

Request for Grant Applications (RFGA-18)

by

The Texas Environmental Research Consortium (TERC)
and the Houston Advanced Research Center (HARC)

Development, Verification and Testing of Innovative Technologies to Reduce NOx Emissions from Diesel Powered Equipment and Vehicles

Date April 6, 2009

Applications are being requested for projects to develop, verify and test innovative emission reduction technologies, particularly focused on oxides of nitrogen emissions (NOx), as part of the State of Texas' New Technology Research and Development (NTRD) program. This request is contingent on availability of sufficient grant funding. This request is to solicit applications for funding to address the following areas:

1. Development, verification and testing of novel and cost effective after treatment technologies, which specifically target:
 - o Innovative catalyst formulation
 - o Catalyst thermal management technologies
 - o Innovative after treatment control strategies
2. Verification testing of conventional urea based SCR systems for existing engines.
3. Development, verification and testing of novel and cost effective clean diesel technologies, which specifically target:
 - o Clean combustion system
 - o EGR system and other engine add-on systems
4. Development, verification and testing of novel and cost effective vehicle or drive-train technologies that can directly or indirectly reduce NOx emissions through engine duty cycle modification.

Any proposed projects should include EPA verification in the scope of work.

Projects proposed in response to this RFGA should target one or more of the following diesel engine categories: On-road heavy duty, off-road heavy duty, construction, marine, locomotive, and airport or marine port service equipment. Projects proposed in response to this RFGA should include a target (minimum 25%) NOx reductions compared to the certified emissions levels of the target engine or application.

For the purposes of this RFGA, the following funding conditions apply:

This request for grant applications is part of the State of Texas' New Technology Research and Development (NTRD) program that provides funds for projects related to reductions of oxides of nitrogen (NOx). Projects funded by this program should advance technologies that can be offered for sale in the state of Texas in less than five years after grant award.

Furthermore, projects proposed in response to this RFGA should result in minimum NO_x reductions of 25% compared to the certified emissions levels of the target engine or application. The proposal should clearly describe the basis of the applicant's estimate for the nitric oxide reduction, for example, preliminary tests or analytical estimates.

Additionally, products resulting from the proposed projects must be commercially available in the State of Texas as soon as practicable, but no later than five years after the date of the application for funding.

It is anticipated that a maximum of \$5,000,000 will be available for projects ranging from \$100,000 to \$750,000. A cost share equal to a minimum of 20% of the total project costs is required.

The complete RFGA and application forms may be viewed and downloaded at <http://www.tercairquality.org/NTRD/RFGAs/RFGA-18>. This RFGA describes the information required from the responding organizations to be considered for selection.

Completed responses to this RFGA are due May 4, 2009. Eligible applicants must provide information that demonstrates the organization's expertise and experience that is applicable to the project.

NTRD grants provide incentives to expedite the commercialization of new and innovative emission reduction technologies that will improve the air quality of Texas. NTRD funded projects will facilitate commercialization of technologies that could receive funding under the Texas Emissions Reduction Plan (TERP) incentive grants program. The TCEQ's Emissions Reduction Incentive Grants (ERIG) Program provides grants to eligible projects in non-attainment areas and affected counties. The grants offset the incremental costs associated with reducing emissions of oxides of nitrogen (NO_x) from high-emitting internal combustion engines. Further information about the ERIG Program can be found at: <http://www.tceq.state.tx.us/implementation/air/terp/erig.html>. We strongly encourage applicants to review the provisions of the Texas Uniform Grant Management Standards (UGMS), which govern the use of the state funds awarded under NTRD. Verification of the technologies is coordinated with the EPA's or California's Environmental Technology Verification Programs.

Grant Applications must have milestone review points and performance metrics that include NO_x emission reduction potential associated with the use of the technology being developed.

ABOUT HARC

The Houston Advanced Research Center (HARC) is a 501(c)(3) non-profit organization located in The Woodlands, Texas, dedicated to improving human and environmental well-being through the application of sustainable science and principles of sustainable development. HARC serves as the Research Management Organization (RMO) of the Texas Environmental Research Consortium (TERC), a private, non-profit organized in Houston to advance leading edge air quality science so that policymakers and regulatory agencies can make sound decisions when writing and implementing air quality legislation. Funding for this research is provided from the State of Texas through the TCEQ. Regulations governing these funds will be included in any grant agreement for research under this initiative.

