NextGen Environmental Management System Framework and Collaboration

Pilot Study Summary Report

Dallas/Fort Worth International Airport (DFW)

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Office of Environment and Energy
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Table of Contents

Introduction ........................................................................................................... 1

Dallas/Fort Worth International Airport Overview ........... 2

Air Quality ........................................................................................................... 3-4

Climate ............................................................................................................. 5-6

Energy .............................................................................................................. 7-8

Noise ............................................................................................................... 9-10

Conclusion ...................................................................................................... 11

Acronyms ......................................................................................................... 12
Introduction

NextGen is an umbrella term for the ongoing transformation of the National Airspace System (NAS). At its most basic level, Next Generation Air Transportation System (NextGen) represents an evolution from a ground-based system of air traffic control to a satellite-based system of air traffic management. This evolution is vital to meeting future demand, avoiding gridlock in the sky and at our nation’s airports, and improving the environmental performance of the NAS.

The environmental vision for NextGen is environmental protection that allows sustained aviation growth. As an initial step toward achieving this vision, the Federal Aviation Administration (FAA) has created goals to reduce aviation impact on air quality, climate, energy, noise, and water quality that should be achieved while striving for NAS transformation. In addition, FAA has developed a NextGen Environmental Management System (EMS) Framework.

NextGen EMS Framework and Collaboration

NextGen EMS Framework and Collaboration is a strategic approach to address the five environmental goals. The goal of the framework is to ensure that environmental benefits of NextGen are maximized, while constraints to mobility (i.e., increasing efficiency and capacity) are reduced or avoided. This framework will establish the overarching means of collaboration for stakeholders (e.g.; Air Carriers, Airports, Manufacturers, Local Community). To achieve broad system level aviation environmental and energy goals, it will provide approaches, tools, and performance assessments to help stakeholders address the important issues specific to their organization; and it will support more efficient and effective planning and decision making.

NextGen EMS Framework and Collaboration Pilot Study

The NextGen EMS Framework and Collaboration Pilot Study aims to foster collaboration between FAA and aviation’s principal stakeholders. It aims to further define their role in NextGen EMS Framework and Collaboration and identify opportunities to address environmental challenges associated with each aspect.

The objective of this pilot study is to evaluate which environmental challenges have the potential to constrain the mobility of the aviation system and the possible effects of future technology and operational changes.

NextGen Airport Pilot Study Goals

2. Identify environmental issues at the study location that could constrain mobility.

10-Step Pilot Study Approach

Through a 10-step technical approach, data were collected and analyzed to establish baselines for air quality, climate, energy, noise, and water quality.* Future scenarios were calculated for each aspect to identify environmental issues that could constrain NextGen implementation. The scenarios were based on forecast data and the assumption that no NextGen technologies and operations are incorporated. Several new technology and operational concepts were evaluated to determine those that could mitigate the environmental impacts. For the DFW Pilot Study, 2009-2010 was chosen as the base year for the future scenarios.

Results

The results of this pilot study are being used to inform the development of NextGen EMS Framework and Collaboration. By leveraging detailed examples and case studies, as well as direct stakeholder involvement during the development process, the implementation of NextGen EMS Framework and Collaboration will be compatible with on-going stakeholder environmental programs and initiatives, while encouraging the stakeholder community to collaborate and meet the environmental goals. Pilot study information is being used to develop NextGen EMS Framework and Collaboration approaches and tools that will help stakeholders identify strategic environmental challenges, address these challenges and track improvements. Because operations are expected to increase over time, an increase in environmental impacts is expected, making NextGen solutions key and measuring progress necessary.

*Water quality was not studied in detail due to a lack of easily accessible available data.
Dallas/Fort Worth International Airport

DFW Overview and Statistics

Dallas/Fort Worth International Airport (DFW) was created by a Contract and Agreement between the Cities of Dallas and Fort Worth, Texas for the purpose of developing and operating an airport as a joint venture between the cities. DFW, which opened in 1974, is located in North Central Texas between the cities of Dallas and Fort Worth. DFW is the principal air carrier facility serving the North Central region of Texas and the Dallas-Fort Worth metroplex.

