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# AVIATION AND THE ENVIRONMENT

## Initial Voluntary Airport Low Emissions Program Projects Reduce Emissions, and FAA Plans to Assess the Program's Overall Performance as Participation Increases



G A O

Accountability \* Integrity \* Reliability



Highlights of [GAO-09-37](#), a report to congressional committees

## Why GAO Did This Study

In 2003, Congress established a program to reduce airport ground emissions at commercial service airports in areas failing to meet or maintain air quality standards. The Federal Aviation Administration (FAA) administers the Voluntary Airport Low Emissions (VALE) Program and oversees the program's two sources of funding: Airport Improvement Program (AIP) federal grants or Passenger Facility Charges (PFC), which airports can collect from passengers. Participating airports also receive credits for the emission reductions achieved through VALE projects in accordance with the law and guidance. Airports can use these credits to offset emissions resulting from development projects to comply with federal Clean Air Act requirements.

GAO was asked to determine (1) how the VALE program has been implemented, including airport participation levels, types of projects, and program expenditures, and (2) the outcomes attributable to the VALE program. To do this, GAO reviewed FAA data on VALE projects for all nine participating airports; visited two of these airports; obtained information from the remaining seven participating airports and four nonparticipating airports; and interviewed officials from FAA, Environmental Protection Agency (EPA), and airport associations. FAA generally agreed with the report's findings, and FAA and EPA offered technical clarifications.

To view the full product, including the scope and methodology, click on [GAO-09-37](#). For more information, contact Gerald Dillingham at (202) 512-2834 or [dillingham@gao.gov](mailto:dillingham@gao.gov).

## AVIATION AND THE ENVIRONMENT

### Initial Voluntary Airport Low Emissions Program Projects Reduce Emissions, and FAA Plans to Assess the Program's Overall Performance as Participation Increases

#### What GAO Found

While the number of airports that have undertaken VALE projects is relatively small compared with the number of eligible airports, the number of participants in the program is increasing, as are the range and scope of projects being conducted and the amount of money spent on them. As of September 2008, 9 of the 160 airports that were eligible had or were planning to initiate a VALE project, which is up from 2 participating airports in VALE's initial year of operation in 2005. FAA expects participation in VALE to increase as more airports become familiar with the program. Although FAA may be correct in its assumption about participation, officials GAO interviewed from 4 nonparticipating airports, and others, such as representatives of airport associations, indicated various reasons for airports not wanting to participate in the program, which is funded through the same sources of funds—AIP grants or PFCs—as other airport development projects. One reason is that some airports have a misperception that VALE projects compete with other projects, such as runways or terminals, for AIP funding. According to FAA officials, this is usually not the case because VALE projects are funded through a discretionary AIP set-aside for noise and emission projects. FAA officials want to increase FAA's outreach to airports regarding VALE, but noted that the regional staff who are responsible for outreach have limited time for this purpose. VALE projects have ranged from airports' purchase of fuel-efficient vehicles to projects that help decrease aircraft ground emissions. Expenditures for the VALE program have been nearly \$20 million for 20 projects through fiscal year 2008 (with 56 percent of these expenditures occurring in fiscal year 2008). All participating airports have used AIP grants to fund VALE projects for various reasons, mainly because their PFCs have already been committed for high-priority, large-scale terminal improvement projects that may not be eligible for any type of AIP grants.

FAA has yet to assess the outcomes and overall performance of the VALE program. However, VALE projects are expected to reduce emissions at participating airports, and two airports have taken advantage of the program to obtain emission credits for planned construction projects. According to FAA data, the VALE projects initiated to date will reduce emissions of such pollutants as nitrogen oxide and carbon monoxide by over 5,700 tons estimated over the projects' lifetime, which range from 10 to 40 years. According to FAA, the emission reductions resulting from VALE projects, although large in some cases, such as equipping gates with electricity and air conditioning outlets for aircraft, represent a small fraction of total emissions at participating airports. FAA plans to assess the overall performance of the VALE program as participation increases. FAA officials have begun developing cost-effectiveness measures, such as the amount of emission reductions per dollar spent. FAA officials stated that based on the number and size of VALE projects funded to date, they believe more history and experience with the program is needed before the agency develops other performance measures, such as setting goals for the number of VALE projects

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## Abbreviations

ACI-NA	Airport Council International, North America
AERC	Airport Emission Reduction Credit
AIP	Airport Improvement Program
CAA	Clean Air Act
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
PFC	Passenger Facility Charges
SIP	State Implementation Plan
VALE	Voluntary Airport Low Emissions

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United States Government Accountability Office  
Washington, DC 20548

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November 7, 2008

The Honorable Jerry Costello  
Chairman  
The Honorable Thomas Petri  
Ranking Member  
Subcommittee on Aviation  
Committee on Transportation and Infrastructure  
House of Representatives

The Honorable Mark Udall  
Chairman  
The Honorable Tom Feeney  
Ranking Member  
Subcommittee on Space and Aeronautics  
Committee on Science and Technology  
House of Representatives

Concerns about the environmental effects of aviation have increasingly focused on emissions from airport operations—including emissions from aircraft; the ground equipment that services aircraft; and the vehicles that transport passengers to, from, and within airport grounds. According to the Environmental Protection Agency (EPA), aviation activities result in the emission of pollutants that account for less than 1 percent<sup>1</sup> of the total local air pollution in the United States, but the contribution of these pollutants in areas surrounding airports can be much larger. Also, aviation-related pollutants such as nitrogen oxide, which contributes to ozone formation, are expected to increase based on forecasted growth in the aviation sector. Better scientific understanding of the potential health effects of certain aviation emissions and the contribution of aviation emissions, such as carbon dioxide, to climate change have also intensified concerns about the overall impact of aviation emissions. As communities have gained more awareness of the health and environmental effects of aviation emissions, opposition to airport expansion projects, which has

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<sup>1</sup>This estimate pertains to aircraft emissions, and it does not include emissions from other sources at airports, such as vehicles and equipment that service aircraft. According to EPA, in areas that do not meet federal Clean Air Act requirements for ozone (which is formed from nitrogen oxides and volatile organic compounds), aircraft emissions are estimated to contribute as much as 3 percent of this pollutant.

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thus far focused primarily on aviation noise, has broadened to include emissions. In addition, airport expansion projects, which can result in increased emissions, must comply with federal Clean Air Act (CAA) requirements.<sup>2</sup> Expanding airport capacity will be necessary to accommodate both the predicted increases in air traffic envisioned for the coming decades and the development of the Next Generation Air Transportation System, which is intended to handle those increases. Addressing the effects of airport ground emissions and other types of aviation emissions is expected to be a major challenge to aviation growth in the coming decades.

