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ENERGY SAVINGS AND NO_X EMISSIONS REDUCTION POTENTIAL FROM THE 2012 FEDERAL LEGISLATION TO PHASE OUT INCANDESCENT LAMPS IN TEXAS

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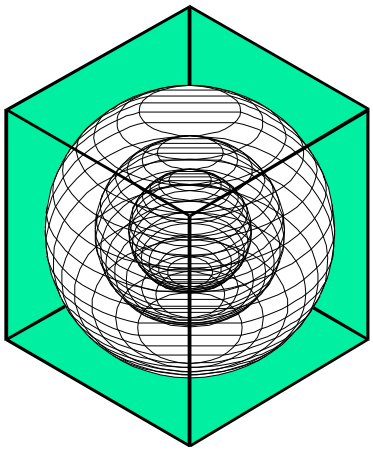

ENERGY SYSTEMS LABORATORY

Texas Engineering Experiment Station
Texas A&M University System

CONTENTS

LIST OF TABLES

EXECUTIVE SUMMARY

This report provides detailed information about the potential savings from the 2012 Federal Legislation to phase out incandescent lamps and the NO_x emissions reduction from the replacement of incandescent bulbs with Compact Fluorescent Lamps (CFL). In Texas, this analysis includes the savings estimates from both the annual and Ozone Season Day[1] (OSD) NO_x reductions. The NO_x emissions reduction in this analysis are calculated using estimated emissions factors for 2007 from the US Environmental Protection Agency (US EPA) eGRID database, which had been specially prepared for this purpose[2].

Table 1: Calculation of Savings from the 2012 Federal Legislation to Phase out Incandescent Lamps in Texas

Description	Value	Reference
Total Housing Units in Texas in 2013:	10,204,056	Real Estate Center, Texas A&M University[3], U.S. Census Bureau[4 5]
Average Lighting Electricity Usage per House:	1,946 kWh/yr	NREL Building America Program[6]
% of Lamps That can be Retrofitted with a CFL:	70%	NREL Building America Program[6] and ESL Assumption
% of Savings From Replacing Incandescent to CFL Lamps:	75%	ESL Assumption
CFL Lighting Electricity Savings per House:	1,022 kWh/yr	
Total Annual CFL Savings in Texas:	***10,424,973 MWh/yr***	
OSD CFL Savings in Texas:	***28,562 MWh/day***	

By 2013, it is estimated that total savings of 10,424,973 MWh/yr would be achieved from replacing incandescent lamps with compact fluorescent lamps (CFL) in residential housing in Texas. This calculation is based on housing units data obtained from the Census Bureau[7], and average lighting electricity usage data available from the NREL Building America program.

The following assumptions were used by the Energy Systems Laboratory (ESL) to calculate the estimated energy saving from the use of CFL instead of incandescent lamps producing the same amount of light output.

- Only 70% of the total lamps will be retrofitted with CFLs.
- There is a 75% energy savings from replacing incandescent lamps with CFLs.

For an average size residence in the U.S., the total energy consumption is estimated to reduce by 1,022 kWh/yr through CFL retrofits. This reduction is calculated based on the assumptions stated above. With over 10.2 Million residential housing units in the State of Texas in 2013, the total savings are estimated to about 10.4 Million MWh/yr and 28,562 MWh/day (Refer Table 1).

[1] An ozone season day (OSD) represents the daily average emissions during the period that runs from mid-July to mid -September.
[2] Savings from CFL replacement for incandescent in commercial and industrial facilities were not included in this analysis.
[3] Building Permit Activity, Real Estate Center, Texas A&M University, http://recenter.tamu.edu/data/databp.html, Date visited: October 2009.
[4] Census 2000 housing information for the State of Texas, US Census Bureau, 2000 (http://quickfacts.census.gov/qfd/states/48000lk.html)
[5] Annual Population Estimates by States, US Census Bureau, 2002, http://eire.census.gov/popest/data/states/tables/ST-EST2002-01.php
[6] Hendron, R., 2008. Building America Research Benchmark Definition, Technical Report NREL/TP-550-44816, NREL December 2008
[7] The average number of building permits issued from 1980 to 2008 was used to predict the number of building permits will be issued in the year 2009 through 2013.

Using the MWh to NO_x conversion values from the 2007 version of the USEPA's eGRID database, and proportioning the electricity sales data in the ERCOT region according to the published electricity sales data for Texas in 1998, the NO_x emissions reduction from CFL retrofits would be 7,712 tons annually and 20.6 tons per day for the Ozone Season Day Period.[8]

[8] The newly published 2010 eGRID would reduce the NOx emissions reduction by about 50% compared to 2007 eGRID.

DESCRIPTION OF THE ANALYSIS

The reduction in the total energy consumption has been calculated using the data available at the Laboratory through the Senate Bill 5 program and the following assumptions.

Housing Data

The total estimated 10.2 million residential includes Single Family, Multi Family and Mobile homes. This data is based on the Census Data available for the year 2000[4] [5], and the number of building permits issued from 2000 through 2008[3]. The number of building permits likely to be issued for the period from 2008 through 2013 is projected based on 20 years historical data over the period 1980 through 2000. Approximately 133,000 building permits are expected to be issued each year for the 5 year period from 2008 to 2013. Table 2 gives the details of the calculations. The total number of houses is estimated to be about 10,204,056 by the year 2013.

Current Energy Consumption:

The estimated average energy consumption for current lighting in an average residence is 1,946 kWh/year[9]. The lighting energy consumption is based on the information provided in the NREL Building America Program. Table 3 gives the details of the lighting electricity usage for a typical residential unit.

Potential for Retrofitting

As per the NREL report[10], based on the sample of 161 homes monitored by the Tacoma Public Utilities (PUCT) for the Bonneville Power Administration, it was found that 86% of all lamps in a home are incandescent, and the remaining 14% are fluorescent.

Since it may not be possible to replace all the incandescent lamps with CFLs in all lighting fixtures (i.e., ovens, refrigerators, decorative lamps) a certain percentage of incandescent lamps may need to be retained. Also there is a possibility that a few incandescent lamps may have already been replaced with CFLs, which will further reduce the energy savings from retrofitting those lamps; hence an assumption of 70% to represent the incandescent bulbs can be retrofitted with CFLs.

Potential Savings from Retrofitting:

The savings from replacing incandescent lamps with CFLs ranges from 77% to 80%. For most common lighting requirements (i.e.,450 to 800 lumens from 40 and 60 W incandescent lamps from) the savings are 75% of the Wattage of an incandescent bulb.

Calculated Energy Reduction:

The energy savings for a typical residence are calculated as follows:

[9] Hong, E., Conroy, L., and Scholand, M., Navigant Consulting, Inc, 2005. U.S. Lighting Market Characterization, Volumn II: Energy Efficient Lighting Technology Options, September 2005.
[10] Hendron, R. 2008 Building America Research Benchmark Definition, *Technical Report* NREL/TP-550-44816, NREL December 2008

$$Estimated\ Energy\ consumption\ for\ Lighting = 70\% \times 75\% \times 1{,}946 \frac{kWh}{year} = \frac{1{,}022\ kWh}{year}$$

The energy consumption due to the retrofits will reduce the energy consumption by 1,022 kWh/yr to about 924 kWh/yr for an average house unit. With over 10.2 Million residential housing units in the State of Texas in 2013, the total savings are estimated to about 10.4 Million MWh/yr or about 28,562 MWh/day on average.

