U.S. Department of Transportation
Federal Aviation Administration

VOLUNTARY AIRPORT LOW EMISSION PROGRAM

TECHNICAL REPORT

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Office of Airports
Airport Planning and Programming

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ACRONYMS & ABBREVIATIONS

ACS	Airport Credit Statement
ADO	Airport District Office
AEE	FAA Office of Environment and Energy
AERC	Airport Emission Reduction Credit
AERCPP	Airport Emission Reduction Credit Post Processor
AFV	Alternative Fueled Vehicle
AIP	Airport Improvement Program
APP	Airport Planning and Programming
APU	Aircraft Auxiliary Power Unit
AQ	Air Quality
BEV	Battery Electric Vehicle
BHP	Brake Horse Power
CAA	Clean Air Act and all subsequent amendments
CI	Compression-ignition
DOE	United States Department of Energy
DOT	Department of Transportation
EDMS	FAA's Emissions and Dispersion Modeling System
EIP	Economic Incentive Programs
EIS	Environmental Impact Statement
EPA	United States Environmental Protection Agency
EPAct	DOE Energy Policy Act of 1992
FAA	Federal Aviation Administration
FFV	Flexible Fueled Vehicle
FIP	Federal Implementation Plan
GAO	United States General Accounting Office
GAV	Ground Access Vehicle
GPU	Ground Power Unit
GSE	Ground Support Equipment
GVWR	Gross Vehicle Weight Rate
HDDV	Heavy Duty Diesel Vehicle
HP	Horse Power
HZ	Hertz
ICAO	International Committee on Aviation Organizations
ICE	Internal Combustion Engine
ILEAV	Inherently Low Emission Airport Vehicle pilot program
LDT	Light Duty Truck
LDV	Light Duty Vehicle
LEV	Low Emission Vehicle
LTO	Landing Takeoff Cycle
MDV	Medium Duty Vehicle
MOBILE6	EPA standard model of on-road vehicle emission factors
NAAQS	National Ambient Air Quality Standards

NEPA	National Environmental Policy Act
NMHC	Non methane hydrocarbons
NMOG	Non methane organic gases
NON-ROAD	EPA's off-road vehicle emissions model
NPIAS	National Plan of Integrated Airport System
NSR	New Source Review
O&M	Operations and Maintenance
OEM	Original Equipment Manufacturer
PFC	Passenger Facility Charge
PGL	Program Guidance Letter
PM	Particulate Matter
PPM	Parts Per Million
PSD	Prevention of Significant Deterioration
PSI	Pounds per square inch
RUL	Remaining Useful Life
SEP	State Energy Program
SI	Spark-ignition
SIP	State Implementation Plan
SULEV	Super Ultra Low Emission Vehicle
TAF	Terminal Area Forecast
TANKS	EPA model to assess emissions of evaporative hydrocarbons from a single storage tank
TIP	Transportation Improvement Program
TPY	Tons per year
ULEV	Ultra Low Emission Vehicle
ULSD	Ultra Low Sulfur Diesel
USAF	United States Air Force
USC	United States Code
VALE	Voluntary Airport Low Emission Program
VOC	Volatile Organic Compound
Vision 100	*The Vision 100 – Century of Aviation Reauthorization Act, Public Law 108-176*

CHAPTER 1
INTRODUCTION

1.1 Program Description

The *Vision 100—Century of Aviation Reauthorization Act* (*Vision 100*), signed into law in December 2003,[1] established a voluntary program to reduce airport ground emissions at commercial service airports in air quality nonattainment and maintenance areas.[2] The new provisions are intended to help airports meet their obligations under the Clean Air Act (CAA) and to assist regional efforts to meet health-based National Ambient Air Quality Standards (NAAQS).

Vision 100 directs the Federal Aviation Administration (FAA) to issue this guidance report describing eligible airport low-emission modifications and improvements and how airport sponsors (hereafter referred to as the "sponsor")[3] should demonstrate program benefits. Developed in consultation with the U.S. Environmental Protection Agency (EPA) and the U.S. Department of Energy (DOE), this guidance discusses program eligibility for converting vehicles to alternative and clean conventional fuels and for obtaining related infrastructure improvements.

The FAA is implementing *Vision 100* airport emission provisions in a single program called the **Voluntary Airport Low Emission (VALE) program**. Participation in the VALE program is entirely voluntary for the airport sponsors and State air quality agencies.[4]

The goal of the VALE program is to help airports to improve air quality in conjunction with regional efforts to meet health-based national ambient air quality standards.

The goal of the VALE program is to reduce the amount of regulated pollutants and other harmful air emissions generated by ground transportation sources at airports. The program also supports efforts to increase U.S. energy independence by emphasizing domestically produced alternative fuels that are substantially non-petroleum based.

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[1] Public Law 108-176, Subtitle B-Passenger Facility Fees, Section 121 (Low-Emission Airport Vehicles and Ground Support Equipment); Subtitle C-AIP Modifications, Sections 151 (Increase in Apportionment for, and Flexibility of, Noise Compatibility Planning Programs), 158 (Emission Credits for Air Quality Projects), and 159 (Low-emission Airport Vehicles and Infrastructure).

[2] 49 U.S.C. §§ 40117, 47139, and 47140.

[3] Airport "sponsors" are planning agencies, public agencies, or private airport owners/operators that have the legal and financial ability to carry out the requirements of the AIP program. The term is also used in this document to refer to the PFC program, which is restricted to "public agencies."

[4] Includes delegated district, local, and Tribal air quality agencies.

The program is designed to provide sponsors with financial and regulatory incentives to increase their investments in proven low-emission technology. The program encourages the use of alternative fuel vehicles (AFVs) and other low-emission technologies that are particularly suited to the airport environment.

Funding for the VALE program is provided through two airport assistance programs, the FAA Airport Improvement Program (AIP), which provides grants to airports from the Aviation Trust Fund, and the Passenger Facility Charges (PFC) program, which approves locally imposed fees from airline passengers for eligible airport development. These programs offer substantial resources to airports for low-emission activities but only if such activities represent a higher priority for the airport than other needed airport development.

Vision 100 also provides an important regulatory incentive to complement program capital investments. *Vision 100* requires the EPA, in consultation with the FAA, to issue guidance on how airports can receive airport emission reduction credits (AERCs) for VALE projects and apply those credits to future airport projects in order to meet regulatory requirements under the CAA. This guidance is provided to airports and States in a separate EPA document, "*Guidance on Airport Emission Reduction Credits for Early Measures Through Voluntary Airport Low Emission Programs*" (hereafter referred to as the "AERC Report"). *Vision 100* states that the FAA may not approve AIP or PFC funding for the VALE program without a State Letter of Assurance[5] that the State will grant appropriate AERCs to airports for their VALE projects. A brief discussion of AERC procedures is contained in Chapter 2.

The eligibility guidelines, requirements, and procedures for the new VALE program are based on established AIP and PFC program regulations, the experience of the FAA with the Inherently Low Emission Airport Vehicle (ILEAV) pilot program, and the statutes and orders governing airport development. For example, the VALE program continues to focus on capital improvement projects and the deployment of proven, cost effective technology that is commercially available. For this reason, research-related activities are not eligible (see Chapter 10).

1.2 Growing Airport Air Quality Responsibilities

Congress recognized the emergence of air quality as a major environmental concern for airports in *Vision 100*. The impetus for the emissions provisions in *Vision 100* is the growing number of nonattainment areas in the country and, consequently, the growing number of airports that will be subject to new air quality requirements. The FAA and airport community understand that controlling airport emissions and meeting these requirements is essential to the continued growth and improvement of public aviation.

Aviation continues to be a fast growing sector of the national transportation system and a vital link in the national economy. The civil aviation sector provides 11 million jobs and

[5] A copy of the required AERC Letter of Assurance is provided in Appendix G.

represents close to one *trillion* dollars of economic activity, or about 10 percent of the U.S. gross domestic product.[6]

On average through 2020, the FAA estimates that domestic aircraft operations will increase by approximately 1 percent annually, and that passenger enplanements will increase by 3 percent annually.[7] This forecast is consistent with a recent report by the United States General Accounting Office (GAO) indicating that domestic air travel will grow at a rate of 3.6 percent annually through 2011.[8] Increasing demand for air travel translates into planning and development for airport capacity and modernization of existing facilities.

The aviation community is assuming increased responsibility for maintaining a clean environment and has made substantial headway in addressing national air quality concerns, despite the fact that airports are a relatively small source of overall regional emissions. The combined emissions from aircraft and ground support equipment (GSE) typically represent approximately three to five percent of emissions regulated under State Implementation Plans (SIP) nationwide, compared to other surface transportation sources (40-60 percent), and other point and area sources (40-60 percent). Despite the relatively small influence of aviation on air quality, the aviation community understands that improving air quality is a regional problem that requires a collaborative effort by the States, industry, vehicle manufacturers, and transportation agencies.

1.3 Benefits of the VALE Program

The voluntary VALE program provides benefits to all participants. Both airports and State air quality agencies benefit from the program's focus on early and accelerated airport emission reductions. Sponsors have the opportunity to apply for AIP grants and PFCs to achieve early emission reductions that earn AERCs from State air quality agencies. These AERCs may be used on airport development projects at a later date to satisfy general conformity and NSR requirements under the CAA.

States have the opportunity to realize the environmental and public benefits of early reductions in airport emissions in exchange for granting appropriate emission credits to airport sponsors. In addition, the program helps sponsors, State air quality agencies, and the environment by:

- Facilitating improved dialog between airport sponsors and air quality agencies
- Expediting the environmental review process for airport projects
- Encouraging better identification and control of airport emission sources

[6] "The National Economic Impact of Civil Aviation," DRI-WEFA, Inc. in collaboration with the Campbell-Hill Aviation Group, Inc. July 2002.
[7] 2003 Terminal Area Forecast, Federal Aviation Administration.
[8] "Airport Operations and Future Growth Present Environmental Challenges," GAO/RCED-00-153. United States General Accounting Office, August 2000.

Airports are constantly changing and improving in response to a dynamic aviation industry and new demands for safe and efficient air travel. In this environment, the VALE program offers increased financial and regulatory support for airports as they adapt to meet their future needs.

The program provides the means for demonstrating that airport growth and air quality improvements can happen together. It reduces uncertainties for sponsors and provides them with the tools to plan more effectively, knowing that VALE-generated AERCs can help them meet future air quality requirements. For example, the sponsor can apply AERCs to an airport terminal or runway project's year of highest emissions, which is often during project construction. Specifically, AERCs can be applied as "design measures" to the project to keep project emissions below general conformity de minimis levels, thereby eliminating the need for a general conformity determination.

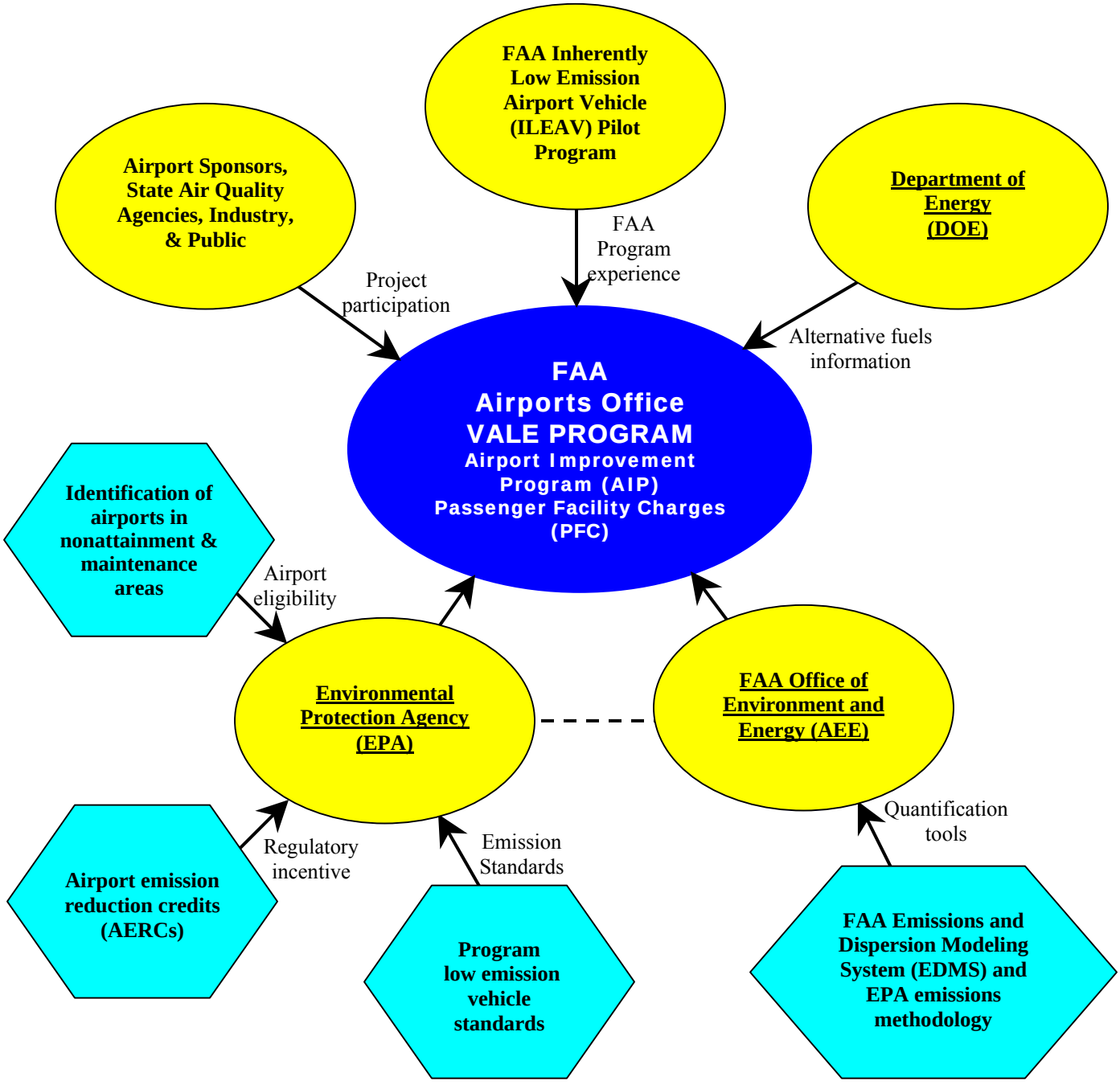
In addition to the environmental benefits of using cleaner-burning alternative fuels, current evidence suggests that alternative fueled vehicles (AFVs) appear to be a sound economic investment. The higher capital cost to purchase AFVs is generally offset in a few years by their lower operating and maintenance (O&M) costs. Indeed, the prevailing view is that the AFV market is constrained primarily due to the lack of refueling infrastructure.

1.4 Agency and Industry Coordination

Many agencies and organizations were consulted by the FAA in the process of developing the VALE program (see **Figure 2-1**). The DOE Clean Cities Program provided information on alternative fuels and fuel station requirements. The EPA provided assistance in three major areas: 1) eligible airports located in nonattainment or maintenance areas, 2) vehicle low-emission standards, and 3) AERC guidance. These agencies will have a continuing role in the implementation of the program and future updates to program standards and procedures.

In addition, numerous aviation and fuel industry associations provided technical suggestions, many of which were incorporated into this report. The FAA also relied on State air quality agencies, equipment manufacturers, energy companies, and environmental organizations to help achieve a realistic balance between forward-looking emission standards and the commercial availability of cost effective low-emission technology.

Figure 1-1. Illustration of Coordinated Effort for the VALE Program



1.5 National Environmental Policy Act of 1969 (NEPA) and Clean Air Act (CAA) Considerations

Two major Federal environmental regulations are associated with airport air quality concerns - NEPA and the CAA. NEPA ensures that Federal actions are considered carefully for their potential environmental effects and that there is an opportunity for public officials and citizens to comment on proposed projects before Federal decisions are made and projects begin. As the lead agency for NEPA on Federal actions for aviation projects, the FAA has issued its procedures for NEPA implementation under *Order 1050.1E, Environmental Impact: Policies and Procedures*.[9] This order describes the agency's requirements and procedures for meeting the nation's environmental laws and addressing specific impact areas, including air and water quality, noise, wildlife protection, preservation of critical habitat, and socio-economic impacts.

Under NEPA, VALE projects are considered to be a separate Federal action with "independent utility" and may be approved without regard to other airport development projects. The potential environmental impacts from VALE projects must be evaluated according to the policies and procedures contained in FAA Orders 1050 and 5050. However, given the potential for VALE projects to permanently improve air quality, environmental review of most VALE projects is expected to be routine.

Under the specific mandates of the CAA, airport development is subject to two air quality regulations: the General Conformity Rule and New Source Review. The CAA protects the public health by ensuring that airport development plans do not interfere with the State's ability to bring designated nonattainment areas into full attainment with the NAAQS. Airports can be located in nonattainment or maintenance areas for one or more of the six criteria pollutants listed below.

- Ground level ozone (O_3)
- Carbon monoxide (CO)
- Particulate matter (PM_{10} and $PM_{2.5}$)
- Nitrogen dioxide (NO_2)
- Sulfur dioxide (SO_2)
- Lead (Pb)

A description of each criteria pollutant is provided in the Glossary in **Appendix A**. Little to no lead (Pb) in domestic fuels and alternative fuels makes the evaluation of Pb emissions unnecessary for this program.

Under the General Conformity Rule, the FAA is developing a list of Federal actions that are *Presumed to Conform*. It is expected that VALE projects will be presumed to conform with the applicable SIP due to the permanent emission reductions provided and the independent utility of VALE activities.[10]

[9] Federal Register. Volume 69, No. 115, pp. 33778-33822. June 16, 2004.
[10] Preliminary draft of the *FAA General Conformity Presumed to Conform List*, Federal Register notice unpublished to date. Released for public comment June 21, 2001. Federal Aviation Administration.

The focus of general conformity regulations and the VALE program is on local air quality, not climate change or global warming. However, consequential reductions in greenhouse gases achieved through implementation of VALE projects may also benefit global air quality.

1.6 Airport Eligibility

To be eligible for the VALE program, an airport must be a commercial service airport listed in the FAA National Plan of Integrated Airport Systems (NPIAS) and located in an EPA-designated nonattainment or maintenance area for one or more of the criteria pollutants.[11,12] A list of eligible airports has been prepared by the FAA in cooperation with the EPA and is available on the FAA VALE website.[13] Sponsors are encouraged to contact their State air quality agency for further information or verification of their nonattainment or maintenance status.

For the purposes of the VALE program, "Level One" pollutants are the criteria pollutant(s) that are responsible for the nonattainment and/or maintenance status of the airport's geographical area. "Level Two" pollutants are the remaining criteria pollutants that are unrelated to the area's nonattainment or maintenance status.

Approximately one-third of U.S. commercial service airports, including many of the nation's largest and busiest, are located in nonattainment or maintenance areas. One reason for the increased number of such airports is EPA's promulgation of more stringent national ambient air quality standards, most recently for ozone and fine particulate matter. The result is that more and more airports are required to perform detailed conformity evaluations and determinations for project approvals, and to make additional air quality investments that were not previously required.

Airports are naturally suited to manage emissions from stationary and ground transportation sources because of their design and centralized operations. Airport fleets, especially GSE, operate primarily, if not exclusively, on airport property. In addition, refueling and recharging stations can often be sited safely and conveniently for vehicle fueling services. Conversely, airports have little ability or authority to control aircraft emissions. For example, aircraft and engine manufacturers require a long lead time in the design and production of new aircraft engines. A multitude of design factors must be considered, including aircraft safety, performance, fuel efficiency, noise, and cost. Further, U.S. aircraft emission standards are established by the EPA within an

[11] 49 U.S.C. §§ 40117, 47139, and 47140.
[12] The 1-hour ozone NAAQS will be revoked one year after the effective date for the 8-hour ozone designations. In most cases, that means the 1-hour ozone standard will be revoked on June 15, 2005. Therefore, funding will not be available under the VALE program for projects based on the 1-hour ozone designations.
[13] http://www.faa.gov/arp/environmental/vale/

international framework administered by the International Committee on Aviation Organizations (ICAO).

1.7 Associated FAA Programs

Air quality provisions in *Vision 100* expand the eligibility of low-emission airport technology under the AIP and PFC programs. With the new legislation, sponsors now may use funds from these programs to acquire low-emission technology to achieve accelerated reductions of stationary and mobile emission sources at airports. Project eligibility for the two funding programs varies in some important respects. Sponsors should consider these funding distinctions in planning their VALE projects and in selecting the most appropriate funding source or combination of sources to support it (see Chapters 7 and 8 on AIP and PFC project eligibility, respectively).

1.7.1 Airport Improvement Program

As authorized by Title 49 U.S.C. Chapter 471 as amended and P.L. 103-272, the objective of the AIP program is to assist sponsors, owners, or operators of public-use airports in the development of a nationwide system of airports adequate to meet the needs of civil aeronautics. The forms of assistance to airports are primarily monetary grants, yet may also include advisory services and counseling. AIP grants made to eligible sponsors for airport planning and development include activities to construct new public airports, improve and rehabilitate infrastructure, extend runways, purchase firefighting, rescue, security and snow removal equipment, and install navigation aids. Environmental activities under the AIP program include the preparation of environmental impact statements (EIS) and coordination with local and regional authorities on land use planning.

Regulations, guidelines, and literature governing the use of AIP funds are provided in FAA Orders and Advisory Circulars (FAA Order 5100.38B, Airport Improvement Program Handbook as amended, and FAA Advisory Circulars in the 150/5100 series). AIP information is available at the FAA's website: www.faa.gov/arp.

1.7.2 Passenger Facility Charges Program

The PFC program is authorized by 49 U.S.C. Subtitle VII, Part A - Air Commerce and Safety, Section 40117. This statute was implemented by the Aviation Safety and Capacity Expansion Act of 1990 which amended the Federal Aviation Act of 1958, as amended, to remove the restriction against a PFC. The statute authorizes the Secretary of Transportation to allow a public agency that controls at least one commercial service airport to impose a fee for each paying passenger of an air carrier enplaned at the airport. This revenue finances program eligible airport

projects to be carried out at the commercial service airport or any other airport that the public agency controls.

The FAA may grant authority to impose a PFC only if the FAA finds, on the basis of an application submitted by the public agency, that the amount and duration of the PFC will not result in excess revenues and the proposed project(s) is: eligible; meets at least one PFC objective or significant contribution finding; and is adequately justified. Air carriers and their agents are required to collect PFCs imposed by public agencies and must remit those charges, less an FAA-authorized handling fee, in a timely manner. In addition, the PFC's collected by the carrier must be noted on the passenger's ticket. More information about the PFC program is available on the FAA website: www.faa.gov/arp.

1.7.3 Inherently Low Emission Airport Vehicle (ILEAV) Pilot Program

The ILEAV pilot program was authorized in 2000 under the Wendell H. Ford Aviation Investment and Reform Act for the 21st Century (AIR-21). The pilot program provided ten public-use airports with individual grants of up to $2 million to demonstrate the benefits and economic feasibility of low-emission vehicles and supporting infrastructure.

The ongoing ILEAV pilot program offered a useful model in implementing *Vision 100* airport emission provisions for the VALE program. Many of the same eligibility criteria, procedures, and assessment techniques developed and used in the ILEAV pilot program are incorporated into the new program.

The ten participating airports are using their ILEAV grants to evaluate various kinds of mobile and stationary low-emission technology. The projects are providing information about the applicability of these low-emission technologies to the airport environment and the various technical, environmental, and economic trade-offs of alternative fuels. This includes information about the commercial availability of AFVs, the safe handling of alternative fuels, improved emission assessments, and vehicle ownership issues.

Sponsors participating in the ILEAV program are required to fulfill their ILEAV project commitments before they apply for VALE program funding.

Under *Vision 100*, the beneficial emission reductions achieved under the ILEAV pilot program are recognized as eligible for AERCs provided within the VALE program. Sponsors participating in the ILEAV program are required to fulfill their ILEAV project commitments before they may apply for VALE program funding. Specifically, all ILEAV grant funds received by a sponsor must be fully obligated and supported by documented equipment orders or signed contracts.

1.7.4 FAA Emissions and Dispersion Modeling System (EDMS)

The FAA Office of Environment and Energy (AEE) made significant improvements to the EDMS model in response to the requirements of this program. These improvements support the need for increased accuracy and quantification of airport early emission reduction benefits.

EDMS was developed in the mid-1980s by the FAA in cooperation with the United States Air Force. The model has become increasingly sophisticated over time and offers the ability to perform emission inventories and dispersion analysis for all of the major emission sources in the airport environment. These sources include aircraft engines, auxiliary power units (APU), GSE, ground access vehicles, training fires, and stationary sources such as boilers and bulk liquid storage tanks.

EDMS is the FAA required model for assessing aviation emission sources at airports. In addition, the EPA has approved the EDMS model for evaluating impacts from these source types, as defined in their Air Quality Modeling Guidelines, Appendix A.[14]

Under the VALE program, sponsors are required to begin their projects with the latest version of EDMS. The output reports from the model will be an integral part of the initial VALE application process and the sponsor's application for AERCs from the State air quality agency. More information about EDMS and the emissions assessment process is contained in Chapter 9.

1.8 Description of the Contents of this Report

The following chapters of this report explain the eligibility, process, requirements, and the technical analysis of the VALE program. Chapter 2 presents the application process and steps an airport must follow to apply for VALE funds. Chapter 3 discusses general vehicle eligibility and use commitments. Chapter 4 addresses fuel eligibility requirements and provides information to sponsors about the technical and emissions trade-offs of different alternative fuels. Chapter 5 presents the program low-emission standards that each vehicle must meet to be eligible for funding. Chapter 6 discusses general infrastructure project eligibility. Chapters 7 and 8 describe the unique eligibility requirements for the AIP and PFC programs, respectively. Chapter 9 outlines the emission assessment methodology using the EDMS model. Finally, Chapter 10 describes the cost effectiveness methodology that sponsors must use in their project applications.

[14] *Guidelines on Air Quality Models (Revised) with Supplements A and B*, EPA-450/2-78-027R, U.S. Environmental Protection Agency, O.A.Q.P.S., Research Triangle Park, NC, July 1, 1997. Codified in 40 CFR Part 51, Appendix W.

There are seven appendices to this report. **Appendix A** is the Glossary of Terms. **Appendix B** provides the sections in *Vision 100* that apply to the VALE program. **Appendix C** lists the "special conditions" to the VALE program for AIP grants and PFC funding approvals. **Appendices D & E** offers sample worksheets for project applications and tracking, respectively. **Appendix F** contains a simple overview of the differences in eligibility between the AIP and PFC programs. Finally, **Appendix G** provides the required AERC Letter of Assurance from the State air quality agency to the FAA.

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CHAPTER 2
APPLICATION PROCEDURES AND AIRPORT EMISSION REDUCTION CREDITS

Application procedures for the VALE program are based on *Vision 100*, the CAA, and AIP and PFC program requirements. This chapter describes how sponsors should begin their project formulation, locate needed technical resources, and construct their project application for funding approval from the FAA and for AERCs from the State air quality agency. The procedures and data for the project application have been simplified as much as possible to help the sponsor.

2.1 Early Planning and Coordination with State Air Quality Agency Regarding AERCs

Vision-100 (Section 158 of the legislation) requires an AERC assurance from the State air quality agency prior to FAA project approval and funding. Therefore, sponsors should discuss their project proposals for reducing emissions with their State air quality agency in advance of developing their formal project application. The State agency can be helpful in a number of ways, beginning with verification of the nonattainment or maintenance status of an airport area. The agency can also provide information about appropriate emission reduction strategies and fuels for reducing the Level One pollutants of concern as well as references to similar activities in the State or region that may be applicable.

Early coordination meetings between the airport and the State air quality agency fosters valuable information exchange.

The benefits of early coordination with the State air quality agency include better understanding of mutual goals and responsibilities, access to available resources, and the development of organizational relationships that can facilitate timely and constructive State and EPA reviews. Early meetings with the State air quality agency are also an opportunity to discuss how the sponsor will show that proposed emission reductions are quantifiable, surplus, Federally enforceable, permanent, and adequately supported.[15]

The sponsor also needs to inquire about the relationship, if any, of the proposed project to the SIP. States may choose to manage the sponsor's early reductions independent of the SIP or to incorporate these protected airport measures into the SIP through various

[15] Emissions reduction criteria is defined in "Guidance on Airport Emission Reduction Credits for Early Measures through Voluntary Airport Low Emission Programs." EPA, 2004.

means. Because SIP revisions take considerable time, the State air quality agency should defer its decision on SIP inclusion until after FAA approvals and implementation of the project. In doing so, the State air quality agency can submit its AERC Letter of Assurance (See **Appendix G**) to the FAA on a timely basis. This also reflects the fact that some changes to the project are likely to happen between the application period and actual implementation.

2.2 Obtaining Technical Information and Resources to Design a Project

Sponsors should begin by exploring low-emission technology options and determining which ones meet their operational needs and the eligibility requirements of the VALE program. Sponsors may want to investigate information about certified vehicles and low-emission technologies, the reliability of equipment and manufacturers, the applicability of fuel types, and relative costs.

