



COORDINATING RESEARCH COUNCIL, INC.

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January 16, 2023

In reply, refer to:
CRC Project No. AVFL-42

Dear Prospective Bidder:

The Coordinating Research Council (CRC) invites you to submit a written proposal to provide services for “Detailed Chemical and Physical Characterization and Analysis of New Low Carbon Liquid Fuels” (CRC Project No. AVFL-42). A description of the project is presented in Exhibit A, “Statement of Work.”

Please indicate if you or your organization intends to submit a written proposal for this research program using the form submission at [THIS LINK](#) by **January 30, 2023**. CRC will answer technical questions regarding the Request for Proposal if they are submitted in writing via [this link](#). 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. Key contract language examples are presented in Exhibits B, C, D, and E. CRC must adhere to standard contract language with minor adjustments only in extraordinary circumstances. **Failure to agree to these contract clauses as written may result in the project being awarded to another contractor.**

Important selection factors are listed in Exhibit F. 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 should not be longer than 10 pages in length (not including resumes). **The schedule / timeline information must be included in the technical proposal; failure to do so may result in your proposal being set aside as non-responsive.**

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
Amber B. Leland Email: aleland@crcao.org

The deadline for receipt of your proposal is **FEBRUARY 20, 2023**.

EXHIBIT A
CRC Project Statement of Work

“Detailed Chemical and Physical Characterization and Analysis of New Low Carbon Liquid Fuels”
CRC Project Number: AVFL-42

Background

- All fuels, including electricity, have significant greenhouse gas (GHG) emissions footprints today. A wide range of fuel and vehicle technologies will be needed to achieve significant GHG reductions from the transportation sector going forward.
- Even with the push towards electrification, internal combustion engine (ICE) vehicles are projected to represent a dominant portion of industry sales for the foreseeable future and persist in the parc for decades to come. Significant GHG reductions will not be realized without improvements in ICE technologies and ICE fuels.
- Low-carbon liquid fuels are a CO₂ reducing technology that can complement other technologies like electrification.
- Information on key characteristics for the selected fuel types is critical for comparison and assessment of fuels effects on vehicle technologies.

Objective

- The objective of this project is to build a database of chemical and physical properties of new advanced low carbon liquid fuels from various companies covering range of production technologies.
- This project will be built on the knowledge of the past studies in AVFL19-2 and AVFL19-a projects and will provide uniform comparisons of critical fuel properties for various low-carbon fuels from different production pathways.
- Properties of these new fuels would be compared against conventional fuels (gasoline, diesel) as well as with first-generation biofuels (ethanol, biodiesel).

Scope of Work

- The fuel candidates would cover gasoline and diesel type fuels from companies that are already commercially running a plant or demonstrating a process with a high level of maturity. Candidates from early-stage research processes should be avoided.
- Also, the current scope of the project would avoid fuel candidates like HVO diesel and cellulosic ethanol that are available at relatively high commercial volumes. In addition, testing a limited number of fuel samples may result in an inadequate account of the quality of these fuels in the marketplace.
- Fuel candidates with drop-in capability would be preferred as illustrated by generation 3 and generation 4 type fuels in Figure 1.
- Properties of these new fuels would be compared against conventional fuels (gasoline, diesel) as well as with first-generation biofuels (ethanol, biodiesel).
- Examples of some the processes for consideration are listed below:
 - Residual wood to gasoline or diesel
 - Municipal biowaste to diesel or gasoline
 - Agricultural byproduct to diesel or gasoline
 - Power to diesel or gasoline from Direct Air Capture of carbon dioxide
 - Biogas to DME
 - Diesel or gasoline from non-food sources like Algae
- Select fuels candidates representing a wide range of technologies defined in the scope (at least 5 but preferably up to 10 samples in gasoline range, and at least 5 but preferably up to 10 samples in diesel range).
- CRC will work with the contractor to pursue the samples from low carbon liquid fuel companies as per the criteria decided by the CRC panel. Additionally, CRC members can approach low carbon liquid fuel companies that meets required criteria for sample selection.
- Analysis will be performed on neat fuels irrespective if the fuel is designed to be used as a blend component or as a neat fuel.

- Fuel samples will be kept anonymous, and result will be published on “blinded basis” (i.e., not identify which sample came from which manufacturer).