TERC is developing a process that ensures that science and research play a significant role in the development of new technologies to reduce oxides of nitrogen (NO_x) emissions from diesel engines. The primary goals of the Consortium are:

- Support and facilitate the development of sound air quality policies in the State of Texas and within the Houston-Galveston-Brazoria and Dallas-Ft. Worth non-attainment regions.
- Assist in the development, verification and certification of technologies which can be used to reduce NOx emissions from diesel engines.

As the RMO, HARC has developed a strategic research plan, in collaboration with TCEQ, EPA, and the TERC Environmental Technology Advisory Committee (ETAC) and is managing the process for soliciting, receiving, selecting, contracting, and monitoring research projects established through this program.

The ETAC is composed of distinguished scientists from universities, government and research organizations across the country. This Committee will review the Grant Applications submitted based on this RFGA, review strategic plans and provide direction for generating future RFGA's.

ABOUT NTRD

This grant program is to implement the New Technology Research and Development (NTRD) Program, Chapter 387 of the Health and Safety Code, established in 2001 by the 77th Texas Legislature. The purpose of this legislation is to improve air quality in Texas.

The goal of NTRD is to adequately fund research and development that will make the state a leader in new technologies that can solve the state's environmental challenges while creating new opportunities for business and industry in the state.

ABOUT THE AWARD

It is anticipated that a maximum of \$5,000,000 will be available for projects ranging from \$100,000 to \$750,000 under this RFGA. Applicants are required to provide cost sharing equal to a minimum of 20% of the total project costs. The anticipated award date is TBA. Grant Applications must include milestone review points and performance metrics, and key deliverables will be required as specified in the Application Form.

GENERAL INFORMATION

Eligibility

Accredited academic institutions, not-for-profit research organizations, national laboratories and for-profit firms are eligible to compete under this RFGA. Non-compete provisions at national laboratories have not been waived in this program.

Additional Requirements

The following requirements apply to the selection, award, and subsequent grant contracts in addition to all other requirements described in this RFGA. TERC may make selection for funding contingent upon agreement by the applicant with additional conditions or changes to the project pertaining to equipment, logistical considerations, expenses and/or other program elements. TERC may select parts of a proposal for funding and may offer to fund smaller amounts of money than requested in a proposal. Based on the number and types of applications received, and the expected available funding, TERC may establish a cut-off level for the project scores under which projects will not be funded or may be held until a later date. TERC is not obligated to fund a proposal from an applicant that has demonstrated marginal or unsatisfactory performance on previous grants and contracts with TCEQ and other state agencies. TERC is not obligated to fund a proposal from an applicant that is considered to be high risk, based on the financial condition of the applicant and other risk factors as determined by the TERC. TERC may also include additional controls in a grant contract to address the risks that may be involved with providing a grant to an applicant considered to be high risk.

Limitations

Grant agreements awarded through this RFGA will contain required certifications regarding Drug Free Workplace Requirements, Debarment and Suspension, Disclosure and Restrictions on Lobbying Activities, General Assurances and Certifications, and Single Audit Certification.

Grant agreements awarded through this RFGA will be funded in whole or in part based on provisions of the 80th Texas legislature, Regular Session, 2007, under Senate Bill 12, Section 2.10. The source of the funds provided is the Texas Emissions Reduction Plan (TERP) Account No. 5071. It is anticipated that adequate funds will be available through this funding mechanism to cover grant agreements awarded through this RFGA. HARC, TERC and the TCEQ will not be responsible for reimbursing grantee costs in excess of the funds available through the TERP.

Grant agreements awarded through this RFGA will be subject to all laws and regulations of the State of Texas including: (1) The Uniform Grant and Contract Management Act, Texas Government Code, Section 783.001 et seq. and the Uniform Grant Management Standards, 1 Texas Administrative Code, Section 5.141 et seq. (UGMS); (2) Chapter 2261, Texas Government Code (pertaining to cost reimbursement contracts); (3) Chapter 391 Local Government Code and implementation rules, and the Governor's Office of Budget and Planning Rules (pertaining to costs only for entities defined as Regional Planning Councils, etc.); (4) Texas Government Code 556.0055 (pertaining to lobbying); (5) TCEQ rules and policies (pertaining to TCEQ grant agreements and grants, and other applicable Federal and State rules and statutes); (6) TCEQ Allowable Expenditure Guidelines (pertaining to allowable costs for cost reimbursement grant agreements and grants); and (7) 30 Texas Administrative Code, Chapter 14 (TCEQ rules pertaining to competitive awarding of grants).

