UTA

Environmental Improvement Project Results

Project #1: UTA Air Emission Reduction Project

Measurements:

1) Reduction of UTA's bus fleet NOx and particulate matter (PM) emission rate through the acquisition of 23 new CNG buses in 2015 to replace older existing buses manufactured in 1999 and previous years.

UTA developed a 6 year plan, beginning in 2009, to acquire new buses as replacements for older buses that will reduce Particulate Matter (PM) and Nitrogen Oxides (NOx) emissions.

Particulate Matter (PM)

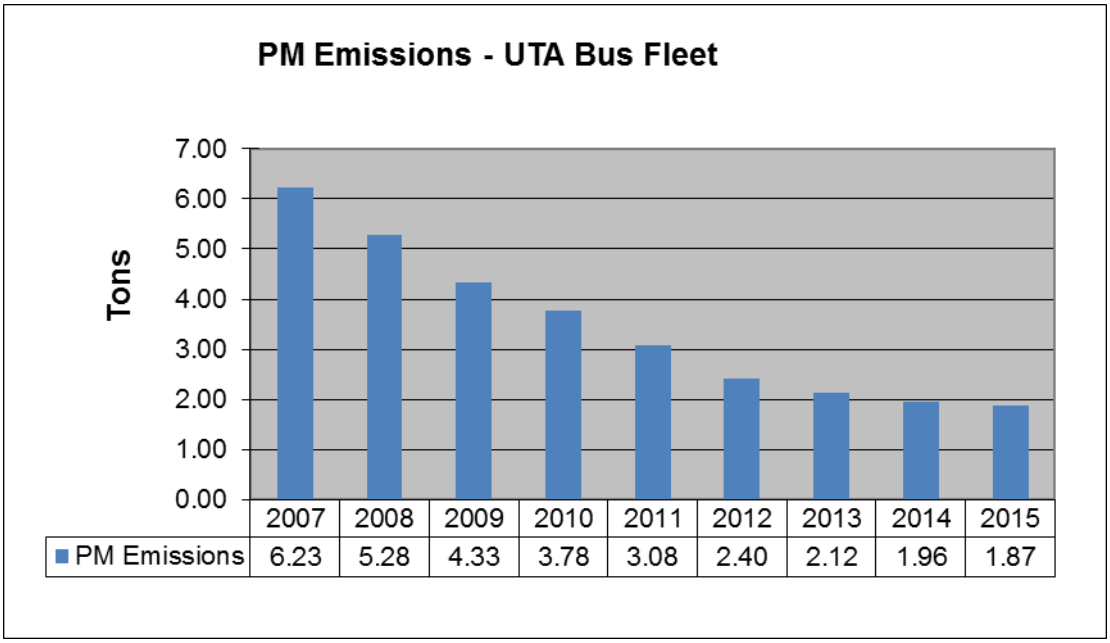
The following table lists the federal emission standards for particulate matter (PM) from heavy-duty diesel engine exhaust in urban buses.

Federal PM Emission Standard			
Model Year	g/bhp-hr	CF bhp-hr/mi	g/mi
1991 – 1992	0.25	4.68	1.17
1993	0.1	4.68	0.468
1994 – 1995	0.07	4.68	0.3276
1996 – 2006	$0.05_{(1)}$	4.68	0.234
2007 –	0.01	4.68	0.0468

UTA's fixed route and express route bus fleet travels 17 million miles annually. Scheduling newer more efficient buses to accumulate more miles than older buses reduces the emissions of PM from UTA's bus fleet. UTA has set a goal of a 10% reduction for the total pounds of PM emitted each year.

	2014		2015	
Model Year	Miles	PM (lbs)	Miles	PM (lbs)
1991 – 1992	0	0	0	0
1993	0	0	0	0
1994 – 1995	0	0	0	0
1996 – 2006	5,537,622	2,854	4,959,329	2,556
2007 –	10,352,648	1,067	11,511,355	1,187
CNG Bus	909,981	6	955,740	6
Total	16,800,251	3,921	17,426,424	3,743

Based on the annual miles and the age of UTA's fleet in 2007, the estimated PM emissions were 6.23 tons. By acquiring new buses that meet the 2007 Federal PM standards to replace older buses, PM emissions were reduced to 1.96 tons in 2014 and 1.87 tons in 2015. UTA reduced its PM emissions from 2014 to 2015 by 4.6%.



