



COORDINATING RESEARCH COUNCIL, INC.

3650 MANSELL ROAD, SUITE 140
ALPHARETTA, GA 30022
TEL: 678/795-0506 FAX: 678/795-0509
WWW.CRCAO.ORG

October 16, 2009

In reply, refer to:

CRC Project Number A-73-1

Subject: CRC Request for Proposal No. A-73-1, "Protocol for Analyzing Data and Developing Inputs to the CONCEPT Emissions Model for Representing Ethanol Blends."

Dear Prospective Bidder:

The Coordinating Research Council (CRC) invites you to submit a written proposal on the subject topic. A description of the project (CRC Project No. A-73-1) is given in Exhibit A

Please indicate via letter, fax, or email by **October 22, 2009** whether or not you intend to submit a written proposal for the project. CRC will answer technical questions regarding the Request for Proposal if they are submitted in writing. CRC will then return written answers to you, along with a copy of the original questions.

A CRC technical group composed of representatives from industry, and government will evaluate your proposal. CRC reserves the right to accept or reject your proposal.

The reporting requirements will be monthly progress reports and a summary technical report at the end of the contractual period along with associated detailed protocol descriptions. The reporting requirements are described in more detail in the attachment entitled, "Reports" (Exhibit B).

The "Intellectual Property Rights Clauses" (Exhibit C and Exhibit D) and "Liability Clause" (Exhibit E) will be a part of the agreement anticipated as a result of this Request for Proposal solicitation.

All computer code developed in this project, if any, shall be free of copyright restrictions and licensing requirements. The contractor will assure CRC that it will comply with any copyright restrictions and licensing requirements for any software used in this program.

The proposal must be submitted as two separate documents. The technical approach to the problem will be described in part one (10 pages or less including the background and technical approach). 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.

CRC expects to negotiate a fixed price or a cost reimbursement contract. Note that there will be a performance requirement clause in the contract. Important selection factors to be taken into account 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.

Thirty (30) copies of the technical proposal (or one electronic copy) and three (3) copies of the cost proposal (or one electronic copy) should be submitted to:

Ms. Pam Kennedy
Coordinating Research Council
3650 Mansell Road, Suite 140
Alpharetta, GA 30022

Phone: 678-795-0506, ext. 103

Fax: 678-795-0509

E-mail: pkennedy@crcao.org

The deadline for receipt of your proposal is **November 15, 2009**.

Sincerely,

Brent K. Bailey
Executive Director

EXHIBIT A

Statement of Work

Protocol for Analyzing Data and Developing Inputs to the CONCEPT Emissions Model for Representing Ethanol Blends

Coordinating Research Council Atmospheric Impacts Committee

Request for Proposal

Project A-73-1

Objectives:

1. Identify, review, and summarize the vehicle emissions data that are now available on ethanol blends and the testing programs that will produce new data before October 2010.
2. Identify and describe gaps in the data required to employ the Consolidated Community Emissions Processing Tool (CONCEPT) for estimating effects of ethanol blends on emissions and recommend how to fill the gaps with assumptions or calculations.
3. Develop detailed protocols for how to use the data (available by October 2010) and necessary assumptions or calculations in applying CONCEPT to estimate effects of ethanol blends on emissions.

Background:

Ethanol production in the U.S. will be increasing as a result of the Energy Independence and Security Act of 2007, which has led to significant interest in ethanol blends ranging from E10 to E85. The Coordinating Research Council (CRC) and the U.S. Environmental Protection Agency (EPA) have initiated and, in some cases, recently completed testing programs to determine the impact of ethanol blends on various categories of vehicle emissions, e.g. cold-start exhaust and hot-soak evaporative emissions.

Beyond determining the effects of ethanol blends on the mass or composition of vehicle emissions, it is also of interest to determine the effects on air quality, namely ozone and particulate matter (PM) concentrations. This requires developing a detailed inventory of vehicle emissions for the base gasoline and another inventory for the ethanol blend. Wherever possible, test data should be used to determine the emission changes from the base gasoline to the ethanol blend. Depending on the test program, the emission changes may represent a fuel effect (switching from a base gasoline to an ethanol blend within the same fleet of vehicles) or a fuel/fleet effect (switching from a base gasoline in a fleet of gasoline vehicles to an ethanol blend in a fleet of flexible-fuel vehicles).