Reservation of Rights

TERC reserves the right to accept or reject all or any part of any response, to waive any or all of these procedures for submitting responses, to waive any formalities and/or minor technicalities, and to award by item or groups of items, whichever best serves the interests of the TCEQ. TERC reserves the right to cancel this RFGA at any time. TERC and TCEQ shall judge what is in the best interest of the TCEQ. TERC may make recommendations regarding equipment, logistical considerations, and other program elements; require implementation of such recommendations on a case by case basis as a condition of any and all grant awards; and conduct discussions with applicants to clarify applications or to improve the quality of applications. TERC shall not be liable for any costs incurred in the preparation, submission, or clarification of a Grant Application.

Intellectual Property and Patents

If grant funds awarded through this RFGA process are used to develop a technology which is later patented, including the payment of fees associated with obtaining the patent, ownership of the rights to that technology will remain with the inventor/developer. However, the inventor/developer will be required to grant to TCEQ a permanent, royalty-free license pursuant to the terms and conditions in the sample grant agreement, so that TCEQ would not subsequently be required to pay license fees for its own use of a product or technology created with the use of TCEQ funding. The same requirements also apply to other forms of intellectual property protection, such as computer software code protected by copyright.

Funding obtained solely for the purpose of EPA technology verification or certification is not subject to the above paragraph.

Confidentiality of Information

The purpose of the NTRD program is to make information available to the public. All information generated with funding from this award will become the property of the State of

Texas and as such is subject to public disclosure under the Texas Public Information Act. Any information the applicant wishes to protect from public disclosure MUST be submitted clearly marked "**Confidential/Proprietary: inform applicant & seek AG opinion before releasing**" on every page and MUST be submitted in a brown envelope separate from but enclosed with the other required application forms and information. Any information that is so marked and submitted will be sent by HARC to the TCEQ for a decision from the Texas Attorney General on whether it may be withheld. Note that the Attorney General may determine that the information is not confidential and therefore must be released. HARC will inform the applicant of the request to TCEQ for the Attorney General's decision, but neither HARC nor TCEQ will make any arguments in support of the request. It is the responsibility of the applicant to explain the basis for its claim that the information is confidential to the Attorney General.

Eligible Activities and Costs

An activity is not eligible if it is required by state or federal law, rule, regulation, memorandum of agreement, or other binding document. Eligible activities are those that are directly related to the success of the project. HARC will not pay for attendance at conferences, publication of papers, the full cost of buying equipment that has a longer life span than the grant agreement life, etc. Equipment costs will be prorated for the project. Indirect costs, overhead, or other common use items such as telephones, tools, office supplies, etc., may be allowed up to a maximum of 15% of total direct costs. Indirect costs in excess of this limit may count toward the required cost share.

Any cost incurred prior to the issuance of a Notice of Grant Award will not be considered as eligible for funding. However, HARC reserves the right to fund certain costs incurred prior to the Notice to Proceed on a case-by-case basis if those costs have been clearly identified in the application and doing so will further the objectives of the NTRD Program. HARC provides no assurance that an applicant will be awarded a grant and accepts no liability for expenses incurred prior to the execution of a grant agreement.

Grant funds may not be expended for food or lobbying purposes or to provide profits or fees in excess of actual costs.

Proof of Insurance

The applicant shall provide proof of insurance for project completion/replacement and liability. Project completion/replacement insurance shall be sufficient to cover lost equipment and time/effort in case of a disaster. General commercial liability insurance shall both cover the grantee up to one million dollars and indemnify HARC, TERC and State of Texas against any liability. Proof of insurance will be requested at the time of issuance of the award or any time during the grant period.

Acknowledgement of Support

All reports, publications, announcements or other documents completed as a part of this award, or referencing the grant activities under this award, shall carry the following or similar notation on the front cover or title page:

**The preparation of this report is based on work funded
by the State of Texas
through a grant from the Texas Environmental Research Consortium
with funding provided by the Texas Commission on Environmental Quality.**

Any grant agreements issued to lower tier subgrantees must include this requirement.