Nitrogen Oxides (NO_x)

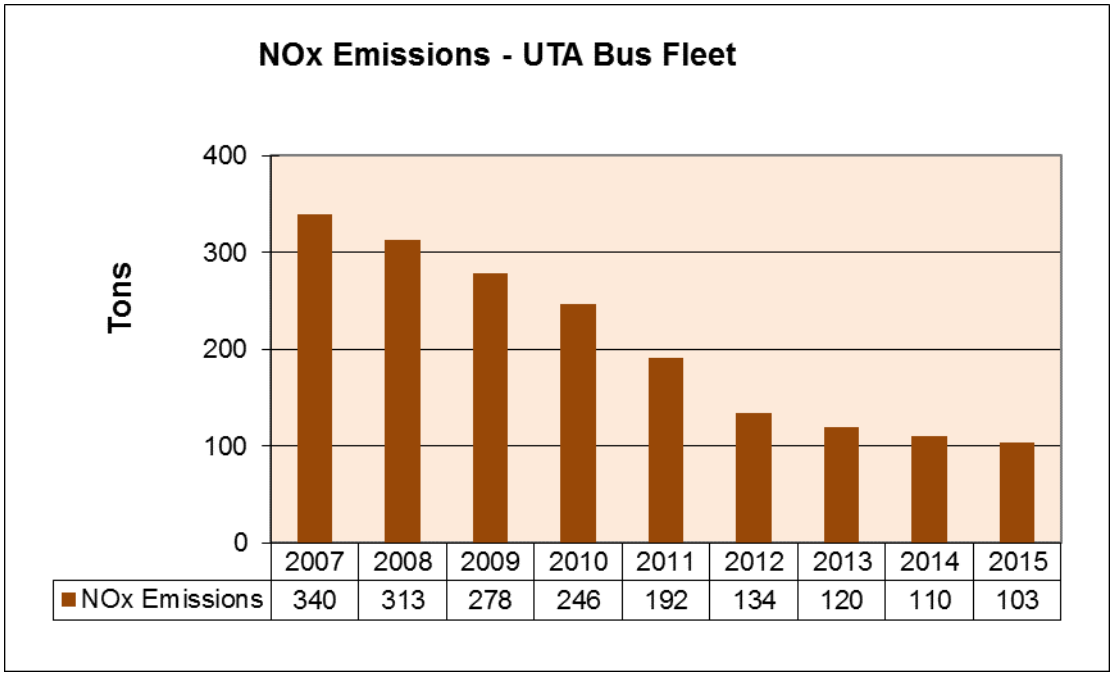
For NOx emission calculations EPA sites an 8% compliance margin from manufacturers based on historical certification data. Therefore, for a NO_x standard of 5.0 g/bhp-hr, a level of 4.6 g/bhp-hr is used as the emission level. The following table illustrates the differing emission standards of NO_x for diesel engine exhaust from urban buses.

Federal NO_x Emission Standard			
Model Year	g/bhp-hr	CF bhp-hr/mi	g/mi (8% margin)
1991 – 1997	5.0	4.68	21.53
1998 – 2001	4.0	4.68	17.22
2002 – 2006	2.2	4.68	9.47
2007 – 2009	1.2	4.68	5.17
2010 –	0.2	4.68	0.86

Based on the annual miles and the age of UTA's fleet in 2007, the estimated NOx emissions were 340 tons. By acquiring new buses that meet the 2010 Federal NOx standards to replace older buses, NOx emissions were reduced to 110 tons in 2014 and 103 tons in 2015.

	2014		2015	
Model Year	Miles	NOx tons	Miles	NOx tons
1992 – 1997	80,476	2	84,165	2
1998 – 2001	2,259,462	43	1,967,306	37
2002 – 2006	3,197,684	33	2,907,858	30
2007 - 2009	4,664,624	27	4,678,602	27
2010 –	5,688,024	5	6,832,753	6
CNG Bus	909,981	<0.25	955,740	1
Total	16,800,251	110	17,426,424	103

UTA reduced its NOx emissions from 2014 to 2015 by 6.4%.



Benefit to the environment for year:

Air Pollutant	Particulate Matter	% Reduction	Nitrogen Oxides	% Reduction
2007	6.23 tons	–	340 tons	–
2008	5.28 tons	15.2 %	313 tons	7.9 %
2009	4.33 tons	18.0 %	278 tons	11.2 %
2010	3.78 tons	12.7 %	246 tons	11.5 %
2011	3.08 tons	18.5 %	192 tons	21.9 %
2012	2.40 tons	22.1 %	134 tons	30.2 %
2013	2.12 tons	13.4%	120 tons	10.4%
2014	1.96 tons	7.5%	110 tons	8.3%
2015	1.87 tons	4.6 %	103 tons	6.4 %

