Erie Regional Airport Authority

2015 Greenhouse Gas Inventory and Reduction Plan

Appendix F

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Contents

Attachments

1. ABOUT THE ERIE REGIONAL AIRPORT AUTHORITY

The Erie Regional Airport Authority (the Authority), a Pennsylvania Municipal Corporation, is comprised of a nine-member Board of Directors that owns and operates the Erie International Airport/Tom Ridge Field (the Airport) as well as other facilities supporting Airport operations (Erie International Airport, 2016a). The Airport is a public-use commercial service airport that sits about five miles southwest of Erie, Pennsylvania at 4411 West 12th Street in Millcreek Township (Google, 2016). Its service area includes all of Erie County as well as the Western Region of Pennsylvania, Western New York State, and Northeast Ohio (C&S Companies, 2002). The Authority employs an Executive Director, who oversees the air transportation facility's day-to-day operations, as well as 32 other persons who support the Executive Director (Erie International Airport, 2016b).

In 2015, the Airport saw 89,587 enplanements (i.e., passenger boardings) and 21,287 aircraft operations (Erie International Airport, 2016c). Major airlines serving the Airport include American Airlines (formerly US Airways), Delta Air Lines, and United Airlines. These airlines provide nonstop flights to three cities (i.e., Philadelphia, Pennsylvania; Atlanta, Georgia; and Chicago, Illinois), and connections to more than 1,100 other destinations (Erie International Airport, 2016d). North Coast Air, a fixed-base operator (FBO), offers charter flights as well as aeronautical services such as aircraft maintenance, hangar leasing, and ground support services (e.g., aircraft fueling and deicing). North Coast Air also provides flight instruction at the Airport.

The Airport consists of a terminal building, as well as support buildings and storage hangars that have a combined total of 147,625 square feet (C&S Companies, 2002). Other assets include the terminal apron and general aviation aircraft parking apron, runways, taxiways, and navigational aids. The Authority owns all of the facilities within the Airport boundary, and leases several of these facilities to various entities, including:

- Federal Aviation Administration (FAA);
- US Customs and Border Protection;
- North Coast Air;
- Car rental companies (i.e., Avis/Budget, Alamo/Enterprise/National, and Hertz);
- Erie Aviation, an aviation distributor and repair station; and
- Republic Parking System, who has an operating agreement to run the Airport surface parking lot.

Within the terminal building, the Authority leases space to the airlines, FAA, Transportation Security Administration (TSA), and a restaurant (ERI Café). The car rental companies also occupy space within the terminal to greet customers and process reservations.

In addition to the Airport, the Authority owns several facilities in the vicinity of the Airport property, including the International Trade Center (ITC) at 3837 W 20th Street. The Authority has administrative offices and a warehouse in the ITC, but also leases areas of this facility to other organizations. The Authority leases all other off-Airport assets to other organizations that support Airport operations.

2. ORGANIZATIONAL AND OPERATIONAL BOUNDARIES

Since the Authority's activities primarily consist of providing public services and "do not involve buying or trading of equity," the consolidation approach chosen for this inventory is operational control (World Resources Institute, 2010). This is consistent with the WRI Greenhouse Gas Protocol for the U.S. Public Sector, which "recommends the operational control approach as the most appropriate boundary for government organizations" (World Resources Institute, 2010). This approach is appropriate as it reflects the assets at which the Authority has the ability to implement actions to reduce greenhouse gas (GHG) emissions.

Based on guidance from the GHG Reporting Protocol, and applying the operational control approach, the organizational and operational boundaries of the Authority should include 100 percent of its direct (scope 1) and indirect (scope 2) GHG emissions from assets at which the Authority exercises operational control (World Resources Institute, 2004). This includes direct and indirect emissions deriving from the Airport and the ITC, with exception to the facilities that the Authority leases to other organizations. All leases at the Airport and ITC are operational leases; therefore, "emissions from tenant/lessee's fuel combustion and the use of purchased electricity will always be scope 3" (World Resources Institute, 2010).

