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STATEWIDE AIR EMISSIONS CALCULATIONS FROM WIND AND OTHER RENEWABLES

SUMMARY REPORT

A Report to the
Texas Commission on Environmental Quality
For the Period September 2010 – August 2011

TCEQ

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August 2011
Updated December 2011

ENERGY SYSTEMS LABORATORY

Texas Engineering Experiment Station
Texas A&M University System

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Texas Engineering Experiment Station
Texas A&M University System

3581 TAMU
College Station, Texas 77843-3581

December 17, 2011

Chairman Bryan W. Shaw, Ph.D.
Texas Commission on Environmental Quality
P. O. Box 13087
Austin, TX 78711-3087

Dear Chairman Shaw:

The Energy Systems Laboratory (ESL) at the Texas Engineering Experiment Station of the Texas A&M University System is pleased to provide its fifth annual report, "Statewide Emissions Calculations From Wind and Other Renewables," as required by the 79th Legislature. This work has been performed through a contract with the Texas Environmental Research Consortium (TERC).

In this work the ESL is required to obtain input from public/private stakeholders, and develop and use a methodology to annually report the energy savings from Wind and Other Renewables. This report summarizes the work performed by the ESL on this project from September 2010 to August 2011.

Please contact me at (979) 845-1280 should you or any of the TCEQ staff have questions concerning this report or the work presently being done to quantify emissions reductions from energy efficiency and renewable energy measures as a result of the TERP implementation.

Sincerely,

David E. Claridge

David Claridge, P.E.
Director

Enclosure

cc: Commissioner Buddy Garcia
Commissioner Carlos Rubenstein
Executive Director Mark R. Vickery, P.G.

Disclaimer

SUMMARY REPORT

Statewide Air Emissions Calculations from Wind and Other Renewables

1. EXECUTIVE SUMMARY

The 79th Legislature, through Senate Bill 20, House Bill 2481 and House Bill 2129, amended Senate Bill 5 to enhance its effectiveness by adding 5,880 MW of generating capacity from renewable energy technologies by 2015 and 500 MW from non-wind renewables.

This legislation also requires the Public Utilities Commission of Texas (PUCT) to establish a target of 10,000 megawatts of installed renewable capacity by 2025, and requires the Texas Commission on Environmental Quality (TCEQ) to develop methodology for computing emissions reductions from renewable energy initiatives and the associated credits. Table 1-1 lists the statutory mandates and total wind power generation capacity (including installed and announced) in Texas from 2001 to 2025. It shows that Texas has achieved its milestone of 10,000 MW by the end of 2010 and will reach 17,374 MW by June 2014 according to the information from PUCT.

Table 1-1: Installed/Announced Wind Power Capacity and The Statutory Mandates

Installed and Announced		SB20 Plan	
Month-Yr	MW	Month-Year	MW
Dec-2001	1,012		
Jan-2002	1,091		
Dec-2003	1,292		
Dec-2005	1,965		
Dec-2006	2,786	Jan-2007	2,280
Dec-2007	4,438		
Dec-2008	8,285	Jan-2009	3,272
Dec-2009	9,652		
Dec-2010	10,622	Jan-2011	4,264
Dec-2011	13,294		
Dec-2012	16,602		
Jun-2013	16,738	Jan-2013	5,256
Jun-2014	17,374	**Jan-2015**	**5,880**
		Jan-2025	**10,000**

In this Legislation the Energy Systems Laboratory (ESL) is to assist the TCEQ in quantifying emissions reductions credits from energy efficiency and renewable energy programs, through a contract with the Texas Environmental Research Consortium (TERC) to develop and annually calculate creditable emissions reductions from wind and other renewable energy resources for the State Implementation Plan (SIP).

The Energy Systems Laboratory, in fulfillment of its responsibilities under this Legislation, submits its fifth annual report, “Statewide Air Emissions Calculations from Wind and Other Renewables,” to the Texas Commission on Environmental Quality.

The report is organized in several deliverables:

1. A Summary Report, which details the key areas of work;
2. Supporting Documentation; and
3. Supporting data files, including weather data, and wind production data, which have been assembled as part of the fifth year’s effort.

This executive summary provides summaries of the key areas of accomplishment this year, including:

4. Continuation of stakeholder’s meetings;
- Analysis of power generation from wind farms using improved method and 2009 data;
- Analysis of emissions reduction from wind farms;
- Updates on degradation analysis;
- Analysis of other renewables, including: PV, solar thermal, hydroelectric, geothermal and landfill gas;
- Review of electricity generation by renewable sources and transmission planning study reported by ERCOT;
- Review of combined heat and power projects in Texas; and
- Preliminary reporting of NOx emissions savings in the 2010 Integrated Savings report to the TCEQ.

1.1 Development of Stakeholder’s meetings

Legislation passed during the regular session of the 79th Legislature directed the Energy Systems Laboratory to work with the TCEQ to develop a methodology for computing emissions reductions attributable to renewable energy and for the ESL to quantify the emissions reductions attributable to renewables for inclusion in the State Implementation Plan annually. HB 2921 directed the Texas Environmental Research Consortium (TERC) to engage the Texas Engineering Experiment Station for the development of this methodology.

During the 2010-2011 periods, Texas A&M held continuing stakeholder’s meetings and made several presentations to EPA, TCEQ and other interested parties regarding the analysis and the results.

1.2 Analysis of wind farms using an improved method and 2009 data

In this report, the weather normalization procedures developed together with the Stakeholders were presented and applied to all the wind farms that reported their data to ERCOT during the 2009 measurement period, together with wind data from the nearby NOAA weather stations. In the 2010 Wind and Renewables report to the TCEQ (Haberl et al. 2010), weather normalization analysis methods were reviewed; an analysis was refered to the last year report.

This report used the same analysis method as the one in the prior report (Sweetwater III as an example) to present the same weather normalization procedure, including
- the processing of weather and power generation data, modeling of daily power generation versus daily wind speed using the ASHRAE Inverse Model Toolkit (IMT) for two separate periods, i.e., Ozone Season Days period (OSP), from July 15 to September 15, and Non-Ozone Season days period (Non-OSP);
- prediction of 1999 wind power generation using developed coefficients from 2009 daily OSP and Non-OSP models; and
- the analysis on monthly capacity factors generated using the models.

A summary of total predicted wind power production in the base year (1999) for all of the wind farms in the ERCOT region using the developed procedure is presented, and the new wind farms which started operation in 2009 were added. Figure 1-1 shows the measured annual wind power generation in 2009 and the estimated wind power generation in 1999 using the developed method for each wind farm in the ERCOT region. The total measured wind power generation in 2009 is 18,632,752 MWh/yr, which is 9.23% less than what the same wind farms would have produced in 1999. Figure 1-2 shows the same comparison but for the Ozone Season Period. The measured wind power generation in the OSP of 2009 is 41,167MWh/day, which is 11.66% lower than the estimated 1999 OSD wind production.

This report also includes an uncertainty analysis that was performed on all the daily regression models for the entire year and Ozone Season Period. The detailed analysis for each wind farm is provided in the Appendix B to this report. The original data used in the analysis is included in the accompanying CD-ROM with this report.

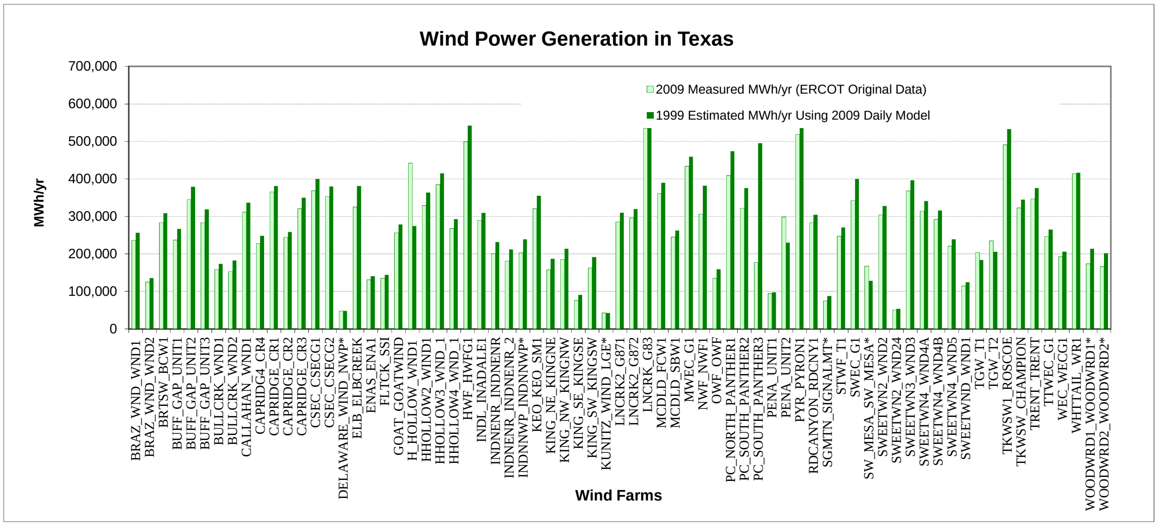

Figure 1-1: Comparison of 2009 Measured and 1999 Estimated Power Production for Each Wind Farm

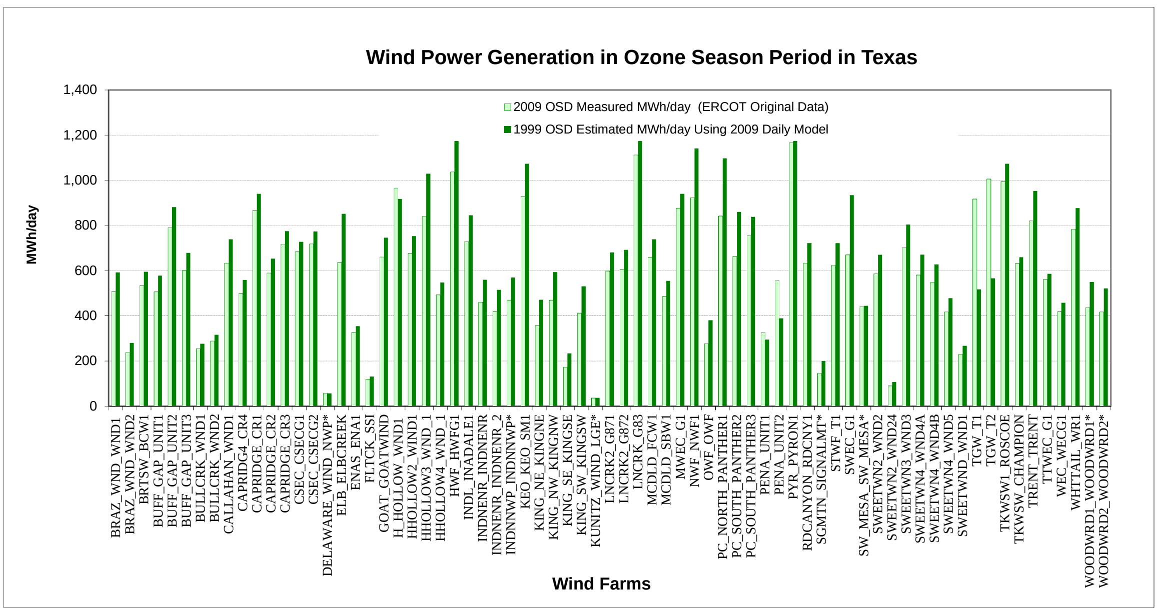

Figure 1-2: Comparison of 2009 OSD Measured and 1999 OSD Estimated Power Production for Each Wind Farm

1.3 Analysis of emissions reduction from wind farms

In this report, the procedure for calculating annual and peak-day, county-wide NOx reductions from electricity savings from wind projects implemented in the Power Control Areas in ERCOT listed in the EPA's eGRID was presented , including assigning the wind farms to PCA based on the information provided by the PUCT, and calculating the NOx emission reductions based on the special version of 2007 eGRID developed by the EPA for the TCEQ. According to the developed models, the total MWh savings in the base year 1999 for the wind farms within the ERCOT region are 20,353,283MWh and 45,969MWh/day in the Ozone Season Period. The total NOx emissions reductions across all the counties amount to 11,859 tons/yr and 27 tons/day for the Ozone Season Period. Figure 1-3 and Figure 1-4 show the estimated emissions reductions from wind power in each county of Texas.

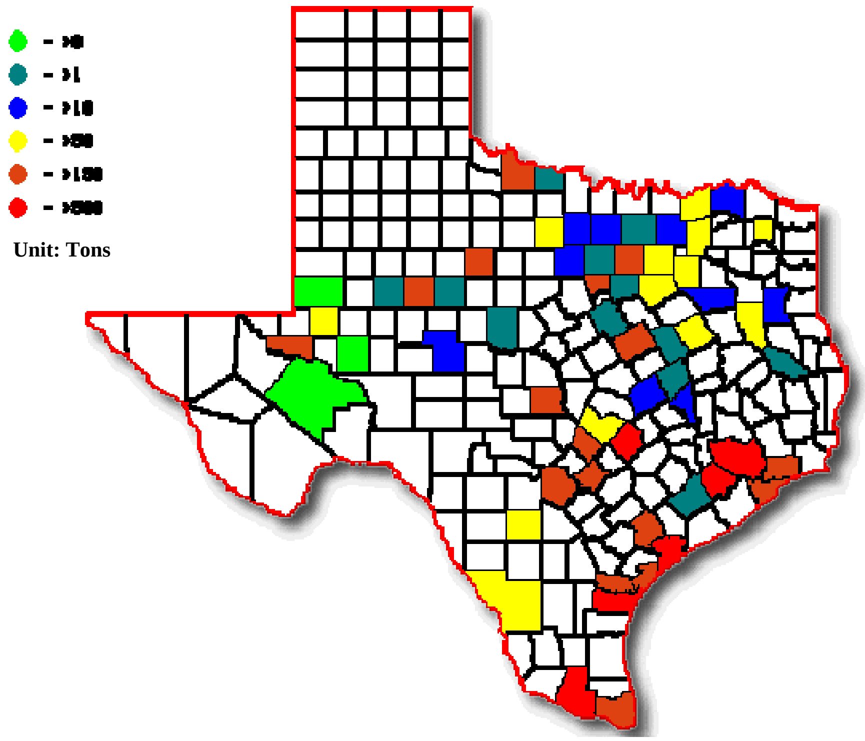

Figure 1-3: 1999 Predicted Annual NOx Reduction from Wind Power in Texas Map

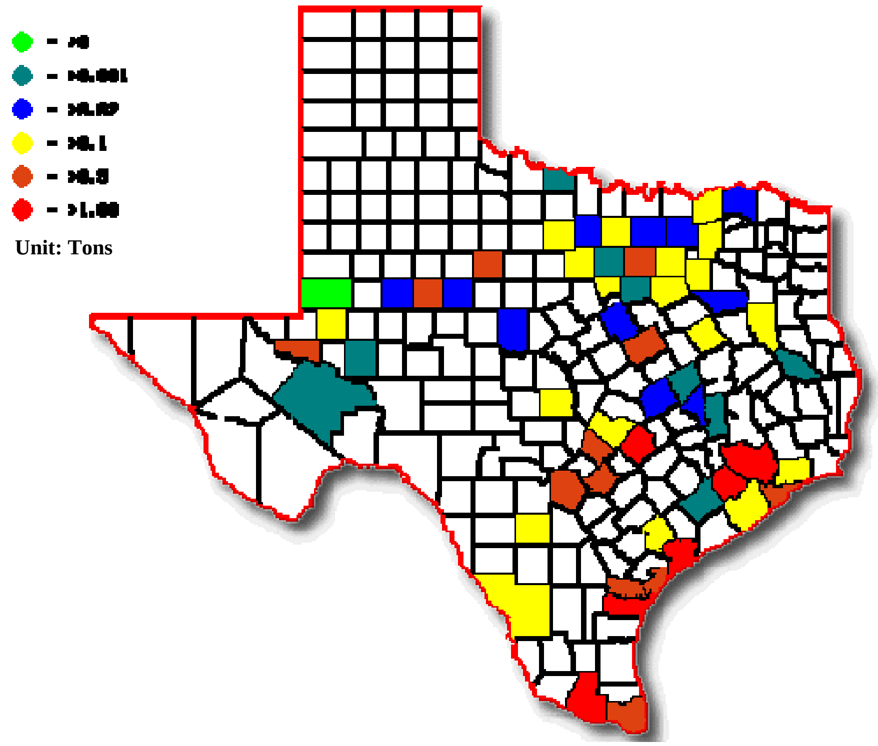

Figure 1-4: 1999 Predicted OSD NOx Reduction from Wind Power in Texas Map

1.4 Development of a degradation analysis

This report contains an updated analysis to determine what amount of degradation could be observed in the measured power from Texas wind farms. Currently, the TCEQ uses a very conservative 5% degradation per year for the power output from a wind farm when making future projections from existing wind farms. Accordingly, the TCEQ asked the ESL to evaluate any observed degradation from the measured data for Texas wind farms. To accomplish this, nine wind farms (12 sites) from 2002 to 2009, two wind farms from 2004 to 2009, and five wind farms from 2006 to 2009, including one new wind farm Sweetwater Wind 3, were evaluated with a total capacity of 1889.6 MW.

In this analysis, a sliding statistical index was established for each site that uses the 10^{th}, 25^{th}, 50^{th}, 75^{th}, 90^{th}, and 99^{th} percentiles of the hourly power generation over a 12-month sliding period, as well as mean, minimum and maximum hourly power generation of the same 12-month period. These indices are then displayed using one data symbol for each 12-month slide, beginning from the first 12-month period until the last 12-month period for each of the wind farms.

As shown in Table 1-2, of the nineteen sites analyzed, thirteen sites showed an increase when one compares the 90^{th} percentile of whole period to the 90^{th} percentile of the first 12-month period, ranging from 1.9% to 28.9%. The remaining six sites showed a decrease from -1.1% to -26.9%. The weighted average of this increase across all wind farms studied is 10.5% (positive), which indicates that no degradation was observed from the aggregate energy production from these wind farms over the studied operation period.

Table 1-2: Summary of 90th Percentile Hourly Wind Power Analysis for Sixteen Wind Farms (19 Sites) in Texas

Wind Farm	First 12-mo 90th Percentile Hourly Wind Power		Average of the Sliding 12-mo 90th Precentile Hourly Wind Power		Minimum of the Sliding 12-mo 90th Precentile Hourly Wind Power		Maximum of the Sliding 12-mo 90th Precentile Hourly Wind Power		No. of Months of Data	Capacity (MW)
	First 12-mo Ending Mo.	MW	MW	% Diff. vs. First 12-mo	MW	% Diff. vs. First 12-mo	MW	% Diff. vs. First 12-mo		
Brazos Wind Ranch	Dec-04	127.5	129.9	1.9%	102.2	-19.8%	139.3	9.2%	72	160
Indian Mesa	Dec-02	48.0	57.3	19.5%	42.1	-12.2%	68.3	42.5%	96	82.5
Delaware	Dec-02	18.5	18.3	-1.1%	14.4	-22.4%	21.5	16.1%	96	28.5
Desert Sky	Dec-02	89.0	114.8	28.9%	83.1	-6.7%	134.4	50.9%	96	160
King Mountain-NE	Dec-02	41.8	46.9	12.1%	36.3	-13.2%	56.4	34.8%	96	79.3
King Mountain-NW	Dec-02	44.7	54.6	22.1%	40.2	-10.1%	65.3	46.1%	96	79.3
King Mountain-SE	Dec-02	21.6	23.4	8.0%	18.4	-15.0%	28.1	29.8%	96	40.3
King Mountain-SW	Dec-02	41.6	46.4	11.5%	38.4	-7.6%	53.4	28.5%	96	79.3
Sweetwater Wind 1	Dec-04	34.1	32.9	-3.4%	31.9	-6.3%	34.2	0.4%	72	37.5
Trent	Dec-02	108.8	124.7	14.6%	100.0	-8.1%	132.8	22.0%	96	150
Woodward	Dec-02	85.3	94.2	10.5%	80.4	-5.7%	109.7	28.6%	96	160
Kunitz	Dec-02	25.2	18.4	-26.9%	11.5	-54.5%	25.2	0.0%	96	35
Big Spring	Dec-02	27.2	25.2	-7.6%	22.7	-16.7%	27.2	0.0%	96	41
Southwest Mesa	Dec-02	51.1	49.4	-3.2%	38.5	-24.6%	56.5	10.6%	96	74.6
Buffalo Gap 1	Nov-06	100.9	95.1	-5.8%	75.4	-25.2%	102.8	1.9%	49	120
Callahan Divide Wind	Feb-06	93.3	98.7	5.8%	93.3	0.0%	101.5	8.8%	58	114
Horse Hollow Phase 1	Jun-06	157.0	164.6	4.9%	141.3	-10.0%	177.3	12.9%	54	213
Sweetwater Wind 2	Jan-06	71.4	81.2	13.7%	71.4	0.0%	85.3	19.5%	59	100.3
Sweetwater Wind 3	Dec-06	99.6	104.7	5.1%	97.9	-1.7%	107.3	7.7%	48	135
Weighted Average:				**10.5%**		**-13.0%**		**26.6%**	**Total:**	**1889.6**

1.5 Analysis of other renewable source

Other renewable energy projects throughout the state of Texas were located to determine NOx emissions reduction and are included in this section. Searches were conducted on five specific categories which include solar photovoltaic, solar thermal, geothermal, hydroelectric, and Landfill Gas-Fired Power Plants. Many newly located renewable energy projects are assembled for inclusion in this report (Table 1-3).

Table 1-3: New Projects Reported in February 2011

S.No	Renewable Energy Source	No Of New Projects Reported in March 2011
1	Solar Photo-Voltaic	64
2	Solar Thermal	3
3	Land fill gas	0
4	Hydro-Electric	0
5	Geothermal	9

1.6 Review of electricity savings and transmission planning study reported by ERCOT

In this report, the information posted on ERCOT's Renewable Energy Credit Program site www.texasrenewables.com is reviewed. In particular, information posted under the "Public Reports" tab was downloaded and assembled into an appropriate format for review. This includes ERCOT's 2001 through 2010 reports to the Legislature and information from ERCOT's listing of REC generators.

Each year ERCOT is required to compile a list of grid-connected sources that generate electricity from renewable energy and report them to the Legislature. Table 1-4 contains the data reported by ERCOT from 2001- 2010. Figure 1-5 is included to better illustrate the annual data collected by ERCOT.

