



COORDINATING RESEARCH COUNCIL, INC.

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June 9, 2016

In reply, refer to:

CRC Project No. E-122

Dear Prospective Bidder:

The Coordinating Research Council (CRC) invites you to submit a written proposal to provide services for “Light Duty PEMS Validation / Chassis Dyno Correlation,” (CRC Project No. E-122). A description of the project is presented in Exhibit A, “Statement of Work.”

Please indicate by letter, fax, or email by **June 20, 2016** if you or your organization intends to submit a written proposal for this research program. CRC will answer technical questions regarding the Request for Proposal if they are submitted in writing. CRC will then return written answers to all of the bidders, along with a copy of the original questions.

A CRC technical group composed of industry representatives will evaluate your proposal. CRC reserves the right to accept or reject any or all proposals.

The reporting requirements will be monthly progress reports and a summary technical report at the end of the contractual period. The reporting requirements are described in more detail in the attachment entitled “Reports” (Exhibit B).

The proposal must be submitted as two separate documents. The technical approach to the problem will be described in part one, and a cost breakdown that is priced by task will be described in part two. The cost proposal document should include all costs associated with conducting the proposed program. The technical proposal shall not be longer than 10 pages in length.

CRC expects to negotiate a cost-plus fixed fee or cost reimbursement contract for the research program.

Contract language for intellectual property and liability clauses is presented in Exhibit C and in Exhibit D, respectively.

Important selection factors to be taken into account are listed in Exhibit E. CRC evaluation procedures require the technical group to complete a thorough technical evaluation before considering costs. After developing a recommendation based on technical considerations, the costs are revealed and the recommendation is modified as needed.

Electronic copies of the technical and cost proposals should be submitted to:

Dr. Christopher J. Tennant
Coordinating Research Council
5755 North Point Parkway, Suite 265
Alpharetta, GA 30022

Phone: 678-795-0506
Fax: 678-795-0509
E-mail: ctennant@crcao.org

The deadline for receipt of your proposal is **July 13, 2016**.

Yours truly,

Christopher J. Tennant
Deputy Director

EXHIBIT A

Statement of Work

TITLE: Light Duty PEMS Validation/ Chassis Dyno Correlation

Background

With Europe adopting the use of portable emissions measurement systems (PEMS) used to determine light duty real world emissions, there is a greater interest in PEMS functionality and use. The California Air Resources Board (CARB) and the Environmental Protection Agency (EPA) are also conducting tests here in the United States with heavy duty on-road and light duty vehicles to determine their viability to measure real world on-road emissions. This is in addition to the normal Federal Test Procedure (FTP-75), Highway Fuel Economy Test (HWFET), and US06 Supplemental Federal Test Procedures (SFTP) chassis dynamometer testing. There are several PEMS manufacturers producing these units and some studies have been conducted to understand how they perform compared to normal chassis dynamometer testing. This project will incorporate a comparison of PEMS vs chassis dynamometer, however, it is also to look at how PEMS perform under real road conditions as well as on a closed track to better understand accuracy, repeatability and road impacts on emissions measurements.

Objective

The objective is to develop an on-road cycle, using a modified real driving emissions (RDE) cycle. This cycle should incorporate city, urban and highway driving to determine how well the PEMS measurements correlate to that of a chassis dynamometer emission test cell. The test is conducted several times to understand the variation in emissions that occur and how they change on the same route on a daily basis. Several PEMS units will be used, one at a time, to measure the tailpipe emissions. This will enable one to compare each PEMS unit under real-road driving conditions. An average of the three to five drive cycles will be used to program a chassis dynamometer in order to conduct chassis dynamometer emissions testing. Three to five repeats will be run on the chassis roll for repeatability and comparison to each PEMS unit. The PEMS unit will also measure emissions at the same time on the chassis roll for direct comparison. Additionally, the same real world cycle will be conducted on a closed track to determine how repeatable the PEMS units are on the road without the variations one might encounter in real driving.