Depending on the size of the project and the degree of analysis, the sponsor may need to obtain technical support to help with project planning and development. Similar to the ILEAV pilot program, not more than 10 percent of the total requested AIP grant amount is recommended for technical assistance. Other project expenses may not be reimbursable under AIP (e.g., public information activities).

In addition to the information provided in this report, the sponsor may want to obtain information from outside sources. Numerous government agencies and private organizations are available to provide assistance in developing a VALE project plan.

A helpful resource to sponsors may be their local coordinator for the DOE National Clean Cities Program, which was established by the National Energy Policy Act (EPAct) in 1992. Over 80 local Clean Cities Coalitions have been designated in metro areas across the nation to work with operators of AFV fleets and with fuel providers who are building the refueling infrastructure. Most of the local coalitions are located in areas that have been classified as air quality nonattainment regions. In addition to coordinating activities among AFV stakeholders (manufacturers, fleet users, fuel and service providers, government partners, etc.), the National Clean Cities Program also provides specialized technical assistance through its "Tiger Team" program and financial grants to help reduce the cost of purchasing AFVs and refueling infrastructure through State Energy Program (SEP) grants. To learn more about the Clean Cities program and to obtain contact information for local Clean Cities Coordinators, go to (http://www.eere.energy.gov/cleancities/).

Another resource for questions and advice is the ten ILEAV airports, which have real-world experience with developing and implementing low-emissions programs. These airports are Hartsfield-Jackson Atlanta International (ATL), Baton Rouge Metropolitan (BTR), Baltimore-Washington International (BWI), Chicago O'Hare International (ORD), Dallas/Fort Worth International (DFW), Denver International (DIA), John F.

Kennedy International (JFK), LaGuardia (LGA), Sacramento International (SMF), and San Francisco International (SFO).

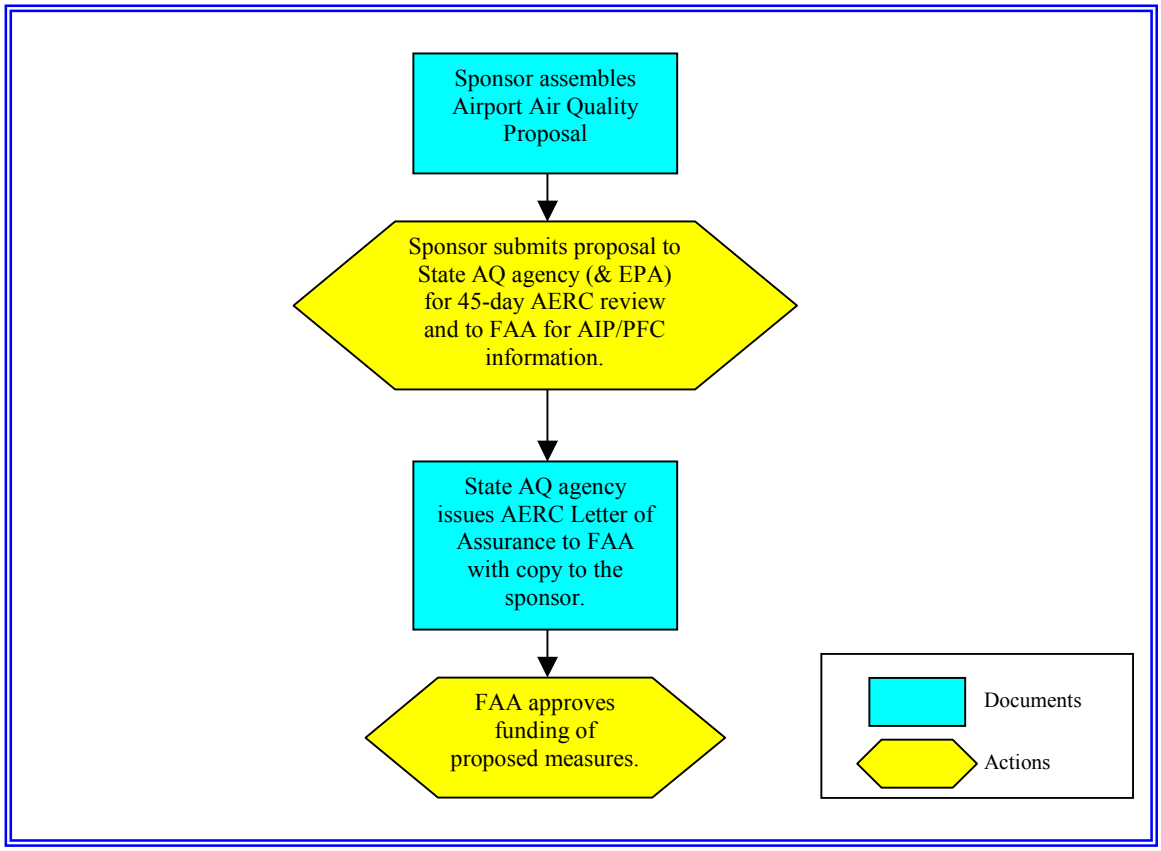
In addition to the airports participating in the ILEAV program, there are many other airports with first-hand experience in developing and managing low-emission airport projects. Notable among these airports are Boston Logan International (BOS), Los Angeles International (LAX), George Bush Intercontinental (IAH), Phoenix Sky Harbor International (PHX), Seattle-Tacoma International (SEA), Salt Lake City International (SLC), Lambert-St. Louis International (STL), Portland International (PDX), and El Paso International (ELP).

2.3 Project Application Phase

Based on the fact-finding process and early discussions with the State air quality agency, the sponsor can begin to assemble a project application for FAA, State, and EPA review. **Figure 2-1** graphically depicts the application process for FAA funding of VALE projects. The process consists of four steps:

1. Sponsor assembles a project proposal per section 2.3.1
2. Sponsor submits proposal to the State air quality agency and EPA for concurrent review, with information copy to the FAA regional Airports program office
3. State air quality agency issues *AERC Letter of Assurance* to the FAA (see **Appendix G**)
4. FAA approves funding

Figure 2-1. Flow Chart of Project Application Phase



2.3.1 Assembling a Project Proposal

The project proposal does not need to be lengthy or complex but it must contain all of the necessary application areas discussed below. To make this process efficient, the FAA strongly encourages the sponsor to read this Technical Report and the AERC Report completely prior to assembling a project proposal.

The sponsor's project proposal should contain four to five major parts. The first part should be the main narrative containing the nine sections listed below. The second part should be the *project application worksheets* contained in **Appendix D** and available from the FAA VALE website (see Chapter 10 for instructions on how to use these worksheets). The third part should be primary EDMS outputs and supporting emissions reduction data. The fourth part should be the prepared draft AERC Letter of Assurance for the State air quality agency to sign (see **Appendix G**). If applicable, the fifth part should contain the enforceable agreements under the PFC program for tenant-owned vehicles or lease arrangements.

Project Proposal Main Narrative

Section 1: Project Information
Title information for the application must include the project title, airport 3-letter ID, airport name, key contact(s), address, phone, fax, and e-mail.

Section 2: Description of proposed emission reduction measures
This main descriptive section should contain as much detailed information as possible on the proposed project such as the number and type of new low-emission vehicles, the replaced/displaced conventional fuel vehicles, refueling and recharging stations, other low-emissions equipment and how the equipment will operate, and the useful life for each vehicle or unit of equipment.

Section 3: Emission reduction estimates
The sponsor should quantify the expected emission reductions from the project in tons per calendar year per criteria pollutant. The timeframe for these calculations is determined by the useful life of project vehicles and equipment and may be extended if the sponsor agrees to replace VALE low-emission vehicles and equipment in the future with equivalent low-emission units (see Section 3.5). Also, cite the method and models used to obtain these estimates.

Section 4: Confirmation that estimated emission reductions meet CAA criteria
The sponsor should refer to the AERC Report for preparing the following discussion of criteria:

Section 4.1 Quantifiable
Section 4.2 Surplus
Section 4.3 Federal Enforceable
Section 4.4 Permanent
Section 4.5 Adequately Supported

This section should provide the State air quality agency with logical confirmations that the criteria will be met. This discussion should include the sponsor's proposed approach to vehicle and equipment tracking over the life of the program.

Section 5: Relationship to State Implementation Plans
As part of the sponsor's showing that its proposed early emission reductions are surplus to the SIP, the sponsor should consult with the State air quality agency to identify what, if any, provisions in the SIP or other state agreements might affect the proposed measures or the sponsor's calculation of emission reductions.

Section 6: Funding Sources
This section should summarize the amount of AIP and/or PFC funds requested, the source of local matching funds for AIP grants, other local contributions to the program if any, and total project expenditures. The sponsor should take note of the differences in funding eligibility between AIP (Chapter 7) and PFC (Chapter 8) programs. AIP and PFC eligibility differences can affect the sponsor's range of options and how the project is designed.

Section 7: Cost Effectiveness
Cost effectiveness calculations should be conducted for individual criteria pollutants based on total project dollars divided by lifetime project emission reductions for that pollutant. Instructions for how to calculate cost effectiveness are presented in Chapter 10, including the use the project cost effectiveness worksheets provided in **Appendix D**.

Section 8: Vehicle Commitments
The sponsor should discuss vehicle use commitments for the project, which ensure that the low-emission vehicles purchased or upgraded through the project are:

- Airport-dedicated
- Certified or verified to program low-emission standards
- Operated and maintained at the airport throughout their useful life, and not transferred, re-converted to conventional fuels, or in some other way disabled from providing the expected long-term emission benefits for the airport.
- Supported by enforceable agreements in the PFC program, prior to funding approval, consistent with the special conditions of the program (see **Appendix C**). Agreements are needed with regard to incremental or retrofit funding for tenant-owned vehicles as well as lease agreements for refueling or recharging stations.
- Replaced during their useful life by equivalent vehicles or equipment with equal or lower levels of emissions. This commitment is related to the CAA requirement that project emission reductions are "permanent." The sponsor may choose to extend this commitment beyond the useful life of individual vehicles or units of equipment up to the AERC life of 20 years (See Section 3.5).

Section 9: Schedule
Clearly define the proposed timeline for completing the application process and implementing major phases of the project (e.g., vehicle acquisition, vehicle deployment, completion of infrastructure). Provide realistic dates and milestones for major activities.

Project Proposal Appendices

Proposal Appendix A
Include project application worksheets

Proposal Appendix B
Include primary EDMS outputs and supporting emission reduction data

Proposal Appendix C
Include a draft copy of the required "State Air Quality Agency AERC Letter of Assurance to the FAA" (see **Appendix G** of this report) for State signature. Include the name and title of the appropriate FAA addressee(s).

Proposal Appendix D
If applicable, include enforceable agreements under the PFC program regarding tenant-owned vehicles as well as lease agreements for refueling or recharging stations.

2.3.2 Format and Distribution of the Project Proposal

Proposal Format
- Standard page size of 8.5" x 11" (including any figures or maps)
- 12 pt. font size
- Include the project title and page number on each page of the proposal.
- The proposal should be as short and succinct as possible. Additional or technical material may be presented in appendices.
- All material, including charts, graphs, maps, and appendices, should be developed in black and white for readability of copied material.

Proposal Copies Two (2) copies of the proposal should be submitted to the State air quality agency and two (2) more copies to the EPA Region Office. Subsequently, the sponsor shall provide two (2) printed copies of the proposal to the appropriate FAA regional Airports program office. Each application document must be a complete package, including financial information; no external material will be accepted.

FAA Recipients Airport proposals/applications should be mailed to the FAA Regional Airports Division Office or ADO as appropriate.

For Further Information Sponsors are encouraged to contact their FAA Regional Airports Division Manager or the ADO Manager. The Headquarters contact is Dr. Jake Plante (202) 493-4875, jake.plante@faa.gov in the Airports Office, Community and Environmental Needs Division, APP-600. Program material will be posted on the following FAA Airports website: www.faa.gov/arp/environmental/vale/

2.3.3 State and EPA Review of the Project Proposal

Upon receipt of the sponsor's proposal, the State air quality agency has 45 calendar days to review the proposal and to make its finding to the sponsor and the FAA. EPA review of the proposal is concurrent with the State's review. Any comments by the EPA must be received by the State (with copies to the FAA and sponsor) within the 45-day State review period and should not delay the State's obligation. The State air quality agency and the EPA will be reviewing the sponsors proposal according to criteria presented in the AERC Report.

A timely State review and the AERC Letter of Assurance (see **Appendix G**) to the FAA is critical to the planning and budgeting AIP funds for the project. Because AIP and PFC programming schedules are tight, a delay by the State in its review and AERC assurance to the FAA could jeopardize an sponsor's ability to obtain funding for a VALE project in the current fiscal year, representing a project delay for the sponsor of at least one year.

If the State air quality agency does not respond within the 45-day review time, the sponsor should notify the appropriate FAA regional office. The sponsor, FAA, and EPA should work with the State air quality agency, and other State and local officials if appropriate, to resolve the delay as soon as possible.

AIP and PFC funds may not be used by the sponsor to pay for EPA, State, district, local, or Tribal reviews of VALE projects or AERC actions.

2.3.4 FAA Funding Approval

The sponsor should send the FAA's regional Airports program office an information copy of the sponsor's project proposal when it is submitted to the EPA and State air quality agency for AERC review. The program office should review this information copy for technological feasibility and cost effectiveness. Once the FAA (State copy to sponsor) has received the State's AERC Letter of Assurance (see **Appendix G**), the FAA funding application can proceed. For the PFC program, the PFC application may then be submitted by the public agency with the attached AERC Letter of Assurance.

The FAA may approve all, some, or none of the proposed airport low-emission measures based on the availability of funding, project cost effectiveness, regional considerations, and other factors in the AIP and PFC decision process. The FAA may also stipulate modifications to proposed measures as needed.

The FAA funding decision is one of several factors that could affect the sponsor's proposal between the application phase and the implementation phase. Other

factors that could affect the sponsor's acquisition and deployment of equipment could be the availability of new or improved technology, changing usage estimates, unexpected costs, or the status of participating manufacturers or operators.

2.4 Project Implementation Phase

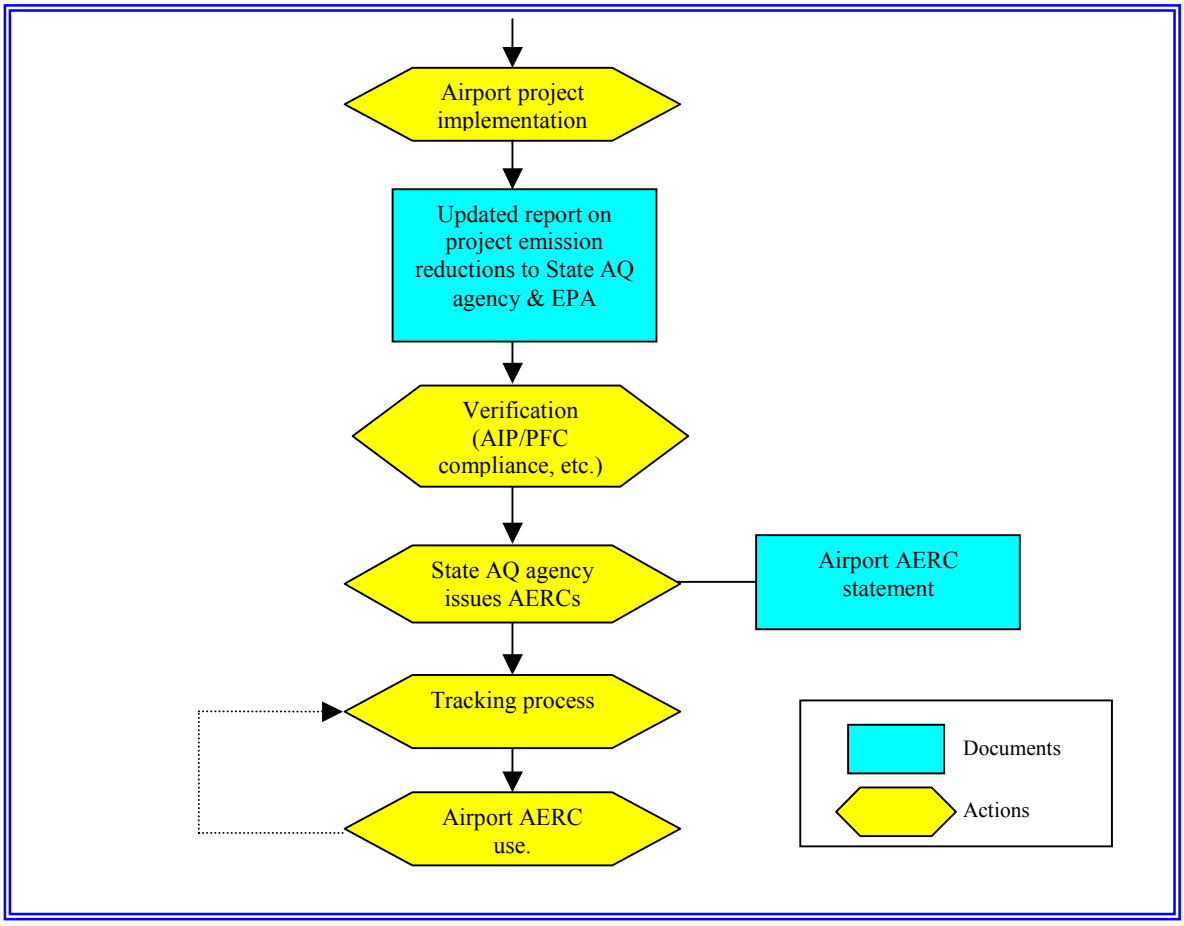
The implementation phase of the program begins with FAA funding approval. **Figure 2-2** illustrates the seven steps of project implementation.

1. Sponsor orders equipment and begins deployment
2. Sponsor revises emission reduction estimates and provides an updated report to the State air quality agency for AERCs, with copies to FAA and EPA
3. Sponsor verifies project implementation
4. State air quality agency confirms the sponsor's emission reduction calculations
5. State air quality agency issues AERCs through an AERC statement
6. Sponsor continues to tracks the progress of the project
7. Sponsor uses the AERCs, as needed, for general conformity or NSR requirements

The sponsor may decide when to submit its updated report to the State air quality agency for AERCs in the implementation phase. The sponsor's updated report should reflect project changes and adjustments in the sponsor's emission reduction estimates. If the sponsor submits the report after it has deployed major parts of its program, the sponsor should attempt, as practicable, to compare available information on actual operations with emission reduction estimates (based originally on certification, manufacturer, and/or model data).

The report should be presented to the State air quality agency in the same way as the initial application. It is expected that State program review during the implementation phase will go quickly due to the previous State review of the project application.

Figure 2-2. Flow Chart of Project Implementation Phase



CHAPTER 3
GENERAL VEHICLE ELIGIBILITY AND AIRPORT USE COMMITMENTS

This chapter addresses general vehicle eligibility requirements that are common to both AIP and PFC programs. To fully understand these requirements as they apply to VALE projects, the sponsor[16] also needs to be acquainted with the program and vehicle requirements that are specific to the AIP (Chapter 7) and to the PFC (Chapter 8) programs. Some of the differences in vehicle eligibility between AIP and PFC funded projects involve new vehicles versus retrofits, allowable fuel types, and local cost-share requirements. Another major variable between AIP and PFC programs is airport ownership of low-emission vehicles. Unlike AIP grants, PFC funding approvals[17] may include non-airport owned (tenant-owned) vehicles, such as airline GSE, as well as lease agreements between sponsors (i.e., public agencies) and third-parties for refueling and recharging stations. (see Chapter 8).

Eligible vehicles for the VALE program include airport maintenance, security, and ground service equipment (GSE) that is located at the airport and used to support aeronautical and related activities at the airport. Eligible vehicles also include certain on-road or ground access vehicles (GAV) used at the airport. All vehicles acquired or upgraded under the VALE program must be airport-dedicated and remain in operation at the airport for their useful life.

The following sections discuss general vehicle eligibility requirements and the AIP/PFC "special conditions" for vehicles acquired or upgraded through the VALE program.

3.1 Expansion of Airport Vehicle Eligibility Under *Vision 100*

The AIP and PFC programs are intended to support capital improvement projects at airport facilities. Traditionally, these projects involve airport-owned facilities, take place on airport property, and represent easily monitored fixed assets.

Prior to *Vision 100*, only a small number of airport-owned vehicles have been AIP and PFC-eligible (e.g., fire trucks, snow removal equipment) because of their essential role in

[16] Airport "sponsors" are planning agencies, public agencies, or private airport owners/operators that have the legal and financial ability to carry out the requirements of the AIP program. Use of this term in this document also refers to the PFC program, which is restricted to public agencies.
[17] PFC "approvals" include "acknowledgments" under *Vision 100*.

airport safety, capacity, and security.[18] Although low-emission models for these vehicle types were eligible also, sponsors had to provide the FAA with documentation of a CAA requirement (e.g., general conformity determination) *in advance* of funding approval. The traditional eligibility[19] for airport low-emission measures continues to exist independently of the VALE program (e.g., under AIP "entitlements").[20]

Vision 100 expands AIP and PFC eligibility to allow more funding for early and more varied airport low-emission projects. However, the financial incentives provided under the VALE program remain limited to capital improvements and do not cover operating and maintenance (O&M) costs, including fuel costs.

3.2 Incremental Vehicle Costs

Under *Vision 100*, VALE program funding is restricted to vehicle "incremental" costs. Incremental costs are defined as the differential in cost between the higher price for an eligible low-emission vehicle and the current market value for a new equivalent conventional fuel vehicle (i.e., gasoline or diesel).

Incremental cost is the differential between the higher cost of an eligible low emission vehicle and the current market value for a new equivalent conventional fuel vehicle.

The VALE program simply offers the means to eliminate the higher purchase price (i.e., incremental cost) of low-emission vehicles as a factor in the owner's decision of a replacement vehicle. By making low-emission vehicles no more expensive to purchase essentially than conventional-fuel vehicles, this program provides a reasonable incentive to buy cleaner vehicles.

The VALE program cannot be used under any circumstances to help finance the "base" costs of airport low-emission vehicles. Vehicle owners should and will buy new vehicles on their own as needed. Moreover, sponsors may not use base costs for local matching funds or as part of their financial and cost effectiveness calculations.

If AIP funding is used for the Federal portion of the incremental vehicle cost, PFC funds may be used as the local match for the AIP grant (see Chapters 7 and 8).

[18] Chapter 5, Section 5. *Safety, Security, and Related Projects* of the Airport Improvement Program Handbook, FAA Order 5100.38B, Change 1, January 2004.
[19] Chapter 5, Section 5. *Safety, Security, and Related Projects* of the Airport Improvement Program Handbook, FAA Order 5100.38B, Change 1, January 2004.
[20] *Vision 100 Act,* Section 151.

3.3 Airport-Dedicated

All equipment purchased under the VALE program must be located at the airport and serve as an integral part of airport facilities and operations. Concerning mobile equipment, all vehicles purchased and upgraded under the program must be airport-dedicated, meaning that the vehicles are located and primarily used within the airport boundary in direct support of airport services or maintenance. Minor intermittent use of on-road vehicles outside of the airport boundary is permitted but only if such use is minimal and related to its primary mission to deliver airport services at the airport.

The requirement for vehicles to be airport-dedicated is consistent with AIP and PFC program rules. It also avoids potential overlap with other Federal transportation programs and related emission reduction measures already considered as part of metropolitan transportation plans and transportation improvement programs reflected in the transportation conformity process.

Eligible vehicles include GSE and airport-dedicated on-road vehicles such as airport parking lot passenger shuttles and buses, airport security vehicles, and airport maintenance vehicles. Vehicles that are not eligible include general use cars, buses, taxis, limousines, rental vehicles, super shuttles, and other vehicles that operate to and from the airport as part of a regional transportation circuit or inter-airport service.

3.4 Level of Vehicle Usage

Vehicle owners are expected to operate vehicles acquired under the VALE program to the same level of use that was estimated in the airport sponsor's original project proposal. Vehicle owners may not substantially reduce their usage of program vehicles or park these vehicles for extended periods of time without prior notification to the FAA (and sponsors if vehicles are tenant-owned). If there is any substantial change from the projected or typical usage (hours or mileage) of vehicles, the sponsor and owners must update their actual and estimated emissions reduction data and provide this information to the FAA, EPA, and State air quality agency (see Section 3.5.3).

3.5 Special Conditions for AIP Grants and PFC Approvals

There are four "special conditions" in the VALE program that the FAA will insert into AIP grants and PFC approvals for this program. With acceptance of funding, sponsors agree to fulfill these special conditions for the VALE program, as well as the standard assurances, to ensure ongoing program compliance. The special conditions are discussed below and presented in **Appendix C**.

3.5.1 Vehicles to Remain at the Airport for Their Useful Life

In accordance with the CAA and *Vision 100*, the low-emission benefits of the program for the airport and surrounding area must be permanent. Therefore, the sponsor must certify to the FAA that vehicles and other assets acquired or contracted through the VALE program will remain in operation at the airport for their useful life. The vehicles may not be transferred to, taken to, or used at another airport without the consent of the FAA in consultation with the EPA and State air quality agency.

The sponsor must also certify that any vehicles or equipment replaced under the program, whether airport or privately owned, will not be transferred to another airport or location within the same or any other nonattainment or maintenance area. This requirement protects regional air quality, prevents adverse effects on other sensitive locations, and eliminates the possibility of duplication of VALE funding for the same vehicles or equipment that have been moved to other locations.

In the event that PFC funds are used to assist parties other than the sponsor, the sponsor shall enter into enforceable agreements with the other party to ensure that their vehicles also remain at the airport for their useful life (see Section 8.2.1). The agreements should specify what steps would be taken by the tenant to re-sell or to reimburse the PFC program if VALE-funded, tenant-owned vehicles are removed or abandoned. These PFC agreements must be signed by all parties and submitted as part of the sponsor's project application prior to PFC funding approval.

Useful life estimates are contained in Chapter 7 (AIP Program Eligibility) for typical airport-owned vehicles and in Chapter 8 (PFC Program Eligibility) for typical GSE, airline, and other privately-owned airport vehicles.

3.5.2 Equipment Labeling

All mobile and stationary equipment purchases made under the VALE program should be clearly labeled with the following logo indicating FAA sponsorship and the environmental benefits of the program. The main purpose for the labels is to enable for easier identification and tracking of VALE-funded vehicles and equipment. Manufacturing of the labels is the responsibility of the airport sponsor or participating airport parties and is an eligible project cost. The FAA will post a high-resolution graphic example of the VALE label on its website at http://www.faa.gov/arp/environmental/vale. An example is shown below in **Figure 3-1**.

Figure 3-1. Label for VALE-Funded Equipment and Vehicles

3.5.3 Tracking and Monitoring Requirements

The sponsor is responsible for the tracking and monitoring of all vehicles at the airport that are acquired or upgraded under the VALE program, including vehicles that are non-airport owned such as airline GSE. Tracking of vehicles and equipment is necessary for identification purposes and for improving the accuracy of estimated versus actual emission reductions.

Detailed annual records of VALE vehicles and equipment should be assembled and maintained by the sponsor so that these records are readily available for FAA review, public review, or auditing. In order to standardize the monitoring process, the FAA recommends the use of the tracking worksheets provided in **Appendix E** and electronically from the VALE website.

Airport sponsors are required to monitor the usage of all vehicles acquired through the VALE program and to keep up-to-date usage records.

Airport identification and usage records for project vehicles and equipment must include ownership, confirmation of program labeling, and individual identifiers such as make, model, and VIN/serial numbers. Annual usage data should be collected and maintained by individual vehicle or piece of equipment, as well as at an aggregate level by vehicle/equipment type and ownership. Vehicle usage is typically estimated or measured by annual hours of operation, fuel usage, and/or miles traveled. Additional vehicle information should include dates of deployment and major maintenance. Vehicle use estimates should be updated periodically to include as

much historical information as possible and to reflect any changes to operating demand or remaining useful life.

The sponsor's collection of financial information must include the dates of equipment orders and delivery, expenditures, and project cost effectiveness.

The sponsor must also maintain annual emissions data by criteria pollutant (in tpy). This information is important for purposes of ongoing cost effectiveness calculations and AERC verification with State air quality agencies and the EPA. The sponsor needs to provide current/updated emission reduction estimates to their State air quality agency, the EPA, and the FAA at three different times:

(1) Initially, when applying for AIP and/or PFC project funding.
(2) When applying to the State air quality agency for issuance of AERCs during project implementation.
(3) When using AERCs to meet regulatory requirements.

Historical information should be relied on as much as possible to update and refine annual emission reduction estimates into the future. If local resources permit, the sponsor is encouraged to partner with vehicle and engine manufacturers, universities, and industry to conduct vehicle emissions monitoring that supplements emission estimates obtained from certification data, manufacturer specifications, or models.

3.5.4 Replacement of Low-Emission Vehicles and Equipment for the Useful Life of the Project and AERCs

In the event that VALE low-emission vehicles or equipment are disabled (e.g., accidents or breakdowns) before the end of their useful life, the airport sponsor agrees to replace such vehicles or equipment with an equivalent unit that produces an equal or lower level of emissions. The financial responsibility for vehicle or equipment replacement under these circumstances is with the sponsor. While replacement vehicles may be eligible for AIP or PFC funding, the FAA offers no guarantee that further funding will be available or approved in the future to meet the sponsor's commitment in this area.