The airport covers more than 29.8 square miles and was ranked 3rd in the US in terms of operations and 8th in terms of passengers in 2010. DFW has 7 runways, 2 of which are over 13,000 feet long. The airport has 5 terminals with a total of 155 gates. DFW is served by 19 airlines, and is the main hub for American Airlines, which accounts for over 70 percent of the airport’s traffic. In 2010, DFW served almost 57 million total passengers and approximately 156,000 on a daily basis.

Environmental Initiatives

In 2008, DFW launched an Airport-wide sustainability program, designed to positively affect the environment, the community, the Airport, and its employees. The DFW sustainability initiative is based on the belief that it is important for activities at DFW to be carried out in a manner that cares for our environment (e.g., conserves energy and water, reduces waste, limits criteria air pollutants and climate emissions, and minimizes flight-related noise). Furthermore, future development must be innovative using modern sustainable approaches and building standards for facility design, construction, and maintenance. Sustainability is also important in marketing and business development for the Airport, attracting airlines and serving customers who care about how the Airport is managed.

Sustainable economic growth and development are fostered via the application of best business practices, deployment of state-of-the-art technology, and embedding sustainable development principles in DFW’s policy implementation, planning, design, construction, and performance assurance methods. These cornerstones must be blended into the mix of DFW’s daily priorities to achieve sustainability:

- Environmental compliance
- Pollution prevention, source reduction, and waste minimization
- "Greening" the Airport
- DFW’s social responsibility
- Effective community outreach

DFW maintains an EMS that was designed and implemented to serve as a platform from which to sustain environmental compliance and achieve a position of environmental leadership in the air transportation industry. The EMS provides a user-friendly framework from which to distinguish the environmental risk aspects of each department’s operations. Additionally, DFW developed an Environmental Primer to provide a more concise tool for identifying environmentally regulated aspects of operations, commercial, and construction activities conducted on-Airport.

DFW's environmental success earned the Airport membership in the U.S. Environmental Protection Agency’s former National Environmental Performance Track Program and the Texas Commission on Environmental Quality's Clean Texas Platinum Award. These programs recognize top businesses and organizations that excel at environmental leadership and performance.
Air Quality

Introduction

Airport operations can impact local and regional air quality by generating criteria air pollutants, including carbon monoxide (CO), unburned hydrocarbons (UHC), nitrogen oxides (NO\textsubscript{X}), and sulfur oxides (SO\textsubscript{X}) during operation of stationary and mobile sources (including aircraft). Aircraft and ground support equipment (GSE) can result in up to 5 percent of emissions regulated under State Implementation Plans compared to other transportation and point/area sources, which make up 40 percent to 60 percent, respectively.* DFW has implemented several initiatives to reduce criteria pollutant emissions over the past decade, including upgrading the central utility plant boilers and using low emissions and alternative fuel airport vehicles.

NextGen Air Quality Goal

Achieve an absolute reduction of significant air quality health and welfare impacts attributable to aviation, notwithstanding aviation growth. \textit{Note: FAA’s system level goals are not applied directly to airports, but can be used as a guide to contextualize air quality at airports such as DFW.}

Current State

\textbf{Approach:} DFW provided criteria pollutant emissions data for operation of facility sources including boilers, emergency generators, underground and above ground storage tanks, and maintenance operations at the airport for 2008 and 2009 as well as emissions data from the central utility plant for 2008, 2009, and January through July 2010.

Criteria pollutant emissions from aircraft operations for 2010 were estimated using the FAA’s Aviation Environmental Design Tool (AEDT). This tool enables aircraft performance to be modeled during various phases of flight to produce fuel burn, emissions, and noise estimates.

\textit{Note: Emissions from Ground Access Vehicles (GAV) and GSE, although typically included in an air quality analysis, were not included in this analysis because information was not available at the airport.}

Future State

\textbf{Approach:} Changes to emissions from aircraft, assuming no NextGen solutions, were forecasted for 2015, 2020, 2025, and 2030, based on changes in aviation activities such as the number of aircraft operations as predicted by FAA. Future emissions estimates were then compared to the 2010 baseline to examine trends for each criteria pollutant.

No emissions were forecast from other sources (e.g., stationary sources, emergency generators, storage tanks) because data was not available.

\textbf{Key Trends:} Criteria pollutant emissions are expected to increase from the baseline as passenger enplanements and aircraft operations increase. As shown in the graph below, emissions of CO, HC, NO\textsubscript{X}, and SO\textsubscript{X} are estimated to increase by 117 percent, 161 percent, 124 percent, and 70 percent respectively by 2030.