Grant Administration and Reimbursement

- A. Grantees will be required to sign a grant agreement with HARC. All services or work carried out under a grant agreement as part of this RFGA must be completed within the scope, time frame, and funding limitations specified in the grant agreement. A sample grant agreement is available at <http://www.tercairquality.org/NTRD/RFGAs/RFGA-18>, but the actual grant agreement may differ.
- B. Payments will be made on a reimbursement basis for eligible expenses incurred by the grantee. There will be no prepayment of expenses. Requests for reimbursement must be submitted to HARC on a monthly basis. The grantee will be required to provide documentation to show that equipment or services have been received and the expenses incurred prior to reimbursement. For an expense to have been incurred, it must actually have been paid unless the grant agreement specifically authorizes the grantee to use accrual-based accounting. The grant agreement may also specify other requirements for cost documentation.
- C. Financial status reports will be required with each request for reimbursement, listing the status of all expenses and budget items. Reporting format will be provided with the grant award.
- D. Progress reports will be required on a monthly basis as described in Exhibit 1- Project Description (attached), section 4.0 titled "Monthly Highlights Communication." Any issues that have been identified should be brought to the attention of the HARC Project Manager as soon as possible.
- E. Applicants must notify HARC of any termination or change in the project.
- F. All final requests for reimbursement must be submitted within 60 days of the grant expiration date.
- G. HARC may select portions of a proposal for funding and may offer to fund less than the total dollar amount requested in a proposal.
- H. HARC may make selection for funding contingent upon agreement by the applicant with additional conditions or changes to the project pertaining to equipment, logistical considerations, expenses and/or other program elements.
- I. HARC is not obligated to fund a proposal from an applicant that is considered to be high risk, based on the financial condition of the applicant and other risk factors as determined by HARC. Additional controls may be included in the grant agreement to address risks that may be involved with a specific grantee.

EVALUATION CRITERIA

ONLY THOSE APPLICATIONS THAT ADDRESS SEPARATELY EACH OF THE MERIT REVIEW CRITERIA AND SUB-CRITERIA WILL BE EVALUATED AND CONSIDERED.

HARC seeks applicants with demonstrated experience in diesel emissions and diesel technologies as they relate to NOx reduction.

Grant Applications will be evaluated based on the following criteria:

1. Technical Merit (Total Weight = 35)
 - a. Discuss the need or problem the technology or product will address and the major issues and key risks in developing the proposed technology. Include a detailed discussion to validate commercial viability of the technology or product. (Weight = 5)

- b. Discuss the proposed approach to technology or product development and plans for verification of the technology/product for NOx emissions reduction given the current development status of the technology, and overall impact of successful project completion to future success in the marketplace. Provide information to prove the feasibility of the proposed technology or product, the scientific merit, and the degree to which the technology or product is innovative and unique. (Weight = 15)
 - c. Provide a proposed work plan and schedule to include milestones and performance metrics in the work plan to gauge technical progress. Include a Gantt chart or equivalent depicting the project schedule, milestones and interrelationship of project tasks. Identify the critical path which identifies the sequential tasks which, if not completed on time, will result in a delay in the overall project schedule. Define all significant milestones in a milestone log and depict them on the schedule. (Weight = 10)
 - d. Provide a table listing the estimated labor hours and categories by position title required for each task and provide totals for each maturation stage. Include a table showing labor hours and categories for any proposed subcontracting or consulting effort for each task. Discuss the rationale used to develop estimates for labor hours, categories, subcontractors and consultants. Explain the purpose of subcontract or consultant efforts. (Weight = 5)
2. Environmental and Economic Merit (Total Weight = 15)
- a. Provide evidence of significant NOx and other emissions reduction benefits and technical performance expected from the proposed technology or product. (Weight = 10)
 - b. Provide evidence of significant economic market potential for the proposed technology or product. (Weight = 5)
3. Applicant and Participant Roles and Capabilities (Total Weight = 25)
- a. Discuss current corporate experience and success in similar projects resulting in successful technology development and commercialization or technology transfer to commercial products. (Weight = 10)
 - b. Discuss experience and availability of key personnel to complete the proposed project. Relative to the nature and timeline of the proposed project, evaluate team capabilities for both technical expertise and, if needed for the success of the project, commercialization and/or technology transfer expertise. For key personnel who are not staff members of the applicant's organization, provide evidence of the availability of such personnel consistent with their role in the proposed tasks, to validate the overall team experience being proposed. (Weight = 5)
 - c. Discuss adequacy (quality, availability and appropriateness) of facilities and equipment to accommodate the proposed project. Identify any major equipment needed for the proposed project which will have to be acquired during the course of the project. (Weight = 5)
 - d. Provide a discussion of cost sharing and in-kind contributions. (Weight = 5)
4. Industrial Involvement and Commercialization Potential (Weight = 25)
- a. Provide a discussion of the commercialization strategy for the proposed technology or product and of the intellectual property rights and/or institutional alliances to execute the commercialization strategy. (Weight = 15)
 - b. Provide information concerning the viability and practicality of the proposed technology, product or information to meet the needs of the target market in a cost effective manner

