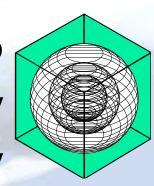
EMISSIONS REDUCTION IMPACT OF RENEWABLES

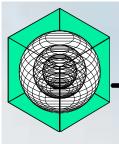
October 2012

Jeff Haberl, Bahman Yazdani, Charles Culp

Energy Systems Laboratory

Texas A&M University





ACKNOWLEDGEMENTS

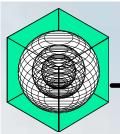
Faculty/Staff: Juan-Carlos Baltazar, Jaya Mukhopadhyay, Hyojin Kim, Patrick Parker, Vic Reid, Gali Zilbershtein, Rose Sauser, Stephen O'Neal, Tammy Jennings, Larry Degelman, Ed Dryden, Shirley Muns, Tom Fitzpatrick

Students: Chunliu Mao, Sung Lok Do

TCEQ: Vince Meiller, Bob Gifford

ERCOT: Warren Lasher

USEPA: Art Diem, Julie Rosenberg



RENEWABLES



Solar PV



Solar Thermal



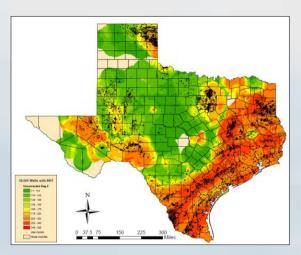
Hydro



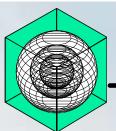
Biomass



Landfill Gas



Geothermal



RENEWABLES

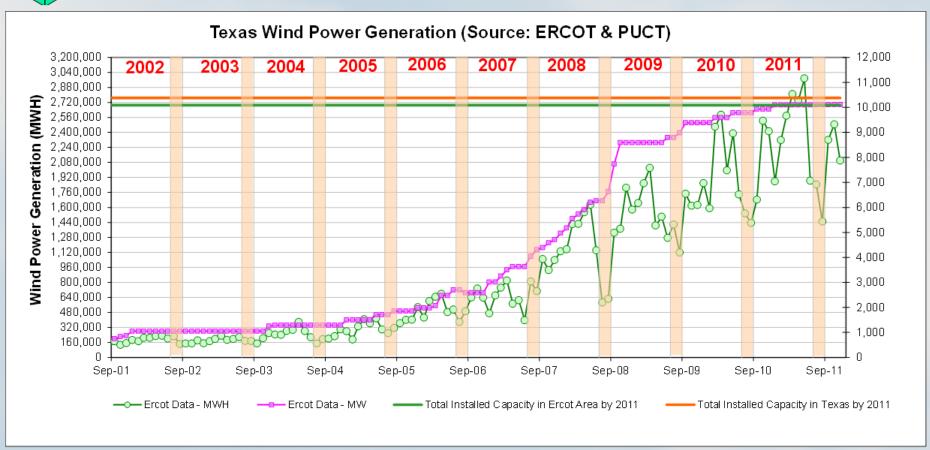


Biomass

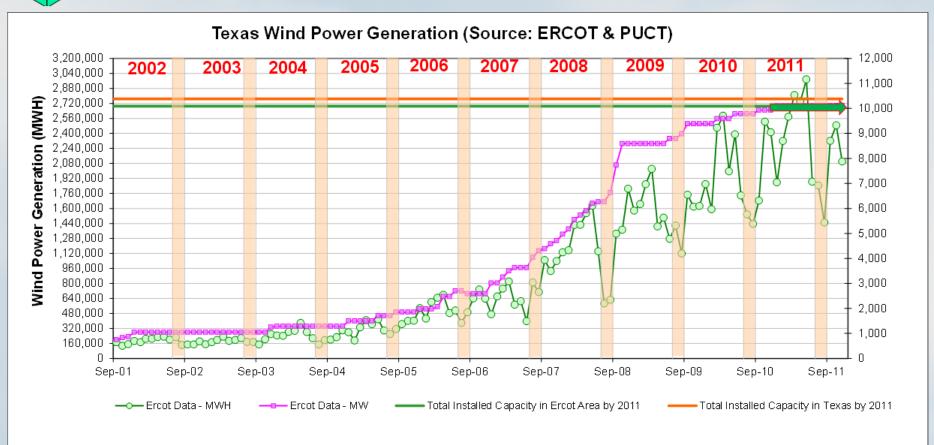
Energy Systems Laboratory © 2012

Geothermal

Substantial increases in measured electricity from wind energy.

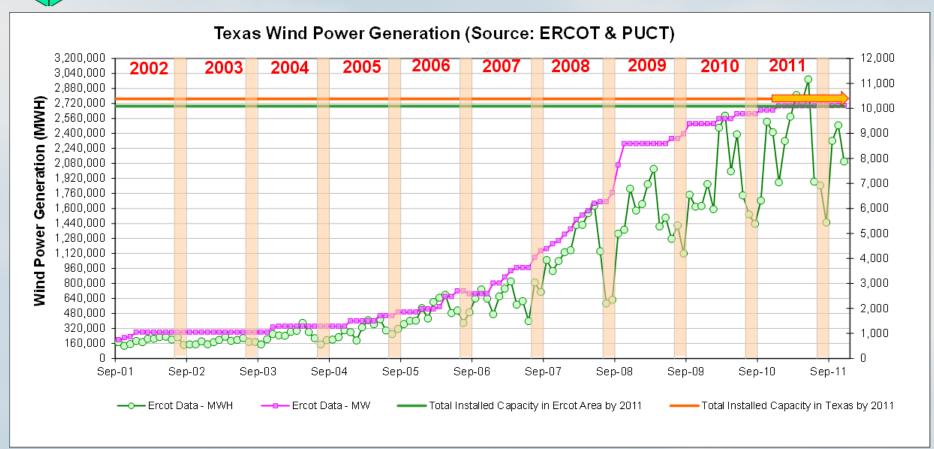


Substantial increases in measured electricity from wind energy.



Total capacity: 10,088 MW/month in ERCOT

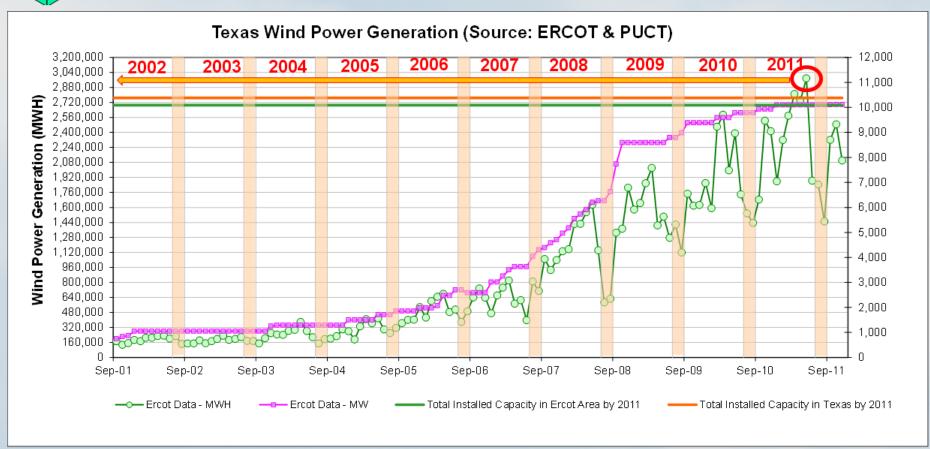
Substantial increases in measured electricity from wind energy.



Total capacity: 10,088 MW/month in ERCOT

10,380 MW/month in Texas

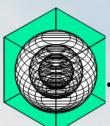
Substantial increases in measured electricity from wind energy.



Total capacity: 10,088 MW/month in ERCOT

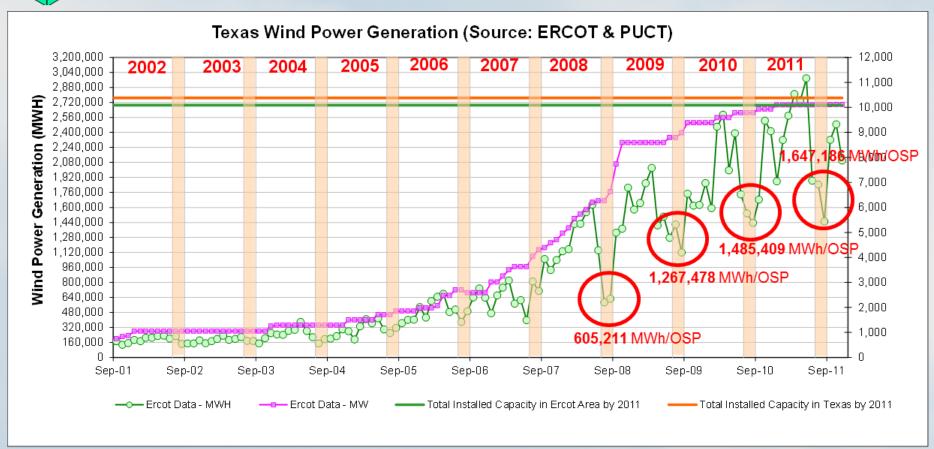
10,380 MW/month in Texas

New peak wind power generation in 2011: 2,975,145 MWh/month



ESL-KT-12-10-36 **WIND PROJECTS IN TEXAS (2011)**

Substantial increases in measured electricity from wind energy.

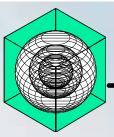


Total capacity: 10,088 MW/month in ERCOT

10,380 MW/month in Texas

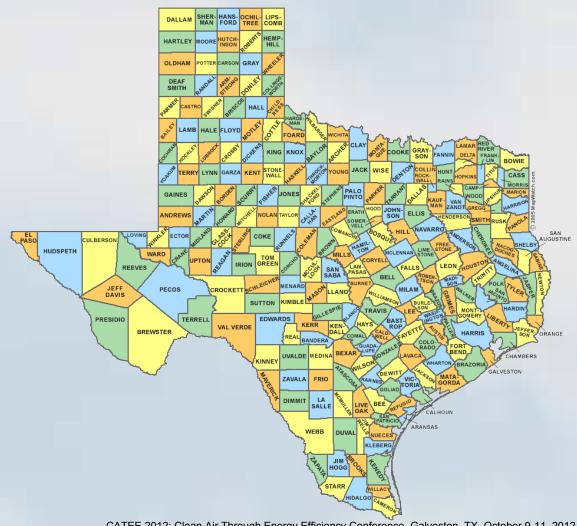
New peak wind power generation in 2011: 2,975,145 MWh/month

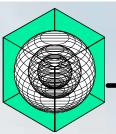
Average Ozone Season Period (OSP) power generation increasing



WIND PROJECTS IN TEXAS

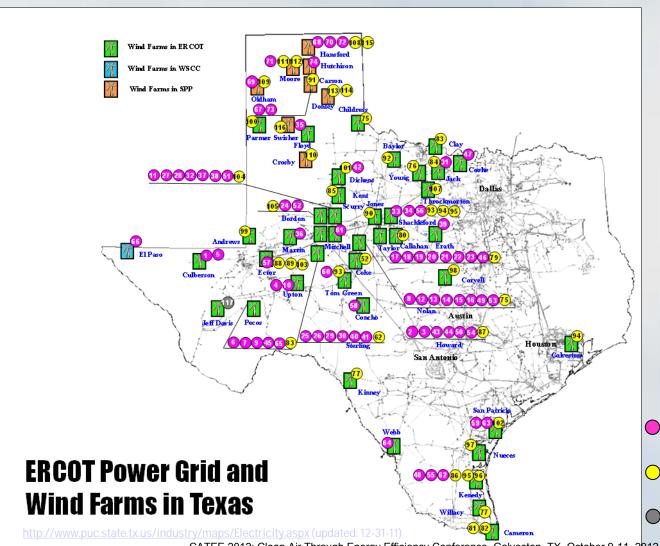
Completed, Announced, and Retired Wind Projects in Texas, as of December 2011