Table 1-4: Annual Electricity Generation by Renewable Resources (MWh, ERCOT: 2001 - 2010)

Technology Type	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Wind	565,597	2,451,484	2,515,482	3,209,629	4,221,568	6,530,928	9,351,168	16,286,440	20,595,989	26,828,660
Hydro	30,639	312,093	239,684	234,791	310,302	210,077	382,882	445,428	507,507	609,257
Landfill gas		29,412	154,206	203,443	213,777	306,087	356,339	386606	412,926	464,904
Biomass			39,496	36,940	58,637	60,569	54101	70,833	73,364	97,535
Solar		87	220	211	227	470	1,844	3,338	4,492	14,449
Total (MWh)	596,236	2,793,076	2,949,088	3,685,014	4,804,511	7,108,131	10,146,334	17,192,645	21,594,278	28,014,805

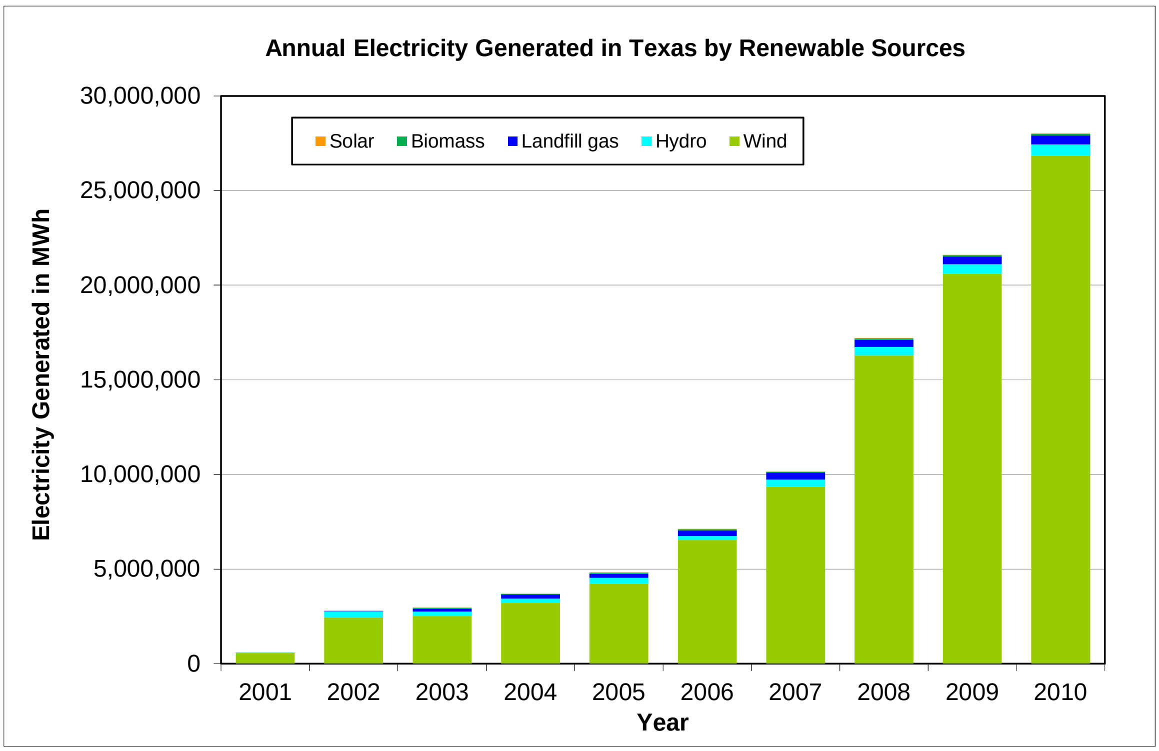

Figure 1-5: Electricity Generation by Renewable Resources (ERCOT: 2001–2010 Annual)

1.7 Preliminary reporting of NOx emissions savings in the 2008 Integrated Savings report to the TCEQ

In this preliminary report, the NOx emissions savings from the energy-efficiency programs from multiple Texas State Agencies working under Senate Bill 5 and Senate Bill 7 in a uniform format to allow the TCEQ to consider the combined savings for Texas' State Implementation Plan (SIP) planning purposes. This required that the analysis should include the cumulative savings estimates from all projects projected through 2020 for both the annual and Ozone Season Day (OSD) NOx reductions. The NOx emissions reduction from all these programs were 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.

In 2010, the cumulative total annual electricity savings from all programs was 31,731,502 MWh/year (18,907 tons-NOx/year). The total cumulative OSD electricity savings from all programs is 84,150 MWh/day, which would be a 3,506 MW average hourly load reduction during the OSD period (51.58 tons-NOx/day). By 2013, the total cumulative annual electricity savings from will be 35,758,047 MWh/year (21,396 tons-NOx/year). The total cumulative OSD electricity savings from all programs will be 98,298 MWh/day, which would be a 4,096 MW average hourly load reduction during the OSD period (60.61 tons-NOx/day).

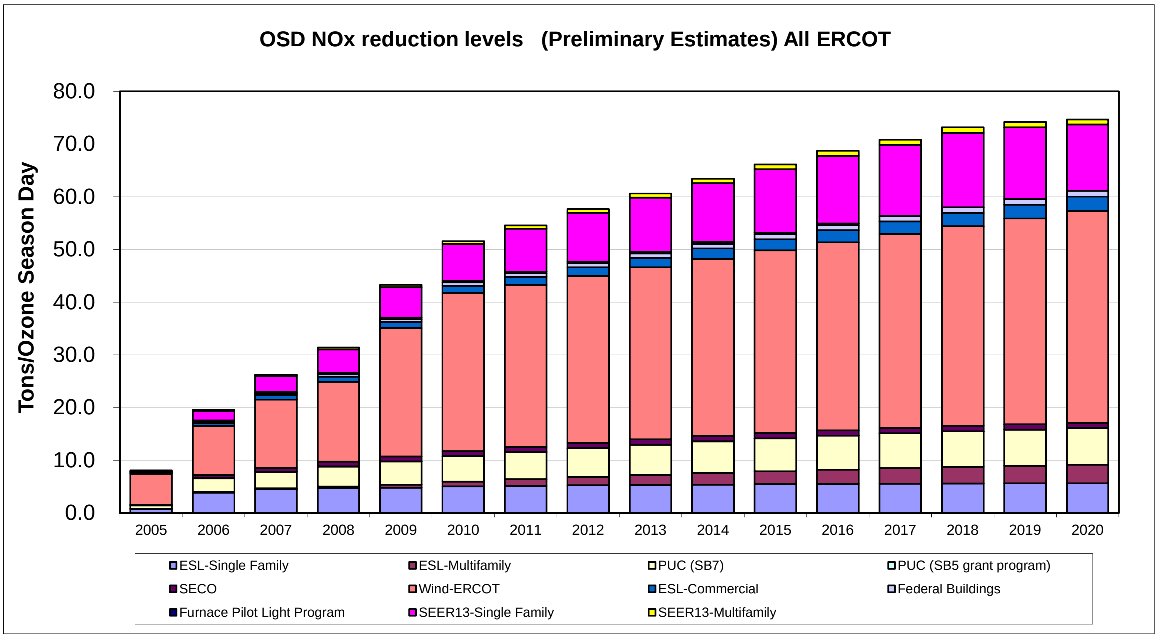

Figure 1-6: Cumulative OSD NOx Emissions Reduction Projections through 2020

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2 INTRODUCTION

2.1 Statement of Work for Calculations of Emissions from Wind and Other Renewables

This summary report covers the Energy Systems Laboratory's work from September 2010 through August 2011. This work is intended to cover the basic work outline included below:

Task 1: Obtain input from public/private stakeholders.

Task 2: Develop a methodology in cooperation with the Texas Commission on Environmental Quality (TCEQ) and the U.S. Environmental Protection Agency (US EPA) for calculating emissions reductions obtained through wind and other renewable energy resources in Texas.

Task 3: Calculate annual, creditable emissions reductions for wind and other renewable energy resources for inclusion in the State SIP.

Task 4: Include emissions reductions by county from wind and renewable energy resources in the ESL's annual report to the TCEQ.

Task 5: Incorporate wind and renewable energy emissions reductions as a component of the ESL's annual *Clean Air Through Energy Efficiency Conference (CATEE)* to facilitate technical transfer.

2.2 Summary of Progress

The progress toward completing each task is provided in the following section and throughout this report.

Task 1: Obtain input from public/private stakeholders.

Legislation passed during the regular session of the 79th Legislature directed the Energy Systems Laboratory to work with the TCEQ to develop a methodology for computing emissions reductions attributable to renewable energy and for the ESL to quantify the emissions reductions attributable to renewables for inclusion in the State Implementation Plan (SIP) annually. HB 2921 directed the Texas Environmental Research Consortium (TERC) to engage the Texas Engineering Experiment Station for the development of this methodology.

During the period from September 2010 to August 2011, several presentations were done to report the analysis methodology and the results with TCEQ, EPA, TCEQ, and other interested parties. Appendix A shows the slides that were presented in those meetings.

- August, 2010 – Presentation at the CATEE Conference about Texas Emissions Reductions Program (TERP) Energy Efficiency/Renewable Energy (EE/RE) Update, Austin, Texas.

Task 2: Develop a methodology in cooperation with the Texas Commission on Environmental Quality and the U.S. Environmental Protection Agency for calculating emissions reductions obtained through wind and other renewable energy resources in Texas.

This task is composed of the following subtasks:

- Review existing methodologies for calculating emissions reductions from wind energy and other renewable energy systems with US EPA, TCEQ and stakeholders. Develop acceptable methodologies for wind and renewables.
- Determine how to implement methodologies for Texas, including accounting of current installations, future sites, degradation, discounting/uncertainty, grid constraints, etc.

- Review methodologies for verifying wind energy production and renewable energy installations with TCEQ, US EPA and stakeholders. Develop acceptable methodologies for verifying installations, including documentation, EPA QAPP, etc.
- Develop draft State Guidelines for the TCEQ for EE/RE SIP credits.

<u>Task 3: Calculate annual, creditable emissions reductions for wind and other renewable energy resources for inclusion in the State SIP.</u>

This task is composed of the following subtasks:

- Calculate annual emissions from wind and other renewable energy projects.
- Verify annual installations of wind and renewable energy systems in Texas.
- Verify ERCOT historical data for wind production and other renewables.

<u>Task 4: Include emissions reductions by county from wind and renewable energy resources in the ESL's annual report to the TCEQ.</u>

This task is composed of the following subtasks:

- Report annual emissions from wind and other renewable energy projects.
- Report on verification of installations of wind and renewable energy systems in Texas.
- Develop documentation for all methods developed.

<u>Task 5: Incorporate wind and renewable energy emissions reductions as a component of the ESL's annual *Clean Air Through Energy Efficiency Conference (CATEE)* to facilitate technical transfer.</u>

Additional information regarding the ESL's efforts on Tasks 2, 3, 4 and 5 are listed below and presented in detail in the following sections. This work was performed during the period September 2010 through August 2011.

- Analysis of wind farms using 2009 data;
- Analysis of emissions reduction from wind farms;
- Updates of the degradation analysis to include more wind farms;
- Analysis of other renewables;
- Review of electricity savings and transmission planning study reported by ERCOT;
- Combined Heat and Power projects in Texas; and
- Preliminary reporting of NOx emissions savings in the 2010 Integrated Savings report to the TCEQ.

3 ANALYSIS ON POWER PRODUCTION FROM WIND FARMS USING 2009 DATA

3.1 Introduction

Texas can now take its place as the largest producer of wind energy in the United States. As of December 2010[1], the capacity of installed wind turbines totals was 10,202 MW with another 9,830MW announced for new projects by 2014. Figure 3-1 shows the total installed wind power capacity in Texas and power generation in the ERCOT region from 2001 to December 2010. Figure 3-2 shows the location of the wind farms completed, announced and retired based on the information from the PUCT.

Following the analysis, a summary of total predicted wind power production in the base year (1999) for all wind farms in the ERCOT region is presented. Then a comparison between the estimated wind power in 1999 and the 1999 Ozone Season Period from the previous reports and the results from this year's modeling are also included in this section to show the performance the modeling procedure.

An uncertainty analysis was also performed on all the daily regression models and included in this report to show the accuracy of applying the OSP and Non-OSP linear regression models to predict the wind power generation that the wind farms would have had in the base year of 1999. The detailed analysis for each wind farm is provided in the Appendix to this report. The original data used in the analysis is included in the accompanying CD-ROM with this report.

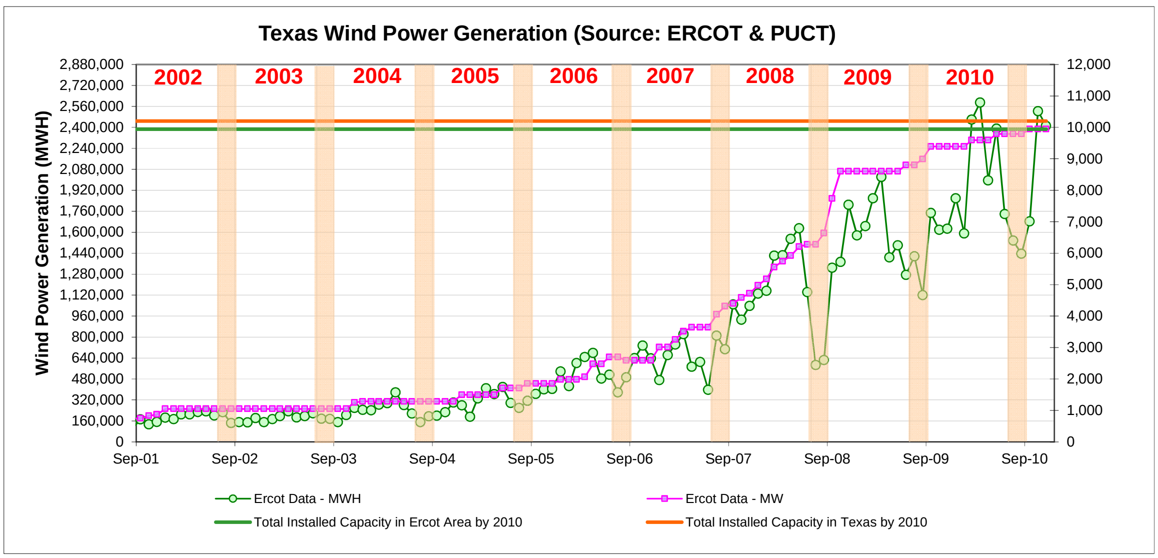
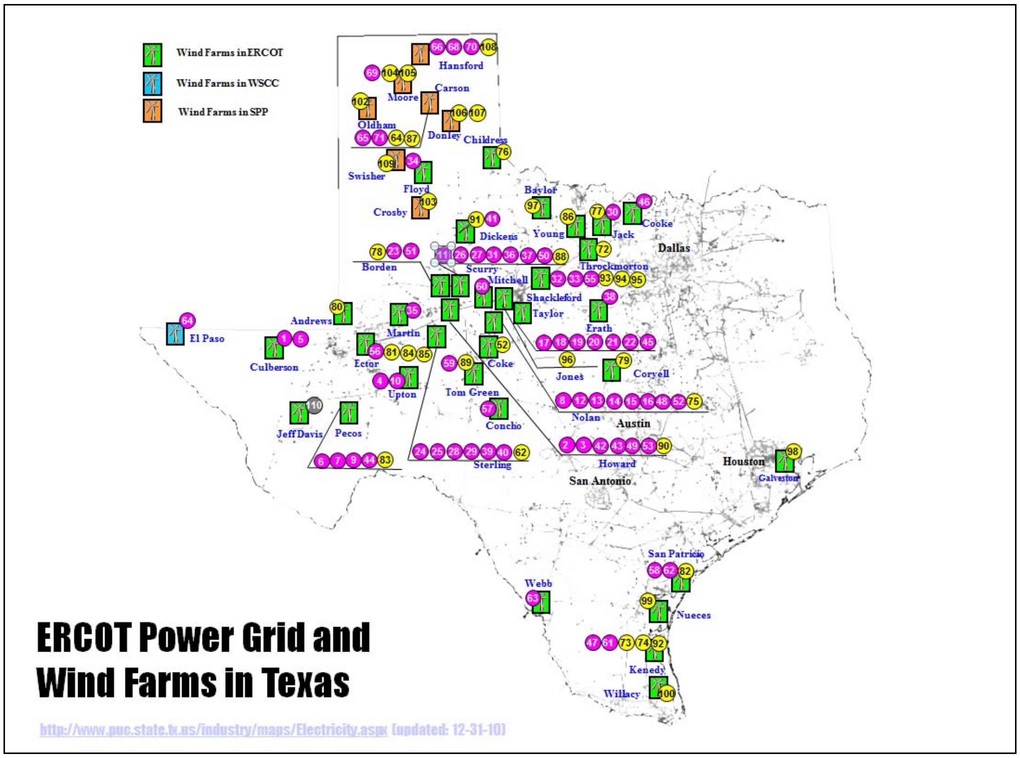


Figure 3-1: Installed Wind Power Capacity and Power Generation in the ERCOT region from 2001 to December 2010

[1] Wind project information obtained from the Public Utility Commission of Texas (www.puc.state.tx.us) as of 7/27/2011 and the Electric Reliability Council of Texas (ERCOT) as of June 2010.



WIND PROJECTS COMPLETED:

ERCOT Region – 9525MW

1.Culberson, Texas Wind Power Project, 35MW, Oct-95
2.Howard, Big Spring Wind Power, 34MW, Feb-99
3.Howard, Big Spring Wind Power, 7MW, Jun-99
4.Upton, Southwest Mesa Wind Project, 75MW, Jun-99
5.Culberson, Delaware Mountain Wind Farm, 30MW, Jun-99
6.Pecos, Indian Mesa, 83MW, Jun-01
7.Pecos, Woodward Mountain Ranch, 160MW, Jul-01
8.Nolan, Trent Mesa, 150MW, Nov-01
9.Pecos, Desert Sky (Indian Mesa II), 160MW, Dec-01
10.Upton, King Mountain Wind Ranch, 278MW, Dec-01
11.Scurry, Brazos Wind Ranch, 160MW, Dec-03
12.Nolan, Sweetwater Wind 1, 38MW, Dec-03
13.Nolan, Sweetwater Wind 2, 92MW, Feb-05
14.Nolan, Sweetwater Wind 3 (Cottonwood Creek), 135MW, Dec-05
15.Nolan, Sweetwater Wind 4 (Cottonwood Creek), 241MW, May-07
16.Nolan, Sweetwater Wind 5, 80MW, Dec-07
17.Taylor, Callahan Divide Wind Energy Center, 114MW, Feb-05Taylor, Buffalo Gap 1, 120MW, Sep-05
18.Taylor, Buffalo Gap 2 (Cirello 1), 233MW, Aug-07
19.Taylor, Buffalo Gap 3, 170MW, Apr-08
20.Taylor, Horse Hollow Phase 1, 213MW, Oct-05
21.Taylor, Horse Hollow Phase 2, 224MW, May-06
22.Taylor, Horse Hollow Phase 3, 299MW, Sep-06
23.Borden, Red Canyon 1, 84MW, May-06
24.Sterling, Forest Creek Wind Farm, 124MW, Dec-06
25.Sterling, Sand Bluff Wind Farm, 90MW, Dec-06
26.Scurry, Camp Springs Wind Energy Center, 130MW, Jul-07
27.Scurry, Camp Springs Energy expansion, 120MW, Jun-08
28.Sterling, Capricorn Ridge Wind, 364MW, Sep-07
29.Sterling, Capricorn Ridge Wind exp., 298 MW, May-08
30.Jack, Barton Chapel Wind 1, 120MW, Dec-07
31.Scurry, Snyder Wind Project, 63MW, Dec-07
32.Shackleford, Lone Star - Mesquite Wind, 200MW, Dec-07
33.Shackleford, Lone Star - Post Oak Wind, 200MW, May-08
34.Floyd, Whirlwind, 60MW, Dec-07
35.Martin, Stanton Wind Energy, 120MW, Jan-08
36.Scurry, Champion Wind Farm, 126MW, Jan-08
37.Scurry, Roscoe Wind Farm 1, 209MW, Jan-08
38.Erath, Silver Star Phase I, 60MW, Mar-08
39.Sterling, Goat Wind, 80MW, Apr-08
40.Sterling, Goat Wind Phase 2, 70MW, Apr-09
41.Dickens, McAdoo Wind Energy, 150MW, May-08
42.Howard, Panther Creek, 143MW, Jul-08
43.Howard, Ocotillo Wind Power 1, 59MW, Aug-08
44.Pecos, Sherbino Mesa Wind farm, 150MW, Spe-08
45.Taylor, South Trent Wind Farm, 101 MW, Oct-08
46.Cooke, Wolf Ridge Wind farm, 113 MW, Oct-08
47.Kenedy, Gulf Wind 1, 283MW, Nov-08
48.Nolan, Inadale, 197MW, Nov-08
49.Howard, Panther Creek 2, 115MW, Nov-08
50.Scurry, Pyron, 249MW, Nov-08
51.Borden, Bull Creek Wind Plant, 180 MW, Nov-08
52.Nolan, Turkey Track Energy Center, 170 MW, Nov-08
53.Howard, Elbow Creek Wind, 117MW, Nov-08
54.Kenedy, Penascal Wind Farm, 202MW, Nov-08
55.Shackleford, Hackberry Wind Farm, 165MW, Nov-08
56.Ector, Notrees Wind power, 153MW, Jan-09
57.Concho, Panther Creek 3, 200MW, Aug-09
58.San Patricio, Papalote Creek Wind Farm, 180MW, Sep-09
59.Tom Green, Langford Wind Power, 150MW, Oct-09
60.Mitchell, Loraine Windpark, 251MW, Oct-09
61.Kenedy, Penascal Wind Farm 2, 202MW, Mar-10
62.San Patricio, Papalote Creek Phase II, 198MW, Jun-10
63.Webb, Cedro Hill Wind, 150MW, Oct-10

WSCC Region – 1 MW

64.El Paso, Hueco Mountain Wind Ranch, 1MW, Apr-01

SPP Region – 676 MW

65.Carson, Llano Estacado Wind Ranch, 79MW, Jan-02
66.Hansford, 3MW, Dec-03
67.Oldham, Wildorado Wind Ranch, 161MW, Apr-07
68.Hansford, Noble Great Plains Windpark, 114MW, Feb-09
69.Moore, Sunray Wind I, II, III, 50MW, Aug-09
70.Hansford, JD Wind 1-7, 9-11, Wege, 190MW, Dec-09
71.Carson, Majestic Wind Power, 80MW, Dec-09

WIND PROJECTS ANNOUNCED:

ERCOT Region – 9223MW

72.Throckmorton, 400MW, Dec-10
73.Kenedy, Gulf Wind 2, 400MW, Jan-11
74.Kenedy, Gulf Wind 3, 400MW, Jan-11
75.Nolan, Buffo Gap 4 and 5, 465MW, Mar-11
76.Childress, Childress County Wind One, 101MW, Oct-11
77.Jack, Senate Wind Project, 150MW, Nov-11
78.Borden, Stephens Wind Farm, 141MW, Nov-11
79.Coryell, Gatesville Wind Farm, 200MW, Dec-11
80.Andrews, M-Bar Wind, 194MW, Dec-11
81.Ector, Pistol Hill Wind Energy, 300MW, Dec-11
82.San Patricio, Midway Farms, 160MW, 2011,
83.Pecos, Sherbino Mesa Wind Farm 2, 150 MW, Jan-12
84.Ector, 2W Whatley Phase 1, 45MW, Mar-12
85.Ector, 2W Whatley Phase 2, 290MW, Aug-12
86.Young, Trinity Hills Wind Farm, 250MW, Mar-12
87.Carson, B&B Panhandle Wind, 1,001MW, Jun-12
88.Scurry, Scurry County Wind III, 350MW, Jun-12
89.Tom Green, Fort Concho Wind Farm, 400MW, Jul-12
90.Howard, Gunsight Mountain, 120MW, Dec-12
91.Dickens, McAdoo Energy Center II, 500MW, Dec-12
92.Kenedy, Penascal Wind Farm 3, 202MW, Dec-12
93.Shackleford, Mesquite Wind 4, 136MW, Jun-13
94.Shackleford, Cedar Elm, 136MW, Jun-14
95.Shackleford, Cottonwood Wind, 100MW, Jun-14
96.Jones, Arranz Wind Tuxedo 1, 200MW, 2014
97.Baylor, Community Wind Energy, 80MW
98.Galveston, Galveston Offshore Wind, 300MW
99.Nueces, Harbor Sunrise Wind Project, 37MW
100.Willacy, Las Palmas, 1000MW
101.Shenyang/US-REG/Cielo, 615MW

SPP Region – 607MW

102.Oldham, Spinning Spur Wind ranch, 161MW, 2011
103.Crosby, Arranz Wind Caprock 1, 200MW, 2014
104.Moore, Blue Creek, 30MW
105.Moore, Channing Flats, 20MW
106.Donley, Hedley Point, 10MW
107.Donley, Leila Lakes, 20MW
108.Hansford, Noble Great Plains II, 126MW
109.Swisher, Swisher, 20MW

WIND PROJECTS RETIRED:

ERCOT Region – 7MW

110.Jeff Davis, 7MW, Ft. Davis Wind Farm, 1996

Figure 3-2: Completed, Announced and Retired Wind Projects in Texas by December 2010

3.2 Summary of Wind Power Production for All Wind Farms in the Texas ERCOT Region

Table 3-1 shows the summary of the 2009 measured power production for the wind farms that were operating in 2009 in the Texas ERCOT region and the estimated 1999 power production using daily regression models (Appendix B). The comparison between 2008 and 2009 annual and OSP power productions are performed for wind farms built since 2008 (Appendix C). For some of the wind farms, 2008 measured data is available ,which was presented in 2010 report. For the rest, wind data for 2008 is not available from ERCOT. In this case, the estimated 2008 annual and OSP power productions are calculated by using 2009 daily models.

Table 3-2 shows the monthly average wind speed across seven weather stations used in the modeling. As shown in Figure 3-3 and Figure 3-4, the estimated power production in 1999 (20,353,283 MWh/yr) increased about 9.2% when compared to what was measured in 2009 (18,632,752 MWh/yr). For the Ozone Season Period, the estimated average daily power production in 1999 is 45,969 MWh/day, a 11.7% increase from that measured in 2009 (41,167 MWh/day). This is because for all the NOAA weather stations involved in the modeling, 1999 is windier than 2009.