Significant resources are being devoted to the recent and ongoing emission testing programs. Nevertheless, not all categories of vehicle emissions that may be affected by ethanol blends are being studied with the same level of effort, and some categories may not be studied at all. Air quality modeling will thus require identifying the best assumptions for effects of ethanol blends on categories of emissions for which test data are unavailable or insufficient.

This project will review all the recent and ongoing testing programs on ethanol blends that may provide data useful for air quality modeling, propose how to use the data to estimate fuel effects

and fuel/fleet effects for the various categories of vehicle-related emissions needed in air quality modeling, and propose assumptions to use when data are unavailable or incomplete. The protocols will be used in a subsequent CRC project to model the impact of ethanol blends on air quality.

Approach:

The contractor will first review what data are already available from the CRC Emissions Committee testing programs and what data will likely be available by October, 2010. The two CRC projects of greatest relevance to air quality modeling of ethanol blends are:

- E-80, Exhaust and Evaporative Emissions Testing of Flex-Fueled Vehicles
- E-89, Energy Policy Act (EPA) Light-duty Vehicle Fuel Effects. (EPA and the National Renewable Energy Laboratory [NREL] are sponsoring extensive testing of ethanol fuel effects in connection with project E-89.)

Other CRC projects that may be relevant are:

- E-65-3, Fuel Permeation from Automotive Systems
- E-67, Effects of Ethanol and Volatility Parameters on Exhaust Emissions
- E-74b, Fuel Vapor Pressure Impacts on CO Emissions
- E-77, In-Use Evaporative Emissions (and various phases including E-77-2, E-77-2c, etc.)
- E-84, Review of Prior Studies of Fuel Effects on Emissions
- E-87-1, Exhaust Emissions Catalyst Durability Screening Test
- E-87-2, Exhaust Emissions Catalyst Durability
- E-91, Evaporative Emissions Systems durability

The contractor can propose additional studies by CRC, EPA, California Air Resources Board or NREL to include in the review. The review should summarize the mass and VOC speciation data that are or will be available for the different emission categories, the fuels tested, the vehicles tested, and any other information relevant to using the data for air quality modeling.

Based on the review, the contractor will prepare detailed protocols for how the data can be used to model the air quality impact (ozone and PM) of ethanol blends. The protocols will cover effects of ethanol blends on refueling, fuel transportation and marketing emissions and on all categories of vehicle emissions that might be identified as important in air quality modeling.

CRC has funded separate work to extend the Consolidated Community Emissions Processing Tool (CONCEPT) developed by the Lake Michigan Air Directors Consortium to include effects of fuel changes (Project No. A-67). The protocol will describe, specifically, how to determine those inputs to CONCEPT that define a fuel change. Where experimental data are insufficient or unavailable, the contractor will recommend the best assumptions or calculations to use in preparing the CONCEPT inputs. The protocol should encompass both changes in the mass and in the composition of emissions due to use of ethanol blends.

The main interest is in ethanol blends from E10 to E85. There are different amounts of experimental data available for different blends. Therefore, it will be necessary to develop somewhat different protocols for modeling different fuels. It also will likely be necessary to

develop different protocols for modeling fuel effects and fuel/fleet effects. The final determination of what air quality simulations will be done will be made later by CRC, depending in part on the amount of experimental data available and the number of assumptions necessary to model individual fuels.

Examples of protocols for use of test data are available in the modeling bulletins of the Auto/Oil Air Quality Improvement Research Program (AQIRP). Attachment A gives the protocol from AQIRP Technical Bulletin No. 20, Air Quality Modeling Results for Methanol Fuels and Reformulated Gasoline in 1993 Production Flexible/Variable Fuel and Gasoline Vehicles. Note that this is only an example because CONCEPT may require different input information.