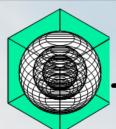


WIND PROJECTS IN TEXAS

Completed, Announced, and Retired Wind Projects in Texas, as of December 2011

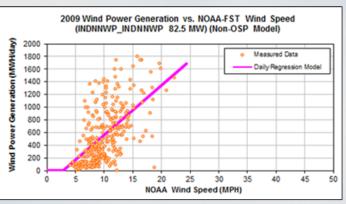


- 74 Wind Projects Completed
- 42 Wind Projects Announced
- 1 Wind Project Retired

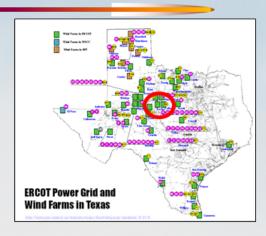


NOX EMISSIONS REDUCTIONS FROM WIND

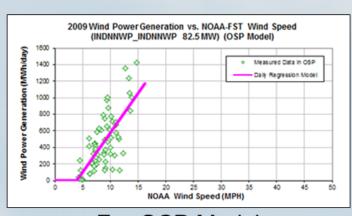
Regression Analysis for Indian Mesa



IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-224.9053
Left Slope	
(MWh/mph-day)	78.4270
RMSE (MWh/day)	356.9138
R2	0.3307
CV-RMSE	62.5%

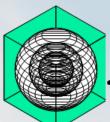


For Non-OSP Model



IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-376.8179
Left Slope	
(MWh/mph-day)	95.0668
RMSE (MWh/day)	238.3325
R2	0.5038
CV-RMSE	50.9%

For OSP Model



NO_X EMISSIONS REDUCTIONS FROM WIND

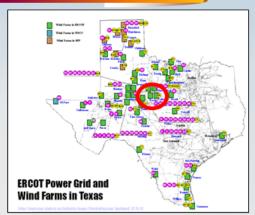
Regression Analysis for Indian Mesa

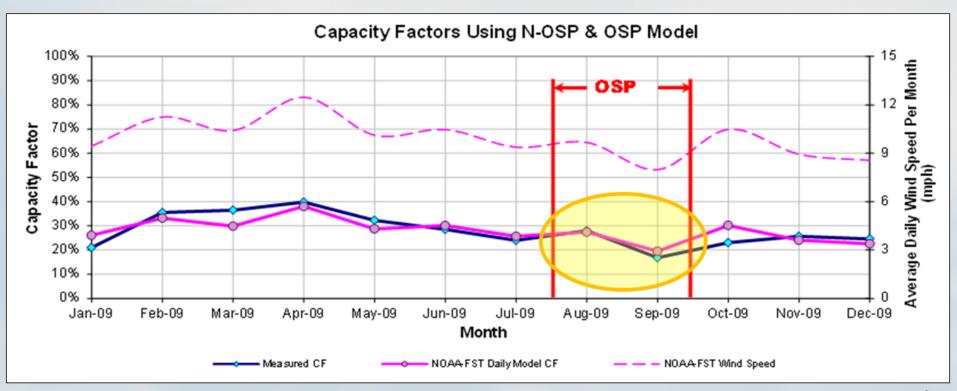
Annual

1999 Estim ated MWh/yr (2009 Daily Model) 2009 Measured MWh/yr 201,716

OSD

1999 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
570	469

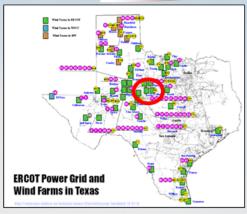


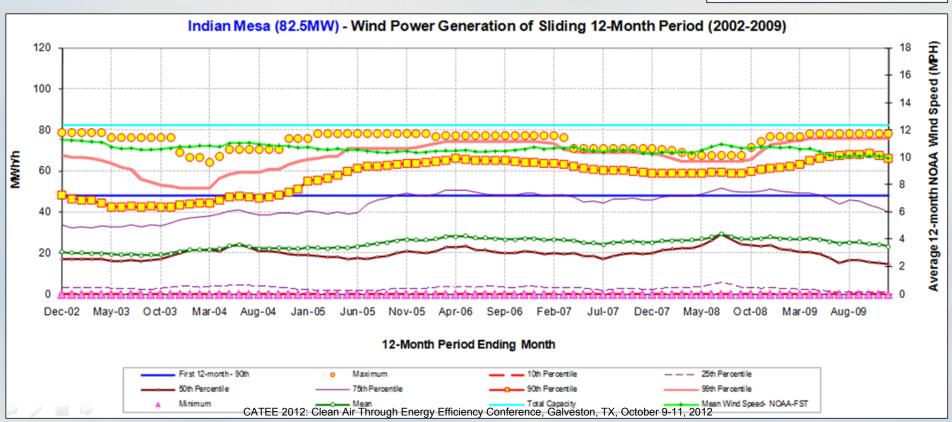


E E

Example: Indian Mesa

: 82.5 MW



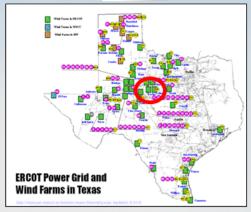


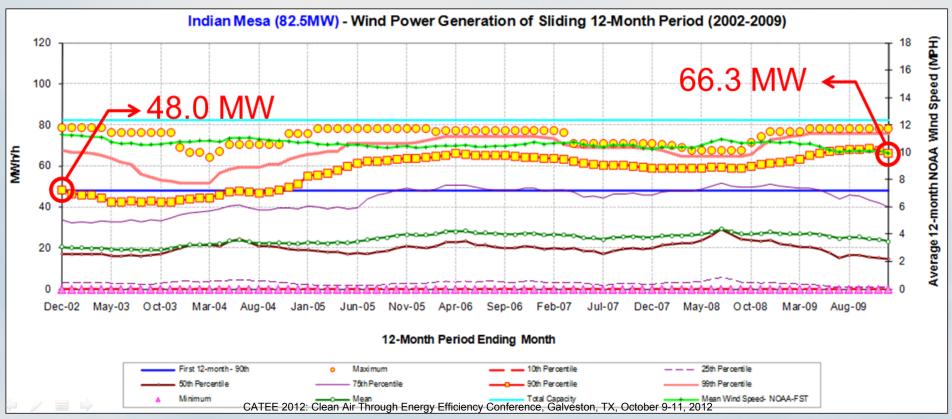
TRACKING WIND POWER GENERATION

Example: Indian Mesa

: 82.5 MW

: Is There Degradation?



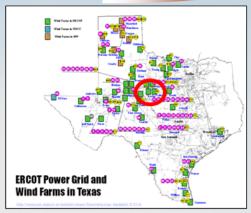


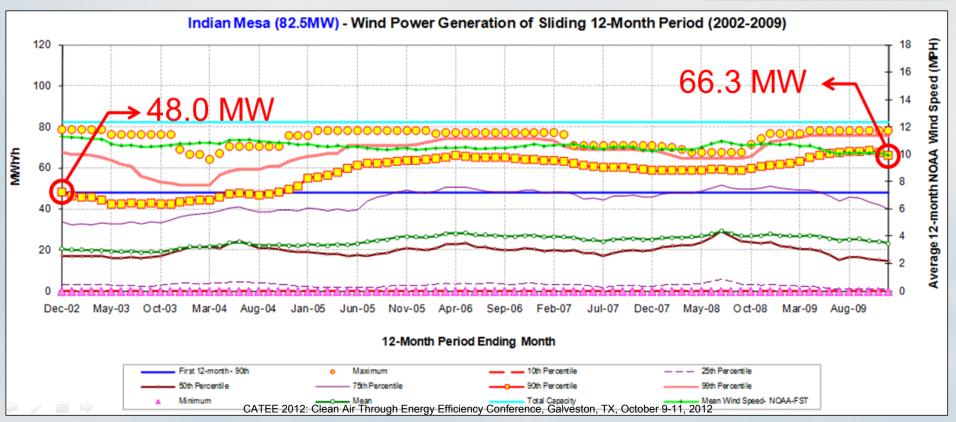
TRACKING WIND POWER GENERATION

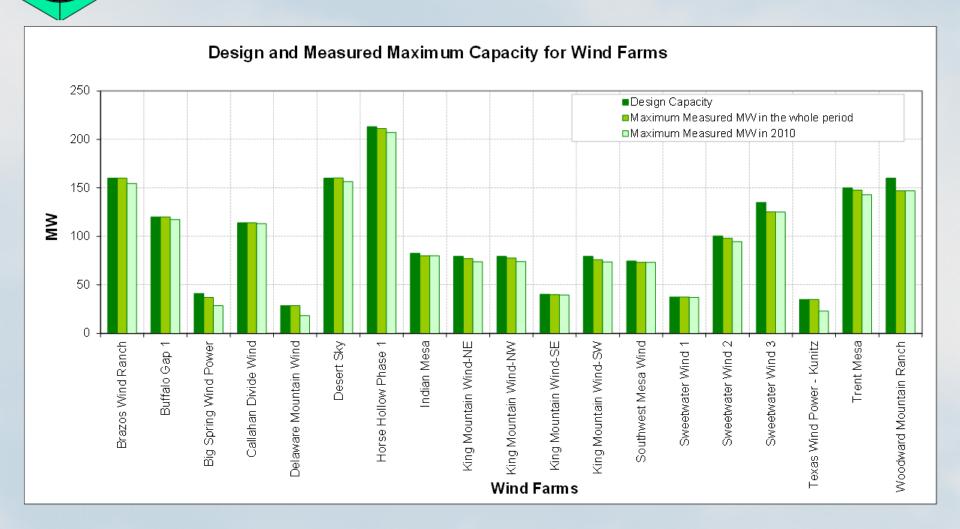
Example: Indian Mesa

: 82.5 MW

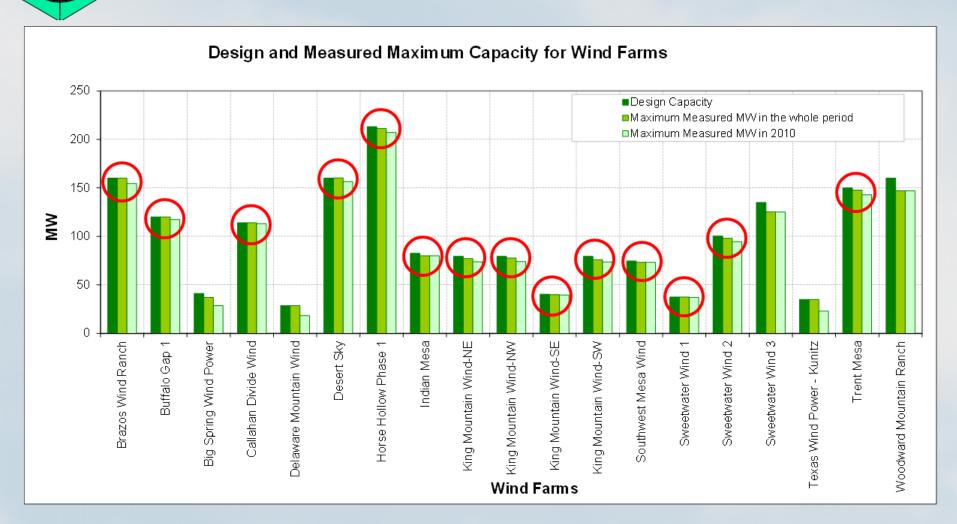
: Is There Degradation? NO!