According to the GHG Accounting and Reporting Principles, although scope 3 reporting is optional, the Authority should strive to disclose scope 3 emissions associated with its operations that "appropriately reflect the GHG emissions of the company" with data that is "sufficiently accurate to enable intended users to make decisions with reasonable confidence" (World Resources Institute, 2011).

3. DESCRIPTION OF GHG EMISSIONS

The following sections summarize the Authority's GHG emissions at the Airport and ITC by scope.

SCOPE 1 EMISSIONS

The Authority's scope 1 emissions include the direct combustion of fossil fuels in stationary and mobile sources as well as emissions associated with chemical processes and fugitive releases. The following scope 1 activities relate to the Authority's operations at the Airport and ITC:

- Natural gas-powered building heating systems (stationary);
- Diesel-powered emergency back-up generators (stationary);
- Fleet vehicles and equipment that support Airport operations such as snow removal equipment and other utility vehicles, as well as the Airport's Aircraft Rescue and Fire Fighting (ARFF) operations and police unit (mobile);
- Glycol that the Authority uses to deice the Airport's pavement surfaces (physical and chemical processes);
- Fire training exercises that burn propane (fugitive); and
- Refrigerant releases associated with air conditioning equipment, fire suppressions systems, and onsite refrigerators (fugitive).

SCOPE 2 EMISSIONS

The Authority's scope 2 emissions include purchased electricity. Electricity is largely consumed at the Airport and ITC by building systems; terminal equipment such as baggage handling facilities; aircraft gates and jet bridges; airfield, roadway, and hazard/obstruction lighting; security fencing; and plug load equipment such as office computers and passenger electronics. The Authority does not purchase steam or district heating/cooling.

SCOPE 3 EMISSIONS

In general, scope 3 emissions fall under one of two categories, upstream or downstream activities. Upstream activities generally include "indirect GHG emissions from purchases or acquired good and services," while downstream activities include "indirect GHG emissions related to sold goods and services" (World Resources Institute, 2011). The bulleted list below identifies the upstream and downstream activities that relate to the Authority's operations at the Airport and ITC by category. Though it cannot manage these activities directly, it can extend influence to reduce related emissions.

- Category 1 - Emissions from the extraction, production, and transportation of purchased goods and services (e.g., embedded emissions in office equipment as well as

vendor/contractor activities such as janitorial services and capital project design/construction);

- Category 2 - Embedded emissions in capital assets (e.g., terminal building and runway);
- Category 3 - The upstream emissions associated with purchased fuels and electricity;
- Category 3 - Transmission and distribution losses associated with purchased electricity;
- Category 4 - Transportation and distribution of products between the Authority and its first-tier suppliers;
- Category 5 – The disposal and treatment of waste generated during operations not under the Authority's control;
- Category 6 - Business travel that includes the Authority's participation in national aviation- and airport-related conferences as well as meetings with regulatory agencies such as the FAA, among other examples;
- Category 7 - Employee commuting; and
- Category 13 - Downstream leased assets that include tenant-purchased stationary sources/facility power, aircraft deicing, ground access vehicles, ground support equipment (e.g., tugs, refuelers, catering vehicles), and employee commuting and business travel (World Resources Institute, 2011).

In addition to the scope 3 categories above, the *Guidebook on Preparing Airport Greenhouse Gas Emissions Inventories* states that airports typically do not own or control aircraft movements and operations (e.g., run-up, taxi, take-off, and landing) and public travel to and from the Airport (Transportation Research Board, 2009).

4. GHG EMISSIONS CALCULATIONS

This GHG inventory includes scope 1 and 2 emissions deriving from Authority operations at the Airport and ITC. In addition to the required reporting of scope 1 and scope 2 GHG emissions, this GHG inventory also reports on employee commuting (scope 3).

The reporting period for the calculations included in this GHG inventory is for Calendar Year 2015 unless otherwise noted. Calculations adhere to the Climate Registry's General Reporting Protocol (The Climate Registry, 2013), and all emission factors derive from the 2015 Climate Registry Default Emission Factors (The Climate Registry, 2015), unless otherwise noted. The sections below detail the emissions of the Authority at the Airport and ITC by scope.