Figure 3-5 presents the comparison of the 2009 measured annual power production against the 1999 estimated annual power production for each wind farm. Figure 3-6 shows the difference between the 2009 measured average daily power production and the 1999 estimated average daily power production during the Ozone Season Period for each wind farm.

From this analysis it can be concluded that the use of weather normalization procedure for predicting 1999 base year production based on 2009 measured power production is more accurate than simply using the measured 2009 power production as the base year power production. Therefore, it is recommended to the TCEQ that the current discount factor should be reduced to take more accurate modeling into account.

Table 3-1:Summary of Power Production for All Wind Farms

Wind Unit Name	County	NOAA Weather Station	PCA	Capacity (MW)	2009 Measured (MWh/yr) (ERCOT Original Data)	1999 Estimated Using Daily Model (MWh/yr)	2009 OSP Measured (MWh/day)	1999 OSP Estimated (MWh/day)
BRAZ_WND_WND1	SCURRY	ABI	AEP-West	99.0	236,421	256,109	507	592
BRAZ_WND_WND2	SCURRY	ABI	AEP-West	61.0	125,036	135,170	237	279
BRTSW_BCW1	JACK	ABI	AEP-West	120.0	283,343	308,589	534	595
BUFF_GAP_UNIT1	TAYLOR	ABI	AEP-West	120.0	237,126	266,376	506	578
BUFF_GAP_UNIT2	TAYLOR	ABI	AEP-West	233.0	344,671	378,841	790	881
BUFF_GAP_UNIT3	TAYLOR	ABI	AEP-West	170.0	283,265	319,177	601	679
BULLCRK_WND1	BORDEN	LBB		91.0	157,838	173,688	254	276
BULLCRK_WND2	BORDEN	LBB		89.0	152,785	182,074	288	316
CALLAHAN_WND1	TAYLOR	ABI	AEP-West	114.0	311,271	336,695	633	739
CAPRIDG4_CR4	STERLING	ABI	LCRA	112.5	227,811	248,056	499	559
CAPRIDGE_CR1	STERLING	ABI	LCRA	214.5	365,212	381,177	866	940
CAPRIDGE_CR2	STERLING	ABI		149.5	244,210	258,415	589	653
CAPRIDGE_CR3	STERLING	ABI		186.0	320,428	349,730	716	775
CSEC_CSECG1	SCURRY	LBB	AEP-West	130.0	368,463	399,731	683	727
CSEC_CSECG2	SCURRY	LBB	AEP-West	120.0	352,834	379,884	718	774
*DELAWARE_WIND_NWP**	*CULBERSON*	*GDP*	*TXU*	*28.5*	*47,640*	47,708	*56*	*56*
ELB_ELBCREEK	HOWARD	MAF	AEP-West	121.9	325,170	380,916	636	852
ENAS_ENA1	SCURRY	LBB		63.0	130,801	140,714	326	354
FLTCK_SSI	ERATH	ABI	AEP-West	60.0	134,999	143,966	119	131
GOAT_GOATWIND	STERING	ABI	LCRA	150.0	256,466	278,310	660	746
H_HOLLOW_WND1	TAYLOR	ABI	AEP-West	213.0	441,908	274,086	965	917
HHOLLOW2_WIND1	TAYLOR	ABI	AEP-West	184.0	329,073	363,599	676	753
HHOLLOW3_WND_1	TAYLOR	ABI	AEP-West	223.5	385,086	414,983	840	1,029
HHOLLOW4_WND_1	TAYLOR	ABI	AEP-West	115.0	267,700	292,516	493	547
HWF_HWFG1	SHACKLEFORD	ABI		165.5	499,178	541,792	1,037	1,189
INDL_INADALE1	NOLAN	ABI		197.0	289,410	309,483	728	845
INDNENR_INDNENR	PECOS	FST	AEP-West	80.0	200,322	231,310	460	560
INDNENR_INDNENR_2	PECOS	FST	AEP-West	80.0	180,636	211,992	419	515
*INDNNWP_INDNNWP**	*PECOS*	*FST*	*AEP-West*	*82.5*	*202,876*	239,087	*469*	*570*
KEO_KEO_SM1	PECOS	MAF		150.0	320,340	355,404	928	1,073
KING_NE_KINGNE	UPTON	MAF	AEP-West	79.3	157,587	186,745	356	471
KING_NW_KINGNW	UPTON	MAF	AEP-West	79.3	184,826	213,779	469	594
KING_SE_KINGSE	UPTON	MAF	AEP-West	40.3	75,849	90,456	172	234
KING_SW_KINGSW	UPTON	MAF	AEP-West	79.3	163,097	191,497	412	530
*KUNITZ_WIND_LGE**	*CULBERSON*	*GDP*	*LCRA*	*35.0*	*42,332*	42,515	*36*	*37*
LNCRK2_G871	SHACKLEFORD	ABI	AEP-West	*100.0*	285,460	309,735	598	681
LNCRK2_G872	SHACKLEFORD	ABI	AEP-West	*100.0*	296,224	319,529	605	692
LNCRK_G83	SHACKLEFORD	ABI	AEP-West	200.0	535,246	581,204	1,112	1,276
MCDLD_FCW1	STERLING	ABI	TXU	124.2	361,031	389,518	659	739
MCDLD_SBW1	STERLING	ABI	TXU	90.0	244,782	262,126	485	554
MWEC_G1	DICKENS	LBB	AEP-West	150.0	434,161	459,306	877	940
NWF_NWF1	ECTOR	MAF		153.0	306,104	381,891	922	1,141
OWF_OWF	HOWARD	MAF	AEP-West	58.8	134,868	159,202	277	381
PC_NORTH_PANTHER1	HOWARD	MAF	AEP-West	142.5	408,963	473,845	842	1,097
PC_SOUTH_PANTHER2	HOWARD	MAF		115.5	321,493	375,646	663	860
PC_SOUTH_PANTHER3	CONCHO	ABI		199.5	176,681	495,256	755	838
PENA_UNIT1	KENEDY	CRP		100.8	94,558	97,644	325	295
PENA_UNIT2	KENEDY	CRP		100.8	298,194	230,032	555	389

Table 3-1 : Summary of Power Production for All Wind Farms(cont.)

PYR_PYRON1	SCURRY	ABI		249.0	518,887	559,399	1,166	1,313
RDCANYON_RDCNY1	BORDEN	ABI	AEP-West	84.0	283,185	304,205	633	722
*SGMTN_SIGNALMT**	*HOWARD*	*MAF*	*TXU*	*41.0*	*74,656*	87,634	*145*	*200*
STWF_T1	TAYLOR	ABI	AEP-West	101.2	247,145	270,563	623	722
SWEC_G1	MARTIN	MAF	AEP-West	123.6	342,124	400,077	670	934
*SW_MESA_SW_MESA**	*UPTON*	*MAF*	*AEP-West*	*74.6*	*167,434*	128,331	*441*	*444*
SWEETWN2_WND2	NOLAN	ABI	LCRA	100.3	304,047	327,777	586	670
SWEETWN2_WND24	NOLAN	ABI	LCRA	16.0	50,098	53,003	90	107
SWEETWN3_WND3	NOLAN	ABI	LCRA	135.0	368,212	396,834	702	804
SWEETWN4_WND4A	NOLAN	ABI	LCRA	135.0	314,238	341,340	580	671
SWEETWN4_WND4B	NOLAN	ABI	LCRA	105.8	291,727	315,745	548	628
SWEETWN4_WND5	NOLAN	ABI	LCRA	80.5	220,450	238,924	417	478
SWEETWND_WND1	NOLAN	ABI	LCRA	37.5	114,514	124,493	229	267
TGW_T1	KENEDY	CRP	AEP-West	141.6	203,934	183,968	917	517
TGW_T2	KENEDY	CRP	AEP-West	141.6	234,622	205,417	1,006	566
TKWSW1_ROSCOE	SCURRY	LBB		220.0	491,239	532,780	994	1,073
TKWSW_CHAMPION	SCURRY	LBB		126.5	322,930	344,823	631	659
TRENT_TRENT	NOLAN	ABI	TXU	150.0	347,232	375,841	820	953
TTWEC_G1	NOLAN	ABI	AEP-West	170.0	246,498	264,706	561	586
WEC_WECG1	FLOYD	LBB	AEP-West	60.0	192,391	206,000	418	458
WHTTAIL_WR1	COOKE	DFW		112.5	413,984	416,767	784	877
*WOODWRD1_WOODWRD1**	*PECOS*	*FST*	*AEP-West*	*80.0*	*173,539*	213,421	*436*	*550*
*WOODWRD2_WOODWRD2**	*PECOS*	*FST*	*AEP-West*	*80.0*	*165,890*	201,731	*417*	*521*
TOTAL				8437.4	18,632,752	20,353,283	41,167	45,969

Wind farms in Italic were built before 9/2001.

Table 3-2: Summary of 1999 and 2009 Monthly Average Wind Speed for Seven NOAA Weather Stations

Month	Wind Speed ABI (mph)		Wind Speed CRP (mph)		Wind Speed DFW (mph)		Wind Speed FST (mph)		Wind Speed GDP (mph)		Wind Speed LBB (mph)		Wind Speed MAF (mph)	
	1999	2009	1999	2009	1999	2009	1999	2009	1999	2009	1999	2009	1999	2009
Jan	11.8	10.7	13.4	11.2	12.1	11.2	12.0	9.5	21.2	20.6	12.8	11.2	10.9	9.4
Feb	12.2	12.9	12.6	9.9	12.1	13.7	11.4	11.2	22.4	21.3	13.0	12.8	11.2	11.3
Mar	12.1	13.3	13.8	14.0	11.8	14.0	11.8	10.4	21.5	22.2	13.4	14.1	11.8	11.1
Apr	13.6	14.7	14.4	15.3	12.2	13.7	13.1	12.5	20.9	23.4	15.7	15.5	13.5	13.3
May	12.4	10.1	11.5	13.6	10.4	9.7	12.6	10.1	19.9	17.7	13.4	11.6	12.8	10.5
Jun	12.7	11.3	10.1	9.3	11.2	7.3	12.0	10.5	16.3	15.6	13.5	11.2	12.8	10.2
Jul	11.7	8.9	8.4	14.6	10.5	8.7	12.3	9.4	14.8	14.6	12.1	9.9	12.3	8.2
Aug	8.4	9.6	9.2	11.1	8.0	9.1	8.8	9.7	13.5	13.4	8.4	10.4	8.0	8.3
Sep	10.4	8.6	7.7	8.1	9.8	8.3	9.9	8.1	16.8	16.2	10.5	9.2	10.1	8.1
Oct	10.0	10.7	8.8	12.7	8.7	10.2	10.4	10.5	14.2	19.9	10.6	11.3	9.1	10.1
Nov	9.7	8.4	9.1	1.9	9.4	8.3	9.5	8.9	18.2	17.8	9.5	9.7	8.3	7.5
Dec	10.7	8.9	12.0	10.6	11.6	9.6	10.6	8.7	20.6	20.3	11.7	9.3	10.0	8.4
Average	11.3	10.7	10.9	11.0	10.6	10.3	11.2	10.0	18.4	18.6	12.0	11.4	10.9	9.7
Average	9.7	8.7	8.1	11.5	9.5	8.3	10.0	8.6	13.9	14.2	10.3	9.1	9.5	7.9

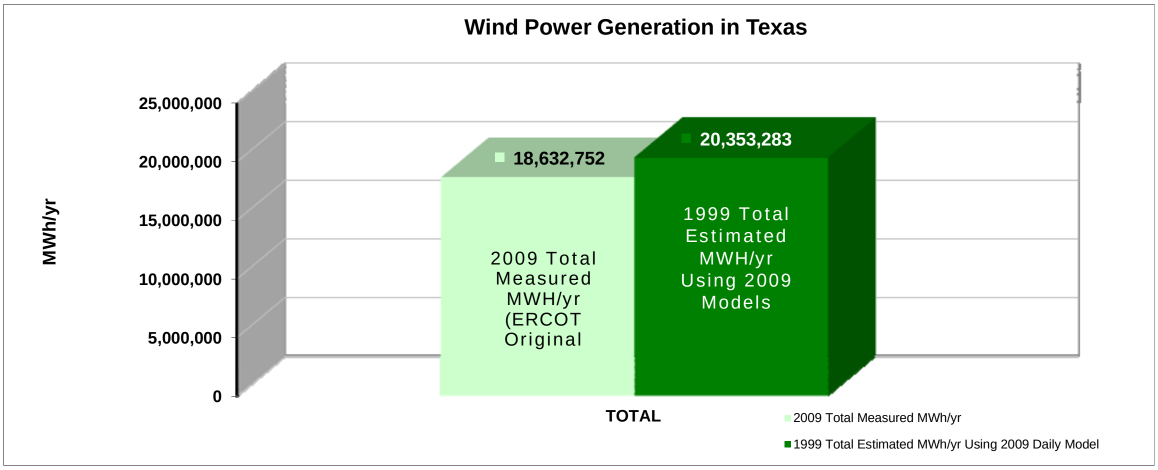


Figure 3-3: Comparison of Total 2009 Measured and 1999 Estimated Power Production

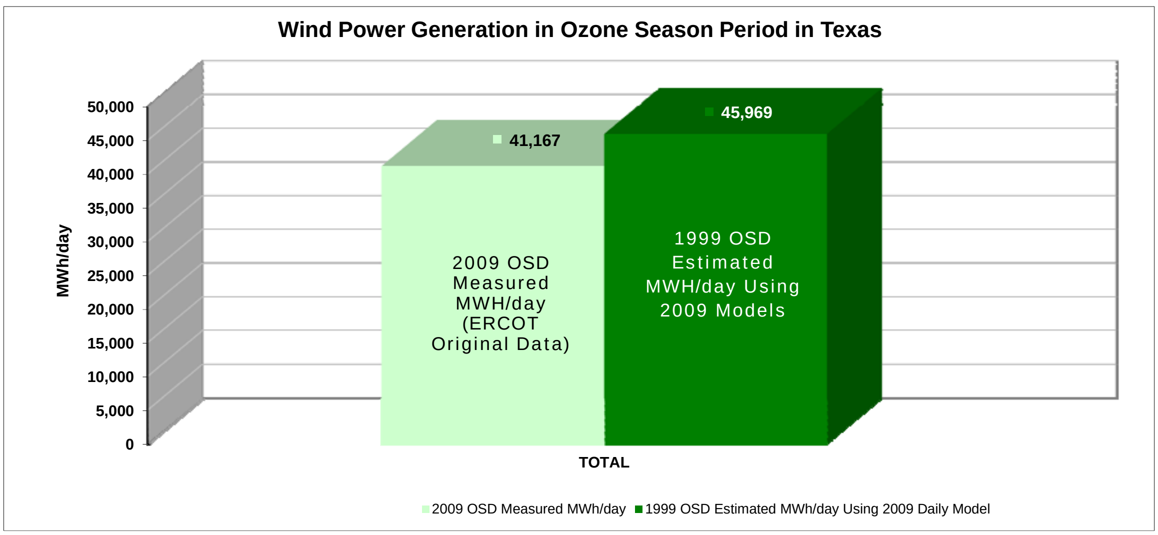


Figure 3-4: Comparison of Total 2009 OSD Measured and 1999 OSD Estimated Power Production

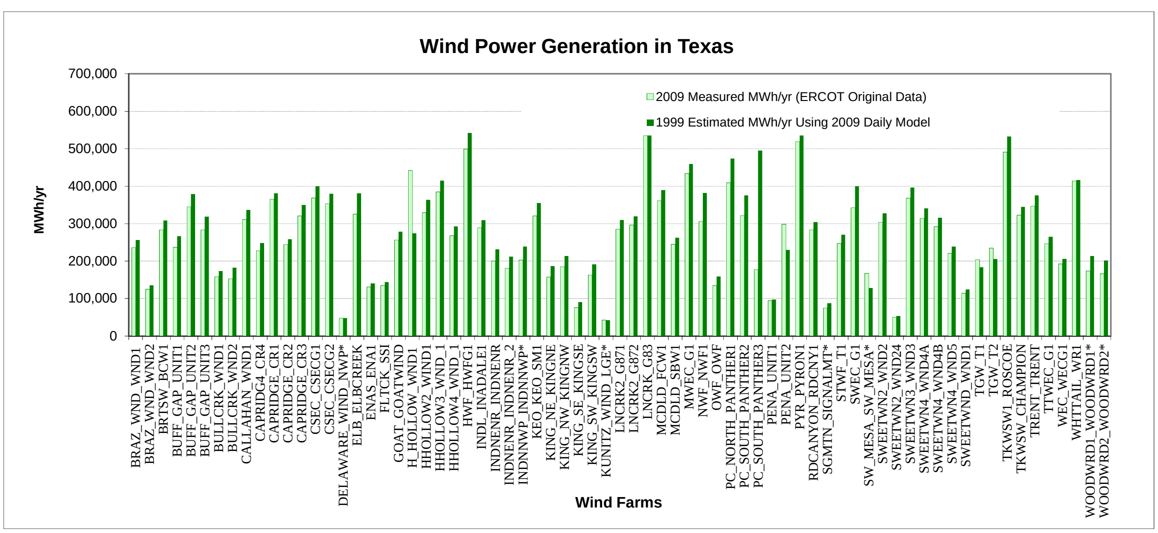


Figure 3-5: Comparison of 2009 Measured and 1999 Estimated Power Production for Each Wind Farm

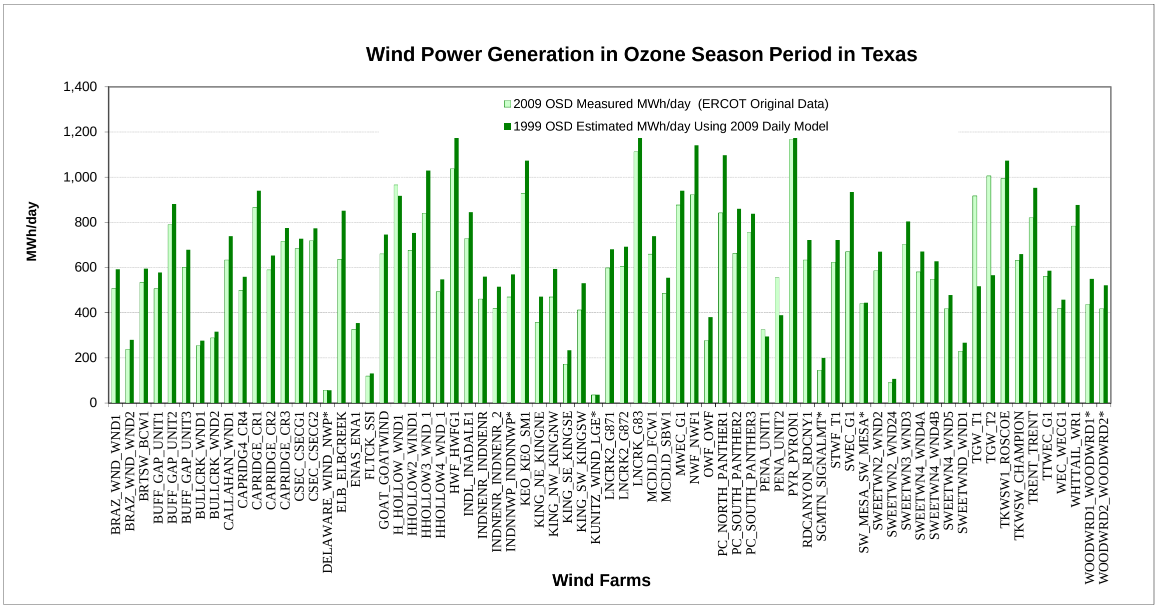


Figure 3-6: Comparison of 2009 OSD Measured and 1999 OSD Estimated Power Production for Each Wind Farm

3.3 Comparison of 1999 Estimated Wind Power in Previous Reports and 2011 Report

Compared to what was reported in the 2010 annual report, an increase of 36% on predicted annual wind power in 1999 was observed, from 14,927,630 MWh/yr to 20,353,283 MWh/yr. The average daily wind power in the 1999 OSD period showed much higher increase of 61.2%, from 29,144 MWh/day to 46,969 MWh/day. The total wind power capacity included in this year's analysis increased from 9,020 MW to 9,942 MWh (a 10.2% increase).

Table 3-3shows the average monthly wind speed for the main seven weather stations used in the analysis. In general, most of the wind farms operated at the similar output level from 2007-2009. The total annual wind power production in 2008 for most wind farms was a little higher than in 2007 and 2009.

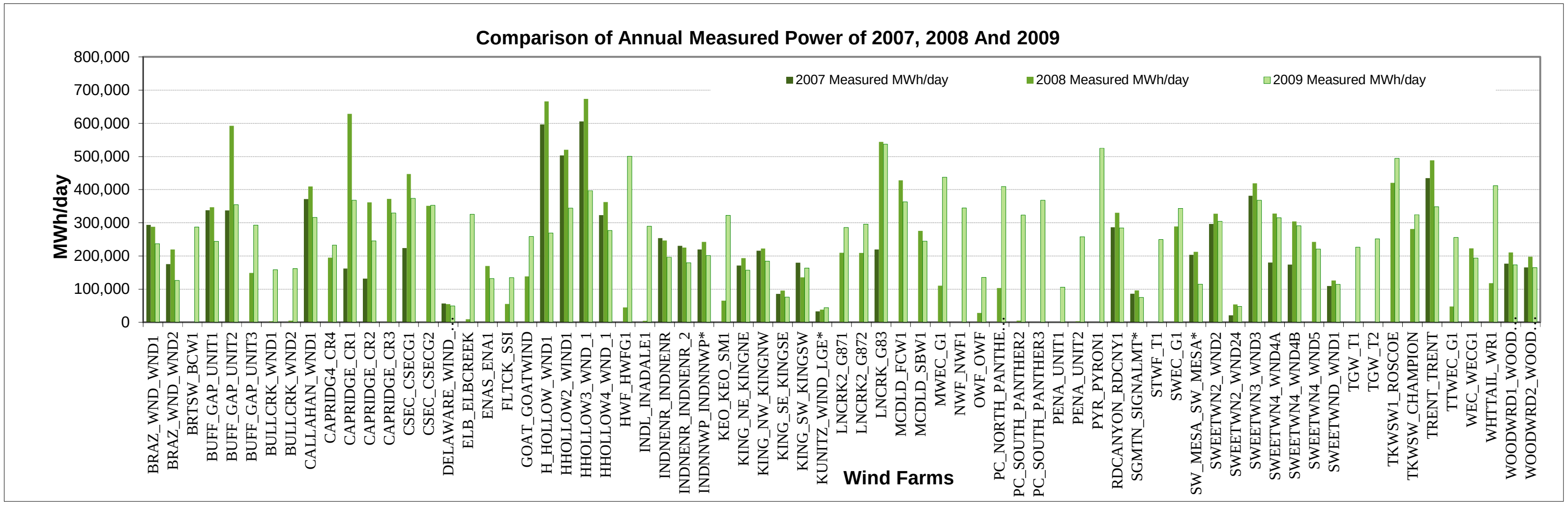
Figure 3-7 (a) shows the annual comparison of measured wind power of 2007, 2008 and 2009 models for all the wind farms. The annual average measured wind power in 2008 is higher than that of 2007 and 2009. Figure 3-7 (b) shows the comparison of measured power of 2007, 2008 and 2009 models for the Ozone Season Period.

Figure 3-8 (a) shows the annual comparison of the predicted power in 1999 using the OSP and Non-OSP models of 2007, 2008 and 2009. Figure 3-8 (b) shows the comparison of predicted power in 1999 using 2007, 2008 and 2009 models for the Ozone Season Period. It is noted that for most of the wind farms, the measured average daily wind power in 2008 OSD is lower than that of 2007 and 2009.

