

2012 through 2013 Dallas – Fort Worth (DFW) On-Road Fleet Turnover Nitrogen Oxides (NO_x) Reductions

This is the supplemental document to the “2013 Discrete Emission Reduction Credit (DERC) Flow Control Limit” report describes the calculation of the 2012 through 2013 on-road fleet turnover in the DFW 1997 eight-hour ozone nonattainment area. Due to time constraints, rather than developing MOVES based inventories and individual control reductions for DFW, a method utilizing readily available inventory and control reduction values was required. The alternative method included the following five steps.

1. Obtain the percentage of reductions due to each on-road emissions control programs - on-road fleet turnover, inspection and maintenance (I/M), reformulated gasoline (RFG), and on-road Texas Low Emission Diesel (TxLED) in the total on-road emissions reductions quantified for the Houston-Galveston-Brazoria (HGB) nonattainment area for years 2011 and 2014.
2. Linearly interpolate the HGB individual control program percent reductions for 2011 and 2014 to 2012 and 2013.
3. Use the 2012 and 2013 individual control reduction percentages to distribute the DFW area total on-road emissions reductions for years 2012 and 2013 to the individual control program reductions for each of the two years.
4. Calculate the difference between the 2012 on-road fleet turnover and 2013 on-road fleet turnover to estimate the 2012-2013 DFW on-road fleet turnover reductions.
5. Apply a 10% safety margin to the estimated DFW 2012 through 2013 fleet turn over reduction. The result with the 10 percent safety margin is the preliminary estimate of the reductions due to the 2012 through 2013 on-road fleet turn over in the DFW 1997 eight-hour ozone nonattainment area used in the 2013 DERC flow control limit.

Estimate the 2012 and 2013 Percent Reductions for Each On-road Emissions Control Program in HGB

The *Houston-Galveston-Brazoria (HGB) 1997 Eight-Hour Ozone Standard Nonattainment Area Motor Vehicle Emissions Budgets (MVEB) Update SIP Revision (2012 HGB MVEBSIP Revision)* included quantification of each on-road mobile source control program. The individual programs were not quantified for DFW. However, because of the similarities between the HGB and DFW control programs and age distributions, it is valid to use control reduction ratios from HGB to distribute the total control reduction in DFW to estimates of individual control program reductions, including fleet turnover. Similarities between the HGB and DFW on-road mobile source inventory development include: the same set of control strategies, the same I/M program design, similar age distributions, and the same emission factor model (MOVES2010a). The individual control programs reductions can be divided by the total reduction to obtain individual control reduction ratios.

To determine the 2011 and 2014 HGB individual control program percent reductions, the 2011 and 2014 emission reductions quantified in the 2012 *HGB MOVES-Based RFP On-Road Inventories and Control Strategy Reduction* developed by Texas Transportation Institute (TTI)¹ were used. The control reduction for each individual control was divided by the total control reduction to calculate the percent reduction for each individual control program.

¹ Texas Transportation Institute, 2012. “HGB Moves-Based RFP On-Road Inventories and Control Strategy Reductions”. Texas Transportation Institute (TTI), The Texas A&M University System, College Station, TX, March 2012.

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HGB 2012 and 2013 Individual Control Program Percent Reduction Linear Inrpolation

The 2012 HGB MVEBSIP Revision included on-road emissions reductions for the years 2011 and 2014 but not 2012 and 2013. The 2012 and 2013 individual control program percent reductions were calculated using linear interpolation of the 2011 and 2014 values, Equations 1 and 2.

Equation 1: For the year 2012: (control program% for 2011) + {(2012-2011)*[(control program % for 2014-control program% for 2011)/ (2014-2011)]}

Equation 2: For the year 2013: (control program% for 2011) + {(2013-2011)*[(control program % for 2011-control program% for 2014)/ (2011-2014)]}

The values resulting from Equations 1 and 2 are shown in Table 1: *Interpolation of 2012 and 2013 for RFG, FMVCP, I/M, and TxLED for the HGB Area.*

Table 1: Interpolation to 2012 and 2013 for RFG, FMVCP, I/M, and TxLED for the HGB Area

	2008	2011	2012	2013	2014	2017	2018	2019
	HGB RFP SIP	HGB RFP SIP	Interpolation	Interpolation	HGB RFP SIP	HGB RFP SIP	HGB RFP SIP	HGB RFP SIP
RFG	0.362813	0.356983	0.349537	0.342091	0.334645	0.32085	0.317107	0.314392
FMVCP	0.580853	0.602166	0.615222	0.628279	0.641335	0.664692	0.670447	0.674722
I/M	0.041787	0.031302	0.027035	0.022768	0.018501	0.010964	0.009331	0.008148
TxLED	0.014523	0.009568	0.008218	0.006869	0.005519	0.003482	0.003102	0.002737
Total	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Calculate DFW 2012 and 2013 On-road Individual Control Program Reductions

Interpolated percent reduction for each individual control program for years 2012 and 2013 (Columns 4 and 5, Table 1) were applied to the DFW area total on-road reductions from the *Dallas-Fort Worth Reasonable Further Progress State Implementation Revision for the 1997 Eight-Hour Ozone Standard*²(2011 DFW RFP SIP Revision) for years 2012 and 2013 to get the estimated reduction for each control strategy.