Finally, for testing programs that are not yet complete, the contractor should propose any additional measurements that would be very useful in developing vehicle emission inventories for the fuels and in minimizing assumptions in the protocols. It may still be possible to gather additional data in some testing programs.

Deliverables: Brief monthly progress reports will be submitted. A final report will be submitted containing an Executive Summary and describing all work. The final report will also include the protocol for each potential fuel effect and/or fuel/fleet effect that could be modeled based on the experimental data available and reasonable assumptions and calculations. While it is not anticipated that computer programs will be developed in this project any such programs should be made available to the Coordinating Research Council without restrictions.

Attachment A

APPENDIX IV. Data and Assumptions for Determining Mass Emission Ratios (MERs) and Speciation of Total Organic Gases (TOG) for Simulations of M85 Fuels and Gasolines Compared to M85 Fuels.^(a)

Emission Category	MERs			
	TOG	CO	NO _x	Speciation TOG
Cold Start Lower ^(b) Higher ^(c)	Data A A	Data A A	Data A A	Data A A
Hot Stabilized Lower ^(b) Higher ^(c)	Data B B	Data B B	Data B B	Data B B
Hot Start Lower ^(b) Higher ^(c)	Data C C	Data C C	Data C C	Data C C
Enrichment Lower ^(d)	Data D	Data D	Data D	Data D
Diurnal Passing, current standard Failing, current standard Passing, future standard Failing, future standard	$F_{TOG} \times F_{RVP}$ F_{RVP} $F_{TOG} \times F_{RVP}$ F_{RVP}	- - - -	- - - -	Vapor @ 88 Vapor @ 88 Vapor @ 88 Vapor @ 88
Hot Soak Passing, current standard Failing, current standard Passing, future standard Failing, future standard	Data E F_{RVP} $F_{TOG} \times F_{RVP}$ F_{RVP}	- - - -	- - - -	Data E Vapor @ 120 Vapor @ 120 Vapor @ 120
Running Losses Passing, current standard Failing, current standard Passing, future standard Failing, future standard	$F_{TOG} \times F_{RVP}$ F_{RVP} $F_{TOG} \times F_{RVP}$ F_{RVP}	- - - -	- - - -	Vapor @ 120 Vapor @ 120 Vapor @ 120 Vapor @ 120
Resting Losses Passing, current standard Failing, current standard Passing, future standard Failing, future standard	$F_{TOG} \times F_{RVP}$ F_{RVP} $F_{TOG} \times F_{RVP}$ F_{RVP}	- - - -	- - - -	Liquid Fuel Liquid Fuel Liquid Fuel Liquid Fuel
Refueling/Fuel Distribution Refueling Spillage Refueling Vapor Fuel Distribution	F_{FE} $F_{VD} \times F_{FE} \times F_{RVP}$ $F_{VD} \times F_{FE} \times F_{RVP}$	- - -	- - --	Liquid Fuel Vapor @ 88 Vapor @ 88
Refinery Operations ^(e)	F_{REF}	F_{REF}	F_{REF}	EPA or CARB profile