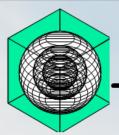


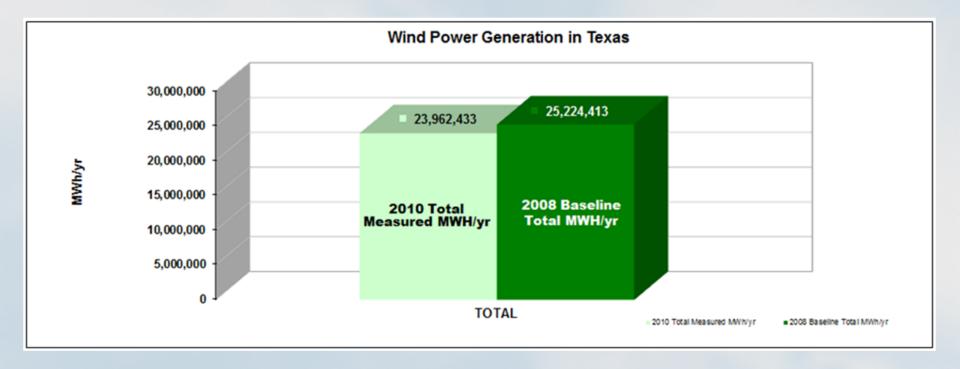


Design and Measured Maximum Capacity

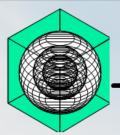


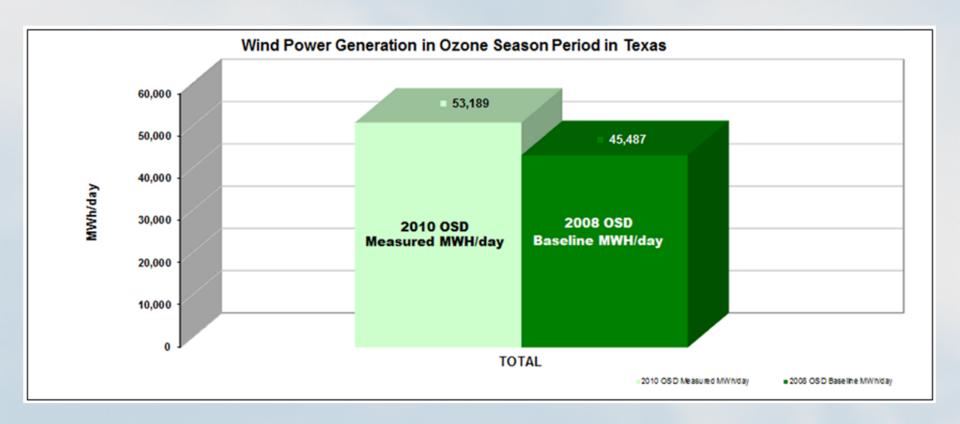
Design and Measured Maximum Capacity



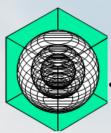


2008 Calculated from 2010 Measured Annual Power Production





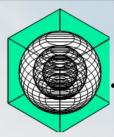
2008 Calculated from 2010 Measured OSD Power Production



NOx REDUCTIONS USING eGRID

NOx Emissions Reductions Calculation

	T	American	I											a-uts									
		Electric				Brownsville		Lower		Rellant		san		South		Texas		Texas-New					
	1 .	Power -	NOx	Austin	NOx	Public Utils	NOx	Colorado	NOx	Energy	NOx	Antonio	NOx	Texas	NOx	Municipal	NOx	Mexico	NOx	TXU	NOx	Total Nox	Total Nox
Area	County	V⊌st	Reductions	Energy/PCA	Reductions	Board/	Reductions	River	Reductions	HL&P/	Reductions	Public	Reductions	Electric	Reductions	Power	Reductions	Power	Reductions	Electric/	Reductions	Reductions	Reductions
		(ERCOT)	(lbs)	Eller Mill CX	(lbs)	PCA	(lbs)	Auhotrity	(Ibs)	PCA	(lbs)	Service	(lbs)	Coop	(lbs)	POOUPCA	(lbs)	CO/PCA	(Ibs)	PCA	(lbs)	(lbs)	(Tons)
		1-11-11				PCA		/PCA		PCA		Bd/P CA		INC/PCA		PODIFCA		COPCA					
_	Viscoria.	/P CA	54.2155459	0.011808715		000000000		000000000	1,177548149	0.071001761		0.018140991		0.008781038		0.005179719		DEPONSORY		0.008771859	28, 280 388 74	83 843 (638)	0.041696669
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	Williamson	0.00050760	2.015049295	0.290194277		0.000374692		0.022779905	8.359400533	0.000222125				0.000269063		0.000-69526		0.0001 0.2541	- 0	0.000465129	1.49037404	12.70209027	0.006531545
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Ares	San Patricio	0.09933088	212.2656245	0.001101949		0.040884338	0	0.001 850982	0.511208023	0.00040889	0	0.000365558	0	0.01127698	0	0.001761676	0	0.000391315	0	0.002014018	6.ASS1265	220 38879 7	0.160194319
Victoria Ar		0.0206047 St 2.56527G-0		0.002090584 2.587169-05		0.0 15217528 1.5 9456G-05		0.003 408874 4.283 426-05	0.94147 6252	0.001131941 1.12134 G-05	0	0.00052405.5	0	0.495811308 3.65442G-05		0.03 0584062		0.000449952 434569-05		0.002127635	6.8547756.28 0.7518765.28	124.4995555 0.909000571	0.082249794
	Andrews	2.58527G-01	0.14529422			0.000221425		4.283.429-05 0.000.538817	0.011830128	0.000140531		4.632396-05		0.000487988		0.000127007		4,345 69-05 0,0005 44609		0.000233373	9.422535772	11,39195539	0.0004545
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	Cahoun	0.08852524	501.3954907 309.8585854	0.001772835 0.001094762		0.065379541	0	0.0 029814	0.817891094	0.000653 873 0.000603 825		0.000632631	0	0.01820231	0	0.00 2515559	0	0.0006 26074	0	0.003222277	10.38147317	512.5978549 318.5751084	0.258298927
	Charokee	0.00467228	19.89728703	0.001024162		0.2 85823104		0.001 828931	0.505121184 1.620072495	0.000403825		0.00039083		0.011241581		0.001740904		0.0003 86657		0.001990046	102.98547.25	124,482812	0.158287599
	Coke	0.00251252	12.02120102	0.00254202		0.00238-0.00		0.003003919	1,02001,2480	0.001323011		0.000000191		0.000000000		0011282813		0.003831000		0.021839174	102.303-1.23	127702012	0.002241400
	Coleman	0.00135509	7.675152545	2.713466-05		0.0 01000501		4,533 166-05	0.01251955	1.00092 6-05		9.687056-06	0	0.000218632	0	4.3 14956-05	0	9,5838 29-08	0	4.93256-05	0.1589143	7.848588705	0.003923293
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	Ector	0.0038292 8 0.0076285 N	20,555500029 43,20715293	0.003660242		0.0 02650373		0.008 080081	1.813891498	0.001588454		0.000522644		0.005170172		0.01 7988982		0.008145021		0.033016916	108.31328.88 223.59090.81	125.6021164 270.3161003	0.084301389
	Fayete	0.00162651	42.20110292	0.007693632		0.000022999		0.012737922	2.31000 9209	0.00223434		0.001099201		0.010061422		OUR Frederic		0.012922021	- 0	0.000299170	223.390,9001	210.3161003	0.12513003
	Freezione	0.00317443				0.002767588	- 6	0.008302484	1.74083 9158		1	0.000943882	i	0.005316916	- i	0.01 8887308		0.0000 93940	- 6	0.034337593		122,7485556	
	Frie		83,62098161			0.010903753		0.002442541	0.614502125			0.000319499	0	0.355261631	0	0.021914212		0.0003 22402		0.0015245.08		89.20717798	0.044500559
	Grimes	0.0005544.2	2.140205538	0.001021149		0.0 00409461		0.001 634436	0.45140.5054	0.000654949		0.00019769	0	0.005316025		0.021278368		0.000218322		0.000993776	1.201729454	6.792340044	0.00339887
	Hardeman Haskel	+		+ + +		1 .		0				- 8		- 8				- 8		- 2			- 2
	Hidelgo	0.23913699	1357.847318	0.004800508		0.177058459		0.008/019821	2.214941281	0.001770768		0.001713762		0.049294041	0	0.00 16888894		0.0018195460	0	0.008126314	28.11427588	1388,178539	0.68408627
	Howard	0.0005550 8	3.313541525			0.000432108	0	0.000 976955	0.259519165	0.000255752		8,430496-05	0	0.000833494	0	0.00 2595145	0	0.000991136	0	0.005322723	17,145651 05	20.73231204	0.010388158
	Jack	0.0021775.5	12,33348018	0.002198145		0.001605224	0	0.003 636037	1.004214899 0.392881889	0.000951 551	0	0.000313767	0	0.003102103	0	0.01 0781137	0	0.0036 55516	0	0.01981015	63,82397198 4,984048949	77.16166705- 246.0233261	0.038580834
Other 86		0.04250012				0.0 31388238		0.00142174	0.392881889 0.498049835			0.000303816		0.008738795		0.001353312		0.0003 00572		0.001546985	4,984045949 31,65409988		0.123046863
counte	Limestone			0				0	0			0	0	0				0			0	0	0
	Liano	0.00124341	7.042837474	0.047475564		0.0 00918251	0	0.083 198331	2297504064	0.000765 953		0.002209807	0	0.000659917	0	0.001153474	0	0.000249702	0	0.00114071	3.675119542	22.69599196	0.016547999
	McLennan	0.02303138	130,4474588	0.023221981		0.0 17009692		0.008457250	1 05212 7414	0.01008794		0.000318814	0	0.002354105	0	0.11 4025501		0.0390 15453		0.209525912	875,048888	818,1154214	0.405057711
	Milam Mitchell	0.00165249				0.001220439		0.002 759294	0.76207 2503 7.62203 6563	0.000722342		0.000238109		0.002354105		0.00 8181524		0.0027 99346		0.015033408		58.55597725 601.0282635	
	Nolan	0.00080327	3.41651911	0.000808422		0.000445544		0.001 007331	0.21520 5102	0.000283704		8.692625-05	0	0.00085941	- 0	0.002998817	- 0	0.0010 21955	- 0	0.005455224	17,661657 17	21,27694558	0.010888473
	Palo Pinto	0.00307457	17.4158211	0.00588337		0.0 02270205		0.000008471	2.503527101	0.003795761		0.001096403		0.020483083	- 0	0.11 5011452		0.001210832	- 0	0.0055115.59	17.757037.45	27.67630500	REPRESENTED IN
l .	Pecca	4,228185-0	0.239366612	4.252256-05		3.1 21225-05	0	7.056 756-05	0.0194 8988	1.84738 6-05	0	6.089546-0.6	0	6.020526-05	0	0.00 0209239	0	7.159216-05	0	0.000384473	1.2355575.25	1.497544177	0.000145112
I	Presido Red Rver	_					0	0	0		0		0	0	0	0	0	0	0			0	0
I	Robertson	0.00035925	2.034199814	0.000408885		0.000265526		0.000 358385	0.005055.0000	0.001533588		0.00035593	0	0.000370532		0.00 0908875		0.093 32343		0.00185487	5.330983897	7.484784084	0.003732362
I	Taylor							0				0	0	0				0					0
I	Tha			0			0	0	0			0	0	0	0	0	0	0	0	0	0	0	0
I	TomGreen	1 22192 0	0.189492854	3.781315-05		211000-0	0	0	0.014567034	1 4001012.00	0	4 84875-08	-	4 407445 74	- 0	00000145411	-	0	- 0	0.000000	n outenant	1 14275	0.0000000000000000000000000000000000000
I	Ugton Ward	0.0195076.2		0.0199767		2.380926-05		5.383 025-05 0.033 074321	9.134595491	1 A0919 G-05 0.005858 385		4.64526-06 0.002854101		4.59255E-05 0.025217522		0.000159811		5.4611 65-05 0.0225 54415		0.000293282	550 55916 55	1.142350202 701.8522532	0.000571175
I	Webb	0.01418004	80.31441645	0.000283942		0.010472598		0.000474259	0.121010458	0.000104738		0.000101367	0	0.002915661		0.00 0451529	0	0.0001 00255		0.000516147	1.6529127 53	82,10833989	0.04105417
I	Wherlon	0.00015431	0.81445005	0.000191235		0.0 00114024	- 6	640002000	0.017763551	0.001170150	- 6	0.000385844	0	0.000108811	- 6	6,717445-05	- 1	8.171756-05	- 6	0.000112223	0.381556515	1.253193096	0.0000595599
I	Wichia	0.00021984	1.24516932	0.000221719	1	0.000182384		0.000 387089	0.101384002	9.809845-05	ū	3.187746-03	0	0.000313184	0	0.001055447	0	0.000372417	0	0.002000002	8.4435707 22	7.790124044	0.000889089
I	Wiberger	0.00291847	18 47001808	0 007054077		0002155421	0	0 0004 507445	1 751714977	0.001787.753	0	0.00042772.5	0	0.004280839	0	0.014957543	0	0.0049.24242		0.0284405.77	84 (84400.77	103.0887531	0.051533377
I	Wise Young	0.00549881	21,1225552	0.005543579		0.0 04059550	8		1.351214903 2.534870587	0.001287 753	8	0.000192019	0	0.007830425	- 0	0.027214083		0.0000 11425	- 0	0.050005398	85.185599 22 181.10848 08		
	Lotel	1.1430373 5		1.154658244		1.089423227	U		328.1389314		U	1.443083194	U	1.48172714	U	1269705424	U	1.1519 68562	U	1.517782624	488 9.9638 46	11890.15456	
S Seeting										_				٦ . T				0010					
Saving by PCA		5,653.9	1	0.00	CATE	±E 2012	ı: Clean	Air ∓hr	ough E	nerqy∙€	ttticiend	v Confe	erence.	Galves	ton, TX	i. Octob	er 9-11	. 2012∞		3,221.75			
(MWh)																							