Potential NextGen Solutions

NextGen includes a range of solutions that will reduce criteria air pollutants. While many of these aim to reduce aircraft emissions, some FAA programs also target non-aircraft emissions at the airport. These are summarized below.

CLEEN: The Continuous Lower Energy, Emissions and Noise (CLEEN) program is a NextGen effort to accelerate development and commercial deployment of environmentally promising aircraft technologies and sustainable jet alternative fuels. For example, current research includes engine technology that reduces landing and takeoff cycle (LTO) nitrogen oxide emissions by 60 percent below the International Civil Aviation Organization (ICAO) standard adopted in 2004.

VALE: The Voluntary Airport Low Emission Program (VALE) aims to reduce the amount of criteria pollutants generated by mobile sources and infrastructure at airports. The program provides financial and regulatory incentives for airports to invest in low-emission technology and non-petroleum based alternative fuels to reduce emissions. VALE allows airport sponsors to take proactive steps to improve air quality at their facilities. Projects can range from the purchase of low-emission vehicles to major infrastructure improvements. Only airports located in EPA-designated nonattainment/maintenance areas, such as DFW, are eligible for this program.

CAAFI: The Commercial Aviation Alternative Fuels Initiative (CAAFI) seeks to enhance energy resources and environmental sustainability for aviation through alternative jet fuels, some of which can offer air quality benefits. For example, synthetics contain little or no sulfur and no aromatic compounds. When these are blended with traditional fuel, sulfur, aromatic content, and particulate matter are reduced.

Advanced Air Traffic Management and Operations: New Air Traffic Management and operational procedures offer the potential to reduce criteria air pollutants. For example, the FAA is implementing a range of Performance Based Navigation (PBN), including optimized profile decent and Radius to Fix Legs which, in addition to fuel savings, can reduce criteria pollutant emissions.

Policy: There are a number of policy development activities led by the International Civil Aviation Organization (ICAO) Committee on Aviation Environmental Protection (CAEP), which aim to improve local air quality. For example, at CAEP/8 a decision was made to increase the stringency of the NOx emissions standard and to conduct future work on an engine certification requirement for non-volatile particulate matter emissions.

Potential Airport Improvement Opportunities

In addition to potential NextGen solutions, a few airport specific solutions are listed below.

1) Encourage air carriers to adopt electric GSE
2) Encourage use of alternative fuels for mobile/stationary sources
3) Encourage use of renewable/sustainable energy sources
4) Investigate ways to improve surface flow management
Introduction

DFW greenhouse gas emissions (GHG) are primarily generated by aircraft Jet A fuel consumption; facility electricity and natural gas consumption; and airport ground service vehicle diesel, gasoline, and compressed natural gas (CNG) consumption. While aircraft fuel consumption is the most significant contributor to aviation GHG emissions, airports generally have greater control over other airport sources.

NextGen Climate Goal

Limit the impact of aircraft carbon dioxide (CO$_2$) emissions on the global climate by achieving carbon neutral growth by 2020 compared to 2005 and net reductions of all aviation emissions that impact climate over the longer term (by 2050). Note: FAA’s system level goals are not applied directly to airports, but can be used as a guide to contextualize emissions from airports such as DFW.

Current State

Approach: DFW provided a 2005-2010 GHG inventory for facility natural gas consumption and airport ground service vehicle fuel consumption. The airport also provided 2008-2010 electricity consumption data for facility operations and docked airplanes. Electricity consumption estimates were made for 2005-2007 using average percent change from 2008-2010. A GHG inventory for electricity consumption was then developed. For aircraft Jet A fuel consumption, emissions estimates were generated for 2005-2010 using Bureau of Transportation Statistics and average fuel burn. CO$_2$ is the only GHG for which emissions were calculated because it is the focus of the NextGen goal.

Key Trends: The five largest sources of emissions (largest to smallest) were: 1) aircraft fuel consumption; 2) facility electricity; 3) facility natural gas; 4) CNG ground service vehicles and 5) boilers and incinerators (natural gas). Jet A fuel burned from aircraft operations made up approximately 97 percent of total CO$_2$ emissions in 2010. DFW’s total CO$_2$ emissions trended downward from 2005 to 2008, as shown in the graph below. This could likely be attributed to a decrease in the number of aircraft operations. In 2009 and 2010, emissions began to increase, which could likely be attributed to an increase in operations.