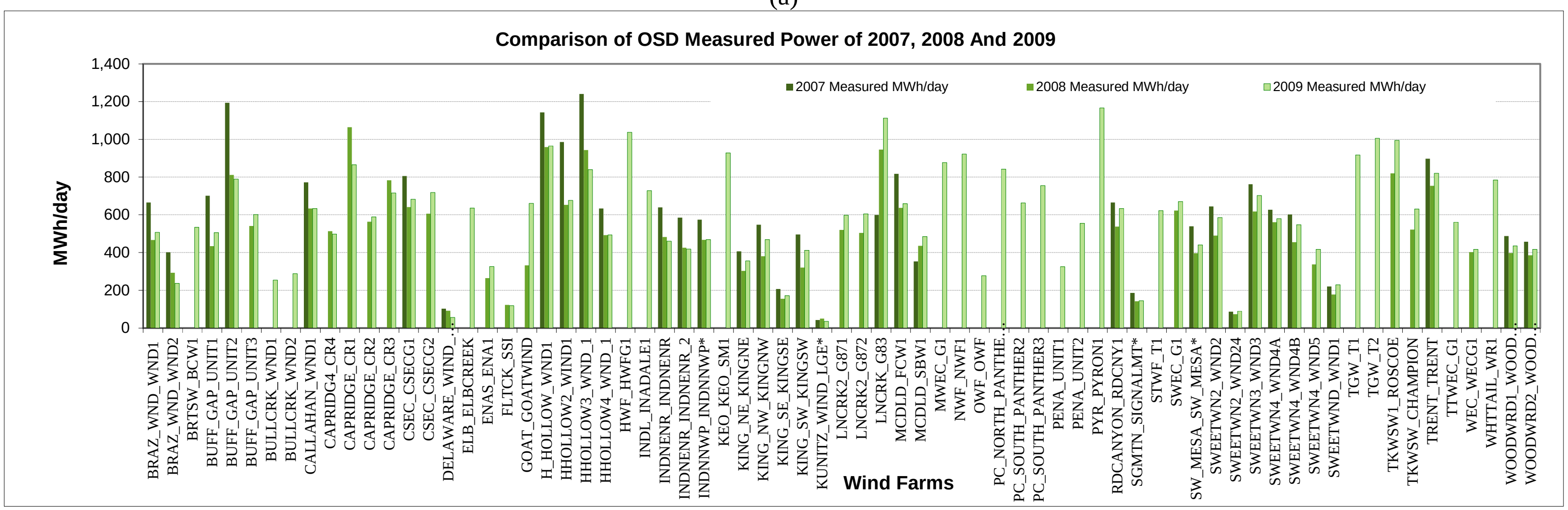
Figure 3-9 and Figure 3-10 show that, in general, the variation in the 1999 predicted wind power caused by using measured data from different years is much smaller than the difference between the 2008 and 2009 measured wind power for most of the wind farms with steady operation. This observation confirms the robust performance and importance of the weather normalization procedure. Due to the absence of detailed information on curtailment, maintenance, or other factors, the explanation on the difference in trend among individual wind farms is not included in this work.

Table 3-3: Comparison of Wind Speeds for 2007, 2008 and 2009

Month		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Average	OSP Average
Wind Speed ABI (mph)	2007	9.5	12.0	11.8	12.9	9.3	9.5	7.0	9.1	9.0	11.0	10.4	10.6	10.2	8.2
	2008	12.1	12.3	13.4	13.9	12.8	13.7	10.6	7.4	8.0	10.5	10.2	12.2	11.4	8.7
	2009	10.7	12.9	13.3	14.7	10.1	11.3	8.9	9.6	8.6	10.7	8.4	8.9	10.7	8.7
Wind Speed CRP (mph)	2007	12.1	11.3	14.2	13.0	10.3	8.6	7.6	7.0	7.0	7.9	10.1	11.9	10.1	6.8
	2008	12.5	13.0	15.3	14.4	13.3	11.3	9.6	8.1	8.7	8.6	9.4	12.4	11.4	9.3
	2009	11.2	9.9	14.0	15.3	13.6	9.3	14.6	11.1	8.1	12.7	1.9	10.6	11.0	11.5
Wind Speed DFW (mph)	2007	10.0	11.9	11.3	11.3	9.3	10.0	7.0	8.7	7.5	9.5	10.6	10.3	9.8	7.5
	2008	11.7	12.4	14.4	13.7	11.8	13.9	10.0	7.9	7.5	9.5	10.5	12.8	11.3	9.1
	2009	11.2	13.7	14.0	13.7	9.7	7.3	8.7	9.1	8.3	10.2	8.3	9.6	10.3	8.3
Wind Speed FST (mph)	2007	9.0	11.2	11.8	13.0	10.0	10.2	9.3	10.5	9.8	10.3	8.4	9.7	10.3	10.0
	2008	10.3	11.0	12.1	11.9	12.7	13.5	11.3	8.6	8.2	10.5	9.2	10.4	10.8	8.9
	2009	9.5	11.2	10.4	12.5	10.1	10.5	9.4	9.7	8.1	10.5	8.9	8.7	10.0	8.6
Wind Speed GDP (mph)	2007	22.7	23.8	16.8	22.1	18.6	17.1	15.1	14.2	13.8	17.6	19.2	22.0	18.6	15.8
	2008	20.9	25.1	20.8	22.6	21.4	19.2	15.1	14.0	13.9	15.0	17.8	24.3	19.2	14.3
	2009	20.6	21.3	22.2	23.4	17.7	15.6	14.6	13.4	16.2	19.9	17.8	20.3	18.6	14.2
Wind Speed LBB (mph)	2007	11.0	12.8	11.8	13.0	11.0	10.6	8.1	10.6	9.7	11.5	10.2	10.7	10.9	9.1
	2008	12.8	12.6	14.9	14.3	13.0	14.1	10.5	8.7	7.9	10.5	10.6	12.1	11.8	9.1
	2009	11.2	12.8	14.1	15.5	11.6	11.2	9.9	10.4	9.2	11.3	9.7	9.3	11.4	9.1
Wind Speed MAF (mph)	2007	9.6	11.2	10.3	12.3	9.7	10.0	8.0	10.0	8.9	10.2	8.9	8.8	9.8	9.0
	2008	9.3	10.8	12.4	12.0	12.8	13.9	11.2	8.1	6.7	9.1	8.3	10.0	10.4	8.7
	2009	9.4	11.3	11.1	13.3	10.5	10.2	8.2	8.3	8.1	10.1	7.5	8.4	9.7	7.9

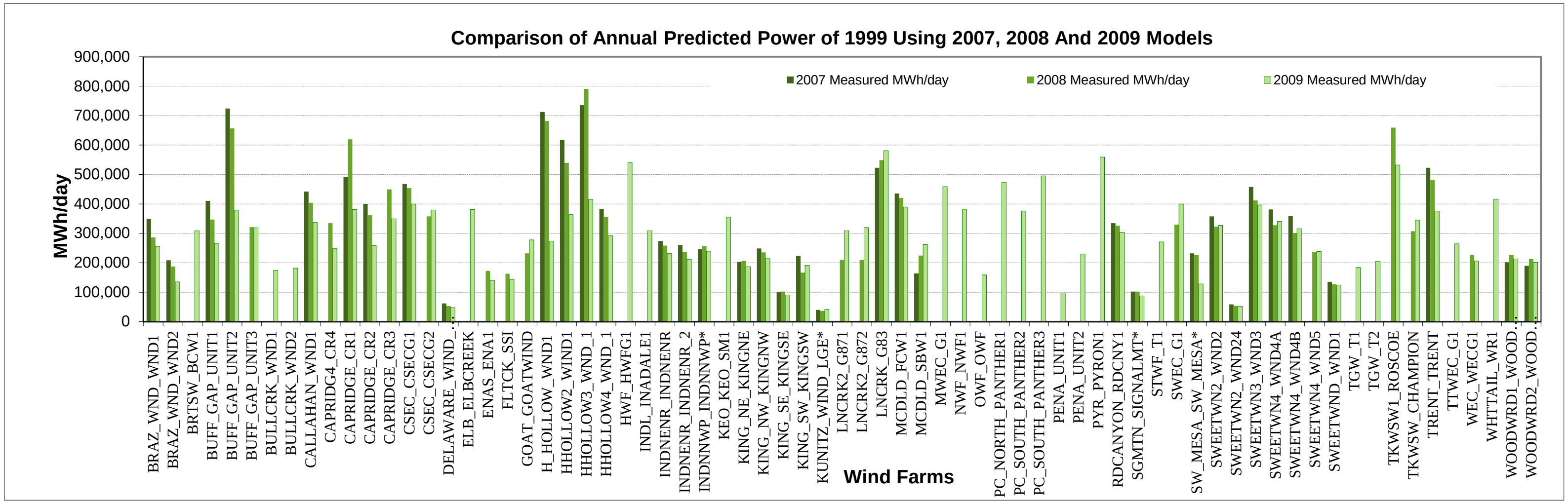


(a)

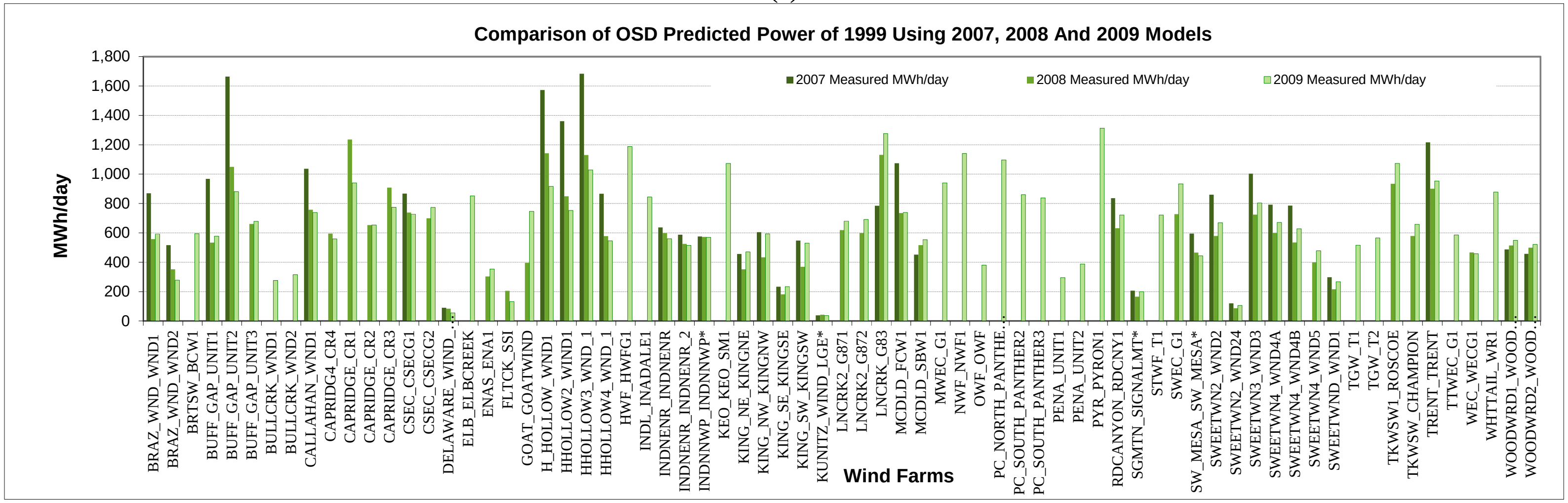


(b)

Figure 3-7: Comparison of Measured Wind Power for 2006, 2007, 2008 and 2009 (Annual and OSD)



(a)



(b)

Figure 3-8: Comparison of Estimated Power of 1999 using the 2005, 2006, 2007 and 2008 Models (Annual and OSD)

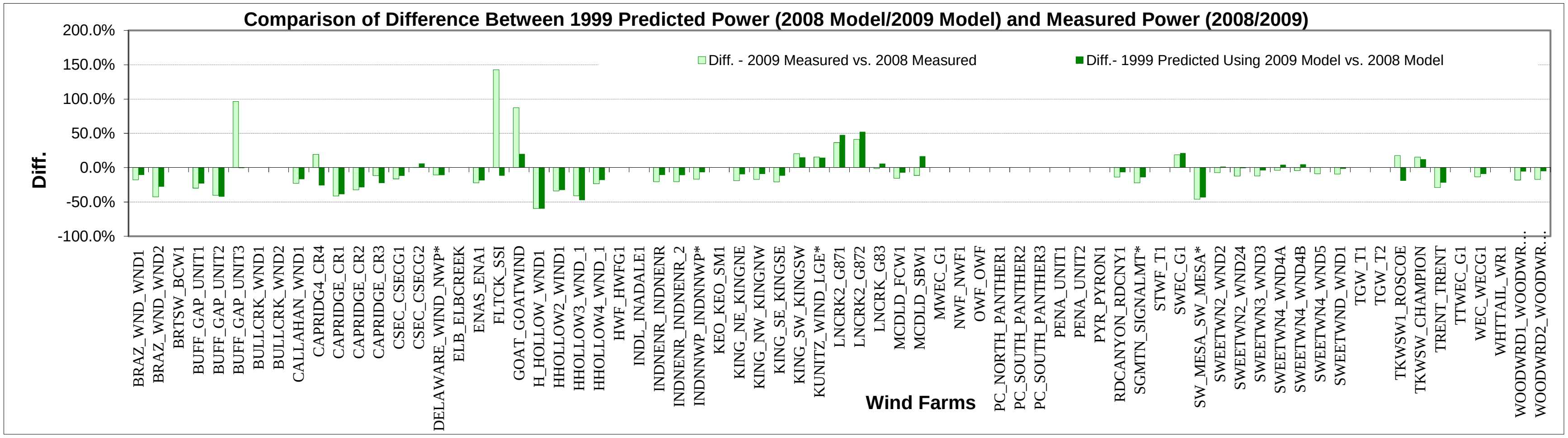


Figure 3-9: Comparison of Difference between 1999 Predicted Power and 2008/2009 Measured Power

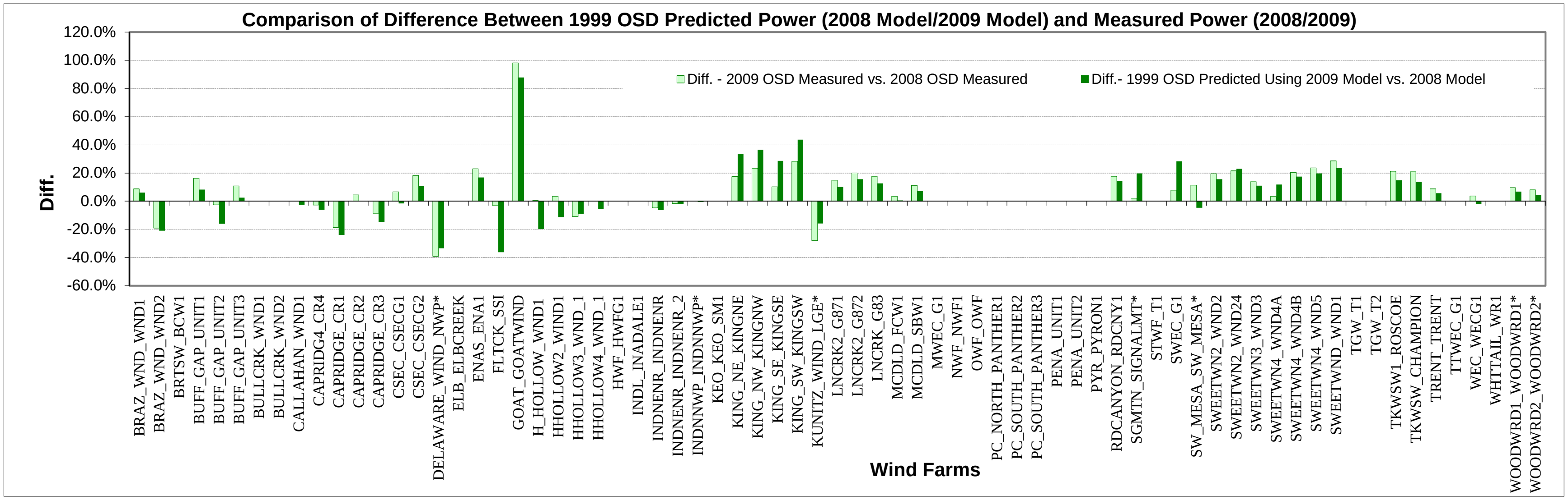


Figure 3-10: Comparison of Difference between 1999 OSD Predicted Power and 2008/2009 OSD Measured Power

3.4 Uncertainty Analysis on the 2009 Daily Regression Models

One of the advantages of using regression models is that it allows for an uncertainty analysis to be calculated, which can be used to assess the accuracy of the model. This section of the report presents an updated uncertainty analysis for the daily regressions that were applied to the 2009 data. The detailed methodology was shown in TCEQ 2010 report.

Table 3-4 presents all the statistics parameters for the daily linear models of all the wind farms in the ERCOT region.

Table 3-5shows the uncertainty of applying the linear models to predict the energy generation that they would have had in the year 1999, ranging from 2.83% to 11.08%. The maximum uncertainty value is a little higher than that of the 2010 report. This comes from a wind farm named PENA_Unit1 due to the ERCOT measured data (a meter problem is suspected). Other than that, the majority results indicate that the daily models are reasonably reliable for predicting the performance of the wind farm in the base year within the same range of wind conditions.

In addition, the same table includes the uncertainty related to the predicted wind generated for the same wind farms in the 1999 Ozone Season Period using the OSP model, which considers the period of July 15 though September 15 – about 63 days. The uncertainty of using OSP models for predicting wind power in the 1999 OSD varies from 5.32 % to 21% for all the wind farms. The reason for this large uncertainty value (21%) is the same as that discussed above.

Table 3-4: Statistical Parameters of the Determined 2009 Daily Power Production Linear Models

Wind Farm	Statistical Parameters of 2009 Non-OSP Daily Models						Statistical Parameters of 2009 OSP Daily Models					
	c_0	c_1	$AdjR^2$	RMSE	CV-RMSE	# Days	c_0	c_1	$AdjR^2$	RMSE	CV-RMSE	# Days
BRAZ_WND_WND1	-116.34	72.36	0.50	321.62	47.3%	301	-439.23	106.18	0.57	251.25	49.5%	63
BRAZ_WND_WND2	-39.65	36.92	0.46	177.49	48.2%	299	-229.18	52.29	0.60	118.56	50.0%	63
BRTSW_BCW1	-249.87	98.74	0.71	283.07	33.7%	297	-144.52	76.15	0.68	143.76	26.9%	63
BUFFALO_GAP_1	-105.48	74.59	0.39	398.21	56.6%	292	-302.75	90.74	0.65	182.94	36.1%	63
BUFFALO_GAP_2	232.06	72.16	0.16	685.86	67.9%	292	-223.54	113.75	0.49	318.56	40.3%	63
BUFFALO_GAP_3	-22.54	80.69	0.26	574.89	67.9%	290	-264.46	97.14	0.60	219.80	36.5%	63
BULLCRK_WND1	-243.85	60.98	0.42	279.01	59.1%	301	-222.63	50.62	0.60	118.03	46.4%	62
BULLCRK_WND2	-101.11	51.09	0.27	297.65	62.1%	281	-247.42	57.25	0.60	134.49	46.8%	63
CALLAHAN_WND1	51.86	78.21	0.32	506.21	55.6%	299	-334.87	110.57	0.63	229.34	36.2%	58
CAPRIDG4_CR4**	95.67	52.41	0.21	451.02	67.6%	295	-116.00	69.53	0.39	236.76	47.5%	62
CAPRIDGE_CR1	588.41	41.11	0.04	843.31	81.2%	299	41.14	92.53	0.32	368.19	42.5%	63
CAPRIDGE_CR2	187.90	45.74	0.14	497.67	72.1%	300	-125.33	80.17	0.47	233.49	39.6%	63
CAPRIDGE_CR3	276.54	61.95	0.13	675.89	71.7%	292	55.71	74.03	0.32	291.03	40.7%	63
CSEC_CSECG1	-254.28	114.23	0.48	468.54	43.1%	302	-379.57	112.32	0.40	396.41	58.0%	58
CSEC_CSECG2	-232.32	106.42	0.48	431.06	42.3%	302	-311.47	110.20	0.45	350.03	48.7%	63
ELB_ELBCREEK	-193.92	114.04	0.45	439.72	46.4%	299	-549.45	147.95	0.47	294.10	46.2%	63
ENAS_ENA1	8.97	30.68	0.26	205.39	55.5%	298	-201.06	56.37	0.57	142.28	43.7%	63
FLTCK_SSI	-83.44	45.84	0.48	212.93	50.5%	302	-22.93	15.87	0.50	43.43	36.6%	63
GOAT_GOATWIND	-73.18	72.21	0.32	461.13	64.2%	299	-305.02	108.21	0.45	325.34	49.3%	63
H_HOLLOW_WND1	704.54	1.01	0.00	414.72	58.1%	215	-8.31	95.29	0.37	337.92	41.0%	51
HHOLLOW2_WIND1	-24.03	92.14	0.26	693.50	69.9%	295	-217.35	99.95	0.46	312.65	46.2%	54
HHOLLOW3_WND_1	554.38	52.06	0.05	709.95	67.0%	277	-51.92	111.36	0.14	496.44	59.1%	54
HHOLLOW4_WND_1	49.53	69.27	0.32	445.59	55.0%	295	-136.14	70.33	0.49	200.73	40.7%	57
HWF_HWFG1	-445.36	171.33	0.66	548.43	38.0%	301	-671.09	191.60	0.80	266.69	25.7%	63
INDL_INADALE1	27.69	70.63	0.21	609.48	75.6%	302	-582.58	147.02	0.71	260.47	35.8%	63
INDNENR_INDNENR	-156.46	70.39	0.33	317.03	57.2%	293	-376.33	94.01	0.53	220.46	48.0%	62
INDNENR_INDNENR_2	-179.13	67.60	0.33	304.87	60.1%	295	-377.02	89.56	0.50	222.60	53.1%	62
KEO_KEO_SM1	238.90	63.75	0.12	594.64	68.0%	299	135.79	98.92	0.11	489.46	52.7%	63
KING_NE_KINGNE	-177.88	62.29	0.50	220.00	49.4%	301	-277.54	79.05	0.44	166.80	46.9%	63
KING_NW_KINGNW	-86.55	59.87	0.37	272.30	53.1%	301	-214.64	85.33	0.36	210.79	44.9%	63
KING_SE_KINGSE	-88.36	30.25	0.48	110.04	51.3%	301	-168.94	42.59	0.49	81.28	47.2%	63
KING_SW_KINGSW	-110.18	56.57	0.45	219.92	48.3%	300	-239.76	81.30	0.46	164.82	40.0%	63
LNCRK_G83	-491.58	184.97	0.63	630.19	40.8%	301	-722.80	205.89	0.80	282.87	25.4%	63
LNCRK2_G871	-263.40	98.68	0.71	280.99	34.1%	301	-338.53	105.03	0.79	149.20	25.0%	63
LNCRK2_G872	-256.20	100.67	0.73	273.58	32.1%	300	-362.06	108.52	0.80	151.49	25.0%	63
MCDLD_FCW1	-231.02	117.59	0.67	368.99	34.6%	300	-230.99	99.90	0.45	303.97	46.1%	63
MCDLD_SBW1	-80.86	71.69	0.56	282.02	39.7%	302	-295.67	87.53	0.60	198.57	41.0%	63
MWEC_G1	284.09	83.34	0.24	583.05	46.0%	299	-310.60	127.03	0.56	326.05	37.2%	63
NWF_NWF1	279.14	66.71	0.19	492.43	51.8%	259	-281.21	150.19	0.42	332.16	36.0%	63
OWF_OWF	-93.32	48.30	0.45	185.19	47.3%	299	-295.07	71.34	0.51	130.01	47.0%	63
PC_NORTH_PANTHER1	-176.49	135.40	0.46	513.77	43.6%	300	-555.39	174.44	0.47	346.89	41.2%	63
PC_SOUTH_PANTHER2	-170.35	110.22	0.43	444.09	47.6%	298	-420.04	135.18	0.38	322.59	48.6%	63
PC_SOUTH_PANTHER3	-179.23	141.49	0.44	620.85	53.8%	112	-175.22	104.33	0.29	440.83	58.4%	63
PENA_UNIT1	-13.58	24.08	0.10	317.17	112.6%	270	210.03	10.20	0.01	249.45	76.7%	57
PENA_UNIT2	-296.79	85.40	0.61	306.75	41.9%	270	-414.19	95.96	0.64	245.98	44.3%	48
PYR_PYRON1	40.42	132.33	0.29	915.80	61.3%	299	-344.89	170.79	0.53	438.94	37.6%	62
RDCANYON_RDCNY1	-41.57	77.28	0.50	339.20	41.8%	300	-368.50	112.35	0.60	251.32	39.7%	63
STWF_T1	-110.10	73.59	0.50	328.82	47.1%	298	-484.84	124.34	0.80	173.95	27.9%	63
SWEC_G1	-122.18	111.77	0.58	331.70	33.2%	299	-779.58	180.92	0.65	249.67	37.3%	63
SWEETWN2_WND2	-238.68	101.90	0.73	276.26	31.2%	302	-359.46	106.03	0.73	176.59	30.2%	63
SWEETWN2_WND24	-68.19	19.04	0.77	45.00	32.5%	291	-97.20	21.04	0.80	28.77	31.8%	63
SWEETWN3_WND3	-281.48	122.86	0.72	341.24	31.8%	302	-439.49	128.03	0.74	210.85	30.1%	63
SWEETWN4_WND4A	-338.15	114.28	0.73	311.46	33.8%	301	-447.69	115.26	0.74	187.41	32.3%	63
SWEETWN4_WND4B	-282.45	102.99	0.73	275.83	32.5%	299	-341.08	99.78	0.74	164.24	30.0%	63
SWEETWND_WND1	-129.73	41.84	0.75	106.53	32.1%	302	-197.15	47.78	0.77	71.79	31.4%	63
SWEETWND4_WND5	-193.98	76.19	0.70	224.38	34.7%	300	-260.60	76.05	0.81	102.36	24.5%	63
TGW_T1	16.02	42.45	0.16	453.86	82.2%	268	-628.07	136.65	0.86	229.20	25.0%	61
TGW_T2	0.21	49.15	0.16	531.55	85.9%	280	-694.43	150.44	0.85	264.60	26.3%	61
TKWSW_CHAMPION	-51.14	84.54	0.31	491.99	52.1%	300	120.66	54.62	0.19	320.77	50.8%	63
TKWSW1_ROSCOE	-239.53	142.53	0.36	731.90	51.2%	300	-485.78	158.33	0.50	458.31	46.1%	63
TRENT_TRENT	-207.64	107.83	0.50	481.22	49.0%	301	-676.22	167.84	0.75	269.67	32.9%	63
TTWEC_G1	398.33	30.63	0.05	553.39	75.7%	289	287.40	30.72	0.06	304.40	54.2%	63
WEC_WECG1	22.87	45.14	0.33	249.24	45.0%	300	-331.84	80.21	0.58	196.35	47.0%	63
WHTTAIL_WR1	-121.92	120.48	0.59	460.34	38.3%	300	-401.09	139.59	0.49	359.02	45.8%	63
DELAWARE_WIND_NWP	-56.96	10.55	0.57	62.42	41.9%	288	-71.39	9.19	0.57	25.31	45.4%	52
INDNNWP_INDNNWP	-224.91	78.43	0.33	356.91	62.5%	294	-376.82	95.07	0.50	238.33	50.9%	62
KUNITZ_WIND_LGE	-61.97	10.12	0.55	63.54	46.8%	288	-70.03	7.69	0.59	20.61	56.8%	52
SGMTN_SIGNALMT	-45.92	26.27	0.39	115.59	53.1%	299	-158.93	37.94	0.44	80.17	55.3%	63
SW_MESA_SW_MESA	90.70	21.57	0.13	159.19	56.1%	232	-148.86	62.59	0.35	148.37	44.5%	53
WOODWRD1_WOODWRD1	-364.65	83.54	0.53	248.68	51.6%	293	-512.80	106.65	0.76	150.41	34.5%	62
WOODWRD2_WOODWRD2	-327.86	77.47	0.53	232.97	50.8%	295	-448.42	97.32	0.77	134.72	32.3%	62