EMISSIONS REDUCTION CALCULATION PROCEDURE

A special version of eGRID is developed by the EPA for TCEQ reflecting the 2007 data for electricity and pollution generated by the electric utilities in ERCOT region during 1998 to 1999 period based on selected growth assumptions for the year 2007. This eGRID give the details of the reduction in NO_x emissions for each county in ERCOT region based on the electricity generated.

The MWh savings in this analysis were then proportioned according to the Texas Public Utilities Commission total sales data for 1998 provided by the Power Control Authority (PCA) as follows: AEP (11.2%), Austin Energy (1.3%), Brownsville Public Power (0.1%), LCRA (4.1%), Reliant (35.2%), San Antonio Public Power (4.9%), Texas Municipal Power (3.0%), Texas-New Mexico Power (3.5%), and TXU (35.7%). Table 4 provides the details of the total power sales data by the electric utilities in ERCOT region.

The NO_x emissions reductions from the 2012 Federal Legislation to phase out incandescent light bulbs can then be estimated based on the MWh savings in each PCA and corresponding NO_x emissions data. The values are for the Annual NO_x Emissions and Ozone Season Days (OSD) in Table 5 and Table 6 respectively.

Table 2: New Privately-Owned Housing Units From Building Permit Data in the State of Texas

Year	Total Units		1 Unit		2 Units		3 and 4 Units		5 or More Units	
	Buildings	Housing Units	Buildings	Housing Units	Buildings	Housing Units	Buildings	Housing Units	Buildings	Housing Units
1980	73,836	127,546	67,221	67,221	2,695	5,390	902	3,453	3,018	51,482
1981	73,815	135,759	65,509	65,509	3,111	6,222	1,325	4,997	3,870	59,031
1982	89,628	201,163	77,421	77,421	3,181	6,362	1,709	6,534	7,317	110,846
1983	116,713	276,224	100,825	100,825	4,385	8,770	1,928	7,456	9,575	159,173
1984	96,556	195,426	84,559	84,559	4,495	8,990	1,746	6,791	5,756	95,086
1985	76,220	143,114	69,322	69,322	2,677	5,354	970	3,758	3,251	64,680
1986	62,094	96,737	59,117	59,117	1,390	2,780	256	983	1,331	33,857
1987	44,842	50,455	43,949	43,949	456	912	91	343	346	5,251
1988	36,437	40,479	35,881	35,881	251	502	94	351	211	3,745
1989	37,115	41,287	36,631	36,631	129	258	145	548	210	3,850
1990	38,782	47,103	38,141	38,141	114	228	124	461	403	8,273
1991	42,503	51,866	41,654	41,654	155	310	158	606	536	9,296
1992	55,748	64,235	54,798	54,798	206	412	198	762	546	8,263
1993	64,171	77,754	62,672	62,672	339	678	232	876	928	13,528
1994	72,954	102,580	70,355	70,355	502	1,004	279	1,067	1,818	30,154
1995	73,466	105,102	70,418	70,418	687	1,374	531	2,029	1,830	31,281
1996	86,193	118,823	83,103	83,103	785	1,570	423	1,629	1,882	32,521
1997	85,688	125,974	82,180	82,180	695	1,390	560	2,159	2,253	40,245
1998	104,645	156,729	99,831	99,831	686	1,372	1,018	3,966	3,110	51,560
1999	105,718	146,564	101,848	101,848	806	1,612	616	2,389	2,448	40,715
2000	111,933	141,231	108,613	108,613	713	1,426	734	2,811	1,873	28,381
2001	115,275	150,342	111,915	111,915	698	1,396	795	3,073	1,867	33,958
2002	126,842	165,027	122,623	122,623	1,076	2,152	1,146	4,461	1,997	35,791
2003	138,296	177,194	134,197	134,197	1,176	2,352	854	3,190	2,069	37,455
2004	153,463	188,842	149,056	149,056	1,573	3,146	941	3,610	1,893	33,030
2005	170,594	210,611	166,178	166,178	1,549	3,098	697	2,664	2,170	38,671
2006	167,273	216,642	162,750	162,750	1,329	2,658	1,043	3,963	2,151	47,271
2007	122,845	176,992	118,455	118,455	1,249	2,498	743	2,843	2,398	53,196
2008	82,637	129,523	79,626	79,626	700	1,400	410	1,579	1,901	46,918

Housing before 2000	8,123,137	(From ESL table for calculating pilot light savings)
Total House Units by 2008:	9,538,310	(Housing before 2000 + total permits from 2001 to 2008)
Predicted Annual Permits from 2009 to 2013:	133,149	(Average number of permits from 1980 to 2008)
Total House Units by 2013:	10,204,056	(Housing for 2008 + Predicted permits from 2009 to 2013)

Table 3: Lighting Electricity Usage - Typical Residential Unit

Room Type	Operation(Hours per day per room)	Room Type Electricity Use (kWh/yr)	Rank by kWh/yr
Bathroom	1.8	251	3
Bedroom	1.1	215	5
Closet	1.1	19	13
Dining Room	2.5	55	10
Family Room	1.8	74	8
Garage	1.5	103	7
Hall	1.5	171	6
Kitchen	3.0	322	2
Living Room	2.5	352	1
Office	1.7	37	11
Outdoor	2.1	248	4
Utility Room	2.0	67	9
Other	0.8	32	12
Total		1,946	

Table 4: PCA Electricity Sales Data for 1998

PCA	PCA 1998 annual net generation (MWh)	% of Power Generated
American Electric Power - West (ERCOT)/PCA	33028932.1	11.2%
Austin Energy/PCA	3712928.5	1.3%
Brownsville Public Utils Board/PCA	236180.0	0.1%
Lower Colorado River Authority/PCA	12037445.6	4.1%
Reliant Energy HL&P/PCA	104265740.6	35.2%
San Antonio Public Service Bd/PCA	14646927.9	4.9%
South Texas Electric Coop Inc/PCA	3239094.0	1.1%
Texas Municipal Power Pool/PCA	8804340.4	3.0%
Texas-New Mexico Power Co/PCA	10258062.7	3.5%
TXU Electric/PCA	105812849.8	35.7%
Total	**296042501.6**	**100%**