without major market restructuring considering potential technical, regulatory, economic, environmental, production or other issues impacting market success. (Weight = 5)

- c. Discuss the corporate commitment to the proposed project by exceeding the minimum required cost sharing and/or providing in-kind contributions to enhance commercialization potential. (Weight = 5)

SUBMISSION REQUIREMENTS

Deadline and Contact Person

Organizations or individual experts interested in being considered must provide the requested information as follows:

- An electronic version of the complete proposal (application and budget forms) must be sent via e-mail to n-RFGA18@harc.edu, no later than 11:59PM (central daylight savings time) May 6, 2009.
- The electronic version shall be submitted using a format readable by commonly available software such as Adobe Acrobat or Microsoft Word. Note: Adobe Acrobat files must be searchable (i.e. they cannot be files from scanned-in paper).
- An original signed hard copy of the complete proposal shall also be submitted and must be postmarked no later than 11:59PM (central daylight savings time) May6, 2009.
- The proposal must be prepared in accordance with the instructions in the RFGA.
- Untimely, incomplete or unsigned Grant Applications will not be reviewed.
- The original, signature copy of the application should not be bound or stapled.
- Send signed completed application and copies via regular mail to:

Mr. Bob Travis – NTRD RFGA-18
Houston Advanced Research Center
4800 Research Forest Drive
The Woodlands, TX 77381

Courier or personally delivered Grant Applications must be brought to the HARC facility in The Woodlands during normal business hours, 8:00 a.m. to 5:00 p.m. Central Time.

All questions regarding the RFGA application process, the scope of work of the emissions reduction technologies project, or grant agreement provisions must be submitted by email RFGA-18questions@harc.edu.

NOTE: Questions that are directed to any other email addresses will not be answered. All questions and responses will be posted at the following website:

<http://www.tercairquality.org/NTRD/RFGAs/RFGA-18-QA>.

APPLICATION CONTENT

Acceptable responses to this RFGA will provide the completed RFGA-18 Application Form and Budget Detail form.

The RFGA-18 Application Form, Application Form Instructions, Budget Form, and Budget Form Instructions can be found at: <http://www.tercairquality.org/NTRD/RFGAs/RFGA-18>.

The Application form contains the following pages:

- Cover page
- Application Summary Page (signature required)
- Abstract Page
- Project Narrative (must be limited to 25 pages)
- Key Contacts Page
- Current and pending projects
- Certification Regarding Lobbying (signature required)
- Certification Regarding Drug-Free Workplace Requirements (signature required)
- Suspension and Debarment Certification (signature required)
- General Certification and Assurances (signature required)
- Single Audit Certification (signature required)
- Personnel Authorized to Charge on the Project

All pages of the application form must be completed or the applicant may run the risk of having the application deemed incomplete and ineligible for award consideration. Please provide signatures on all pages indicated in the listing above.

APPENDIX

VENDOR'S GUIDE TO VERIFICATION PROCESS

1. INTRODUCTION

This guide is intended to help applicants to the Air Pollution Control Technologies (APCT) Center, a center under the EPA's Environmental Technology Verification (ETV) Program, understand the verification process and their role and responsibilities. The guide addresses conduct of ETV verification tests under New Technology Research and Development (NTRD) grants and for listing technologies on EPA's Office of Transportation & Air Quality's Voluntary Diesel Retrofit Program (VDRP) Approved Technology List. ETV and VDRP are separate but complementary programs run by separate offices within the EPA. NTRD is a program run by the Texas Environmental Research Consortium (TERC).