SCOPE 1 EMISSIONS

This section calculates the scope 1 categories listed in Section 3.1 with exception to the emergency back-up generators, glycol use on pavement surfaces, and refrigerant releases. Though the Authority has four diesel-powered emergency back-up generators at the Airport and ITC, it did not use this equipment in 2015; therefore, there are no associated emissions to report. With regard to glycol use on pavement surfaces and refrigerant releases, the Authority does not have sufficient data available to calculate associated emissions. It is recommended that the Authority begin to track these data to enhance future emission reporting and to allow for a comparison of performance over time.

Natural Gas-powered Building Heating Systems

This GHG inventory calculated emissions from the combustion of natural gas in the Authority's building heating systems at the Airport and ITC based on fuel use. Consumption data obtained for calculating these emissions derived from monthly utility bills issued by National Fuel and provided by the Authority. In 2015, the Authority consumed 9,450.0 MMBtu of natural gas, which equates to 501.9 metric tons of CO2e.

Although the Authority leases space at the Airport and ITC to other organizations, on-site heat generation equipment at these facilities fall under the operational control of the Authority (World Resources Institute, 2015).

Fleet Vehicles and Equipment

Attachment A provides a full list of the Authority's fleet, which includes 28 fleet vehicles and equipment distributed among Airport operations (21), ARFF (4), and police (3). Calculating direct emissions from these mobile sources involved identifying the total annual fuel consumption by fuel type, which the Authority provided. In 2015, the Authority's fleet consumed 10,746 gallons of diesel, 8,396 gallons of gasoline, and 520 pounds of propane. This equates to 184.1 metric tons of CO2.

Although the Authority has inventoried its fleet vehicles and equipment, and tallied total fuel consumption by fuel type, it has not identified control technologies, model years, annual mileage, or fuel consumption. Since the only readily available data related to these mobile sources is the quantity of fuel consumed, a complete calculation of CH4 and N2O emissions associated with the combustion of gasoline and diesel in the Authority's fleet vehicles is not possible (The Climate Registry, 2013).

The Authority has identified, however, that only its passenger cars and light-duty trucks consume the reported amount of gasoline. Accordingly, this GHG inventory applied the simplified estimation method for calculating mobile CH4 and N2O emissions to capture these emissions. Based on this methodology, related mobile CH4 and N2O emissions amount to 0.79 metric tons of CO2e. The simplified estimation method could not be applied to calculate CH4 and N2O emissions from the combustion of diesel in the Authority's fleet, as it is not applicable to heavy-duty vehicles (The Climate Registry, 2013).

The Authority also identified that only its fork-lifts consume the reported amount of propane. Since The Climate Registry does not provide relevant emission factors to calculate CH4 and N2O emissions (The Climate Registry, 2015), this GHG inventory utilized emission factors from the U.S. Environmental Protection Agency (U.S. EPA) (U.S. Environmental Protection Agency, 2015a). In 2015, CH4 and N2O emissions from the combustion of propane in the Authority's forklifts were 0.01 metric tons of CO2e.

In 2015, total emissions from the Authority's fleet vehicles, excluding CH4 and N2O from the mobile combustion of diesel, were 184.9 metric tons of CO2e.

Fire Training

The Authority conducts fire-training exercises at the Airport on an annual basis. In 2015, it purchased approximately $1,000 worth of propane in association with its annual "hot drill" event. Using an average price of $0.59 per gallon, as reported by the U.S. Energy Information Administration, the Authority consumed 1,694.9 gallons of propane (U.S. Energy Information Administration, 2016). Since The Climate Registry does not provide U.S.-based emission factors to calculate CH4 and N2O emissions from the stationary combustion of propane (The Climate Registry, 2015), this GHG inventory utilized emission factors from the U.S. EPA (U.S. Environmental Protection Agency, 2015a). In 2015, total emissions from the fire-training exercise at the Airport were 9.73 metric tons of CO2e.