The agreement above assures that actual emission reductions from the program are consistent with the underlying emission reduction estimates used for granting AERCs.[21] This fulfills CAA and *Vision 100* requirements by insuring that VALE low-emission benefits for the airport and surrounding area are *permanent* for the duration of AERCs.

[21] See Chapter 6, Section 6.2 Life of AERCs, *Guidance of Airport Emission Reduction Credits for Early Measures through Voluntary Airport Low Emission Programs*, EPA, 2004.

The sponsor may choose to extend its replacement commitment into the future for up to 20 years, which is the maximum AERC life for vehicles and most equipment eligible under the program. This decision must be included in the project proposal, and reflected in the emission reduction calculations, at the time the proposal is submitted to the State air quality agency. By extending the replacement commitment beyond the typical useful life of funded vehicles and equipment, the sponsor is permitted to receive AERCs for up to the 20-year lifespan for AERCs.

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CHAPTER 4
FUEL ELIGIBILITY AND CHARACTERISTICS

The primary goal of *Vision 100* is to provide commercial service airports with the ability to purchase low-emission vehicles and equipment. To meet this goal, low-emission vehicles purchased through the VALE program must use alternative fuels or cleaner burning conventional fuels (e.g., gasoline and diesel). Under the VALE program, vehicles using both fuel types may be funded through PFCs, while AIP funding may only be applied to vehicles using eligible alternative fuels. As mentioned earlier, no AIP or PFC funds may be used to pay for the cost of fuel.

Unlike the AIR-21 legislation for the FAA ILEAV pilot program, which specified only six alternative fuels and a single low-emission (ILEV) standard for light duty vehicles, Congress recognized the need for a more sophisticated approach in *Vision 100*. As a result, *Vision 100* directs the FAA to consult with other Federal agencies to permit more alternative fuels and to establish "best achievable" low-emission standards for all vehicle weights and categories.

The FAA relied heavily on the expertise of the DOE and EPA in developing this guidance and for integrating eligible fuel and low-emission vehicle standards. There are three dimensions to VALE program requirements on fuels and low-emissions standards:

- Alternative fuels that are substantially non-petroleum based (AIP requirement)
- Clean conventional fuels and alternative fuels (PFC program)
- Best achievable low-emission vehicle standards for all program vehicles and eligible fuels regardless of funding source

The VALE program is fuel neutral to the greatest extent possible. All of the eligible alternative fuels (AIP and PFC) and clean conventional fuels (PFC only) can lead to substantial emission reductions. The sponsor must consider which fuel type does the best job of reducing emissions for the area's Level One pollutant(s), is the most cost-effective, and meets the many logistical issues regarding supply, safety, handling, and location.

This chapter discusses the types of fuels that may be used in low-emission vehicles acquired through the VALE program, as well as the comparative emissions reduction benefits and other characteristics of those fuels. Within the established framework of the program, sponsors have a great deal of flexibility to determine which fuel is most appropriate for their airport and operational needs.

4.1 Eligible Fuels Criteria

The following information is intended to help sponsors understand the characteristics and parameters for alternative fuels, their relative emission benefits, and how to weigh the various factors in developing a VALE project.

As noted previously, *Vision 100* stipulates differences in eligible fuels based on the type of funding a sponsor chooses for their VALE project.

There are some limitations that sponsors must consider in their selection of alternative fuels. First, each VALE-funded vehicle must meet program low-emission standards, regardless of the fuel used. These low-emission standards are discussed in detail in Chapter 5. Second, the VALE program is restricted to funding of capital improvements and therefore does not pay for O&M expenses, including fuel costs. Third, the sponsor, along with their project partners, must comply with all national safety standards pertaining to alternative fuel use, as appropriate, for the project vehicles and activity areas undertaken as part of the VALE program.

VALE program alternative fuels requirements under AIP funding:

- ***Cleaner burning than conventional petroleum-based fuels***
- ***Primarily non-petroleum based to enhance energy security***

4.1.1 AIP Eligible Fuels

Under *Vision 100*, if a sponsor chooses to use AIP funds to purchase low-emission vehicles, these vehicles must be powered exclusively by dedicated alternative fuels as defined by the DOE EPAct, not excluding hybrid engine systems. Under DOE EPAct guidelines, eligible alternative fuels are as follows:

- Electricity (including electricity from solar energy)
- Natural gas and liquid fuels domestically produced from natural gas – (compressed natural gas (CNG) or liquefied natural gas (LNG))
- Liquefied petroleum gas (LPG or propane)
- Hydrogen
- Mixtures containing 85 percent or more by volume of alcohol fuel with gasoline, including denatured ethanol (E85) and methanol (M85)
- Ethanol, methanol and other alcohols (100 percent)
- Coal-derived liquid fuels
- Biodiesel (B85 to B100-biofuel)
- P-series fuels[22]

[22] Section 301(2) of EPAct defines alternative fuels and sets forth authority for the U.S. DOE to add more alternative fuels to the list of authorized alternative fuels, which are defined in Section 301(2). Newly added alternative fuels are called p-series.

These alternative fuels meet the program goals of eligible EPAct low-emission fuels that are cleaner-burning than conventional fuels, are substantially non-petroleum based, and are available domestically to reduce foreign imports. Hybrid vehicles, which Congress did not want to exclude from the program, must meet program low-emission standards in the same way as other AFVs. Typical hybrid vehicle technology combines gasoline or diesel engines with shared power supply from an electric motor. Some medium and heavy-duty truck and bus original equipment manufacturers (OEMs) also plan to offer hybrid electric vehicles powered by natural gas or propane engines.

AIP funding is restricted to alternative fuels only:

- ***Electric***
- ***Natural Gas (CNG or LNG)***
- ***Propane (LPG)***
- ***Ethanol 85***
- ***Methanol 85***
- ***Hydrogen***
- ***Coal-derived liquid fuels***
- ***Biodiesel (B85 to B100-biofuel)***
- ***p-series***

and

- ***Hybrid Systems***

4.1.2 PFC Eligible Fuels

The fuel choices for the program using PFC funds are somewhat less restrictive than using AIP funds. However, the underlying requirements for achieving program low-emission standards remain the same. Provided that program low-emission standards are met, the selection of fuels using PFCs is open to all alternative and clean conventional fuels, including clean diesel, clean gasoline, and any blend of biodiesel.

Difference in program fuel eligibility:

- ***AIP funding requires alternative fuels only as defined by DOE.***
- ***PFC funding allows all alternative fuels plus clean conventional fuels.***

4.2 Clarification of AIP Alternative Fuels Technology

The discussion below provides additional information and clarification on the alternative fuels that are available to the sponsor for their VALE projects under the AIP program.

Domestic Fuel Distinctions. The DOE-designated alternative fuels approved for the VALE program are primarily domestic. Although natural gas is produced from natural gas wells as well as in conjunction with crude oil wells in the United States, Canada and Mexico, domestic usage is primarily from U.S. wells. This is why gaseous and liquid fuels derived from natural gas (CNG, LNG, and LPG) qualify as being non-petroleum based fuels and EPAct designated clean fuels, burn cleaner than conventional fuels and

lessen the Nation's dependence on imported crude oil. LPG can also be derived from the petroleum refining process, and is not considered to be an exclusively petroleum-based fuel that is part of the oil refining process. Natural gas is distributed through underground pipelines and served to compressors at CNG fueling stations to produce CNG as a vehicle fuel. Natural gas is also delivered through the same underground pipeline to strategically located liquefaction plants to produce LNG as a transportation fuel. LPG is distributed in tanks by truck and is available widely throughout the United States.

Blended Fuels and Technology. Mixtures or fuel blends are not permitted below the 85 percent minimum level for equipment to qualify for AIP funding. Eligible EPAct-designated blended fuels include E85 and M85 and satisfy *Vision 100* criterion of primarily non-petroleum based fuels, consistent with DOE eligible alternative fuels. Blended fuels are eligible in blended forms below the 85 percent minimum level only when the equipment is funded with PFCs and local funds. AIP funds cannot be included in the project. Sponsors are responsible for assuring E85 and M85 and other potential 85 alternative fuel blends are in fact being used in the program vehicles. Flexible-fuel vehicles (FFVs) automatically detect the blended fuel composition in the fuel tank, and adjust the combustion parameters accordingly for optimum engine performance.

Bi-Fuel and Dual Fuel Technology. Bi-fuel vehicles have the ability to operate on either one fuel or another, but not simultaneously. Generally, bi-fuel vehicles have two or more fuel tanks and the operator can manually switch from one fuel tank to another. Typical bi-fuel vehicles available today do not provide adequate assurance that low-emission fuels are being used and that predicted emission benefits are being realized under actual conditions. As a result, bi-fuel vehicles will not qualify for funding unless both fuels are eligible alternative fuels and the vehicle is EPA-certified or verified to meet program low-emission standards during operation of either fuel source.

Dual fuel technology is the ability to combust two fuels simultaneously (e.g., CNG and diesel). Dual fuel technology is accepted under the VALE program provided that the technology is EPA-certified to meet the program low-emission vehicle standards as follows: (1) if both fuels are AIP-eligible fuels as defined in Chapter 7, then the vehicle is eligible for AIP or PFC funding, or (2) if the fuels are a combination of alternative fuels and clean conventional fuels, then the vehicle is eligible for PFC funding only.

Hybrids. Eligible hybrid AFVs must substantially displace the vehicle's gasoline or diesel fuel use and meet the VALE program low-emission standards. In the airport environment, this should be accomplished by the intrinsic nature of airport driving conditions that demand frequent braking, which regenerates the electrical battery portion of the hybrid system. Non-propulsion and accessory functions are not considered relevant hybrid-electric applications (e.g., plugging a microwave or utility into the car's cigarette lighter) to make the vehicle eligible for AIP funding.

Fuel Cells. Fuel cells may be thought of simply as batteries that operate with hydrogen and oxygen. The energy released from the oxidation of hydrogen to water is directly

converted to an electrical current. Fuel cells may be directly fueled by hydrogen or may use reformers to generate hydrogen from methanol, natural gas, or other hydrocarbons with water. However, adding a reformer increases the cost, bulk, and complexity of the fuel cell system. Fuel cell technology used for propulsion of vehicles is in a developmental stage and is, at this time, considered to be more research in nature than commercially cost effective. Since the intent of the VALE program is to support commercially available, low-emission technology, the FAA does not expect to fund many fuel cell projects in the immediate future.

4.3 Relative Emission Benefits of Alternative Fuels

The FAA expects sponsors to choose the appropriate alternative fuels and AFV technology that reduce the Level One pollutants emitted by the proposed vehicle(s) or GSE according to the nonattainment or maintenance area criteria pollutant(s) of concern.

Table 4-1 provides a general guide to selecting alternative fuels based on the criteria pollutant causing the nonattainment or maintenance status in the vicinity of the airport. The table provides a quick comparison of each eligible alternative fuel relative to the emission performance of conventional fuels. The relative scale was developed from emissions criteria and databases commonly available on the internet from the EPA, the fueling industry, and several state agencies. To be consistent with the EPA's approach to tail pipe emission standards, the electric emissions criterion is considered to be zero at the tailpipe instead of considering the transmission efficiency throughout the electric grid and estimating stack emission at the power plant.

Table 4-1. Alternative Fuels Emissions Performance Relative to Conventional Fuels for Each Criteria Pollutant

AIP Eligible Fuels	O_3		NO_2	SO_2	PM	CO
	VOC	NO_x				
Electric	★	★	★	★	★	★
CNG	●	●	●	●	●	●
LNG	●	●	●	●	●	●
Propane	●	●	●	●	●	●
E85	●	●	●	●	●	●
M85	●	●	●	●	●	●
Hydrogen	★	★	★	★	★	★
B100	●	⊘	⊘	★	●	●

⊘ = not better ● = better ★ = best

Scale is in comparison to baseline emissions from conventional fuels.

4.4 Fuel Characteristics

This section describes the characteristics of the cleaner-burning alternative fuels that potentially meet the VALE program low-emission goals. Each alternative fuel discussed is an EPAct-designated fuel and qualifies for AIP and PFC programs. Additionally, these fuels meet the DOE's requirements of being substantially non-petroleum based and domestically available to reduce airport dependence on foreign imports.

Table 4-2 provides a guide for selecting alternative fuels based on selected fuel characteristics. The table provides a quick comparison of each eligible alternative fuel with unleaded gasoline and diesel relative to the selected fuel characteristics. The information was developed from fuel characteristics and databases commonly available on the internet, from the DOE, and from the fueling industry.

4.4.1 Electricity

Electricity can be used as a transportation fuel to power battery-electric and fuel cell vehicles. Electricity is unique among the alternative fuels in that mechanical power is derived directly from it, whereas the other alternative fuels release stored chemical energy through combustion to provide power. When used to power electric vehicles (EVs), electricity is stored in an energy storage device such as a battery. EV batteries have limited storage capacity and must be replenished by

plugging the vehicle into a recharging unit. The electricity for recharging the batteries can come from the existing power grid, or from distributed renewable energy sources such as solar or wind.

The principal benefit of using EVs is that there are no vehicle tailpipe emissions. The economic advantage of using EVs, once the relative high initial capital cost is made, comes through lower "fuel" and maintenance costs. The cost of an equivalent amount of fuel for EVs is less than the price of gasoline. Additionally, maintenance for EVs is less because they have fewer moving parts to service and replace.

4.4.2 Compressed Natural Gas (CNG) and Liquefied Natural Gas (LNG)

Natural gas is a mixture of hydrocarbons, mainly methane, and is extracted from underground either from gas wells or in conjunction with crude oil production. The interest in using natural gas as an alternative transportation fuel stems mainly from its clean burning qualities, its domestic resource base, and its availability, via underground pipelines, to end-user markets.

Natural gas can be used as a transportation fuel in either a gaseous form (compressed natural gas or CNG) or as a liquid (liquefied natural gas or LNG). CNG is dispensed into vehicles at 3,600 psi, and LNG is dispensed as super-cooled liquid at -260 ºF. In order to achieve comparable travel distances to gasoline or diesel vehicles, CNG is stored onboard as a gas in high-pressure cylinders and LNG is stored as a liquid in super-insulated tanks. To the vehicle user, performance and drivability of natural gas vehicles (NGVs) is essentially the same as for gasoline and diesel vehicles.

Natural gas is safer for storage than other liquid transportation fuels. It is lighter than air and does not pool on the ground, so it poses less of a hazard in the event of a leak or spill. The fuel storage cylinders are, of necessity, much stronger than gasoline or diesel fuel tanks, which is a safety benefit in the event of a collision. Natural gas is odorless, non-toxic and non-corrosive, cannot be absorbed through the skin, and will not contaminate ground water. The familiar "rotten egg" smell associated with natural gas is added as a safety feature for leak detection. Natural gas vehicle fueling systems are sealed or closed loop, so no gas escapes during the refueling process and virtually zero evaporative emissions are produced.

Like electricity, the economic advantage of using NGVs once the relative high initial capital cost is made comes through lower fuel and maintenance costs. Depending upon market conditions, the cost of an equivalent amount of fuel for NGVs can be less than the price of gasoline or diesel. Additionally, maintenance for NGVs can be less because the fuel does not contaminate the engine oil like gasoline and diesel. The most commonly cited benefits of NGVs include extended oil change intervals, increased spark plug life, and extended engine life.

4.4.3 Liquefied Petroleum Gas (LPG or Propane)

Liquefied petroleum gas (LPG or propane) is a mixture of various hydrocarbons (propane, propylene, butane, and butylene) that exist as gases at atmospheric pressure and temperature, and yet liquefy at higher pressures. For all such fuel mixtures in the United States, it is also named for its major constituent, propane. Propane is a natural derivative of both natural gas processing and crude oil refining.

Propane is stored onboard a vehicle at pressures between 130 and 170 psi. Within this pressure range propane exists in a liquid state. Tanks are filled to no more than 80 percent of capacity to allow for liquid expansion as ambient temperatures rise.

Propane is heavier than air and pools on the ground like other liquid transportation fuels. Propane vapors are also heavier than air and will collect at ground level like gasoline and diesel. However, propane vapors will dissipate more rapidly than vapors of gasoline or diesel fuel. Sponsors should consider placing propane storage/dispensing facilities away from confined spaces. The vehicle fuel storage cylinders are much stronger than gasoline or diesel fuel tanks. Propane is considered to be non-toxic and non-corrosive, and will not contaminate ground water.

Propane vehicles are typically converted gasoline or diesel vehicles. The economic advantage of using propane comes from lower fuel and maintenance costs. The cost of an equivalent amount of fuel for propane-powered vehicles can be less than the price of gasoline or diesel, depending on demand fluctuations in the fuel distribution market. Similar to natural gas, propane does not contaminate engine oil the way gasoline and diesel fuels do. Propane-powered vehicles also deliver extended oil change intervals, increased spark plug life, and extended engine life. Propane-powered vehicles exhibit similar tailpipe emission benefits as natural gas-powered vehicles. Propane vehicle fueling systems are also sealed or closed loop, so no gas escapes during the refueling process and virtually zero evaporative emissions are produced.

4.4.4 Hydrogen

Hydrogen (H_2) is being explored for use in internal-combustion engines (ICE) and fuel-cell electric vehicles. H_2 is the simplest and lightest fuel and is a gas at normal temperatures and pressures, which presents greater transportation and storage hurdles than what currently exists for liquid fuels. Storage systems being developed include compressed hydrogen, liquid hydrogen, and chemical bonding between hydrogen and a storage material like metal hydrides.

Unfortunately, hydrogen does not exist naturally as a fuel. H_2 must be produced. There are two methods currently used to produce hydrogen. The first is electrolysis and the second is synthesis gas production from steam reforming or partial oxidation.

Electrolysis uses electrical energy to split water molecules into hydrogen and oxygen. The electrical energy can come from any electricity production sources including renewable fuels. Fuel cell vehicles (FCVs) can then use electricity produced from an electrochemical reaction that takes place when the produced hydrogen (from electrolysis or reformation) is oxidized in the fuel cell "stack." The production of electricity using fuel cells takes place without combustion or pollution and leaves only two byproducts, heat and water.

The predominant method for producing synthesis gas is steam reforming of natural gas, although other hydrocarbons can be used as feedstocks. For example, biomass, and coal can be gasified and used in a steam reforming process to create hydrogen.

Internal-combustion engines used in today's vehicles convert less than 30 percent of the energy in gasoline to power that moves the vehicle. FCVs that reform hydrogen from gasoline can use about 40 percent of the energy in the fuel.

While no transportation distribution system currently exists for hydrogen transportation use, the ability to create the fuel from a variety of resources and its clean-burning properties make it a desirable alternative fuel.

4.4.5 Ethanol

Ethanol (E100) (ethyl alcohol, grain alcohol, EtOH) is a clear, colorless liquid with a characteristic, agreeable odor. In dilute aqueous solution, it has a somewhat sweet flavor, but in more concentrated solutions it has a burning taste. In the United States ethanol is made primarily from corn. The grain alcohol produced is denatured or poisoned prior to shipment to prevent ingestion. Like gasoline, ethanol contains hydrogen and carbon, but ethanol also contains oxygen in its chemical structure. The oxygen makes ethanol a cleaner burning fuel than gasoline.

Ethanol is blended with gasoline to improve the burning characteristics of gasoline. For a blend of ethanol and gasoline to qualify as an alternative fuel under the AIP portion of the VALE program ethanol must be mixed or blended to a ratio not less than 85 percent ethanol and 15 percent gasoline. The final product is termed "E85" and is an EPAct designated alternative fuel and qualifies as a primarily non-petroleum based fuel consistent with DOE eligibility requirements. Other blends of ethanol and gasoline may qualify under PFC funding.

The emissions from an E85 powered vehicle are the same as those from a gasoline vehicle, but lower in terms of quantity. E85 cannot be burned in a conventional gasoline vehicle. The vehicle manufacturer makes modifications to the engine and vehicle fuel system to accommodate E85. FFVs are capable of optimizing the vehicle performance when burning ethanol-blended fuels.

E85 fuel is heavier than air and pools on the ground like gasoline. E85 vapors are also heavier than air and will collect at ground level like gasoline. E85 is considered to be toxic and corrosive, since it is blended with potential contaminants from gasoline, and will contaminate ground water. Due to the corrosive nature of some alcohol fuels, fuel pumping and dispensing equipment must be properly designated without aluminum or other materials that are not compatible. Gasoline and diesel pumps cannot be used to dispense alcohol fuels until they have been modified.

4.4.6 Methanol

Methanol (M100) is a clear, colorless liquid with a faintly sweet pungent odor similar to ethyl alcohol. It is fully soluble in water. In the United States methanol is made primarily from natural gas, however it can be made from coal and biomass (e.g., wood). The alcohol produced is poisonous, can be absorbed through the skin, and cannot be made non-poisonous. Like gasoline methanol contains hydrogen and carbon, but methanol also contains oxygen in its chemical structure. The oxygen makes methanol a cleaner burning fuel than gasoline.

Like ethanol, methanol is blended with gasoline to improve the burning characteristics of gasoline. For a blend of methanol and gasoline to qualify as an alternative fuel under the AIP portion of the VALE program, methanol must be mixed or blended to a ratio not less than 85 percent methanol and 15 percent gasoline. The final product is termed “M85” and is an EPAct designated alternative fuel that qualifies as a primary non-petroleum based fuel consistent with DOE eligibility requirements. Other blends of methanol and gasoline may qualify under PFC funding.

As a vehicle fuel M85 has similar benefits as E85 in reducing both vehicle tailpipe emissions and evaporative emissions. The types of emissions from an M85 powered vehicle are essentially the same as those from a gasoline vehicle, but lower in quantities.

M85 cannot be burned in a conventional gasoline vehicle. The vehicle manufacturer makes modifications to the engine and vehicle fuel system to accommodate M85. Most FFVs are capable of using M85 as a transportation fuel. Due to the corrosive nature of some alcohol fuels, fuel pumping and dispensing equipment must be properly designed without aluminum or other

materials that are not compatible. Gasoline and diesel pumps cannot be used to dispense alcohol fuels until they have been modified.

M85 fuel is heavier than air and pools on the ground like gasoline. M85 vapors are also heavier than air and will collect at ground level like gasoline. M85 is considered to be toxic and corrosive, can be absorbed through the skin, and will contaminate ground water.

4.4.7 Coal-Derived Liquid Fuels

The main fuel in the Coal-Derived Liquid Fuel category is Fisher-Tropsch Liquids. Fischer-Tropsch technology was developed in 1923 by two German coal researchers, Franz Fischer and Hanz Tropsch. Their technology converts coal, natural gas, and low-value refinery products into high-value, clean burning fuel that can be a replacement for diesel fuel. The resultant fuel is colorless, odorless, and low in toxicity. In addition, it is virtually interchangeable with conventional diesel fuels and can be blended with diesel in any ratio with little to no modification. Fischer-Tropsch fuels offer important emissions benefits compared with diesel, reducing NOx, CO, and PM. Fischer-Tropsch Liquids is another way to use alternative fuels in diesel engines without impacting infrastructure or refueling costs. These fuels are slightly less energy dense than diesel, which could result in lower fuel economy and power. Fischer-Tropsch fuels are not currently being produced in the United States at this time and, therefore, are not widely available.

4.4.8 Biodiesel

Biodiesel (B100) (fatty acid alkyl esters) is a cleaner-burning diesel-like fuel replacement made from natural, renewable sources such as soybean oil, new and used vegetable oils, and animal fats. Just like petroleum diesel, biodiesel operates in diesel-fueled compression-ignition (CI) engines. Because biodiesel is considered to be a solvent, it should not be stored for longer than six months in fuel storage tanks or in onboard vehicle fuel tanks. As an organic substance, long-term storage of bio-fuels can also promote the growth of living organisms in the fuel tanks and should be guarded against. Additionally, the fuel should not come in contact with painted surfaces since the solvent characteristics of the fuel will degrade the paint finish.

Biodiesel should be used only in compression-ignition engines with vehicle fuel systems specially suited for the fuel. It is not advisable to use pure biodiesel in existing diesel powered engines and fuel systems without first consulting with the engine manufacturer. The solvent characteristics of the biodiesel may not be compatible with current engine and fuel system materials such as rubber gaskets

and hoses. In some cases, the engines must be retrofitted with synthetic materials that are compatible with the solvent effect of biodiesel.

Biodiesel is desirable as an alternative fuel to diesel because of its clean burning characteristics and resulting lower tailpipe emissions. One disadvantage of biodiesel is an increase in NOx emissions. This tendency is due to high concentrations of polyunsaturated compounds in the fuel. Biodiesel contains no nitrogen or aromatics and typically contains less that 15 ppm of sulfur, so it is compatible with many of the latest diesel emissions aftertreatment equipment designed for ultra low sulfur diesel or ULSD). Biodiesel contains 11 percent oxygen by weight, which accounts for its lower carbon monoxide, particulate, soot and hydrocarbon tailpipe emissions. The energy content of biodiesel is roughly 10 percent less than No. 2 diesel, therefore the vehicle miles per gallon will be reduced by approximately 10 percent. The fuel efficiency is the same as diesel.

Contamination levels in biodiesel can be reduced by storage in tanks kept free of water; tankage should have water-draining provisions on a scheduled basis. Underground or isothermal storage is preferred in order to avoid temperature extremes because high storage temperatures accelerate fuel degradation. Therefore, above-ground storage tanks should be sheltered or painted with reflective paint. Fixed roof tanks should be kept full to limit oxygen supply and tank breathing. The use of air-tight sealed containers, such as drums or totes, can enhance the storage life of biodiesel. Copper and copper-containing alloys should be avoided with biodiesel due to increased sediment and deposit formation. Contact with lead, tin, or zinc can also cause increased sediment levels that can rapidly plug filters and should be avoided.

4.4.9 P-Series

P-Series fuel is a unique blend of natural gas liquids (pentanes plus), ethanol, and the biomass-derived co-solvent methyltetrahydrofuran (MeTHF). The ethanol and MeTHF can be derived from renewable domestic feedstocks, such as corn, waste paper, cellulosic biomass, agricultural waste and wood waste from construction. P-series fuels are clear, colorless, liquid blends.

These fuels are designed to operate in flexible-fuel vehicles that can run on E85, or gasoline or any blend of the two. The P-series fuels emissions are generally below those of reformulated gasoline and are well below federal emissions standards. These fuels are not currently being produced in large quantities and are not widely used.

