



COORDINATING RESEARCH COUNCIL, INC.

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March 3, 2016

In reply, refer to:

CRC Project No. E-94-2a

Dear Prospective Bidder:

The Coordinating Research Council (CRC) invites you to submit a written proposal to provide services for “Statistical Analysis of The Coordinating Research Council “Fuel Effects on Gaseous and Particulate Emissions On SIDI In-Use Vehicles” E-94-2 Project Data,” (CRC Project No. E-94-2a). A description of the project is presented in Exhibit A, “Statement of Work.”

Please indicate by letter, fax, or email by **March 11, 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
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Alpharetta, GA 30022

Phone: 678-795-0506
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The deadline for receipt of your proposal is **March 24, 2016**.

Yours truly,

Christopher J. Tennant
Deputy Director

EXHIBIT A

Statement of Work

Statistical Analysis of The Coordinating Research Council “Fuel Effects on Gaseous and Particulate Emissions On SIDI In-Use Vehicles” E-94-2 Project Data

Background

This program used 12 spark ignited direct injection (SIDI) vehicles and eight test fuels. The fuels were obtained by forming the eight possible combinations of the following three main parameters, each at two levels: particulate matter index (PMI) as described by Honda, ethanol level, and octane. Other fuel parameters were controlled as similarly as possible. Four types of emissions were measured: gaseous particulate mass (PM), gaseous particulate number (PN), organic carbon (OC), and elemental carbon (EC). Some of the vehicles were naturally aspirated (NA) and others were turbocharged (TC). Four and six cylinder engines were in the program. The goal of the program is to determine the impacts of fuels and aspiration type on emissions. The next step is to determine the statistical analysis of the data.

Fuels

The test program uses eight fuels, the three main fuel parameters were, PMI, octane and ethanol. The other fuel parameters were held to be as similar as possible.

Vehicles

The 12 vehicles used in this program are described below:

The twelve vehicles used in this project represent the wide variety of SIDI vehicles in use in the United States.

- Vehicle properties:
 - Model year 2011 to model year 2015
 - Front wheel drive or rear wheel drive
 - Automatic transmission (including CVT)
 - Hyundai, Mazda, VW, Chevrolet, Lexus, Mercedes, Ford, Honda and Nissan

Engine Property	Description
Displacement	1.6 L – 3.5 L
Induction Type	Naturally Aspirated & Turbocharged
Engine Architecture	Inline-4 & V-6
Emissions Certification	Tier 2 Bin 4, Tier 2 Bin 5, California ULEV

Objectives

The task is to specify the appropriate statistical models and perform the related statistical analyses to quantify the impacts of PMI, ethanol, and octane (the three fuel parameters) on emissions for each vehicle separately and for all the vehicles together. Additional parameters to be investigated include total aromatics, gum, T90, and final boiling point (FBP). The impact of

aspiration type on emissions is also required. Models, assumptions, and the meaning of all model parameters should be clearly stated. Appropriate plots and graphical analyses of the data and model results should be provided. Power calculations should also be provided to determine the probability of detecting a given difference.

As an example, a possible model for the 3 fuel parameters using all 12 vehicles with each vehicle observed twice at each of the 2^3 factor level combinations is the following:

$$y_{hijkl} = \mu + \alpha_h + \beta_i + \gamma_j + \alpha\beta_{hi} + \alpha\gamma_{hj} + \beta\gamma_{ij} + \alpha\beta\gamma_{hij} + v_k + e_{hijk} + \varepsilon_{hijkl}$$

$h = 1,2$ α_h : PMI

$i = 1,2$ β_i : ethanol

$j = 1,2$ γ_j : octane

$k = 1, \dots, 12$ v_k : vehicles

$$e_{hijk} \sim N(0, \sigma_1)$$

$l = 1,2$ runs

$$\varepsilon_{hijkl} \sim N(0, \sigma_0)$$

This over-parameterized model treats the vehicle as a blocking variable (v_k) with 12 levels. The actual models will be more involved because they will include the aspiration type and the number of observations at each fuel factor level combination is not constant.

Cost

Please include the cost of providing statistical analysis for each of the three major tasks

- 1) Provide statistics for each vehicle on all eight fuels
- 2) Provide statistics for the full set of vehicles on all eight fuels
- 3) Provide statistics for naturally aspirated vs turbocharged

Timing

Please provide timing of the tasks, and completion of final report.

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.