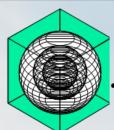


NOx REDUCTIONS USING eGRID

NOx Emissions Reductions Calculation

Area	County	American Electric Power - Vest (ERCOT) /PCA	NOx Reductions (lbs)	Austin Energy/PCA	NOx Reductions (lbs)	Brownsville Public Utils Board/ PCA	NOx Reductions (lbs)	Lower Colorado River Auhotrity /PCA	NOx Reductions (lbs)	Reliant Energy HL&P/ PCA	NOx Reductions (lbs)	San Antonio Public Service BoliP CA	NOx Reductions (lbs)	South Texas Electric Coop INC/PCA	NOx eductions (lbs)	Texas Municipal Power Pool/PCA	NOx eductions (lbs)	Texas-New Mexico Power Co/PCA	NOx Reductions (lbs)	T XU Electric/ P CA	NO x Reductions (lbs)	Total Nox Reductions (lbs)	Total Nox Reductions (Tons)
Houston- Calveston Are	Charters Fort Sand Galveston Harris Liberty	0.021881395 0.05589513 0.027555985 0.077380573	54.2155459 123.9341223 215.4540332 156.0144534 436.1625551	0.027103415 0.065957309 0.033693644 0.09582276	0	0.0 16180356 0.0 41123619 0.0 20351324 0.0 57134232	0	0.009 125898 0.023 225475 0.012 791501 0.032 284145	1.17754 814 2.5204 2556 6.41533 0963 3.53260 6564 8.91083 7853	0.165543.463 0.422127.404 0.201446.635 0.566331.222	0	0.03767749 5 0.09590190 5 0.04561251 5 0.133206 9	0	0.01513807 0.038531479 0.019523885 0.053519883	0	0.00 9805529 0.02 4449302 0.0 1677514 0.03 3939584	0	0.0115 81666 0.0294 19235 0.5946 56509 0.0409 46391	0	0.015905217 0.040484129 0.025709453 0.055232098	25, 260366 14 51, 242134 05 130, 42101 45 92, 495550 52 181, 16152 25		0.226150169
Besumont/ Port Arthur	Monigomery Waler Hardin Jeffers on	0	0	0	0	0	0		20	07	е	G	ric		0	0	0	0	0	0	0	0	0 0
Ares	Orange Colin Dallas Denton Tarrant	0.001763649 0.005045553 0.005045756	28.51192898	0.003151136 0.00305276 0.00117031 0.011705165	0	0.0 01302533 0.0 01726366 0.0 00469535 0.0 014500766	0	0.005 05-01-01 0.005 757265 0.001 874207 0.005 007175	2 A1562 1603 0 31762 3519 7 41512 5 2519	0.002413.087 0.002413.087 0.000785-431 0.008808.984	-	0.000762263 0.000762263 0.000226891		0.015988397 0.009310387 0.009316388 0.008098882	0 0 0	0.06 3755515 0.05 3755515 0.03 3672029 0.02 4399555 0.07 7095512	0	0.0005 46136 0.0052 09179 0.0052 09179	0	0.004013208 0.044002183 0.044002183 0.001139562	12.929617.53 141.76541.69 1.6114236.42 456.42061.02	0 24.31255364 172.7615655 7.760917674 551.6016531	0.012156792 0.056360763 0.003694959 0.275900842
United Fort Worth Area	Ello Johnson Kaufman Parker Rockwall	0.0039 24 0.00 76 0.0084 53 0.0004 532	12 232012 2 232012 2 3744144	- Table 10	W	60 3 (00 3		40 E		0.001531163		0.000504725	th	O Į	iti	001724200 000 E T	=	100 E 1)	0. 0007263 0. 0007263 0. 0007263	102,8613465 1,941145155 190,3015095 2,145560032	124.1223848 4.121405797 230.0103108 5.631617632	0.062061192 0.002065703 0.115035185 0.002915909
B Neso Area	Hender zon Hood Hunt El Pazo Zecer	0.0009502 F1 0.0123278 82 0.0083512 11 0.0311281 14	5.382243956 69.82393943 35.97265051 0	0.008408424	0	0.0 00701818 0.0 0910469 0.0 04690853 0 0.0229895	0		0 A3823 2315 5 85519 5036 2 92696 0122 0 2 3 3269 5512	0.00277 626	0	0.000136926 0.001776337 0.000915153 0	0	0.001353736 0.017562036 0.0090476 0.043667482	0	0.00 4704512 0.06 1035609 0.03 1444954 0	0	0.0016 09173 0.0205 53617 0.0107 59047 0.0004 54041	0	0.112151858 0.057779803 0.052332591	27.852332 23 361.32576 45 186.15325 16 0 7.5150969 3	225.0548622	
San Antonio Area	Comei Guadalupe Witson Bastrop Caldwell	0.0020076 11 0.0020076 11	0 11.37091358 0 25.31490134	0	0	0.0 0145271 0.0 01300936	0	0.134326688 0.134326688 0.299049574	0 27.0955 7027 0 52.5926 5142	0.00124 155 0.002764 046	0	0.00356749 0.00356749	0	0.001085557 0.002372235	0	0.001862326 0.004148062	0	0.0004 02152 0.0004 02152	0	0.001841718 0.00410019	5.933612737 5.933612737 0	54.40339889 0 121.1174993	0.027201698 0.027201698 0.08055875
Austn Ares	Hays Travis Williamson Gregg	0.0024693 53 0.0005076 09 0	13.9551774 2.575049395 0	0.094281013 0.298194277 0	0	0.0 01823727 0.0 00374892 0	0	0.165.221.219 0.033.779905 0	45.6314.5945 9.32946.6233 0.000	0.001527 102 0.000333 135 0	0	0.00438799.8 0	0	0.001310631 0.000269883 0	0	0.00 2290653 0.00 0489528 0	0	0.0004 95576 0.0001 02541 0	0	0.0022653 06 0.0004651 39 0	7.295319499 1.4955745.4 0	86.91595634 13.70309027 0	0.033451918 0.008851545 0
North bast I exast Area Corpus Christ	Harrison Rusk Smith Ugshur I Nueces	0 0 0.2235245.25	0 0 0 1288.021442	0 0 0.00447587	0	0 0 0.1 65052527	0	0 0 0 0.007477478	0 0 0 2.065159113	0 0 0.001651 016	0	0 0 0.00159788.8	0	0 0 0 0.045950479	0	0 0 0 0.00 7117588	0	0 0 0.0015 50524	0	0 0 0 0.0081381 88	0 0 0 26.21301794	0 0 1294.299619	
Victoria Area	San Patricio Victoria Andrews Angelina Scague	0.0553306 86 0.0206047 52 2.565276-0 5 0.0003214 9 0.0009364 53	213.3888245 116.7033366 0.14529422 1.820889418 5.320989764	0.002090584 2.55716E-05 0.000324234 0.001730301	0	0.0 40884326 0.0 15217528 1.5 94569-05 0.0 00237435 0.0 00893528	0	0.001 850982 0.003 408874 4.263 426-05 0.000 538817 0.002 769498	0.94147 6252 0.94147 6252 0.01163 0126 0.14526 0204 0.76459 0264	0.00040 589 0.001131 941 1.12134 6-05 0.000140 531 0.001180 623	0	0.0003553 8 0.00052405 5 1.696325-0 6 4.632395-0 5 0.00033497 9	0	0.01137698 0.495811308 3.654429-05 0.000457988 0.009007821	0	0.00 1761876 0.03 0584062 0.00 0127007 0.00 1591705 0.03 6055459	0	0.0003 91315 0.0004 49932 4 345 65-05 0.0005 44609 0.0003 69939	0	0.0020140 16 0.0021216 35 0.0002333 13 0.0029241 29 0.0016839 19	6.65475636 6.654756326 0.751676526 9.422536772 5.425219917	120.388757 124.499585 0.909000871 11.39195839 11.51107995	0.0004545 0.005695994 0.00575554