1.1 APCT Verification Center Background

EPA's ETV Program (<http://www.epa.gov/etv/>), funded by EPA's Office of Research and Development (ORD), verifies the performance of commercially available, innovative or improved technologies as an independent third party. Verification tests generate credible performance information with quality-assured data approved by EPA. The ETV Program addresses problems that threaten human health or the environment; it was designed to accelerate the entrance of new environmental technologies into the domestic and international marketplace. RTI International¹ is partnering with EPA for the ETV Air Pollution Control Technology (APCT) Verification Center. The APCT Center (<http://etv.rti.org/apct/>) addresses control technologies for both stationary and mobile air pollution sources. For mobile source retrofit technologies, the APCT Center worked with EPA's Office of Transportation and Air Quality (OTAQ) and interested stakeholders representing manufacturers and end users to develop verification test protocols; these protocols have been accepted by the NTRD.

1.2 New Technology Research and Development Program

The New Technology Research and Development (NTRD) program was created by the Texas Legislature in 2001 with the passage of Senate Bill 5, which also established the Texas Emission Reduction Plan (TERP). The fundamental purpose of the NTRD program is to facilitate the development, certification, and verification of new technologies so that they may be broadly and economically used to support clean air attainment efforts. The program also has the additional objectives of supporting attainment of State Implementation Plans (SIPs) and helping the State of Texas develop business and industry related to emission reduction technology. Texas Environmental Research Consortium (TERC), a non-profit research organization located in Houston, began management of the NTRD program effective September 1, 2005.

1.3 VDRP Background

The objective of OTAQ's Voluntary Diesel Retrofit Program (VDRP) (<http://www.epa.gov/otaq/retrofit/index.htm>) Verification Process is to evaluate the emissions reduction effectiveness of retrofit technologies and provide stakeholders with confidence that these technologies will achieve quantifiable emissions reductions. This verification process will evaluate the emission reduction performance of retrofit technologies, including their durability, and identify engine operating criteria and conditions that must exist for these technologies to achieve those reductions.

1.4 Relationship between the ETV APCT Center, NTRD, and VDRP

ETV measures the performance of a given technology using a specified fuel on a specified engine tested under specified loading cycles and issues verification reports and statements on the results of that unique configuration. These reports and associated data sets meet data

¹ RTI International is a trade name of Research Triangle Institute

requirements of the NTRD and VDRP programs and can be submitted to both programs. NTRD awards grants to manufacturers of technologies that will improve air quality by reducing emissions and support attainment of Texas' SIP. VDRP evaluates the data generated by ETV to apply emissions reductions from the single verified configuration to a broader sector, such as the engine family that includes the make and model used for verification.

1.5 Applying to the APCT Center

The APCT Center uses the same application for verification program as the VDRP; the application is available as an Excel spreadsheet on the EPA OTAQ website at <http://www.epa.gov/otaq/retrofit/retrofittech.htm>. The application requires detailed descriptions of the product, components, and test results, as well as contact information for the manufacturer's designated technical authority.

If a manufacturer wishes to list his technology as approved by the VDRP, OTAQ requires a thorough technical understanding of how the technology works before it will be considered for verification. To ensure OTAQ acceptance of the data, its requests for information must be fulfilled before a test plan can be finalized and verification can proceed.

1.6 Protocols and Test Plans

Stakeholders representing federal, state, and local government agencies; manufacturers; end users; trade associations; and testing organizations developed three protocols to cover technologies in the mobile sources area. The Devices protocol provides the requirements for verification of the performance of diesel exhaust catalysts, particulate matter filters, and engine modifications applied to highway and non-road diesel engines. The SCR protocol provides the requirements for verification of selective catalytic reduction systems applied to highway and non-road diesel engines and some categories of stationary engines. The Fuels protocol provides the requirements for verification of emissions reductions achieved by fuel modifications and reformulations, alternative fuels, and lubricants applied to highway and non-road diesel engines and light-duty gasoline engines. All three protocols are available on the website in portable document file (pdf) format. The protocol sets the requirements for testing. The verification tests are based on Federal Test Procedures detailed in the Code of Federal Regulations. Highway engine testing is based on 40 CFR 86, Subpart N (40 CFR 86.1301). Non-road engine testing is based on 40 CFR 89, Subpart E (40 CFR 89.401). Test/QA plans are developed that document how the protocol will be implemented by a testing organization. These documents are in place before verification testing may begin in a technology area. A technology-specific addendum documents the vendor, the technology, how many tests are required to distinguish the expected emissions reductions from normal test variability, and decisions on optional measurements.