- Determine the repeatability of each PEMS unit with real road driving
- Determine the repeatability of the chassis roll testing to compare to each of the PEMS units
- Determine how driving on a closed track on the same real world driving impacts PEMS measurements
- If available conduct same testing on a rough road to determine if road roughness impacts PEMS emissions
- Determine which exhaust flow measurement instrument from the individual PEMS system correlates best with the direct vehicle exhaust flow meter from the test cell and with the CVS bags based on CO₂.

Scope of Work

Project Management

CRC and its project technical panel will provide management and oversight for this project. These entities are hereafter referred to collectively as the project sponsor.

Vehicles

Vehicle selection will be determined by the project sponsor. There will be at least one light duty gasoline direct inject vehicle used for testing provided by CRC. The potential for a second light duty diesel direct injection vehicle exists. All testing will be conducted on the gasoline vehicle first using each of the PEMS units before moving to the diesel vehicle to avoid cross contamination.

Measure engine parameters from the vehicle for airflow and fuel rates to calculate exhaust flow for each test.

The contractor shares with project sponsor how each PEMS unit will be installed based on PEMS Manufactures recommendations for exhaust flow measurements prior to testing.

Fuels

There will be one fuel used for testing. The fuel will be 87 AKI E10 market fuel. There will be a method of measuring the amount of fuel used for testing. The project sponsor will pay for the fuel that is used.

Real World Drive Cycle

The drive cycle will be developed by the contractor based on the guidelines of the RDE European cycle and the project sponsor with the sponsor having final approval. This will be dependent on who is awarded the contract and the location of the contractor with respect to the local road system.

Emissions

The chassis dynamometer test cell equipment should be 1065/1066 compliant and will measure both second by second and bag gaseous emissions including CO₂ as well as filter based particulate matter PM emissions. Additionally, particulate number PN emissions will be measured. Each of the PEMS units will measure TP gaseous, PM, and PN emissions, if capable. Additionally, a direct vehicle exhaust flow meter from the chassis dynamometer will be used for modal measurements and exhaust flow rate comparison to the PEMS. An AVL489 instrument or equivalent for PN measurement will be used for chassis testing.

Test Procedure

1. Start with one PEMS unit on a vehicle and drive the developed real road cycle 5 times. Each test is a cold start with a soak time of at least 8 hours. All ambient conditions should be measured, air temperature, humidity, rain, etc. (use the average drive cycle to program the chassis dynamometer for testing.)

2. Run the same cycle on a closed track 3 to 5 times for repeatability (repeatability parameters to be developed based on PEMS data). Each test is a cold start with a soak time of at least 8 hours. All ambient conditions should be measured, air temperature, humidity, rain, etc.
3. Conduct chassis roll emissions testing with 5 measurements from the chassis dynamometer emissions and simultaneous PEMS measurements.
Each test is a cold start with a soak time of at least 8 hours. All ambient conditions should be measured, air temperature, humidity, rain, etc.
4. Conduct real road cycle on closed rough road track for repeatability for 5 tests. Each test is a cold start with a soak time of at least 8 hours. All ambient conditions should be measured, air temperature, humidity, rain, etc.
5. Run the next PEMS unit and repeat steps 1 through 4 (minus developing the drive cycle on chassis roll).

Statistics

Conduct statistics on all test data.

Quote

Please provide a quote on a per-vehicle, per-PEMS unit basis, i.e., one vehicle with one PEMS unit, two PEMS units...up to four PEMS units.

Deliverables

As outlined in the subsequent “Exhibit” section, the contractor should submit monthly reports in addition to the draft and final reports. Monthly reports should contain all data acquired during the report month using the scan tool, shown in MS Excel chart format when appropriate. Emission test results and drivability notes should also be included. Depending on the final program schedule, the contractor may be requested to issue an interim report. This interim report would be structured in format of a final report, and would address all vehicles that had completed testing to that point.

EXHIBIT B

REPORTS

MONTHLY TECHNICAL PROGRESS REPORTS

The contractor shall submit a monthly technical progress report covering work accomplished during each calendar month of the contract performance. An electronic Microsoft® Word compatible file (<1 MB) of the monthly technical progress report shall be distributed by the contractor within ten (10) calendar days after the end of each reporting period. The report shall contain a description of overall progress, plus a separate description for each task or other logical segment of work on which effort was expended during the reporting period.