	Enerce Calhoun Carreron Charokee Coke	0,001913926 0,055525246 0,054672255 0,003512995	10.840295 501.3954907 309.6555554 19.69726703	0.003525105 0.001772635 0.001094762 0.003542952	0	0.0 0141252 0.0 65379541 0.2 65623104 0.0 02594504	0	0.005 642234 0.0 029614 0.001 626931 0.005 665919 0	1,5552 9416 0,51759 1094 0,50512 1154 1,52007 2495	0.002364 512 0.000653 573 0.000403 525 0.001535 611	0	0.00085244.5 0.00085283.1 0.0005988.3 0.00050815.1	0	0.015291436 0.01520231 0.011241561 0.005004526 0	0	0.07 3454996 0.00 2515559 0.00 1740904 0.01 7292915 0	0 0	0.000 75367 0.0006 26074 0.0003 56657 0.0059 51066	0	0.0034306 12 0.0032222 77 0.0019900 46 0.0319591 74	11.052651 55 10.351473 17 6.41142177 102.96547 25 0	23.45121011 512.5916549 216.5151984 124.45251 2	0.011725835 0.256295927 0.156287599 0.062241406 0
	Coleman Crockett Ector Fannin Fayete	0.0012550 99 0 0.0035292 54 0.0075255 16	7.675152545 0 20.55550029 43.20715293	2.713466-05 0.003660242 0.007693632	0	10800010 0.0 0 17100850 0.0 00011860 0.0	0	4.533 16G-05 0 0.006 060081 0.012 737922 0	0.0125 1956 0 1.61369 1495 3.51600 9209 0	1,00092 G-05 0 0,001556 434 0,003334 599 0	0	9.65705G-06 0.00052294-4 0.00109920-1	0	0.000275632 0 0.005170172 0.010567422 0	0	4.3 14959-05 0 0.01 1985562 0.03 1765945 0	0	9,5838 25-08 0 0,0081 45027 0,0129 22521 0	0	4.93256-05 0.033016916 0.069399716 0.069399716	0.15591-43 0 108:31326-86 223:59090-81 0	7.846586705 0 126.6027784 270.3161003	0.003923293 0 0.084201389 0.12515805 0
	Freezione Frio Grimes Hardeman Haskel	0.002774434 0.014763636 0.000354424 0	21,3760323 83,62096167 3,140205536 0	0	0	0.0 02787555 0.0 10903753 0.0 00409467 0	0	0.006 302484 0.002 442547 0.001 634436 0	1,74083 9158 0,81459 2128 0,85140 5054 0	0.001649 592 0.000511 065 0.000654 949 0	0	0.00054356 2 0.00037549 9 0.0001976 9 0	0	0.005376976 0.355261637 0.005316025 0	0	0.01 5657305 0.02 1914272 0.02 1276365 0	0	0.0003 23402 0.0003 23402 0.0002 18322 0	0	0.0343315 93 0.0015245 08 0.0009937 76 0	110 82821 81 4.9118241 82 3.2017294 94 0	133,7465656 89,20717796 6,793340044 0 0	0.088873445 0.044803585 0.00339867 0
Other BCOI	Fidalgo Howard Jack Jones Larrer	0. 2397369 98 0. 0005850 81 0. 0021775 58 0. 0425001 24 0. 0010799 8	1357.547316 3.313541525 12.33345016 240.7166165 6.116905624	0.000590075	0	0.0 00432108 0.0 00432108 0.0 01605224 0.0 31355236 0.0 00797614	0	0.005 019527 0.000 976955 0.003 636037 0.001 42174 0.001 503327	2 21494 7257 0 26951 9165 1 100421 4599 0 29265 1659 0 A9504 9525		0	0.001713782 8.430496-0.5 0.000313787 0.000303818 0.000155616	0	0.049294041 0.000823494 0.003102102 0.008128755 0.001528517	0	0.00 7633834 0.00 2696748 0.01 0781137 0.00 1353312 0.00 5347007	0	0.0016 95453 0.0009 91136 0.0036 55516 0.0003 00572 0.0016 29503	0	0.0087263 14 0.0053227 23 0.01981 015 0.001546985 0.00982 503	28.114275 88 17.148831 05 83.823971 98 4.9540439 49 31.854099 88	77.16166705	0.038580834
	Limestone Lisno McLennan Mism Mishel Notes	0.00124346 0.023031386 0.001652492 0.01652492 0.016981453	7.042531414 130.4474555 9.35955525 96.05504012 2.41651911	0.047475884 0.023227581 0.001688598 0.017108233 0.000808422	0	0.0 00918291 0.0 17009892 0.0 01220439 0.0 12326789 0.0 00443544	0	0.083 198331 0.038 457253 0.002 759294 0.025 321847 0.001 007231	2 2.9780 4084 1 0.8212 7474 0 .76207 2503 7 .82203 8583 0 .27820 8102	0.000765 963 0.01006 794 0.000722 342 0.000741 424 0.000263 704	0	0.00220980 7 0.00221881 4 0.00023810 9 0.00244399 3 8.692826-0 5	0	0.000859977 0.032509997 0.002354105 0.002354105 0.00085941	0	0.00 1153474 0.11 4028801 0.00 5151524 0.05 3976519 0.00 2956517	0	0.000249102 0.039013483 0.002199346 0.025132956 0.001021983	0	0.00114 071 0.2095299 12 0.0150334 06 0.1543053 73 0.0054882 24	2.675119542 675.046655 45.43434522 457.1351542 17.65163717	23.69599796 516.1154214 56.55597725 601.0252635 21.27694556	0.016547999 0.405057711 0.029277959 0.300514132 0.010655473
	Palo Pinio Pecos Presido Red River Robertson	0.0030748 79 4.226159-05 0 0.0003592 57	17.4158211 0.239366612 0 0 2.034799814	0.00588337 4.262256-05 0	0	0.0 02270925 2.1 21225-05 0 0.0 00285028	0	0.009 08471 7.056 75G-05 0 0	2 50352 7101 0.0194 5965 0 0 0.09595 0293	0.003198161 1.54738 (-05 0 0.001533 887	0	0.001098403 6.05954G-06 0 0.00035593	0	0.029453083 6.020526-05 0 0 0.000370532	0	0.11 8011483 0.00 0209239 0 0 0.00 0908875	0	0.001210832 7.159216-05 0 0 0.09332243	0	0.003511539 0.000354473 0 0.000354673	17.757037 45 1.2356576 26 0 0 5.3309636 97	17.67636565 1.497544177 0 0 7.484764064	0.018838193 0.000748772 0
	Taylor Titus TomGreen Uglon Ward	1 22385-05 0.0198076.26	0.182592854 112.1854893	0 0 0 1.251316-05	0	0 0 23 50925-05 0.0 14625515	0	0 0 0 5383025-05 0.033074321	0 0 0 0.01456 0.01456 0.01456	0 0 0 1.40919 \$-05 0.008655 365	0	0 0 4.84525-08 0.002854101	0	0 0 0 4.50255-05 0.028217522	0	0 0 0.00 0199811 0.00 019981	0	0 0 5.4811.8505 0.0335.54415	0	0.0002932 82 0.1501981 87	0.944590515 550.5591655	0 0 0 1.142350202 701.8522532	0 0 0 0.000571175
	Webb Wharbn Wichts Wiberger Was	0.014150046 0.00015439 0.000219543 0.0002195471	50.31441545 0.87445005 1.24516932 0 16.52993696	0.000283942 0.000191235 0.000221719 0.002285932	0	0.0 10472598 0.0 00114024 0.0 00182384 0 0.0 02155421	0	0.000 474359 6.439 025-05 0.000 367059 0 0.004 592446	0.13101 0455 0.01776 3531 0.10135 4002 0	0.000104 738 0.001170 153 9.80954 6-05 0	0	0.000101387 0.000265844 3.187749-05 0.00042372.5	0	0.0029156611 0.0001066111 0.000313184 0 0.004250539	0	0.00 0451529 6.7 77446-05 0.00 1088447 0 0.01 4952843	0	0.0001 00255 8.1717 56-05 0.0003 72417 0 0.0049 24352	0	0.000516147 0.000112223 0.002000002 0 0.002000002	1.8529127 53 0.3815595 15 6.4435707 22 0 55.155599 22		0.04105417 0.000828897 0.003895082 0 0.051533377
ms Emergy Savings	Young Total	1.1430373 55	31, 13255532 8474,U53786	0.005542579 1.154656244	CATE	0.0 04059529 1.0 89429227	. Class	0.009 176196 1.180 868675	2 5345T 056T 3 26.1389314	0.002402716 1.599350626	0	0.000192019 1.443063194	0	0.007830425 1.48172714	4 TV	0.02 1214063 1.26 9705424	0 11	0.0093 11425 1.1519 68562	Ü	0.0500053 98 1.5177826 24	181 .10848 08 488 9.3638 46	194, 7735565 1165U .15456	0.097358943 5.845UTTZKZ
byPCA (MWh)		5,663.90		0.00	CATE	IE 2012	. ciean	AIT MA	ougn E	nergy	inciend	y Confe	erence,	Galves	ion, TX	, Octob	er 9-11	, 2012∞		3,221.76			