Future State

Approach: GHG emissions for DFW were estimated for 2015, 2020, 2025 and 2030, trended against a 2010 baseline, assuming no NextGen solutions, based on forecasted operations and energy use. A forecast GHG inventory was created for all emission sources using methods specific to each emission source. A regression analysis for historical aircraft fuel use was completed to find correlations with operational projections and estimate future fuel use. Two different forecasts were made, one using data from the Terminal Area Forecast (TAF) and another from the 2009 DFW Vision of the Future Realizes (VFR) Airport Development Plan Update.

Forecasted CO$_2$ Year Over Year

Key Trends: As shown in the graph above, the two projections provide a range of future emissions, but both show a year over year increase in emissions. Aircraft operations are predicted to continue to be the largest contributor to CO$_2$ emissions.
Potential NextGen Solutions

NextGen includes a range of solutions that will reduce CO₂ emissions. FAA is investigating the potential for CO₂ emissions reductions from changes in aircraft operations, airframe/engine technology, and alternative fuels. Several of these solutions are summarized below.

CLEEN: The CLEEN program is a NextGen effort to accelerate development and commercial deployment of environmentally promising aircraft technologies and sustainable alternative jet fuels. For example, current research includes engine technology that may reduce aircraft fuel burn by 33 percent relative to 2009 subsonic aircraft technology, and which reduces energy consumption and greenhouse gas emissions.

VALE: The program aims to reduce the amount of criteria pollutants generated by mobile sources and infrastructure at airports. Though the VALE Programs focus is on local air quality and criteria pollutants, consequential reductions in GHG emissions achieved through implementation of VALE projects can also help to mitigate global climate change.

CAAFI: The Commercial Aviation Alternative Fuels Initiative (CAAFI) strives to improve environmental sustainability for aviation by introducing alternative jet fuels that are cost effective. The initiative has already experienced success with approval from the American Society for Testing and Materials for the development of synthetic non-petroleum jet fuels that can replace Jet Fuel A. As more cost effective alternative fuels are available on the market, the more air carriers will be able to use them and reduce GHG emissions from to aircraft operations.

The FAA has examined the GHG intensity of coal, biomass alternative fuel, and hydrotreated renewable jet fuel (HRI) through its ongoing alternative fuel research portfolio. The following figure illustrates the potential for reducing GHG emissions if 100 percent of fuel at DFW was replaced with the stated alternative fuel starting in 2015 compared to forecasted emissions from petroleum fuels.

Advanced Air Traffic Management and Operations: New Air Traffic Management and operational procedures offers the potential to reduce criteria CO₂ emissions. For example, the FAA is implementing a range of Performance Based Navigation (PBN) such as optimized profile decent and Radius to Fix Leg which can reduce CO₂ emissions.

Policy: There are a number of policy development activities led by the International Civil Aviation Organizations (ICAO) Committee on Aviation Environmental Protection (CAEP), which aim to reduce CO₂ emissions. For example, CAEP is in the process of developing an aircraft CO₂ standard and ICAO is in the process of collecting action plans from Member States on measures to reduce aviation greenhouse gas emissions.

Potential Airport Improvement Opportunities

In addition to potential NextGen solutions, a few airport specific solutions are listed below.

1) Develop airport specific goals for reducing CO₂ emissions
2) Encourage air carriers to accelerate adoption of electric GSE
3) Continue to implement Continuous Commissioning across all board-owned facilities
Introduction

DFW consumes energy through a number of its operations and activities. For example, DFW facilities consume electricity to service docked aircraft and electricity and natural gas to operate the facility (HVACs, lighting, etc.). Ground service vehicles consume gasoline, diesel, biodiesel, propane and CNG. In addition, aircraft operations (flights) consume Jet A fuel. In general, energy consumption is a function of operations and enplanements. Therefore, as operations and enplanements increase so does energy consumption. DFW has implemented several initiatives to reduce energy consumption over the past decade.

NextGen Energy Goal

Improve aircraft efficiency in the NAS by at least two percent per year, and develop and deploy alternative jet fuels for commercial aviation. Note: FAA’s system level goals are not applied directly to airports, but can be used as a guide to contextualize energy use at airports such as DFW.