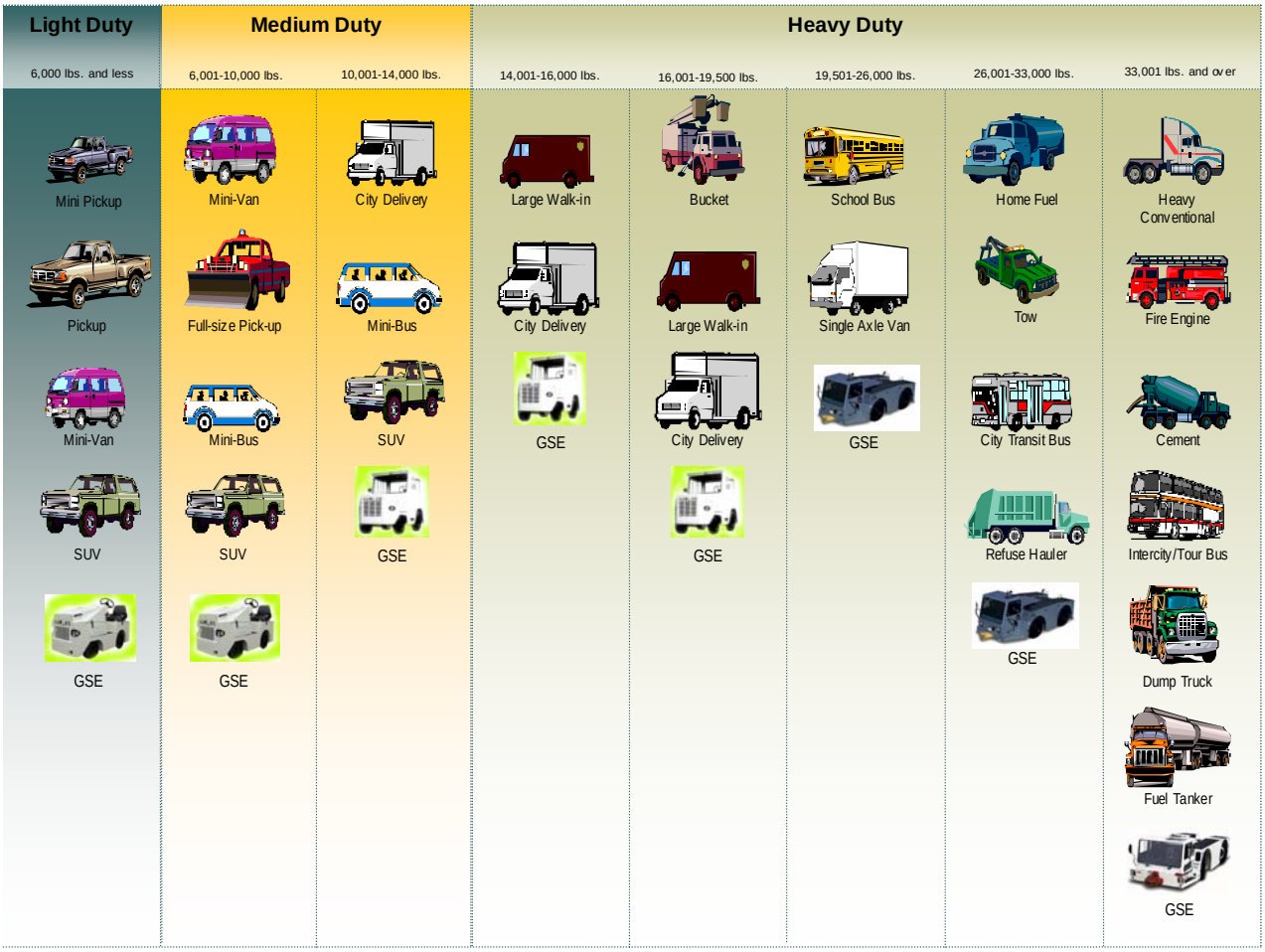
Table 4-2. Fuel Characteristics

Property	Unit	Fuel									
		Diesel (No. 2)*	**Automotive Gasoline***	**Compressed Natural Gas (CNG)**	**Liquefied Natural Gas (LNG)**	**Propane (LPG)**	**Ethanol (E85)**	**Methanol (M85)**	**Hydrogen**	**Biofuel (B100)**	**Biodiesel (B20)***
Higher Heating Value(HHV) (60^0F Liquid)	Btu/lb	19,400 avg	20,100 avg	22,179	23,890	21,489	12,770	9,751	61,000	unknown	16,928 - 17,996
	Btu/gal	138,700 avg	125,000 avg	140	84,242	90,830	84,532	64,732		117,000	unknown
(Gas at 60^0 F & 1 atm)	Btu/scf	NA	NA	1,050	1,010	2,516		867	317	NA	NA
Lower Heating Value (LHV) (60^0 F liquid)	Btu/lb	18,300	18,900	20,476	21,501	19,757	11,531	8,559	51,532	unknown	15,700 - 16,735
	Btu/gal	131,000	117,180	124	75,818	83,509	76,331	56,819		115,993	120,900
(Gas at 60^0 F & 1 atm)	Btu/scf	NA	NA	930	909	2,315	unknown	766	267	unknown	unknown
Heat of Vaporization (at boiling point)	Btu/lb	90	150	219	219	183	359	463	192.1	unknown	189
Density:											
Liquid at 60^0 F, except methane	lb/ft^3	52.7	46.4	NA	23.6	31.6	49.5	49.7	NA	unknown	55.7
	lb/gal	7.05	6.2	NA	3.16	4.23	6.62	6.64	NA	unknown	7.450
Gas at 60^0 F & 3,000 psig	lb/ft^3	NA	NA	10.6	10.5	unknown	NA	NA	unknown	NA	NA
Vapor gas at 60^0F & 1 atm	lb/ft^3	0.30 – 0.45	0.15 – 0.30	0.0454	0.0423	0.116	0.121	0.084	unknown	NA	NA
Storage Volume Relative to Diesel	%	100%	110%	445%	190%	154%	170%	228%	1,722%	110%	108%
Reid Vapor Pressure	psia	0.02 – 0.2	7 - 14	2,400	NA	189	2.31	4.63	(gas)		<<1
Flammability Limits (by volume)	lower	0.60%	1.40%	5.00%	5.00%	2.00%	3.28%	5.50%	4%	unknown	0.6%
	upper	5.50%	7.60%	15%	15%	9.50%	19.00%	44.00%	75%	unknown	7.5%
Autoignition Temperature	^{0}F	480	495	999	999	919	793	867	1,050	unknown	482

* Only eligible for PFC funding, provided that the tailpipe emissions meet the prescribed program standards.

Table 4-3 is a generic illustration of the types of vehicles that fall into different weight classes that are applicable to the VALE program. It is offered as a general reference to assist sponsors in their decision process. Notice that certain vehicles of the same type can be produced in different sizes, thereby spanning several weight classes.

Table 4-3. Vehicle Types by Weight Class



4.5 Proposed Alternative Fuels Evaluation Checklist

The following checklist is provided to help sponsors to evaluate which alternative fuel(s) would be best for the airport. These guidelines are simply intended to raise some of the more important issues and the available alternatives. They are by no means exhaustive or applicable to all airports in all cases. Also, for those sponsors that are interested in building an alternative fuels fueling station, please see Chapter 6 for possible footprint sizes for various alternative fuels fueling stations.

General checklist for evaluating alternative fuels for airport use.

1. Asses your existing vehicle fleet
    a. Inventory your current fleet
        i. What vehicles are due to be replaced?
            1. In the current year?
            2. Beyond the current year?
    b. Project future fleet needs
        i. Rate of fleet turnover
        ii. New vehicles needed
        iii. Changes in fleet mix: Auto/LD/MD/HD/Transit/Specialty
2. Analyze the existing fueling infrastructure
    a. Plot service area for existing fueling infrastructure
    b. Fleet Fueling Assessment
        i. Physical considerations
            1. Location of existing stations
            2. Excess space availability
            3. Availability of alternative fuel locally
        ii. Security
        iii. Ingress/Egress
    c. Build a new fueling facility?
        i. Evaluate usability
        ii. Determine type of alternative fuel for fueling station
        iii. Design and construction
        iv. Sizing, equipment selection, specifications
        v. Contractors
3. Understand alternative fuel characteristics
    a. Safety Parameters (flammability, etc.)
    b. Energy content
4. Economics
    a. Cost of available fuels
    b. Cost to build a fueling station
    c. Ownership options (PFC)
    d. Partnerships towards regional air quality
5. Consider available AFV options
6. Decide on an implementation strategy

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CHAPTER 5
PROGRAM LOW-EMISSION VEHICLE STANDARDS

All vehicles acquired through the VALE program must meet the program's low-emission vehicle standards. In *Vision 100*, Congress directed the FAA to develop low-emission vehicle standards that are best achievable in terms of the balance between low-emission reductions and the commercial availability of technology. The selected program standards described below are based on EPA national vehicle emission standards and are referenced in some cases to appropriate California Air Resources Board (CARB) standards. In consultation with the EPA, the FAA will review its program low-emission standards on an annual basis, updating them as needed.

The VALE emission standards apply to all eligible fuel types, whether they are AIP-eligible (alternative fuels) or PFC-eligible (alternative fuels and clean conventional fuels). For purposes of the PFC program, "clean conventional fuels" are eligible options to conventional fuels if they lower vehicle emissions to meet program low-emission standards.

Sponsors do not have to replace vehicles and equipment purchased or upgraded through the VALE program in response to future EPA new vehicle standards or VALE program low-emission standards.

The VALE program is based on EPA tailpipe emissions and <u>not</u> the "well-to-wheels" approach that accounts for the full energy production cycle, including emissions from power plants, transmission losses, etc.

The main purpose for establishing program low emission vehicle standards is the need for cost effectiveness (i.e., emission reductions per project dollar spent). Using standards developed for the VALE program, the FAA will ensure that available funding for low-emission technology is an effective investment for as many years as possible over the useful life of vehicles and other equipment. The FAA is not interested in funding low-emission projects that simply offer a marginal benefit in the near term. Rather, the FAA is looking for effective long-range investments for which project emission reductions exceed minimum standards and are considered "surplus" for many years.

The FAA is also interested in simplifying low-emission standards for sponsors by focusing solely on tail pipe emission standards. Although the emissions from evaporation of fuels, hot soak, and crank cases are valid and sometimes substantial, the inclusion of these emissions would increase the complexity of the VALE program for sponsors.

The program low-emission vehicle standards are based on a number of factors related to EPA national standards. For example, there are separate standards for on-road and non-road vehicles and for spark-ignited (gasoline) and compression-ignited (diesel) engines. There are also different standards based on the weight and class of vehicles, such as light, medium-, and heavy-duty trucks.

Developing effective low-emission vehicle standards for the VALE program was difficult for several reasons. For example, in some vehicle categories, there are not enough Federal low-emission standards, or enough flexibility in those standards, from which to make an easy program choice. Sometimes the present EPA low-emission standards for a particular vehicle category are not stringent enough or else they are too stringent, at least for the next few years while vehicle manufacturers endeavor to meet them. In addition, EPA low-emission standards are generally developed on the basis of fleet averaging and monitored by the EPA on the basis of individual manufacturers. In contrast, the VALE program is oriented to individual airport facilities and the acquisition of individual airport vehicles that must each meet its applicable low-emission standard, regardless of manufacturer or owner.

Light-duty vehicles are a good example of EPA fleet averaging for emissions. Specifically, the total population of light-duty vehicles produced within a model year is balanced by emissions performance centered on the EPA Tier2-Bin5 emissions standard (ranging from the cleanest Bin1 to the dirtiest Bin10). In contrast, the best achievable low-emission standard for light-duty vehicles purchased and deployed under the VALE program (Tier2-Bin3) is more stringent than the Tier2-Bin5 industry fleet average. Again, this judgment is based on the fact that each VALE-funded vehicle is evaluated for program eligibility based on its individual emissions performance.

In order for vehicles to be eligible for AIP or PFC funding under the VALE program, the vehicles or engines must be certified or verified by the EPA to meet the program's low-emission vehicle standards. These standards are purposefully set at cleaner levels than the present regulated emission levels for all categories.

New vehicles purchased under VALE must be obtained directly from an OEM or associated dealer. Under the additional provisions of the PFC program, qualified low-emission VALE vehicles may be retrofitted (e.g., with aftermarket pollution control devices) or re-powered as long as these systems meet the program low-emission vehicle standards. Sponsors may also pursue retrofit and re-powered vehicles through the separate AIP Airport Ground Support Equipment Emissions Retrofit pilot program (see Chapter 7, Section 7.5).

The program low-emission standards are intended to produce the greatest amount of emission reductions and AERCs. The emission standards are broken down into five vehicle categories, comprised of three standards for on-road and two for non-road vehicles:

- On-road light-duty vehicles and trucks

- On-road medium-duty vehicles (MDV)
- On-road heavy-duty diesel vehicles (HDDV) and heavy-duty gasoline vehicles
- Non-road gasoline vehicles
- Non-road diesel vehicles

Dedicated electric drive vehicles, which EPA rates as zero emissions, meet the program standards in all categories.

5.1 On-Road Program Low-Emission Standards

The following three sections describe the program on-road vehicle standards.

5.1.1 Vehicle Category 1 – On-Road LDV

Vehicle Category 1	Program Low-Emission Standard
On-road Light-Duty Vehicles (LDV) and Light-Duty Trucks (LDT)	Tier2-Bin3

Vehicle Category 1 is focused on the on-road light-duty vehicles, both passenger cars and trucks, that would be used at an airport. The typical weight range for this category is less than 6,000 pounds GVWR. Regulatory descriptions for the light-duty pickup trucks in this category can be described in as either light light-duty trucks or heavy light-duty trucks. Relative to GSE and other airport service vehicles, on-road light-duty vehicles represent a small population at airports.

Commercial Availability. The EPA's Green Vehicle Guide[23] indicates that there are several passenger car vehicle models that are certified to this stringent standard and are commercially available today. In addition to currently available models, the EPA expects more models to be certified to this standard with each coming model year. In this category, the sponsor may also take advantage of numerous other models of LDVs certified to a cleaner Californian SULEV2 standard.

At the start of the VALE program, there were no LDTs certified to the Tier2-Bin3 standard. However, the FAA expects that technology advances will allow both light-LDTs and heavy-LDTs to meet the recommended low-emission standards in the foreseeable future. For instance, several OEM manufacturers have recently started offering pickup hybrid vehicles to commercial fleet owners.

[23] www.epa.gov/greenvehicles/

5.1.2 Vehicle Category 2 – On-Road MDV

Vehicle Category 2	Program Low-Emission Standard
On-road Medium-Duty Vehicles (MDV)	Tier2-Bin6 or any engine/fuel type certified to meet Tier2-Bin6 standards for Level One pollutants

MDVs include larger vehicles such as passenger and cargo vans. Vehicles of this size are popular at airports nationwide because of their passenger/cargo storage capacities. Fleet averaging methodology applies to certified emissions from MDVs as well as for the smaller LDVs. Since MDVs and LDVs are averaged together, the heavier MDVs are typically found on the "dirtier" side of the fleet average standard of Tier2-Bin5.

Commercial Availability. According to the EPA Green Vehicle Guide, the Tier2-Bin6 standard includes two CNG-powered Ford Econoline model vans at approximately 8,500 pounds GVWR each. Unfortunately, Ford is discontinuing their CNG-powered vehicles after MY2004.

Flexibility Provision: In recognition of the current limited availability of MDV at the Tier2-Bin6 level, sponsors have the option of acquiring alternative-fueled or hybrid MDVs that are EPA-certified to meet Tier2-Bin6 standards for the applicable Level One pollutants only. For example, if the airport is located in an ozone nonattainment area, the proposed AFV must meet the low-emission standards for both NOx and NMOG. For a CO nonattainment area, the proposed AFV must meet the low-emission standard for CO only. Likewise, for PM nonattainment, the proposed AFV must meet the low-emission standard for PM only.

The FAA provides this flexibility provision because there is a shortage of vehicles in this category to meet the low-emission standards at this time. The sponsor may use this provision only if it can demonstrate that there are no reasonable commercial options available for similar vehicle types that meet the low-emission standards for all pollutants. Sponsors should consult the EPA Greenbook website, OEMs, and other information sources in making this demonstration.

New technology is expected to catch up with the Vehicle Category 2 standards soon. Once reasonable commercial availability exists for this category, then the flexibility provision will no longer be valid.

5.1.3 Vehicle Category 3 – On-Road HD Diesel and Gasoline Vehicles

Vehicle Category 3	Program Low-Emission Standard
(3a) On-road Heavy-Duty Diesel Vehicles (HDDV) & (3b) Heavy-Duty Gasoline Vehicles	EPA On-road Heavy-Duty Emission Standards for 2007 for all pollutants, except: (3a) 1.5 g/bhp-hr interim NOx standard for HDDV through MY2006 & (3b) 0.2 g/bhp-hr NOx standard for HD gasoline

On-road Heavy-Duty Diesel Standards. On January 18, 2001, the EPA established stringent emission standards for on-road HDDV that will be phased-in beginning in 2007 (50 percent of the fleet) and be complete in 2010 (100 percent compliance). The on-road HDDV emission standards coincide with the mandate for all on-road HDDV to use ultra-low sulfur diesel (ULSD) beginning in 2006. Under these promulgated standards, on-road heavy-duty engine manufacturers are attempting to meet the 0.2 g/bhp-hr NOx standard. At this time, however, no diesel engine manufacturer can certify that their engines meet this standard.

The FAA accepts the EPA 2007 0.2 g/bhp-hr NOx standard as its low-emission standard for 2007 through 2009. However, because of the difficulty achieving this NOx standard today, the FAA will use an interim NOx standard for two years that challenges technology yet provides adequate commercial availability. The FAA's choice of an interim low-emission NOx standard is based upon CARB's decision to relax the on-road HDDV standard to 1.8 g/bhp-hr combined for NOx+NMHC, effective 2004 through 2006. The FAA selects a slightly more stringent interim standard of 1.5 g/bhp-hr combined for NOx+NMHC through 2006 for on-road HDDV, based on a survey of available certified engines for MY2004.

On-road Heavy-Duty Gasoline Standards. HD on-road gasoline trucks are common at airports for food catering deliveries and bulk transport of materials. The current emission standards for gasoline trucks (spark-ignited or "SI") mandate a 1.0 g/bhp-hr for NOx+HC starting in MY2005. Ultimately, the NOx standard for on-road SI engines will match the 2007 diesel NOx standard (0.2 g/bhp-hr) beginning in 2008. For the VALE program, clean gasoline vehicles purchased with PFC funds must meet the program low-emissions standard for on-road heavy-duty SI engines of 0.2 g/bhp-hr NOx, valid through FY 2007.

On-road Heavy-Duty Alternative Fuel and Clean Diesel Vehicles. For AFVs purchased under the program, including clean diesel vehicles purchased with PFCs, sponsors must select heavy-duty vehicles that meet the interim diesel NOx+NMHC standard of 1.5 g/bhp-hr in addition to meeting the other pollutant standards.

Commercial Availability. Based on a survey of MY2004 certification data for HD on-road engines, FAA is aware of John Deere (3 engine families) and Mack

Trucks Inc. (1 engine family) engine manufacturers that have certified to the interim NOx+NMHC low-emission standard of 1.5 g/bhp-hr or cleaner.[24] In addition, the CARB Carl Moyer Program in California has a 2004 ISE heavy-duty gasoline/hybrid bus engine and a 2004 Ford 225 hp heavy-duty Otto cycle engine certified at or below this standard.[25]

In MY2004, General Motors has certified two on-road heavy-duty gasoline engines to the 0.2 g/bhp-hr NOx standard or cleaner. This data provides positive indication that there is commercial availability to achieve the low-emission standards for Vehicle Category 3, with expanded commercial availability anticipated for subsequent model years. Therefore, no flexibility provision will be allowed for Vehicle Category 3.

5.2 Non-Road Program Low-Emission Standards

The following two sections describe the program non-road vehicle standards. Sponsors interested in purchasing non-road AFVs are allowed to meet the less stringent standards between Vehicle Category 4 (gasoline) and Vehicle Category 5 (diesel).

5.2.1 Vehicle Category 4 – Non-Road Gasoline

Vehicle Category 4	Program Low-Emission Standard
Non-road Gasoline Vehicles	EPA Blue Sky Engine Program

The only regulatory mechanism that preserved adequate cost effective emission reductions for large SI nonroad engines is the EPA's voluntary Blue Sky Engine program, which mandates qualifying emission standards of 0.6 g/bhp-hr for NMHC+NOx and 3.3 g/bhp-hr for CO. EPA-certified vehicles that meet Blue Sky program low-emission standards are eligible. Note, the Blue Sky program does not set a PM standard. Therefore, airports located in PM nonattainment or maintenance areas must meet the NMHC standard as a surrogate to PM, as shown in **Table 5-1**.)

Commercial Availability: To date, no engine manufacturer has certified their products under the Blue Sky program. However, the FAA is aware of many electric equipment manufacturers that produce battery-powered GSE and other electric nonroad vehicles that meet the low-emissions criteria for this vehicle category. Therefore, sponsors are encouraged to pursue electric and other AFVs certified to meet the Blue Sky Engine Standards.

Flexibility Provision: There may be non-road vehicle types that do not have a commercially available electric version or equivalent that meets the low-emission

[24] United States EPA MY2004 engine certification data. http://www.epa.gov/otaq/certdata.htm
[25] ARB Carl Moyer Program website. http://www.arb.ca.gov/msprog/moyer/certeng.htm

standards for all pollutants. In this case, the FAA provides the flexibility to acquire non-road AFVs (including hybrids) that are EPA-certified to meet the less stringent standard of Vehicle Categories 4 and 5 for the applicable Level One pollutant(s) only.

For example, if the airport is located in an ozone nonattainment area, the proposed non-road AFV must meet the low-emission standards for both NOx and NMOG. For a CO nonattainment area, the proposed AFV must meet the low-emission standard for CO only. Likewise, for PM nonattainment, the proposed AFV must meet the low-emission standard for PM only.

The FAA provides this flexibility provision because there is a shortage of vehicles in this category to meet the low-emission standards at this time. The sponsor may use this provision only if it can demonstrate that there are absolutely no other vehicles commercially available that meet the low-emission standards for all pollutants. Sponsors should consult the EPA Greenbook website, OEMs, and other information sources in making this demonstration. Once reasonable commercial availability exists for this category, then the flexibility provision will no longer be valid.

5.2.2 Vehicle Category 5 – Non-Road Diesel

Vehicle Category 5	Program Low-Emission Standard
Non-road Diesel Vehicles	Tier 4 or any engine/fuel type that is EPA-certified to meet Tier 4 standards for Level One pollutants

The recently approved Tier 4 nonroad clean diesel regulations set a goal to reduce nonroad diesel emissions based on the use of ultra low sulfur diesel (ULSD) beginning in 2008. The availability and use of ULSD will allow engine manufacturers to use increasingly advanced clean engine technologies that will meet Tier 4 emission requirements for 2014. The Tier 4 low-emission standard will be used in VALE program for nonroad diesel engines.

Commercial Availability. The FAA is aware of many electric equipment manufacturers that produce battery-powered GSE and other electric nonroad vehicles that meet the low-emissions criteria for this vehicle category. Therefore, sponsors are encouraged to pursue electric and other AFVs certified to meet the Tier 4 Standards.

Flexibility Provision: There may be non-road vehicle types that do not have a commercially available electric version or equivalent that meets the low-emission standards for all pollutants. In this case, the FAA provides the flexibility to acquire non-road AFVs (including hybrids) that are EPA-certified to meet the less

stringent standard of Vehicle Categories 4 and 5 for the applicable Level One pollutant(s) only.

For example, if the airport is located in an ozone nonattainment area, the proposed non-road AFV must meet the low-emission standards for both NOx and NMOG. For a CO nonattainment area, the proposed AFV must meet the low-emission standard for CO only. Likewise, for PM nonattainment, the proposed AFV must meet the low-emission standard for PM only.

The FAA provides this flexibility provision because there is a shortage of vehicles in this category to meet the low-emission standards at this time. The sponsor may use this provision only if it can demonstrate that there are absolutely no other vehicles commercially available that meet the low-emission standards for all pollutants. Sponsors should consult the EPA Greenbook website, OEMs, and other information sources in making this demonstration. Once reasonable commercial availability exists for this category, then the flexibility provision will no longer be valid.

5.3 Summary of Program Low-Emission Vehicle Standards

The standards in **Table 5-1** are in effect for the present time to ensure the best achievable program emission benefits. These standards will be reviewed annually and may be modified in the future, in consultation with the EPA, to reflect changing EPA standards, advances in vehicle, engine, and tailpipe technologies, and FAA program cost-effectiveness considerations.

Table 5-1. Program Low-Emission Standards for the VALE Program

On-Road Vehicles:

Vehicle Category	Vehicle Classification	Best Achievable Low-Emission Standard	NOx (g/mile)	NMOG (g/mile)	CO (g/mile)	PM (g/mile)
1	LDV & LDT	Tier 2-Bin3 or	0.03	0.055	2.1	0.01
		SULEV2	0.02	0.03	1.0	0.01
2	MDV	Tier 2-Bin6 or EPA-certified to meet Tier 2-Bin6 standards for Level One pollutants	0.1	0.09	4.2	0.01
			NOx (g/bhp-hr)	NMHC (g/bhp-hr)	CO (g/bhp-hr)	PM (g/bhp-hr)
3a	HDDV	Interim combined NOx+NMHC (valid through FY2006)	1.5 (combined standard)		7.0	0.01
		EPA 2007 emission standards (valid for FY2007 to FY2009)	0.2	0.05	5.0	
3b	Heavy-Duty Gasoline Vehicles	EPA 2008 emission standards (valid through FY2007)	0.2	0.14	7.2	

Non-Road Vehicles:

Vehicle Category	Vehicle Classification & Standard	Maximum Engine Power (hp)	PM (g/bhp-hr)	NOx (g/bhp-hr)	NMHC (g/bhp-hr)	NOx + NMHC (g/bhp-hr)	CO (g/bhp-hr)
4	Non-road GSE – Gasoline Blue Sky Engine Standards[26] (listed) for any engine/fuel type	> 25	Meet NMHC standard as surrogate for PM	0.48 [26]	0.12 [26]	0.6	3.3
5	Non-road GSE – Diesel Tier 4 standards (listed) or any engine/fuel type EPA-certified to meet Tier 4 standards for Level One pollutants	< 25.5	0.30	na	na	5.59	4.92
		25.5 ≤ Hp < 75.1	0.02	na	na	3.50	3.73
		75.1 ≤ Hp < 174.3	0.01	0.30	0.14	na	3.73
		174.3 ≤ Hp ≤ 751	0.01	0.30	0.14	na	2.61
		Hp > 751	0.02 *	0.50 *	0.14 *	na	2.61 *
			0.03	2.61	0.14	na	2.61

**** Emission standards apply to non-road diesel engines greater than 751 Hp that power generator sets only.***

[26] The EPA voluntary Blue Sky program only establishes a combined standard for NMHC+NOx for large SI nonroad engines. Based on discussions with EPA, this combined standard can be assumed to be an 80/20 split between NOx/NMHC for purposes of certifying engines to meet Level One pollutant standards.

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CHAPTER 6
INFRASTRUCTURE ELIGIBILITY AND FUEL FACILITY GUIDELINES

6.1 Infrastructure Project Eligibility

Eligible infrastructure projects for the VALE program must contribute directly to emission reductions at the airport. Eligible low-emission equipment or facilities must reduce emissions by virtue of either vehicle displacement, fuel conversion, and/or reduced conventional fuel consumption at the airport, such as refueling or recharging systems that service airport AFVs.

The following is a description of the most common types of low-emission infrastructure that are eligible for this program. Other infrastructure activities not listed below may be eligible. However, sponsors must receive FAA pre-approval for any type of system or equipment that is not discussed below.

Infrastructure development funded through this program must be airport owned and located within the airport boundary. A lease option is available to the sponsor under the PFC program for equipment that supports AFVs directly (i.e., refueling and recharging stations) (See Chapter 8). The main reasons for airport ownership are program accountability and the need to avoid potential problems with tenants or operators that relocate or have economic difficulties.

For any proposed infrastructure measure, the sponsor must demonstrate the direct connection between this acquisition or development and the direct and permanent reduction of airport emissions. The sponsor must also show that the proposed activity is in compliance with all relevant AIP, PFC, and VALE funding conditions and requirements.

Program infrastructure funding through the VALE program is limited to the airport boundary and further limited to the portion of an eligible airport project that is directly associated with the VALE program. For example, funding for electric power upgrades to support gate electrification or vehicle rechargers is limited to system elements within the airport boundary as well as to electrification demand that is directly related to eligible VALE activities, excluding other airport or facility electrification needs that may or may not be AIP or PFC eligible independently. In effect, the FAA will not make the VALE AIP discretionary resources available for non-low-emission, non-germane activities.

6.1.1 AFV Refueling and Recharging Stations

AFV refueling and recharging stations are eligible for funding, including fast-chargers, on-site fuel storage tanks, and other stationary components needed for operation of the station. Airport ownership of refueling, recharging stations/rechargers is required. However, if purchased with PFC funding, the sponsor may lease operation of these facilities to a third-party (see Chapter 8).

In terms of station capacity, the FAA limits the size of the facility to the planned and reasonably foreseeable future requirements of the airport. Sponsors may size the facility to the maximum size needed to service the anticipated level of airport AFVs, plus some additional limited capacity for public fleets (see discussion of public access below). Specifically, sponsors may size the VALE-funded fueling station so that the maximum intended airport use consumes 90 percent of the capacity of the station. No more than 10 percent of station capacity can be dedicated to public use. During the interim period between the operational start of the refueling and recharging station and the full 90-100 percent use of the station by airport AFVs, the sponsor may allow public access on a temporary basis up to the existing capacity of the station.

6.1.2 Public Access to AFV Stations

VALE funding is intended primarily for airport operations and vehicles. However, the sponsor may grant limited **public access** to airport refueling and recharging stations supported by the VALE program under certain conditions. If public access is granted to these facilities, the sponsor must assure that security and public safety are guaranteed. These conditions can be met only if the airport refueling or recharging station is located at a reasonable distance from the airport terminal and outside of the main airport security areas.

Public access to refueling and recharging stations is allowed if security and public safety are guaranteed.

The sponsor should certify public users and track their use of the facility. If public access is granted, the sponsor and airport vehicles are entitled to priority use of the facility. Public access to the facility cannot delay or impede the use of the facility for airport needs. Moreover, airport vehicles also have priority use in the event of fuel shortages.

Sponsors may wish to coordinate with other operators in the area that have AFV refueling or recharging stations (e.g., freight depots, van shuttle services). Although these fleets are not eligible for funding under the VALE program, an informal arrangement to assist each other in case of equipment failure or emergency can provide a useful back-up plan for airport operations.

The sponsor may claim some emission reductions (and AERCs) from non-airport or non-airport owned low-emission vehicles that use airport refueling and recharging stations purchased with assistance from the VALE program. (See Chapter 9 for assessment methodology and the EPA AERC Report).

6.1.3 Gate Electrification

Gate electrification is the aircraft equivalent of vehicle idle reduction. Its purpose is to provide conditioned air and electrical service for an aircraft while parked at a gate. It eliminates or reduces the use of a higher-emitting on-board aircraft auxiliary power unit (APU) powered by jet fuel or a mobile GSE unit that runs on diesel.

Aircraft gate electrification projects include directly related upgrades to the power supply from the airport boundary to the terminal building, electrical improvements at aircraft gates, and power improvements within gate areas that provide electricity for aircraft auxiliary power and recharging for airport GSE.