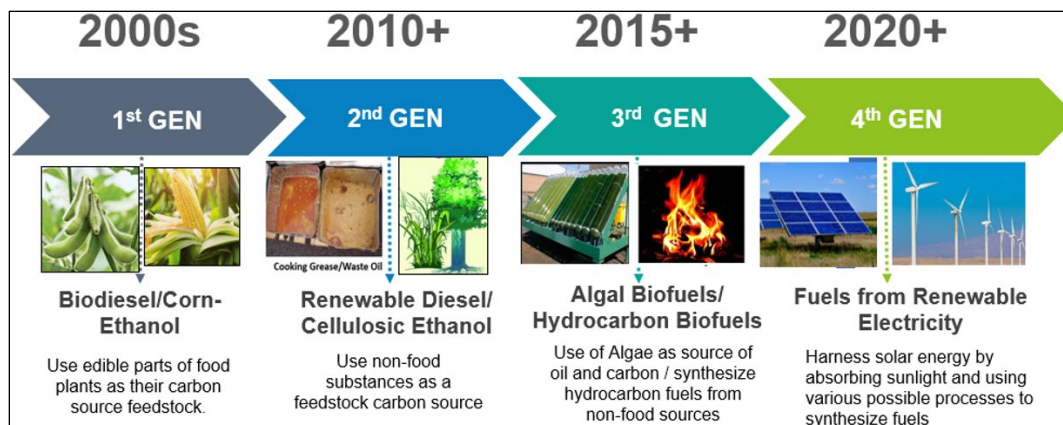


Figure 1. Technology Progression for Low Carbon Liquid Fuels

Fuel Analysis Methods

- Spark Ignition Fuel Candidates

Test Methods for Gasoline Fuel Types				
PROPERTY	ASTM METHOD	UNITS	Test Volume	Cost
			milliliters	\$
Lead Content				
Unleaded	D 3237 or D5059	g/L		
Leaded	D 3341 or D5059	g/L		
Sulfur	D 1266, D2622, D3120, D5453, D7039	ppm		
Unleaded		% by mass		
Leaded		% by mass		
Manganese content	D3831	mg/L		
Copper Strip Corrosion	D130	rating		
Silver strip corrosion	D7667	rating		
Wire corrosion test	Savant Lab Method	rating		
Conductive Deposit Test	Savant Lab Method	value		
Solvent -washed gum content	D381	mg/100 mL		
Oxidation stability	D525	minutes		
RON/MON				
Distillation	D86	°C		
SimDis	D7096	°C		
Reid Vapor Pressure (RVP)	D5191	psi		
VUV-Gasoline	D8071	Vol%		
DHA with PMI Determination	D6730- Appendix 1			
ICP-MS metals	D8110 or Similar	ppm		

2D GC analysis with TOFMS and FID detection systems,	Experimental Method			
H-NMR & C-NMR tests	Experimental Method			
Elemental analysis	D5291	Wt%		
Oxygen by GC-AED	D4815	Wt%		
Aromatics	D5769	Wt%		
Net heat of combustion	D4809 & D3338	Btu		
Biogenic Carbon Content	D6866	Wt%		
Density	D4052	g/l		

Test Methods for Ethanol Fuel Types

PROPERTY	ASTM METHOD	UNITS	Test Volume	Cost
			milliliters	\$
Ethanol	D5501	% by volume		
Methanol	D5501	% by volume		
Solvent -washed gum content	D381	mg/100 mL		
Water	E203, E1064 or D7923	% by volume		
Inorganic Chloride	D7319 or D7328	mg/kg		
Copper Strip Corrosion	D1688	mg/kg		
Acidity (as acetic acid)	D7795	mg/kg		
pHe	D6423	value		
Sulfur	D2622 D3120 D5453 or D7039	mg/kg		
Existent and potential sulfate	D7328	mg/kg		

- **Compression Ignition Fuel Candidates**

Test Methods for Diesel Fuel Types

PROPERTY	ASTM METHOD	UNITS	Test Volume	Cost
			milliliters	\$
Flash Point (closed cup)	D 93	°C		
Water and Sediment	D2709	% volume		
Distillation	D 86	°C		
Kinematic viscosity, 40°C	D445	mm ² / s		
Ash	D482	% mass		
Sulfur	D5453	ppm		
Copper Strip Corrosion	D130	-		
Cetane Number	D613	Value		

Cetane Index	D976	-		
Aromatics	D 1319	Vol. %		
Aromatics	D5186	Wt%		
Cloud Point	D2500	°C		
Carbon Residue (10% Bottoms)	D524	% mass		
Lubricity, HFRR @ 60C	D6079	micron		
IQT Ignition Quality Tests	D6890	Value		
VUV-Diesel	D8368	Vol%		
ICP-MS metals	D8110 or similar	ppm		
2D GC analysis with TOFMS and FID detection systems	Experimental Method			
PIONA Analysis	D5443 or D6839	% by mass		
H-NMR & C-NMR tests				
Elemental analysis	D5291			
Oxygen by GC-AED	D4815	Wt%		
Hydrocarbons by GM-MS	D2425	Wt%		
Net heat of combustion	D4809 & D3338	Btu		
Density	D4052	g/l		
Biogenic Carbon Content	D6866	Wt%		

Deliverables

- Contractor will pursue the fuel samples as per discussion with CRC panel for this project.
- Contractor will perform characterization and assessment of selected low carbon liquid fuel candidates from existing companies (or coordinate characterization of the samples) per the prescribed list of tests as the samples arrive for the project.
- Contractor will be responsible for the project updates throughout the project timing, and a final report at the end of the program (or prepared Executive Summary and journal publication as negotiated and agreed with the CRC Panel).