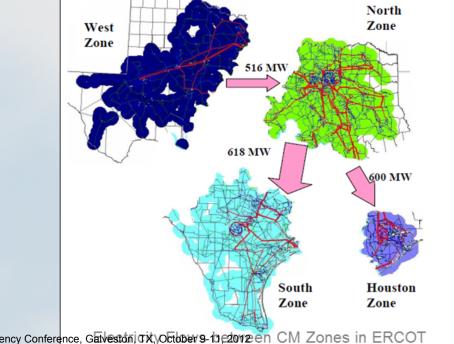
Energy System

NOx REDUCTIONS USING eGRID

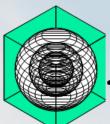
NOx Emissions Reductions Calculation

										F	T
Area	Oounty		н		CM Z	ones v	v			Total lox Maductions (lbs)	Total Nox Reduction (Tona)
	Brazoria									0.00	0.0
	Chambers	0.0204500		0.0000026		0.0000001		0.0001916	0.0000	0.00	0.0
Houston-	Fort Band Galveston	0.0313863	0.0000	0.0000029	0.0000	0.00000002	0.0000	0.0002937	0.0000	0.00	0.0
Galveston Area	Herb	0.1486911	0.0000	0.0000189	0.0000	0.0000000	0.0000	0.0013930	0.0000	0.00	0.0
	Liberty	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.00	0.1
	Montgomery	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.00	0.1
	White	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.00	0.
	Hardin	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.00	0.
Beaum ont/ Port	Jeff erech	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.00	0.
Arthur Area	Orang	.0000000	0.0000	0.000			0.0000	0.000	0.0000	0.00	0.
	Calls	DOT: N		0.007455	0 00 0 00 0 00	1 000 St	0.00*		1 0	0.00	0.1
	Date	- E A	W	0.01557	0. 00	200 SE	0.0 40	10 SEE		0.00	0.
	Dentor	10 AC-	- 1414	0.00	W 00	000 15	0.0 0	70.00 VER	0000	0.00	0.
	Terrent	0.000000	0.000	0.00	0.0000	0.0001800	0.0000		0.0000	0.00	0.
	Cia Cia			DADES DE CONTRA			0.00000			0.00	0.
Dellas / Port	Johnson	0.0007256	0.0000	0.0044512	0.0000	0.0002150	0.0000	0.0000454	0.0000	0.00	0.
Worth Area	Kaufman	0.0059718	0.0000	0.0366343	0.0000	0.0017895	0.0000	0.0003738	0.0000	0.00	0.
	Pericer	0.0000012	0,000	0.0000075	0.0000	0.0000004	0.0000	9.00000001	0.0000	0.00	0.
	Plackwell	0.07 000	400	0.0000000	0.0000	0,0000000	0.0000	.00000000	0.0000	0.00	0.
	Hender son	07 .6 00	0,0000		101		40.00	-00 ar 100 ar	933 0		0.
	Hood		(8000)	0 42 0 1 511 E	AF	- # #	0	UDC 81		0.00	0.
	Hunt	0.008 (65		0. 35			- 10	G 55.	0.0 0	0.00	0.
Paso Area	E Page	0.0000000	0.0000	0.0000000	0.000		0.0000	0.0000000	0.0000	0.00	0.
	Secur	0.0138906	0.0000	0.0009368	0.0000	0.0000452	0.0000	0.1109355	0.0000	0.00	0.
San Antonio	Com	0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.000000	0.07 0		0.
Area	Gued 1	1 200	00	1021	9	C 1	30	্ব স	0.07 0	CI	0.
	Guad What	SOURCE.	0.0	- 10 Oct		T 60 60		000 00	0. 00		
		= a a a a a =	0.6 36				3,000	0.02 776	0. 00	1	0.
	Callwell	0.0000000	0.0000	0.00000		0.00000000	0.0000	0.0000000	0.0 50	0.00	0.
Austin Area	Haya	0.0008331	0.0000	0.0000962	0.0000	0.0000027	0.0000	0.0066537	0.0000	0.00	0.
	They	0.0051785	0.0000	0.0003493	300	0.0000160	0.0000	0.0413577	0.0000	0.00	0.
	Williamson	0.0000000	0.0000	0.0000000	A000	0.0000000	0.0000	0.00000000	0.0000	0.00	0.
	Grego	0.0000000	0.0000	0.0000000	6,000		7.40	7000000	0.0000	0.00	0.
	Hermon	0.0000000	0.0000	0.0000000	0.000	0, 00, 00	ww.	Page 200	0.0000	0.00	0.
North East Texas Area	Flunk	0.0000000	0.0000	0.0000000			- b	b	0.0000	0.00	0.
T WARE CITY	Snith	0.00000000	0.0000	0.00000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.00	0.
	Upshur	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.00	0.
Oorpus Ohrlati Area	Nunces	0.0128578	0.0000	0.0008872	0.0000	0.0000619	0.0000	0.1026870	0.0000	0.00	0.
	San Ratrido	0.0015100	0.0000	0.0001018	0.0000	0.0000049	0.0000		0.0000	0.00	0.
Victoria Area	Victoria	0.0021192	0.0000	0.0001429	0.0000	0.00000000	0.0000	0.0160244	0.0000	0.00	0.
	Andrews	0.0000037	0.0000	0.0000250	0.0000	0.0050005	0.0000	0.0000002	0.0000	0.00	0.
	Angeline	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.00	0.
	Bonque	0.0022204	0.0000	0.0156212	0.0000	0.0006579	0.0000	0.0001580	0.0000	0.00	0.
	Brazos	0.0024089	0.0000	0.0112305	0.0000	0.0005125	0.0000		0.0000	0.00	0.
	Cahoun	0.0001166	0.0000	0.0000038	0.0000	0.0000031	0.0000	0.0075368	0.0000	0.00	0.
	Cemeron	0.0063636	0.0000	0.0004285	0.0000	0.0000207		0.0507425	0.0000	0.00	0.
	Cherokee	0.0027592	0.0000	0.0168033	0.0000	0.0008116	0.0000	0.0001714	0.0000	0.00	0.
	Odice	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.00	0.
	Odermin	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.00	0.
	Crodkett		0.0000			0.0000000		0.0000000			0.
	Ector	0.0019215	0.0000	0.0006004	0.0000	0.0011346		0.0146527	0.0000	0.00	0.
	Famh	0.0000041	0.0000	0.0000249	0.0000	0.0000012	0.0000	0.0000003	0.0000	0.00	0.
	Payette	0.0051867	0.0000	0.0103217	0.0000	0.0004986	0.0000	0.0283993	0.0000	0.00	0.
	Prio	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.00	0.
	Grimm										
	Hardeman	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.00	0.
	Himkell	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.00	0.
	Howard	0.0053716	0.0000	0.0007641	0.0000	0.0000175	0.0000	0.0009190	0.0000	0.00	0.
	Howard Jack	0.0002811	0.0000	0.0007641	0.0000	0.1283942		0.0009190	0.0000	0.00	0.0
	Jack	0.0030783	0.0000	0.0188839	0.0000	0.00000121	0.0000	0.0001927	0.0000	0.00	0.
Other EXCOT	Jones	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.00	0.
co untile a	Limestone	0.0000000	0.0000	0.0000000	0.0000	0.0000000		0.0000000	0.0000	0.00	0.
	Limestone	0.0000000	0.0000	0.0002719	0.0000	0.0000000	0.0000	0.0021988	0.0000	0.00	0.
	McLennen	0.0040514	0.0000	0.0002719	0.0000	0.0000131	0.0000	0.0321966	0.0000	0.00	0.
	Milem	0.001288	0.0000	0.0000856	0.0000	0.0000041	0.0000		0.0000	0.00	0.
	Michel	0.0000311	0.0000	0.0001910	0.0000	0.0024500	0.0000	0.0000019	0.0000	0.00	0.
	Noten	0.0000095	0.0000		0.0000		0.0000		0.0000	0.00	0.
	Relo Pinto	0.0056129	0.0000	0.0001795	0.0000	0.0010705	0.0000	0.000261	0.0000	0.00	0.
	Pecce Pecce	0.0000020	0.0000	0.0000121	0.0000	0.0020500	0.0000	0.0000001	0.0000	0.00	
	Restin	0.0000000	0.0000	0.00000121	0.0000	0.0020820	0.0000	0.0000000	0.0000	0.00	0.
	Red River	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.00	
	Red River Repertagn	0.0000000	0.0000	0.0055755	0.0000	0.0002593	0.0000		0.0000	0.00	
	Taylor	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.00	
	Thus	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.00	
	TomGreen	0.0000000	0.0000	0.0000000	0.0000	0.0000000		0.0000000	0.0000	0.00	0
	TomGreen Ucton	0.0000000	0.0000	0.0000000	0.0000	0.0026494	0.0000	0.0000000	0.0000	0.00	0
	Upton Ward	0.0000025	0.0000	0.0000156	0.0000	0.0026194	0.0000	0.0000002	0.0000	0.00	
	Walte		0.0000			0.2078335	0.0000			0.00	
	Whatton	0.0042017	0.0000	0.0002834	0.0000	0.0000137	0.0000	0.0555565	0.0000	0.00	0
	Wichite	0.0000121	0.0000	0.0000743	0.0000	0.0126190		0.0000008	0.0000	0.00	0.
	Wilberger	0.0179710	0.0000	0.1102850	0.0000	0.0053249	0.0000	0.0011247	0.0000	0.00	0.
	Was	0.0010202	0.0000	0.0062583	0.0000	0.0003023	0.0000	0.0000638	0.0000	0.00	0.
	Young		0.0000	0.0155580					0.0000		0.
	Total	0.4414801	0.0000	0.4512563	* C /	TEE	04200	0.6529549	A : 0.0000	ough Éñ	حصر ⊏داً:
Bhergy Savin					UF		LUIZ. T	Clean	Air i ni	Jugit Em	Figy ⊑ill