SCOPE 2 EMISSIONS

Between December 2014 and November 2015, the Authority purchased 2,224,399 kilowatt-hours (kWh) of electricity for consumption at its facilities where it exercises operational control. The basis for calculating GHG emissions associated with electricity purchases was monthly utility bills issued by Penelec (Pennsylvania Electric Company), a unit of FirstEnergy Corporation, and provided by the Authority.

The GHG emission factors for calculating purchased electricity were based on the U.S. EPA's 2012 Emissions & Generation Resource Integrated Database (eGrid). According to eGrid, the Airport and ITC are within the RFC East eGrid subregion, an area where the electricity generated comes from

nuclear (40.9 percent), natural gas (30.8 percent), coal (23.9 percent) and oil (< 1 percent) (U.S. Environmental Protection Agency, 2015b). Renewables comprise only 3.4 percent of the electricity generated in this subregion, which is below the national average of 12.1 percent (U.S. Environmental Protection Agency, 2015b). Based on the 2010 emission factors associated with the RFC East eGrid subregion (1001.72 lbs. CO2 / MWh, 27.07 lbs. CH4 / GWh, 15.33 lbs. N2O / GWh), the Authority's purchase of 2,224,399 kWh of electricity equates to 1,015.6 metric tons of CO2e.

Most tenants at the Airport and ITC purchase electricity directly from the local electric utility or are billed by the Authority for the electricity consumption such as the car rental companies. Such purchases are not included in the Authority's scope 2 emissions, but could be reported under its scope 3 emissions (World Resources Institute, 2006). The Authority pays for all electricity at the terminal; therefore, associated emissions are reported herein under scope 2 (World Resources Institute, 2015). The Authority does not generate its own electricity, on- or off-site.

SCOPE 3 EMISSIONS

Among the previously listed sources of scope 3 emissions that are applicable to the Authority's operations, this GHG inventory calculates emissions related to its 33 employees that commute to and from the Airport and ITC on a regular basis. The Authority does not collect information related to fuel consumed during commuting, distance travelled, or mode used for commuting; therefore, this GHG inventory cannot employ the fuel-based or distance-based methods of the *GHG Protocol* for calculating emissions from employee commuting (World Resources Institute, 2013). Instead, it applies a modified version of the average-data method of the *GHG Protocol* that utilizes emission and conversion factors by mode of transport from the U.S. EPA (U.S. Environmental Protection Agency, 2008).

To calculate emissions associated with employee commuting, this GHG inventory utilized commuting data for Erie County, Pennsylvania from the U.S. Census Bureau. According to this source, 89.8 percent of workers 16 years and over commute to work by car; 1.7 percent by public transportation; 4.3 percent by walking or riding their bicycle; 0.8 percent by taxi, motorcycle, or other; and 3.4 percent work from home (U.S. Census Bureau, 2014). This GHG inventory also relied on version 3.1 of the Airport Carbon and Emissions Reporting Tool (ACERT) to derive the average one-way commute (5 miles [based on the distance between the Airport and the downtown area of the City of Erie]) and identify the number of work days per year (332) (Airports Council International, 2016). Airports Council International distributes and maintains ACERT, which is an airport industry GHG accounting tool that is consistent with the *Greenhouse Gas Protocol* (Juliana Scavuzzi, personal communication, April 11, 2016).

Based on the methodology described above, it is estimated that employee commuting contributed 37.2 metric tons of CO2e to the Authority's scope 3 emissions in 2015. It is recommended that the Authority conduct a robust employee transportation study/survey to better understand the commuting patterns of its employees and calculate associated emissions with greater accuracy.

ANALYSIS OF EMISSIONS

Table F-1 provides the Authority's GHG emissions by scope and category. Considering only the categories of emissions that this GHG inventory provides estimations for, purchased electricity is

the Authority's largest emission contributor at 58.1 percent, and therefore, presents the greatest leverage for performance improvement. The combustion of natural gas in Authority's building heating systems (28.7 percent) and the combustion of fossil fuels in its fleet (10.6 percent) are also significant contributors. The Authority's smallest emission contributor is fire training at less than 1 percent.