Table 5: Annual NO_X Emissions

Area	County	American Electric Power - West (ERCOT) /PCA	NOx Reductions (lbs)	Austin Energy/PCA	NOx Reductions (lbs)	Brownsville Public Utils Board/PCA	NOx Reductions (lbs/year)	Lower Colorado River Auhotrity /PCA	NOx Reductions (lbs)	Reliant Energy HL&P/PCA	NOx Reductions (lbs)	San Antonio Public Service Bd/PCA	NOx Reductions (lbs)	South Texas Electric Coop INC/PCA	NOx Reductions (lbs)	Texas Municipal Power Pool/PCA	NOx Reductions (lbs)	Texas-New Mexico Power Co/PCA	NOx Reductions (lbs)	TXU Electric/PCA	NOx Reductions (lbs)	Total Nox Reductions (lbs)	Total Nox Reductions (Tons)
Houston-Galveston Area	Brazoria	0.00883113	10271.4509	0.010890729	1423.948916	0.006522185	54.2446732	0.003944232	1671.928286	0.0654443	240289.2139	0.014877	7673.534439	0.006262	714.2978643	0.0048171	1493.508509	0.121275	43808.3958	0.00816387	30419.73131	337820.2546	168.9101273
	Chambers	0.02176222	25311.5445	0.026955801	3524.436572	0.016072371	133.673078	0.009076193	3847.32554	0.1649402	605604.493	0.037472	19327.58982	0.015056	1717.288039	0.0095532	2961.878285	0.011519	4160.882712	0.01581859	58942.30577	725531.4173	362.7657086
	Fort Bend	0.07043123	81918.2566	0.087239726	11406.48292	0.052016606	432.619413	0.029374182	12451.48044	0.5338124	1959977.762	0.121275	62551.79192	0.048726	5557.829253	0.030918	9585.819851	0.037279	13466.27655	0.05119528	190760.8181	2348109.137	1174.054568
	Galveston	0.03385674	39378.6237	0.041710519	5453.597092	0.025004711	207.962886	0.015351589	6507.415483	0.2495874	916400.0949	0.056747	29269.19091	0.024143	2753.830575	0.0192972	5982.888435	0.567751	205089.9116	0.03283689	122354.8702	1333398.386	666.6991929
	Harris	0.06826733	79401.4326	0.084559408	11056.03466	0.050418468	419.327785	0.028471701	12068.92609	0.5174117	1899760.182	0.117549	60629.97547	0.047229	5387.07271	0.0299681	9291.308922	0.036133	13052.54401	0.04962237	184899.9584	2275966.763	1137.983381
	Liberty	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Montgomery	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Waller	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Beaumont/ Port Arthur Area	Hardin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Jefferson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Orange	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dallas/ Fort Worth Area	Collin	0.00203914	2371.70908	0.003716345	485.9073203	0.001505992	12.5252591	0.005950953	2522.561182	0.0024815	9111.145193	0.000717	369.8429156	0.019166	2186.157847	0.0766809	23774.15714	0.000864	312.2526107	0.0040002	14905.30672	56051.56527	28.02578263
	Dallas	0.00453947	5279.83882	0.004683963	612.4221359	0.003352602	27.8834153	0.00774211	3281.818391	0.0020856	7657.656051	0.000681	351.2796571	0.007503	855.7930055	0.026717	8283.352204	0.007525	2718.246668	0.04037045	150426.0041	179494.2945	89.74714724
	Denton	0.00047388	551.168074	0.000872802	114.1176853	0.000349982	2.91077982	0.001396994	592.1744996	0.0005854	2149.549199	0.000169	87.15219833	0.004544	518.2721764	0.0181872	5638.745114	0.000187	67.40787672	0.00084941	3165.004244	12886.50185	6.443250923
	Tarrant	0.01216249	14146.1411	0.012266309	1603.804303	0.008982543	74.7073424	0.020308652	8608.674981	0.0053165	19520.39904	0.001753	903.9136623	0.017326	1976.302644	0.0602168	18669.6034	0.020603	7442.623536	0.11064724	412287.2076	485233.3776	242.6166888
	Ellis	0.00327981	3814.73662	0.003307809	432.4918706	0.002422289	20.1460479	0.005476558	2321.468984	0.0014337	5263.992546	0.000473	243.7549955	0.004672	532.9420961	0.0162384	5034.561687	0.005556	2007.024279	0.02983782	111179.9397	130851.0588	65.42552939
	Johnson	0.00028606	332.713354	0.000526868	68.88729527	0.000211267	1.75709618	0.000843297	357.4669386	0.0003534	1297.578285	0.000102	52.60954254	0.002743	312.8557011	0.0109787	3403.836124	0.000113	40.69085606	0.00051274	1910.559098	7778.95429	3.889477145
	Kaufman	0.00632545	7357.10587	0.006379446	834.1043681	0.004671629	38.8536933	0.010562096	4477.188015	0.002765	10152.14267	0.000911	470.1061922	0.009011	1027.8328	0.0313175	9709.662031	0.010715	3870.74956	0.05754527	214421.7721	252359.5173	126.1797586
	Parker	0.00021749	252.961055	0.000400576	52.37482248	0.000160626	1.33591543	0.000641157	271.7811373	0.0002687	986.5452268	7.75E-05	39.99889153	0.002085	237.8633352	0.0083471	2587.92731	8.56E-05	30.93714675	0.00038984	1452.592865	5914.317705	2.957158852
	Rockwall	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Henderson	0.00081989	953.616171	0.000826893	108.1152599	0.000605529	5.03615293	0.001369042	580.3258734	0.0003584	1315.904323	0.000118	60.93440474	0.001168	133.2260261	0.0040593	1258.550698	0.001389	501.7203012	0.00745892	27793.0035	32710.43271	16.35521636
	Hood	0.01252711	14570.2262	0.012634039	1651.88452	0.009251829	76.9469829	0.020917482	8866.753199	0.0054759	20105.59825	0.001805	931.0119588	0.017846	2035.549934	0.062022	19229.29673	0.021221	7665.744867	0.11396431	424647.106	499780.1186	249.8900593
	Hunt	0.00618756	7196.72178	0.006240374	815.9209861	0.004569788	38.0066872	0.010331844	4379.585816	0.0027047	9930.827099	0.000892	459.8579298	0.008815	1005.42616	0.0306347	9497.992484	0.010482	3786.367652	0.05629078	209747.4014	246858.108	123.429054
El Paso Area	El Paso	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
San Antonio Area	Bexar	0.03341375	38863.3861	0.051775843	6769.625459	0.024677545	205.241859	0.090663423	38431.49899	0.0011418	4192.453324	1.143572	589835.4043	0.046874	5346.566813	0.0046695	1447.745224	0.00052	187.6897656	0.00250387	9329.75472	694609.3666	347.3046833
	Comal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Guadalupe	0.00200047	2326.73453	0.076378745	9986.423405	0.001477434	12.2877435	0.133848731	56737.40485	0.0012371	4542.33139	0.003555	1833.505145	0.001062	121.1081003	0.0018557	575.3409358	0.000402	145.1135176	0.00183516	6838.082881	83118.3325	41.55916625
	Wilson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Austin Area	Bastrop	0.00450233	5236.64455	0.171901148	22475.85582	0.003325174	27.6553016	0.301245466	127695.5402	0.0027843	10223.15811	0.008001	4126.562196	0.00239	272.5708784	0.0041765	1294.886006	0.000904	326.5984594	0.0041303	15390.07097	187069.5425	93.53477123