6.1.4 Power Plant, HVAC, and Generator Conversions to Cleaner Fuel

Airports may build or retrofit power plants and HVAC equipment located within the airport boundary if the proposed improvements use eligible alternative fuels and displace the use of conventional fuels. Eligible power production may be derived from solar and photovoltaic systems, hydrogen fuel cells, wind power, and natural gas. Airports may also develop cogeneration facilities, which are eligible to the extent that they directly displace conventional fuels, and provide electricity and hot water/steam to the airport for power, heating, and other essential functions.

Eligible costs for power plant construction are related to the emissions saved by displacing the use of conventional fuels and to provide electric power for:

- Aircraft at the gate
- Low-emission airport ground transportation vehicles
- Emergency back-up power required for aircraft at the gate and for airport ground transportation vehicles

6.1.5 Underground Fuel Hydrant Systems

Underground fuel hydrant systems deliver aviation fuels from the bulk storage tanks to the individual aircraft gates. Construction and development of underground fuel hydrant systems within the airport boundary are eligible to the

extent that the system directly reduces the number and usage of fuel trucks at the airport.

6.1.6 Public Transit Projects at the Airport

Projects on the airport that displace or remove vehicles from airport roadways, such as people mover systems, public transit lines (only the section on airport boundary that goes to/from the airport), and intermodal connection stations may qualify for VALE funding. For public transit projects, the sponsor may use VALE funding as appropriate to complement other Federal transportation funding that may be used for different portions of the system.

6.1.7 Activities Not Eligible

Eligible activities for the VALE program must be designed and implemented primarily for the purpose of airport emission reductions. Among activities that are generally not eligible are projects that may reduce airport emissions but are designed for and around other requirements such as operational efficiency, cost, and safety (e.g., parking lots, rental car consolidation facilities, fuel farms). Other projects that are not eligible are research-related projects (see Chapter 10) and private revenue producing projects, unless specifically permitted under AIP and PFC programs (e.g., See Chapter 8.5, PFC lease agreements for refueling and recharging stations).

6.2 Fuel Facility Guidelines

This section discusses fueling facility considerations for each of the fuels in **Table 6-1, Fueling Stations** (see below). The Fueling Station Footprint shown in the considerations column of the table compares the size of a selected alternative fuel fueling station to a conventional gasoline/diesel fueling station.

6.2.1 Electric

Although electricity is considered an alternative fuel, it is technically not a fuel, but rather a pure energy source. Therefore some considerations that apply to other alternative fuels do not apply to electricity.

Fuel Availability: An electric charging station may be installed where there is access to the local electric utility power distribution system.

Fueling Station Footprint: Because there is no fuel to be stored, electric vehicle charging stations are much smaller than conventional gasoline/diesel fueling stations. The space needed to park vehicles at the rechargers must be considered.

Special Handling Requirements: There are two different charging systems commercially available. "Fast-fill" or magnetic inductive charging systems employ a paddle-like connector that is inserted into a slot in the vehicle. Magnetic induction is used to transfer energy from the charging station to the vehicle. There is no direct flow of current. This method optimizes charging capabilities using intelligent computer controllers and extends battery life by means of "opportunity charging." "Slow-fill" or conductive charging systems are plugged in the same manner as a home appliance. Current flows from the station to the vehicle.

6.2.2 Compressed Natural Gas (CNG)

Fuel Availability: A CNG fueling station may be located wherever there is access to the local gas utility natural gas distribution or transmission system. The expense of extending the underground gas piping system significant distances may be a consideration.

Fuel Storage: CNG is stored above ground in high-pressure steel vessels. This significantly increases the footprint of fueling stations that employ storage banks.

Fueling Station Footprint: Broadly speaking, there are three approaches to fueling compressed gas on vehicles. Each has different footprint characteristics, and each is discussed separately below.

The first CNG method, *Time-Fill*, requires that a vehicle remain connected to the dispenser for a period of hours. This is a very economical and small footprint approach that can be integrated into a vehicle storage facility or yard. In a typical application, vehicles are active during the day and then return to a central facility at night. A small, inexpensive compressor system is used to compress the natural gas onto the vehicle over several hours.

The second method, *Cascade Fast-Fill*, allows a vehicle to be fueled within a few minutes, similar to gasoline or diesel fueling. To do this, the gas is compressed and stored in high-pressure steel tanks located at the fueling station. Because the gas must be pressurized and stored on site, these stations are typically significantly larger in size, more complex, and more expensive to design and construct than a conventional gasoline or diesel fueling station. In a typical application, vehicles fuel in high volume at peak times from the high-pressure storage. When the peak is over, the compressor runs continuously for a period of time to return the storage tanks to maximum pressure and then shuts down. This approach is not suitable for continuous, high-volume fueling.

The third method, *Buffered Fast-Fill*, is also very fast, and also supports continuous, high-volume fueling for fleets of heavy duty vehicles like transit buses. Because buffered fast-fill systems use even larger and more powerful compressors, they are the largest and most complex of all natural gas fueling stations.

Special Handling Requirements: Despite misperceptions to the contrary, natural gas is actually a safer fuel than gasoline because it is difficult to ignite (ignition temperature about 1,100 ^{0}F) and is lighter than air. Leaks do not pool beneath a vehicle as gasoline does. Natural gas is non-toxic. The greatest safety concern with CNG is the fact that the gas is stored at high-pressure capable of projecting fittings and couplings at high velocity. Drivers can be trained to perform their own vehicle fueling safely.

6.2.3 Liquefied Natural Gas (LNG)

Fuel Availability: LNG is normally supplied by delivery trucks so LNG fueling stations may be located where there is sufficient road access.

Above or Below Ground Storage: LNG is usually stored above ground in cryogenic tanks. However, LNG tanks may also be stored below grade in an open pit.

Fueling Station Footprint: LNG has a significantly greater energy density than natural gas at atmospheric pressure, but it is still lower in energy density than gasoline, requiring about 50 percent more volume than gasoline for a similar amount of energy. Because LNG is denser than CNG and does not need to be compressed, LNG stations require less area than CNG stations. Nevertheless, LNG fueling station footprints are usually larger than conventional gasoline stations. The use of vertical LNG storage tanks can reduce real estate requirements.

Special Handling Requirements: Because LNG is a cryogenic liquid, special fittings are used and protective clothing must be worn. Vehicle fueling is usually performed by a trained technician.

6.2.4 Liquefied Petroleum Gas (LPG or Propane)

Fuel Availability: LPG is supplied by delivery trucks so fueling stations should be located where there is roadway access.

Fuel Storage: LPG is stored above ground in low-pressure steel tanks.

Fueling Station Footprint: LPG contains more energy per unit of volume than natural gas at atmospheric pressure, but it is still less energy dense than gasoline, requiring about 33 percent more volume than gasoline for a similar amount of energy. Since LPG is a liquid fuel at low pressure the station footprint is slightly larger than gasoline/diesel stations, mostly as a result of the need to store propane above ground. A skid-mounted system equipped with a vertical tank and dispenser requires about the same or less real estate as the retail propane dispensers found at many retail gasoline stations.

Special Handling Requirements: Because LPG gas is heavier than air, leaks may pool beneath a vehicle. Propane is non-toxic. Drivers can be trained to perform fueling safely.

6.2.5 E85/M85

Fuel Availability: E85 is supplied by delivery truck. Distribution is limited but growing outside of the Midwest. M85 is not currently commercially available.

Fuel Storage: Below ground storage is common.

Fueling Station Footprint: Same as for conventional gasoline or diesel fueling facilities.

Special Handling Requirements: The dispensing technique of these fuels are similar to gasoline. Due to the corrosive solvent nature of ethanol and methanol, contact with skin and other materials should be avoided.

6.2.6 Hydrogen

Fuel Availability: At present, there is no underground pipeline system for hydrogen. Liquid hydrogen is currently distributed over the road by industrial gas vendors. Alternatively, hydrogen may be produced on-site by a variety of methods that include steam reforming of natural gas and electrolysis. Where natural gas reforming is employed, access to the natural gas distribution or transmission system is necessary.

Fuel Storage: Compressed hydrogen is stored above ground in high-pressure steel tanks. Liquid hydrogen is stored above ground in cryogenic vessels.

Fueling Station Footprint: On-site production by electrolysis or reforming increases the overall footprint of a hydrogen fueling station. The amount of equipment to generate hydrogen fuel and store it makes hydrogen fueling stations real estate intensive.

Special Handling Requirements: Even at 10,000 psi, hydrogen contains only two thirds of the energy by volume of CNG at 3,000 psi. To achieve viable performance, vehicles will need to store on board hydrogen at pressures ranging from 5,000 to 10,000 psi, posing significant technical and safety challenges.

6.2.7 Biodiesel (B85-B00)

Fuel Availability: Biodiesel is delivered via delivery truck. Distribution is limited but growing.

Fuel Storage: Same as conventional diesel.

Fueling Station Footprint: With modest preparation, existing diesel fueling facilities may be used.

Special Handling Requirements: Generally same as for diesel. However, biodiesel may require special additives or tank heating in cold climates to prevent gelling. Existing diesel tanks must be properly cleaned and retrofitted with solvent-resistant fittings and gaskets prior to the introduction of biodiesel. Dispensing of biodiesel is the same as diesel fuel.

Table 6-1. Fueling Station Considerations

Alternative Fuel	Fuel Availability	Fuel Storage	Fueling Station Footprint *(compared to gasoline)*	Gaseous vs. Liquid	Special Handling Requirements
Electric	Electrical Distribution System	N/A	Smaller	N/A	Inductive vs. Conductive
Compressed Natural Gas (CNG)	Underground Pipeline	Above Ground	Smaller to Largest	Gaseous	High Pressure
Liquefied Natural Gas (LNG	Delivery Truck	Above Ground	Larger	Liquid	Cryogenic
Hybrid Electric (Gasoline)	Delivery Truck	Below Ground	Same	Liquid	N/A
Hybrid Electric (Diesel)	Delivery Truck	Below Ground	Same	Liquid	N/A
Propane (LPG)	Delivery Truck	Above Ground	Smaller	Liquid	Heavier than Air
Ethanol (E85)	Delivery Truck	Below Ground	Same	Liquid	Avoid Skin Contact
Methanol (M85)	Delivery Truck	Below Ground	Same	Liquid	Avoid Skin Contact
Hydrogen	Underground Pipeline	Above Ground	Largest	Gaseous	High Pressure
Biodiesel (B85-B100)	Delivery Truck	Above or Below Ground	Same	Liquid	Cold Weather

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CHAPTER 7
AIP PROJECT ELIGIBILITY

The air quality provisions in *Vision 100* expand existing AIP eligibility guidelines and offer additional Federal guidance to sponsors on how to implement effective low-emission projects. AIP funding for VALE projects through the "noise and air quality set aside" (discretionary funds) will be evaluated on the basis of their relative priority to other airport noise and emission projects.

This chapter provides sponsors with program guidelines for funding low-emission vehicles and infrastructure with AIP grants under the VALE program. It also discusses the special stand-alone GSE Emissions Retrofit Pilot Program under AIP that was authorized in *Vision-100*.

7.1 AIP Vehicle Eligibility

AIP funds can be used to purchase new, airport-dedicated AFVs, whether they are on-road or non-road vehicles. For the purposes of this program, new vehicles are defined as vehicles purchased from an OEM that are pre-market (i.e., "neofits") with essentially zero miles. A new vehicle does not include reprogrammed or re-engined vehicles. In addition, AIP-funded vehicles must be owned and operated by the sponsor, who must hold title to the vehicle(s) at all times.

Low-emissions vehicles purchased with AIP funds under the VALE program must meet the following requirements:

All vehicles and equipment purchased with AIP funds must be owned by the sponsor.

- Airport-owned
- Airport-dedicated and operated on a regular basis as part of the normal operation of the airport. Aircraft GSE (e.g., bag tugs and belt loaders) are not eligible if they are owned by airlines or third-party providers, which is generally the case.
- New vehicles only. Each vehicle must be purchased and delivered from an Original Equipment Manufacturer (OEM). No retrofits or aftermarket modifications qualify.
- AFVs fueled by alternative fuels (including hybrid systems) as defined by the DOE EPAct (see Chapter 4). Clean conventional fuels and vehicles are not allowed under AIP except for the GSE Retrofit Pilot Program (See Section 7.5).
- EPA-certified or tested to meet the VALE program low-emission standards (See Chapter 5).

There are a wide variety of on-road and non-road vehicles used at airports. The useful life of these vehicles differs from the typical life span of the same vehicles when used off-airport. **Table 7-1** provides a summary of the average useful life for vehicles typically owned by the sponsor. These useful life estimates should be used for the VALE program unless sponsors can document more refined data to support modifications. (Note that certain types of aircraft GSE do not appear on the list because airlines or their contractors generally provide aircraft services that utilize GSE.)

Table 7-1. Average Useful Life of Typical AIP-Funded Airport Vehicles[27]

Category/Type	Average Useful Life (years)
Lawn care equipment	10
Snow removal equipment	10
Emergency equipment	10
Deicer trucks	14
Fork lifts	13
Fuel trucks	14
Construction equipment	10
Cars/vans/pickups	10
Dump trucks	11
Flatbed/straight trucks	12
Vacuum sweeper trucks	10
19-35 foot buses	10
40+ foot buses	12

Source: FAA compilation of ILEAV data, 2004.

7.2 AIP Infrastructure Eligibility

AIP funds can be used to purchase, construct and install eligible low-emission infrastructure projects described in Chapter 6.

7.3 AIP Matching Funds

Vehicle base costs cannot be counted as part of the airport local match.

Eligible sources for local matching funds are defined under current AIP guidelines (see FAA Order 5100.38). These sources include PFCs, other eligible airport revenues, and State or local grants that do not include other Federal funds. Any use of PFCs by the sponsor as a local match for AIP projects means that the AIP grant assurances and compliance are extended to these PFC funds as well. It is important to emphasize, the base cost of a vehicle cannot be counted as part of airport local matching requirements.

[27] If appropriate, see GSE useful life estimates provided in Chapter 8, Table 8-1.

Consistent with AIP procedures, sponsors are expected to finance their VALE project in advance of AIP reimbursement for the allowable Federal cost share (See **Table 7-2)**.

Table 7-2. AIP Federal Cost Share Under *Vision 100* [28]

Activity	AIP Grant	Local Matching Funds
Vehicles*	• 75 percent incremental costs for large and medium hub airports • 95 percent incremental costs for smaller airports	Allowed • PFCs • Eligible local airport revenues
Infrastructure	• 75 percent for large and medium hub airports • 95 percent for smaller airports	Not allowed • Base vehicle costs

* VALE eligible vehicles must meet program low-emission standards described in Chapter 5.

7.4 AIP Grant Assurances and Special Conditions

The Airports Financial Assistance Division (APP-500) monitors project activity and ensures that grant monies are spent in a timely manner for the appropriate purpose at proposed costs. FAA ADOs and Regional Airports Division Offices oversee airport grant activity and conduct regular on-site inspections.

Sponsors who participate in the VALE program must adhere to standard AIP grant assurances. As described in Chapter 3 and **Appendix C**, the VALE program also includes "special conditions" that the low-emission vehicles and equipment must be airport-dedicated, remain at the airport for their useful life, be used to the intended levels, meet low-emission standards, be visibly labeled, etc. In addition, the sponsor will be responsible for tracking all equipment purchased under the program regardless of ownership.

The FAA may impose sanctions if a sponsor fails to comply with AIP grant assurances or program requirements as described in the FAA Order 5100.38B, AIP Handbook, Chapter 11, Section 6 on "Suspension and Termination of the Grant." If vehicles are removed

[28] AIP funding for the VALE program is restricted to the discretionary 'noise and air quality set-aside' portion of the budget and to the incremental costs of eligible low-emission vehicles. It should be noted that airport sponsors may continue to use other elements of the AIP budget to fund the base cost of traditionally "AIP-eligible" vehicles that meet the criteria presented in *Chapter 5, Section 5. Safety, Security, and Related Projects* of FAA Order 5100.38B, Change 1, AIP Handbook, January 2004. Historically AIP-eligible vehicles include safety and security-related equipment owned by the airport sponsor (e.g., Aircraft Rescue and Fire Fighting (ARFF) and snow removal equipment). Thus, if a traditionally AIP-eligible vehicle meets the low-emission standards of the VALE program, it is possible for airport sponsors to fund the vehicle's base cost through entitlement or other allowable portions of the AIP budget and the low-emission incremental costs for the vehicle through the VALE program.

from the airport or are not used as prescribed, a "Termination for Cause" will go into effect and the sponsor will be required to reimburse the FAA for related funds and make appropriate revisions to its project emission reduction estimates. In addition, if circumstances arise after the grant funds have been authorized and/or distributed that prevent the sponsor from continuing and/or completing the commitments of the VALE program, the FAA may issue a "Termination for Convenience" by which the sponsor is required to return unspent grant monies to the FAA, thereby voiding project commitments and related AERCs.

7.5 Airport Ground Support Equipment Emissions Retrofit Pilot Program

Vision 100 (Section 159) establishes an Airport Ground Support Equipment Emissions Retrofit pilot program. This pilot program, entitled the GSE Retrofit pilot program, will be managed separately from the main program but include many of the same procedures and requirements discussed in this report. This pilot program is the only mechanism at this time by which AIP funding can be used for retrofit technology or conventional-fuel technology.

Vision 100 creates the opportunity for ten commercial service airports to be awarded up to $500,000 each to retrofit existing airport GSE. The purpose of the GSE Retrofit Pilot Program (GRPP) is to obtain information on a one-time basis for low-emission retrofit GSE technologies. For this reason, eligible retrofit technologies do not have to meet the VALE program low-emission standards.

Like the VALE program, eligible airports for the pilot program must be located in nonattainment or maintenance areas, receive the same State AERC assurances prior to funding, and assess project emission reductions and cost effectiveness similarly. Existing ground service and maintenance vehicles retrofitted under the pilot program must be located at the airport, used to support aeronautical and related activities at the airport, and remain in operation at the airport for their useful life.

Eligible projects for the pilot program are retrofits of existing airport GSE that burn conventional fuels (i.e., gasoline and diesel) to achieve lower emissions using retrofit aftermarket low-emissions technology. An engine "retrofit" includes (but is not limited to) any of these activities:

- Addition of new/better pollution control after-treatment equipment to certified engines
- Re-engining or re-powering
- Upgrading of certified engines to cleaner certified configurations
- Upgrading uncertified engines to cleaner "certified-like" configurations
- Conversion of engine to cleaner fuels
- Early replacement of older engines with newer (presumably cleaner) engines (in lieu of regular expected rebuilding)

Vehicles and equipment upgraded through the pilot program must be certified or verified by the EPA and meet VALE program low emission standards. While the EPA does not formally certify retrofit aftermarket low-emission technology, the agency does evaluate and verify it. For purposes of this program, verified EPA low-emission retrofit technologies are defined as those technologies and devices that are contained in the EPA website on retrofit technology (i.e., www.epa.gov/otaq/retrofit).

Sponsors are responsible for documenting verification of vehicle retrofit technologies and fuel systems. This documentation should be attached to the sponsors pilot program application. Any uncertainties or lack of information are the responsibility of the sponsor.

The FAA will give priority consideration to project applications that achieve the greatest emission reductions per dollar of pilot project funds. The FAA may give priority consideration to eligible airport-dedicated GSE that is airport-owned.

By law, the FAA must protect the investment made in vehicles and infrastructure equipment acquired or constructed through the VALE and GSE Retrofit pilot programs. To comply with this requirement, the sponsor must adhere to the special conditions discussed in Chapter 3 and provided in **Appendix C**.

Sponsors that apply for a GSE Retrofit pilot project should follow the application procedures provided in Chapter 2. However, unlike applications for the main VALE program, the GSE Retrofit pilot project will be reviewed initially by the FAA field office to assure completeness of the application. Pilot project proposals that represent a complete application will be forwarded to headquarters (APP-520) for technical and program review. Headquarters will evaluate and approve pilot project applications as received, pending receipt of an AERC Letter of Assurance (see **Appendix G**) from the State air quality agency.

7.6 AIP Funding Annual Timetable

Sponsors need to plan and coordinate the submittal of their VALE applications to coincide with the State air quality agencies‘ 45-day review and approval time (see AERC Report) and to meet the FAA schedule for fiscal year AIP programming and funding decisions. The Federal government’s fiscal year begins October 1; however, programming decisions begin in the previous fiscal year.

The FAAs Airport Capital Improvement Program (ACIP) timetable for AIP planning and programming is presented below. Based on the activities outlined, the best time for a sponsor to submit their VALE application to the FAA and State air quality agency is spring of the previous fiscal year. In most cases, the sponsor can expect AIP approval of their proposed VALE project in the December-February timeframe. For purposes of public information, **Table 7-3** provides the general timeline of the AIP funding approval process.

Table 7-3. General Timeline of the AIP Funding Approval Process

Period	Action
Spring Previous FY	*Office of Airport Planning & Programming, Financial Assistance Division* (APP-500) submits ACIP guidance memorandum to FAA regions
Summer Previous FY	FAA regions submit 3-year ACIP to *Airports AIP Branch* (APP-520)
Summer Previous FY	APP-520 performs national review of regional ACIPs and coordinates corrections with regional offices
Summer Previous FY	APP-520 performs national analysis to create national priority rating thresholds (final candidate list is determined)
Fall Current FY	Regional offices submit proposals to add/delete projects to the final candidate list
Fall Current FY	APP-520 prepares and submits regional budgets to regional offices –
Fall Current FY	Regional offices develop recommended funding plans and submit to APP-520
Winter Current FY	*Associate Administrator for Airports* (ARP-1) makes selection/approval of projects for implementation of regional programming actions
Spring/Summer Current FY	Unfunded candidate list projects will be considered as priority projects to receive any remaining converted "carryover" funding

CHAPTER 8
PFC PROJECT ELIGIBILITY

PFC eligibility for VALE projects is different from AIP eligibility in several ways. Consistent with the traditional relationship between AIP and PFC programs, PFC eligibility requirements for the VALE program are somewhat broader than the AIP program. These differences are attributable in part to the fact that AIP is a Federal grant-in-aid program while PFCs are a local source of airport funding with FAA project authorization. VALE projects will be considered by public agencies on the basis of their relative priority to other PFC-eligible airport projects.

Airport sponsors[29] obtain PFC revenues through fees collected from passengers at the time that airline tickets are purchased. While public agencies administer those revenues locally, the authority to collect PFCs is subject to FAA approval. Moreover, airport use of PFC revenues is regulated by the FAA, generally following AIP rules and procedures unless otherwise differentiated in legislation such as *Vision 100* or in agency PFC regulations and orders.

PFC funding eligibility requirements for the VALE program go beyond the AIP program in four major areas: 1) vehicle types; 2) ownership; 3) fuel types; and 4) cost-share. The expanded scope of PFC funding for airport air quality improvement projects through the VALE program is the focus of this chapter.

8.1 PFC Funding for Alternative Fuel Vehicles

PFC funds can be used to help purchase on-road and non-road vehicles that are airport-dedicated and meet other requirements described in Chapter 3. PFC funding is limited to the incremental costs of acquiring new vehicles but may be used for financing the full cost of retrofitting existing vehicles with EPA-approved low emission equipment.

PFC vehicle eligibility extends to non-airport owned vehicles also. For example, PFCs may be used to fund the incremental cost of new GSE or the cost of retrofitting existing GSE that is owned by an airline. This allowance is important to the low-emission goals of the VALE program because airlines own and operate approximately 75 percent of the GSE at domestic airports. Moreover, most of the other 25 percent is privately owned by cargo handlers, FBO's and other third-party operators.

[29] "Airport sponsors" are planning agencies, public agencies, or private airport owners/operators that have the legal and financial ability to carry out the requirements of the AIP program. In reference to the PFC program, the term refers to "public agencies" only.

Vehicles eligible for PFC funding may be powered by alternative fuels or by clean conventional fuel systems (e.g., utilizing ultra low sulfur diesel or super efficient gasoline engines). Regardless of eligible fuel type, all program vehicles must meet VALE low-emission standards.

In addition to allowable purchases of new vehicles similar to the AIP program[30], PFC funding can be used to purchase and retrofit aftermarket low-emissions technology for existing or newly acquired vehicles. An engine "retrofit" includes (but is not limited to) any of these activities:

- Addition of new/better pollution control after-treatment equipment to certified engines
- Re-engining or re-powering
- Upgrading of certified engines to cleaner certified configurations
- Upgrading uncertified engines to cleaner "certified-like" configurations
- Conversion of engine to cleaner fuels
- Early replacement of older engines with newer (presumably cleaner) engines (in lieu of regular expected rebuilding)

Vehicles and equipment acquired or upgraded through the VALE program must be certified or verified by the EPA and meet VALE program low emission standards. While the EPA does not formally certify retrofit aftermarket low-emission technology, the agency does evaluate and verify it. For purposes of this program, verified EPA low-emission retrofit technologies are defined as those technologies and devices that are contained in the EPA website on retrofit technology (i.e., www.epa.gov/otaq/retrofit).

The public agency is responsible for documenting verification of PFC-funded vehicle retrofit technologies and fuel systems. This documentation should be attached to the public agency's PFC application. Any uncertainties or lack of information are the responsibility of the public agency.

8.2 PFC Ownership Allowances

An important distinction between AIP and PFC eligibility is the broader PFC allowance for low emission vehicle ownership. PFC funding is available for the incremental cost of new vehicles or for retrofitting existing vehicles that are not owned by the airport (i.e., tenant-owned).

[30] PFC funding for the VALE program is restricted to the incremental costs of eligible low emission new vehicles as well as the retrofit of existing eligible low emission vehicles. It should be noted that public agencies may continue to use PFC revenue to fund the base cost of traditionally "AIP-eligible" vehicles that meet the criteria presented in *Chapter 5, Section 5. Safety, Security, and Related Projects* of FAA Order 5100.38B, Change 1, AIP Handbook, January 2004. Historically AIP-eligible vehicles include safety and security-related equipment owned by the public agency (e.g., Aircraft Rescue and Fire Fighting (ARFF) and snow removal equipment). Thus, if a traditionally AIP-eligible vehicle meets the low emission standards of the VALE program, it is possible for public agencies to fund both the vehicle's base cost and the low emission incremental or retrofit costs for the vehicle through the PFC program.

8.2.1 Enforceable Agreements with Airport Tenants

An enforceable agreement between the public agency and tenant is required to meet the special conditions of the VALE program (see Appendix C) that are part of the PFC determination paragraph or acknowledgement letter in PFC approvals. This agreement should include what the public agency and the airport tenant will do in the event that the tenant is unable to fulfill the special conditions of the VALE program for any reason. There are two basic options for tenants:

1. The tenant may sell the VALE-funded vehicles and equipment to another tenant at the same airport with approval of the public agency. New tenant owners must likewise accept and abide by the special conditions of the program.
2. The tenant may reimburse the public agency for the total PFC amount spent to obtain the VALE-funded vehicles and equipment. (The public agency must deposit any reimbursement in the public agency's PFC account for use on other PFC-eligible projects.)

The tenant needs to notify the sponsor and the FAA prior to taking action on either option. Regardless of the option selected, if the tenant moves, sells, or disposes of VALE-funded vehicles, the public agency is responsible for adjusting their actual and estimated program emission reduction estimates and communicating this information to the FAA, EPA, and State air quality agency as soon as possible.

8.3 Useful Life for Typical Tenant-Owned Vehicles

Airport-dedicated vehicles represent a variety of on-road and non-road vehicles. Because they operate primarily on airport property, their useful lives can differ from the typical life span of the same vehicles when used off-airport. To define on-airport useful life, data obtained from the ILEAV pilot program was compiled and averaged for an assortment of airport vehicle classifications. **Table 8-1** provides average useful life data for typical tenant-owned airport vehicles.

Table 8-1. Average Useful Life of PFC-Funded Airport Vehicles

Category/Type	Average Useful Life (years)
Baggage tug	13
Belt loader	11
Cargo loader	11
Deicer trucks	14
Fork lifts	13
Fuel trucks	14
Lavatory truck	13
Pushback tractor	15
Cars/vans/pickups	10
Dump trucks	11
Flatbed/straight trucks	12
Vacuum sweeper trucks	10
19-35 foot buses	10
40+ foot buses	12

Source: FAA compilation of ILEAV data, 2004.

8.4 PFC Reimbursement and Eligible Costs

Public agencies that participate in the VALE program using PFC funds must adhere to the established general eligibility requirements and procedures of the PFC program.

Similar to the AIP program, public agencies may need to finance VALE projects initially from existing airport revenues prior to approved cost reimbursement of PFC funds.

Because PFCs are local airport revenues and may be used to finance 100 percent of eligible costs, there is no local matching requirement for PFC project activities. A description of PFC eligible costs is presented in **Table 8-2**.

Table 8-2. PFC Eligible Costs for the VALE Program.

Activity	PFCs
Vehicles*	• 100 percent incremental costs of new low-emission vehicles. No base vehicles costs. • 100 percent low emission retrofitting costs for existing airport vehicles.
Infrastructure	• 100 percent.

* VALE eligible vehicles must meet program low-emission standards described in Chapter 5.