FINAL REPORT

The contractor shall submit to or distribute for CRC an electronic (Microsoft Word) copy transmittable via email) of a rough draft of a final report within thirty (30) days after completion of the technical effort specified in the contract. The report shall document, in detail, the test program and all of the work performed under the contract. The report shall include tables, graphs, diagrams, curves, sketches, photographs and drawings in sufficient detail to comprehensively explain the test program and results achieved under the contract. The report shall be complete in itself and contain no reference, directly or indirectly, to the monthly report(s).

The draft report must have appropriate editorial review corrections made by the contractor prior to submission to CRC to avoid obvious formatting, grammar, and spelling errors. The report should be written in a formal technical style employing a format that best communicates the work conducted, results observed, and conclusions derived. Standard practice typically calls for a CRC Title Page, Disclaimer Statement, Foreword/Preface, Table of Contents, List of Figures, List of Tables, List of Acronyms and Abbreviations, Executive Summary, Background, Approach (including a full description of all experimental materials and methods), Results, Conclusions, List of References, and Appendices as appropriate for the scope of the study. Reports submitted to CRC shall be written with a degree of skill and care customarily required by professionals engaged in the same trade and /or profession.

Within thirty (30) days after receipt of the approved draft copy of the final report, the contractor shall make the requested changes and deliver to CRC thirty (30) hardcopies including a reproducible master copy of the final report. The final report shall also be submitted as electronic copies in a pdf and Microsoft Word file format. The final report may be prepared using the contractor's standard format, acknowledging author and sponsors. An outside CRC cover page will be provided by CRC. The electronic copy will be made available for posting on the CRC website.

EXHIBIT C

INTELLECTUAL PROPERTY RIGHTS

Title to all inventions, improvements, and data, hereinafter, collectively referred to as (“Inventions”), whether or not patentable, resulting from the performance of work under this Agreement shall be assigned to CRC. Contractor X shall promptly disclose to CRC any Invention which is made or conceived by Contractor X, its employees, agents, or representatives, either alone or jointly with others, during the term of this agreement, which result from the performance of work under this agreement, or are a result of confidential information provided to Contractor X by CRC or its Participants. Contractor X agrees to assign to CRC the entire right, title, and interest in and to any and all such Inventions, and to execute and cause its employees or representatives to execute such documents as may be required to file applications and to obtain patents covering such Inventions in CRC’s name or in the name of CRC’s Participants or nominees. At CRC’s expense, Contractor X shall provide reasonable assistance to CRC or its designee in obtaining patents on such Inventions.

To the extent that a CRC member makes available any of its intellectual property (including but not limited to patents, patent applications, copyrighted material, trade secrets, or trademarks) to Contractor X, Contractor X shall have only a limited license to such intellectual property for the sole purpose of performing work pursuant to this Agreement and shall have no other right or license, express or implied, or by estoppel. To the extent a CRC member contributes materials, tangible items, or information for use in the project, Contractor X acknowledges that it obtains only the right to use the materials, items, or information supplied for the purposes of performing the work provided for in this Agreement, and obtains no rights to copy, distribute, disclose, make, use, sell or offer to sell such materials or items outside of the performance of this Agreement.

EXHIBIT D

LIABILITY

It is agreed and understood that _____ is acting as an independent contractor in the performance of any and all work hereunder and, as such, has control over the performance of such work. _____ agrees to indemnify and defend CRC from and against any and all liabilities, claims, and expenses incident thereto (including, for example, reasonable attorneys' fees) which CRC may hereafter incur, become responsible for or pay out as a result of death or bodily injury to any person or destruction or damage to any property, caused, in whole or in part, by _____'s performance of, or failure to perform, the work hereunder or any other act of omission in connection therewith.

EXHIBIT E

PROPOSAL EVALUATION CRITERIA

- 1) Merits of proposed technical approach.
- 2) Previous performance on related research studies.
- 3) Personnel available for proposed study – related experience.
- 4) Timeliness of study completion.
- 5) Cost.