To provide financial assistance for airports seeking to reduce airport ground emissions, Congress established a voluntary program in 2003 to reduce such emissions at commercial service airports located in areas failing to meet or maintain EPA ambient air quality standards. To administer this program, the Federal Aviation Administration (FAA), which is responsible for managing and overseeing the nation's air transportation system, created the Voluntary Airport Low Emissions (VALE) Program in 2004. Airports eligible for the VALE program can fund low-emission projects through two sources of funds administered by FAA, the Airport Improvement Program (AIP), which is a federal grant program for the planning and development of public use airports, and Passenger Facility Charges (PFC), which airports can collect from passengers to use for eligible airport development projects.<sup>3</sup> According to FAA, many airport low-emission projects, including low-emission vehicles, were formerly not eligible for AIP or PFC funding. In addition, airports can receive credits for the emission reductions achieved through VALE projects and can use these credits to offset emissions that result from other airport development projects.<sup>4</sup> In this way, VALE is designed to provide a method for airports to continue expanding or improving but still comply with federal CAA requirements.

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<sup>2</sup>The Clean Air Act, codified at 42 U.S.C. § 7401 *et seq.*, is a comprehensive federal response to address air pollution.

<sup>3</sup>Airports can collect PFCs of up to \$4.50 for every enplaned passenger and can use these PFCs to fund FAA-approved projects for various purposes, such as enhancing safety and security, increasing capacity and air carrier competition, or decreasing noise or emissions. PFCs are considered local funds.

<sup>4</sup>EPA, *Guidance on Airport Emission Reduction Credits for Early Measures Through Voluntary Airport Low Emission Programs* (Washington, D.C.: 2004).

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You requested that we evaluate FAA's implementation of the VALE program. Specifically, we addressed the following questions: (1) How has the VALE program been implemented, including airport participation levels, types of projects, and program expenditures? (2) What have been the outcomes attributable to the VALE program?

To address these questions, we analyzed FAA and airport information on VALE projects, including types of projects, expenditures, and estimated outcomes in terms of reducing pollution. We also reviewed and synthesized relevant literature and our body of work on airport-related emissions. We visited two of the nine airports participating in the VALE program (these nine airports have VALE projects that are in operation or under development). At these two airports, we observed the VALE projects and interviewed airport officials. We chose these two airports because their projects are relatively large and account for over half of the total expenditures for the VALE program. Also, we interviewed via telephone airport officials at another three participating airports and obtained written responses to our interview questions from the remaining two participating airports.<sup>5</sup> In addition, we visited or interviewed via telephone airport officials at four eligible airports that have not participated in the VALE program. We selected these nonparticipating airports on the basis of their size, including large and medium commercial service airports, and geographic location. See appendix I for a list of the airports that we contacted or visited. We also interviewed officials from FAA, EPA, and selected airport associations representing major airports in the United States. Lastly, we met with air quality officials from Pennsylvania to discuss the state's role in granting airport emission reduction credits (AERCs) under the VALE program. We conducted our work from June 2008 through November 2008.

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## Results in Brief

FAA implemented the VALE program in 2004, and while the number of airports that have undertaken VALE projects is relatively small compared with the number of eligible airports, the number of participants in the program is increasing, as is the range and scope of projects being conducted and the amount of money spent on them. As of September 2008, 9 of the 160 eligible airports have initiated a VALE project, which is up from 2 participating airports in VALE in fiscal year 2005. FAA expects

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<sup>5</sup>For two of the nine airports, FAA provided us with information on these participating VALE airports.

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participation in VALE to increase as more airports become familiar with the program. Although FAA may be correct in its assumption about future participation, officials we interviewed from 4 airports that do not have VALE projects and representatives of airport associations indicated various reasons for not wanting to participate in the program, which is funded through the same sources of funds—AIP grants or PFCs—as other airport development projects. One reason is that some airports have a misperception that VALE projects compete with other projects, such as runways or terminals, for AIP funding. According to FAA officials, this is usually not the case because VALE projects are funded through a discretionary AIP set-aside for noise and emission projects. FAA officials want to increase FAA’s outreach to airports in regards to VALE, but noted that the regional staff who are responsible for outreach have limited time for this purpose. VALE projects have ranged from airports’ purchase of fuel-efficient vehicles to projects that help decrease aircraft ground emissions. Expenditures for the VALE program, including VALE grants and the airports’ share of project funding, have been nearly \$20 million for 20 projects through fiscal year 2008 (with 56 percent of these expenditures occurring in fiscal year 2008). All participating airports have used only AIP grants to fund VALE projects for various reasons, mainly because their PFC funds have already been committed for high-priority, large scale terminal improvement projects that may not be eligible for any type of AIP grants.

FAA has yet to assess the overall performance of the VALE program. However, VALE projects are helping to reduce emissions at participating airports, and two airports have taken advantage of the program to secure emission credits for planned construction projects. According to FAA data, the VALE projects initiated to date will reduce emissions of such pollutants as nitrogen oxide and carbon monoxide by over 5,700 tons estimated over the projects’ lifetime, which ranges from 10 years for vehicle projects to 40 years for some infrastructure projects. According to FAA, the emission reductions resulting from VALE projects, while significant in some cases, represent a small fraction of total emissions at participating airports. Some projects, such as equipping gates with electricity and air conditioning outlets for aircraft, result in more reductions than other projects, such as purchasing hybrid vehicles. FAA plans to assess the overall performance of the VALE program in reducing emissions across airport activities as participation in the program increases. FAA officials have begun measuring the performance of projects in reducing emissions and are developing cost-effectiveness measures, such as the amount of emission reductions per dollar spent. FAA officials stated that based on the number and size of VALE projects



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funded to date, they believe more history and experience with the program is needed before the agency develops other performance measures, such as setting goals for the number of VALE projects implemented and the amount of reductions achieved through these projects.

We provided copies of a draft of this report to EPA and the Department of Transportation for review and comment. EPA and FAA both provided several clarifying comments and technical corrections, which we have incorporated in this report as appropriate. We also received comments from officials in FAA's Office of Airport Planning and Programming, including the National Resource Advisor, Noise and Air Quality, who is responsible for managing the VALE program. FAA generally agreed with the report's findings. The FAA representatives, however, stated that the draft suggested that FAA was not aware of the performance of the VALE program, and that tracking program benefits and performance is one of VALE's strongest attributes. We modified the report to more clearly reflect that FAA is developing a methodology to assess VALE's cost-effectiveness and plans to develop other measurable performance objectives, but that FAA has yet to assess the overall performance of the VALE program. The representatives also stated that while the report covers the various elements of the VALE program, they also wanted to emphasize the "innovativeness" of the program. These officials provided information on what they considered to be the innovative elements of the program, which we have incorporated in this report as appropriate.

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## Background

Although aviation-related activities produce a small amount of the total air pollution in the United States, according to EPA, the types of pollutants emitted by these activities are among the most prevalent and harmful in the atmosphere and are expected to increase based on the forecasted growth in the aviation sector. The major sources of emissions at airports are aircraft, the ground equipment (such as vehicles that transport baggage) that services the aircraft,<sup>6</sup> and vehicles transporting passengers to and from the airport. The emissions produced by these sources include carbon monoxide; toxic substances (such as benzene and formaldehyde); particulate matter;<sup>7</sup> sulfur dioxide; and nitrogen oxides and volatile

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<sup>6</sup>Such equipment is known generally as ground service equipment.