Public agencies may use PFC funds to fulfill local matching AIP requirements. Any use of PFCs by the public agency as a local match for AIP projects, or as a supplement to an AIP grant, means that AIP grant assurances and compliance standards must also be followed.

8.5 PFC Lease Agreements for Refueling and Recharging Facilities

Airport-owned refueling and recharging stations may be leased to airport tenants for management and operations. The lease agreement between the public agency and the tenant must include the following provisions related to the VALE program:

1. The facility complies with all airport safety and security standards, including the safe handling and transportation of alternative fuels.
2. The facility guarantees that the public agency and airport-owned vehicles will have priority to facility use and fueling in all cases, including periods of high demand or in the event of fuel shortages. Public access to the facility cannot impede the use of the facility for airport needs and the efficient delivery of airport services.
3. The facility may offer limited public access, as approved by the public agency.
4. The facility may co-locate non-VALE equipment, as approved by the public agency.

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CHAPTER 9
EMISSIONS ASSESSMENT METHODOLOGY

This chapter describes the methodology to be used by the sponsor to calculate and quantify emission reductions due to the VALE project. This technical evaluation requires the collection of data, emission calculations using EDMS, and the presentation of the analysis to the FAA, EPA, and State air quality agency.

The sponsor's analysis for VALE is limited to project-specific low-emission vehicles and equipment. The sponsor is not required to perform an analysis or inventory of non-project or total airport emissions.

The emissions reduction assessment process involves a step-by-step progression that accounts for the baseline conditions and the proposed VALE project(s) intended to reduce emissions, with each step requiring documentation and verification.

The sponsor only needs to evaluate VALE project emissions. No inventory of airport emission sources unrelated to the VALE program is required.

Step 1: Data collection and documentation. The process begins with collection of information about proposed vehicles and equipment and their rate of usage. This includes EPA certification or verification data for low-emission vehicles. This documentation should be submitted with the project proposal.

Step 2: Identify baseline operating conditions. Baseline conditions reflect the operation of existing vehicles and equipment that would occur if no VALE low-emission project was implemented.[31]

Step 3: Identify future operating conditions. VALE project conditions may involve operational changes that are different than baseline conditions.

Step 4: Emission reduction calculations. The FAA requires sponsors to use EDMS to calculate emissions reductions for VALE projects.

Step 5: Documentation of emissions analysis. Results of emission reduction calculations are an integral part of the sponsor's proposal to the FAA for funding and to the State air quality agency for issuance of AERCs.

The emission calculations are intended to support the sponsor's request for AERCs from the State air quality agency. Before planning a VALE project, sponsors should read the

[31] EPA 452/R-01-001, Section 16.3.4.a(1).

EPA/FAA report entitled "*Guidance on Airport Emission Reduction Credits for Early Measures through Voluntary Airport Low-Emission Programs.*" This AERC Report provides general guidance to State air quality agencies on how to review airport proposals and issue AERCs under the VALE program.

As described in the AERC Report, sponsors are allowed to apply AERCs as "design measures" against the annual de minimis levels established in the CAA for demonstrating general conformity (see example below). For purposes of NSR permit requirements, AERCs are used as emission "offsets."

9.1 Timeframe for Emission Reduction Calculations

The sponsor calculates estimated project emission reductions (and AERCs) on the basis of the latest EPA and VALE program low-emission standards in effect during the fiscal year of AIP and/or PFC funding. These calculations are valid for the entire life of the project provided that AIP and/or PFC funding is approved in the same fiscal year. A few examples are provided below to clarify this basis.

> Example 1: A sponsor prepares a proposal in FY '05 for funding in FY '06. In this case, the sponsor should base their calculations on EPA and VALE standards that will be in place for FY '06. Since the FAA will review VALE low-emission standards annually, the sponsor is encouraged to contact APP-600 to discuss possible modifications to the standards for the coming year.
>
> Example 2: A sponsor proposes a project for FY '06 funding and does not obtain funding until FY '07. In this case, the sponsor needs to recalculate estimated emission reduction estimates for FY '07, applying any new EPA or VALE standards for FY '07 into its revised estimates.
>
> Example 3: A sponsor submits a proposal, obtains funding, and implements a VALE project in FY '05. The sponsor waits three years before submitting an updated report to the State air quality agency for AERCs. During this time, EPA new vehicle standards and/or VALE low-emission program standards change. Regardless of this fact, the vehicle standards that were used in the sponsor's original application are valid and continue to be valid for the life of the project.

Sponsors should consider the number of years they will need AERCs and the "replacement" commitment that comes with this choice (see special conditions discussed in Chapter 3 and provided in **Appendix C**). The sponsor has two options regarding the duration of emission reduction calculations:

- Option 1 - The VALE-funded "project life" for the useful life of individual vehicles and equipment

- Option 2 - The typical 20-year life of AERCs

Option 2 requires the sponsor to commit to replace the new vehicles/equipment purchased under the VALE program with equivalent low-emission units that are as clean or cleaner for the 20-year life of AERCs.[32]

The sponsor is required to declare which option they choose on Page 1 of the Project Application Worksheets (see **Appendix D** for sample Project Application Worksheets and instructions in Chapter 10).

9.2 Data Collection

The collection and development of data should consider all relevant sources, including project vehicles, non-airport vehicles that use VALE refueling and recharging stations, and airport stationary sources. Information should include hours of operation, the remaining useful life (RUL), and EPA-certified/verified emission levels. In the event that the sponsor lacks adequate historical records to determine usage, a conservative estimate of existing usage should be developed using typical operating data for similar equipment at the airport. A description of data requirements are provided below.

9.2.1 Ground Support Equipment

To evaluate emissions from existing GSE, the following information is necessary:

- manufacturer
- model and model year
- make
- fuel type
- total number of units, by type
- annual average fuel consumption
- annual average operating hours, by type

9.2.2 Ground Access Vehicles

In order to calculate GAV emissions, data will be required for each vehicle category as follows:

- number of vehicles in the category
- fuel type
- model year

[32] Refer to the FAA *Guidance on Airport Emission Reduction Credits for Early Measures through Voluntary Airport Low Emission Programs*, Section 6.2 Life of the AERC.

- average speed
- average annual miles traveled

9.2.3 Non-Project Vehicles

Sponsors may count emission reductions and receive AERCs for non-airport vehicles that utilize VALE-funded refueling and recharging stations. Emission reductions from non-project vehicles should be based on the proportion of reductions that are directly related to the VALE program and can be supported with documentation. The sponsor may not claim emission reductions for on-road vehicles that are considered part of metropolitan transportation plans and transportation improvement programs reflected in the transportation conformity process.

The sponsor should work with the State air quality agency to determine the level of emission reductions claimed for non-VALE vehicles. To determine the appropriate level of emission reductions, the sponsor should:

- Provide documentation of planned fuel usage
- Use historical fueling records if available or documentation of planned vehicle use of VALE facilities.

9.2.4 Stationary Sources

Terminal Gate Aircraft Power Supply. The following data will be required:

- Aircraft and APU type
- Gate turn-around time

The EDMS default aircraft and APU emission indices, which are based on fuel flow, should be used unless the aircraft or aircraft engines requiring modeling are not included in the EDMS database.

Airport Heating Plant. Typically, boilers are used for heating individual terminal buildings, hangars, or air traffic control towers. A separate analysis outside EDMS may be required to determine annual fuel throughput for proposed HVAC systems and/or terminal boilers. The data required for each boiler is as follows:

- Type of boiler
- Heat capacity
- Fuel type
- Fuel throughput

User-defined emissions factors, sulfur/ash content, and pollutant control factors may be applied, if available. Otherwise, the EDMS default emission parameter values may be used.

9.3 Baseline Operating Conditions

Emission calculations and AERCs are based on the net surplus reductions between the baseline and project emissions. The net surplus reductions will usually, but not always, translate into an equal amount of AERCs (see AERC Report). Emission reductions for the program are rate-based and should be presented in tons of pollutants per calendar year (tpy) to one decimal place. Emission comparisons are typically between existing baseline vehicles (diesel or gasoline) and proposed new AFVs.

Project emission reduction comparisons are either "old vs. new" or "new vs. new" as discussed below.

9.3.1 "Old vs. New" Emission Reductions

"Old vs. new" applies when existing vehicles or equipment are replaced or retrofitted with new low-emission vehicles or equipment. The sponsor should rely on EDMS (which includes MOBILE6.2 on-road and NONROAD emission factors) to assess existing (old) conventional fuel vehicles that are being retired or replaced. The sponsor must identify each individual vehicle being retired or replaced. EDMS emission factors represent the basic historical average for the national fleet, and uses the study year to correlate the emission factors with the model year of the existing vehicle.

The important aspect of "old vs. new" comparisons is that the old equipment could possibly have additional useful life at the time of replacement or retrofit. Therefore, the sponsor must base the emission reduction calculations using the old equipment as the baseline conditions.

> Example of "old vs. new" A sponsor wishes to purchase a new electric baggage tug to replace an existing diesel baggage tug. At the time of replacement, the old diesel tug has 3 more years of useful life. The new electric baggage tug has a useful life of 13 years. The emission comparison for the first 3 years is the difference between the old diesel tug and the new electric tug. Starting in year 4, the comparison now becomes "new vs. new" because the old tug would be replaced, presumably with another diesel unit. For "new vs. new," the emission comparison is the difference between the new electric tug and a new diesel tug that meets the EPA vehicle standards that were in effect during ***the***

fiscal year of AIP and/or PFC funding. This comparison is extended for the remaining useful life of the new electric tug.

If EPA new vehicles standards change during the useful life of the new vehicle, the sponsor is not required to adjust the emission reduction calculations.

9.3.2 "New vs. New" Emission Reductions

"New vs. new" applies when a sponsor is adding new vehicles or equipment to airport operations (i.e., no replacement of old equipment).

Vehicle emission factors available from EDMS (including both NONROAD and MOBILE6.2) are acceptable for the project assessments. However, if appropriate new vehicle types are not available in the models or sponsors seek greater refinement, the following emission factor hierarchy should be considered in order of priority:

1. EPA-certified data (or verified, if retrofit technology)
2. Manufacturer's emissions data
3. VALE low-emission standards
4. Default model emission factors with substitutions documented

The important aspect of "new vs. new" comparisons is that the new VALE-funded vehicles/equipment are cleaner than applicable EPA emission standards during the fiscal year of AIP and/or PFC funding. This approach provides sponsors with more incentive to purchase low-emission vehicles now rather than later because the longer the sponsor waits to purchase a new vehicle, the cleaner the new baseline will become. Also, the VALE program annual procedure of reviewing and updating low-emission standards with the EPA is consistent with the legislative mandate for "best achievable" standards.

Example of "new vs. new" A sponsor seeks to purchase a new 40-foot shuttle bus powered by a CNG engine. Baseline emissions are for a new diesel bus engine, with emissions that meet the applicable EPA emission standards in place during the ***fiscal year of AIP and/or PFC funding***. The baseline emissions are compared to the new CNG engine that is certified to meet VALE low-emission standards. The difference between each set of emissions would equal the project emission reductions (and AERCs).

In "new vs. new" comparisons, the new conventional fuel vehicle (i.e., baseline) is represented by the applicable national EPA emission standards. Since EDMS does not contain the applicable EPA emission standards, the following look-up

tables are provided for "new vs. new" comparisons to represent baseline emissions (in tpy). Emission factors from the tables below for the fiscal year of funding should be entered into EDMS. Baseline emission factors for future years are provided as reference information only to assist sponsors that may want to plan ahead and explore emission reduction options for future years.

Table 9-1. "New vs. New" Baseline Emission Factors for Vehicle Category 1

Fiscal Year of AIP/PFC Funding Request	NOx (g/mile)	NMOG (g/mile)	CO (g/mile)	PM (g/mile)
2005	0.315	0.1055	3.15	0.045
2006	0.315	0.1055	3.15	0.045
2007	0.115	0.09	3.15	0.015
2008	0.115	0.09	3.15	0.015
2009	0.115	0.09	3.15	0.015
2010	0.115	0.09	3.15	0.015

Note: Baseline emission factors for Vehicle Category 1 are the midpoint between the VALE low-emission standard (Tier2-Bin3) and the dirtiest available standard (Tier2-Bin10). According to EPA Tier2 regulations, Bin9 and Bin10 are eliminated starting in 2007, at which time the baseline emission factors become the midpoint between Tier2-Bin3 and Tier2-Bin8.

Table 9-2. "New vs. New" Baseline Emission Factors for Vehicle Category 2

Fiscal Year of AIP/PFC Funding Request	NOx (g/mile)	NMOG (g/mile)	CO (g/mile)	PM (g/mile)
2005	0.35	0.16	5.3	0.045
2006	0.35	0.16	5.3	0.045
2007	0.35	0.16	5.3	0.045
2008	0.35	0.16	5.3	0.045
2009	0.15	0.123	4.2	0.015
2010	0.15	0.123	4.2	0.015

Note: Baseline emission factors for Vehicle Category 2 are the midpoint between the VALE low-emission standard (Tier2-Bin6) and the dirtiest available standard (Tier2-Bin10). According to EPA Tier2 regulations, Bin9 and Bin10 are eliminated starting in 2009, at which time the baseline emission factors become the midpoint between Tier2-Bin6 and Tier2-Bin8.

Table 9-3. "New vs. New" Baseline Emission Factors for Vehicle Category 3a

Fiscal Year of AIP/PFC Funding Request	NOx (g/bhp-hr)	NMHC (g/bhp-hr)	CO (g/bhp-hr)	PM (g/bhp-hr)
2005	2.5		15.5	0.01
2006	2.5		15.5	0.01
2007	1.1	0.32	15.5	0.01
2008	1.1	0.32	15.5	0.01
2009	1.1	0.32	15.5	0.01
2010	TBD	TBD	TBD	TBD

Note: Baseline emission factors for 2005 and 2006 represent EPA national regulatory emission standards for on-road heavy-duty engines. For the years of 2007 through 2009, the 50 percent phase-in of the 0.2 g/bhp-hr NOx standard is mathematically averaged with the NOx portion of the combined national standard (i.e., 2.0 g/bhp-hr NOx), yielding a baseline value of 1.1 g/bhp-hr NOx.

Table 9-4. "New vs. New" Baseline Emission Factors for Vehicle Category 3b

Fiscal Year of AIP/PFC Funding Request	NOx (g/bhp-hr)	NMHC (g/bhp-hr)	CO (g/bhp-hr)	PM (g/bhp-hr)
2005	0.8	0.2	14.4	0.01
2006	0.8	0.2	14.4	0.01
2007	0.8	0.2	14.4	0.01
2008	TBD	TBD	TBD	TBD
2009	TBD	TBD	TBD	TBD
2010	TBD	TBD	TBD	TBD

Note: Baseline emission factors for Vehicle Category 3b are based on the EPA national emission standards for on-road spark ignition engines (combined standard 1.0 g/bhp-hr NOx+NMHC) divided into the 80/20 split for NOx/NMHC.

Table 9-5. "New vs. New" Baseline Emission Factors for Vehicle Category 4

Fiscal Year of AIP/PFC Funding Request	NOx (g/bhp-hr)	NMHC (g/bhp-hr)	CO (g/bhp-hr)	PM (g/bhp-hr)
2005	2.98		37.1	0.01
2006	2.98		37.1	0.01
2007	2.0		3.28	0.01
2008	TBD	TBD	TBD	TBD
2009	TBD	TBD	TBD	TBD
2010	TBD	TBD	TBD	TBD

Note: Baseline emission factors for Vehicle Category 4 are based on the EPA Tier Rule emission standards for non-road spark ignition engines (40 CFR Parts 89, 1048, et al.).

Table 9-6. "New vs. New" Baseline Emission Factors for Vehicle Category 5

Fiscal Year of AIP/PFC Funding Request	Maximum Engine (Hp)	NOx (g/bhp-hr)	NMHC (g/bhp-hr)	CO (g/bhp-hr)	PM (g/bhp-hr)
2005	< 11	5.0	0.6	6.0	0.6
	11 to 25	5.0	0.6	4.9	0.6
	26 to 49	5.0	0.6	4.1	0.45
	50 to 99	5.2	0.4	3.7	0.3
	100 to 174	4.5	0.4	3.7	0.22
	175 to 299	4.5	0.4	2.6	0.15
	300 to 750	4.5	0.3	2.6	0.15
	> 750	6.9	1.0	8.5	0.4
2006	< 11	5.0	0.6	6.0	0.6
	11 to 25	5.0	0.6	4.9	0.6
	26 to 49	5.0	0.6	4.1	0.45
	50 to 99	5.2	0.4	3.7	0.3
	100 to 174	4.5	0.4	3.7	0.22
	175 to 750	2.8	0.2	2.6	0.15
	> 750	4.5	0.3	2.6	0.15
2007	< 11	5.0	0.6	6.0	0.6
	11 to 25	5.0	0.6	4.9	0.6
	26 to 49	5.0	0.6	4.1	0.45
	50 to 99	5.2	0.4	3.7	0.3
	100 to 174	2.8	0.2	3.7	0.22
	175 to 750	2.8	0.2	2.6	0.15
	> 750	4.5	0.3	2.6	0.15
2008		TBD	TBD	TBD	TBD
2009		TBD	TBD	TBD	TBD
2010		TBD	TBD	TBD	TBD

Note: Baseline emission factors for Vehicle Category 5 are based on the EPA Tier Rule emission standards for non-road compression engines (40 CFR Parts 9, 69, 89, et al.).

9.4 EDMS Modeling

The EDMS users manual and other technical documents are available from the FAA Office of Environment and Energy (AEE) on the internet at http://www.aee.faa.gov/emissions/edms/edmshome.htm. AEE made dedicated enhancements to EDMS in support of vehicle and equipment emission calculations for the VALE program. These enhancements include:

- A new stand alone post-processor called the *Airport Emission Reduction Credit Post Processor* (AERCPP), which combines and displays output results (see below).
- A direct interface to MOBILE6.2, the EPA reference on-road vehicle emissions model for the program. Users will need to select the MOBILE6.2 option from the study setup screen in EDMS 4.2 to take advantage of this feature. Incrementing the study year in EDMS will automatically retrieve the proper emission factors from MOBILE6.2.
- Included new VOC and NMHC data for mobile and stationary sources.
- Improved emission factor accuracy for individual vehicles characteristics (e.g., horsepower, annual hours of operation, fuel type, etc.).

Sponsor's proposals should include EDMS output from the AERCPP (see figure below). The AERCPP functions to retrieve data from the EDMS studies and to reformat the data into a tabulated AERC report so that the annual emissions reductions and the total benefit of the proposed project can be easily reviewed.

Figure 9-1. Format of EDMS AERCPP Output Report

Your Airport
Report Date: 9/29/2004 4:18:54 PM

AERC Report

(short tons per year)

Data shown for Total source group and categorized by pollutants

Year	Study	Carbon Monoxide CO	Total Hydrocarbons THC	Non-Methane Hydrocarbons NMHC	Volatile Organic Compounds VOC	Nitrogen Oxides NO_x	Sulfur Oxides SO_x	Particulate Matter PM_{10}	Particulate Matter $PM_{2.5}$
2005	Baseline								
	Proposed								
	Net Change								
2006	Baseline								
	Proposed								
	Net Change								
2007	Baseline								
	Proposed								
	Net Change								
2008	Baseline								
	Proposed								
	Net Change								
2009	Baseline								
	Proposed								
	Net Change								
2010	Baseline								
	Proposed								
	Net Change								
2011	Baseline								
	Proposed								
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2012	Baseline								
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2013	Baseline								
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2014	Baseline								
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2016	Baseline								
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	Net Change								
2017	Baseline								
	Proposed								
	Net Change								
2018	Baseline								
	Proposed								
	Net Change								
2019	Baseline								
	Proposed								
	Net Change								
2020	Baseline								
	Proposed								
	Net Change								
2021	Baseline								
	Proposed								

9.5 Application of AERCs to General Conformity

The following example illustrates how AERCs might be applied to an airport development project that exceeds the general conformity de minimis thresholds.

Suppose a sponsor successfully completes two separate projects under VALE and receives AERCs for emissions of NOx. VALE Project 1 is the conversion of employee

transport buses to new alternative fuel engines with a total useful life of 12 years. VALE Project 2 is the conversion of aircraft tugs to CNG fuel, with an expected useful life of 13 years. At some future time, an improvement project proposed for that airport is estimated to cause construction emissions above the de minimis levels for NOx. In this scenario, the construction period is from 2007-2011 with annual emissions of NO_x exceeding the *de minimis* threshold by one to five tons each year. The annual assignment of AERCs and the use of the credits that will allow the airport project to conform are illustrated in **Table 9-7**.

Table 9-7. Example Application of AERCs

Grant/Action	Calendar Year (tons per year)								
	2005	2006	2007	2008	2009	2010	2011	2012	2013
CAAA *de minimis* threshold for NO_x	50	50	50	50	50	50	50	50	50
Direct and indirect NO_x emissions from airport improvement project			53	54	48	51	50		
VALE Project 1 AERCs	1	2	2	2	2	2	2	2	2
VALE Project 2 AERCs	0	0	4	4	4	4	4	4	4
Total AERCs Available	1	2	6	6	6	6	6	6	6
AERCs used for General Conformity			4	5	0	2	1		
Annual balance of available AERCs after General Conformity	1	2	2	1	6	4	5	6	6
Annual NO_x emissions from construction with AERC use			49	49	48	49	49		

In this example, VALE Project 1 started mid-year 2005 and initially generated one tpy of AERC. The project's full emission reduction potential of two tpy AERCs was generated for the following years. VALE Project 2 generates four tons per year AERCs each year beginning in 2007. The emissions of NOx resulting from the construction emissions from the proposed improvement project are expected to exceed the de minimis threshold of 50 tpy in four of the construction years, beginning in 2007. In 2007 four tons per year AERCs would be used to bring the construction emissions down to 49 tons, which conforms to the SIP. Similarly, in 2008 five tpy AERCs would be consumed, in 2009 no AERCs are needed, in 2010 four tpy AERCs would be consumed, and in 2011 only one tpy AERC would be required. Each year the balance of AERCs is equal to the total assigned from Project 1 and Project 2, minus the number of AERCs consumed to bring the construction emissions below the de minimis thresholds. After construction, since AERCs are permanent for the lifetime of the VALE project, each year the full value of the Project 1 and Project 2 AERCs return to their full emission reduction potential.

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CHAPTER 10
PROJECT COST EFFECTIVENESS METHODOLOGY

This chapter discusses methodology that the sponsor must use to calculate cost effectiveness for the project. Cost effectiveness is a parameter that allows the FAA to assess whether the sponsor's proposed use of Federal dollars to reduce airport emissions will be accomplished in a fiscally responsible manner.

In accordance with *Vision 100*, the sponsor evaluates cost effectiveness on the basis of the project's total costs and estimated lifetime emission reductions (see Chapter 9). Cost effectiveness is defined simply as the total amount of dollars spent on the project divided by its estimated lifetime emission reductions in tons per criteria pollutant (see **Appendix D**, Page 6 of the Project Application Worksheets).

The emphasis of the VALE program is on airport capital improvement projects using proven low-emission technology that is commercially viable. Because of the AIP/PFC program emphasis on construction and deployment, research and development (R&D) activities are not eligible. For proposed airport demonstration projects of commercial-ready technology, sponsors should refer to the AIP Handbook (5100.38B, Change 1, Chapter 5, Section 504(b)).

Funding emphasis is on deployment – R&D is not eligible.

10.1 Project Cost Considerations

The sponsor must indicate the requested amount of AIP and/or PFC funding on the project application. If the sponsor is requesting AIP funding, the source of local matching funds must be identified also.

The FAA assumes that the sponsor will conduct due diligence on their choice of low-emissions technology and cost information prior to assembling their air quality applications. Sponsors should support all vehicle values with quotes from potential vehicle OEMs or vendors, and attach this information to the proposal.

Cost information for vehicles should always distinguish between eligible incremental costs, which are included in the cost effectiveness calculations, and base costs, which are not eligible project costs and should not be included in the cost effectiveness calculations.

Cost information for infrastructure should include the capital and construction costs, labor to install, and the associated architecture, design, and planning fees.
Eligible program costs include project formulation and design. Costs that are not allowed include operations and maintenance (O&M), fuel, or separate facilities to store low-emission vehicles or equipment.

While the basis for project cost effectiveness is the initial capital investment, the sponsor is encouraged to develop supplemental life-cycle cost information and to submit this information with the project application. For example, electric vehicles generally cost less to operate and maintain than conventional fuel vehicles, even when accounting for battery replacement costs before the end of the vehicle's useful life.

10.2 Cost Effectiveness

The FAA will evaluate the cost effectiveness of projects primarily on the basis of Level One pollutants. The typical range of cost effectiveness for each criteria pollutant is provided below.[33]

Pollutant	Cost Effectiveness Ranges ($/ton)
Ozone (NOx + VOC)	$5,000 to $10,000
CO	$1,000 or less
PM_{10}	$25,000 to $50,000
$PM_{2.5}$	TBD
SO_2	NA

Source: FAA ILEAV pilot program. 2001.

The cost effectiveness ranges provided above are recommended. Cost effectiveness may vary somewhat by project and airport size. For example, a small project involving a refueling station may yield lower cost effectiveness (i.e., showing higher dollar values than the above ranges) because of the greater investment in supporting infrastructure versus emission-saving vehicles.

10.3 Project Application Worksheets

A set of worksheets is provided in **Appendix D** and electronically as a workbook at http://www.faa.gov/arp/environmental/vale. The sponsor is required to submit the worksheets as an appendix to the VALE application proposal.

The entire workbook contains six spreadsheets intended to standardize project applications, to automate the process for convenience and quality control, and to simplify

[33] Based on similar estimates for the ILEAV Pilot Program, Report to Congress, November 2002.

the process in general for sponsors and reviewing agencies alike. Sponsors should copy spreadsheets for vehicles (Page 2) and infrastructure (Page 3) as many times as needed to represent the total number of project vehicles and all elements of project infrastructure.

CAUTION: The workbook contains equations embedded into some cells of the spreadsheets. These equations automatically calculate parameters and determine the distribution of requested funds from available sources. The workbook is not locked or secure, so careful manipulation of these spreadsheets is suggested.

How to Use Proposal Application Worksheets

Page 1. – General Information. The sponsor fills out this general information page with contact information, airport characteristics, the status of air quality at the airport, and the timeframe for emission reduction calculations and AERCs. The *Air Quality Proposal Date* should be entered into cell L7, and it will automatically repeat at the top of each subsequent page in the workbook.

Page 2 and Page 3. – Individual Vehicle Information. Sponsors seeking to purchase low-emission vehicles should complete the Page 2 worksheet(s) for AIP funding and the Page 3 worksheet(s) for PFC funding. Both AIP and PFC vehicle worksheets are designed to accommodate only one vehicle type per page. Therefore, additional copies of Page 2 and Page 3 are required for applications that involve the purchase of multiple vehicle types. For instance, a VALE program that is seeking AIP funds to purchase 20 identical CNG-powered buses, 30 identical hybrid LDVs, and 10 identical electric fork lifts would need to complete Page 2 three separate times.

Completion of all eight sections on Page 2 and/or Page 3 is mandatory.

> *Vehicle Identification* – Provide the anticipated date (mm-yyyy) of deployment for new vehicles, which should coincide with schedule information provided in the air quality proposal. In addition, the vehicle model, model year, and manufacturer are required.
>
> *Vehicle Class* – Check boxes to indicate if the new vehicle(s) is GSE or GAV. This information determines the technique used for emissions quantification. In general, any vehicle with a registered license plate to travel on-road is GAV. For instance, a catering truck typically found on the airfield supplying aircraft with provisions is usually GSE. However, many catering trucks travel on public roadways to get to/from the flight kitchen. This requires license plates and, in turn, an on-road engine. In this case, the catering truck would be considered an on-road vehicle and the GAV box should be checked. Other possible transitional vehicles are fuel trucks and deicer trucks.
>
> *Alternative Fuel Type* – Place an "X" next to the alternative fuel that is being used for the proposed vehicle type.

Replacement Conventional Fuel Type – Place an "X" next to the conventional fuel that is being replaced or displaced, and used for the quantification of baseline emissions.

Unit Cost Per Vehicle – Provide the unit cost and useful life information for the proposed low-emission vehicle(s). For AIP-funded vehicles, obtain useful life information from **Table 7-1** in this Technical Report. If a specific vehicle type is not available on **Table 7-1**, then consult **Table 8-1**. For PFC-funded vehicles, consult **Table 8-1** first, then **Table 7-1**. If neither table provides the appropriate vehicle type, then use a default value of 10 years. The vehicle base cost is the purchase price of the same or equivalent new conventional fuel vehicle. The incremental cost is the difference in total purchase price between the proposed VALE low-emission vehicle and the same or equivalent new conventional fuel vehicle. Finally, on Page 2 only, place a "Y" in the box if PFCs will be used as the required local match for AIP funding, or place an "N" in the box if other local revenue sources are used as the AIP match.

Airport Vehicle Type – Place the number of proposed VALE vehicles in the appropriate box next to the listed vehicle type. If a particular vehicle type is not available, use the "Other" line (Page 2 cell Q26; Page 3 cell Q27) to provide a descriptive label of the proposed vehicle type. As a reminder, there should be only one proposed VALE vehicle type identified in this section. For projects that propose multiple vehicle types, Page 2 (AIP) and Page 3 (PFC) must be repeated for each unique vehicle type.