1.6 The Verification Process: Step by Step

The verification process follows the steps listed below:

- *The vendor initiates the verification process by submitting an application to the APCT Center.* The application form is posted as an Excel spreadsheet on the APCT Center web site (<http://etv.rti.org/apct/tech/index.cfm>) or the OTAQ VDRP website (<http://www.epa.gov/otaq/retrofit/retrofittech.htm>). It is listed under Specific Verification Documents as part of the Retrofit Technology Application Packet. The APCT Center uses the same application to reduce the paperwork burden on the applicant and is primarily interested in the technical and contractual contacts, identification of the specific technology to be verified, a general description of the technology and how it works, how it should be installed, and what the claimed emissions reductions are. The vendor is not required to submit an application to OTAQ, however, if

the vendor wishes to be listed on the VDRP approved technology list, the APCT Center requires that OTAQ be involved from the beginning. OTAQ requires a thorough and complete understanding of the mechanism by which technologies reduce emissions and may require the submission of information that may be considered by the applicant to be confidential business information (CBI). EPA can maintain CBI in accordance with applicable regulations. Generally, the APCT Center will not need to receive any proprietary information.

- *The applicant, the APCT Center, and the testing organization discuss the intent of the test and develop a testing outline.* If the applicant has an NTRD grant, TERC may be included in the discussions. If the applicant wishes to apply to the VDRP, OTAQ is included in the discussions. The manufacturer should have a thorough understanding of his intended market and application of the technology to that market to facilitate the discussions. These discussions are usually conducted as a series of conference calls, but may include meetings. During the discussion, OTAQ may bring up questions about the technology and how it operates. Depending upon how quickly issues are resolved, the discussions may require multiple calls and the submission of additional technical information.
- *After the initial discussions have been completed, the APCT Center prepares a contract outlining Terms & Conditions, Statement of Work, and Cost.* The Terms and Conditions include provisions and guidelines for use of the ETV logo.
- *The applicant approves and returns a signed copy of the Terms & Conditions with full payment.*
- *The APCT Center and its testing organization (with input from the applicant) prepare a test plan addendum, to be approved by EPA, by following the applicable protocol.* The addendum specifies the number of tests necessary to guarantee a 90% probability of detecting the expected emissions reductions. More data are needed for low emissions reductions.
- *The applicant provides degreened and aged devices and the engine intended for verification testing to the testing organization.* The applicant is encouraged to provide one degreened device and one aged device. The applicant may choose to suspend the verification process after testing in the degreened condition so the same device can be aged. The delay between testing the device in the degreened condition and the aged condition requires an additional series of baseline tests.
- *Testing is conducted.* The applicant is responsible for providing to the testing organization the test engine and the system(s) to be verified as well as installation and operation instructions. In some cases, an inspection and functional test may be required to ensure that the unit is operating as it is supposed to before testing begins.
- *A test report is prepared by the testing organization and submitted to the APCT Center.*
- *The APCT Center submits a draft verification report and verification statement to EPA.* The reports are subject to peer, technical, and quality assurance reviews at EPA. The applicant has an opportunity to comment on the report before it is submitted to EPA.
- *EPA approves and signs the verification report and statement.* Verification statements are signed by the Director of EPA's National Risk Management Research Laboratory of the Office of Research and Development and the Director of the APCT Center.
- *The APCT Center releases the verification statements and reports.* The APCT Center

posts the verification report and statement on the Center and EPA ETV web sites so they are available to the general public and distributes copies to the applicant and EPA. The applicant may use the ETV reports, statements, and logo for marketing as described in the Terms and Conditions in the contract package.

2. PRETEST ACTIVITIES & DISCUSSION

2.1 Verification Scope

Several key issues addressed during development of the statement of work affect TERC's or OTAQ's use of the data. They include selection of the test engine, test fuel, and the test cycle. Applicants should make these choices to best match the verification to their intended market for the technology.