	Caldwell	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hays	0.0024586	2859.5858	0.093870431	12273.43914	0.001815785	15.1017903	0.164501762	69730.97947	0.0015205	5582.582033	0.004369	2253.400732	0.001305	148.8433684	0.0022807	707.1011987	0.000494	178.3463263	0.00225544	8404.089299	102153.4692	51.07673458
	Travis	0.00051001	593.186902	0.299602906	39172.69765	0.000376663	3.13268592	0.033939476	14386.67213	0.0003347	1228.936991	0.000906	467.362236	0.000271	30.92674083	0.0004717	146.2594271	0.000103	37.32497169	0.00046734	1741.358974	57807.85871	28.90392935
	Williamson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
North East Texas Area	Gregg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Harrison	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rusk	0.00068596	797.842675	0.00069182	90.45459881	0.000506616	4.21349579	0.001145408	485.5294627	0.0002999	1100.950946	9.88E-05	50.9807509	0.000977	111.4635136	0.0033962	1052.966052	0.001162	419.764135	0.00624051	23253.00779	27367.17342	13.68358671
	Smith	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Upshur	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Corpus Christi Area	Nueces	0.22756873	264684.184	0.004556851	595.8024938	0.168069652	1397.82658	0.007612767	3226.991003	0.0016809	6171.649387	0.001627	839.0744722	0.046792	5337.23556	0.0072464	2246.663133	0.001609	581.3761684	0.00828339	30865.0967	315945.8996	157.9729498
	San Patricio	0.05031335	58519.2365	0.001007478	131.7264466	0.037158653	309.046588	0.001683113	713.4580042	0.0003716	1364.494865	0.00036	185.5116416	0.010345	1180.01365	0.0016021	496.7165367	0.000356	128.5369189	0.00183138	6823.988746	69852.72991	34.92636495
Victoria Area	Victoria	0.02183674	25398.2108	0.002215582	289.6845415	0.016127403	134.130772	0.003612695	1531.392587	0.0011996	4404.60136	0.000555	286.4603579	0.525456	59935.0921	0.0324127	10049.23923	0.000477	172.2554099	0.00225485	8401.885931	110602.9531	55.30147653
Other ERCOT counties	Andrews	2.4742E-05	28.7774069	2.49533E-05	3.262609135	1.82731E-05	0.15197668	4.13138E-05	17.51257406	1.082E-05	39.71022656	3.57E-06	1.83882595	3.52E-05	4.020380196	0.0001225	37.97945827	4.19E-05	15.14048284	0.00022509	838.7133063	987.107247	0.493553623
	Angelina	0.00031082	361.513275	0.000313473	40.98619852	0.000229554	1.90919176	0.000519	219.999947	0.0001359	498.85572	4.48E-05	23.10006572	0.000443	50.50562111	0.0015389	477.1131177	0.000527	190.2007902	0.00282766	10536.2514	12400.43533	6.200217664
	Bosque	0.00059539	692.497538	0.001096604	143.3795241	0.000439723	3.65715642	0.001755208	744.0187532	0.0007356	2700.732497	0.000212	109.4995985	0.005709	651.1665375	0.0228507	7084.621361	0.000234	84.69247565	0.00106721	3976.568584	16190.83402	8.095417012
	Brazos	0.00193973	2256.08581	0.003572622	467.1157548	0.001432574	11.9146398	0.005718288	2423.936637	0.0023964	8798.708929	0.000692	356.7384389	0.018599	2121.43366	0.0744451	23080.96833	0.000764	275.919382	0.00347685	12955.25178	52748.07336	26.37403668
	Calhoun	0.08269981	96187.782	0.001655986	216.518114	0.061077496	507.978361	0.002766524	1172.707421	0.0006108	2242.813516	0.000591	304.9245751	0.017004	1939.582647	0.0026334	816.4505345	0.000585	211.2755029	0.00301023	11216.55682	114816.5895	57.40829473
	Cameron	0.04837175	56260.9651	0.000968599	126.6430914	0.297964476	2478.15509	0.001618161	685.9254885	0.0003573	1311.838681	0.000346	178.3527028	0.009946	1134.476639	0.0015403	477.5481263	0.000342	123.5766483	0.00176071	6560.649382	69338.13097	34.66906548
	Cherokee	0.0035039	4075.36933	0.003533808	462.0408373	0.002587786	21.5224781	0.00585073	2480.077768	0.0015316	5623.642174	0.000505	260.4089692	0.004992	569.3540829	0.0173479	5378.536004	0.005936	2144.149385	0.03187642	118776.0416	139791.1426	69.89557131
	Coke	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Coleman	0.00129879	1510.61328	2.6007E-05	3.400381335	0.000959212	7.97771653	4.34478E-05	18.41717698	9.593E-06	35.22301702	9.28E-06	4.788790251	0.000267	30.46082614	4.136E-05	12.82222123	9.19E-06	3.31804699	4.7275E-05	176.1541783	1803.175635	0.901587817
	Crockett	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ector	0.00353575	4112.41245	0.003565928	466.2405635	0.002611307	21.718107	0.005903911	2502.620467	0.0015456	5674.758342	0.000509	262.7759599	0.005037	574.5292342	0.0175056	5427.424277	0.00599	2163.638658	0.03216616	119855.658	141061.776	70.53088801
	Fannin	0.00705631	8207.16844	0.007116546	930.4793446	0.005211403	43.3429682	0.011782473	4994.496048	0.0030845	11325.15237	0.001017	524.4237033	0.010052	1146.591754	0.034936	10831.54616	0.011954	4317.987834	0.06419422	239196.7212	281517.9098	140.7589549
	Fayette	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Freestone	0.00367718	4276.90895	0.003708565	484.890186	0.00271576	22.5868312	0.006140067	2602.725285	0.0016074	5901.748676	0.00053	273.2869983	0.005238	597.5104035	0.0182058	5644.521248	0.006229	2250.184205	0.03345281	124649.8843	146704.2471	73.35212353
	Frio	0.00858833	9989.05408	0.000871383	113.9322206	0.006342868	52.7533042	0.001420864	602.2929532	0.0004718	1732.318926	0.000218	112.6641571	0.206661	23572.32491	0.0127478	3952.341175	0.000188	67.74763078	0.00088683	3304.441156	43499.87052	21.74993526
	Grimes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hardeman	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Haskell	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hidalgo	0.18852746	219275.451	0.003775086	493.5877104	0.139235931	1158.01801	0.006306735	2673.374343	0.0013925	5112.852534	0.001348	695.1243942	0.038764	4421.589214	0.0060032	1861.229725	0.001333	481.6363389	0.00686231	25569.9373	261742.8004	130.8714002
	Howard	0.00055511	645.649532	0.000559851	73.19985664	0.000409976	3.4097469	0.000926915	392.9118865	0.0002427	890.9381329	8E-05	41.25587539	0.000791	90.20119842	0.0027484	852.1066378	0.00094	339.6916786	0.00505009	18817.36096	22146.72551	11.07336276