Key to Table

Lower	For Mobile5a, these are normal and high emitters for TOG/CO and low emitters for NO _x . For EMFAC7F, these are normal, moderate, and high emitters for TOG and CO and normal and moderate emitters for NO _x .
Higher	For Mobile5a, these are very high and super emitters for TOG/CO and high emitters for NO _x . For EMFAC7F, these are very high and super emitters for TOG and CO and high, very high and super emitters for NO _x .
Data X	AQIRP test data are available for this emission category X, e.g., cold start emissions from lower emitters.
X	AQIRP test data are not available for this emission category. Assumed MER or TOG speciation is the same as for emission category X.
Passing	For Mobile5a, these are vehicles that pass the pressure/purge test of the evaporative system. For EMFAC7F, these are vehicles with conforming evaporative systems.
Failing	For Mobile5a, these are vehicles that fail the pressure/purge test. For EMFAC7F, these are vehicles with malperforming evaporative systems.
Current Standard	Vehicles certified to the current one-hour test for evaporative emissions.
Future Standard	Vehicles certified to the new multiday, real time test for evaporative emissions.
F _{TOG}	Factor to adjust for the difference in certification procedures between FFV/VFVs and gasoline vehicles. FFV/VFV emissions are calculated as OMHCE (organic material hydrocarbon equivalent) for certification whereas gasoline vehicle emissions (and Mobile5a/EMFAC7F predictions) are calculated as hydrocarbons. The factor is the grams of TOG per gram of OMHCE determined from the speciation profile for this emission category. With this adjustment, the OMHCE emissions for M85 are equal to the TOG emissions for a test gasoline of the same RVP.
F _{RVP}	Factor to adjust for a RVP difference between the base fuel and test fuel greater than 0.2 psi. The factor is the emissions predicted by Mobile5a/EMFAC7F for the RVP of the test fuel divided by the emissions predicted for the RVP of the base fuel. The factor is calculated separately for each category of emissions.
F _{VD}	Factor to adjust for the difference in vapor density between gasoline and M85. The factor is the vapor density for M85 divided by the vapor density of a gasoline of the same RVP, as predicted by a headspace vapor model (ref. 28).
Vapor @ N	Prediction of headspace vapor model (ref. 28) for a temperature of N deg. F
F _{FE}	Factor to adjust for the difference in fuel economy between gasoline and M85. The factor is the measured volumetric fuel economy (in miles per gallon) for the base gasoline divided by the fuel economy for M85.
F _{REF}	Factor to adjust for reduced refinery output in alternative-fuel scenarios. For M85, $F_{REF} = 1. - F_{GSLE} \times F_{LDV} \times (1. - 0.15F_{FE})$, where F_{GSLE} is the fraction of refinery output that is gasoline and F_{LDV} is the fraction of gasoline that is used in light duty vehicles. Based on national averages for 1988-1990, F_{GSLE} and F_{LDV} are 0.46 and 0.92, respectively. For gasoline scenarios, $F_{REF} = 1.0$.

Footnotes to Table

- (a) The mass emissions for a test fuel are equal to the MER for that test fuel times the MOBILE5a or EMFAC7F prediction for the base fuel. The base fuel is industry-average gasoline in New York and Chicago/Milwaukee and a gasoline blended to meet California Phase 2 specifications in Los Angeles. MERs and TOG speciation were the same for cars and light-duty trucks.

For the fuel effect, the MER is calculated as the ratio of emissions for the FFV/VFVs operating on the test fuel to emissions for the FFV/VFVs on the base fuel. For the fuel/fleet effect, the MER is calculated as the ratio of emissions for the FFV/VFVs operating on the test fuel to emissions for gasoline vehicles on the base fuel.

- (b) Based on recommendations by EPA and CARB, national (49-state) LEVs and California LEVs subject to enhanced inspection/maintenance programs are assumed to be lower emitters throughout their lifetime. For all other vehicles, the fraction of lower and higher emitters is determined from Mobile5a or EMFAC7F projections.
- (c) TOG emissions for higher emitters include only emissions from TOG high emitters (i.e., not from CO or NO_x higher emitters). Similarly, CO and NO_x emissions from higher emitters are only for CO higher emitters and NO_x higher emitters, respectively. However, in MOBILE5a, the definitions of TOG and CO higher emitters are combined so that the TOG and CO higher emitters are the same vehicles.
- (d) Enrichment emissions were added only for lower emitters. MERs for enrichment emissions were derived only from tests on the FFV/VFVs (because the gasoline vehicles tested for enrichment emissions were not matched to the FFV/VFVs). I.e., MERs for enrichment emissions were based on the fuel effect for all simulations. The MERs were calculated from the total mass of emissions during enrichment events on the REPO5 cycle (emission rate during enrichment multiplied by seconds in enrichment).
- (e) Refinery operations are those activities related to manufacturing crude oil into gasoline, diesel fuel, and other finished products. The MER for alternative-fuel scenarios is based on the assumption that emissions from refinery operations will be reduced in direct proportion to the reduction in use of finished products. However, this is an approximation because petroleum products may be shipped into or out of a given modeling domain. Also, all current refineries are designed to produce a range of finished products, and it is unclear what emissions would be from refineries that could produce much less gasoline per barrel of crude oil than current refineries.