Calculate 2012-2013 DFW On-road Fleet Turnover Reductions

Subtracting the 2013 individual control reduction from the 2012 individual control reduction gives the incremental value between 2012 and 2013. More specifically, subtracting the 2013 individual control reduction for the Federal Motor Vehicle Control Program (FMVCP) from the 2012 individual control reduction for the FMVCP, gives the estimated fleet turnover from 2012 to 2013, a value of 28.07 tons per day (Table 2).

Table 2: Individual Control Reduction DFW

Source	2012	2013	Incremental 2012
RFG	192.67	199.93	7.26
FMVCP	339.12	367.18	28.07
I/M	14.90	13.31	-1.60
TxLED	4.53	4.01	-0.52
Total	551.22	584.43	33.22

² Project Number 2010-023-SIP-NR available at the following link:
http://www.tceq.texas.gov/assets/public/implementation/air/sip/dfw/rfp_2011/2010023_ado.pdf

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10% Safety Adjustment

To compensate for possible differences between the standard and alternative methods, a 10 percent adjustment was applied to the estimated DFW 2012 to 2013 fleet turn over value. Therefore, the preliminary estimate for fleet turnover from 2012 to 2013 in the DFW area is 25.26 tons per day, Equation 3.

$$\text{Equation 3: } 28.07 - (28.07 * 0.10) = 25.26.$$

Linear Interpolation Method Verification

To verify the accuracy of the linear interpolation method, the method was used to calculate individual control values for HGB, and compare the values to actual values from the 2012 HGB MVEB SIP Revision. The 2012 HGB MVEB SIP Revision includes individual control reductions for 2011 that were developed using the standard method for quantifying individual control reductions. The calculated values could be compared to values developed using the standard control program quantification method. The percent reductions for each control program, for HGB, for year 2011 were linearly interpolated using the 2012 HGB MVEB SIP Revision values for 2008 and 2014, Equation 4.

$$\text{Equation 4: } (\text{control program\% for 2008}) + \{(3) * [(\text{control program \% for 2014} - \text{control program\% for 2008}) / (2014 - 2008)]\}$$

To easily compare the linearly interpolated value to the actual value, the interpolated percent reduction was divided by the actual percent reduction multiplied by 100, (Column 4, Table 3). The individual control reductions that influence the fleet turn over calculations are the values for RFG and FMVCP. These two programs have a variance of less than 3 percent. The linear interpolation method check was also done for years 2014 and 2017 and showed similar results. A summary of the results for the linear interpolation check for 2011 is provided in Table 3.

Table 3: Comparison of Actual and Interpolated 2011 HGB Percent Reductions

Source	2011 Actual % Reduction	2011 Interpolated % Reduction	Interpolated Compared to Actual %
RFG	35.70	34.87	97.69
FMVCP	60.22	61.11	101.48
I/M	3.13	3.01	96.30
TxLED	0.96	1.00	104.74
Total	100.01	99.99	

Comparison of the Total Incremental Value

The incremental 2012 to 2013 total for the alternative method should be equal to the incremental 2012 to 2013 total from the 2011 DFW RFP SIP Revision. The calculated sum of each individual control program incremental value for the on-road reduction for 2012 to 2013 using the alternative method was 33.22 tons per day (Table 3). This value is equal to the total incremental value for on-road reductions as defined in the 2011 DFW RFP SIP Revision (551.21-584.43=33.22).

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Percent Reduction Comparison

Although the individual control reductions in DFW for 2012 and 2013 were not available, the total reductions for DFW area for 2008 and 2011 were defined in the 2011 DFW RFP SIP Revision. The total reductions for the HGB area 2008 and 2011 were also defined in the 2012 HGB MVEB SIP Revision. In order to assure that 10 percent was a reasonable method adjustment factor, MOVES based percent reductions for 2008 and 2011 were compared between the two areas, Tables 4 and 5. The difference in the total percent reductions for both years is less than one percent, demonstrating that the two areas have comparable on-road percent reductions each year. The two areas also have the same control programs, RFG, FMVCP, I/M, and TxLED, as well as similar fleet age distributions.

Table 4: Total Percent Reduction Comparison for 2008

Description	HGB	DFW	Difference in Total % Reduction
Pre-90 Control Inventory	653.33	632.28	N/A
Reductions for: Tier 1 FMVCP, RFG, I/M Program, ATP, Tier 2 FMVCP, 2007 HDDV FMVCP, On-road TxLED	415.20	396.98	N/A
Control Strategy Inventory	238.13	235.30	N/A
Total Percent Reduction	36.45	37.21	-0.77

Table 5: Total Percent Reduction Comparison for 2011

Description	HGB	DFW	Difference in Total % Reduction
Pre-90 Control Inventory	744.52	707.87	N/A
Reductions for: Tier 1 FMVCP, RFG, I/M Program, ATP, Tier 2 FMVCP, 2007 HDDV FMVCP, On-road TxLED	530.95	510.82	N/A
Control Strategy Inventory	213.57	197.05	N/A
Total Percent Reduction	28.69	27.84	0.85

Contact Information

For questions or comments, contact Mary McGarry-Barber via e-mail at Mary.McGarry-Barber@tceq.texas.gov or by phone at 512-239-1987 for questions and comments.

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