<sup>7</sup>Particulate matter, also known as particle pollution, is a complex mixture of extremely small particles and liquid droplets. Particulate matter is made up of a number of components, including acids (such as nitrates and sulfates), organic chemicals, metals, and soil or dust particles.

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organic compounds, which contribute to the formation of ozone, a major pollutant in many metropolitan areas and a major concern to many airport operators and to state and local air quality authorities. In addition, the potential health effects of particulate matter are becoming an increasing concern of these groups.

In response to concerns about emissions from airport sources, the Vision 100—Century of Aviation Reauthorization Act (Vision 100), signed into law in December 2003,<sup>8</sup> established a voluntary program to reduce airport ground emissions at commercial service airports in air quality nonattainment and maintenance areas. Geographic areas that have levels of a criteria pollutant<sup>9</sup> above those allowed by the standard are called nonattainment areas. Areas that did not meet the standard for a criteria pollutant in the past but have reached attainment and meet certain procedural requirements are known as maintenance areas. The program, according to FAA, is intended to help airports meet their obligations under the CAA, and to assist regional efforts to meet National Ambient Air Quality Standards set by EPA for limiting the amount of the six criteria pollutants considered harmful to public health and the environment. States that have areas exceeding these standards are required to develop and implement a plan, known as a State Implementation Plan (SIP),<sup>10</sup> for bringing the areas into compliance with the standards.<sup>11</sup> Under the CAA conformity provision,<sup>12</sup> no federal agency may approve or provide financial assistance for any activity that does not conform to an applicable SIP.

To implement the Vision 100 provisions relating to airport emission reductions, FAA created and began implementing the VALE program in

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<sup>8</sup>Pub. L. No. 108-176, 177 Stat. 2490, Sections 121, 151, 158 and 159, December 12, 2003.

<sup>9</sup>The criteria pollutants are carbon monoxide, lead, nitrogen oxide, sulfur oxides, ozone, and particulate matter. Ozone is formed in the atmosphere when nitrogen oxides and volatile organic compounds combine in the atmosphere and are heated by sunlight.

<sup>10</sup>SIPs specify the programs that states will develop to achieve and maintain compliance with the CAA standard.

<sup>11</sup>States are preempted from adopting or enforcing any standard respecting aircraft engine emissions unless such a standard is identical to EPA's standards (see 42 U.S.C. § 7573). This provision does not preclude all state regulation of the field of aircraft engines. *People of the State of California v. Department of the Navy*, 624 F.2d 885, 888 (9<sup>th</sup> Cir. 1980). If state pollution measures can be met without affecting the design, structure, operation, or performance of the aircraft engine, then the regulations are not preempted. *Id.*

<sup>12</sup>42 U.S.C. § 7506(c)(1).

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2004. According to FAA, in the 9-month period between the passage of the act in 2003 and the implementation of the VALE program, the agency—in cooperation with EPA and the Department of Energy—developed program guidelines and application procedures; technical requirements, such as standards for low-emission vehicles; and a system for assigning credits to airports for emission reductions.

The FAA relied on experience with the FAA Inherently Low Emission Airport Vehicle (ILEAV) Pilot Program to design the VALE program. Authorized under the Wendell H. Ford Aviation Investment and Reform Act for the 21st Century (AIR-21), the ILEAV pilot program operated from 2001 to 2005. Six airports implemented ILEAV projects with individual grants of up to \$2 million each to demonstrate the benefits and economic feasibility of low-emission vehicles and supporting infrastructure.<sup>13</sup> According to FAA, the pilot program projects also provided useful information about the environmental and economic trade-offs of alternative fuels, their safe handling, and the commercial availability of low-emission technology.

Airports eligible for the VALE program can apply for federal AIP entitlement funds or discretionary funds under the “set-aside” for noise and air quality projects.<sup>14</sup> With FAA approval, eligible airports may also use their PFCs to finance VALE projects. According to FAA officials, VALE grants using discretionary set-aside funds have no impact on the amount of entitlement funds an airport receives through AIP, since AIP entitlements are based on a legislated apportionment formula tied to the number of passengers an airport enplanes. FAA officials stated that most participating airports seek set-aside funding for VALE projects because VALE projects only compete in this portion of the AIP budget against noise reduction projects. According to FAA officials, the agency considers the approval and funding of VALE projects on a case-by-case basis based on the project’s relative importance to other eligible airport activities. FAA officials stated that prior to the establishment of VALE, the only emission-reduction projects eligible for AIP grants and PFC use were those intended

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<sup>13</sup>Baltimore-Washington, Baton Rouge, Dallas/Fort Worth, Denver, Sacramento, and San Francisco airports had active ILEAV projects. Four airports (Atlanta, Chicago O’Hare, and New York’s Kennedy and LaGuardia) had to ask FAA to terminate their ILEAV grants and to redistribute the funding to other eligible AIP projects due to economic considerations after September 11, 2001.

<sup>14</sup>FAA reserves 35 percent of the AIP discretionary budget, which in fiscal year 2009 will be about \$337 million, as a set-aside for airport noise and air quality improvement efforts.

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to reduce emissions as a condition of approval of an environmental action associated with an AIP-funded airport development project. These officials also noted that the VALE program expands AIP and PFC eligibility into new areas, such as airport mobile sources, including vehicles.

VALE projects may be stand-alone projects (i.e., they do not have to be linked to a project that could increase emissions to be eligible for program funding); however, for a project to be approved, it must meet specific criteria. For example, an airport must demonstrate that the project will result in emission reductions. Although according to FAA officials, these reductions are “surplus” in the sense that they are not required in the SIP for meeting CAA standards. To demonstrate that a project will lower emissions, an airport must prepare estimates comparing the amount of emissions currently produced with the amount of emissions that will be produced after the project is implemented. To prepare these emission estimates, airports use FAA’s Emissions and Dispersion Modeling System (EDMS), which calculates emissions from project-related airport sources,<sup>15</sup> such as aircraft, ground service equipment, and shuttle buses. The airport must also demonstrate, among other things, that the VALE project will result in permanent emission reductions.<sup>16</sup> According to FAA officials, using the EDMS air quality model ensures the reliability of emission-reduction estimates and reduces planning costs.

VALE’s authorizing legislation and implementing guidance greatly expanded AIP and PFC eligibility for low-emission technology, including the purchase of low-emitting hybrid vehicles and electric-powered equipment used to service aircraft, such as baggage tugs. FAA officials stated that VALE employs an innovative approach by converting EPA average national fleet standards into low-emission standards for each VALE vehicle purchase. All vehicles and engines that are eligible for AIP or PFC funding under the VALE program must either be EPA certified (new vehicles) or EPA verified (retrofit technology). VALE low-emission standards for all new vehicles are based on EPA average national fleet standards and are referenced, in some cases, to comparable California Air Resources Board standards. The VALE program sets emission standards at cleaner levels than presently required by EPA. According to FAA officials,

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<sup>15</sup>Project-related airport sources are sources that are directly related to the airport’s VALE project and do not include other or all airport emission sources.