	Jack	0.00212145	2467.44747	0.002139557	279.7443381	0.001566784	13.0308642	0.003542346	1501.57228	0.0009273	3404.855005	0.000306	157.6655759	0.003022	344.7175405	0.0105033	3256.454566	0.003594	1298.183195	0.0192997	71913.39477	84637.06561	42.3185328
	Jones	0.04071872	47359.7658	0.000815354	106.6065457	0.030072592	250.112184	0.001362147	577.4033636	0.0003008	1104.289138	0.000291	150.1350397	0.008372	954.988025	0.0012966	401.9939469	0.000288	104.0252529	0.00148214	5522.671316	56531.99062	28.26599531
	Lamar	0.00095084	1105.9153	0.000958954	125.3820177	0.000702236	5.84046152	0.001587687	673.0079455	0.0004156	1526.063382	0.000137	70.66605234	0.001355	154.5031477	0.0047076	1459.549984	0.001611	581.8485175	0.00865017	32231.73917	37934.51597	18.96725798
	Limestone	0.00071976	837.145933	0.000891528	116.5660889	0.000531572	4.42106066	0.000300183	127.2452155	0.0054552	20029.56948	0.001239	639.2345294	0.000498	56.79703583	0.000316	97.9602159	0.000381	137.6157052	0.00052318	1949.438986	23995.99425	11.99799712
	Llano	0.00123817	1440.11465	0.047274044	6181.020879	0.000914447	7.60540546	0.082844655	35117.18558	0.0007657	2811.441497	0.0022	1134.834077	0.000657	74.95893835	0.0011486	356.1029002	0.000249	89.816909	0.00113586	4232.379436	51445.46028	25.72273014
	McLennan	0.02453432	28535.756	0.024743738	3235.212204	0.018119687	150.700497	0.040966843	17365.51667	0.0107245	39376.77003	0.003535	1823.384877	0.034951	3986.620075	0.1214699	37660.53542	0.041562	15013.34449	0.22319886	831670.4245	978818.2647	489.4091324
	Milam	0.0022454	2611.62053	0.002264571	296.0898121	0.001658332	13.7922581	0.003749326	1589.309214	0.0009815	3603.800833	0.000324	166.8779825	0.003199	364.8594016	0.011117	3446.72935	0.003804	1374.036096	0.02042738	76115.2976	89582.41308	44.79120654
	Mitchell	0.01494317	17380.3335	0.015070721	1970.47757	0.011036196	91.7874719	0.024951762	10576.85212	0.006532	23983.29297	0.002153	1110.5729	0.021288	2428.139158	0.073984	22937.98231	0.025314	9144.209619	0.1359442	506547.2721	596170.9198	298.0854599
	Nolan	0.00056465	656.746227	0.000569473	74.45793304	0.000417022	3.46834978	0.000942846	399.664812	0.0002468	906.2505706	8.14E-05	41.96493475	0.000804	91.75147467	0.0027956	866.7516837	0.000957	345.5299152	0.00513689	19140.7725	22527.3584	11.2636792
	Palo Pinto	0.003207	3730.0456	0.005906709	772.2946776	0.002368511	19.6987851	0.009454195	4007.557751	0.003962	14547.13528	0.001144	589.8049784	0.03075	3507.421679	0.1230821	38160.36777	0.001263	456.1847209	0.00574838	21419.25614	87209.76738	43.60488369
	Pecos	4.0968E-05	47.6493263	4.13174E-05	5.402193727	3.02565E-05	0.25164139	6.84069E-05	28.99713505	1.791E-05	65.75177349	5.9E-06	3.044708576	5.84E-05	6.656903041	0.0002028	62.88598565	6.94E-05	25.06945149	0.0003727	1388.732629	1634.441748	0.817220874
	Presidio	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red River	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Robertson	0.00073771	858.024603	0.000835096	109.187788	0.00054483	4.53132324	0.000735917	311.9493467	0.0031497	11564.54731	0.000731	376.9733942	0.000761	86.78588504	0.0018663	578.629036	0.191633	69223.79889	0.00339774	12660.44867	95774.87624	47.88743812
	Taylor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Titus	0.00569644	6625.50113	0.005745061	751.1594277	0.004207073	34.9900075	0.009511781	4031.96784	0.00249	9142.594109	0.000821	423.3579296	0.008115	925.6231323	0.0282032	8744.11459	0.00965	3485.83479	0.05182285	193099.2592	227264.4022	113.6322011
	Tom Green	0.00148245	1724.22878	2.96846E-05	3.881228525	0.001094854	9.1058437	4.95918E-05	21.021546	1.095E-05	40.20389625	1.06E-05	5.465972046	0.000305	34.76828499	4.72E-05	14.63540876	1.05E-05	3.787251299	5.396E-05	201.0641026	2058.162312	1.029081156
	Upton	3.1166E-05	36.2491845	3.14322E-05	4.109714286	2.30176E-05	0.19143597	5.20405E-05	22.05954584	1.362E-05	50.02060579	4.49E-06	2.316259461	4.44E-05	5.06423333	0.0001543	47.84046012	5.28E-05	19.07156391	0.00028353	1056.477167	1243.40017	0.621700085
	Ward	0.01855953	21586.5057	0.01871795	2447.348049	0.013707039	114.000734	0.030990277	13136.53036	0.0081128	29787.43131	0.002674	1379.339944	0.02644	3015.767204	0.0918886	28489.14757	0.03144	11357.17753	0.16884373	629135.5442	740448.7926	370.2243963
	Webb	0.02001433	23278.5756	0.000400768	52.39993245	0.014781473	122.936743	0.000669531	283.8090011	0.0001478	542.7872732	0.000143	73.79533675	0.004115	469.4018333	0.0006373	197.5906406	0.000142	51.13115885	0.00072851	2714.538793	27786.96627	13.89348313
	Wharton	0.00014434	167.880864	0.000178787	23.37611034	0.000106601	0.88659749	6.01986E-05	25.51769751	0.001094	4016.720733	0.000249	128.1918011	9.99E-05	11.39005168	6.336E-05	19.64489704	7.64E-05	27.59739079	0.00010492	390.9396056	4812.145748	2.406072874
	Wichita	0.00020763	241.497269	0.000209406	27.37950635	0.000153346	1.2753739	0.000346701	146.9638601	9.076E-05	333.2444541	2.99E-05	15.43125293	0.000296	33.7386492	0.001028	318.7200108	0.000352	127.0574957	0.00188893	7038.4025	8283.710371	4.141855186
	Wilbarger	0.02861682	33284.0946	0.000573025	74.92229527	0.021134796	175.777001	0.000957307	405.7948318	0.0002114	776.0862743	0.000205	105.5138003	0.005884	671.1585513	0.0009112	282.5183855	0.000202	73.10818166	0.00104164	3881.292731	39730.2667	19.86513335
	Wise	0.00284449	3308.4109	0.002882008	376.8188737	0.002100781	17.4720855	0.00476997	2021.952279	0.0012561	4611.88213	0.000413	213.1430246	0.004182	477.0013118	0.0146143	4531.009357	0.004798	1733.171146	0.02576141	95990.65053	113281.5116	56.64075582
	Young	0.00623586	7252.89693	0.006289085	822.2897854	0.004605458	38.3033543	0.010412491	4413.771361	0.0027258	10008.34373	0.000899	463.447423	0.008883	1013.274171	0.0308739	9572.130554	0.010564	3815.922739	0.05673017	211384.6177	248784.9977	124.3924989
	Total	**1.12183722**	**1304803.91**	**1.172570094**	**153312.0436**	**1.090766584**	**9071.84908**	**1.189130767**	**504063.008**	**1.62936**	**5982456.617**	**1.542363**	**795525.1515**	**1.359386**	**155055.4947**	**1.2316428**	**381858.5101**	**1.221806**	**441355.4628**	**1.52878695**	**5696475.721**	**15423977.77**	**7711.988885**

