet the evermore stringent rules and regulations and remain competitive in today's energy markets. The validation of the proposed new sampling technique seeks to replace two testing methods which are cumbersome and expensive to conduct with a simpler more reliable testing alternative. This proposal seeks to reduce the cost and complexity of demonstrating compliance and should either of the tests be validated and approved by the EPA, they would in fact save the utilities money.

However, the MATS regulations allow operators to demonstrate compliance using surrogate parameters. Many of the plants which choose to use the surrogate parameters have the continuous emissions monitors or testing ability already in place to prove that the MATS emission limits are being met. The proposed MEST Methods would not be implemented. These plants will have minimal additional cost burden placed on them to demonstrate compliance and will not utilize the proposed MEST sampling methods.

Not all operators will be able to meet the surrogate parameters and will be forced to show compliance with MATS for HCl through either the existing EPA testing methods, the proposed MEST-H testing method or through Continuous Emission Monitors (CEMS). Currently HCl CEMS are being developed and tested for utility operations. Once the CEMS are developed, the plants will likely use the CEMS to ensure that they are continuously in compliance rather than a single sample method. Plants currently operate and maintain a number of CEMS to monitor NO_x, SO₂, Opacity and in some cases particulate matter emissions and would likely add the additional HCl monitors. In this case the CEMS would be used in lieu of the proposed MEST sampling methods or the EPA test methods to show compliance.

Therefore, I do not recommend funding of the further development of the MEST sampling method through the North Dakota Industrial Commission Lignite Research Council. The impact to the lignite industry by simplifying the demonstration of compliance does not necessarily ensure that the plants can stay in compliance and hence preserve or create new jobs within North Dakota's Lignite industry.

After further review of EERC comments and doing some additional research, I feel this project "May Be Considered for Funding. If a utility installs an HCL CEMS monitor, it would still be required to do the yearly RATA test of the HCL monitors and could use the MEST-H test.

Reviewer 14-08 (Rating: FUNDING MAY BE CONSIDERED)

As described above testing costs are only a small component of the overall cost to comply with emission reduction requirements. As such it is hard to see how such relatively small cost savings will materially impact the coal industry given the huge costs associated with installing and operating emission control technologies. It seems to me that it might be better to apply the Commission's limited funds on projects which propose ways to reduce the cost of installing and operating emission control technologies.

Therefore given there is significant interest from the industry, I would recommend that "Funding May Be Considered".

Reviewer 14-09 (Rating: FUNDING MAY BE CONSIDERED)

In my opinion, the approval of a MEST method for both HCL and Metals would be welcomed by both industry and regulators. My concern with the proposal is that its title appears to indicate that the funding is to be used for the development of an approved MEST method for both HCL and metals, but a review of the proposal suggests that the researchers are only attempting to validate the MEST-H for HCL emissions. If funding allows, they hope to further their research on the MEST-M for metals. Funding of the project may be dependent on the trying to quantify what resources will be allocated to each MEST method.