Schedule

- Project Kick Off and discussion with Panel -**2 Month**
- Sample Collection, Analysis and Reporting- **12 Months**
- Report Writing- **4 Months**

EXHIBIT B

REPORTS

A. CONTRACTOR shall submit a technical progress report covering work accomplished during each month of the contract performance. 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.

B. CONTRACTOR shall submit to CRC a draft final report on or before DRAFT FINAL REPORT DUE DATE. The *Draft Final Report* shall be reviewed and returned to CONTRACTOR with comments no later than forty-five (45) days thereafter. The report shall document, in detail, all of the work performed under the contract including data, analyses, and interpretations, as well as recommendations and conclusions based upon results obtained. The report shall include tables, graphs, diagrams, curves, sketches, photographs, and drawings in sufficient detail to comprehensively explain the results achieved under the contract. The report shall be complete in itself and contain no reference, directly or indirectly, to the monthly progress reports and should be suitable for publication in the peer-review literature. Additional rounds of review may be required prior to acceptance of the Final Report. If applicable, data from the research shall be provided in a format suitable for releasing to the public along with the final report.

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 report structure that includes:

- CRC Title Page and Disclaimer Statement (both provided by CRC)
- 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 (may also include Recommendations if CRC requests them)
- List of References
- 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.

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 shall promptly disclose to CRC any Invention which is made or conceived by CONTRACTOR, 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 by CRC or its Participants. CONTRACTOR 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 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, CONTRACTOR 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 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

RELATIONSHIP OF PARTIES

It is agreed and understood that CONTRACTOR is acting as an independent contractor in the performance of any and all work hereunder, and to the extent caused by CONTRACTOR, CONTRACTOR shall be solely liable and responsible for the payment of all legal claims for damages made by its employees or agents, or by another person or persons, on account of any property damage or on account of personal injury sustained or suffered by, or on account of the death, of any person or persons, or on account of any other legal claims arising or growing out of CONTRACTOR's negligence in the performance of the agreement; and CONTRACTOR undertakes to indemnify CRC against any such liability.

EXHIBIT E

KEY PERSONNEL REQUIREMENTS

Certain skilled experienced professional and/or technical personnel are essential for successful performance by CONTRACTOR of its obligations and work under this Agreement. These personnel are persons whose resumes were submitted for evaluation of the Proposal and are identified by CRC as “Key Personnel”. CRC awards contracts based on several requirements and the reputation and experience of Key Personnel are a significant requirement. CONTRACTOR agrees that CONTRACTOR will not remove or replace any Key Personnel from the contract work without compliance with paragraphs (a) and (b) hereof.

(a) If any Key Personnel for whatever reason becomes, or is expected to become, unavailable for work under this Agreement (or any specific Project) for a continuous period exceeding thirty (30) work days, or is not expected to perform the work hours and volume of work indicated in the proposal or initially anticipated, the CONTRACTOR shall immediately notify CRC and shall, subject to the concurrence of CRC, promptly replace such Key Personnel with personnel of at least substantially equal ability and qualifications acceptable to CRC.

(b) All requests for approval of substitutions of Key Personnel hereunder must be in writing to CRC and provide a detailed explanation of the circumstances necessitating the proposed substitutions. Requests for substitution must contain a complete resume for the proposed substitute Key Personnel, and any other information requested by CRC needed to approve or disapprove the proposed substitution. CRC will evaluate such requests and notify CONTRACTOR of approval or disapproval thereof in writing. CRC is not responsible for, and shall not be charged, any fees or other costs related to such replacement Key Personnel’s performance of the services until the replacement Key Consultant has obtained the same proficiency and knowledge regarding the services as the former Key Personnel.

(c) If CRC determines that suitable and timely replacement of Key Personnel who have been reassigned, terminated or have otherwise become unavailable for the contract work is not reasonably forthcoming or that the proposed replacement Key Personnel would impair the successful completion of the contract or the services ordered, at the option of CRC, (i) the Agreement (in whole or in part related to the applicable contract work) may be terminated by CRC or (ii) the contract price or fixed fee may be equitably adjusted downward to compensate CRC for any resultant delay, loss, or damage, in an amount acceptable to CRC

EXHIBIT F

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.