Energy Savings by PCA (MWh)		1163095.58		130748.7241		8316.948107		423891.9908		3671660.4		515783.5		114062.9		310039.98		361232		3726141		10424973	

Table 6: Ozone Production Period NO_x Emissions

Area	County	American Electric Power - West (ERCOT) /PCA	NOx Reductions (lbs)	Austin Energy/PCA	NOx Reductions (lbs)	Brownsville Public Utils Board/PCA	NOx Reductions (lbs/year)	Lower Colorado River Auhority /PCA	NOx Reductions (lbs)	Reliant Energy HL&P/PCA	NOx Reductions (lbs)	San Antonio Public Service Bd/PCA	NOx Reductions (lbs)	South Texas Electric Coop INC/PCA	NOx Reductions (lbs)	Texas Municipal Power Pool/PCA	NOx Reductions (lbs)	Texas-New Mexico Power Co/PCA	NOx Reductions (lbs)	TXU Electric/PCA	NOx Reductions (lbs)	Total Nox Reductions (lbs)	Total Nox Reductions (Tons)
Houston-Galveston Area	Brazoria	0.00957217	30.5023236	0.011806715	4.229350427	0.007069474	0.161086159	0.004263638	4.951566797	0.0710018	714.2311709	0.01614	22.80807306	0.006781	2.119080963	0.0051797	4.399781154	0.126288	124.9843433	0.008772	89.54640231	997.9331787	0.498966589
	Chambers	0.0218814	69.7264504	0.027103415	9.708868305	0.016160386	0.36823313	0.009125896	10.59833997	0.1658435	1668.276375	0.037677	53.24227585	0.015138	4.730663489	0.0096055	8.159172569	0.011582	11.46210506	0.015905	162.3700902	1998.642574	0.999321287
	Fort Bend	0.05569551	177.477273	0.068987309	24.71233594	0.041133619	0.937277191	0.023228475	26.97634055	0.4221274	4246.324589	0.095902	135.519503	0.038531	12.04113	0.0244493	20.76783897	0.029479	29.17491329	0.040484	413.2865017	5087.217702	2.543608851
	Galveston	0.02755599	87.8088894	0.033893644	12.14123465	0.020351324	0.463728499	0.012791501	14.85538335	0.2014466	2026.420908	0.045813	64.73791225	0.019824	6.19492353	0.0167751	14.24921624	0.594657	588.5177087	0.028709	293.0834741	3108.473378	1.554236689
	Harris	0.07736057	246.514358	0.09582276	34.32521551	0.057134232	1.301869707	0.032264145	37.46989784	0.5863312	5898.107204	0.133207	188.2353881	0.05352	16.7250228	0.0339599	28.84634419	0.040946	40.52369588	0.056232	574.0512864	7066.100282	3.533050141
	Liberty	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Montgomery	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Waller	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Beaumont/ Port Arthur Area	Hardin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Jefferson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Orange	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dallas/ Fort Worth Area	Collin	0.00176365	5.61997872	0.003151138	1.128786906	0.001302533	0.029679732	0.005050143	5.864972742	0.0020858	20.98128857	0.000604	0.853628687	0.015958	4.987016715	0.0637888	54.18379108	0.000846	0.837401093	0.004013	40.96925269	135.4557969	0.067727898
	Dallas	0.00504555	16.0779734	0.005305276	1.900433012	0.003726366	0.084093563	0.008757286	10.17025625	0.0024131	24.2740686	0.000782	1.105420463	0.00931	2.909506272	0.033672	28.60184977	0.008209	8.124433864	0.044002	449.2009312	542.4497824	0.271224891
	Denton	0.00063576	2.02588249	0.001170951	0.419452852	0.000469535	0.01069891	0.001874207	2.176606385	0.0007854	7.90091859	0.000227	0.320338062	0.006096	1.904969784	0.0243999	20.7258648	0.00025	0.247765507	0.00114	11.63334195	47.36583933	0.02368292
	Tarrant	0.01557224	49.6219379	0.015705165	5.625836552	0.011500796	0.262058966	0.026002176	30.19757352	0.006807	68.47379959	0.002244	3.170755004	0.022184	6.932488974	0.0770985	65.48937237	0.02638	26.10728968	0.141667	1446.224105	1702.105217	0.851052609
	Ellis	0.00350282	11.161969	0.003532723	1.265476838	0.002586991	0.058947598	0.005848935	6.792648438	0.0015312	15.40251065	0.000505	0.713230287	0.00499	1.559395505	0.0173426	14.73119297	0.005934	5.872579143	0.031867	325.3139494	382.8718998	0.19143595
	Johnson	0.00033718	1.07443275	0.000621017	0.222458056	0.00024902	0.005674199	0.000993991	1.154369611	0.0004166	4.19027546	0.00012	0.169892235	0.003233	1.010306339	0.0129406	10.99202348	0.000133	0.131403167	0.000604	6.169777188	25.12061249	0.012560306
	Kaufman	0.00649275	20.6895651	0.006548174	2.345658485	0.004795187	0.109263899	0.01084145	12.59069543	0.0028381	28.54973613	0.000936	1.3220271	0.009249	2.890459301	0.0321458	27.30539727	0.010999	10.88527635	0.059067	602.9943834	709.6824639	0.354841232
	Parker	0.00047595	1.51664987	0.000876616	0.314017776	0.000351511	0.008009596	0.0014031	1.629487302	0.000588	5.91491786	0.00017	0.239816812	0.004564	1.426130188	0.0182667	15.51614189	0.000187	0.185486338	0.000853	8.709146085	35.45980304	0.017729902
	Rockwall	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Henderson	0.00095027	3.02809879	0.000958382	0.34330761	0.000701818	0.015991726	0.001586741	1.842758262	0.0004154	4.178503277	0.000137	0.193490215	0.001354	0.423043968	0.0047048	3.996383415	0.00161	1.593155281	0.008645	88.25349544	103.868228	0.051934114
	Hood	0.01232788	39.2835755	0.012433111	4.453735271	0.00910469	0.207460926	0.020584816	23.90613326	0.0053888	54.20779178	0.001776	2.510151738	0.017562	5.488156362	0.0610356	51.84514782	0.020884	20.66802969	0.112152	1144.914049	1347.484231	0.673742116
	Hunt	0.00635121	20.2385363	0.006405424	2.294523393	0.004690653	0.106881958	0.010605108	12.31621968	0.0027763	27.92735507	0.000915	1.293207057	0.009048	2.827447612	0.031445	26.71014266	0.010759	10.64797854	0.05778	589.8491733	694.2114655	0.347105733
El Paso Area	El Paso	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
San Antonio Area	Bexar	0.03112811	99.191703	0.048234164	17.27823395	0.0229895	0.523842402	0.084461674	98.0893898	0.0010637	10.70047224	1.065347	1505.447261	0.043667	13.64613637	0.0043501	3.69510556	0.000484	0.479043885	0.002333	23.81249682	1772.863685	0.886431842
	Comal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Guadalupe	0.00200761	6.39737812	0.076651484	27.4577636	0.00148271	0.033785264	0.134326688	156.0000192	0.0012416	12.48918221	0.003567	5.041239372	0.001066	0.332987843	0.0018623	1.581905229	0.000403	0.3989909	0.001842	18.80137219	228.5346247	0.114267312
	Wilson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Austin Area	Bastrop	0.00446951	14.2423909	0.170648096	61.12882414	0.003300936	0.075215648	0.299049574	347.3006003	0.002764	27.8044867	0.007942	11.2232387	0.002372	0.741326045	0.0041461	3.521772857	0.000898	0.888267835	0.0041	41.85722445	508.7833476	0.254391674