<sup>16</sup>Emission reductions must be permanent for the life of the project. Additionally, to be eligible for emission-reduction credits, emission reductions must be quantifiable, adequately supported, and enforceable.

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a goal of the VALE program is to encourage airports to make investments in capital equipment to provide substantial emission-reduction benefits over many years. The VALE program is also intended to support U.S. energy independence by emphasizing domestically produced alternative fuels that are substantially nonpetroleum based. Also, the program is designed to provide airports with financial and regulatory incentives to increase their investments in proven low-emission technologies. FAA officials stated that FAA, EPA, and the Department of Energy coordinate on an ongoing basis VALE program standards, including nonattainment status for airport eligibility and eligible alternative fuels.

The legislation authorizing the VALE program also provides a means for airports to receive credits for the emission reductions achieved through VALE projects and use these credits to comply with federal CAA air quality standards. Before the VALE program was instituted, airports could not receive credit for voluntary emission reductions. Therefore, any voluntary reductions lowered an airport's emission baseline, which is used to calculate the impact of future emissions, and thus airports would need to find further emission reduction options to obtain approval for future projects.<sup>17</sup> In 2003, we reported that because of this situation, some airport officials told us that they waited to initiate emission-reduction efforts until these efforts were needed to gain approval for an expansion project.<sup>18</sup> The EPA issued national guidance in September 2004 on how airports can receive airport emission-reduction credits (AERC) for VALE projects and apply those credits to future airport projects to meet certain CAA requirements. AERCs can be used to mitigate future airport project emissions, as long as they will be earned in the year for which they will be applied. To be approved for the VALE program, an airport must obtain a commitment from the state's air quality authority that it will approve the use of AERCs for projects to conform to federal air quality requirements, should the airport choose to use them for this purpose.

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<sup>17</sup>For example, if an airport were to produce 100 tons of nitrogen oxides per year and then voluntarily initiated a project that reduced that amount by 10 tons, the airport's emission baseline would become 90 tons. If an expansion project then resulted in a 10-ton yearly increase in nitrogen oxides, the airport might have to initiate new mitigation measures that would compensate for the increase.

<sup>18</sup>GAO, *Aviation and the Environment: Strategic Framework Needed to Address Challenges Posed by Aircraft Emissions*, [GAO-03-252](#) (Washington, D.C.: Feb. 28, 2003).

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**A Small Number of Eligible Airports Have Used VALE Funding to Help Reduce Airport Emissions, but Participation in the Program Is Increasing**

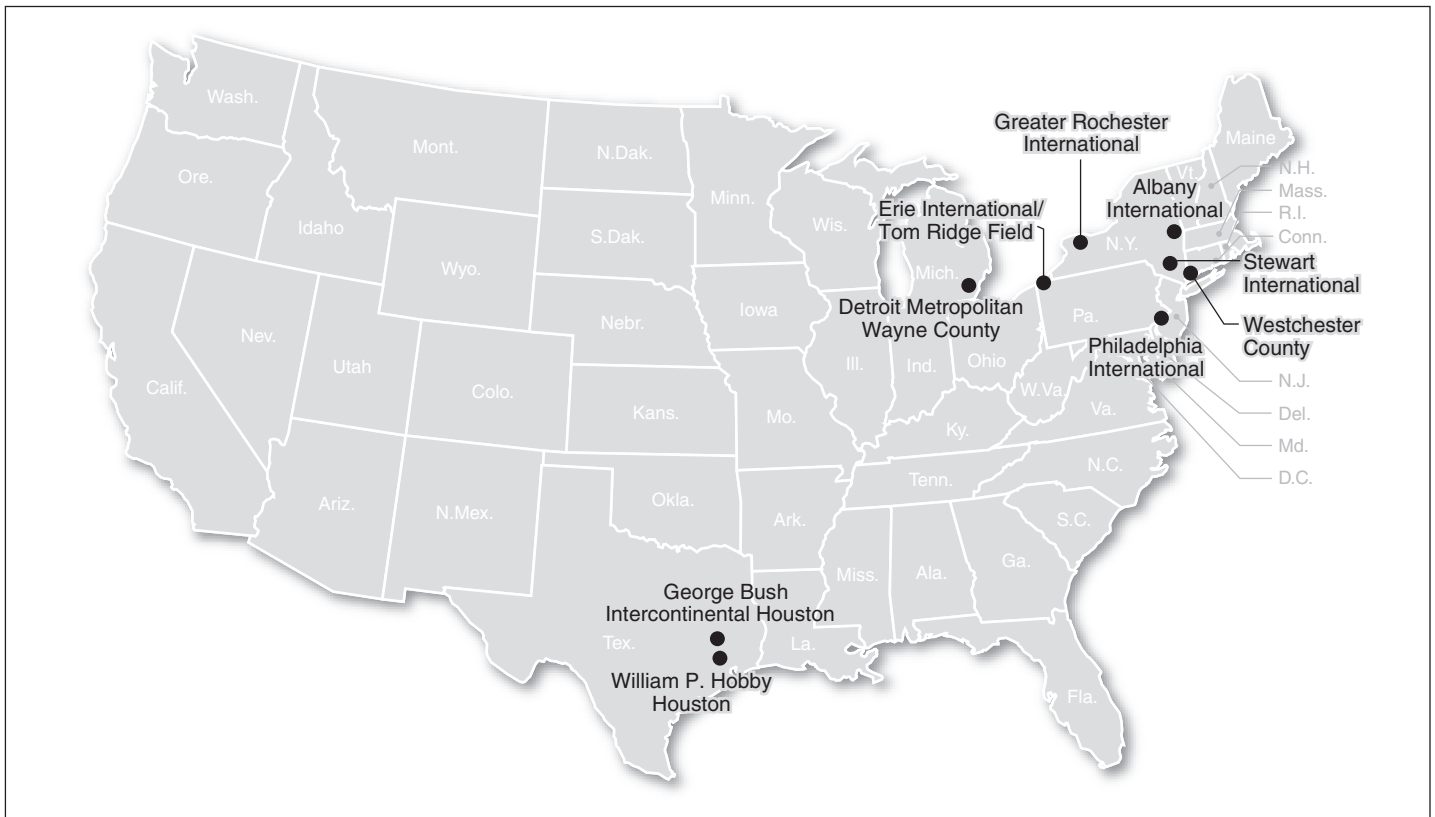
While the number of airports that have undertaken VALE projects since 2004 is relatively small compared with the number of eligible commercial airports—9 of 160—the number of participants is increasing, as are the range of projects being conducted and the amount of money spent on them.

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**Few Eligible Airports Have Initiated VALE Projects, but FAA Expects Participation to Increase**

Participation in the VALE program has been limited to date, although the number of airports applying for the program is increasing, and FAA expects more airports to seek VALE funding as they become more familiar with the program. About 160 of the 524 commercial service airports are eligible to participate in the VALE program; however, as of September 2008, 9 airports had received VALE program funding. (Fig. 1 shows the locations of airports participating in VALE.) According to FAA officials, all airports that have applied to participate in VALE have been approved.