Emissions from oil production were not adjusted. Oil production is the removal of crude oil from underground reservoirs, e.g., offshore drill platforms, and is likely to continue regardless of whether or not alternative fuels are used in light-duty vehicles, due to the value of the oil for other uses and for regions outside the modeling domains.

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. The Work Scope Document may serve as one of the progress reports. Thirty-five (35) hardcopies or one 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, PROTOCOL DESCRIPTIONS

The contractor shall submit to or distribute for CRC thirty-five (35) hardcopies (or one hardcopy and one electronic word and 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, 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 program and results achieved under the contract. The report shall be complete in itself and contain no reference, directly or indirectly, to the periodic progress report(s).

The CRC Steering Committee shall furnish comments regarding the report to the contractor within one (1) month after receipt of the draft copy.

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 twenty (20) hardcopies including a reproducible master copy of the final report. The final report shall also be submitted as an electronic copy in Microsoft Word file format. The electronic copy will be made available for posting on the CRC website.

EXHIBIT C

INTELLECTUAL PROPERTY RIGHTS

A. Protected Works

The term “Protected Works” as used in this agreement includes any and all works of authorship, inventions, discoveries, processes, machines, manufactures, compositions of matter, formulas, techniques, computer programs, systems, mask works, trade secrets, proprietary information, schematics, flow charts, databases, customer lists, marketing plans, product plans, business strategies, financial information, forecasts, trademarks, service marks, brand names, trade names, compilations, documents, data, notes, designs, drawings, ideas, concepts, technical data and/or training materials, and improvements to or derivatives from any of the above, whether or not patentable, or subject to copyright or trademark or trade secret protection, delivered by _____ to CRC under this Agreement or conceived, developed or produced by _____, whether alone or jointly with others, in connection with or pursuant to _____’s performance under this Agreement.

B. Assignment and Ownership of Protected Works

_____ agrees that except as provided in Section C below:

(1) All copyrightable Protected Works which are created by _____ pursuant to this Agreement shall be deemed “Works Made for Hire,” as that phrase is defined in Section 101 of the United States Copyright Act, 17 U.S.C. 101, and used in 17 U.S.C. 201, on behalf of CRC and that CRC shall own right, title, and interest, including the worldwide copyright, in and to such materials; and

(2) _____ hereby assigns and agrees to assign to CRC all of its respective rights, title, and interest in Protected Works, including all rights of inventorship and authorship, all patents and patent applications, all copyrights, all trademark and service mark rights, all rights in trade secret and proprietary information, all rights of attribution and integrity and other moral rights, and all other intellectual property rights of any type (collectively referred to herein as “Intellectual Property Rights”); and

(3) _____ and _____’s successors in interest will, at CRC’s request and without further consideration, communicate to CRC any facts known to them respecting the Protected Works, and testify in any legal proceedings, sign all lawful papers, make all rightful oaths, execute all divisional, continuing, continuation-in-part, or reissue applications, all assignments, all registration applications and all other instruments or papers to carry into full force and effect, the assignment, transfer and conveyance hereby made or intended to be made and generally do everything possible for title to Intellectual Property Rights in the Protected Works to be clearly and exclusively held by CRC, including the execution from time to time as requested by CRC, Confirmatory Assignment, Agreements in the form attached as Exhibit D; and

(4) _____ agrees that it will not apply for any state, federal, or other U.S. or foreign jurisdiction's registration of rights in any of the Protected Works, and that it will not oppose or object in any way to applications for registration of same by CRC or others designated by CRC; and

(5) _____ agrees to provide CRC a copy of the source code and all annotations thereto for all deliverables under this Agreement.