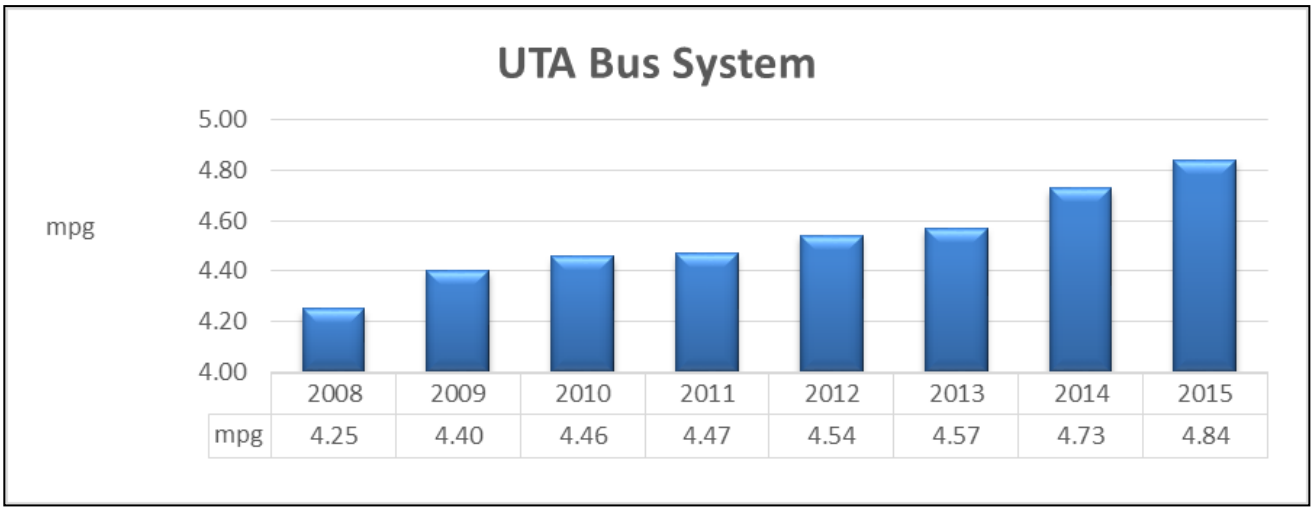
Benefit or savings for company:

The acquisition of new buses as replacements for older models reduces UTA's investment per rider because of the improved fuel efficiency of the newer buses. In 2015 UTA added 23 CNG buses, as a part of our bus replacement 6 year plan. UTA now operates a fleet of over 500 buses that has 32 hybrid-electric buses and 47 CNG buses. Today's technology of hybrid-electric buses is 20% more fuel efficient than their diesel bus counterparts. CNG buses offer 10 times less particulate matter emissions and 4 times less NOx emissions per mile than the EPA mandated clean diesel buses.

<u>Project #2:</u> Engine Idling Reduction Program

1) Monitor and measure the miles per gallon (mpg) of UTA's Bus fleet.

UTA identified Fuel Consumption – Excessive Idling as one of its significant environmental aspects, using our Environmental Management System (EMS), ISO 14001. In 2008, UTA approved a policy, no. 4.4.13 Vehicle Engine Idling, to reduce air pollution and increase fuel savings by eliminating unnecessary bus idling at our maintenance facilities and at the end of the line (EOL) of our bus routes. UTA has been able to increase the mpg of our bus fleet in each subsequent year following 2008 (baseline year).



Benefit to the environment for year:

The UTA is a Founding member of The Climate Registry. Annually, UTA calculates its total GHG emissions, both direct and indirect, for all of our emission sources. Emissions associated with fuel consumption are considered to be direct. Reduction in CO2 emissions from UTA's bus fleet fuel consumption in this project is summarized in the table below.

CO2 Emissions Saved From Engine Idling Reduction					
Year	Bus Miles	Diesel Gallons	mpg	Fuel Saved	CO_2(e) tons Saved
2009	19,460,707	4,419,405	4.40	159,348	1,793
2010	18,989,309	4,258,660	4.46	209,181	2,354
2011	18,263,268	4,086,206	4.47	210,811	2,373
2012	17,547,585	3,863,712	4.54	264,918	2,981
2013	16,518,743	3,615,555	4.57	271,007	3,050
2014	15,890,270	3,361,530	4.73	377,163	4,245
2015	16,470,684	3,404,166	4.84	471,088	5,302

1) "eGrid2012_Data.xls", United States Environmental Protection Agency, 9/8/2015.
2) Fuel savings are normalized with 2008 mpg (4.25) as the baseline

Benefit or savings for company:

Electrical Conservation: Year to Year Savings at UTA Bus Divisions		
Year	$/diesel gallon	Savings
2009	$1.82/gallon	$290,013.36
2010	$2.36/gallon	$493,667.16
2011	$3.19/gallon	$672,487.09
2012	$3.23/gallon	$855,685.14
2013	$3.20/gallon	$867,222.40
2014	$3.10/gallon	$1,169,205.30
2015	$1.91/gallon	$899,778.08

1) Cost savings are based on the average price of diesel for each calendar year.