Table F-1: Scope 1, 2, and 3 Emissions by Category

Scope/Category	Total (Metric tons CO_{2e})	Percent of total (CO_{2e})
Scope 1	**696.5**	**39.8**
Natural Gas	501.9	28.7
Fleet Vehicles and Equipment	184.9	10.6
Fire Training	9.7	0.6
Scope 2	**1,015.6**	**58.1**
Purchased Electricity	1,015.6	58.1
Scope 3	**37.2**	**2.1**
Employee Commuting*	37.2	2.1
Total	**1,749.3**	**100.0**

**Employee commuting is outside of the Airport's direct control*

This GHG inventory does not include calculations for the breadth of the Authority's scope 3 emissions. Similar to many other organizations, these indirect emissions likely represent the Authority's largest source of emissions (World Resources Institute, 2011), and among these emissions, aircraft operations very likely represent the majority. In the U.S. alone, aircraft account for roughly 11 percent of GHG emissions from the U.S. transportation sector and 3 percent of total U.S. GHG emissions (U.S. Environmental Protection Agency, 2015c). In addition, the Intergovernmental Panel on Climate Change estimates that "total contribution of aircraft emissions to total anthropogenic carbon dioxide (CO2) emissions was considered to be about 2 percent in 1990" (Rypdal, 2002).

5. POTENTIAL REDUCTION STRATEGIES

Many opportunities exist for the Authority to reduce its emissions across scopes, particularly its largest emission contributors, as Section 4.4 discusses. These opportunities can be categorized under one or more of the following categories: behavioral, conservation, efficiency, process change, and new technology (Banta, 2016). The sections below discuss many of these opportunities, which derive from industry publications such as the Sustainable Aviation Guidance Alliance (SAGA) and the Transportation Research Board's Airport Cooperative Research Program (ACRP) reports.

Behavioral Change

The Authority should provoke behavioral change to reduce its emissions by raising awareness and building related employee skill-sets among its employees, passengers, tenants, and vendors/contractors. Examples of awareness-building activities include mandates from management through policy statements, the identification of sustainability champions, or the creation of an internal team focused on evaluating, facilitating, and communicating sustainable practices. Awareness can also be generated through physical signage, informational and/or interactive displays, or the Airport's website/social media accounts. To build employee skill sets, the Authority could sponsor targeted trainings focused on enhancing existing or new sustainability practices.

In addition, the Authority could provide preferential parking for carpool or alternative-fuel vehicles to encourage its employees and passengers to avoid the use of single-occupancy or high-polluting vehicles. Specific to tenant electricity consumption in the Airport terminal, the Authority could install sub-metering systems to provide tenants with the incentive to better manage their electricity consumption.

Conservation

The Authority can reduce its purchased electricity through conservation efforts that may include establishing an energy conservation program for building users that "includes protocols to turn off lights and electrical equipment when not in use, modification of thermostat set-points, and reduction of the use of space heaters through 'employee comfort' feedback programs" (Transportation Research Board, 2011). It may also include installing a building automation system that would allow the Authority "to establish a controls sequence for the mechanical and electrical systems, allowing for a reduction in down time and unnecessary energy consumption (Sustainable Aviation Guidance Alliance, 2016).

Efficiency

Many of the Authority's facilities were constructed shortly after the Airport opened in 1952, and have undergone few modifications in the interim (C&S Companies, 2002). The Authority should strive to upgrade its existing electricity-consuming equipment with more efficient equivalents,

where possible. For example, it could replace less efficient runway lighting with high-efficiency light-emitting diodes (LEDs), which are typically 5 to 15 percent more efficient and last 30 times longer than incandescent lighting (Transportation Research Board, 2011).