Table 3-5: 1999 Uncertainty of the Power Generation Prediction using the Linear Daily Models

Wind Farm	1999 Non Ozone Season Period				1999 Ozone Season Period (OSP)			
	Predicted days	Total Variance	Total Estimated	Relative Uncertainty	Predicted Days	Total Variance	Total Estimated	Relative uncertainty
BRAZ_WND_WND1	302	10,969.79	256,109	4.28%	63	3,933.26	37,275.7	10.55%
BRAZ_WND_WND2	302	6,053.87	135,170	4.48%	63	1,855.99	17,549.7	10.58%
BRTSW_BCW1	302	9,655.01	308,589	3.13%	63	2,250.44	37,477.4	6.00%
BUFFALO_GAP_1	302	13,584.30	266,376	5.10%	63	2,863.89	36,434.1	7.86%
BUFFALO_GAP_2	302	23,397.60	378,841	6.18%	63	4,986.97	55,496.2	8.99%
BUFFALO_GAP_3	302	19,611.70	319,177	6.14%	63	3,440.82	42,757.3	8.05%
BULLCRK_WND1	302	9,520.24	173,688	5.48%	63	1,846.43	17,381.4	10.62%
BULLCRK_WND2	302	10,161.43	182,074	5.58%	63	2,103.47	19,934.2	10.55%
CALLAHAN_WND1	302	17,266.30	336,695	5.13%	63	3,593.03	46,537.9	7.72%
CAPRIDG4_CR4**	302	15,384.05	248,056	6.20%	63	3,707.37	35,223.2	10.53%
CAPRIDGE_CR1	302	28,764.09	381,177	7.55%	63	5,763.93	59,191.3	9.74%
CAPRIDGE_CR2	302	16,974.68	258,415	6.57%	63	3,655.16	41,140.8	8.88%
CAPRIDGE_CR3	302	23,057.13	349,730	6.59%	63	4,555.94	48,794.0	9.34%
CSEC_CSECG1	302	15,987.24	399,731	4.00%	63	6,202.77	45,775.6	13.55%
CSEC_CSECG2	302	14,708.31	379,884	3.87%	63	5,474.40	48,748.1	11.23%
ELB_ELBCREEK	302	15,007.28	380,916	3.94%	63	4,620.80	53,672.1	8.61%
ENAS_ENA1	302	7,008.25	140,714	4.98%	63	2,225.31	22,309.4	9.97%
FLTCK_SSI	302	7,262.50	143,966	5.04%	63	679.85	8,263.1	8.23%
GOAT_GOATWIND	302	15,728.50	278,310	5.65%	63	5,093.02	46,975.3	10.84%
H_HOLLOW_WND1	302	14,147.33	274,086	5.16%	63	5,292.72	57,767.0	9.16%
HHOLLOW2_WIND1	302	23,654.40	363,599	6.51%	63	4,895.93	47,447.0	10.32%
HHOLLOW3_WND_1	302	24,220.11	414,983	5.84%	63	7,773.98	64,849.0	11.99%
HHOLLOW4_WND_1	302	15,198.50	292,516	5.20%	63	3,143.54	34,443.1	9.13%
HWF_HWFG1	302	18,705.62	541,792	3.45%	63	4,174.96	74,922.2	5.57%
INDL_INADALE1	302	20,787.97	309,483	6.72%	63	4,077.62	53,229.7	7.66%
INDNENR_INDNENR	300	10,786.01	231,310	4.66%	63	3,450.82	35,277.4	9.78%
INDNENR_INDNENR_2	300	10,372.09	211,992	4.89%	63	3,484.28	32,439.5	10.74%
KEO_KEO_SM1	302	20,295.63	355,404	5.71%	63	7,690.33	67,582.8	11.38%
KING_NE_KINGNE	302	7,508.38	186,745	4.02%	63	2,620.67	29,685.6	8.83%
KING_NW_KINGNW	302	9,293.28	213,779	4.35%	63	3,311.88	37,396.8	8.86%
KING_SE_KINGSE	302	3,755.49	90,456	4.15%	63	1,277.03	14,769.2	8.65%
KING_SW_KINGSW	302	7,505.90	191,497	3.92%	63	2,589.59	33,411.8	7.75%
LNCRK_G83	302	21,494.30	581,204	3.70%	63	4,428.22	80,400.4	5.51%
LNCRK2_G871	302	9,583.92	309,735	3.09%	63	2,335.67	42,916.5	5.44%
LNCRK2_G872	302	9,331.12	319,529	2.92%	63	2,371.50	43,568.8	5.44%
MCDLD_FCW1	302	12,585.60	389,518	3.23%	63	4,758.50	46,556.9	10.22%
MCDLD_SBW1	302	9,618.95	262,126	3.67%	63	3,108.58	34,916.0	8.90%
MWEC_G1	302	19,894.90	459,306	4.33%	63	5,099.42	59,246.9	8.61%
NWF_NWF1	302	16,810.28	381,891	4.40%	63	5,218.76	71,905.3	7.26%
OWF_OWF	302	6,320.57	159,202	3.97%	63	2,042.77	23,984.2	8.52%
PC_NORTH_PANTHER1	302	17,534.59	473,845	3.70%	63	5,450.26	69,105.6	7.89%
PC_SOUTH_PANTHER2	302	15,156.79	375,646	4.03%	63	5,068.51	54,206.0	9.35%
PC_SOUTH_PANTHER3	302	21,249.76	495,256	4.29%	63	6,900.97	52,775.8	13.08%
PENA_UNIT1	302	10,819.85	97,644	11.08%	63	3,906.95	18,604.8	21.00%
PENA_UNIT2	302	10,462.39	230,032	4.55%	61	3,791.90	24,517.0	15.47%
PYR_PYRON1	302	31,236.45	559,399	5.58%	63	6,873.00	82,740.3	8.31%
RDCANYON_RDCNY1	302	11,569.51	304,205	3.80%	63	3,934.37	45,508.7	8.65%
STWF_T1	302	11,215.72	270,563	4.15%	63	2,723.09	45,513.2	5.98%
SWEC_G1	302	11,320.72	400,077	2.83%	63	3,922.84	58,846.9	6.67%
SWEETWN2_WND2	302	9,422.52	327,777	2.87%	63	2,764.48	42,208.7	6.55%
SWEETWN2_WND24	302	1,535.01	53,003	2.90%	63	450.36	6,745.5	6.68%
SWEETWN3_WND3	302	11,638.81	396,834	2.93%	63	3,300.84	50,624.3	6.52%
SWEETWN4_WND4A	302	10,623.25	341,340	3.11%	63	2,933.87	42,296.6	6.94%
SWEETWN4_WND4B	302	9,408.10	315,745	2.98%	63	2,571.19	39,546.0	6.50%
SWEETWND_WND1	302	3,633.65	124,493	2.92%	63	1,123.86	16,805.0	6.69%
SWEETWND4_WND5	302	7,653.14	238,924	3.20%	63	1,602.44	30,098.5	5.32%
TGW_T1	302	15,480.67	183,968	8.41%	61	3,532.99	32,579.7	10.84%
TGW_T2	302	18,129.88	205,417	8.83%	60	4,045.57	35,691.3	11.33%
TKWSW_CHAMPION	302	16,787.47	344,823	4.87%	63	5,016.79	41,487.5	12.09%
TKWSW1_ROSCOE	302	24,974.59	532,780	4.69%	63	7,167.97	67,628.9	10.60%
TRENT_TRENT	302	16,413.33	375,841	4.37%	63	4,221.62	60,063.5	7.03%
TTWEC_G1	302	18,877.27	264,706	7.13%	63	4,765.34	36,898.4	12.91%
WEC_WECG1	302	8,504.39	206,000	4.13%	63	3,070.83	28,859.7	10.64%
WHTTAIL_WR1	302	15,682.15	416,767	3.76%	63	5,634.35	55,296.9	10.19%
DELAWARE_WIND_NWP	302	*2,129.70*	*47,708*	*4.46%*	*61*	395.63	3,555.2	*11.13%*
INDNWP_INDNNWP	*300*	*12,142.83*	*239,087*	*5.08%*	*63*	*3,730.50*	*35,907.6*	*10.39%*
KUNITZ_WIND_LGE	*302*	*2,168.00*	*42,515*	*5.10%*	*58*	*314.51*	*2,356.8*	*13.34%*
SGMTN_SIGNALMT	*302*	*3,945.26*	*87,634*	*4.50%*	*63*	*1,259.59*	*12,626.1*	*9.98%*
SW_MESA_SW_MESA	*302*	*5,433.22*	*128,331*	*4.23%*	*63*	*2,331.22*	*27,970.5*	*8.33%*
WOODWRD1_WOODWRD1	*300*	*8,460.64*	*213,421*	*3.96%*	*63*	*2,354.23*	*34,608.6*	*6.80%*
WOODWRD2_WOODWRD2	*300*	*7,926.20*	*201,731*	*3.93%*	*63*	*2,108.75*	*32,808.8*	*6.43%*

4 DEGRADATION ANALYSIS FOR WIND FARMS

The analysis contained in this section is an update of the work reported in the 2010 annual report in response to a request by the TCEQ to determine what amounts of degradation could be observed in the measured power from Texas wind farms. Currently, the TCEQ uses a very conservative 5% degradation per year for the power output from a wind farm when making future projections from existing wind farms. Accordingly, the TCEQ asked the ESL to evaluate any observed degradation from the measured data for Texas wind farms. To accomplish this, nine wind farms (12 sites) from 2002 to 2009, two wind farms from 2004 to 2009, and five wind farms from 2006 to 2009, including one new wind farm Sweetwater Wind 3, were evaluated with a total capacity of 1889.6 MW.

In this analysis, a sliding statistical index was established for each site that uses the 10th, 25th, 50th, 75th, 90th, and 99th percentiles of the hourly power generation over a 12-month sliding period[2], as well as mean, minimum and maximum hourly power generation of the same 12-month period. These indices are then displayed using one data symbol for each 12-month slide, beginning from the first 12-month period until the last 12-month period for each of the wind farms, as shown from Figure 4-1 and Figure 4-14. The 90th percentile values were chosen to present the degradation for each wind farm[3]. In addition, our analysis revealed that the maximum hourly power generation over a 12-month period was also a useful index to watch, since this facilitated a way to see if there was major operation change (i.e., shut down of wind turbines) during the studied time period.

Table 4-1 presents the summary of the degradation analysis for the sixteen wind farms (19 sites). Of the 22 sites analyzed, 13 sites showed an increase when one compares the 90th percentile of whole period to the 90th percentile of the first 12-month period, ranging from 1.9% to 28.9%. The remaining six sites showed a decrease from -1.1% to -26.9%. The weighted average of this increase across all wind farms studied is 10.5% (positive), which indicates that no degradation was observed from the aggregate energy production from these wind farms over the studied operation period.

Table 4-2 and Figure 4-20 show the design capacity, the maximum and minimum of the observed maximum hourly wind power over the sliding 12-month period, and the observed maximum hourly wind power for the last 12-month period for the studied wind farms. It is interesting to note that the observed maximum hourly wind power generation is slightly lower than the design/announced capacity for all the sites except for the Brazos Wind Ranch wind farm.

[2] To calculate this, the hourly data for the 12-month period is converted into quartiles, and those quartiles are recorded in a table. The oldest month is dropped from the dataset as a new month is added, and the quartiles recalculated and recorded, etc.

[3] The choice of the 90th percentile is consistent with the recommendation by Abushakra, B., Haberl, J., Claridge, D. 2004. "Overview of Literature on Diversity Factors and Schedules for Energy and Cooling Load Calculations (1093-RP)," *ASHRAE Transactions-Research*, Vol. 110, Pt. 1 (February), pp. 164-176; and in Claridge, D., Abushakra, B., Haberl, J. 2003. "Electricity Diversity Profiles for Energy Simulation of Office Buildings (1093-RP)," *ASHRAE Transactions-Research*, Vol. 110, Pt. 1 (February), pp. 365-377.