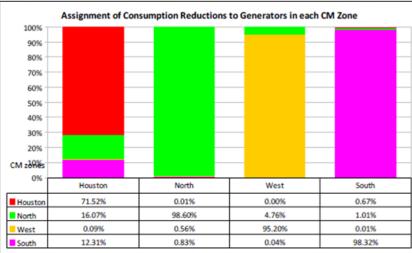


NOx REDUCTIONS USING eGRID

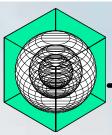
NOx Emissions Reductions Calculation

Area	Oounty				CM Z					Total lox Raductions	Total Nox Reduction
					¥ .	٧	v		3	(lb s)	(Tons)
	Brazoria									0.00	0.
	Chamber a	0.0204500	0.0000	0.0000026	0.0000	0.0000001	0.0000	0.0001916	0.0000	0.00	0.
	Calveston	0.0215865	0.0000	0.0000029	0.0000	0.0000001	0.0000	0.0002937	0.0000	0.00	0.
Houston-	Heri	0.1486011	0.0000	0.0000189	0.0000	0.0000000	0.0000	0.0013930	0.0000	0.00	0.
A COLLON ALCON	Liberty	0.1600011	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.0013930	0.0000	0.00	0.
	Montpowery	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.00	
	Mongomery Walter	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.00	
	Hardin	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.00	- 0
eaum ont/ Fort	Jefferson	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.00	1 8
Arthur Area	Orang	.0000000	0.0000	0.000			0.0000		0.0000	0.00	- :
				0.007430	7 00 00 0 00	2000	0.000	0.00°		0.00	
	Dela	1 m	- 20	0.01527		1 000 St	0.0	10 EE	- E	0.00	
	Denter	10 AC-	-VIII	0.00	0, 00	000 5		77.00 VIDE		0.00	1
	Terrent	0.000	0.000	0.0022000	0 000	0000000		0.0000		0.00	
	City	0.0008742	0.0000	0.0020000	6.0000	0.0001103	0.0000	0.0000297	0.0000	0.00	1 3
Dellas/Fort	Johnson	0.0007256	0.0000	0.0044512	0.0000	0.0000150	0.0000	0.0000454	0.0000	0.00	1
Worth Area	Kaufman	0.0059718	0.0000	0.0366343	0.0000	0.0017895	0.0000	0.0003738	0.0000	0.00	-
	Parker	0.0000012	0,000	0.0000075	0.0000	0.0000004	0.0000	0.0000001	0.0000	0.00	
		0.07 000	- 200	0.0000075			0.0000			0.00	
	Plockw all	07 6 208	0.00000	0.0000000	0.0000	0,000000		1,000,000	0.0000		
	Henderson Hood	9 6 28		0 4± 6	AF	883	T 4810	-00 ar 100 ar	A 24 4	0.00	
		0.000 500	1000	2 211 1			°			0.00	
	Hunt	0.000 000	0.0000	0.000000	000	000000	0.0000	0.0000000			
Paso Area	E Peso				0.000				0.0000	0.00	
	Secur	0.0138906	0.0000	0.0009368		0.0000452	0.0000	0.1109355	0.0000	0.00	
en Antonio	Com	0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.000000	0.000		,
Area	Guad 1	1 8 3	00	027				100 00	0.0	CI	4
	Wine V	Topos.	1 10 10			T 60 60		100 DE	0. 00	- 1	
		_ a ⊕	0.0 50				3,000	0.02 776	0. 00	1.1	
	Caldwell	0.00000000	0.0000	0.00000***0		0.0000000	0.0000	0.0000000	0.0 0	0.00	,
Austin Area	Hays	0.0008331	0.0000	0.0000562		0.0000027	0.0000	0.0066537	0.0000	0.00	- 0
	They	0.0051785	0.0000	0.0005495	300	0.0000160	0.0000	0.0413577	0.0000	0.00	
	Williamson	0.0000000	0.0000	0.00000000	.000	-A.(000000000	0,000	p. 600000000	0.0000	0.00	
	Grego	0.0000000	0.0000	0.0000000	0.000	0.00.0	7.00	7000000	0.0000	0.00	
	Hermon	0.0000000	0.0000	0.0000000	0.000		es re	Pass 000	0.0000	0.00	
No rth East	Runk	0.0000000	0.0000	0.0000000			- 6	0000	0.0000	0.00	
Texas Area	Smith	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.00	
	Ucehur	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.00	
Annua Obriell	Nunces	0.0128578	0.0000	0.0008672	0.0000	0.0000419	0.0000	0.4026870	0.0000	0.00	1
Oorpus Ohristi Area	Sen Battleto	0.0015100	0.0000	0.0001018	0.0000	0.0000049	0.0000		0.0000	0.00	-
letoria Area	Victoria	0.0021192	0.0000	0.0001629	0.0000	0.0000000	0.0000	0.0100044	0.0000	0.00	1
I CONTRACTOR	Andrews	0.0000037	0.0000	0.00000000	0.0000	0.0000000	0.0000	0.0000002	0.0000	0.00	1
	Angelre	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.00	-
	Dondra	0.0022204	0.0000	0.0156212	0.0000	0.0006679	0.0000	0.0001500	0.0000	0.00	1
	Brazon	0.002204	0.0000	0.0130212	0.0000	0.0005475	0.0000		0.0000	0.00	
	Cabour	0.0024089	0.0000	0.0112505	0.0000	0.0005425	0.0000	0.0047829	0.0000	0.00	1 .
	Cemeron	0.0063536	0.0000	0.0004285	0.0000	0.0000207	0.0000	0.0507425	0.0000	0.00	0
	Cherokee									0.00	
	Odke	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000		0.0000	0.00	0
	Odemen	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.00	
	Croduett	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.00	
	Ector	0.0019215	0.0000	0.0006604	0.0000	0.0911546	0.0000		0.0000	0.00	
	Famin	0.0000041	0.0000	0.0000249	0.0000	0.0000012	0.0000	0.0000003	0.0000	0.00	
	Payette	0.0051867	0.0000	0.0103217	0.0000	0.0004986	0.0000		0.0000	0.00	
	Freestone	0.0047645	0.0000	0.00000000	0.0000	0.0014117	0.0000	0.0002-82	0.0000	0.00	
	Prio	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.00	
	Grimma	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000		0.0000	0.00	
	Hardeman	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.00	-
	Himkell	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.00	
	Hibingo	0.0055716	0.0000	0.0005525	0.0000	0.0000175	0.0000	0.0428994	0.0000	0.00	
	Howard	0.0002811	0.0000	0.0007841	0.0000	0.1283042	0.0000	0.0009190	0.0000	0.00	
	Jack	0.0030783	0.0000	0.0188830	0.0000	0.0009121	0.0000	0.0001927	0.0000	0.00	
	Jones	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.00	-
Other EROOT countles	Lame	0.0040001	0.0000	0.0245588	0.0000	0.0011855	0.0000	0.0002504	0.0000	0.00	
oo unt s	Limestone	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.00	
	Llano	0.0040514	0.0000	0.0002719	0.0000	0.0000151	0.0000	0.082996	0.0000	0.00	-
	McLennen	0.0056576	0.0000	0.0347066	0.0000	0.0016764	0.0000	0.0003541	0.0000	0.00	
	Milem	0.0012888	0.0000	0.0000356	0.0000		0.0000		0.0000	0.00	
	Mitchell	0.0000311	0.0000	0.0001910	0.0000	0.0324560	0.0000	0.0000019	0.0000	0.00	
	Noten	0.000000	0.0000	0.0001795	0.0000	0.0304745	0.0000	0.0000018	0.0000	0.00	
	Palo Pinto	0.0036129	0.0000	0.0221635	0.0000	0.0010705	0.0000	0.0002261	0.0000	0.00	-
	Fece	0.0000000	0.0000	0.0000121	0.0000	0.0020820	0.0000	0.0000001	0.0000	0.00	
	Realib	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.00	1
	Red River	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.00	-
	Robertson	0.0036505	0.0000	0.0055755	0.0000	0.000293	0.0000	0.0246170	0.0000	0.00	
	Taylor	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.00	
	Thylor	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.00	
	TomGreen	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.0000000	0.0000	0.00	
	Upton	0.0000025	0.0000	0.0000156	0.0000	0.0026894	0.0000	0.0000002	0.0000	0.00	
		0.0001995	0.0000	0.0012259	0.0000	0.2078555	0.0000	0.0000155	0.0000	0.00	
	YVER O	0.0042017	0.0000	0.0002634	0.0000	0.0000137	0.0000	0.0555565	0.0000	0.00	
	Webb		0.0000	0.0001456	0.0000	0.00000000	0.0000	0.0168474	0.0000	0.00	
	Wharton	0.0024005									
		0.0021095	0.0000	0.0000743	0.0000	0.0126190	0.0000	0.0000008	0.0000	0.00	
	Wharton			0.0000743	0.0000	0.0126190	0.0000	0.0000008	0.0000	0.00	
	Wharton Wichta	0.0000121	0.0000		0.0000						
	Wharton Wichita Wilberger	0.0000121	0.0000	0.1102850	0.0000	0.0053249	0.0000 0.0000	0.0011247	0.0000	0.00	
	Wharton Wichts Wibsrger Was Young	0.0000121 0.0179710 0.0010202 0.0071054	0.0000 0.0000 0.0000	0.1102150 0.0062583 0.0135880	0.0000	0.0053249	0.0000 0.0000 0.0000	0.0011247 0.0000838 0.0004447	0.0000 0.0000 0.0000	0.00 0.00	0
	Wharton Wichts Wilberger Was	0.0000121	0.0000	0.1102830	0.0000	0.0053249 0.0003023 0.0024054	0.0000 0.0000 0.0000	0.0014247 0.0000838 0.0004447	0.0000 0.0000 0.0000	0.00	



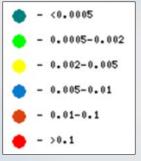


Assignment of Consumption Reductions to Generators in Each CM Zone

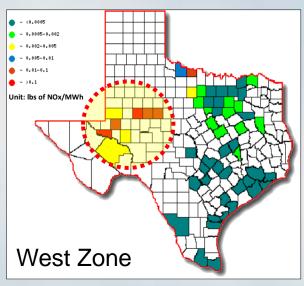


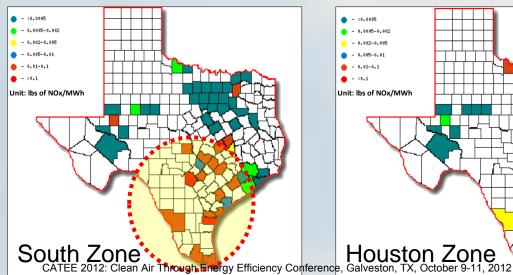
NOx REDUCTIONS FROM WIND POWER

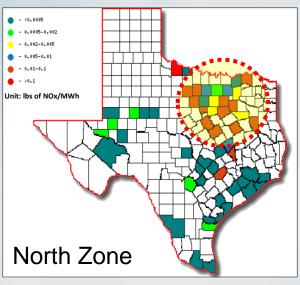
New 2010 Annual eGrid for NOx Emissions

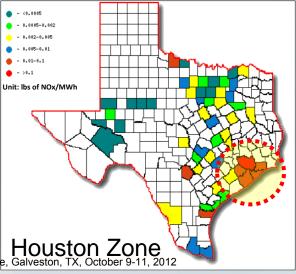


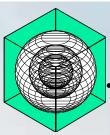
Unit: lbs of NOx/MWh





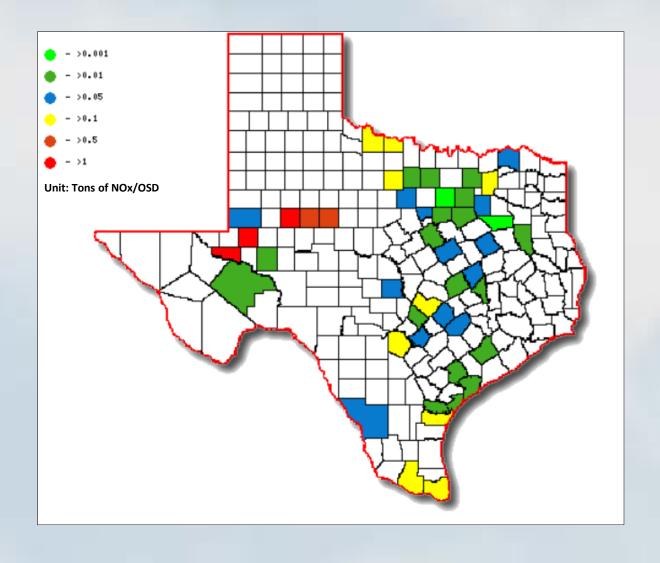


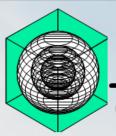




NOX REDUCTIONS FROM WIND POWER

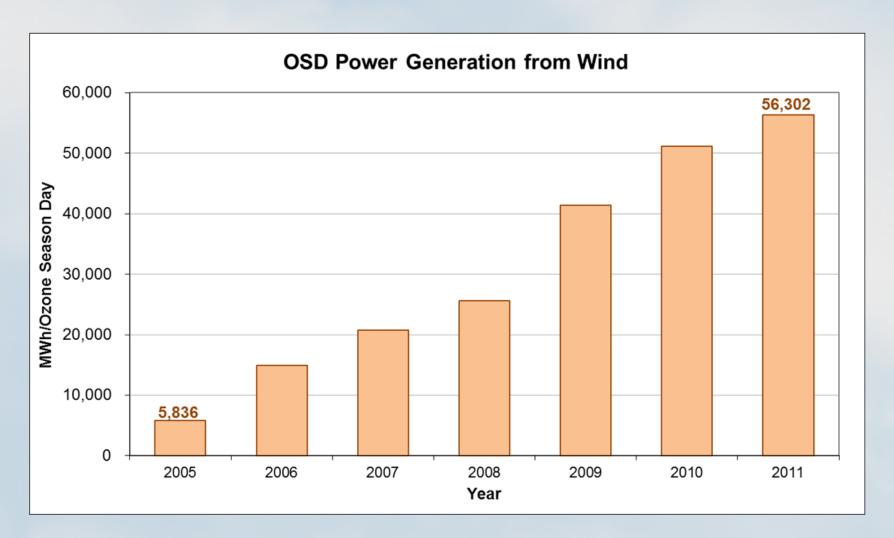
New 2010 OSD eGrid for NOx Emissions

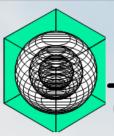




WIND POWER IN TEXAS

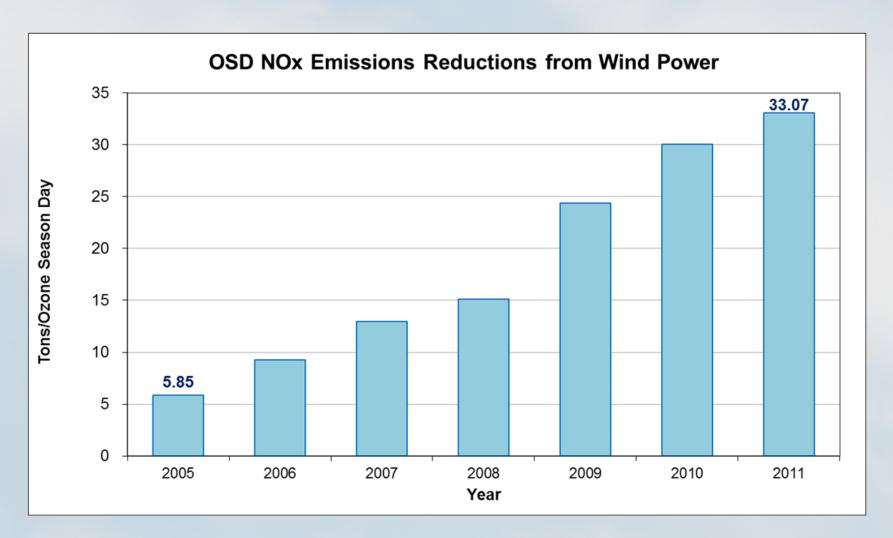
OSD Power Generation and NOx Emissions Reductions