**Figure 1: Airports That Participate in the VALE Program**



Sources: FAA data and Map Resources.

Participation in the VALE program has risen in recent years. For example, in 2005, the first year of the program, FAA approved VALE projects for 2 airports. In fiscal year 2008, FAA approved 11 projects at 6 airports, 4 of which were new participants in the program. Overall, FAA reports that a total of 20 projects at 9 participating airports are under way. In fiscal year 2009, FAA expects additional VALE participants. For example, the Seattle-Tacoma International Airport has proposed a multiyear project to purchase electric ground support equipment, with a \$3.1 million first phase beginning in fiscal year 2009. FAA officials stated that FAA regional officials are considering the airport's application to fund this project through VALE.

FAA officials stated that as the VALE program matures, and concerns about foreign oil, climate change, and fuel prices influence public policy, airport participation in the VALE program is expected to grow. These

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officials noted that they expect VALE applications to increase as airports learn more about the program and about projects initiated at other airports, and that numerous airports throughout the country have recently expressed their interest in the program. FAA points to the Part 150 Noise Compatibility Program as an example of an airport environmental program that grew gradually. The Part 150 program provides guidance to airports on the types of land use that are incompatible with certain levels of airport noise and encourages airports to develop a noise compatibility plan to reduce and prevent such uses. Airports that develop such plans can receive AIP noise set-aside funds, which, among other things, can be used to (1) soundproof residences and public buildings, such as schools, and (2) support relocation by acquiring homes in areas that experience significant noise exposure. When the Part 150 program was initiated in the early 1980s, only a few of the approximately 3,000 eligible airports completed compatibility plans and applied for AIP grants. However, the program has grown over the years and, as of fiscal year 2007, nearly 300 airports have participated. According to FAA officials, the growth of the VALE program in its first 4 years of existence has outpaced that of the Part 150 program during its initial 4 years, particularly considering that far fewer airports are eligible for VALE than for the Part 150 program.

FAA officials responsible for the VALE program have conducted outreach to eligible airports in a number of ways, but these officials believe that more outreach is needed. FAA's VALE outreach efforts include making presentations at conferences attended by airport executives and working with airport associations—including Airport Council International, North America (ACI-NA), and the American Association of Airport Executives—to disseminate information about the program to eligible airports. FAA has also provided guidance to FAA regional staff on the program and encourages these staff to contact airports in their region about VALE. However, FAA officials noted that few regional staff are available to work on VALE outreach, and that more resources to administer the program and provide technical assistance to airports could increase participation. FAA officials noted several instances where airports learned about VALE too late in the process of planning expansion projects to fully take advantage of assistance offered through the program. For example, Detroit Metropolitan Wayne County Airport began installing its fuel hydrant system before its VALE grant was issued to meet its project deadline; therefore, only part of the system was covered by a VALE grant. Officials at this airport noted that had they known about VALE earlier, they could have submitted their application in time to use VALE funding for the entire project.



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Although FAA may be correct in its assumption that VALE will follow the Part 150 program's experience of participation levels gradually increasing as the program matures, we found several reasons that airports are not currently participating in VALE.

- Officials at all four of the nonparticipating airports we contacted stated that VALE emission-reduction projects currently are not a high-priority use of AIP funds when compared with airport expansion or improvement efforts. For example, these officials stated that they prefer to use AIP funds for higher-priority safety and airport efficiency and capacity improvement efforts. However, these officials noted that reducing emissions is important for addressing community air quality concerns. In addition, officials at two nonparticipating airports, as well as an official at one airport that has been approved for a VALE project, said that it was their understanding that VALE projects compete for AIP funds with all AIP-eligible projects. Consequently, the two nonparticipating airports chose not to pursue VALE projects and the participating airport has limited the scale of its VALE project to use AIP funds for high-priority projects. FAA officials stated that these airports have a misperception of VALE AIP grants in that VALE projects do not compete with most other types of AIP-eligible projects at airports, because VALE projects are funded through a 35 percent set aside earmarked for noise-abatement and emission-reduction projects. Therefore, VALE AIP grants have no effect on an airport's eligibility for other types of AIP grants.
- ACI-NA officials noted that some airports may not be best positioned to take advantage of the VALE program because they have no relevant capital projects planned or do not need to replace ground service equipment, which has up to a 15-year life cycle. Officials from one of the nonparticipating airports we contacted stated that most of the airport's facilities and equipment are relatively new and will not need to be replaced in the near future. Also, officials at the four nonparticipating airports we contacted stated that they already have some of the equipment and facilities that are eligible under VALE.
- Officials from one airport noted that their airport lacked the expertise to conduct the emissions inventory required to establish a baseline for measuring VALE project emission reductions. FAA officials noted that airports eligible for VALE, including smaller airports with less planning resources, typically can be reimbursed by FAA for project formulation costs, including hiring a contractor to assist in conducting the emissions inventory and preparing the VALE application, if the project is approved.

- FAA officials and airport officials noted that some airports have been reluctant to seek approval for emission-reduction credits from their state air quality authority, as FAA requires before it will approve a project. According to these officials, some airports have little experience in dealing with their state air quality authority because airport emission reductions previously have not been necessary as part of the CAA SIP. Officials from one airport we visited stated that it is their impression that the state air quality authority will not grant emission-reduction credits for any reason, and, consequently, the airport had not pursued a VALE grant, even though it is currently undertaking a terminal and gate expansion project. According to FAA officials, the guidance that EPA has developed for AERCs provides instructions to state air quality officials on the process and criteria for issuing AERCs to airports.

## Participating Airports Have Initiated a Range of VALE Projects

The VALE projects initiated at airports have ranged from purchases of small numbers of fuel-efficient, low-emitting vehicles<sup>19</sup> to projects that help decrease aircraft ground emissions. Table 1 shows a summary of the projects at the airports participating in the VALE program from fiscal years 2005 through 2008.