	Caldwell	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hays	0.00246935	7.86874903	0.094281013	33.7729374	0.001823727	0.041555738	0.165221279	191.8793891	0.0015271	15.36164325	0.004388	6.200703895	0.001311	0.40957369	0.0022907	1.945736989	0.000496	0.490757256	0.002265	23.12561122	281.0966576	0.140548329
	Travis	0.00050761	1.61752863	0.298194277	106.8178667	0.000374892	0.008542348	0.033779905	39.23022194	0.0003331	3.351120432	0.000902	1.274424279	0.00027	0.084332402	0.0004695	0.398826737	0.000109	0.101779405	0.000465	4.748415648	157.6330584	0.078816529
	Williamson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
North East Texas Area	Gregg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Harrison	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rusk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Smith	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Upshur	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Corpus Christi Area	Nueces	0.22352453	712.275035	0.00447587	1.603326785	0.165082827	3.76160358	0.007477478	8.683953434	0.001651	16.60813923	0.001598	2.257980774	0.04596	14.36270043	0.0071176	6.045854486	0.001581	1.564505004	0.008136	83.05912914	850.2222278	0.425111114
	San Patricio	0.05533089	176.315368	0.001107949	0.396884824	0.040864326	0.931141042	0.001850962	2.149611269	0.0004087	4.111150932	0.000396	0.558936774	0.011377	3.555318777	0.0017619	1.496580668	0.000391	0.387274945	0.002014	20.56031753	210.4625844	0.105231292
Victoria Area	Victoria	0.02060475	65.6583454	0.002090584	0.748879827	0.015217528	0.346749016	0.003408874	3.958889243	0.0011319	11.3865831	0.000524	0.740544808	0.495811	154.9415829	0.0305841	25.97885444	0.00045	0.445307164	0.002128	21.72018862	285.9259245	0.142962962
Other ERCOT counties	Andrews	2.5653E-05	0.08174383	2.58716E-05	0.009267624	1.89456E-05	0.000431698	4.28342E-05	0.049745446	1.121E-05	0.112799119	3.7E-06	0.005223288	3.65E-05	0.011420115	0.000127	0.107882774	4.35E-05	0.043007388	0.000233	2.382412036	2.80393332	0.001401967
	Angelina	0.00032149	1.02444874	0.000324234	0.11614583	0.000237435	0.005410228	0.000536817	0.623431239	0.0001405	1.413646884	4.63E-05	0.065460482	0.000458	0.143121771	0.0015917	1.352033154	0.000545	0.538987013	0.002925	29.85740841	35.14009375	0.017570047
	Bosque	0.00093945	2.99362538	0.001730301	0.619821096	0.000693828	0.015809668	0.002769496	3.216348511	0.0011606	11.67510484	0.000335	0.473360206	0.009008	2.814953943	0.0360555	30.62639385	0.00037	0.3661205	0.001684	17.19046783	69.99200582	0.034996003
	Brazos	0.00191393	6.09884734	0.003525105	1.262747924	0.00141352	0.03220969	0.005642234	6.55259628	0.0023645	23.78543503	0.000682	0.964366367	0.018351	5.734843932	0.073455	62.39448049	0.000754	0.745889265	0.003431	35.02176309	142.5931784	0.071296589
	Calhoun	0.08852525	282.091294	0.001772635	0.634985794	0.065379841	1.489755461	0.0029614	3.439215956	0.0006539	6.577531523	0.000633	0.894256696	0.018202	5.688241983	0.0028189	2.39441625	0.000626	0.619610713	0.003222	32.89495786	336.7242667	0.168362133
	Cameron	0.05467229	174.216702	0.001094762	0.392160739	0.285623104	6.508253518	0.001828931	2.124024639	0.0004038	4.062216271	0.000391	0.5522838	0.011242	3.513000136	0.0017409	1.478767014	0.000387	0.382665246	0.00199	20.31558991	213.5456628	0.106772831
	Cherokee	0.003513	11.1943812	0.003542982	1.269151536	0.002594504	0.0591187	0.005865919	6.812372965	0.0015356	15.44723654	0.000506	0.715301369	0.005005	1.563923685	0.0173929	14.77396949	0.005951	5.889631968	0.031959	326.2585977	383.9836852	0.191991843
	Coke	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Coleman	0.0013551	4.31810976	2.71346E-05	0.009720039	0.001000801	0.02280447	4.53316E-05	0.052645765	1.001E-05	0.1006859	9.69E-05	0.013688826	0.000279	0.087072709	4.315E-05	0.036652504	9.58E-06	0.009484685	4.93E-05	0.503539249	5.154403455	0.002577202
	Crockett	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ector	0.00362926	11.5648779	0.003660242	1.311156224	0.002680373	0.061075405	0.006060061	7.037839817	0.0015864	15.95848861	0.000523	0.738975461	0.00517	1.615684349	0.0179686	15.26293866	0.006148	6.084559167	0.033017	337.0566704	396.692266	0.198346133
	Fannin	0.00762852	24.3087492	0.007693632	2.755979628	0.005633999	0.128377205	0.012737922	14.7931595	0.0033346	33.54388187	0.001099	1.553286541	0.010867	3.396081313	0.0377689	32.08187341	0.012923	12.78941502	0.0694	708.4749322	833.8257359	0.416912868
	Fayette	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Freestone	0.00377443	12.027473	0.003806652	1.363602473	0.002787588	0.063518421	0.006302464	7.31935341	0.0016499	16.59682816	0.000544	0.76853448	0.005377	1.680311723	0.0186873	15.87345621	0.006394	6.327941533	0.034338	350.5389373	412.5599567	0.206279978
	Frio	0.01476384	47.0459041	0.001497957	0.536591782	0.010903753	0.248454646	0.002442547	2.836646624	0.0008111	8.158781547	0.000375	0.530619525	0.355262	111.019655	0.0219143	18.6145217	0.000322	0.31907411	0.001525	15.5630774	204.8733265	0.102436663
	Grimes	0.00055442	1.76670784	0.001021149	0.365791523	0.000409467	0.00933018	0.001634436	1.898149369	0.0006849	6.890140421	0.000198	0.27935666	0.005316	1.661263707	0.0212784	18.0743691	0.000218	0.216068437	0.000994	10.14506841	41.30624565	0.020653123
	Hardeman	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Haskell	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hidalgo	0.239737	763.937096	0.004800509	1.719617773	0.177056459	4.034436666	0.008019827	9.31380976	0.0017708	17.81274514	0.001714	2.421754508	0.049294	15.40444228	0.0076338	6.484366705	0.001695	1.677980207	0.008726	89.08349561	911.8897451	0.455944873
	Howard	0.00058508	1.86439718	0.000590075	0.211374127	0.000432108	0.009846089	0.000976955	1.134584284	0.0002558	2.572699982	8.43E-05	0.119131717	0.000833	0.260467717	0.0028967	2.460568978	0.000991	0.980903996	0.005323	54.3375824	63.95155646	0.031975778
	Jack	0.00217756	6.93892673	0.002196145	0.786693735	0.001608224	0.036645243	0.003636037	4.22270389	0.0009519	9.575093167	0.000314	0.443385277	0.003102	0.96941061	0.0107811	9.157763198	0.003689	3.6507355	0.01981	202.2340023	238.0153596	0.11900768