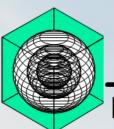




WIND POWER IN TEXAS

OSD Power Generation and NOx Emissions Reductions

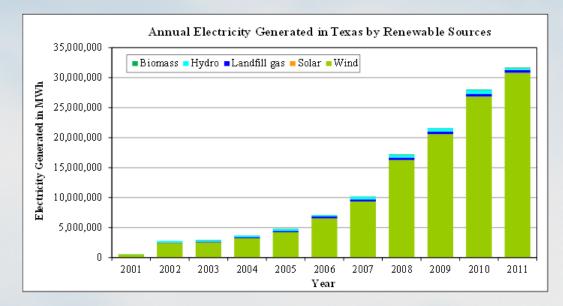


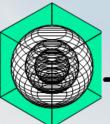


OTHER RENEWABLES

Biomass, Hydro, Landfill Gas, Solar, Wind

Wind energy is the largest portion





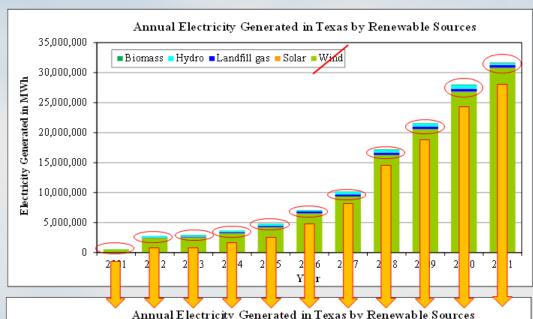
OTHER RENEWABLES

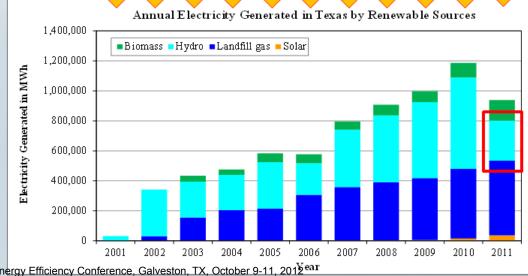
Biomass, Hydro, Landfill Gas, Solar, Wind

Wind energy is the largest portion

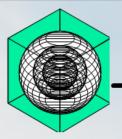
Biomass and solar are smallest

Drought in Texas 2011









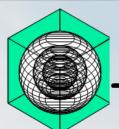
Solar PV

NOTE: The numbers inside the circles represent the county FIPS Number and the number within brackets represents the number of projects in the county. 43 (11) https://openpv.nrel.gov CATEE 2012: Clean Air Through Energy Efficiency Conference, Galveston, TX, October 9-11, 20

Renewables:

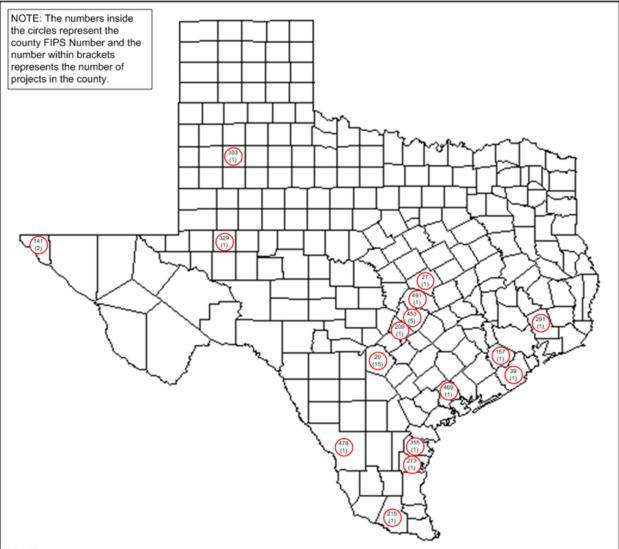
Solar PV (3,033 projects)





RENEWABLE PROJECTS IN TEXAS

Solar Thermal

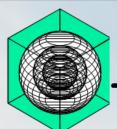


Renewables:

Solar PV (3,033 projects)

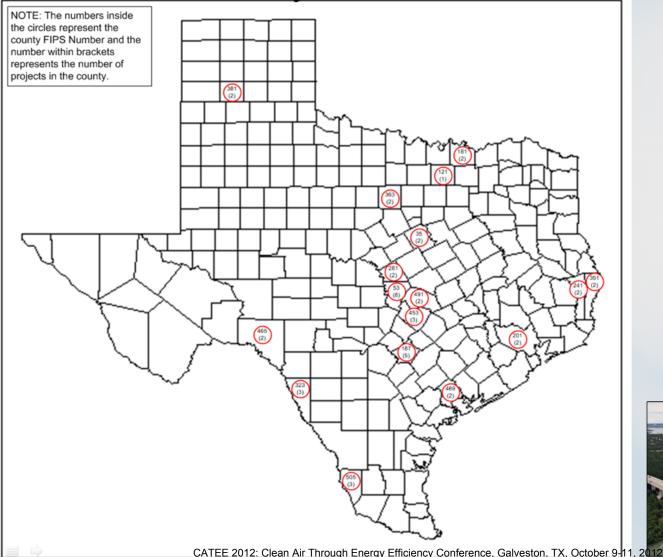
Solar Thermal





RENEWABLE PROJECTS IN TEXAS

Hydro



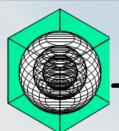
Renewables:

Solar PV (3,033 projects)

Solar Thermal

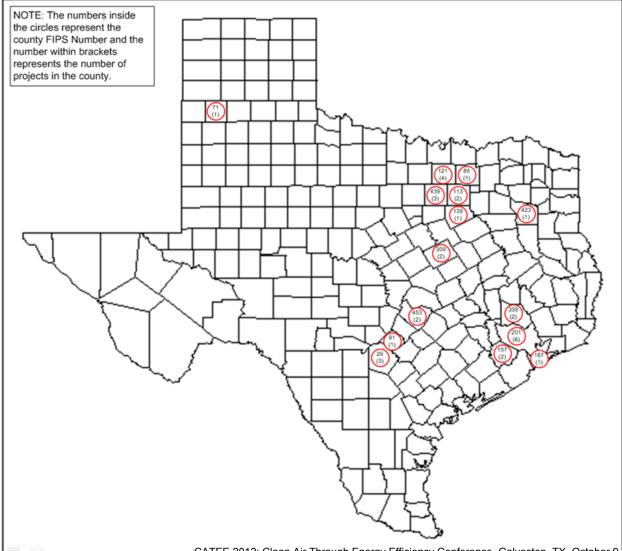
Hydro





ESL-KT-12-10-36 RENEWABLE PROJECTS IN TEXAS

Landfill Gas



Renewables:

Solar PV (3,033 projects)

Solar Thermal

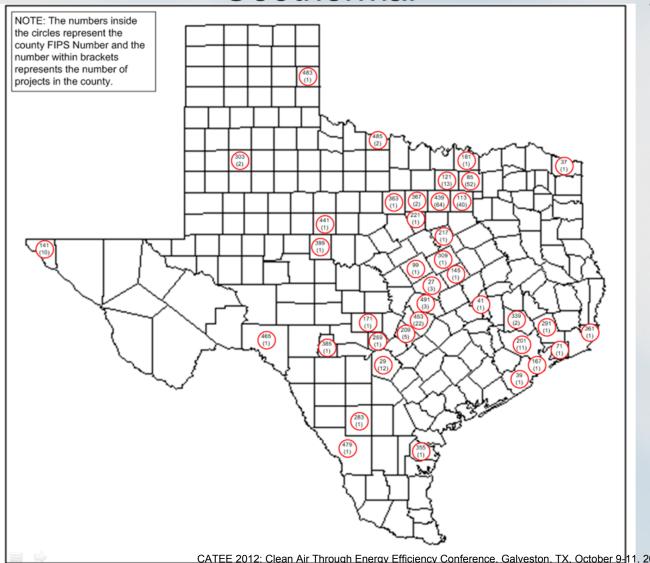
Hydro

Landfill Gas



RENEWABLE PROJECTS IN TEXAS

Geothermal



Renewables:

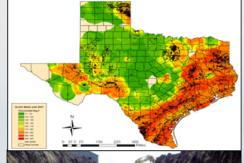
Solar PV (3,033 projects)

Solar Thermal

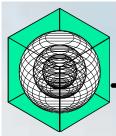
Hydro

Landfill Gas

Geothermal





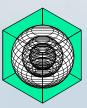


INTEGRATED NOx SAVINGS

Integrated Emissions Savings Across Agencies To Report Savings To TCEQ and EPA



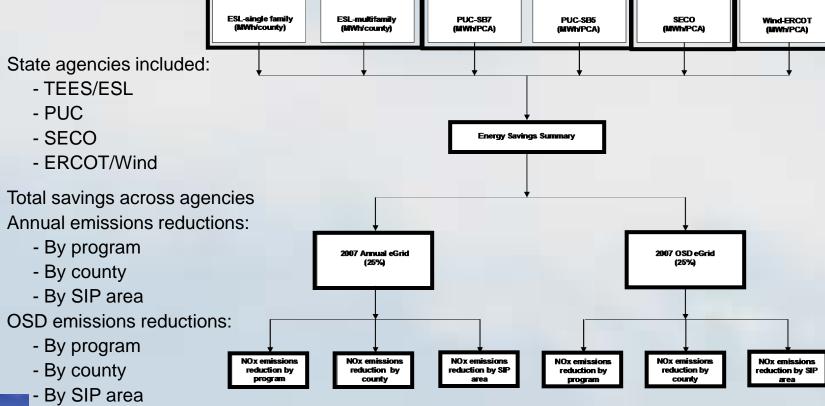


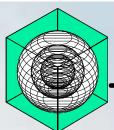






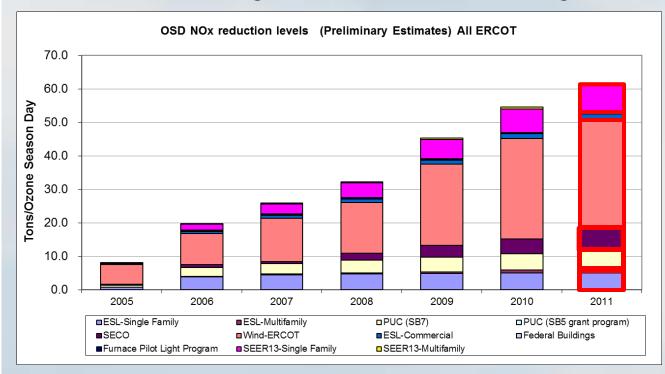






INTEGRATED NOx SAVINGS

2011 Integrated Emissions Savings



ESL Code Compliance (8.17 tons/day) PUC SB5,SB7 programs (5.24 tons/day) SECO Political Sub. (6.03 tons/day) Green Power (Wind) (33.07 tons/day) Residential AC Retrofits (8.78 tons/day) **Total (2011)** (61.69 tons/day)





The Energy Systems Laboratory

The Energy Systems Laboratory (ESL) is a division of the Texas A&M Engineering Experiment Station and a member of the Texas A&M University System. The ESL is affiliated with the Energy Systems Group in the Department of Mechanical Engineering (five faculty), as well as two faculty



- Conducting research and calibrated testing on HVAC systems ement and verification of energy savings for commercial buildings

ESL Contact Information



http://eslsb5.tamu.edu