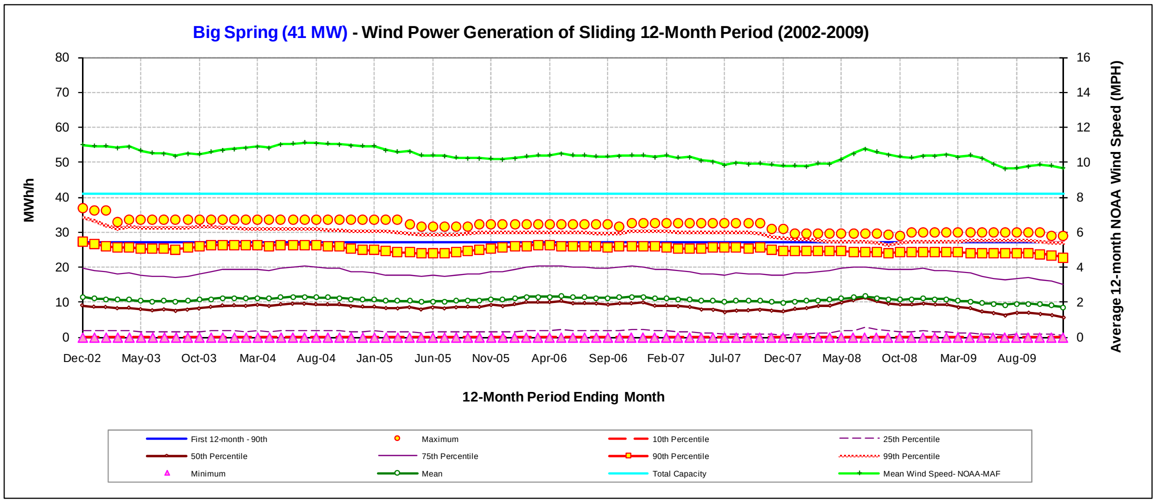


Figure 4-1: Sliding 12-month Hourly Wind Power Generation for Big Spring

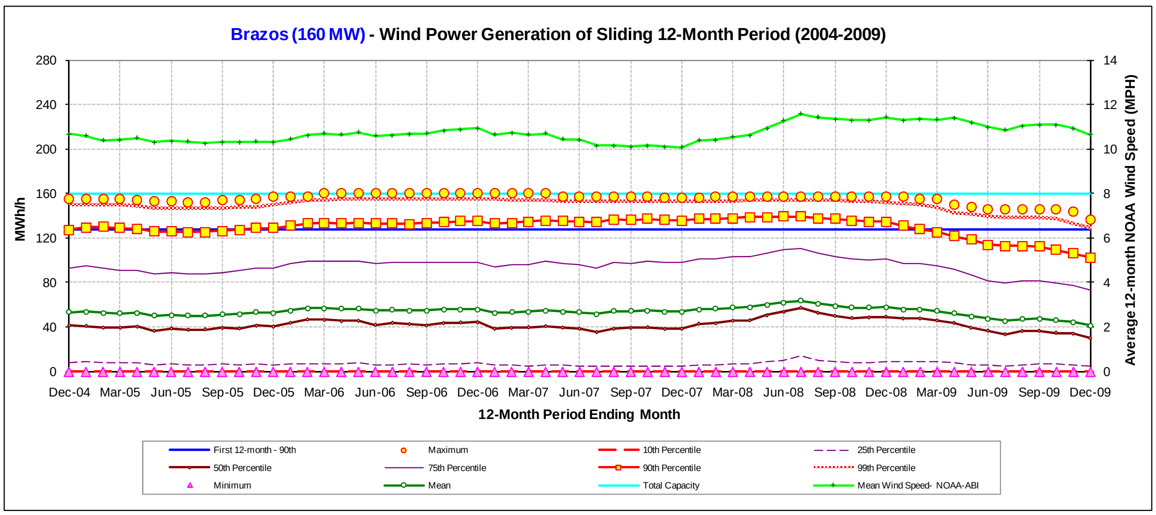


Figure 4-2: Sliding 12-month Hourly Wind Power Generation for Brazos

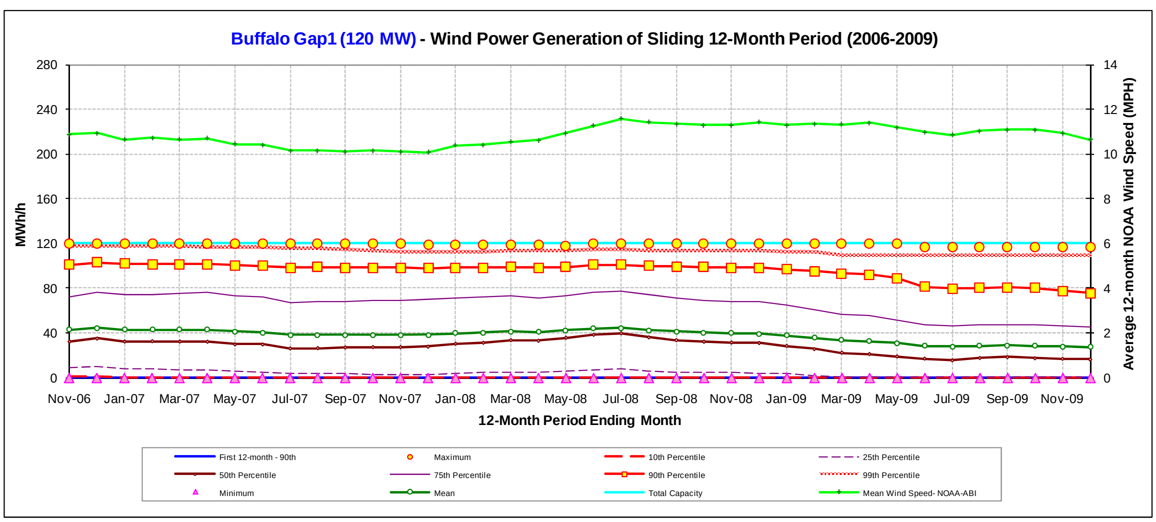


Figure 4-3: Sliding 12-month Hourly Wind Power Generation for Buffao Gap1

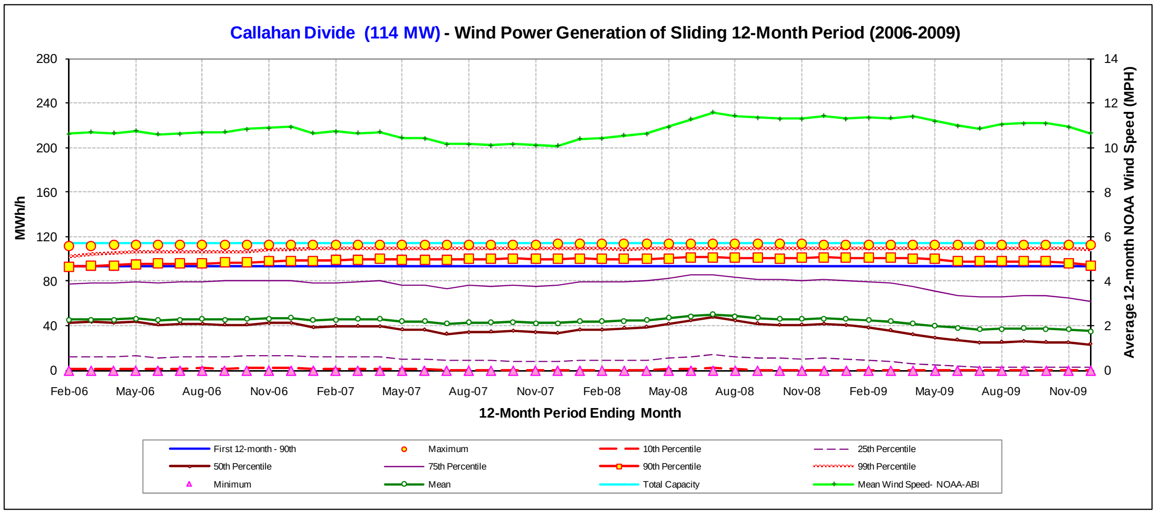


Figure 4-4: Sliding 12-month Hourly Wind Power Generation for Callahan Divide

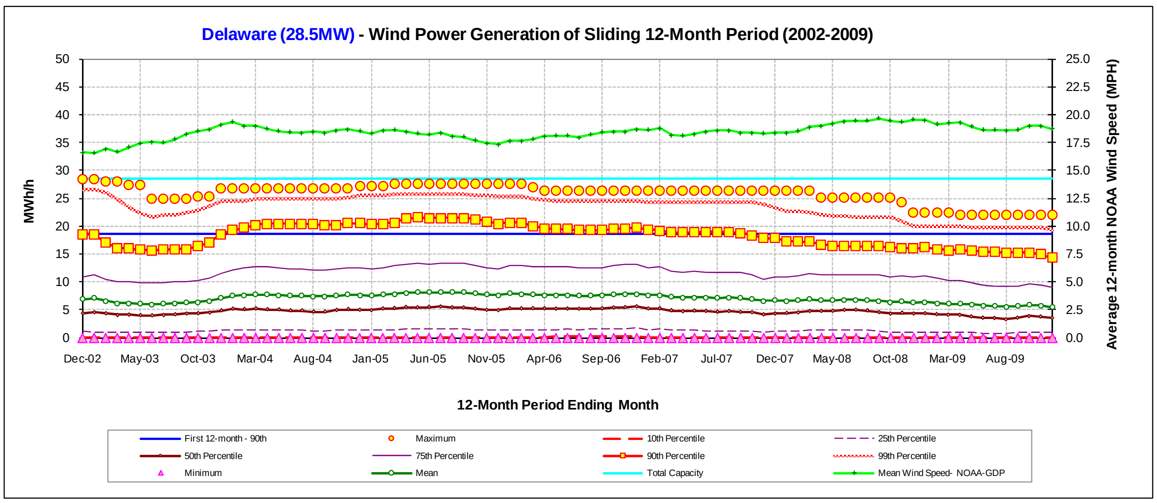


Figure 4-5: Sliding 12-month Hourly Wind Power Generation for Delaware

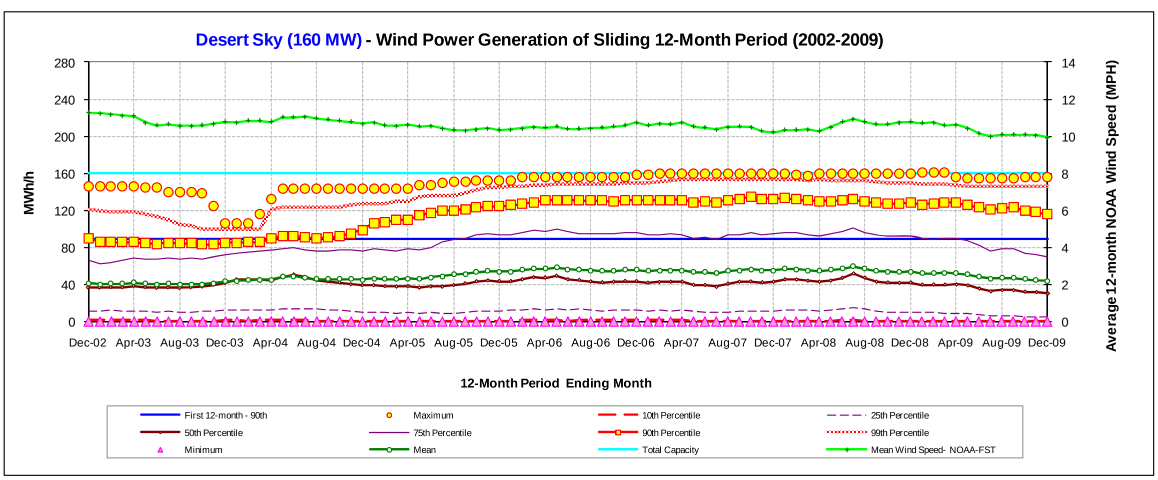


Figure 4-6: Sliding 12-month Hourly Wind Power Generation for Desert Sky

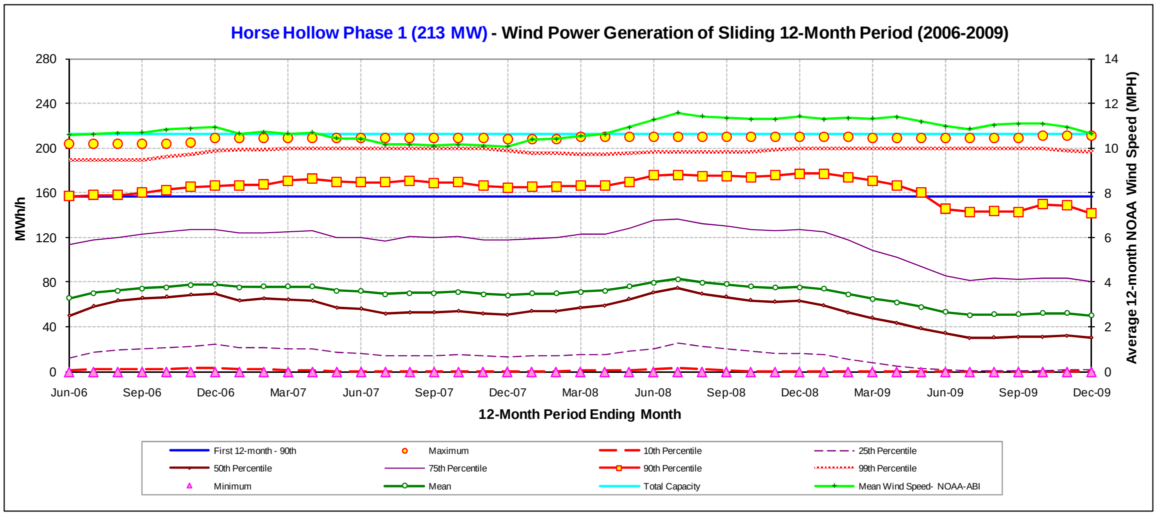


Figure 4-7: Sliding 12-month Hourly Wind Power Generation for Horse Hollow Phase 1