	Jones	0.04250012	135.429332	0.000851025	0.304850605	0.031388236	0.715217344	0.00142174	1.651134678	0.0003139	3.157809957	0.000304	0.429324084	0.008739	2.730870556	0.0013533	1.149536334	0.000301	0.297469175	0.001547	15.79255456	161.658099	0.08082905
	Lamar	0.00107998	3.44142605	0.001089139	0.390168165	0.000797614	0.018174553	0.001803327	2.094289754	0.0004721	4.748857614	0.000156	0.219901103	0.001539	0.480788332	0.005347	4.541878887	0.00183	1.810616645	0.009825	100.2998576	118.0459587	0.059022979
	Limestone	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Llano	0.00124346	3.96236362	0.047475864	17.0065989	0.000918351	0.020925682	0.083198331	96.62220877	0.000769	7.735462928	0.00221	3.122407826	0.00066	0.206243697	0.0011535	0.979789473	0.00025	0.24712425	0.001141	11.64506331	141.5481885	0.070774094
	McLennan	0.02303137	73.3909119	0.023227961	8.320619724	0.017009692	0.387585558	0.038457253	44.66225131	0.0106675	101.2728404	0.003319	4.689550858	0.03281	10.25316039	0.1140288	96.85886862	0.039015	38.61271607	0.209526	2138.967369	2517.415874	1.258707937
	Milam	0.00165249	5.26577057	0.001666598	0.597001363	0.001220439	0.027809119	0.002759294	3.204499882	0.0007223	7.266288549	0.000238	0.336473526	0.002354	0.735660436	0.0081815	6.949587716	0.002799	2.770447984	0.015033	153.4701114	180.6236505	0.090311825
	Mitchell	0.01696145	54.0487426	0.017106233	6.127721021	0.012526789	0.285437414	0.028321847	32.89151833	0.0074142	74.58239095	0.002444	3.453620082	0.024163	7.55094074	0.0839765	71.33172108	0.028733	28.43633765	0.154305	1575.24268	1853.95111	0.926975555
	Nolan	0.00060327	1.92236722	0.000608422	0.217946421	0.000445544	0.010152235	0.001007331	1.169862118	0.0002637	2.652693409	8.69E-05	0.122835901	0.000859	0.268566487	0.0029868	2.537075896	0.001022	1.011044122	0.005488	56.0271107	65.94001381	0.032970007
	Palo Pinto	0.00307488	9.79829738	0.00566337	2.028707885	0.002270935	0.051745897	0.00906471	10.5272822	0.0037988	38.21324801	0.001096	1.549333493	0.029483	9.213496123	0.1180115	100.2418393	0.001211	1.198332149	0.005512	56.26532863	229.0876111	0.114543806
	Pecos	4.2262E-05	0.13466984	4.26225E-05	0.015268056	3.12122E-05	0.000711206	7.05678E-05	0.08195372	1.847E-05	0.185832235	6.09E-06	0.008605167	6.02E-05	0.018814202	0.0002092	0.177732746	7.16E-05	0.070853027	0.000384	3.924932731	4.619372929	0.002309686
	Presidio	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red River	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Robertson	0.00035926	1.14479669	0.000406685	0.145680925	0.000265328	0.006045798	0.000358385	0.416210184	0.0015339	15.42969209	0.000356	0.502966804	0.000371	0.115791777	0.0009089	0.772020523	0.093323	92.36002704	0.001655	16.89186956	127.7851014	0.063892551
	Taylor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Titus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tom Green	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Upton	3.2238E-05	0.10272827	3.25131E-05	0.011646712	2.38092E-05	0.000542519	5.38302E-05	0.062515584	1.409E-05	0.141755745	4.65E-06	0.006564157	4.59E-05	0.014351769	0.0001596	0.135577328	5.46E-05	0.054047801	0.000293	2.994000288	3.52373017	0.001761865
	Ward	0.01980763	63.1182518	0.0199767	7.155967363	0.014628815	0.333334499	0.033074321	38.4107943	0.0086584	87.09749573	0.002854	4.033145848	0.028218	8.818006777	0.098068	83.30135563	0.033554	33.20802358	0.180198	1839.572195	2165.048457	1.082524285
	Webb	0.01418005	45.1856121	0.000283942	0.101712539	0.010472596	0.238630237	0.000474359	0.550896398	0.0001047	1.053594328	0.000101	0.143242762	0.002916	0.911147209	0.0004515	0.383539535	0.0001	0.099249746	0.000516	5.269141	53.93676584	0.026968383
	Wharton	0.00015439	0.49197345	0.000191235	0.068503494	0.000114024	0.002598166	6.43902E-05	0.074779397	0.0011702	11.77096616	0.000266	0.37566499	0.000107	0.03337845	6.777E-05	0.057569205	8.17E-05	0.08087392	0.000112	1.14564521	14.10195244	0.007050976
	Wichita	0.00021984	0.70054346	0.000221719	0.079423398	0.000162364	0.003699648	0.000367089	0.426317735	9.61E-05	0.966686781	3.17E-05	0.0447635	0.000313	0.097870214	0.0010884	0.924553704	0.000372	0.36857268	0.002	20.41723596	24.02966715	0.012014834
	Wilbarger	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Wise	0.00291847	9.29989213	0.002955932	1.058861128	0.002155421	0.049113763	0.004892446	5.681832082	0.0012878	12.95395067	0.000424	0.598768651	0.004281	1.337673083	0.0149528	12.70131261	0.004924	4.873516491	0.026441	269.9209111	318.4758317	0.159237916
	Young	0.00549666	17.5154553	0.005543579	1.985796861	0.004059529	0.092501065	0.009178198	10.65908086	0.0024027	24.1697488	0.000792	1.119206944	0.00783	2.447016495	0.0272141	23.11631148	0.009311	9.215300409	0.050005	510.4853758	600.805794	0.300402897
	Total	**1.14303735**	**3642.36081**	**1.154658244**	**413.6166911**	**1.089429227**	**24.82390781**	**1.180868675**	**1371.399379**	**1.5393506**	**15484.85682**	**1.443965**	**2040.4748**	**1.481727**	**463.041372**	**1.2697054**	**1078.519021**	**1.151969**	**1140.076478**	**1.517783**	**15494.444**	**41153.61328**	**20.57680664**
Energy Savings by PCA (MWh)		3186.56324		358.2156825		22.7861592		1161.34792		10059.344		1413.105		312.5011		849.4246		989.6767		10208.61	28561.56986		

RESULTS

Table 7 provides a summary of the energy savings from replacing incandescents with Compact Fluorescent Lamps in the state of Texas.

Table 7: Summary of Energy Savings

CFL Savings Calculation	Value	Unit	Reference
Total Housing Units in Texas:	10,204,056		(Real Estate Center, Texas A&M University, U.S. Census Bureau)
Average Lighting Electricity Usage per Unit:	1,946	kWh/yr	(NREL Building America Program)
% of Lamps that can be Retrofitted to CFL:	70%		(NREL Building America Program and ESL Assumption)
% of Savings from Replacing Incandescent to CFL:	75%		(ESL Assumption)
CFL Lighting Electricity Savings per Unit:	1,022	kWh/yr	
Total CFL Savings in Texas:	***10,424,973***	**MWh/yr**	

For an average size house in the U.S., the total energy consumption is estimated to reduce by 1022 kWh/yr through CFL retrofits. With over 10.2 Million residential housing units in the State of Texas in 2013, the total savings are estimated to about 10.4 Million MWh/yr and 28,562 MWh/day. The NO_x emissions reduction from CFL retrofit would be 7,712 tons annually and 20.6 tons per day for the Ozone Season Days.