Current State

Approach: DFW provided facility electricity and natural gas consumption data, and ground service vehicle fuel consumption data for 2008-2010. For all 2010 data, one month of data were estimated because only 11 months of data were available. Note: Aircraft fuel consumption was not included in the analysis because detailed data on Jet A consumption was not available.

Key Trends: Total facility energy (docked aircraft and facility equipment) fell by 6.4 percent from 2008 to 2010 (see chart above). This reduction is likely a result of energy efficiency programs implemented by DFW.

DFW ground service vehicle fuel use decreased by approximately 15 percent from 2008-2010 (see graph below). A large portion of the vehicle fleet runs on CNG. This is due to a conscious effort by DFW to increase its number of CNG vehicles to help improve regional air quality since Dallas/Fort Worth is designated by EPA as a non-attainment area.

Future State

Docked aircraft electricity consumption was estimated using projections for aircraft operations in combination with a typical electrical load and service time. This was combined with projected facility equipment electricity and natural gas consumption. In estimating facility energy consumption, it was assumed that the amount of air conditioned space would remain constant and that some appropriate energy consumption would increase at 25 percent the rate of enplanements. For ground support vehicles, the future state fuel use was projected to increase with corresponding increases in passenger enplanements.

Key Trends: Based on available data, reductions in facility equipment energy consumption are projected to be greater than increases in docked aircraft energy consumption, resulting in a decrease in total facility energy consumption compared to a 2010 baseline (see chart below).

Due to a number of assumptions there is some uncertainty associated with these estimates. Further analysis on the relative consumption of docked aircraft, facility HVAC, and other facility equipment would reduce this uncertainty.
Energy

However, ground service vehicle energy consumption is expected to increase by approximately 35 percent by 2030. This is due primarily to the relationship between ground service vehicle use and enplanements, which are expected to increase.

Potential NextGen Solutions

NextGen includes a range of solutions that will reduce energy consumption. While many of these solutions aim to reduce aircraft emissions, the FAA VALE program also targets ground access vehicle fuel consumption.

VALE: The VALE program provides financial and regulatory incentives for airports to invest in low-emission technology and non-petroleum based alternative fuels. Though the VALE Programs focus is on local air quality and criteria pollutants, consequential reductions in greenhouse gas emissions achieved through implementation of VALE projects can also help to mitigate global climate change.

Potential Airport Improvement Opportunities

In addition to potential NextGen solutions, a few airport specific solutions are listed below.

1) Energy management awareness and training
2) Encourage use of additional renewable energy and sustainable alternative fuels
3) Continue building Commissioning/Recommissioning
4) Encourage the use of new and efficient support vehicle technology
Introduction

While noise exposure at airports is directly caused by aircraft, the airport is the stakeholder that actively addresses the impacts of noise on the surrounding community. Although DFW has a buffer of airport property to the north and south of the airfield, the airport continues to receive noise complaints from a number of surrounding communities and works closely with the local municipalities on land use planning to mitigate noise issues.

NextGen Noise Goal

Reduce the number of people exposed to significant noise around U.S. airports in absolute terms, notwithstanding aviation growth, and provide additional measures to protect public health and welfare and our national resources. Note: FAA’s system level goals are not applied directly to airports, but can be used as a guide to contextualize noise from airports such as DFW.

Current State

Approach: FAA considers noise exposure at or above a Day/Night Average Level (DNL) of 65 dB or greater to be a significant impact under the National Environmental Policy Act (NEPA). Noise modeling analysis for the EMS pilot study was conducted using three data sources:

- FAA TAF, current as of December 2011.
- Integrated Noise Model (INM) input data files provided by DFW for baseline years 2007, 2015 and 2020, which were adjusted to reflect VFR operations levels. In addition, the 2007 and 2015 cases were then used to create the 2010 baseline.

Both TAF and VFR operations were modeled for baseline year 2010 using INM version 7.0b. DNL contours and underlying land use were used to create Noise Exposure Maps (NEM); noise contour areas and population impacts were determined using Geographic Information System (GIS) analysis using data from the 2010 U.S. Census.

Key Trends: The 2010 TAF includes a higher number of total operations than the VFR, resulting in larger noise contours. In addition, the 2010 TAF fleet mix includes a higher level of wide and narrow body jets and a lower level of regional jets as compared to the VFR forecast. The table below shows the difference between TAF and VFR 2010 operations and the population count within the DNL 65 dB.