**Table 1: VALE Project Summary, Fiscal Years 2005-2008**

Airport	Fiscal year that project was funded	Project type
Erie International/Tom Ridge Field (ERI)	2008	3 preconditioned air units at 3 gates
Westchester County (HPN)	2008	25 electric ground support equipment (eGSE) and 13 dual-port rechargers (9 baggage tugs, 5 belt loaders, 3 pushback tractors, 4 water trucks, and 4 stairs)
Philadelphia International (PHL)	2008	<ul style="list-style-type: none"> <li>• 5 dual-port rechargers for 5 gates at Terminal D, supporting 10 United Airlines eGSE baggage tugs</li> <li>• Preconditioned air and electrical system upgrades for 11 gates at Terminal A East</li> <li>• 3 electric hybrid vehicles</li> <li>• 15 dual-port rechargers supporting 34 US Airways electric hybrid vehicles</li> </ul>
Greater Rochester International (ROC)	2008	8 compressed natural gas (CNG) shuttle buses and CNG station

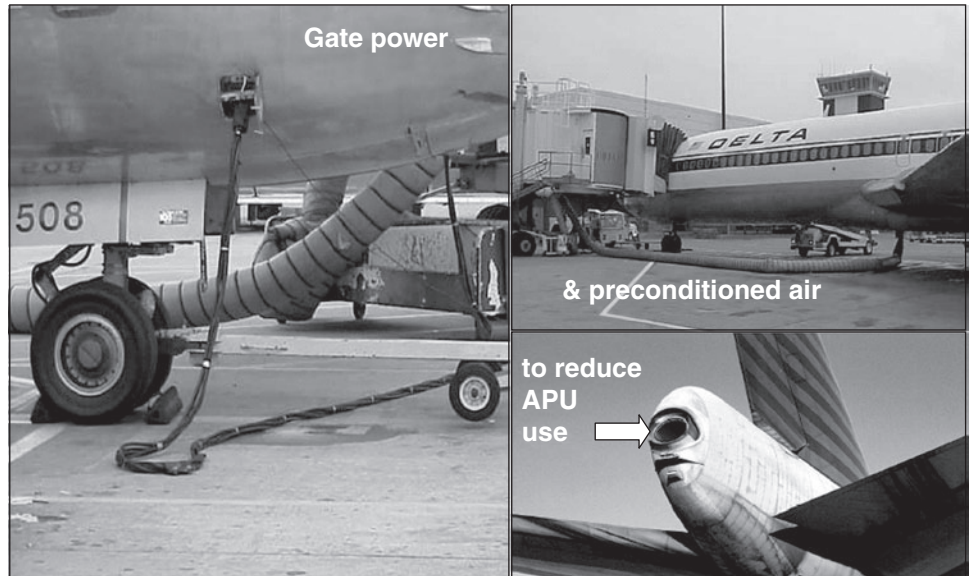
<sup>19</sup>Low-emitting vehicles purchased primarily use alternative fuel, such as electric hybrid or natural gas.

Airport	Fiscal year that project was funded	Project type
George Bush Intercontinental Houston (IAH)	2008	<ul style="list-style-type: none"> <li>Expansion of automated people-mover between Terminal A and other terminals</li> <li>Underground fuel hydrant system for new 30-gate Terminal B</li> <li>Gate power and preconditioned air for new 30-gate Terminal B</li> </ul>
	2008	2 eGSE cargo carts 8 electric hybrid vehicles
	2007	14 electric hybrid vehicles
	2005	9 electric hybrid vehicles
William P. Hobby Houston (HOU)	2008	3 electric hybrid vehicles
	2007	1 electric hybrid vehicle
	2006	2 electric hybrid vehicles
Detroit Metropolitan Wayne County (DTW)	2007	Gate power and preconditioned air, underground fuel hydrant system for 26-gate new terminal
Stewart International (SWF), Newburgh/New Windsor, NY	2007	Gate electrification and preconditioned air for 7 gates at main terminal
Albany International (ALB)	2006	6 runway sweeper diesel retrofits using muffler technology Nitrogen oxide-reducing catalysts and particulate filters (GSE pilot) (Note: project modification is pending)
	2005	2 CNG shuttle buses and CNG refueling station upgrade

Source: FAA data.

Detroit Metropolitan Wayne County Airport has used VALE funding to install systems to supply electricity and air conditioning to aircraft from gates at a new terminal that opened in September 2008, eliminating the need for aircraft to run their auxiliary engines to power and cool aircraft while loading and unloading passengers, thereby reducing emissions (see fig. 2). The airport has also partially relied on VALE funding to install an underground fuel hydrant system for refueling aircraft, which reduces emissions by eliminating the need to truck fuel to the aircraft.

**Figure 2: Gate Power and Preconditioned Air Reduce Auxiliary Power Unit (APU) Use and Emissions**



Source: FAA data.

Note: An aircraft's APU is a small engine that is used to supply power to the cabin when the aircraft's main engines are not in use.

Several other airports have used the VALE program to purchase low-emitting vehicles for use at the airport. For example, George Bush Intercontinental Airport and William P. Hobby Airport, which are both owned by the city of Houston, have received VALE funding to purchase 37 hybrid cars and sport utility vehicles, and Albany International Airport has purchased natural gas-powered shuttle buses and other low-emitting vehicles through VALE (see fig. 3). As table 1 indicates, George Bush Intercontinental Houston Airport and Philadelphia International Airport have also used VALE funding to purchase ground service equipment, such as baggage tugs and power stations to recharge this equipment.

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**Figure 3: Examples of Alternative Fuel Vehicles**



Source: FAA.

Top photo: A low-emitting hybrid car. Bottom photo: A natural-gas-powered shuttle bus.

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The scope of VALE projects at airports has also been increasing. For example, in fiscal year 2008, Philadelphia International Airport received FAA approval for a \$3.4 million VALE grant for electric tugs that transport baggage, systems for supplying electricity and air conditioning to aircraft at gates, and hybrid vehicles. FAA officials noted that this is the first VALE project with airline participation. United Airlines has agreed to keep 10 of its electric baggage tugs at the airport for their entire useful life<sup>20</sup> in exchange for the airport agreeing to purchase a recharging station for the tugs through VALE. Similarly, US Airways agreed to purchase 34 new electric ground support vehicles for use at Philadelphia International. For this project, US Airways obtained a grant from Pennsylvania through the state's Alternative Fuels Incentive Program<sup>21</sup> to fund part of the purchase of the tugs. George Bush Intercontinental Houston Airport, which previously used VALE to purchase hybrid vehicles, increased its participation in the VALE program to include funding the expansion of its people-mover system and other projects.

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## Expenditures for the VALE Program Are Increasing

Expenditures for the VALE program have increased significantly as the program has matured. In fiscal years 2005 and 2006, VALE funding for projects totaled less than \$400,000, but has increased to nearly \$20 million for projects funded through fiscal year 2008, including the airports' required share for AIP-funded projects.<sup>22</sup> About 56 percent of these expenditures occurred in fiscal year 2008. Table 2 indicates that most of the VALE funding came from the AIP program. To date, no airports have applied PFC funds to VALE projects. Officials at Philadelphia International Airport had initially intended to use PFC funds to meet its required 25 percent share for its VALE grant, but later decided to rely on other funding sources for this share. According to FAA officials and officials of the seven participating airports we contacted, because there is more flexibility in

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<sup>20</sup>Airlines often move the ground support equipment between airports.

<sup>21</sup>The state of Pennsylvania grant program was established in 1992 and is administered by the Department of Environmental Protection's Office of Pollution Prevention and Compliance Assistance. The program is intended to help improve the Commonwealth's air quality and reduce the use of imported oil through the use of alternative fuels.