Replacement of Old Vehicles – If funds are being used to purchase new vehicles that will replace/retire existing old vehicles, then supply information about the existing older vehicle(s) in this section. Such information should include: make, model, unique airport vehicle identification number, model year, horsepower size of the engine, average miles per year or hours per year vehicle usage, the method of disposal of the old vehicle, and the remaining useful life (RUL) of the vehicle at the time of anticipated retirement.

Summary – The worksheet will automatically summarize the financial project costs and grant cost share for the unique VALE vehicle type. Failure to provide complete information in the prior sections will result in an inaccurate automated summary.

Page 4. – VALE Infrastructure Summary Sheet. Sponsors should complete this worksheet if the project proposal involves low-emission infrastructure. There are three options for funding infrastructure,

1) AIP cost share with PFC matching funds [code = AIPPFC],
2) AIP cost share with matching funds from other sources [code = AIPOTH], and

3) PFC funding [code = PFC].

The appropriate code should be entered into the *Infrastructure Funding Options Box* (cell I3) to represent the sponsor's approach to funding low-emissions infrastructure. Each code will automatically distribute the infrastructure costs into the appropriate columns.

Description – Provide a brief description of the individual low-emission infrastructure projects. If possible, provide important size parameters, major components, fuel types, and other information that matches the description in the air quality proposal.

Start-up Date – Provide the anticipated time for the infrastructure project to become fully functional. The dates should be in the format of (mm-yyyy) and coincide with the project schedule provided in the air quality proposal.

Estimated Operating Life – Provide the estimate operating (useful) life in years for each low-emission infrastructure project proposed.

Number of Units – Provide the number of identical or similar equipment.

Total Cost – Provide the total costs associated with each low-emission infrastructure project, including all eligible costs such as design, equipment, and installation.

Page 5. – Project Funding Summary Sheet. This worksheet summarizes the total low-emissions project costs by AIP, PFC, and other airport funds. Each cell in this worksheet is automatically populated per the entries of Pages 1 through 4.

AIP Requested Funding for Vehicles should be the sum of cell Q35 for each Page 2 worksheet used in the project application.

AIP Requested Funding for Infrastructure should be the sum of cell G18 for each Page 4 worksheet used in the project application.

PFC Requested Funding for Vehicles should be the sum of cell Q36 for each Page 2 worksheet and cell Q39 for each Page 3 worksheet used in the project application.

PFC Requested Funding for Infrastructure should be the sum of cell H18 for each Page 4 worksheet used in the project application.

Other Local Funds for Vehicles should be the sum of cell Q37 for each Page 2 worksheet used in the project application.

Other Local Funds for Infrastructure should be the sum of cell I18 for each Page 4 worksheet used in the project application.

Page 6. – Project Cost Effectiveness Summary Sheet. This worksheet summarizes the total cost effectiveness of the proposed VALE project. The sponsor should enter the cumulative emission reductions for the total project lifetime indicated on Page 1, as calculated in the EDMS analysis. The cost effectiveness will automatically appear per pollutant.

APPENDIX A
GLOSSARY OF TERMS

Aftertreatment Device	Engine pollutant emissions are generally reduced by engine modifications, fuel specifications or exhaust gas aftertreatment. An aftertreatment device is a component used to reduce engine pollutant emissions downstream of the combustion chamber. Catalytic converters and particulate traps are examples of aftertreatment devices.
Airport-Dedicated	Located of primarily used at the airport.
Airport Owned	Owned directly by the sponsor.
Alternative Fuel	Consistent with the Energy Policy Act (EPAct), non-conventional fuels including: compressed natural gas (CNG), liquefied petroleum gas (LPG), hydrogen, electricity, and any liquid at least 85 percent of the volume of which consists of methanol (M85) or ethanol (E85).
Alternative Fuel Vehicle (AFV)	A vehicle that is powered by an alternative fuel.
Attainment Area	A geographic area in which levels of a criteria air pollutant meet the health-based primary standard (national ambient air quality standard, or NAAQS) for the pollutant. An area may have an acceptable level for one criteria air pollutant, but may have unacceptable levels for others. Thus, an area could be both attainment and nonattainment at the same time. Attainment areas are defined using federal pollutant limits set by EPA.
Base Cost	The cost of a conventional-fueled vehicle.
Bi-Fuel Vehicle	A vehicle that can operate on either an alternative fuel or conventional fuel, but not both simultaneously. Typically, the operator can manually choose which fuel to operate the vehicle.
Bio Fuel	Fuel that is produced from biomass, including corn, soybeans, and other grains. Bio-fuel is often part of a blend (e.g., "B5" represents 5 percent bio-fuel).
Brake Horsepower (bhp)	This value is determined experimentally with the use of a band brake, as the name implies, or more modernly, with an absorption dynamometer. Horsepower is the rate of doing work, measured in units equal to lifting 33,000 pounds a distance of one foot in one minute (1 hp = 0.746 kwh). As applied to an internal combustion engine, it is the amount of work done per minute by the torque developed by the engine. BHP = T x RPM / 5252 where, T = torque expressed in foot-pounds

	RPM = engine revolutions/minute
Carbon Monoxide (CO)	A criteria pollutant that is colorless, odorless, poisonous gas, and is produced by incomplete burning of carbon-based fuels, including gasoline, oil, and wood. Carbon monoxide is also produced from incomplete combustion of many natural and synthetic products (e.g., cigarette smoke) When carbon monoxide gets into the body, the carbon monoxide combines with chemicals in the blood and prevents the blood from bringing oxygen to cells, tissues and organs. The body's parts need oxygen for energy, so high-level exposures to carbon monoxide can cause serious health effects, with death possible from massive exposures. Symptoms of exposure to carbon monoxide can include vision problems, reduced alertness, and general reduction in mental and physical functions. Carbon monoxide exposures are especially harmful to people with heart, lung and circulatory system diseases.
Catalytic Converter	A catalytic converter consists of a metal housing filled with a hard material which is covered with a catalytic compound. The presence of the catalytic converter in the engine exhaust system breaks down the chemicals in the exhaust and reduces harmful pollutant emissions.
Certified	Certification means, with respect to new highway and nonroad engines, obtaining a certificate of conformity from the EPA for an engine family that complies with the highway or nonroad engine emission standards and requirements.
Clean Air Act (CAA)	The original Clean Air Act was passed in 1963, but the national air pollution control program is actually based on the 1970 version of the law. The 1990 Clean Air Act Amendments are the most far-reaching revisions of the 1970 law. The 1990 amendments are routinely referred to as the 1990 Clean Air Act.
Clean Diesel (ULSD)	Ultra low-sulfur diesel fuel that has 15 ppm or less of sulfur
Clean Fuels	Low-pollution fuels that can replace ordinary gasoline. These are *alternative* fuels, such as electricity, gasohol (gasoline-alcohol mixtures), natural gas and LPG (liquefied petroleum gas).
Conventional Fuel	Petroleum-based fuels, primarily gasoline and diesel
Commercial Service Airport	A publicly owned airport in a State that the Secretary determines has at least 2,500 passenger boardings each year and is receiving scheduled passenger aircraft service. The airport must also be listed in the FAA's NPIAS.
Cost Effectiveness	The greatest air quality benefits measured by the amount of emissions reduced per dollar of funds expended.
Criteria Air Pollutants	A group of very common air pollutants regulated by EPA on the basis of health and/or environmental effects of pollution.

	Criteria air pollutants are widely distributed all over the country. They are CO, NO_2, SO_2, PM_{10}, $PM_{2.5}$, O_3, and lead.
Diesel Engine	An engine that operates on diesel fuel and principally relies on compression-ignition for engine operation. The non-use of a throttle during normal operation is indicative of a diesel engine.
Electric Vehicle (EV)	Vehicles that derive 100 percent of their motive energy from the electric grid via batteries.
Engine Family	Each group of engines with similar emission characteristics is defined as a separate engine family. Vehicles or engines in an engine family are expected to have similar emission characteristics. A permanent label is affixed to the engine which list the engine family designation as well as other important information.
Flexible-Fuel Vehicles (FFV)	vehicles that automatically detects the blended fuel composition in the fuel tank, and adjusts the combustion parameters accordingly for optimum engine performance. Typically, FFVs operate on an alcohol-gasoline blend such as ethanol/gasoline or methanol/gasoline.
Fuel Cells	Energy released by the oxidation of hydrogen to water is directly converted to an electrical current.
Fuel Cell Vehicle	An electric vehicle powered by a chemical hydrogen fuel cell battery. These vehicles may or may not be capable of capturing regenerative braking energy.
Gross Vehicle Weight Rate (GVWR)	The curb weight of the vehicle plus its maximum recommended load of passengers and cargo.
Ground Access Vehicles (GAV)	Vehicles licensed for on-road use.
Ground Support Equipment (GSE)	Non-road vehicles used on the airport tarmac to service aircraft and other airport-specific duties.
Highway Engine	Any engine which is designed to transport people or property on a street or highway.
Hybrid Vehicle	As defined in Subpart R – General Provisions for the Voluntary National Low-emission Vehicle Program for Light-Duty Vehicles and Light-Duty Trucks (62 FR 31242, June 6, 1997), any vehicle defined as a *series hybrid electric vehicle* that delivers power to the wheels by battery-powered electric motor, but which also incorporates the use of a combustion engine to provide power to the battery and/or electric motor; *a parallel hybrid electric vehicle* that delivers power to the wheels by either a combustion engine and/or by a battery-powered electric motor, or a *battery assisted combustion engine vehicle* that uses stored battery packs to propel the vehicle.
Hydrocarbons (HC)	An exhaust and evaporative pollutant of hydrogen and carbon atoms resulting from unburned fuel. The volatile portion of

	HCs contribute to the formation of ozone which is responsible for the choking, coughing, and stinging eyes associated with ozone smog. Ozone damages lung tissue, aggravates respiratory disease, and makes people more susceptible to respiratory infections.
Incremental Cost	The cost difference between a low-emissions vehicle typically powered by an alternative fuel, and the conventional-fueled equivalent
Large Hub Airport	A commercial service airport that has 1 percent or more of the annual passengers boardings.
Level One Pollutants	The criteria pollutant(s) that is causing the area nonattainment or maintenance status.
Level Two Pollutants	The remaining criteria pollutants that are not Level One Pollutants.
Low-Emission Technology	Technology for vehicles and equipment whose emission performance is the best achievable under emission standards established by the EPA and that relies exclusively on alternative fuels that are substantially nonpetroleum based, as defined by the Department of Energy, but not excluding hybrid systems or natural gas powered vehicles.
Low-Emission Vehicle (LEV)	any vehicle certified to the low-emission vehicle standards specified in this program.
Low Sulfur Diesel Fuel	Current EPA regulations specify that diesel test fuel contain 300 - 500 ppm sulfur for highway engines and 300 – 4,000 ppm sulfur for nonroad engines. Significant reductions from these current sulfur levels are necessary in order for many retrofit technologies to provide meaningful, lasting emissions reductions. The manufacturers of these retrofit technologies will specify the maximum allowable sulfur level for effective operation of its products. In addition to enabling a wide array of emissions control technologies, the use of low sulfur alone reduces emissions of particulate matter. Sulfate, a major constituent of particulate matter, is produced as a byproduct of burning diesel fuel containing sulfur. Reducing the sulfur content of fuel in turn reduces sulfate byproducts of combustion and therefore particulate matter emissions.
Maintenance Area (MA)	A geographic area that was formerly nonattainment for one or more criteria pollutants, but has experienced three or more years of no violations of the NAAQS. Maintenance status typically lasts for two consecutive decades to ensure air quality has improved adequately.
Medium Hub Airport	A commercial service airport that has at least 0.25 percent but less than 1 percent of the annual passengers boardings.
Model Year (MY)	The manufacturer's annual new model production period which includes January 1 of the calendar year, ends no later than December 31 of the calendar year, and does not begin

	earlier than January 2 of the previous calendar year. Where a manufacturer has no annual new model production period, model year means calendar year.
National Ambient Air Quality Standards (NAAQS)	The Clean Air Act (amended in 1990), requires EPA to set National Ambient Air Quality Standards for pollutants considered harmful to public health and the environment. The Clean Air Act established two types of national air quality standards. Primary standards set limits to protect public health, including the health of "sensitive" populations such as asthmatics, children, and the elderly. Secondary standards set limits to protect public welfare, including protection against decreased visibility, damage to animals, crops, vegetation, and buildings. The EPA has set NAAQS for six principal pollutants, which are called "criteria" pollutants. They are O_3, CO, NO_2, SO_2, PM_{10}, $PM_{2.5}$, and lead.
Natural Gas	Either compressed natural gas (CNG) or liquefied natural gas (LNG).
Neofit	A pre-market modification of a vehicle with control equipment directly from an OEM and before delivering the vehicle to the purchaser.
New Vehicle	Vehicle purchased from an OEM that essentially has no miles on it. This definition does not include reprogrammed or re-engined vehicles.
Nitrogen Oxides (NOx)	Nitrogen oxides are a family of reactive gaseous compounds that contribute to air pollution in both urban and rural environments. NOx emissions are produced during the combustion of fuels at high temperatures. The primary sources of atmospheric NOx include highway sources (such as light-duty and heavy-duty vehicles), nonroad sources (such as construction and agricultural equipment, and locomotives) and stationary sources (such as power plants and industrial boilers). NOx can irritate the lungs, cause bronchitis and pneumonia, and lower resistance to respiratory infections. Nitrogen oxides are an important precursor both to ozone and acid rain, and may affect both terrestrial and aquatic ecosystems.
Nonattainment Area (NA)	A locality where air pollution levels persistently exceed National Ambient Air Quality Standards. Designating an area as nonattainment is a formal rulemaking process and EPA normally takes this action only after air quality standards have been exceeded for several consecutive years.
Non Methane Hydrocarbons (NMHC)	Same as the definition of non methane organic gases (NMOG), but excludes oxygenated hydrocarbons such as alcohols and aldehydes.

Non Methane Organic Gases (NMOG)	Organic compounds in the atmosphere that contain the element carbon (C) and are reactive with nitrogen oxides in the presence of sunlight to produce ozone in the troposphere. This includes oxygenated hydrocarbons such as alcohols and aldehydes, but does not include less reactive hydrocarbons such as methane.
Nonroad Engine	Although nonroad engines can be self-propelled vehicles that are not licensed to travel on streets and highways, their primary function is to perform a particular task. Examples of nonroad engines include ground support equipment, garden tractors, lawnmowers, bulldozers, and cranes.
Oxidation Catalyst	A type of catalyst (e.g., catalytic converter) which chemically converts HC (hydrocarbons) and CO (carbon monoxide) to water vapor and carbon dioxide.
Oxygenated fuel	Special type of gasoline, which burns more completely than regular gasoline in cold start conditions; more complete burning results in reduced production of CO. In some parts of the country, CO release from cars starting up in cold weather makes a major contribution to pollution. In these areas, gasoline refiners must market oxygenated fuels, which contain a higher oxygen content than regular unleaded gasoline.
Ozone (O_3)	Ozone is a photochemical oxidant and the major component of smog. While O_3 in the upper atmosphere shields the earth from harmful ultraviolet radiation that comes from the sun, high concentrations of O_3 at ground level are a major health and environmental concern. O_3 is not emitted directly into the air but is formed through complex chemical reactions between emissions of volatile organic compounds (VOC) and nitrogen oxides (NOx) in the presence of sunlight. These reactions are stimulated by sunlight and temperature so that peak O_3 levels occur typically during the warmer times of the year. Both VOCs and NOx are emitted by transportation and industrial sources such as vehicles, chemical manufacturing, dry cleaners and paint shops. O_3 causes health problems because it damages lung tissue, reduces lung function and sensitizes the lungs to other irritants. Scientific evidence indicates that ambient levels of O_3 not only affect people with impaired respiratory systems, such as asthmatics, but healthy adults and children as well. Exposure to O_3 for several hours at relatively low concentrations has been found to significantly reduce lung function and induce respiratory inflammation in normal, healthy people during exercise. This decrease in lung function generally is accompanied by symptoms including chest pain, coughing, sneezing and pulmonary congestion.

Particulate Matter (PM)	PM includes dust, dirt, soot, smoke and liquid droplets directly emitted into the air by sources such as factories, power plants, cars, engines, construction activity, fires and natural windblown dust. Particles formed in the atmosphere by condensation or the transformation of emitted gases are also considered particulate matter. Exposure to PM include effects on breathing and respiratory symptoms, aggravation of existing respiratory and cardiovascular disease, alterations in the body's defense systems against foreign materials, damage to lung tissue, as well as premature death. The major subgroups of the population that appear to be most sensitive to the effects of PM include individuals with chronic obstructive pulmonary or cardiovascular disease or influenza, asthmatics, the elderly and children. Particulate matter is a cause of impaired visibility in the United States. The EPA has established NAAQS for PM with aerodynamic diameters less than or equal to 10 micrometers (PM_{10}) and PM with aerodynamic diameters less than or equal to 2.5 micrometers ($PM_{2.5}$).
Particulate Trap/Filter	An aftertreatment device which filters or traps diesel particulate matter from engine exhaust until the trap becomes loaded to the point that a regeneration cycle is implemented to burn off the trapped particulate matter.
Program Low-Emission Standards	Low-emission EPA standards that are more stringent than existing vehicle emission standards, with the goal of generating early voluntary emission reductions.
Public Access	The use of VALE-funded low-emission technology by persons not affiliated with the airport or related operations.
Retrofit	An engine "retrofit" includes (but is not limited to) any of these activities: • Addition of new/better pollution control aftertreatment equipment to certified engines • Re-engining or re-powering • Upgrading a certified engine to a cleaner certified configuration • Upgrading an uncertified engine to a cleaner "certified-like" configuration • Conversion of any engine to a cleaner fuel • Early replacement of older engines with newer (presumably cleaner) engines (in lieu of regular expected rebuilding)
Small Hub Airport	A commercial service airport that has at least 0.05 percent but less than 0.25 percent of the annual passengers boardings.
Sponsor	Also known as “Airport sponsors” that are planning agencies, public agencies, or private airport owners/operators that have

	the legal and financial ability to carry out the requirements of the AIP program. The term is also used in this document to refer to the PFC program, which is restricted to "public agencies."
State Implementation Plan (SIP)	A State Implementation Plan (SIP) is a written plan that describes a state's strategy for achieving and maintaining the National Ambient Air Quality Standards. Section 110 of the Clean Air Act requires states with areas that do not meet the air standards to develop a written SIP outlining steps they will take to reduce air pollution. The purpose of a SIP is to ensure the implementation of programs that will reduce emissions.
Sulfur Dioxide (SO_2)	A criteria air pollutant. SO_2 is a gas produced by burning fuels containing sulfur. Some industrial processes, such as production of paper and smelting of metals, produce sulfur dioxide. SO_2 is closely related to sulfuric acid, a strong acid. SO_2 plays an important role in the production of acid rain.
Ultra Low-emission Vehicle (ULEV)	defined in 40 CFR 88.302, either conventionally or alternatively fueled.
Ultra Low Sulfur Diesel (ULSD)	Current EPA regulations specify that ultra low sulfur diesel fuel contain 15 ppm sulfur.
Useful Life	The time a piece of equipment reasonably functions as it was originally manufactured to, without catastrophic breakdown or major repair.
Verified Retrofit Technology List	This is a list that EPA prepares of Heavy Duty Diesel (HDD) emission control technologies that are suitable for use with HDD engines. If a control technology appears on EPA's list, the manufacturer's emission reduction claims have been confirmed through EPA's Environmental Technology Verification Program. For more information see http://www.epa.gov/etv/centers/center5.html.
Volatile Organic Compounds (VOC)	Generally, all organic compounds in the atmosphere containing the element carbon (C) that are reactive to drive the formation of ozone in the presence of sunlight. This includes oxygenated compounds such as alcohols and aldehydes. Some hydrocarbons are less ozone-forming than other hydrocarbons, so EPA has officially excluded them from the definition of regulated hydrocarbons or VOCs. This definition excludes methane, ethane, and compounds not commonly found in large quantities in engine exhaust like chlorohydrocarbons from consideration as VOC. Many VOCs are also hazardous air pollutants.

APPENDIX B
VISION 100 – CENTURY OF AVIATION REAUTHORIZATION ACT

This Appendix provides the applicable Vision 100 Legislative Sections that support the FAA VALE program:

- Section 121 – Low-emission airport vehicles and ground support equipment
- Section 151 – Increase in apportionment for, and flexibility of, noise compatibility planning programs
- Section 158 – Emission credits for air quality projects
- Section 159 – Low-emission airport vehicles and infrastructure

They are as follows:

Subtitle B – Passenger Facility Fees

SEC. 121. LOW-EMISSION AIRPORT VEHICLES AND GROUND SUPPORT EQUIPMENT.

(a) IN GENERAL. – Section 40117(a)(3) is amended by inserting at the end the following:

> "(G) A project for converting vehicles and ground support equipment used at a commercial service airport to low-emission technology (as defined in section 47102) or to use cleaner burning conventional fuels, retrofitting of any such vehicles or equipment that are powered by a diesel or gasoline engine with emission control technologies certified or verified by the Environmental Protection Agency to reduce emissions, or acquiring for use at a commercial service airport vehicles and ground support equipment that include low-emission technology or use cleaner burning fuels if the airport is located in an air quality nonattainment area (as defined in section 171(2) of the Clean Air Act (42 U.S.C. 7501(2))) or a maintenance area referred to in section 175A of such Act (42 U.S.C. 7505a) and if such project will result in an airport receiving appropriate emission credits as described in section 47139.".

(b) MAXIMUM COST FOR CERTAIN LOW-EMISSION TECHNOLOGY PROJECTS. – Section 40117(b) is amended by adding at the end the following:

> "(5) MAXIMUM COST FOR CERTAIN LOW-EMISSION TECHNOLOGY PROJECTS. – The maximum cost that may be financed by imposition of a passenger facility fee under this section for a project described in subsection

(a)(3)(G) with respect to a vehicle or ground support equipment may not exceed the incremental amount of the project cost that is greater than the cost of acquiring a vehicle or equipment that is not low-emission and would be used for the same purpose, or the cost of low-emission retrofitting, as determined by the Secretary.".

(c) GROUND SUPPORT EQUIPMENT DEFINED. – Section 40117(a) is amended –
  (1) by redesignating paragraphs (4) and (5) as paragraphs (5) and (6), respectively; and
  (2) by inserting after paragraph (3) the following: "(4) GROUND SUPPORT EQUIPMENT. – The term 'ground support equipment' means service and maintenance equipment used at an airport to support aeronautical operations and related activities.".

(d) GUIDANCE. – The Secretary, in consultation with the Administrator of the Environmental Protection Agency, shall issue guidance determining eligibility of projects, and how benefits to air quality must be demonstrated, under the amendments made by this section.

Subtitle C – AIP Modifications

SEC. 151. INCREASE IN APPORTIONMENT FOR, AND FLEXIBILITY OF, NOISE COMPATIBILITY PLANNING PROGRAMS.

Section 47117(e)(1)(A) is amended –
  (1) by striking "At least 34 percent" and inserting "At least 35 percent";
  (2) by striking "of this title and" and inserting a comma;
  (3) by striking "of this title." And inserting ", for noise mitigation projects approved in an environmental record of decision for an airport development project under this title, for compatible land use planning and projects carried out by State and local governments under section 47141, and for airport development described in section 47102(3)(F), 47102(3)(K), or 47102(3)(L) to comply with the Clean Air Act (42 U.S.C. 7401 et seq.)"; and
  (4) by striking "34 percent requirement" and inserting "35 percent requirement".

SEC. 158. EMISSION CREDITS FOR AIR QUALITY PROJECTS.

(a) EMISSIONS CREDIT. – Subchapter I of chapter 471 is further amended by adding at the end the following:

"§ 47139. Emission credits for air quality projects

"(a) IN GENERAL. – The Administrator of the Environmental Protection Agency, in consultation with the Secretary of Transportation, shall issue guidance on how to ensure that airport sponsors receive appropriate emission reduction

credits for carrying out projects described in sections 40117(a)(3)(G), 47102(3)(F), 47102(3)(L). Such guidance shall include, at a minimum, the following conditions:

"(1) The provision of credits is consistent with the Clean Air Act (42 U.S. C. 7402 et seq.).

"(2) Credits generated by the emission reductions are kept by the airport sponsor and may only be used for purposes of any current or future general conformity determination under the Clean Air Act or as offsets under the Environmental Protection Agency's new source review program for projects on the airport or associated with the airport.

"(3) Credits are calculated and provided to airports on a consistent basis nationwide.

"(4) Credits are provided to airport sponsors in a timely manner.

"(5) The establishment of a method to assure the Secretary that, for any specific airport project for which funding is being requested, the appropriate credits will be granted.

"(b) ASSURANCE OF RECEIPT OF CREDITS. – As a condition for making a grant for a project described in section 47102(3)(F), 47102(3)(K), 47102(3)(L), or 47140 or as a condition for granting approval to collect or use a passenger facility fee for a project described in section 40117(a)(3)(G), 47103(3)(F), 47102(3)(K), 47102(3)(L), or 47140, the Secretary must receive assurance from the State in which the project is located, or from the administrator of the Environmental Protection Agency where there is a Federal implementation plan, that the airport sponsor will receive appropriate emission credits in accordance with the conditions of this section.

"(c) PREVIOUSLY APPROVED PREJECTS. – The Administrator of the Environmental Protection Agency, in consultation with the Secretary, shall determine how to provide appropriate emissions credits to airport projects previously approved under section 47136 consistent with the guidance and conditions specified in subsection (a).

"(d) STATE AUTHORITY UNDER CAA. – Nothing in this section shall be construed as overriding existing State law or regulation pursuant to section 116 of the Clean Air Act (42 U.S.C. 7416).".

(b) CONFORMING AMENDMENT. – The analysis for chapter 471 is further amended by inserting after the item relating to section 47138 the following:
"47139. Emission credits for air quality projects.".

SEC. 159. LOW-EMISSION AIRPORT VEHICLES AND INFRASTRUCTURE.

(a) AIRPORT GROUND SUPPORT EQUIPMENT EMISSIONS RETROFIT PILOT PROGRAM. –

(1) IN GENERAL. – Subchapter I of chapter 471 is further amended by adding at the end the following:

"§ 47140. Airport ground support equipment emissions retrofit pilot program

"(a) IN GENERAL. – The Secretary of Transportation shall carry out a pilot program at not more than 10 commercial service airports under which the sponsors of such airports may use an amount made available under section 48103 to retrofit existing eligible airport ground support equipment that burns conventional fuels to achieve lower emissions utilizing emission control technologies certified or verified by the Environmental Protection Agency.

"(b) LOCATION IN AIR QUALITY NONATTAINMENT OR MAINTENANCE AREAS. – A commercial service airport shall be eligible for participation in the pilot program only if the airport is located in an air quality nonattainment area (as defined in section 171(2) of the Clean Air Act (42 U.S.C. 7501(2))) or a maintenance area referred to in section 175A of such Act (42 U.S.C. 7505a).

"(c) SELECTION CRITERIA. – In selecting from among applicants for participation in the pilot program, the Secretary shall give priority consideration to applicants that will achieve the greatest air quality benefits measured by the amount of emissions reduced per dollar of funds expended under the pilot program.

"(d) MAXIMUM AMOUNT. – Not more than $500,000 may be expended under the pilot program at any single commercial service airport.

"(e) GUIDELINES. – The Secretary, in consultation with the Administrator of the Environmental Protection Agency, shall establish guidelines regarding the types of retrofit projects eligible under the pilot program by considering remaining equipment useful life, amount of emission reduction in relation to the cost of projects, and other factors necessary to carry out this section. The Secretary may give priority to ground support equipment owned by the airport and used for airport purposes.

"(f) ELIGIBLE EQUIPMENT DEFINED. – In this section, the term 'eligible equipment' means ground service or maintenance equipment that is located at the airport, is used to support aeronautical and related activities at the airport, and will remain in operation at the airport for the life or useful life of the equipment, whichever is earlier.".

(2) CONFORMING AMENDMENT. – The analysis for chapter 471 is further amended by inserting after the item relating to section 47139 the following:
"47140. Airport ground support equipment emissions retrofit pilot program.".

(b) ACTIVITIES ADDED TO DEFINITION OF AIRPORT DEVELOPMENT. –

(1) IN GENERAL. – Section 47102(3) is amended –

(A) by striking subparagraphs (J), (K), and (L) and redesignating subparagraph (M) as subparagraph (J); and

(B) by adding at the end the following:

"(K) work necessary to construct or modify airport facilities to provide low-emission fuel systems, gate electrification, and other related air quality improvements at a commercial service airport if the airport is located in an air quality nonattainment or maintenance area (as defined in sections 171(2) and 175A of the Clean Air Act (42 U.S.C. 7501(2); 7505a) and if such project will result in an airport receiving appropriate emission credits, as described in section 47139.