<table>
<thead>
<tr>
<th></th>
<th>Operations</th>
<th>Pop. ≥ 65 DNL</th>
</tr>
</thead>
<tbody>
<tr>
<td>TAF</td>
<td>649,900</td>
<td>812</td>
</tr>
<tr>
<td>VFR</td>
<td>645,400</td>
<td>347</td>
</tr>
<tr>
<td>Difference</td>
<td>4,500</td>
<td>465</td>
</tr>
</tbody>
</table>

Future State

Approach: Projected noise impacts for 2015, 2020, 2025, and 2030, assuming no use of NextGen solutions were computed for both the TAF and VFR forecasts of aircraft operations. While the TAF operations are about 1 percent higher than VFR in 2010, this difference grows steadily up to 6 percent in 2030. TAF operations were the focus of the Future State analysis; DNL 60 and 65 dB for each year are shown in the Noise Exposure Map on the previous page.

Key Trends: Noise levels increase over time as the number of operations increase and changes occur within the fleet mix (i.e., older aircraft are retired and replaced by newer, often quieter, aircraft). Note: population counts show non-linear trends because these data are spatially-dependent (i.e., population is not equally distributed around the airport).

As shown in the graph below, the noise exposure within the 65 DNL contour will increase by 2030: a 34 percent increase in contour area and a 94 percent increase in population count, relative to 2010 levels, were projected.
Potential NextGen Solutions

NextGen includes a range of solutions that will reduce noise emissions. These are summarized below.

**CLEEN:** The Continuous Lower Energy, Emissions and Noise (CLEEN) program is a NextGen effort to accelerate development and commercial deployment of environmentally promising aircraft technologies with significant noise reduction. For example, current research includes aircraft technology that may reduce noise levels by 32 dB cumulative, relative to the Stage 4 standard. The figure to the right shows the potential noise impacts with the implementation of CLEEN technology beginning in 2020.

**Advanced Air Traffic Management and Operations:** New Air Traffic Management and operational procedures may offer the potential to reduce noise impacts. For example, the FAA is implementing a range of Performance Based Navigation (PBN) such as optimized profile decent and Radius to Fix Leg, which can avoid certain noise impacts.

The two figures below compare conventional Standard Instrument Departures (SIDs) (on the left) to Area Navigation (RNAV) SIDs (on the right).

**Policy:** There are a range of policy initiatives which have the potential to reduce noise. For example, in February 2010, ICAO’s CAEP identified the need for further analyses to improve the aircraft noise standards. The assessment results will be reviewed by the ninth meeting of CAEP in 2013. Other policy initiatives include Part 150 Airport Noise and Compatibility Planning and market based measures.

Potential Airport Improvement Opportunities

In addition to potential NextGen solutions, a few airport specific solutions are listed below.

1) **Continue to manage land-use zoning encroachment**

2) **Continue to utilize public outreach to communicate noise issues**

3) **Involve the relevant agencies and local communities from the outset of any project that will impact noise**
Summary

Four NextGen environmental aspects were analyzed to determine their potential for contributing to NextGen Aviation Environmental and Energy goals and/or Federal, State, or Local requirements. The study findings include data from sources beyond those addressed in existing Aviation Environmental and Energy goals (i.e., it includes sources beyond the aircraft for climate and energy). The inclusion of this information and supporting analysis does not imply that other sources or environmental issues may be included in the Aviation Environmental and Energy goals where they are not already. A brief overview of aspect findings is listed below.

Air Quality: Although criteria pollutant emissions are expected to increase, DFW has already been able to significantly reduce emissions through changes to its central utility plant and by replacing airport ground support vehicles. DFW can further mitigate impacts to air quality by implementing improvements related to operations, technology, and policy changes.

Climate: A combination of technology, alternative fuel, operational improvement, and policy solutions are needed to mitigate anticipated increases in CO₂ emissions.

Energy: Because of increased efficiencies, projected facility energy is expected to have a net decrease. Airport ground support vehicle energy is expected to increase, however, potential improvements in new technologies and alternative fuels should also be implemented.

Noise: NextGen will provide aircraft noise-reduction improvements via the CLEEN program and operational procedures, but additional measures may be necessary to reduce noise impacts to comply with locally-specific noise constraints, new national and international noise policies, and enhanced operational solutions.