<sup>22</sup>The federal government's share of AIP grants is 95 percent for smaller airports and 75 percent for large and medium hub airports.

using PFC funds for airport projects than in using AIP funds,<sup>23</sup> participating airports use AIP funds for VALE projects and apply PFCs to other types of projects, such as terminal improvement projects, that may not be eligible for any type of AIP grants. In addition, these participating airport officials, as well as FAA officials, said that VALE projects have to compete with all other priorities for PFC use, and many PFC priority projects have been set well into the future. For example, officials at one airport we visited said that the airport currently collects the maximum \$4.50 PFC, and that all PFCs collected have already been dedicated to capital projects, including building a new terminal with six additional gates.

**Table 2: VALE Project Expenditures Summary, Fiscal Years 2005-2008**

<b>Airport</b>	<b>Fiscal year that project was funded</b>	<b>AIP expenditure</b>	<b>PFC expenditure</b>	<b>Airport's share of project funding</b>	<b>Total project expenditures</b>
Erie International/Tom Ridge Field (ERI)	2008	\$313,500	\$0	\$16,500	<b>\$330,000</b>
Westchester County (HPN)	2008	1,032,949	0	54,366	<b>1,087,315</b>
Philadelphia International (PHL)	2008	3,484,301	0	1,161,433	<b>4,645,734</b>
	2008	451,950	0	150,650	<b>602,600</b>
Greater Rochester International (ROC)	2008	1,524,147	0	80,218	<b>1,604,365</b>
George Bush Intercontinental Houston (IAH)	2008	2,133,112	0	711,037	<b>2,844,149</b>
	2008	30,808	0	10,270	<b>41,078</b>
	2007	51,896	0	17,125	<b>69,021</b>
	2005	42,655	0	14,218	<b>56,873</b>
William P. Hobby Houston (HOU)	2008	10,779	0	3,593	<b>14,372</b>
	2007	7,905	0	2,608	<b>10,513</b>
	2006	12,557	0	5,186	<b>17,743</b>
Detroit Metropolitan Wayne County (DTW)	2007	5,099,971	0	1,699,990	<b>6,799,961</b>

<sup>23</sup>AIP funding is usually limited to construction or improvements related to aircraft operations, such as runways or taxiways, whereas PFCs are considered local revenues; therefore, airports generally have more flexibility in the use of PFCs than AIP grants. PFCs can be used in furthering airport development, including preserving or enhancing airports' safety, security, or capacity; reducing noise; or enhancing airline competition.

Airport	Fiscal year that project was funded	AIP expenditure	PFC expenditure	Airport's share of project funding	Total project expenditures
Stewart International (SWF), Newburgh/New Windsor, NY	2007	1,053,500	0	451,500	1,505,000
Albany International (ALB)	2006	128,324	0	6,754	135,078
	2005	106,489	0	5,605	112,094
<b>Total</b>		<b>\$15,484,843</b>	<b>\$0</b>	<b>\$4,391,053</b>	<b>\$19,875,896</b>

Source: FAA data.

## While VALE Projects Reduce Emissions, FAA Plans to Assess the Program's Overall Performance as Participation Increases, and Two Airports Have Used Emissions Credits

VALE projects have reduced emissions at participating airports, according to FAA officials, and FAA plans to assess the overall performance of the VALE program in reducing emissions across airport activities as participation in the program increases. Thus far, two airports have taken advantage of emission credits available through the program to offset emissions from planned construction projects.

## VALE Projects Reduce Emissions at Participating Airports

The estimated emissions reductions resulting from VALE projects initiated at airports vary, depending on the type and scope of the project. Table 3 shows the estimated reductions in tons of criteria pollutants, including nitrogen oxides, volatile organic compounds, carbon monoxide, and particulate matter. Airports use FAA's EDMS, which calculates emissions produced by aircraft and equipment used at airports. Airports determine the estimated reductions by comparing the estimated amount of pollution produced before the project was initiated with the estimated amount after it was implemented. For example, officials at George Bush Intercontinental Houston Airport compared the estimated amount of pollution produced by the airport's conventional vehicles with the estimated amount of pollution produced by the replacement hybrid vehicles purchased with VALE funding.



**Table 3: VALE Projects' Estimated Emission Reductions Summary**

Reductions in tons				
Airport	Estimated project lifetime <sup>a</sup> emission reductions			
	Nitrogen oxide	Volatile organic compounds	Carbon monoxide	Particulate matter
Erie International/Tom Ridge Field (ERI)	11.1	1.0	15.2	0.0
Westchester County (HPN)	33.8	16.2	656.1	1.7
Philadelphia International (PHL)	730.7	60.0	937.8	18.4
Greater Rochester International (ROC)	248.4	33.1	835.8	9.1
George Bush Intercontinental Houston (IAH)	426.5	54.2	898.2	0.9
	0.1	0.0	0.6	0.0
	1.0	0.3	5.2	0.0
	0.4	0.1	1.6	0.1
William P. Hobby Houston (HOU)	0.0	0.0	0.2	0.0
	0.0	0.0	0.1	0.0
	0.0	0.0	0.1	0.0
Detroit Metropolitan Wayne County (DTW)	396.6	46.5	453.5	50.6
Stewart International (SWF) Newburgh/New Windsor, NY	38.6	3.7	40.9	0.9
	8.4	1.2	8.2	1.4
Albany International (ALB)	3.3	9.5	0.0	0.0
	<b>Total</b>	<b>1,898.0</b>	<b>226.0</b>	<b>3,854.0</b>

Source: FAA data.

Note: The emission reductions data represent emission reductions from all VALE projects at each of the airports.

<sup>a</sup>According to FAA, the lifetime duration of projects varies and ranges from 10 years for some vehicle projects to 40 years for some infrastructure projects. For these initial VALE projects, the estimated emission reductions for such pollutants as nitrogen oxide and carbon monoxide is over 5,700 tons.

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According to FAA officials, the emission reductions resulting from VALE projects, although relatively large in the case of some projects, represent a small portion of total emissions at the participating airports. For example, the VALE project at Philadelphia International Airport is projected to reduce nitrogen oxide emissions by about 1 percent. In addition, some of the VALE projects would have been undertaken even without VALE funding. For example, according to Detroit Metropolitan Wayne County Airport officials, the airport would have used other funding sources to install systems to supply electricity and air conditioning to aircraft at the gates of its new terminal even if it had not received an AIP grant through the VALE program for this purpose. However, airport projects that are not part of the VALE program may not receive emission credits from their state air quality agency.

According to FAA officials, the agency has taken steps to ensure that estimates of emission-reductions from VALE projects are quantified accurately. These steps include developing and updating emission standards for airport vehicles eligible for VALE in cooperation with EPA. FAA also publishes a technical report that contains vehicle emission standards as well as guidance on how to do the required emission inventories for proposed VALE projects. In addition, emission reduction estimates that airports are required to provide are verified by FAA regions using a formal checklist. The estimates are also checked by FAA headquarters and by the airport's EPA region and state air quality agency.