(6) The deliverables provided to CRC by _____ under this Agreement shall not include any Protected Works which infringe the Intellectual Property Rights of any third party or for which _____ does not have the ownership and authority necessary to make the conveyances of rights described in this Section B. _____ will obtain the express written consent of CRC prior to incorporating into the deliverables any works owned by parties other than _____.

C. Portions of Protected Work

With respect to portions of the Protected Works which were originally developed by _____ prior to and unrelated to the course of performance under this Agreement (Pre-Existing Protected Works), _____ will continue to own these Pre-Existing Protected Works. However, _____ hereby grants to CRC a fully paid, perpetual, irrevocable, worldwide, non-exclusive license to prepare derivative works from such Pre-Existing Protected Works (using either CRC's own employees, independent contractors, or sponsoring participants), and to reproduce Pre-Existing Protected Works and derivative works therefrom, and to make, use, distribute, perform, and display such Pre-Existing Protected Works and derivative works therefrom and reproductions thereof, both in connection with the Protected Works and otherwise, and to sublicense the rights granted to CRC in this paragraph.

EXHIBIT D

CONFIRMATORY ASSIGNMENT

For good and valuable consideration, receipt of which is hereby acknowledged, _____ (_____) has assigned and does hereby assign and transfer to CRC, _____'s entire right, title, and interest in and to any and all Intellectual Property Rights in Protected Works, as defined below, including but not limited to the Protected Works specifically identified below and the Protected Works delivered to CRC by _____ or conceived, developed, or produced by the _____, whether alone or jointly with others, in connection with the Projects identified below:

Specific Protected Works: _____

Specific Projects:

Additional Terms and Definitions:

1. The term Protected Works as used in this agreement includes any and all works of authorship, inventions, discoveries, processes, machines, manufactures, compositions of matter, formulas, techniques, computer programs, systems, software, source code, object code, hardware systems, mask words, trade secrets, proprietary information, schematics, flow charts, databases, customer lists, marketing plans, product plans, business strategies, financial information, forecasts, trademarks, service marks, brand names, trade names, compilations, documents, data, notes, designs, drawings, ideas, concepts, technical data and/or training materials, and improvements to or derivatives from any of the above, whether or not patentable, or subject to copyright or trademark or trade secret protection.
2. The term Intellectual Property Rights as used in this agreement includes all of _____'s rights, title, and interest in Protected Works, including all rights of inventorship and authorship, patents and patent applications, all copyrights, all trademark and service mark rights, all rights in trade secret and proprietary information, all rights of attribution and integrity and other moral rights, and all other intellectual property rights of any type.
3. _____ further agrees at CRC's request and without further consideration, _____ and _____ successors will communicate to CRC any facts known to them respecting said Protected Works, and testify in any legal proceedings, sign all lawful papers, make all rightful oaths, execute all divisional, continuing, continuation-in-part, or reissue applications, all assignments, all registration applications and all other instruments or papers to carry into full force and effect, the assignment transfer and conveyance

hereby made or intended to be made and generally do everything possible for title to Intellectual Property Rights in the Protected Works to be clearly and exclusively held by CRC.

4. _____ agrees that it will not apply for any state, federal, or other U.S. or foreign jurisdiction's registration of rights in and of the Protected Works, and that it will not oppose or object in any way to applications for registration of same by CRC or others designated by CRC.

5. _____ agrees to provide to CRC a copy of the source code and all annotations thereto for all Protected Works assigned under this Agreement.

Signed and sealed this ____ day of _____, _____.

Signed on behalf of CONSULTANT:

By: _____

Printed Name: _____

Title: _____

STATE OF _____

COUNTY OF _____

On this ____ day of _____, _____, before me personally appeared _____ personally known to me proved to me on the basis of satisfactory evidence to be the person whose name is subscribed to the within instrument, and acknowledged to me that he executed the same of his own free will for the purposes therein set forth.

Notary Public
[SEAL]

EXHIBIT E

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 of Contractor in connection therewith.

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.