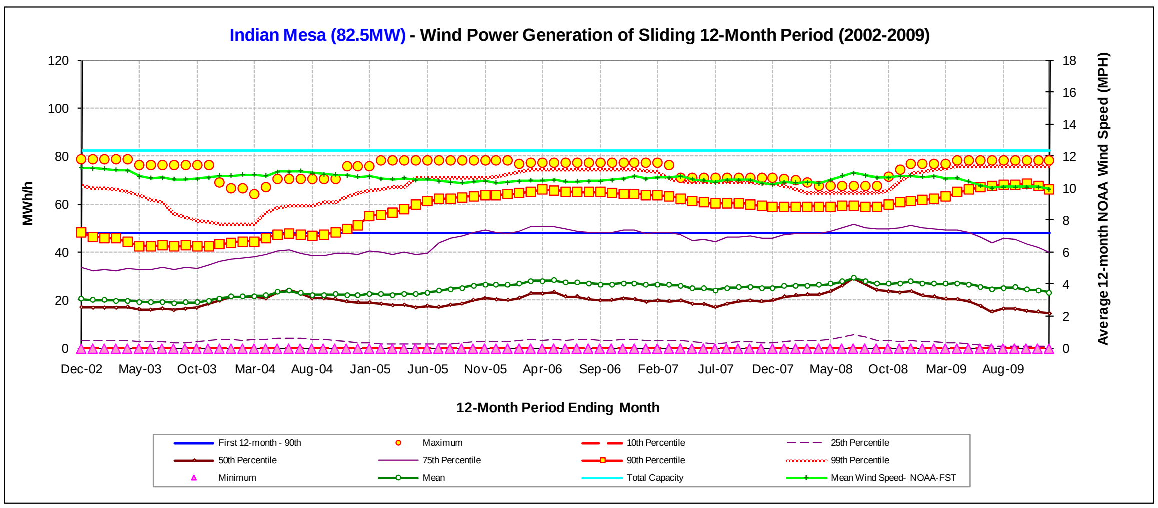


Figure 4-8: Sliding 12-month Hourly Wind Power Generation for Indian Mesa

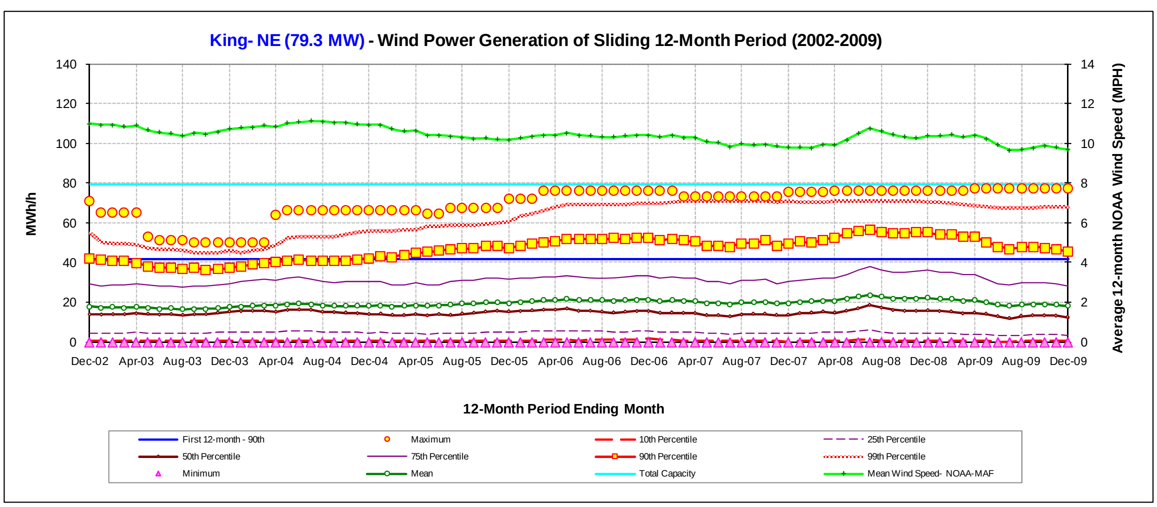


Figure 4-9: Sliding 12-month Hourly Wind Power Generation for King Mountain-NE

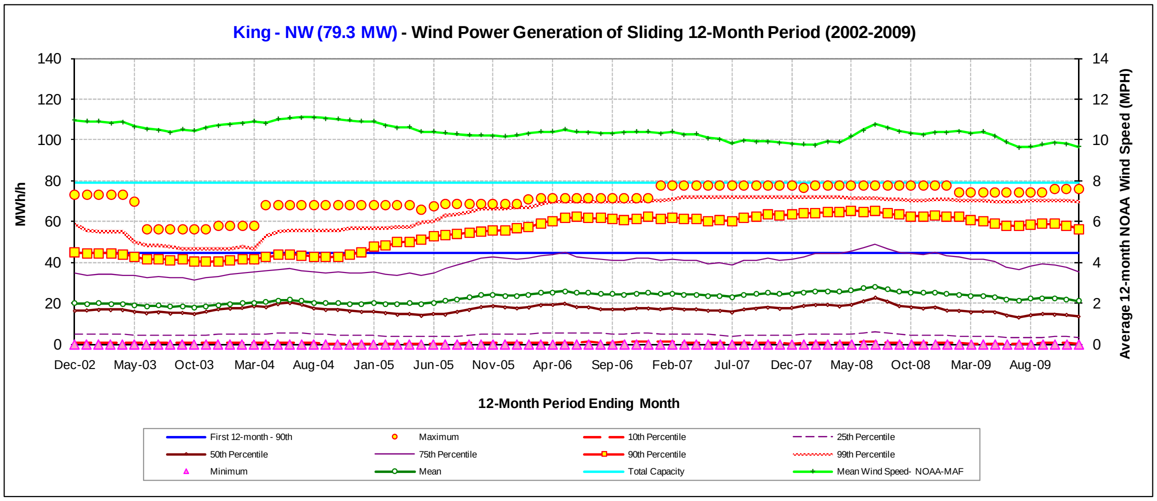


Figure 4-10: Sliding 12-month Hourly Wind Power Generation for King Mountain-NW

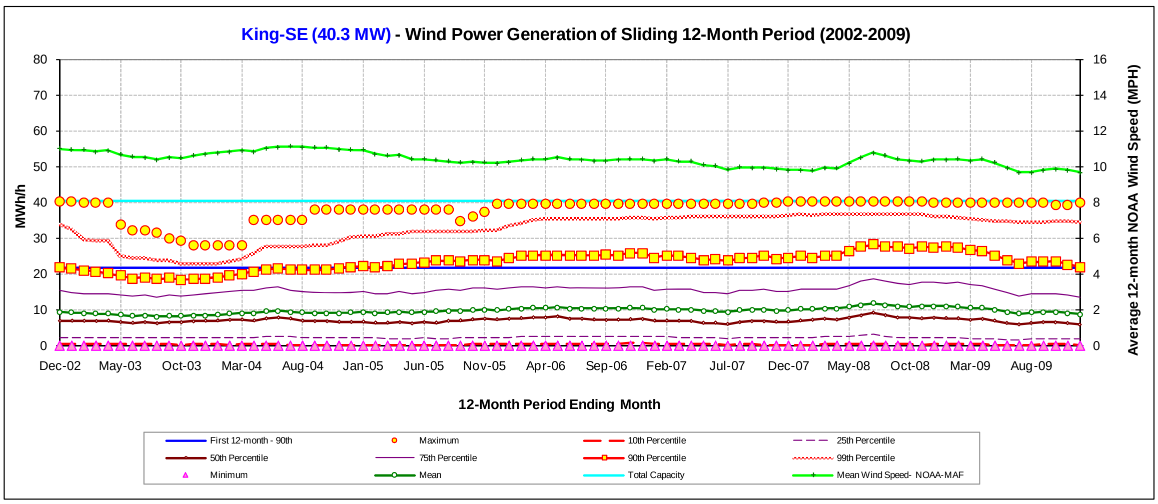


Figure 4-11: Sliding 12-month Hourly Wind Power Generation for King Mountain-SE

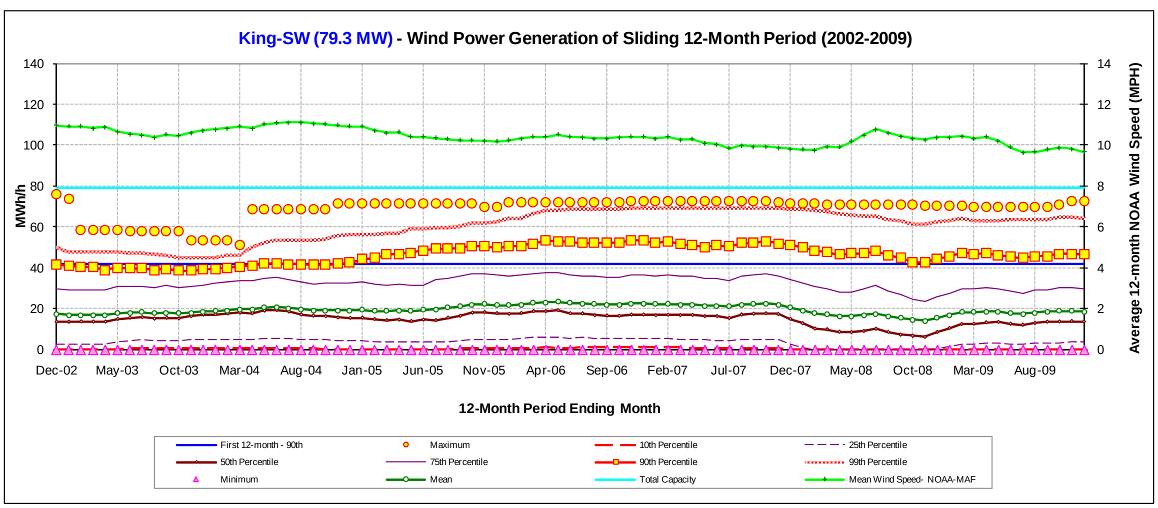


Figure 4-12: Sliding 12-month Hourly Wind Power Generation for King Mountain-SW

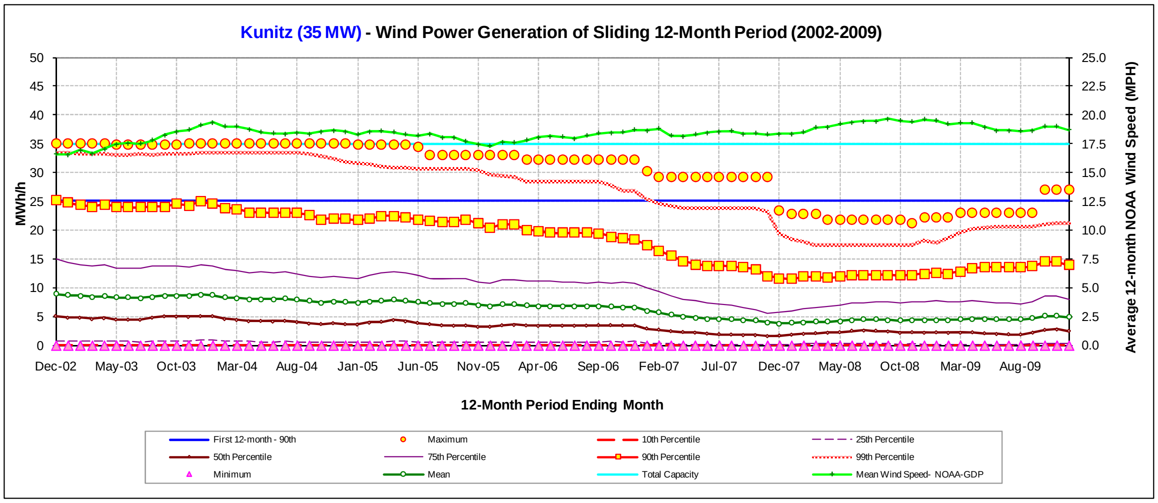


Figure 4-13: Sliding 12-month Hourly Wind Power Generation for Kunitz

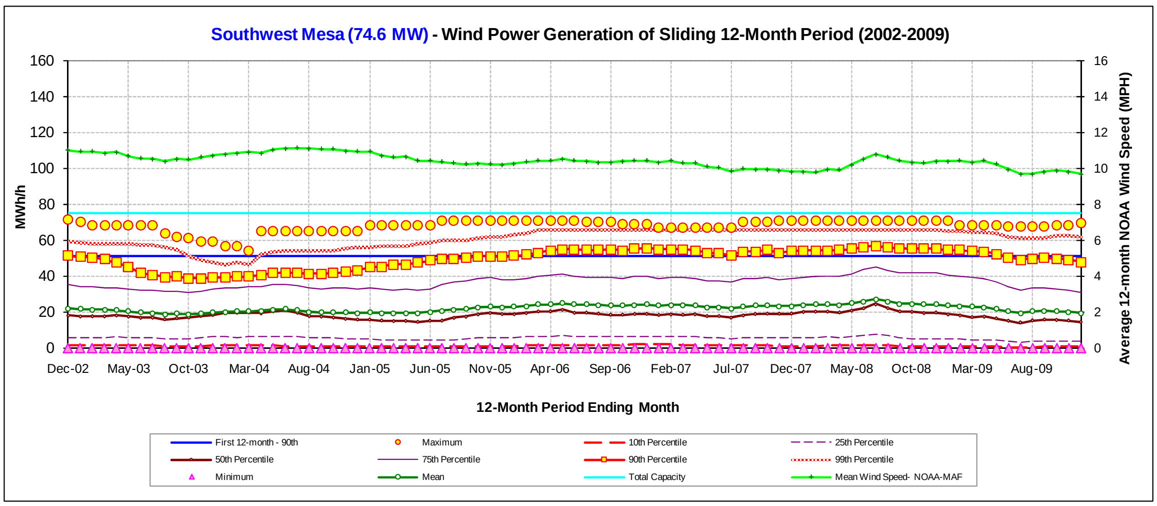


Figure 4-14: Sliding 12-month Hourly Wind Power Generation for Southwest Mesa

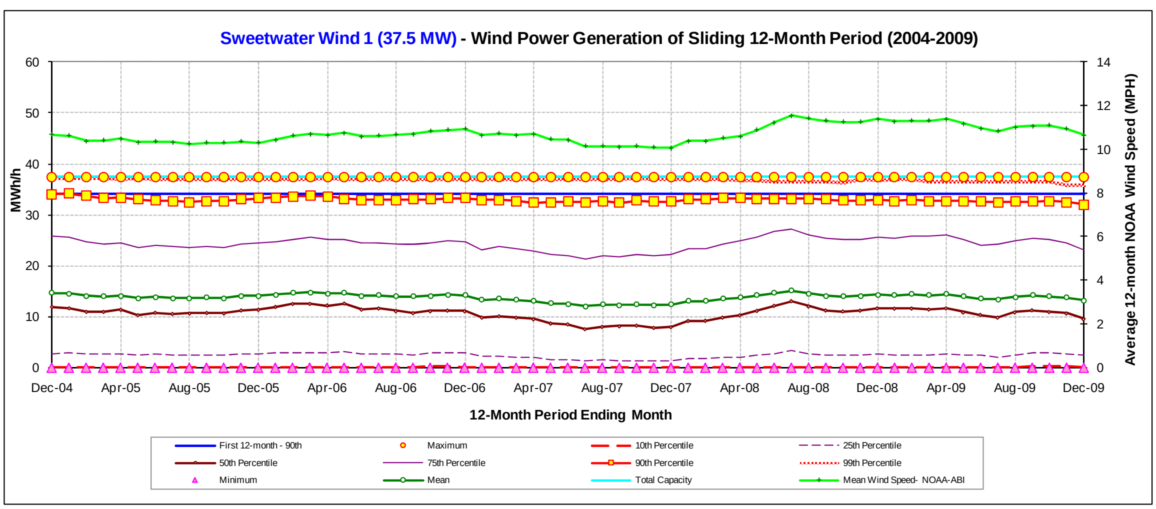


Figure 4-15: Sliding 12-month Hourly Wind Power Generation for Sweetwater Wind 1

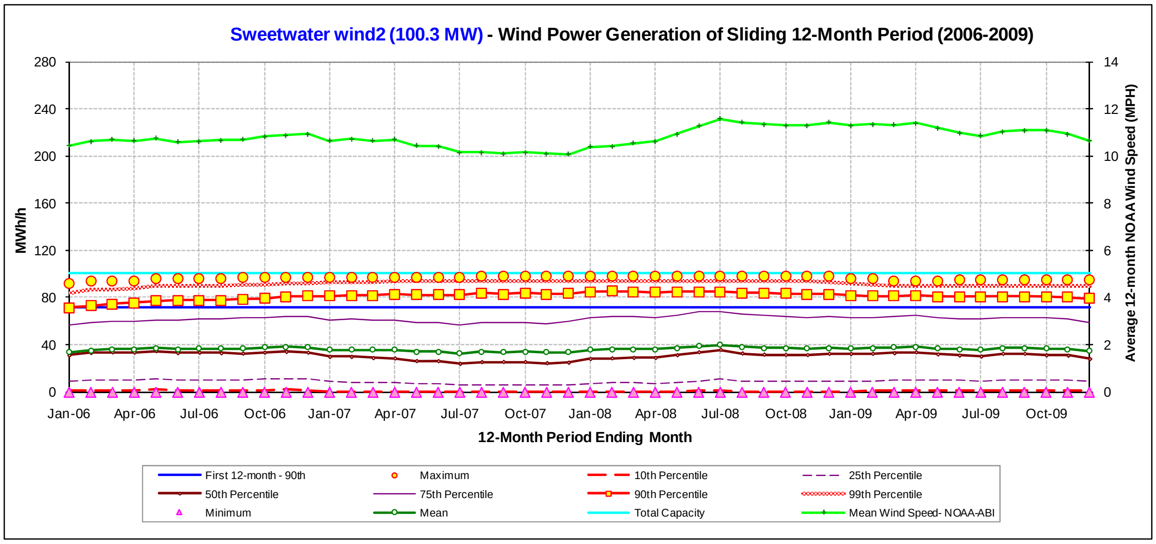


Figure 4-16: Sliding 12-month Hourly Wind Power Generation for Sweetwater Wind 2

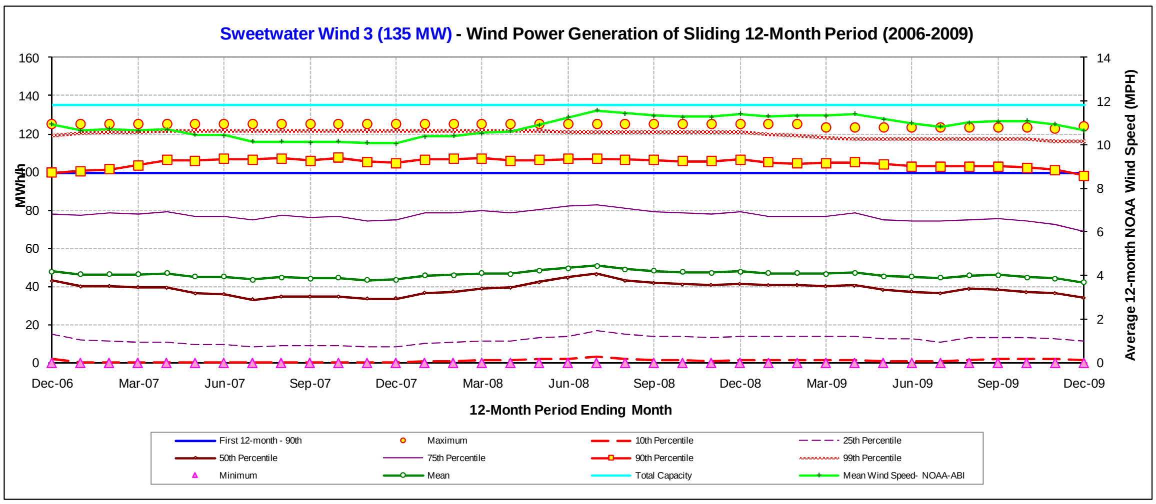


Figure 4-17: Sliding 12-month Hourly Wind Power Generation for Sweetwater Wind 3

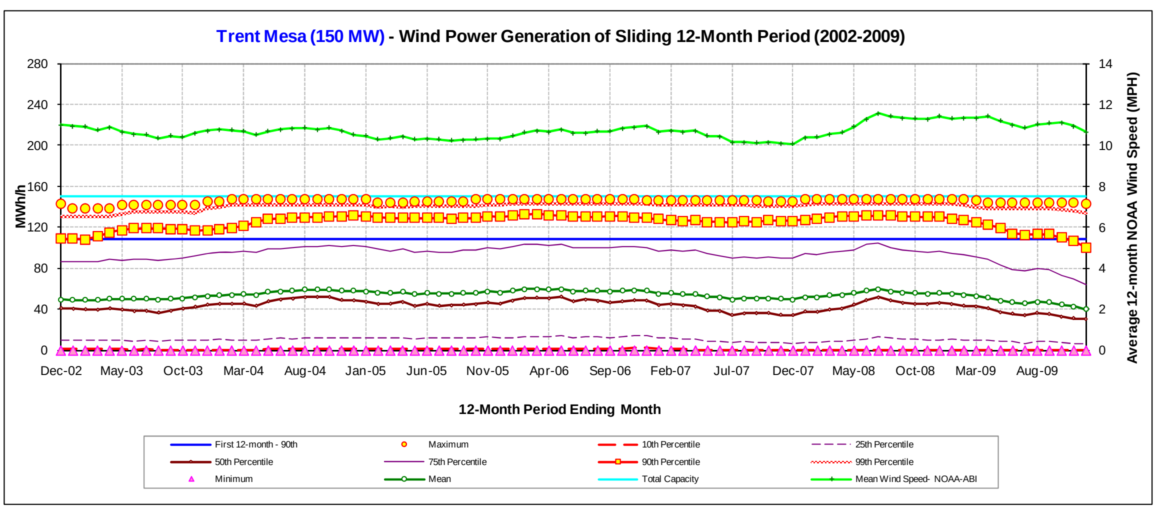


Figure 4-18: Sliding 12-month Hourly Wind Power Generation for Trent Mesa

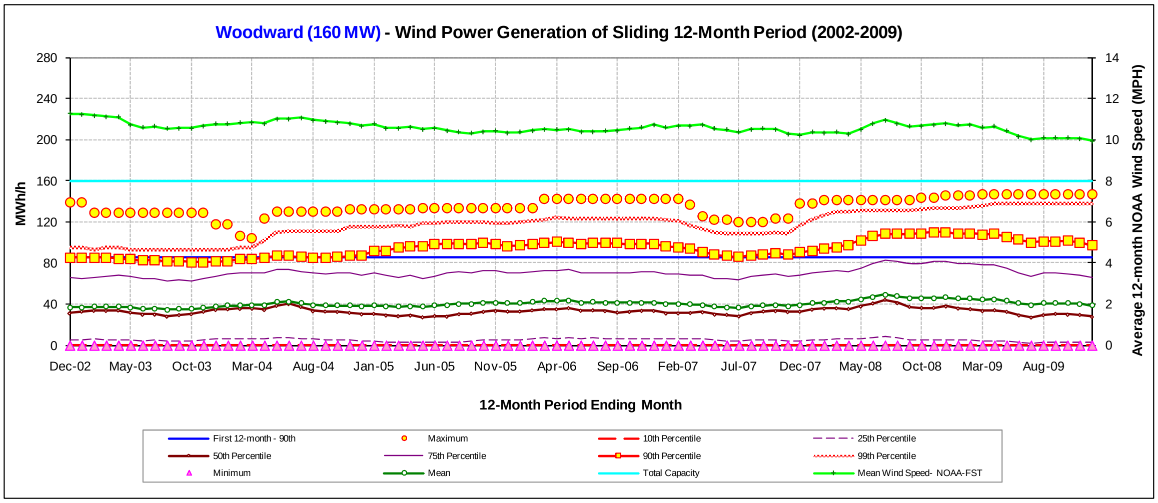


Figure 4-19: Sliding 12-month Hourly Wind Power Generation for Woodward

Table 4-1: Summary of 90th Percentile Hourly Wind Power Analysis for SixteenWind (19 sites)Farms in Texas

Wind Farm	First 12-mo 90th Percentile Hourly Wind Power		Average of the Sliding 12-mo 90th Precentile Hourly Wind Power		Minimum of the Sliding 12-mo 90th Precentile Hourly Wind Power		Maximum of the Sliding 12-mo 90th Precentile Hourly Wind Power		No. of Months of Data	Capacity (MW)
	First 12-mo Ending Mo.	MW	MW	% Diff. vs. First 12-mo	MW	% Diff. vs. First 12-mo	MW	% Diff. vs. First 12-mo		
Brazos Wind Ranch	Dec-04	127.5	129.9	1.9%	102.2	-19.8%	139.3	9.2%	72	160
Indian Mesa	Dec-02	48.0	57.3	19.5%	42.1	-12.2%	68.3	42.5%	96	82.5
Delaware	Dec-02	18.5	18.3	-1.1%	14.4	-22.4%	21.5	16.1%	96	28.5
Desert Sky	Dec-02	89.0	114.8	28.9%	83.1	-6.7%	134.4	50.9%	96	160
King Mountain-NE	Dec-02	41.8	46.9	12.1%	36.3	-13.2%	56.4	34.8%	96	79.3
King Mountain-NW	Dec-02	44.7	54.6	22.1%	40.2	-10.1%	65.3	46.1%	96	79.3
King Mountain-SE	Dec-02	21.6	23.4	8.0%	18.4	-15.0%	28.1	29.8%	96	40.3
King Mountain-SW	Dec-02	41.6	46.4	11.5%	38.4	-7.6%	53.4	28.5%	96	79.3
Sweetwater Wind 1	Dec-04	34.1	32.9	-3.4%	31.9	-6.3%	34.2	0.4%	72	37.5
Trent	Dec-02	108.8	124.7	14.6%	100.0	-8.1%	132.8	22.0%	96	150
Woodward	Dec-02	85.3	94.2	10.5%	80.4	-5.7%	109.7	28.6%	96	160
Kunitz	Dec-02	25.2	18.4	-26.9%	11.5	-54.5%	25.2	0.0%	96	35
Big Spring	Dec-02	27.2	25.2	-7.6%	22.7	-16.7%	27.2	0.0%	96	41
Southwest Mesa	Dec-02	51.1	49.4	-3.2%	38.5	-24.6%	56.5	10.6%	96	74.6
Buffalo Gap 1	Nov-06	100.9	95.1	-5.8%	75.4	-25.2%	102.8	1.9%	49	120
Callahan Divide Wind	Feb-06	93.3	98.7	5.8%	93.3	0.0%	101.5	8.8%	58	114
Horse Hollow Phase 1	Jun-06	157.0	164.6	4.9%	141.3	-10.0%	177.3	12.9%	54	213
Sweetwater Wind 2	Jan-06	71.4	81.2	13.7%	71.4	0.0%	85.3	19.5%	59	100.3
Sweetwater Wind 3	Dec-06	99.6	104.7	5.1%	97.9	-1.7%	107.3	7.7%	48	135
Weighted Average:				**10.5%**		**-13.0%**		**26.6%**	**Total:**	**1889.6**

Table 4-2: Summary of Maximum Hourly Wind Power Analysis for SixteenWind Farms (19 sites) in Texas

Wind Farm	Design Capacity (A)	Maximum of the Sliding 12-mo Maximum MW-Measured (B)	Minimum of the Sliding 12-mo Maximum MW - Measured (C)	Maximum MW in Last 12-mo - Measured (D)	Difference (A-B)	Difference (B-D)
Brazos Wind Ranch	160	160.0	136.9	136.9	0.0	23.1
Indian Mesa	82.5	78.5	63.9	78.2	4.0	0.3
Delaware	28.5	28.5	22.0	22.0	0.0	6.5
Desert Sky	160	160.2	105.8	155.7	-0.2	4.5
King Mountain-NE	79.3	77.0	49.8	77.0	2.3	0.0
King Mountain-NW	79.3	77.6	56.2	75.9	1.7	1.7
King Mountain-SE	40.3	40.0	27.8	39.9	0.3	0.1
King Mountain-SW	79.3	75.9	51.2	72.3	3.4	3.6
Sweetwater Wind 1	37.5	37.5	37.4	37.4	0.0	0.1
Trent	150	147.6	138.8	142.4	2.4	5.2
Woodward	160	146.4	104.1	146.4	13.6	0.0
Kunitz	35	35.0	21.2	27.1	0.0	7.9
Big Spring	41	37.0	28.8	28.8	4.0	8.2
South Mesa	74.6	71.2	53.8	69.3	3.4	1.9
Buffalo Gap 1	120	120.0	116.3	116.3	0.0	3.7
Callahan Divide Wind	114	113.9	111.2	113.1	0.1	0.8
Horse Hollow Phase 1	213	211.1	204.1	211.1	1.9	0.0
Sweetwater Wind 2	100.3	98.0	91.8	94.7	2.3	3.3
Sweetwater Wind 3	135	125.4	122.6	123.9	9.6	1.5
Total:	**1889.6**	**1840.8**	**1543.7**	**1768.4**	**48.8**	**72.4**

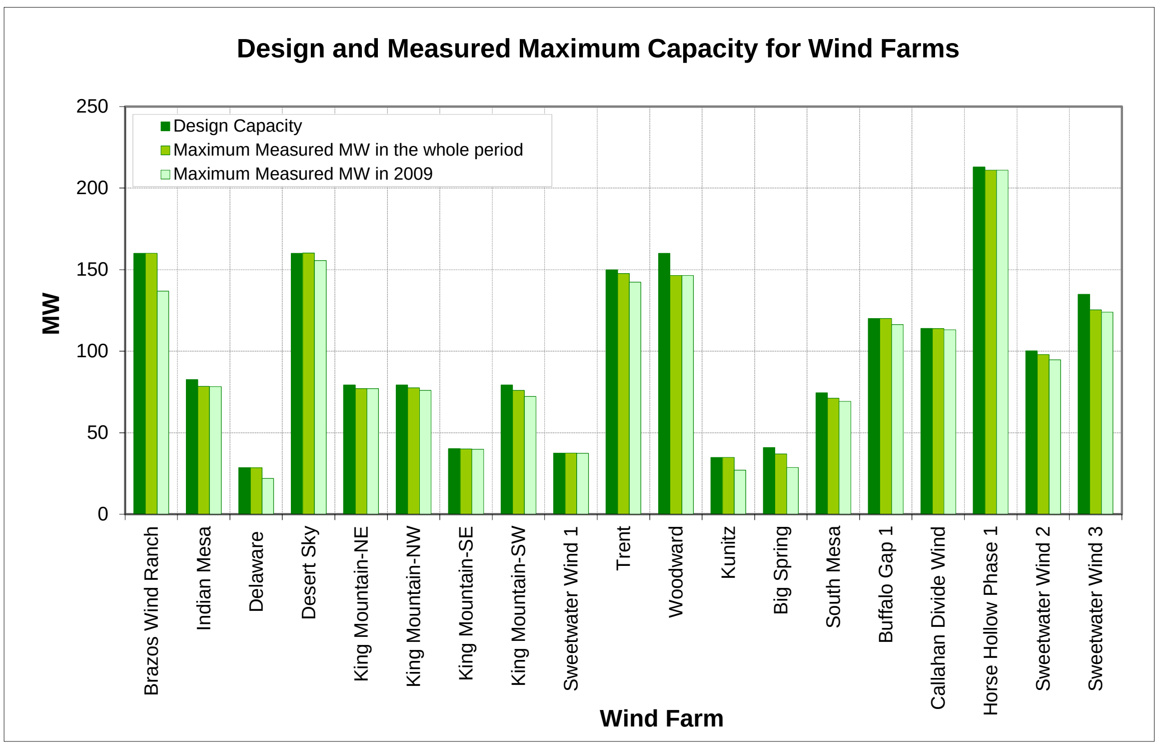


Figure 4-20: Design and Measured Maximum Capacity for sixteen Wind Farms (19 sites)

5 CALCULATING NO_X EMISSIONS REDUCTION FROM WIND POWER

5.1 Calculation of NOx Emissions from Wind Power Using 2007 eGRID

The Energy Systems Laboratory has worked closely with the TCEQ and EPA to develop creditable procedures for calculating NOx reductions from electricity savings using the EPA's Emissions and Generation Resource Integrated Database (eGRID). Calculating the NOx emissions from wind power to counties within the ERCOT regionpresents some major complications. First, electricity can be generated from different primary energy sources which results in very different NOx emissions. Second, the combination of generation resources used to meet loads may vary during each day or different seasons. Third, electricity is transported over long distances by complex, interconnected transmission and distribution systems. Therefore, the generation source related to electricity usage can be difficult to trace and may occur far from the jurisdiction in which that energy is consumed. Due to the limited availability of public data and the fact that the eGRID database aggregates the emissions on the basis of PCAs[4], the decision was made by the TCEQ and EPA to calculate and assign emissions, according to the PCA where it was generated. A similar decision has been used in California (Marnay et al. 2002). This assumption does not address the deregulation of generation, but provides a good estimation of the emissions reduction from wind power electric production for the base year of 1999, which is currently in use by the TCEQ using the EPA's eGRID.

The procedure presented in this section calculates annual and peak-day, county-wide NOx reductions from electricity savings from wind projects implemented in the Power Control Areas in ERCOT listed in the EPA's eGRID. For this purpose, a special version of eGRID[5] was developed by the EPA for the TCEQ that reflects the 2007 electricity and pollution from electric utilities in ERCOT. The NOx production for each power plant is provided from the 2007 eGRID database for ten electric utility suppliers. This eGRID matrix was utilized to assign the power plant used by the utility provider, once the utility provider had been chosen for a given county. Figure 5-1 shows a snapshot of the NOx emission distribution among Texas counties from generating one mega-watt-hour of electricity in the power control area of AEP-West, which was derived from the 2007 Annual eGRID table. For example, the counties marked in red show higher NOx emissions of above 0.228 lbs/MWh. The counties marked in green were least impacted by the NOx emissions (less than 0.0005 lbs/MWh) from the power plants assigned to AEP-West. Figure 5-2 and Figure 5-3 show the same county-wide NOx emissions distribution from TXU and LCRA.

To calculate the NOx emissions reduction from the wind projects within the ERCOT region, the total MWh wind power for each Power Control Area are summarized in Table 5-1. Both annual wind power and Ozone Season Days wind power are presented.

Table 5-2 shows the the lastest wind farm information from PUCT which was updated in December 2010. Only completed projects are shown in ERCOT, WSCC and SPP regions, with total generation capacity 10,202 MW by wind resource.The total MWh production in each PCA was input in the corresponding cells in the eGRID table to calculate the total annual and OSD emissions reduction for the entire ERCOT region (Table 5-3 and Table 5-4).

According to the developed models, the total MWh savings in the base year 1999 for the wind farms within the ERCOT region is 20,353,283 MWh and 45,969 MWh/day in the Ozone Season Period. The total NOx emissions reductions across all the counties amount to 11,859 tons/yr and 27 tons/day for the Ozone Season Period. The distribution of the NOx emissions reduction in the counties within the ERCOT region is shown in Figure 5-4, Figure 5-5, Figure 5-6, and Figure 5-7. Based on the 2007 eGRID, it is shown that the counties in the Gulf Coast area will get emissions benefit from the wind farms located in the west. Figure 5-8 shows the average modeled power flows during 2006 for each of the Commercially Significant

[4] A Power Control Area (PCA) is defined as one grid region for which one utility controls the dispatch of electricity. Some smaller utilities are embedded in the power control areas of larger utilities. The corresponding PCA for wind farms was obtained from PUCT.
[5] This 2007 eGRID table for Texas was provided by Art Diem of the US EPA and includes emissions values for AEP, Austin Energy, Brownsville Public Utility, LCRA, Reliant, San Antonio Public Service, South Texas Coop, TMPP, TNMP, and TXU.

Constraints from ERCOT[6]. Based on modeled flows, Houston is a significant importer from the 'North Zone' and the 'South Zone,' while the 'South Zone' and the 'Northeast Zone' export significant amounts of power.In addition, any modifications on the generation patterns in the North area could affect the generation on the South area (Gulf Coast) which has a larger emissions rate than its northern counterpart, thus giving a major emissions reduction impact. Therefore, we believe the distribution of electricity is adequately reflected in the current choice of the PCAs continued in the 2007 eGRID.

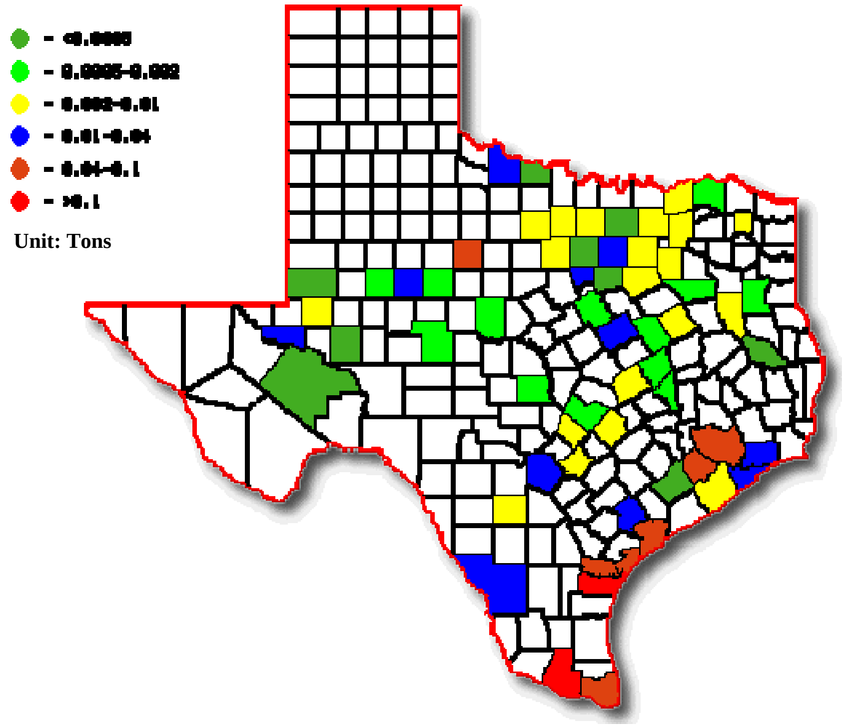


Figure 5-1: NOx Emissions (lbs/MWh) from PCA-AEP West in the 2007 Annual eGRID

[6] ERCOT, "2006 State of the Market Report for the ERCOT Wholesale Electricity Markets" Available at: http://www.puc.state.tx.us/WMO/documents/annual_reports/2006annualreport.pdf

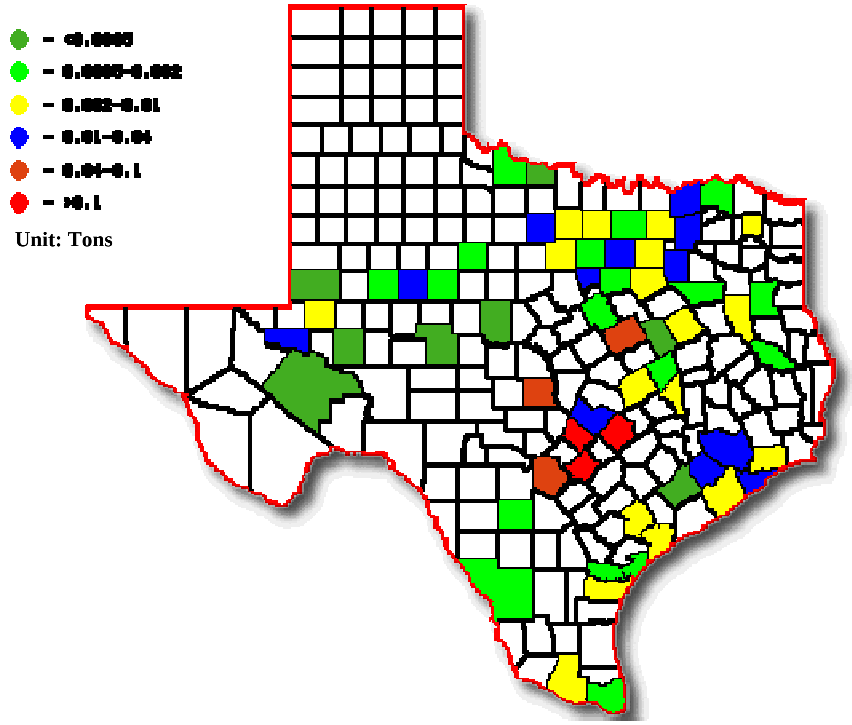


Figure 5-2: NOx Emissions (lbs/MWh) from PCA-LCRA in the 2007 Annual eGRID

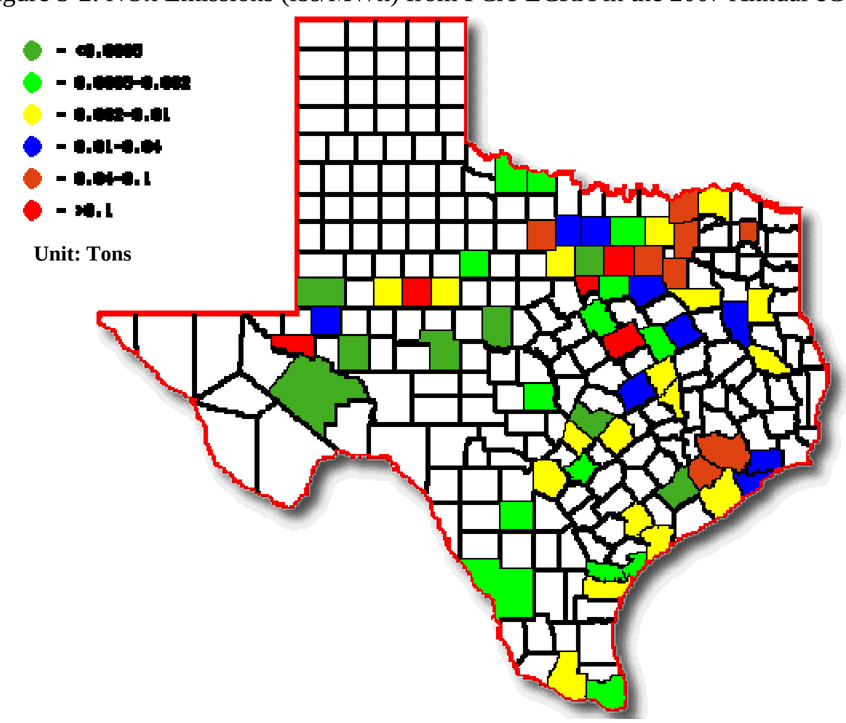


Figure 5-3: NOx Emissions (lbs/MWh) from PCA-TXU in the 2007 Annual eGRID

Table 5-1: Wind Power Production Assigned to Each PCA in the ERCOT Region

PCA	Annual Wind Power (MWh/yr)	OSD Wind Power (MWh/day)
AEP-WEST	29,275,927	66,957
TXU	2,941,232	6,354
LCRA	8,489,408	18,627
Total	40,706,566	91,938

Table 5-2: Wind Farm Information from the PUCT (Updated December 31, 2010).