"(L) a project for the acquisition or conversion of vehicles and ground support equipment, owned by a commercial service airport, to low-emission technology, if the airport is located in a air quality nonattainment or maintenance area (as defined in sections 171(2) and 175A of the Clean Air Act (42 U.S.C. 7501(2) ; 7505a) and if such project will result in an airport receiving appropriate emission credits as described in section 47139.".

(2) GUIDANCE. –

(A) ELIGIBLE LOW-EMISSION MODIFICATIONS AND IMPROVEMENTS. – The Secretary of Transportation, in consultation with the Administrator of the Environmental Protection Agency, shall issue guidance describing eligible low-emission modifications and improvements, and stating how airport sponsors will demonstrate benefits, under section 47102(3)(K) of title 49, United States Code, as added by this subsection.

(B) ELIGIBLE LOW-EMISSION VEHICLE TECHNOLOGY. – The Secretary, in consultation with the Administrator, shall issue guidance describing eligible low-emission vehicle technology, and stating how airport sponsors will demonstrate benefits, under section 47102(3)(L) of title 49, United States Code, as added by this subsection.

(c) ALLOWABLE PROJECT COST. – Section 47110(b) is amended –

(1) by striking "and" at the end of paragraph (4);

(2) by striking the period at the end of paragraph (5) and inserting "; and"; and

(3) by adding at the end the following:

"(6) if the cost is for a project not described in section 47102(3) for acquiring for use at a commercial service airport vehicles and ground support equipment owned by an airport that include low-emission technology, but only to the extent of the incremental cost of equipping such vehicles or equipment with low-emission technology, as determined by the Secretary.".

(d) LOW-EMISSION TECHNOLOGY EQUIPMENT. – Section 47102 (as amended by section 801 of this Act) is further amended by inserting after paragraph (10) the following:

"(11) 'low-emission technology' means technology for vehicles and equipment whose emission performance is the best achievable under emission standards established by the Environmental Protection Agency and that relies exclusively on alternative fuels that are substantially nonpetroleum based, as defined by the Department of Energy, but not excluding hybrid systems or natural gas powered vehicles.".

APPENDIX C
"SPECIAL CONDITIONS" FOR AIP GRANTS AND PFC APPROVALS

The following language should be inserted as "special conditions" in all AIP grant agreements and as a part of the determination paragraph or acknowledgement letter in PFC approvals for this program.

1. "Vehicles and equipment purchased with assistance from this [grant/approval] shall be maintained and used for their useful life at the airport for which they were purchased. Moreover, any vehicles or equipment replaced under this program shall not be transferred to another airport or location within the same or any other nonattainment or maintenance area. No airport-owned vehicles or equipment may be transferred to, taken to, or used at another airport without the consent of the Federal Aviation Administration, in consultation with the EPA and State air quality agency."

   [For PFC approvals only] "In the event that funds from this approval are used to assist parties other than the public agency, the public agency shall establish enforceable agreements with the purchasing or leasing party. These agreements, established prior to funding, shall require vehicles and equipment to remain at the airport for their useful life unless a sale or reimbursement option is executed in accordance with the requirements in the VALE Technical Report."

2. "All vehicles and equipment purchased with assistance from this action shall be clearly labeled using the VALE program emblem designed by the Federal Aviation Administration."

3. "The [airport sponsor/public agency] shall maintain annual reporting records of all vehicles and equipment purchased with assistance from this action. These public records shall contain detailed information involving individual vehicles and equipment, project expenditures, cost effectiveness, and emission reductions."

4. "The [airport sponsor/public agency] certifies that it shall replace any disabled or seriously damaged vehicle or equipment purchased with assistance from this action, at any time during its useful life, with an equivalent vehicle or unit that produces an equal or lower level of emissions. The [airport sponsor/public agency] assumes all financial responsibility for replacement costs. The [airport sponsor/public agency] also certifies that it shall fulfill this replacement obligation, beyond the useful life of the affected vehicle or equipment, for the possible longer life of AERCs that were granted to the [airport sponsor/public agency] for this vehicle or equipment."

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APPENDIX D
PROJECT APPLICATION WORKSHEETS

The FAA prefers the electronic use of the program application worksheets. Electronic versions of these worksheets can be downloaded at http://www.faa.gov/arp/environmental/vale.

These worksheets are required with the submittal of each VALE air quality proposal to FAA, EPA, and the State air quality agency. See Chapter 10 for instructions on how to use these worksheets.

FAA Voluntary Airport Low Emission Program
PAGE 1. GENERAL INFORMATION

Airport Name: _____ 3-Letter Airport ID: _____

Contact Person: _____ Air Quality Proposal Date: _____

Mailing Address: _____ Phone: _____

Email Address: _____ Fax: _____

What is the air quality status of the airport?
(Place an "X" for all designations that apply)

☐	Ozone (O_3) 8-hour standard	☐ Nonattainment ☐ Maintenance
	Particulate Matter (PM)	
☐	PM_{10}	☐ Nonattainment ☐ Maintenance
☐	$PM_{2.5}$*	☐ Nonattainment ☐ Maintenance
☐	Carbon Monoxide (CO)	☐ Nonattainment ☐ Maintenance
☐	Nitrogen Dioxide (NO_2)	☐ Nonattainment ☐ Maintenance
☐	Sulfur Dioxide (SO_2)	☐ Nonattainment ☐ Maintenance

Hub Designation (place "X" in one)[1]

Large	Medium	Small	Non-hub

[1/] Per the criteria in FAA Order 5100.38B and subsequent updates.

Timeframe for Project Emission Reduction Estimates

The sponsor has two options (see below) regarding the length of emission reduction estimates and AERCs. This timeframe depends on whether the sponsor agrees to equivalent replacement of VALE vehicles and equipment for their useful life or for a longer period up to the typical 20-year life of AERCs (see Special Condition #4, Appendix C of the Technical Report).

(check one box)

☐ Option 1: The useful life of VALE-funded vehicles and equipment.

☐ Option 2: A longer period up to the 20-year life of AERCs. (certain stationary equipment for up to 40-years if agreed.)

☐ If Option 2 is selected, please provided the number of years for which the sponsor agrees to equivalent replacement of VALE vehicles and equipment.

* Implementation of PM2.5 requirements are expected to be effective in Spring of 2005.

NOTE: Please consult the airport nonattainment & maintenance area list at http://www.faa.gov/arp/environmental/vale ver. 1.0

PAGE 2. AIP-funded - INDIVIDUAL VEHICLE INFORMATION

(Repeat the completion of this sheet for <u>each</u> VALE vehicle type to be acquired using AIP funds)[1]

Air Quality Proposal Date:

Vehicle Identification

Anticipated Vehicle(s) Deployment Date: _____

Model: _____

Model Year: _____

Manufacturer: _____

Vehicle Class (check one)

- ☐ Ground Support Equipment (GSE) (nonroad & unlicensed)
- ☐ Ground Access Vehicle (GAV) (licensed for onroad use)

Alternative Fuel Type (check one)

- ☐ Electric
- ☐ CNG (compressed natural gas)
- ☐ LNG (liquified natural gas)
- ☐ LPG (liquified petroleum gas/propane)
- ☐ Hybrid Technology
- ☐ Hydrogen (Fuel Cell)
- ☐ Ethanol 85
- ☐ Methanol 85
- ☐ Coal-derived liquid fuels
- ☐ Biodiesel (100%)
- ☐ Other _____

Replacement Conventional Fuel Type (check one)

- ☐ Diesel
- ☐ Gasoline
- ☐ Other _____

Unit Cost Per Vehicle

Avg. Useful Life (years):[2] _____

Vehicle Base Cost ($):[3] _____

Incremental Cost ($):[4] _____

AIP Funding Share per Vehicle/Incremental Cost:	$0.00
Matching Funds Required:	$0.00
Use PFCs for matching funds (Y/N)?	

Airport Vehicle Type (place number of proposed vehicles in box next to type - choose only one vehicle type per worksheet)

- ☐ Air Conditioning Unit
- ☐ Baggage Tug
- ☐ Belt Loader
- ☐ Cargo Loader
- ☐ Cargo Tractor
- ☐ Catering Truck
- ☐ Deicer Truck
- ☐ Fork Lift
- ☐ Fuel Truck
- ☐ Generator
- ☐ Ground Power Unit
- ☐ Fire Truck
- ☐ Lavatory Truck
- ☐ Pushback Tractor
- ☐ Sweeper
- ☐ Sport Utility Vehicle (SUV)
- ☐ Passenger Car
- ☐ Passenger Van
- ☐ Service Van
- ☐ Pickup Truck
- ☐ 22' Shuttle
- ☐ 30-35' Bus
- ☐ 40' Bus
- ☐ Other _____

If proposed VALE program includes the replacement of old vehicles, provide old vehicle info below:

	Make/Model/Vehicle ID	Model Year	Hp	Avg. miles/year or hours/year	Method of Disposal of old vehicle	RUL[5] (yr)
1						
2						
3						
4						
5						
6						
7						
8						
9						

Repeat this page as needed for each proposed vehicle type.

Summary

Total Number of Proposed Vehicles:		0
Total Request for AIP Funding Share:		$0.00
Total PFC Matching Funds Requested:	+	$0.00
Total Other Matching Funds:	+	$0.00
Total Incremental Cost:	**=**	**$0.00**

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1/ Multiple vehicles can be listed only if they're IDENTICAL vehicle types (i.e., same model, year etc.) Otherwise, a separate vehicle information sheet (this page) must be prepared.

2/ Refer to Table 8-1 in the VALE program Technical Report.

3/ "Vehicle Base Cost" is the purchase price of the same or equivalent new conventional-fuel (gas/diesel) vehicle. This is not eligible for AIP funding, except for emergency and safety vehicles (FAA Order 5100.38B).

4/ The "Incremental Cost" is the difference in total purchase price between the proposed VALE vehicle and the same, or closely similar, new conventionally fueled (gas/diesel) vehicle (Base Cost).

5/ RUL = Remaining Useful Life (see Chapter 7 in the Technical Report).

PAGE 3. PFC-funded - INDIVIDUAL VEHICLE INFORMATION

(Repeat the completion of this sheet for <u>each</u> VALE vehicle type to be acquired using PFC funds)[1]

Air Quality Proposal Date:

Vehicle Identification

Anticipated Vehicle(s) Deployment Date: _____

Model: _____

Model Year: _____

Manufacturer: _____

Vehicle Class (check one)

- ☐ Ground Support Equipment (GSE) nonroad, unlicensed
- ☐ Ground Access Vehicle (GAV) licensed for onroad use

Alternative Fuel Type (check one)

- ☐ Electric
- ☐ CNG (compressed natural gas)
- ☐ LNG (liquified natural gas)
- ☐ LPG (liquified petroleum gas/propane)
- ☐ Hybrid Technology
- ☐ Hydrogen (Fuel Cell)
- ☐ Ethanol 85
- ☐ Methanol 85
- ☐ Coal-derived liquid fuels
- ☐ Biodiesel (100%)
- ☐ Retrofit/Rebuild
- ☐ Other _____

Replacement Conventional Fuel Type (check one)

- ☐ Diesel
- ☐ Gasoline
- ☐ Other _____

Unit Cost Per Vehicle

Avg. Useful Life (years):[2] _____

Vehicle Base Cost ($):[3] _____

Incremental Cost ($):[4] _____

Incremental Funding/Vehicle: $0.00

Airport Vehicle Type (place number of proposed vehicles in box next to type - choose only one vehicle type per worksheet)

- ☐ Air Conditioning Unit
- ☐ Baggage Tug
- ☐ Belt Loader
- ☐ Cargo Loader
- ☐ Cargo Tractor
- ☐ Catering Truck
- ☐ Deicer Truck
- ☐ Fork Lift
- ☐ Fuel Truck
- ☐ Generator
- ☐ Ground Power Unit
- ☐ Fire Truck
- ☐ Lavatory Truck
- ☐ Pushback Tractor
- ☐ Sweeper
- ☐ Sport Utility Vehicle (SUV)
- ☐ Passenger Car
- ☐ Passenger Van
- ☐ Service Van
- ☐ Pickup Truck
- ☐ 22' Shuttle
- ☐ 30-35' Bus
- ☐ 40' Bus
- ☐ Other _____

If proposed VALE program includes the replacement of old vehicles, provide old vehicle info below:

	Make/Model/Vehicle ID	Model Year	Hp	Avg. miles/year or hours/year	Method of Disposal of old vehicle	RUL[5] (yr)
1						
2						
3						
4						
5						
6						
7						
8						
9						

Repeat this page as needed for each proposed vehicle type.

Summary

Total Number of Proposed Vehicles: 0

Total Requested PFC Funding for Incremental Cost: $0.00

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1/ Multiple vehicles can be listed only if they're IDENTICAL vehicle types (i.e., same model, year etc.) Otherwise, a separate vehicle information sheet (this page) must be prepared.

2/ Refer to Table 9-1 in the VALE program Technical Report.

3/ "Vehicle Base Cost" is the purchase price of the same or equivalent new conventional-fuel (gas/diesel) vehicle. This is not eligible for AIP funding, except for emergency and safety vehicles (FAA Order 5100.38B).

4/ The "Incremental Cost" is the difference in total purchase price between the proposed VALE vehicle and the same, or closely similar, new conventionally fueled (gas/diesel) vehicle (Base Cost).

5/ RUL = Remaining Useful Life (see Chapter 8 in the Technical Report).

PAGE 4. VALE INFRASTRUCTURE SUMMARY SHEET

Air Quality Proposal Date:

						Infrastructure Funding Options Box: [1]		AIPPFC
Low Emissions Infrastructure Technololgy or Equipment Units								
	Description (including fuel type, size)	Start-up Date	Estimated Operating Life (years)	No. of Units	Total Cost[2]	AIP Eligible Cost Share	PFC Funds Required	Other Matching Funds Required
1						$0.00	$0.00	NA
2						$0.00	$0.00	NA
3						$0.00	$0.00	NA
4						$0.00	$0.00	NA
5						$0.00	$0.00	NA
6						$0.00	$0.00	NA
7						$0.00	$0.00	NA
8						$0.00	$0.00	NA
9						$0.00	$0.00	NA
10						$0.00	$0.00	NA
11						$0.00	$0.00	NA
12						$0.00	$0.00	NA
	Totals:				**$0.00**	**$0.00**	**$0.00**	**$0.00**

1/ Chose one of the following for funding low emissions infrastructure: ver. 1.0

AIPPFC = To designate the use of AIP funds for low emissions infrastructure with matching funds from PFCs.
AIPOTH = To designate the use of AIP funds for low emissions infrastructure with matching funds from another funding source.
PFC = To designate the use of PFC funds for low emissions infrastructure.

2/ Include all eligible costs such as design, equipment, and installation.

PAGE 5.
PROJECT FUNDING SUMMARY SHEET

Air Quality Proposal Date:

VALE Capital Purchases	AIP Requested Funds	PFC Requested Funds	AIP Matching Funds	Other Local Funds*	Total Project Funds
Vehicles	$0.00	$0.00	$0.00	$0.00	$0.00
Infrastructure	$0.00	$0.00	$0.00	$0.00	$0.00
Totals	$0.00	$0.00	$0.00	$0.00	$0.00

* Supplemental voluntary contributions.

ver. 1.0

PAGE 6.
PROJECT COST EFFECTIVENESS SUMMARY SHEET

Air Quality Proposal Date:

Pollutant	Projected Emission Reductions over Project Lifetime (tons)	Cost Effectiveness over Project Lifetime ($/ton)
NOx		
HC		
Ozone (NOx + HC)		
CO		
PM_{10}		
SO_2		

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APPENDIX E
PROJECT TRACKING WORKSHEETS

The FAA prefers the electronic use of the program tracking worksheets. Electronic versions of these worksheets can be downloaded at http://www.faa.gov/arp/environmental/vale.

FAA Voluntary Airport Low Emission Program
PAGE 1. TRACKING FORMS - GENERAL INFORMATION

Airport Name:		3-Letter Airport ID:	
Contact Person:		Calendar Year	
Mailing Address:		Phone:	
Email Address:		Fax:	

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DESCRIPTION OF TRACKING WORKSHEETS

The FAA provides these VALE project tracking worksheets to help sponsors monitor the emissions performance and cost effectiveness of VALE projects. Following a calendar year of operations, the sponsor should complete these forms and keep them on file for purposes of updating reports to the State air quality agency for AERCs, facilitating FAA review, and providing information to the public upon request. Information on the VALE program is available at http://www.faa.gov/arp/environmental/vale.

PAGE 1 - General Information

This sheet should be updated as needed to reflect changes in contact information.

PAGE 2 - Vehicle Tracking

Annual operational data and maintenance costs should be kept for each VALE-funded vehicle. Copies of PAGE 2 should be made as necessary. The annual emissions should be calculated for each VALE-funded vehicle and recorded in the lower right corner. This information, as well as supporting EDMS documentation, will need to be comunicated to the State air quality agency for AERC issuance and use.

PAGE 3 - Infrastructure Tracking

Annual operating data and maintenance costs should be kept for VALE-funded infrastructure.

PAGE 4- Emissions Tracking Worksheet

Total project emissions (vehicles + infrastructure use) should be calculated on an annual basis. Total emissions should be entered into the "project" columns. The baseline emissions should be indentical to what was calculated in the initial project application. AERCs are issued on a 1:1 basis with project emission reductions (ERs) but for very few exceptions regarding "surplus" status (see AERC Report). ERs for each project year are automatically calculated as the difference between "baseline" and "project." A running cumulative emissions reduction will automatically appear at the top of the page.

The total number of years for the project is equal to the useful life for individual VALE vehicles and equipment or to a longer period up to the typical 20-year life of AERCs.

PAGE 5 - Cost Effectiveness

For each respective "Calendar Year," sponsors must record the operational & maintenance (O&M) costs for VALE-funded vehicles and infrastructure. These costs should be summed and divided by the total annual emission reductions per pollutant in the appropriate cells to the right of the cost information. This provides annual cost effectiveness for each project year.

At the bottom of page 5, the sponsor should enter in the total sum of AIP requested, PFC requested, AIP matching, and other local funds from the original project application. The worksheet will automatically calculate the overall project cost effectiveness.

PAGE 2. INDIVIDUAL VEHICLE INFORMATION

(Repeat the completion of this sheet for <u>each</u> VALE vehicle)

Calendar Year: _____

Vehicle Identification

Vehicle Airport Deployment Date: _____

Make & Model: _____

Model Year: _____ Hp: _____

VIN or Serial Number: _____

Vehicle Class Information

☐ Ground Support Equipment (GSE) nonroad, unlicensed

<OR>

☐ Ground Access Vehicle (GAV) licensed for onroad use

☐ Vehicle leased to a Tenant (Y/N)?

If yes, to whom? _____

Alternative Fuel Type (check one)

☐ Electric
☐ CNG (compressed natural gas)
☐ LNG (liquified natural gas)
☐ LPG (liquefied petroleum gas/propane)
☐ Hybrid Technology
☐ Hydrogen (Fuel Cell)
☐ Ethanol 85
☐ Methanol 85
☐ Coal-derived liquid fuels
☐ Biodiesel (85-100%)
☐ Retrofit/Rebuild
☐ Other _____

Program ID Information

Unique Airport Vehicle ID: _____

License Plate (if applicable): _____

☐ Does vehicle have <u>required</u> VALE Program label affixed (Y/N)?

Annual Vehicle Usage

Avg. Useful Life (years):[1] _____

Original Vehicle Purchase Price: _____

For this calendar year, complete all that apply:

Miles traveled: _____

Hours operated: _____

Annual Fuel Use: _____

Fuel use units: _____

Airport Vehicle Type (choose only one vehicle type per worksheet)

☐ Air Conditioning Unit
☐ Baggage Tug
☐ Belt Loader
☐ Cargo Loader
☐ Cargo Tractor
☐ Catering Truck
☐ Deicer Truck
☐ Fork Lift
☐ Fuel Truck
☐ Generator
☐ Ground Power Unit
☐ Fire Truck
☐ Lavatory Truck
☐ Pushback Tractor
☐ Sweeper
☐ Sport Utility Vehicle (SUV)
☐ Passenger Car
☐ Passenger Van
☐ Service Van
☐ Pickup Truck
☐ 22' Shuttle
☐ 30-35' Bus
☐ 40' Bus
☐ Other _____

Maintenance Records

	Description of Maintenance	Service Date	Maintenance Cost ($)
1			
2			
3			
4			
5			
6			
7			
8			
			$ -

Annual Emissions Summary

Calculate annual emission based on the operating parameters of the vehicle(s) listed on this worksheet.

Pollutant	Annual Emissions (tons per year)
NOx	
VOC	
CO	
PM10	
PM2.5	
SOx	

Repeat this page as needed for each VALE vehicle type.

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1/ Refer to Tables 7-1 and 8-1 in the VALE program Technical Report.

PAGE 3. VALE INFRASTRUCTURE TRACKING SHEET

Calendar Year:

Low Emissions Infrastructure Technololgy or Equipment Units

	Description of Low Emission Infrastructure	Start-up Date	Estimated Operating Life (years)	No. of Units	Original Purchase Price	Does equipment have required VALE label affixed ? (Y/N)	Fuel Throughput (if applicable)	Maintenance Description	Maintenance Cost ($)
1									
2									
3									
4									
5									
6									
7									
8									
9									
#									
#									
#									
	Totals:				**$0.00**		**0.00**		**$0.00**

Repeat this page as needed.

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PAGE 4. VALE EMISSION REDUCTIONS (ER) TRACKING WORKSHEET

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Project Cumulative Emission Reductions Summary					
NOx	VOC	CO	PM10	PM2.5	SOx
0.0	0.0	0.0	0.0	0.0	0.0

All values are in tons per year

	Project Year #1			Project Year #2			Project Year #3			Project Year #4			Project Year #5		
	Baseline	Project	ER	Baseline	Project	ER	Baseline	Project	ER	Baseline	Project	ER	Baseline	Project	ER
NOx			0.0			0.0			0.0			0.0			0.0
VOC			0.0			0.0			0.0			0.0			0.0
CO			0.0			0.0			0.0			0.0			0.0
PM10			0.0			0.0			0.0			0.0			0.0
PM2.5			0.0			0.0			0.0			0.0			0.0
SOx			0.0			0.0			0.0			0.0			0.0

	Project Year #6			Project Year #7			Project Year #8			Project Year #9			Project Year #10		
	Baseline	Project	ER	Baseline	Project	ER	Baseline	Project	ER	Baseline	Project	ER	Baseline	Project	ER
NOx			0.0			0.0			0.0			0.0			0.0
VOC			0.0			0.0			0.0			0.0			0.0
CO			0.0			0.0			0.0			0.0			0.0
PM10			0.0			0.0			0.0			0.0			0.0
PM2.5			0.0			0.0			0.0			0.0			0.0
SOx			0.0			0.0			0.0			0.0			0.0

	Project Year #11			Project Year #12			Project Year #13			Project Year #14			Project Year #15		
	Baseline	Project	ER	Baseline	Project	ER	Baseline	Project	ER	Baseline	Project	ER	Baseline	Project	ER
NOx			0.0			0.0			0.0			0.0			0.0
VOC			0.0			0.0			0.0			0.0			0.0
CO			0.0			0.0			0.0			0.0			0.0
PM10			0.0			0.0			0.0			0.0			0.0
PM2.5			0.0			0.0			0.0			0.0			0.0
SOx			0.0			0.0			0.0			0.0			0.0

	Project Year #16			Project Year #17			Project Year #18			Project Year #19			Project Year #20		
	Baseline	Project	ER	Baseline	Project	ER	Baseline	Project	ER	Baseline	Project	ER	Baseline	Project	ER
NOx			0.0			0.0			0.0			0.0			0.0
VOC			0.0			0.0			0.0			0.0			0.0
CO			0.0			0.0			0.0			0.0			0.0
PM10			0.0			0.0			0.0			0.0			0.0
PM2.5			0.0			0.0			0.0			0.0			0.0
SOx			0.0			0.0			0.0			0.0			0.0

PAGE 5. PROJECT COST EFFECTIVENESS TRACKING WORKSHEET

	Calendar Year	Annual Vehicle O&M Costs ($)	Annual Infrastructure O&M Costs ($)	Annual Project Cost Effectiveness ($/ton of emissions saved)					
				NOx	VOC	CO	PM10	PM2.5	SOx
Project Year #1									
Project Year #2									
Project Year #3									
Project Year #4									
Project Year #5									
Project Year #6									
Project Year #7									
Project Year #8									
Project Year #9									
Project Year #10									
Project Year #11									
Project Year #12									
Project Year #13									
Project Year #14									
Project Year #15									
Project Year #16									
Project Year #17									
Project Year #18									
Project Year #19									
Project Year #20									
	Totals:	$ -	$ -						

Initial Total Project Funds:[1]

Cummulative Project Cost Effectiveness ($/ton of emissions saved)					
NOx	VOC	CO	PM10	PM2.5	SOx
#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!

[1/] Enter in the total sum of AIP requested, PFC requested, AIP matching, and other local funds from the original project application.

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APPENDIX F
AIP AND PFC PROGRAM ELIGIBILITY OVERVIEW

<table>
<tr><th colspan="2">VALE Program Elements</th><th>AIP</th><th>PFC</th></tr>
<tr><td rowspan="4">Vehicles</td><td rowspan="2">Eligible Vehicles</td><td colspan="2">New vehicles</td></tr>
<tr><td></td><td>• Retrofit of existing vehicles</td></tr>
<tr><td rowspan="2">Program Criteria</td><td colspan="2">Airport-owned
Must remain at airport for useful life
Must meet program low-emission vehicle standards
Must be monitored on an annual basis
Must be labeled with VALE logo
May require equivalent low-emission replacement</td></tr>
<tr><td>• Must operate exclusively on alternative fuels</td><td>• May be tenant-owned
• May operate using alternative fuels or clean conventional fuels
• Must have enforceable agreement in place for tenant-owned vehicles</td></tr>
<tr><td>Funding</td><td>• 75% <u>incremental</u> cost for large and medium hub airports
• 90% <u>incremental</u> cost for smaller airports</td><td>• 100% <u>incremental</u> cost
• May be used as AIP matching funds</td></tr>
<tr><td rowspan="3">Infrastructure</td><td>Eligible Infrastructure</td><td colspan="2">Eligible infrastructure project must contribute directly to airport emission reductions, Examples below:
➢ AFVs refueling and recharging stations
➢ Aircraft gate electrification
➢ Power plant, HVAC, and generator replacement to cleaner fuels</td></tr>
<tr><td rowspan="2">Program Criteria</td><td colspan="2">Must be airport-owned
Must be labeled with VALE logo
Cannot extend beyond airport boundary
Limited public access to refueling and recharging stations is allowed if airport safety/security are guaranteed</td></tr>
<tr><td></td><td>• Operation of refueling and recharging stations may be leased to tenants through enforceable agreements, provided airport sponsors and vehicles have priority use</td></tr>
</table>

	Funding	• 75% cost for large and medium hub airports • 90% cost for smaller airports	• 100% cost • May be used as AIP matching funds
Fuels	**Eligible Fuels**	Electricity CNG LNG LPG Blended fuels 85 percent or greater such as E85, M85, and Biodiesel (B85-100) Hydrogen Coal-derived liquid fuels P-series fuels Hybrid technology	
			• Clean conventional fuels that meet program low-emission vehicle standards • Blended fuels of any composition that meet program low-emission vehicle standards
	Program Criteria	• Substantially non-petroleum based and domestically produced	
	Funding	No operation and maintenance (O&M), including the cost of fuel.	

APPENDIX G
STATE AIR QUALITY AGENCY AERC LETTER OF ASSURANCE TO THE FAA

*****The following example Letter of Assurance is required by the FAA*****

Manager, Airports Division
Regional Airports Division and Airport District Office (copy to APP-600)
Federal Aviation Administration
Local Address

To the Program Manager:

The _____(name of State air quality agency) has reviewed the application for airport emission reduction credits (AERCs) submitted to us by the _____(name of airport sponsor) on _____(date by month, day, year). We have determined that the proposed low-emission project described in the airport sponsor's application meets the requirements of the Clean Air Act (CAA) and is consistent with the Federal Aviation Administration (FAA) Voluntary Airport Low Emission (VALE) "*Technical Report*" and the U.S. Environmental Protection Agency (EPA) "*Guidance on Airport Emission Reduction Credits for Early Measures through Voluntary Airport Low Emission Programs.*"

Our review of the airport sponsor's VALE project application indicates that the emission reduction estimates are reasonable and accurate. Based on our preliminary evaluation, we accept the application and agree to issue AERCs to the airport sponsor on a 1:1 basis (emission reductions to AERCs) and in a timely manner. AERCs will be granted in accordance with the airport sponsor's use of emission reduction methodology provided in the VALE Technical Report, consistent with the EPA guidance cited above. Moreover, the issuance of AERCs will not be subject to any additional requirements or agreements related to this program or other State or local activities.

The _____ (name of State air quality agency) will grant AERCs to the airport sponsor following FAA project funding and upon receipt of the sponsor's updated estimates and report of project emission reductions. We look forward to an ongoing effort with the airport sponsor to track the progress of the project and their allowed use of AERCs in the future to meet CAA general conformity and/or NSR permit requirements.

Sincerely,

Director of the State Air Quality Agency

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