Given the age of the Authority's facilities, it is likely that some depreciation in the performance of building systems at the Airport and the ITC has occurred. The Authority should consider retro-commissioning its HVAC and control systems in existing facilities to ensure they are operating at their maximum efficiency. Retro-commissioning is a verification process that measures building systems against their manufacturer-intended performance and enables corrections through the identification of issues (e.g., simultaneous heating/cooling, leaks) (Transportation Research Board, 2015).

In 2016, the Authority conducted an ASHRAE Level 1 energy audit (walk-through) to understand how energy is consumed at the Airport, and to identify energy efficiency and conservation measures specific to reducing its energy demand without adversely affecting its expected level of operations. The Authority should perform regular energy audits to capture its changing operational context, as well as to measure performance and progress over time.

Process Change

The Authority has existing operating standards - ways in which it performs processes on a routine basis. An example of a process change that the Authority can implement to reduce its emissions is using warm-mix asphalt instead of hot-mix asphalt in its pavement projects. In contrast to the standard hot-mix asphalt, warm-mix asphalt reduces the temperature at which asphalt mixtures are produced and placed, thereby reducing the required amount of energy (Sustainable Aviation Guidance Alliance, 2016).

New Technology

As noted, many of the Authority's facilities are older, and some of its embedded building systems are outdated. The Authority would benefit from identifying relevant new technologies that would help reduce its electricity demand. For instance, variable frequency drives (VFDs) can reduce energy used by fans, chillers, and pumps by varying the motor speed of these systems under part load conditions (Sustainable Aviation Guidance Alliance, 2016). VFDs can also be applied to the Airport's baggage handling system, producing energy savings when the conveyors are not required to operate at full speed (E Source Companies, 2008).

The Authority may also benefit from the installation of renewable energy generation equipment such as solar photovoltaics (PV). Solar PV is highly regulated by the FAA due to its potential to generate glare that may interfere with pilot vision (Federal Aviation Administration, 2013). If feasible, however, the Authority could significantly reduce its dependence on fossil fuels for its own operations and potentially for its tenant's operations, and reduce associated emissions in the process. If the Authority does not wish to operate its own solar PV system, it could consider entering into a power-purchasing agreement (PPA), where a third party would own and maintain the equipment, and sell the electricity generated directly to the Authority.

PRIORITIZATION OF POTENTIAL REDUCTION STRATEGIES

Table F-2 details and prioritizes the projects discussed above in terms of their cost (capital and operations and maintenance [O&M]), implementation efforts and limitations, simple payback, and potential GHG reduction benefits. Priority was given to those strategies that have a greater cost-benefit (i.e., short payback periods and high GHG reduction benefits), as well as those that represent low-hanging fruit (i.e., low initial costs and shorter implementation periods).

Table F-2: Prioritization of Potential GHG Reduction Strategies

Rank	Strategy	Estimated Cost	Implementation Effort/Limitations	Payback	Typical GHG Reduction Benefit
1	Conduct recurring energy audits	Capital: $10,000 - $100,000 O&M: < $5,000	Can be implemented immediately; requires the allocation of staff time to assist energy auditor(s)	< 2 years	Dependent on the results of the energy audit Scopes 1 and 2: relatively low to high Scope 3: relatively low to high
2	Retro-commission existing building systems	Capital: $10,000 - $100,000 O&M: < $5,000	Can be implemented immediately; requires external contractor(s) to perform work; requires staff training and allocation of time for ongoing monitoring and measurement	< 2 years	Dependent on the results of the assessment, typical 15 percent average energy savings Scopes 1 and 2: relatively high Scope 3: relatively high
3	Provide preferential parking for carpool vehicles and/or alternative-fuel vehicles	Capital: < $10,000 O&M: < $5,000	Can be implemented immediately; requires the reassigning of existing parking spaces and the addition of appropriate signage	> 10 years	Dependent on stakeholder buy-in and follow-on actions Scope 3: relatively high