EPA groups engine families into boxes with similar characteristics for current and past model years. For highway engines, families are categorized by emissions standards and either urban bus or non-urban bus. Each box has 6 subgroupings: stroke technology (2- or 4-stroke) and engine classification (LHDDE, MHDDE, HHDDE). The emissions reductions are verified by ETV for only the specific engine model and fuel combination tested. To extend the emissions reductions to other engines within the same engine box, the applicant may petition OTAQ and submit additional data. Engine box classifications are posted on OTAQ's VDRP website for both highway engines (<http://www.epa.gov/dieselretrofit/documents/engfamoh.pdf>) and non-road engines (<http://www.epa.gov/dieselretrofit/documents/engfamnr.pdf>).

2.2 Developing the Statement of Work

What engine will I use? The engine selected for verification testing must be representative of the intended market. ETV requires the model year, make, model, engine serial number, date of manufacture, displacement, service class, EPA engine family, record of service hours or miles, and record of maintenance, repairs, recalls, and damage. The testing organization may provide a suitable engine for a fee but is not obligated to do so. The applicant is responsible for providing the engine for verification testing.

What fuel will I use? Testing may be conducted using either 2D standard diesel fuel or ultra low sulfur diesel fuel (ULSD). In some cases, the applicant may choose to use an alternative fuel specific to its intended market. The same fuel must be used for both the baseline and controlled tests. The testing organization may provide the fuel for verification testing.

What test cycle will I use? Transient cycles are used to load highway heavy-duty engines; verification testing may also include a steady-state Supplemental Emissions Test. Multi-mode steady-state cycles are used to load non-road compression ignition (CI) engines; verification testing may also include a non-road transient cycle. The cycle generated during the baseline test is used to load the engine with the degreened and aged technologies installed; new cycles are not generated. Backpressure and exhaust temperature are monitored.

Do my products meet the requirements for degreening and aging? Degreened retrofit devices must have between 25-125 hours of service life; aged devices must have more than 1000 hours of service life. Field use is the preferred method for accumulating service hours on the aged device. The aging must be appropriate for the test engine and representative of the intended market. ETV requires the same engine information on the engines used for aging and degreening as for the test engine. Documentation of aging and degreening must include the serial numbers of the control technologies and these serial numbers must match those cited in the statement of work.

3. SIGNING A CONTRACT

Upon completion of a satisfactory Statement of Work, the applicant will sign a contract with RTI to conduct the verification test. The contract includes Terms and Conditions with guidelines for proper use of the ETV Program name and international logo, the Statement of Work, and price and payment terms. The SOW describes the system(s) to be verified, and outlines the testing procedure. The price of the verification covers the cost of testing and reporting. Applicants are required to remit payment when returning the signed contract package.

4. TESTING

Southwest Research Institute is currently the authorized testing organization for verification of mobile source control technologies under the APCT Center. Testing is conducted at their facility in San Antonio, TX. ETV is an open transparent process. Applicants and their guests can witness testing of their technology. Changes to the ETV test/QA plan are not permitted once testing has started.

5. REPORTING

5.1 Results

Results are reported as the percent mean emissions reductions and 95% confidence limits for PM, NOX, HC, and CO compared to the baseline.

If the confidence interval includes zero reduction, then the performance is reported as not distinguishable from zero. The vendor can opt for no verification statement under these circumstances; however, a verification report with the results is issued and posted to the websites.

5.2 Deliverables

The applicant will receive originals of the verification report and verification statement. The statement will be signed by the director of the National Risk Management Research Laboratory of EPA's Office of Research and Development and the director of the APCT Center. Portable document format (pdf) versions are also posted to the APCT Center and EPA ETV websites.

6. REFERENCES & LINKS

Air Pollution Control Technologies Center:

<http://etv.rti.org/apct/>

EPA ETV Program website:

<http://www.epa.gov/etv/>

EPA Voluntary Diesel Retrofit Program:

<http://www.epa.gov/otaq/retrofit/index.htm>

Code of Federal Regulations:

<http://www.gpoaccess.gov/cfr/index.html>

7. CONTACT INFORMATION

For more information about RTI or the APCT Center, contact:

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