



COORDINATING RESEARCH COUNCIL, INC.

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March 24, 2021

In reply, refer to:
CRC Project No. SM-1

Dear Prospective Bidder:

The Coordinating Research Council (CRC) invites you to submit a written proposal to provide services for “Evaluate the Potential for Significant Greenhouse Gas Emission Reductions from Internal Combustion Engines Operated on Liquid Fuels Over the 2021-2030 Time Period: Literature Review and Future Prospects” (CRC Project No. SM-1). A description of the project is presented in Exhibit A, “Statement of Work.”

Please indicate by email before **April 7, 2021** 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). 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.

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 (not including resumes). **The schedule / timeline information should be included in the technical proposal.**

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

The technical and cost proposals should be submitted to:
Christopher J. Tennant Email: ctennant@crcao.org

The deadline for receipt of your proposal is **April 26, 2021**.

EXHIBIT A
CRC Project SM-1 Statement of Work
**Evaluate the Potential for Significant Greenhouse Gas Emission Reductions from Internal
Combustion Engines Operated on Liquid Fuels Over the 2021-2030 Time Period:
Literature Review and Future Prospects**

Background

Despite strong pressure to electrify mobility, the internal combustion engine (ICE) is expected to continue powering vehicles for some decades to come because of its versatility, cost, consumer preferences, the inertial effect of fleet turnover and other factors. Nevertheless, the electrification of light duty vehicles is growing worldwide as countries attempt to leap-frog over ICE-based propulsion system technologies and into battery electric vehicles. Several OEMs already have announced plans to introduce many electrified products (HEV, PHEV, BEV, FCEV.)* while others have set carbon neutrality goals.

In the US, the EPA and NHTSA implement vehicle fuel economy and GHG standards through rulemaking. Consequently, the efficiency and GHG performance of ICE-equipped vehicles has improved significantly over time, but governments are moving to greatly further reduce GHG emissions. At one extreme, California already has announced a commitment to end sales of new light-duty internal combustion engine vehicles by 2035 and there are indications that other states may follow California's lead. In addition, future significant increases in the stringency of existing standards will force major vehicle redesigns that may ultimately imperil the viability of internal combustion engines operated on liquid fuels. These factors dictate a need to undertake a study using a systems-based wells-to-wheels (WTW) framework to assess the feasibility of alternative pathways for the ICE-equipped vehicle operated on liquid fuels to achieve significant transportation sector GHG emissions reductions that help efforts to mitigate the impacts of climate change.

Objective

The objective of this review is to evaluate and determine the total greenhouse gas (GHG) emissions reductions that are achievable now and in 2030 from liquid fuel-based light-duty vehicles. Phase I of the study will focus upon the GHG reduction opportunities on a WTW basis for liquid fuels/ICEV and electric grid/PEVs operation. To capture the overall lifecycle performance of a light-duty vehicle (including manufacturing and disposal) and the liquid fuel used to operate its internal combustion engine (ICE) and provide a holistic perspective, Phase II of the study will incorporate the elements of vehicle manufacturing and end of life disposal.

The goal of Phase I is to:

- (1) define those pathways that come closest to representing a net GHG neutral (net-zero) scenario for light-duty vehicles equipped with internal combustion engines operating with liquid-based fuels,
- (2) evaluate, for each pathway now and in 2030, the relative contributions to net GHG emissions that result from vehicle-related improvements in engine/energy efficiency and changes in the carbon intensity of the liquid fuels used for vehicle operation, and

*[In this document, "PEV" is used to refer to PHEV & BEV]

- (3) compare with plug-in electric vehicle (PEV) performance utilizing a WTW (electricity generation + vehicle efficiency) approach.

The objective questions of utmost interest are: Is there a pathway to 2030 for significant WTW GHG reductions for ICE-equipped light-duty vehicles operated on liquid fuels? How does the pathway compare to PEVs using a similar WTW approach (energy production + vehicle operation)? Can the transportation sector achieve a goal of net-zero carbon given the technologies and processes available today and that are conceivably expected to be available in the near-term for the ICE-equipped LDV, the liquid fuel on which it operates, and, in the case of PEVs, the US electricity grid carbon footprint?

It is anticipated that a second phase of this research will examine the full range of GHG reductions possible with a future vehicle & fuel system. The contractor should recommend future areas of research for this expanded focus.

Statement of Work

The project should include a review of publicly available articles or reports of research in industry, academic, or government settings, supplemented by modeling and/or other analyses to develop evaluations of the maximum WTW GHG emission reductions achievable both now and in 2030 from 1) alternative pathways representing ICE-equipped light-duty vehicles operated on liquid fuels and 2) compare with WTW GHG emission reductions of plug-in electric vehicles taking into account the US electric grid carbon intensity.

Topics to be included in the review/assessment encompass:

- Technologies and processes employed in all energy extraction, refining and distribution phases that impact the carbon intensity of the liquid fuels intended for consumption by ICE-equipped light-duty vehicles.
 - This would include consideration of refinery energy efficiency improvements, use of biofuels and/or “e-fuels”, carbon capture & sequestration, direct air capture, etc.
- Improvements in PEV WTW efficiency and GHG performance
- ICE-based propulsion system technologies and strategies aimed at WTW improvement in engine/energy fuel efficiency and GHG performance.
- Feasibility assessment of the various pathways included in the study.
- Impact of pathways investigated on GHG reductions from the light duty vehicle fleet in 2030.

Bidders should itemize major work items in their technical and cost proposals to facilitate matching the project scope to the available budget.

PHASE II Topics:

- While the focus of Phase I is on the above areas, Phase II of the study would consider other technologies employed in the production, use and disposal of light-duty vehicles that are intended to reduce their lifecycle GHG emissions (e.g., vehicle weight reduction, improved transmission designs, improved tire rolling resistance, etc.)

The fuel and vehicle technology systems evaluated should represent those available today as well as those that are currently expected to be commercially available within the next 10 years.

Deliverables

Deliverables include:

- A kick-off meeting/call between CRC and the contractor to discuss project scope and align expectations.
- Monthly calls between CRC and the contractor to discuss preliminary results and identify any information gaps before finalizing findings and starting the final report.
- A final report, the draft of which will be reviewed by CRC before final release.

Project Schedule

CRC expects that this effort should be performed over a 9-month period following contract execution. However, please propose an appropriate timeline for completing the study, including milestones for study deliverables.

Project Management

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

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. Periodic conference calls may also be requested by CRC to update the technical committee overseeing the project.

FINAL REPORT

The contractor shall submit to CRC a draft final report. The report shall document the test procedure, document details of each test iteration, and explain any observations noted. The test data will be recorded and reviewed, and the final report will include a certification that the test procedures were followed, noting any exceptions. The detailed data will also be supplied electronically to CRC.

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. Incomplete draft reports or reports of poor quality requiring additional outside editorial review may have outside editorial services charged back to the project budget.

Comments regarding the report shall be furnished by the CRC committee to the contractor within one (1) month after receipt of the draft copy. Additional rounds of review may be required.

Within thirty (30) days after receipt of comments, the contractor shall make the requested changes and submit an electronic copy of the draft final report in both Microsoft Word and Adobe pdf file format. Once accepted, the contractor shall deliver five (5) hard copies of the final report to CRC. 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.