



COORDINATING RESEARCH COUNCIL, INC.

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June 15, 2012

In reply, refer to:
CRC Project No. PC-2-12

Dear Prospective Bidder:

The Coordinating Research Council (CRC) invites you to submit a written proposal to provide services for "Natural Gas Fuel Survey" (CRC Project No. PC-2-12). A description of the project is presented in Exhibit A, "Statement of Work."

Please indicate by letter, fax, or email by **June 29, 2012** 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. Chris Tennant
Coordinating Research Council
3650 Mansell Road, Suite 140
Alpharetta, GA 30022

Phone: 678-795-0506
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The deadline for receipt of your proposal is **July 16, 2012**.

Yours truly,

Chris Tennant
Deputy Director

EXHIBIT A

Statement of Work

Project PC-2-12

Natural Gas Fuel Survey

Background

In recent years, natural gas has gained prominence as an energy source in the US market. Domestic resource estimates have increased dramatically, as production technology advancements have made “new” resources available. A minimum 100-year supply is available at the current rate of consumption, and some estimates are much higher. Natural gas prices have decreased accordingly, and are expected to remain stable into the foreseeable future. Assuming future exports of LNG to be relatively minor, the US will continue to enjoy natural gas prices that are a fraction of that in many other countries. In addition to the benefits of low price and energy security, natural gas is generally considered the fuel of choice regarding climate change issues, especially when compared to liquid fuels and coal.

For all of these reasons, the use of natural gas in the power generation sector has been increasing. Use in the transportation sector has historically been minimal, but that sector is also expected to experience growth. This is true not only for commercial trucks (as LNG) and buses, but also for light- and medium-duty vehicles. Many automakers have announced plans to introduce new NGV models beginning this year. Although lack of refueling infrastructure remains a challenge, NGVs are attractive from a consumer’s perspective because:

- Fuel price can be one-quarter that of gasoline, on an energy-equivalent basis.¹
- NGVs have access to HOV (carpool) lanes in many cities.
- Option for refueling at home.

However, the quality of natural gas at the point of refueling is not well understood. (Note that refueling can occur at a CNG station, or through the use of a home refueling appliance.) No recent survey data exist. This is especially a point of concern given that the composition of natural gas has changed with the rapid increase in “shale gas” production. There are no federal standards. Natural gas quality is controlled through specifications included in pipeline tariffs, which are designed to protect the pipeline and ensure interchangeability. Honda has found pipeline gas in Ohio with water concentrations up to 20x the typical tariff limit of 7 lbs/MMscf. Water is especially problematic for NGVs; examples include hardware corrosion, valve plugging by methane hydrates, and simple volumetric displacement. High water concentrations can also inundate drying hardware in home refueling appliances.

Objectives

The objective of this program is to gain an understanding of natural gas quality in the following locations along the distribution line:

- Large-scale transmission pipelines
- LDC pipelines (Local Distribution Company)
- Vehicle refueling nozzle at station

Resulting data will be used to (1) form a basis for the development of a NGV fuel specification through a consensus organization such as ASTM, and (2) inform NGV developers regarding the range of natural gas fuel properties that can be expected in the US market. The working assumption is that gas quality is generally acceptable during transmission, but contamination can occur in the LDC pipelines. The latter contamination may or may not be possible to mitigate at NGV refueling stations.

¹ A more typical value is one-third to one-half the price of gasoline. The current domestic oversupply of natural gas coupled with relatively high crude oil prices has created a larger differential.

Scope of Work

Overview

The project is to be completed in two sequential phases:

1. **Search for existing data.** (< 1 month) Such data might provide important temporal information, i.e., the variation of gas quality with time. These data could also help define the analytes for the sampling & analysis phase. Existing data are known to be available from some large transmission pipelines and LDCs.
2. **Sampling & analysis.** This is the main part of the project, in which samples are acquired from the field for subsequent (or on-site) analysis. Samples from large transmission pipelines are not necessary, assuming sufficient data are collected in Phase 1. The preferred location for sampling LDC pipelines is the input pipeline into the NGV refueling stations. (Note: Existing LDC data collected in Phase 1 will likely be far upstream of this sampling location.)

Specific Tasks

1. **Search for existing data** (Phase 1 of project.) An assessment and collection of existing fuel quality data shall be performed. Source examples include pipeline company and LDC websites, and consortia such as GTI, ANGA, etc. A compilation of data sources shall be provided as a deliverable.
2. **Preparation of equipment for sampling and analysis.** Appropriate hardware for sampling and analysis of natural gas shall be acquired. Auto OEMs can assist with the hardware required to interface to a refueling nozzle. A list of target analytes is included as Attachment 1, but this list is subject to modification based on the findings of Task 1.
3. **Arrangements with CNG stations.** NGV refueling stations targeted for sampling shall be contacted to obtain access and, if needed, assistance. The CRC can assist with this task, and will be responsible for compensating station owners if necessary. A list of target station locations is provided in Attachment 2.
4. **Site visits and on-site analyses.** At each station, natural gas samples shall be acquired in two locations: (1) the input pipeline into the station, and (2) the vehicle refueling nozzle. Samples acquired at the inlet would require only a subset of the full analysis list; see Attachment 1. Note that for some analytes, it would be preferable to perform the analysis on-site. An example of this would be the analysis for water; it is very difficult to measure water content of the gas accurately after a pressurized sample has been captured in a canister and transported to a lab.
5. **Off-site sample analysis.** For analyses that cannot be completed in the field, a sample of the gas shall be captured in an appropriate container and transported to a laboratory. The cost of all analyses should be included in the submitted quote.

Project Schedule

Bidders shall provide a schedule for the work as part of their technical proposal. Note that “timeliness of study completion” is one of the proposal evaluation criteria (Exhibit E).

Deliverables

Deliverables are defined in the Specific Tasks (above) and in “Reports” (Exhibit B).

Attachment 1 – Analyte List

Analyte or Property	ASTM Method ¹	Sampling Location	
		Inlet ²	nozzle
Moisture content	D5454-11e1 On-site measurement preferred	✓	✓
Speciation <ul style="list-style-type: none"> ○ Light HCs through C6 ○ Heavy HCs >C6; e.g., compressor oil ○ N₂, Ar, H₂, He, CO₂, CO, and O₂ 	D1945-03(2010)	✓	✓
Sulfur <ul style="list-style-type: none"> ○ Total ○ Speciated, incl. H₂S 	D6667-10 or D7551-10 D5504-08		✓
Heating value (lower and higher) and relative density	D3588-98(2011)		✓
Methane Number	calculated		✓
Wobbe Index	calculated		✓

1. Alternate methods can be used with the prior approval of the CRC.
2. Sampling the station inlet gas may not be possible in some cases.

Attachment 2 – Station List (Subject to change; for quote purposes only)

- California
 - San Francisco
 - Los Angeles
 - San Diego

- Ohio
 - Columbus

- New York
 - New York

- Texas
 - Dallas

- Colorado
 - Denver

- Utah
 - Salt Lake City

- Oklahoma
 - Oklahoma City

- Arizona
 - Phoenix

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 pdf-compatible 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).

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 an electronic copy in a pdf or pdf-convertible 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.