Rank	Strategy	Estimated Cost	Implementation Effort/Limitations	Payback	Typical GHG Reduction Benefit
4	Build awareness and skill building	Capital: < $10,000 O&M: < $5,000	1 to 5 years required for implementation; requires staff time to facilitate and ensure continuous improvement; potential need for external contractors to design and/or provide training	2- 5 years	Dependent on stakeholder buy-in and follow-on actions Scopes 1 and 2: relatively low to high Scope 3: relatively low to high
5	Establish an energy conservation program for building users	Capital: < $10,000 O&M: < $5,000	1 to 5 years required for implementation; allocation of staff time to facilitate and ensure continuous improvement	2- 5 years	Dependent on stakeholder buy-in and follow-on actions Scopes 1 and 2: relatively low to high Scope 3: relatively low to high
6	Install sub-meters to measure tenant energy consumption	Capital: $10,000 - $100,000 O&M: < $5,000	Can be implemented immediately; potential resistance from tenants; allocation of staff hours to manage related data	< 2 years	Dependent on implementation details and tenant behavior Scopes 1 and 2: relatively low Scope 3: relatively low to high

Rank	Strategy	Estimated Cost	Implementation Effort/Limitations	Payback	Typical GHG Reduction Benefit
7	Retrofit existing air handling units with VFDs	Capital: < $10,000 O&M: < $5,000	1 to 5 years required for implementation	2 - 5 years	Dependent on implementation details Scopes 1 and 2: relatively high Scope 3: relatively high
8	Replace less efficient runway lighting with LEDs	Capital: $100,000 - $1,000,000 O&M: < $5,000	1 to 5 years required for implementation; Installation may impact aircraft operations or result in a temporary runway closures	2 – 5 years	Dependent on implementation details Scope 2: relatively high
9	Install a Building Automation System	Capital: $100,000 - $1,000,000 O&M: $5,000 - $50,000	1 to 5 years required for implementation; may require additional staff; may cause the temporary shut-off of equipment/systems during upgrade	> 10 years	Dependent on implementation details Scopes 1 and 2: relatively high Scope 3: relatively high
10	Switch from hot-mix asphalt to warm-mix asphalt	Capital: $100,000 - $1,000,000 O&M: < $5,000	Can be implemented immediately; may result in expedited construction schedules	> 10 years	Dependent on implementation details Scopes 1 and 2: relatively low Scope 3: relatively high

Rank	Strategy	Estimated Cost	Implementation Effort/Limitations	Payback	Typical GHG Reduction Benefit
11	Install solar PV	Capital: $100,000 to $1,000,000 O&M: $5,000 to $50,000	Requires a feasibility analysis to be conducted by external experts; subject to FAA regulations, as proper siting is required to avoid/reduce glare	> 10 years	Dependent on implementation details Scopes 1 and 2: relatively high Scope 3: relatively low to high
12	Enter into a solar PPA	Capital: $100,000 to $1,000,000 O&M: < $5,000	Can be implemented immediately; may require renegotiation of current utility contract	> 10 years	Dependent on implementation details Scopes 1 and 2: relatively high Scope 3: relatively low to high

Source: Transportation Research Board, 2011; Transportation Research Board, 2015; Sustainable Aviation Guidance Alliance, 2016

6. GHG EMISSION REDUCTION TARGET

It is recommended that the Authority set a GHG emission reduction target to keep the organization focused on improving its performance in this area. By creating such a target, the Authority will be taking a step toward minimizing and managing risks associated with GHGs, preparing for future regulations, achieving costs savings, and spurring innovation (World Resources Institute, 2004). A GHG emission reduction target for the Authority would continue the trend of airport authorities and airports establishing such targets. Examples of airport GHG emission reduction targets include:

- Portland International Airport - Reduce direct and indirect GHG emissions 15 percent below 1990 levels by 2020 (Port of Portland, 2013; Port of Portland, 2013);
- Boston-Logan International Airport – Reduce direct and indirect GHG emissions 40 percent from the 2002 baseline by 2020 (Massachusetts Port Authority, 2015); and
- Dallas-Fort Worth International Airport – Reduce scope 1 and scope 2 GHG emissions by 2 percent annually from 2010 to 2020 (Dallas-Fort Worth International Airport, 2014).