FAA officials are developing a methodology to assess the cost-effectiveness of VALE projects in reducing emissions and plan to develop other measurable performance objectives. As part of its oversight of the VALE program, FAA evaluates the cost-effectiveness of VALE projects based on a comparison of emission reductions over the useful life of the project and the total project costs. FAA recognizes that cost-effectiveness may vary by project type, the way the project is implemented, and airport size. For example, according to FAA, gate electrification projects tend to provide the largest emission reductions and are the most cost-effective, while a project involving a refueling station tends to yield lower cost-effectiveness. FAA has developed specific cost-effectiveness measures for gate electrification projects initiated under VALE based on actual program experience to date. According to FAA, these projects have reduced ozone

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and carbon monoxide at a cost of \$7,000 and \$6,000 per ton, respectively.<sup>24</sup> To further develop its cost-effectiveness methodology, FAA plans to expand its cost-effectiveness ranges to include other types of VALE projects. FAA officials stated that based on the number and size of VALE projects funded to date, they believe more history and experience with the VALE program is needed before they can develop other performance measures, such as setting goals for the number of projects implemented and the amount of reductions achieved through these projects. Nevertheless, FAA program officials noted that they have set an informal goal for each of FAA's nine regions to approve at least one VALE project in fiscal year 2009. An EPA official involved in the development of the VALE program noted that a future requirement should be the development of the cost-effectiveness and efficiency measures for the VALE program to hold airports and the federal government accountable for results.

As we have previously noted, airports that participate in the VALE program can apply to their state or local air quality authority to receive AERCs for emission reductions achieved through the program. To date, two airports have obtained these credits to help mitigate the increases in emissions resulting from airport development projects. FAA officials stated that while most airports that participate in VALE are mainly interested in receiving VALE funding, some airports also plan to use emission credits to meet CAA conformity requirements.<sup>25</sup> As of June 2008, William P. Hobby Houston Airport and George Bush Intercontinental Houston Airport have applied for and received a formal AERC statement from the Texas Commission on Environmental Quality, which allows the airports to use their AERCs to mitigate emissions from airport development projects. For example, Houston Intercontinental will use AERCs in its environmental impact statement for a terminal expansion project to help satisfy CAA conformity requirements. According to FAA, other airports, including Philadelphia International, are planning to use emission credits to offset emissions from development projects currently

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<sup>24</sup>FAA has also developed cost-effectiveness ranges for other pollutant reductions, including particulate matter (\$30,000 per ton) and sulfur dioxide (\$35,000 per ton). The calculations of all these ranges do not include the costs for upgrading the electrical infrastructure at the terminal or in main electric lines or subsystems. In addition, these ranges assume minimum aircraft gate occupancy of 4 hours per day.

<sup>25</sup>EPA is proposing to extend the types of emissions available under VALE to all federal actions subject to General Conformity Regulations. See "Revisions to the General Conformity Regulations," Early Emission Reduction Credit Program, 73 Fed. Reg. 1402 (Jan. 8, 2008).

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under way. For example, Philadelphia International Airport plans to use AERCs to satisfy CAA conformity requirements to offset the emissions produced in the construction of its ongoing capacity enhancement project, which includes a new airport runway. Airport officials at Philadelphia International expect that the state will approve these credits. Officials with whom we spoke from two airports that have initiated VALE projects but that have not applied for earned AERCs stated that they currently have no ongoing development projects, or have not needed the credits for ongoing projects because the resulting emissions fall within federal standards. In addition, FAA officials indicated that some airports do not need AERCs for expansion projects, but are expressing interest in participating in the VALE program to buy low-emitting equipment partly because such equipment uses less fuel, and rising fuel prices have put a strain on airport finances.

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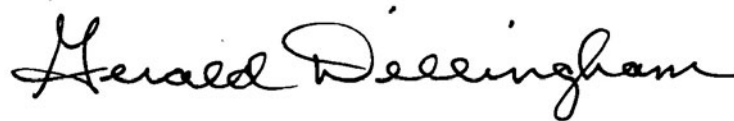
## Agency Comments and Our Evaluation

We provided copies of a draft of this report to EPA and the Department of Transportation for review and comment. EPA and FAA both provided several clarifying comments and technical corrections, which we have incorporated in this report as appropriate. We also received comments from officials in FAA's Office of Airport Planning and Programming, including the National Resource Advisor, Noise and Air Quality who is responsible for managing the VALE program. FAA generally agreed with the report's findings. The FAA representatives, however, stated that the draft suggested that FAA was not aware of the performance of the VALE program, and that tracking program benefits and performance is one of VALE's strongest attributes. We modified the report to more clearly reflect that FAA is developing a methodology to assess VALE's cost-effectiveness and plans to develop other measurable performance objectives, but that FAA has yet to assess the overall performance of the VALE program. The representatives also stated that while the report covers the various elements of the VALE program, they also wanted to emphasize the "innovativeness" of the program. In this regard, they noted that VALE represents a new model for government efforts to promote clean fuels and technology. For this reason, they state and we point out in the report, EPA is recommending in current proposed revisions to its General Conformity Regulations that the VALE system for granting emissions credits be expanded to all actions subject to General Conformity Regulations. The FAA representatives also provided information on what they regarded as other innovative elements of the VALE program, which we have incorporated in this report as appropriate.

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We are sending copies of this report to interested congressional committees, the Secretary of Transportation, the FAA Administrator and the EPA Administrator. We will also make copies available to others on request. In addition, this report will be available at no charge on the GAO Web site at <http://www.gao.gov>.

If you or your staffs have any questions about this report, please contact me at (202) 512-2834 or [dillingham@gao.gov](mailto:dillingham@gao.gov). Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made major contributions to this report are listed in appendix II.

A handwritten signature in black ink that reads "Gerald Dillingham". The signature is written in a cursive style with a large initial "G" and "D".

Gerald L. Dillingham, Ph.D.  
Director, Physical Infrastructure Issues

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# Appendix I: Airports GAO Contacted with and without VALE Projects

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## Airports with VALE Projects

Albany International (ALB)  
Detroit Metropolitan Wayne County (DTW)<sup>1</sup>  
George Bush Intercontinental Houston (IAH)  
Greater Rochester International (ROC)  
Philadelphia International (PHL)  
Stewart International (SWF), Newburgh/New Windsor, New York  
William P. Hobby Houston (HOU)

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## Eligible Airports without VALE Projects

Chicago O'Hare International (ORD)  
Denver International (DEN)  
John Wayne Airport-Orange County, California (SNA)  
Los Angeles International (LAX)

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<sup>1</sup>GAO also visited this airport and Philadelphia International Airport.

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# Appendix II: GAO Contact and Staff Acknowledgments

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## GAO Contact

Gerald L. Dillingham, Ph.D., (202) 512-2834 or [dillinghamg@gao.gov](mailto:dillinghamg@gao.gov)

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## Staff Acknowledgments

In addition to the contact named above, individuals making key contributions to this report include Edward Laughlin (Assistant Director), Lauren Calhoun, James Geibel, Delwen Jones, Rosa Leung, Josh Ormond, Stan Stenersen, and Larry Thomas.

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