Results

The results of this study are being used to inform the development of NextGen EMS Framework and Collaboration. Detailed examples and case studies, as well as direct stakeholder involvement were used during the development of the NextGen EMS Framework and Collaboration. By using these, the implementation of NextGen EMS Framework and Collaboration will be compatible with on-going stakeholder environmental programs and initiatives. In turn, the stakeholder community will be encouraged to collaborate and meet the Aviation Environmental and Energy goals.

Acknowledgements

Eleven departments within the DFW organization participated in the Airport Pilot Study interviews to help provide first-hand information on a variety of the airport’s operations, environmental management, planned improvements, and experience with NextGen. The departments were:

- Airport Management
- Environmental Affairs
- Energy
- Operations
- Planning
- Noise
- Communications
- Real Estate
- GIS
- Engineering
- DFW ATCT

A special thanks also goes to the staff members who helped make it possible:

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- Sandy Lancaster, Manager, Noise Compatibility Office
<table>
<thead>
<tr>
<th>Acronym</th>
<th>Definition</th>
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<tbody>
<tr>
<td>AEDT</td>
<td>Aviation Environmental Design Tool</td>
</tr>
<tr>
<td>BTU</td>
<td>British thermal unit (a measurement of thermal energy)</td>
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<tr>
<td>CAAFI</td>
<td>Commercial Aviation Alternative Fuels Initiative</td>
</tr>
<tr>
<td>CAEP</td>
<td>Committee on Aviation Environmental Protection</td>
</tr>
<tr>
<td>CLEEN</td>
<td>Continuous Lower Energy, Emission and Noise</td>
</tr>
<tr>
<td>CNG</td>
<td>Compressed Natural Gas (CNG is natural gas compressed to about one percent of its volume at standard atmospheric pressures)</td>
</tr>
<tr>
<td>CO</td>
<td>Carbon Monoxide</td>
</tr>
<tr>
<td>CO₂</td>
<td>Carbon Dioxide</td>
</tr>
<tr>
<td>dB</td>
<td>Decibel</td>
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<tr>
<td>DFW</td>
<td>Dallas/Fort Worth International Airport</td>
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<tr>
<td>DNL</td>
<td>Day/Night Average Sound Level</td>
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<tr>
<td>EMS</td>
<td>Environmental Management System</td>
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<tr>
<td>EPA</td>
<td>Environmental Protection Agency</td>
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<tr>
<td>FAA</td>
<td>Federal Aviation Administration</td>
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<tr>
<td>GAV</td>
<td>Ground Access Vehicle</td>
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<tr>
<td>GHG</td>
<td>Greenhouse Gas</td>
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<tr>
<td>GIS</td>
<td>Geographic Information System</td>
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<tr>
<td>GSE</td>
<td>Ground Support Equipment</td>
</tr>
<tr>
<td>HC</td>
<td>Hydro Carbons</td>
</tr>
<tr>
<td>HRJ</td>
<td>Hydrotreated Renewable Jet Fuel</td>
</tr>
<tr>
<td>ICAO</td>
<td>International Civil Aviation Organization</td>
</tr>
<tr>
<td>INM</td>
<td>Integrated Noise Model</td>
</tr>
<tr>
<td>Jet A</td>
<td>Kerosene based fuel used in jet and turbo-prop aircraft</td>
</tr>
<tr>
<td>kWh</td>
<td>Kilowatt hours</td>
</tr>
<tr>
<td>MMBTU</td>
<td>Represents one million Btu</td>
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<tr>
<td>NAS</td>
<td>National Airspace System</td>
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<td>National Environmental Policy Act</td>
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<td>Next Generation Air Transportation System</td>
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<td>Nitrogen Oxides</td>
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<tr>
<td>PBN</td>
<td>Performance Based Navigation</td>
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<td>Particulate Matter</td>
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<td>Area Navigation</td>
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<td>TAF</td>
<td>Terminal Area Forecast</td>
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<tr>
<td>TPD</td>
<td>Tons Per Day</td>
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<td>ULSJ</td>
<td>Ultra-Low Sulfur Jet Fuel</td>
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<td>Voluntary Airport Low Emissions Program</td>
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<td>VFR</td>
<td>DFW Vision of the Future Realized Airport Development Plan Update, 2009</td>
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