It is suggested that the Authority adopt the following GHG emission reduction target:

Reduce scope 1 and scope 2 emissions per passenger by 15 percent, compared to 2015, by the commitment year 2025. The average of emissions from 2016 to 2025 must not exceed 85 percent of 2015.

This recommended GHG emission target is based on the following:

- Airports are dynamic entities that grow as demand for air service increases, choosing an intensity target such as emissions per passenger would demonstrate emission reductions independent of growth (or decline), and will make it easier for the Authority's stakeholders to compare its performance against other airports (World Resources Institute, 2004).
- The chosen consolidation approach, operational control, requires the Authority to report on its scope 1 and scope 2 emissions (The Climate Registry, 2013). Since the Authority's scope 3 emissions have not yet been sufficiently calculated, it is not recommended that the Authority include scope 3 in its GHG emission reduction target at this time.
- The Authority has not previously conducted a GHG inventory; therefore, to streamline the inventory and target reporting process, the reporting year for this inventory, 2015, should be the fixed base year for its GHG emission reduction target (World Resources Institute, 2004).
- The FAA advises airports to update airport capital improvement plans (ACIP) at least every five years (Federal Aviation Administration, 2000). As this is a shorter planning cycle, a practical GHG emission target would be five years (World Resources Institute, 2004).

- To "mitigate the risk of unpredictable events in one particular year influencing performance against the target," it is recommended that the Authority make a target commitment of a period longer than one year (World Resources Institute, 2004).
- Based on the potential for emission reductions from the strategies identified, particularly those in the short-term such as conducting an energy audit and retro-commissioning building systems, as well as the GHG emission reduction targets of other airports, a 15 percent target level is a modest, but achievable goal. The retro-commissioning strategy has the potential to reduce the Authority's scope 1 and scope 2 emissions by 5 percent alone, assuming a 15 percent energy savings (Transportation Research Board, 2015).

With numerous potential reduction strategies, some of relatively low cost, it is not anticipated that the Authority would use GHG offsets or credits to achieve its GHG emission reduction target (World Resources Institute, 2004). A double counting policy is not applicable to the Authority, as it does not "engage in trading (sale or purchase) of GHG offsets" and the Authority does not have target overlap, as defined by the *GHG Protocol* (World Resources Institute, 2004). The Authority should continuously track its performance to its GHG emission target once approved to maintain its focus and reporting credibility (World Resources Institute, 2004).

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Attachment A -
ERIE REGIONAL AIRPORT AUTHORITY FLEET (current as of January 4, 2016)

Operations

Mobile 4 - Street sweeper

Mobile 5 - Airfield snow blower

Mobile 6 - Airfield snow plow

Mobile 7 - Airfield snow plow

Mobile 8 - Airfield snow plow

Mobile 9 - Utility tractor/mower/loader

Mobile 11 - Front loader

Mobile 15 - Runway broom

Mobile 17 - Chevy 1-ton truck

Mobile 18 - Chevy ¾-ton

Mobile 19 - Snow blower

Mobile 21 - Trackless vehicle

Mobile 25 - Bucket Truck

Mobile 26 - Mower (small)

Mobile 28 - Tractor/Mower

UT1 - Utility Vehicle/Weed Sprayer

Mobile 40 - Chevy Silverado 2500

Mobile 41 - Chevy Silverado 3500 (utility bed)

Mobile 42 - Chevy 1 Ton Dump 3500

Mobile 43 - Chevy Silverado 1500

Mobile 65 - Runway broom

Mobile 820 - Ford Explorer

Aircraft Rescue and Fire Fighting

Mobile 822 - Structural fire truck

Mobile 823 - Primary Oshkosh ARFF truck

Mobile 824 - E-One ARFF truck

Mobile 829 - Incident command vehicle

Police

Mobile 70 - Ford interceptor (K-9 vehicle)

Mobile 71 - Ford interceptor

Mobile 72 - Ford interceptor