Company	Facility	City	County	Resource	Capacity (MW)	Status	In Service	Intercon-nection	Region
Project Completed									
LG&E	Texas Wind Power Project		Culberson	Wind	35	Completed	Oct-95	TXU, LCRA	ERCOT
York Research	Big Spring Wind Power	Big Spring	Howard	Wind	34	Completed	Feb-99	TU	ERCOT
York Research	Big Spring Wind Power	Big Spring	Howard	Wind	7	Completed	Jun-99	TXU	ERCOT
FPL Energy	Southwest Mesa Wind Project	McCamey	Upton	Wind	75	Completed	Jun-99	WTU	ERCOT
American National Wind Power	Delaware Mountain Wind Farm		Culberson	Wind	30	Completed	Jun-99	TXU	ERCOT
Cielo/El Paso Electric	Hueco Mountain Wind Ranch	Hueco Mtn.	El Paso	Wind	1	Completed	Apr-01	EPE	WSCC
Orion Energy/American National Wind Power	Indian Mesa		Pecos	Wind	83	Completed	Jun-01	WTU	ERCOT
FPL/Cielo/TXU	Woodward Mountain Ranch	McCamey	Pecos	Wind	160	Completed	Jul-01	WTU	ERCOT
AEP	Trent Mesa	Sweetwater	Nolan	Wind	150	Completed	Nov-01	TXU	ERCOT
AEP	Desert Sky (Indian Mesa II)	Iraan	Pecos	Wind	160	Completed	Dec-01	WTU	ERCOT
FPL/Cielo	King Mountain Wind Ranch	McCamey	Upton	Wind	278	Completed	Dec-01	WTU	ERCOT
Shell Wind Energy	Llano Estacado Wind Ranch	White Deer	Carson	Wind	79	Completed	Jan-02	SPS	SPP
Cielo/Orion/Green Mountain	Brazos Wind Ranch	Fluvana	Scurry	Wind	160	Completed	Dec-03	ONCOR	ERCOT
Aeolus Wind			Hansford	Wind	3	Completed	2003	SPS	SPP
DKR Development	Sweetwater Wind 1	Sweetwater	Nolan	Wind	38	Completed	Dec-03	LCRA	ERCOT
DKRW Development	Sweetwater Wind 2	Sweetwater	Nolan	Wind	92	Completed	Feb-05	LCRA	ERCOT
DKRW Energy	Sweetwater Wind 3 (Cottonwood Creek)	Sweetwater	Nolan	Wind	135	Completed	Dec-05	LCRA	ERCOT
DKRW/BabcockBrown	Sweetwater Wind 4 (Cottonwood Creek)	Sweetwater	Nolan	Wind	241	Completed	May-07	LCRA	ERCOT
DKRW/BabcockBrown	Sweetwater Wind 5	Sweetwater	Nolan	Wind	80	Completed	Dec-07	LCRA	ERCOT
FPL Energy	Callahan Divide Wind Energy Center	Abilene	Taylor	Wind	114	Completed	Feb-05	AEP-TNC	ERCOT
AES Seawest	Buffalo Gap 1	Abilene	Taylor	Wind	120	Completed	Sep-05	AEP/TNC	ERCOT
AES	Buffalo Gap 2 (Cirello 1)	Abilene	Taylor	Wind	233	Completed	Aug-07	AEP/TNC	ERCOT
AES	Buffalo Gap 3		Taylor	Wind	170	Completed	Apr-08	AEP/TNC	ERCOT
FPL Energy	Horse Hollow Phase 1	Abilene	Taylor	Wind	213	Completed	Oct-05	AEP/TNC	ERCOT
FPL Energy	Horse Hollow Phase 2	Abilene	Taylor	Wind	224	Completed	May-06	AEP/TNC	ERCOT
FPL Energy	Horse Hollow Phase 3	Abilene	Taylor	Wind	299	Completed	Sep-06	AEP/TNC	ERCOT
FPL Energy	Red Canyon 1		Borden	Wind	84	Completed	May-06	BEPC	ERCOT
Airtricity	Forest Creek Wind Farm		Sterling	Wind	124	Completed	Dec-06	TXU-ED	ERCOT
Airtricity	Sand Bluff Wind Farm		Sterling	Wind	90	Completed	Dec-06	TXU-ED	ERCOT
Edison Mission Group	Wildorado Wind Ranch	Wildorado	Oldham	Wind	161	Completed	Apr-07	SPS	SPP
Invenergy	Camp Springs Wind Energy Center		Scurry	Wind	130	Completed	Jul-07	Oncor	ERCOT
Invenergy	Camp Springs Energy expansion		Scurry	Wind	120	Completed	Jun-08	Oncor	ERCOT
FPL Energy	Capricorn Ridge Wind		Sterling	Wind	364	Completed	Sep-07	LCRA	ERCOT
FPL Energy	Capricorn Ridge Wind exp.		Sterling	Wind	298	Completed	May-08	LCRA	ERCOT
Gamesa Energy	Barton Chapel Wind 1		Jack	Wind	120	Completed	Dec-07	Oncor	ERCOT
Enel North America/WKN USA	Snyder Wind Project	Snyder	Scurry	Wind	63	Completed	Dec-07	BCEC	ERCOT
Horizon Wind Energy	Lone Star - Mesquite Wind		Shackleford	Wind	200	Completed	Dec-07	Oncor	ERCOT
Horizon Wind Energy	Lone Star - Post Oak Wind		Shackleford	Wind	200	Completed	May-08	Oncor	ERCOT
Renewable Energy Systems	Whirlwind	Floydada	Floyd	Wind	60	Completed	Dec-07	AEP	ERCOT
Invenergy	Stanton Wind Energy		Martin	Wind	120	Completed	Jan-08	Oncor	ERCOT
Airtricity	Champion Wind Farm		Scurry	Wind	126	Completed	Jan-08	Oncor	ERCOT
Airtricity	Roscoe Wind Farm 1		Scurry	Wind	209	Completed	Jan-08	Oncor	ERCOT
BP/Clipper Windpower	Silver Star Phase I		Erath	Wind	60	Completed	Mar-08	Oncor	ERCOT
Edison Mission Group	Goat Wind		Sterling	Wind	80	Completed	Apr-08	LCRA	ERCOT
Edison Mission Group	Goat Wind Phase 2		Sterling	Wind	70	Completed	Apr-09	LCRA	ERCOT
Invenergy	McAdoo Wind Energy		Dickens	Wind	150	Completed	May-08	AEP	ERCOT
Airtricity	Panther Creek		Howard	Wind	143	Completed	Jul-08	Oncor	ERCOT
Duke Energy	Ocotillo Windpower 1		Howard	Wind	59	Completed	Aug-08	Oncor	ERCOT
BP Alt. Energy - NRG	Sherbino Mesa Wind Farm		Pecos	Wind	150	Completed	Sep-08		ERCOT
Babcock & Brown	South Trent Wind Farm		Taylor	Wind	101	Completed	Oct-08	Oncor	ERCOT
FPL Energy	Wolf Ridge Windfarm		Cooke	Wind	113	Completed	Oct-08		ERCOT
Babcock & Brown	Gulf Wind 1		Kenedy	Wind	283	Completed	Nov-08	AEP/TCC	ERCOT
E.On Climate & Renewables	Inadale		Nolan	Wind	197	Completed	Nov-08		ERCOT
E.On Climate & Renewables	Panther Creek 2		Howard	Wind	115	Completed	Nov-08		ERCOT
E.On Climate & Renewables	Pyron		Scurry	Wind	249	Completed	Nov-08		ERCOT
Eurus Energy Holdings	Bull Creek Wind Plant		Borden	Wind	180	Completed	Nov-08		ERCOT
Invenergy	Turkey Track Energy Center		Nolan	Wind	170	Completed	Nov-08		ERCOT
NRG Padoma Wind	Elbow Creek Wind		Howard	Wind	117	Completed	Nov-08	Oncor	ERCOT
PPM Energy	Penascal Wind Farm		Kenedy	Wind	202	Completed	Nov-08		ERCOT
Renewable Energy Systems	Hackberry Wind Farm		Shackleford	Wind	165	Completed	Nov-08		ERCOT
Duke Energy	Notrees Windpower		Ector	Wind	153	Completed	Jan-09		ERCOT
Noble Environmental	Noble Great Plains Windpark		Hansford	Wind	114	Completed	Feb-09		SPP
E.On Climate & Renewables	Panther Creek 3		Concho	Wind	200	Completed	Aug-09		ERCOT
Valero Energy	Sunray Wind I, II, III		Moore	Wind	50	Completed	Aug-09	SPS	SPP
E.On Climate & Renewables	Papalote Creek Wind Farm		San Patricio	Wind	180	Completed	Sep-09		ERCOT
Padoma Wind	Langford Wind Power		Tom Green	Wind	150	Completed	Oct-09		ERCOT
Third Planet Windpower	Loraine Windpark		Mitchell	Wind	251	Completed	Oct-09		ERCOT
Deere & Company	JD Wind 1-7, 9-11, Wege	Gruver	Hansford	Wind	190	Completed	Dec-09	SPS	SPP
Babcock & Brown	Majestic Wind Power		Carson	Wind	80	Completed	Dec-09		SPP
Iberdrola	Penascal Wind Farm 2		Kenedy	Wind	202	Completed	Mar-10		ERCOT
E.On Climate & Renewables	Papalote Creek Phase II		San Patricio	Wind	198	Completed	Jun-10		ERCOT
Edison Mission Group	Cedro Hill Wind	Bruni	Webb	Wind	150	Completed	Oct-10		ERCOT

Table 5-3: Annual NOx Reductions Using the 1999 Base Year and the 2007 eGrid (25%)

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)	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	0.008831132	129269.7873	0.010890729	0	0.006522185	0	0.003944232	16742.09666	0.065444292	0	0.014877434	0	0.006262315	0	0.004817148	0	0.121274957	0	0.00816387	12005.91808	158017.8021	79.00890103
	Chambers	0.021762222	318554.6033	0.026955801	0	0.016072371	0	0.009076193	38525.75293	0.164940225	0	0.037472294	0	0.015055623	0	0.009553214	0	0.011518588	0	0.015818592	23263.07512	380343.4313	190.1717157
	Fort Bend	0.070431234	1030969.792	0.087239726	0	0.052016606	0	0.029374182	124684.7074	0.533812376	0	0.121275295	0	0.048726002	0	0.030918012	0	0.037278747	0	0.051195276	75288.59253	1230943.092	615.471546
	Galveston	0.033856739	495593.6955	0.041710519	0	0.025004711	0	0.015351589	65162.94983	0.249587379	0	0.056747051	0	0.024143087	0	0.019297151	0	0.567751219	0	0.032836887	48290.45115	609047.0965	304.5235482
	Harris	0.068267332	999294.685	0.084559408	0	0.050418468	0	0.028471701	120853.9439	0.517411736	0	0.117549281	0	0.047228963	0	0.029968099	0	0.03613341	0	0.049622373	72975.45566	1193124.085	596.5620423
	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	0.002039135	29848.78483	0.003716345	0	0.001505992	0	0.005950953	25260.03267	0.002481478	0	0.000717051	0	0.019166247	0	0.07668094	0	0.00086441	0	0.004000199	5882.757138	60991.57464	30.49578732
	Dallas	0.004539471	66448.6106	0.004683963	0	0.003352602	0	0.00774211	32862.96499	0.002085611	0	0.00068106	0	0.007502816	0	0.026717045	0	0.007524933	0	0.040370454	59369.43573	158681.0113	79.34050566
	Denton	0.00047388	6936.642183	0.000872802	0	0.000349982	0	0.001396994	5929.825337	0.000585443	0	0.000168971	0	0.00454374	0	0.018187155	0	0.000186605	0	0.000849405	1249.149156	14115.61668	7.057808338
	Tarrant	0.012162492	178034.1125	0.012266309	0	0.008982543	0	0.020308652	86204.21692	0.005316504	0	0.001752506	0	0.017326428	0	0.060216761	0	0.020603444	0	0.110647237	162719.5977	426957.9272	213.4789636
	Ellis	0.003279814	48009.7891	0.003307809	0	0.002422289	0	0.005476558	23246.36675	0.001433682	0	0.000472592	0	0.004672353	0	0.016238427	0	0.005556053	0	0.029837824	43879.98153	115136.1374	57.56806869
	Johnson	0.000286058	4187.313447	0.000526868	0	0.000211267	0	0.000843297	3579.547094	0.000353404	0	0.000101999	0	0.002742835	0	0.010978701	0	0.000112645	0	0.000512745	754.0505793	8520.911121	4.26045556
	Kaufman	0.006325453	92591.73991	0.006379446	0	0.004671629	0	0.010562096	44832.97228	0.002765	0	0.000911441	0	0.009011105	0	0.031317452	0	0.010715411	0	0.057545265	84626.98781	222051.7	111.02585
	Parker	0.000217489	3183.60298	0.000400576	0	0.000160626	0	0.000641157	2721.519881	0.000268692	0	7.75498E-05	0	0.00208537	0	0.008347076	0	8.56434E-05	0	0.000389838	573.3025964	6478.425458	3.239212729
	Rockwall	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Henderson	0.000819895	12001.59166	0.000826893	0	0.000605529	0	0.001369042	5811.177398	0.000358395	0	0.00011814	0	0.001168005	0	0.004059317	0	0.001388914	0	0.007458924	10969.21337	28781.98242	14.39099121
	Hood	0.01252711	183371.3714	0.012634039	0	0.009251829	0	0.020917482	88788.52063	0.005475887	0	0.001805044	0	0.017845854	0	0.062021991	0	0.021221112	0	0.113964315	167597.7449	439757.6369	219.8788184
	Hunt	0.006187558	90573.25033	0.006240374	0	0.004569788	0	0.010331844	43855.6185	0.002704724	0	0.000891572	0	0.008814664	0	0.030634735	0	0.010481817	0	0.056290785	82782.12893	217210.9978	108.6054989
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	0.033413751	489109.2509	0.051775843	0	0.024677545	0	0.090663423	384839.3955	0.001141841	0	1.143571754	0	0.046873844	0	0.004669544	0	0.000519582	0	0.002503865	3682.224204	877630.8706	438.8154353
	Comal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Guadalupe	0.002000467	29282.76442	0.076378745	0	0.001477434	0	0.133848731	568148.2419	0.001237133	0	0.003554796	0	0.001061766	0	0.001855699	0	0.000401718	0	0.001835165	2698.82275	600129.8291	300.0649145
	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	0.004502334	65904.99565	0.171901148	0	0.003325174	0	0.301245466	1278697.833	0.002784342	0	0.008000571	0	0.002389654	0	0.004176513	0	0.000904124	0	0.004130298	6074.081636	1350676.91	675.3384552
	Caldwell	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hays	0.002458599	35988.88334	0.093870431	0	0.001815785	0	0.164501762	698261.288	0.001520452	0	0.004368889	0	0.001304924	0	0.002280677	0	0.000493717	0	0.00225544	3316.88688	737567.0582	368.7835291
	Travis	0.000510007	7465.463773	0.299602906	0	0.000376663	0	0.033939476	144063.0303	0.000334709	0	0.000906121	0	0.000271138	0	0.000471744	0	0.000103327	0	0.000467336	687.2714616	152215.7655	76.10788277
	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	0.000685965	10041.12795	0.00069182	0	0.000506616	0	0.001145408	4861.919775	0.000299851	0	9.88414E-05	0	0.000977211	0	0.003396227	0	0.001162035	0	0.006240507	9177.388974	24080.4367	12.04021835
	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	3331142.649	0.004556851	0	0.168069652	0	0.007612767	32313.94298	0.001680888	0	0.001626796	0	0.046792036	0	0.007246366	0	0.001609426	0	0.008283395	12181.69282	3375638.284	1687.819142
	San Patricio	0.050313351	736484.9742	0.001007478	0	0.037158653	0	0.001683113	7144.31532	0.000371629	0	0.00035967	0	0.010345288	0	0.001602105	0	0.000355829	0	0.001831382	2693.260142	746322.5496	373.1612748
Victoria Area	Victoria	0.021836736	319645.3289	0.002215582	0	0.016127403	0	0.003612695	15334.82203	0.001199621	0	0.000555389	0	0.52545648	0	0.032412721	0	0.000476855	0	0.002254849	3316.017265	338296.1682	169.1480841
Other ERCOT counties	Andrews	2.47421E-05	362.1736896	2.49533E-05	0	1.82731E-05	0	4.13138E-05	175.3647032	1.08153E-05	0	3.56511E-06	0	3.5247E-05	0	0.000122499	0	4.19135E-05	0	0.000225089	331.0194672	868.55786	0.43427893
	Angelina	0.00031082	4549.770483	0.000313473	0	0.000229554	0	0.000519	2203.001414	0.000135867	0	4.47864E-05	0	0.000442787	0	0.001538876	0	0.000526534	0	0.002827658	4158.398703	10911.1706	5.4555853
	Bosque	0.000595392	8715.322716	0.001096604	0	0.000439723	0	0.001755208	7450.339818	0.000735562	0	0.000212298	0	0.005708837	0	0.02285067	0	0.000234455	0	0.001067208	1569.453595	17735.11613	8.867558065
	Brazos	0.001939725	28393.62576	0.003572622	0	0.001432574	0	0.005718288	24272.44147	0.002396384	0	0.000691644	0	0.018598805	0	0.074445136	0	0.000763829	0	0.003476855	5113.118524	57779.18576	28.88959288
	Calhoun	0.082699809	1210556.739	0.001655986	0	0.061077496	0	0.002766524	11743.07604	0.000610844	0	0.000591187	0	0.0170045	0	0.002633372	0	0.000584875	0	0.003010234	4426.898483	1226726.713	613.3633567
	Cameron	0.048371747	708063.8422	0.000968599	0	0.297964476	0	0.001618161	6868.614477	0.000357288	0	0.00034579	0	0.009946061	0	0.001540279	0	0.000342098	0	0.001760709	2589.326587	717521.7832	358.7608916
	Cherokee	0.003503899	51289.94245	0.003533808	0	0.002587786	0	0.00585073	24834.61884	0.001531635	0	0.00050488	0	0.00499158	0	0.017347879	0	0.005935657	0	0.031876422	46877.97571	123002.537	61.5012685
	Coke	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Coleman	0.001298787	19011.59428	2.6007E-05	0	0.000959212	0	4.34478E-05	184.4230759	9.59321E-06	0	9.2845E-06	0	0.000267053	0	4.13567E-05	0	9.18536E-06	0	4.72752E-05	69.52371185	19265.54107	9.632770536
	Crockett	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ector	0.003535748	51756.14305	0.003565928	0	0.002611307	0	0.005903911	25060.35343	0.001545556	0	0.00050947	0	0.005036951	0	0.017505563	0	0.00598961	0	0.032166163	47304.07368	124120.5702	62.06028508
	Fannin	0.007056315	103290.0735	0.007116546	0	0.005211403	0	0.011782473	50013.11138	0.003084477	0	0.001016752	0	0.010052276	0	0.034935966	0	0.011953503	0	0.064194222	94405.04949	247708.2344	123.8541172
	Fayette	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Freestone	0.003677178	53826.38877	0.003708565	0	0.00271576	0	0.006140067	26062.76756	0.001607379	0	0.000529848	0	0.005238429	0	0.018205785	0	0.006229194	0	0.033452809	49196.23662	129085.393	64.54269648
	Frio	0.008588335	125715.7249	0.000871383	0	0.006342868	0	0.001420864	6031.147941	0.000471808	0	0.000218433	0	0.206660746	0	0.012747844	0	0.000187546	0	0.000886827	1304.181468	133051.0543	66.52552715
	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	0.188527456	2759657.923	0.003775086	0	0.139235931	0	0.006306735	26770.22217	0.001392518	0	0.001347706	0	0.03876448	0	0.006003193	0	0.001333316	0	0.006862311	10091.82394	2796519.97	1398.259985
	Howard	0.000555113	8125.724246	0.000559851	0	0.000409976	0	0.000926915	3934.480227	0.000242653	0	7.99868E-05	0	0.000790802	0	0.002748377	0	0.00094037	0	0.005050094	7426.748513	19486.95299	9.743476493
	Jack	0.002121449	31053.68583	0.002139557	0	0.001566784	0	0.003542346	15036.21206	0.000927334	0	0.000305682	0	0.00302217	0	0.010503338	0	0.003593766	0	0.019299698	28382.44421	74472.34209	37.23617105
	Jones	0.040718722	596039.1485	0.000815354	0	0.030072592	0	0.001362147	5781.912421	0.00030076	0	0.000291082	0	0.008372468	0	0.001296587	0	0.000287974	0	0.001482142	2179.662231	604000.7231	302.0003616
	Lamar	0.000950838	13918.32919	0.000958954	0	0.000702236	0	0.001587687	6739.262784	0.000415633	0	0.000137007	0	0.001354543	0	0.004707619	0	0.001610734	0	0.008650166	12721.07292	33378.66489	16.68933245
	Limestone	0.000719757	10535.77315	0.000891528	0	0.000531572	0	0.000300183	1274.188441	0.00545518	0	0.001239347	0	0.000497945	0	0.0031596	0	0.000380962	0	0.000523179	769.3955127	12579.35711	6.289678553
	Llano	0.001238174	18124.34452	0.047274044	0	0.000914447	0	0.082844655	351651.0369	0.000765714	0	0.002200214	0	0.000657172	0	0.001148571	0	0.000248641	0	0.001135861	1670.415833	371445.7973	185.7228986
	McLennan	0.024534317	359132.4281	0.024743738	0	0.018119687	0	0.040966843	173892.1226	0.010724513	0	0.003535175	0	0.034951066	0	0.121469933	0	0.041561501	0	0.22319886	328239.8153	861264.3661	430.632183
	Milam	0.002245405	32868.15406	0.002264571	0	0.001658332	0	0.003749326	15914.77859	0.000981518	0	0.000323543	0	0.003198756	0	0.011117048	0	0.00380375	0	0.02042738	30040.83167	78823.76432	39.41188216
	Mitchell	0.014943169	218737.5509	0.015070721	0	0.011036196	0	0.024951762	105912.8445	0.006532002	0	0.002153177	0	0.02128772	0	0.07398395	0	0.025313952	0	0.135944204	199921.7216	524572.117	262.2860585
	Nolan	0.000564654	8265.380011	0.000569473	0	0.000417022	0	0.000942846	4002.101627	0.000246823	0	8.13615E-05	0	0.000804394	0	0.002795613	0	0.000956532	0	0.005136889	7554.391073	19821.87271	9.910936355
	Palo Pinto	0.003206998	46943.92306	0.005906709	0	0.002368511	0	0.009454195	40130.26144	0.003962005	0	0.001143513	0	0.030749889	0	0.123082087	0	0.001262858	0	0.005748375	8453.652401	95527.8369	47.76391845
	Pecos	4.09677E-05	599.6833678	4.13174E-05	0	3.02565E-05	0	6.84069E-05	290.3670223	1.79079E-05	0	5.90308E-06	0	5.83617E-05	0	0.000202832	0	6.93999E-05	0	0.0003727	548.0985356	1438.148926	0.719074463
	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	0.000737708	10798.53849	0.000835096	0	0.00054483	0	0.000735917	3123.750079	0.003149678	0	0.000730875	0	0.00076086	0	0.001866305	0	0.191632518	0	0.003397737	4996.767002	18919.05557	9.459527785
	Taylor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Titus	0.005696437	83384.23947	0.005745061	0	0.004207073	0	0.009511781	40374.69541	0.002490043	0	0.000820806	0	0.008115023	0	0.028203184	0	0.00964985	0	0.051822854	76211.51761	199970.4525	99.98522624
	Tom Green	0.001482448	21700.01973	2.96846E-05	0	0.001094854	0	4.95918E-05	210.5023033	1.09498E-05	0	1.05974E-05	0	0.000304817	0	4.72049E-05	0	1.04843E-05	0	5.39604E-05	79.35504493	21989.87707	10.99493854
	Upton	3.11661E-05	456.2086123	3.14322E-05	0	2.30176E-05	0	5.20405E-05	220.8964654	1.36234E-05	0	4.49076E-06	0	4.43986E-05	0	0.000154304	0	5.27959E-05	0	0.000283531	416.9654951	1094.070573	0.547035286
	Ward	0.018559529	271673.693	0.01871795	0	0.013707039	0	0.030990277	131544.5542	0.008112796	0	0.002674262	0	0.026439509	0	0.091888626	0	0.03144012	0	0.16884373	248304.2907	651522.5379	325.7612689
	Webb	0.020014327	292968.9815	0.000400768	0	0.014781473	0	0.000669531	2841.962642	0.000147832	0	0.000143074	0	0.004115289	0	0.000637307	0	0.000141547	0	0.000728512	1071.361546	296882.3057	148.4411528
	Wharton	0.00014434	2112.839145	0.000178787	0	0.000106601	0	6.01986E-05	255.5251692	0.001093979	0	0.000248538	0	9.98576E-05	0	6.33625E-05	0	7.6398E-05	0	0.000104918	154.2942254	2522.65854	1.26132927
	Wichita	0.000207633	3039.327244	0.000209406	0	0.000153346	0	0.000346701	1471.643953	9.07612E-05	0	2.99181E-05	0	0.00029579	0	0.001027996	0	0.000351734	0	0.001888925	2777.883966	7288.855162	3.644427581
	Wilbarger	0.028616818	418891.9242	0.000573025	0	0.021134796	0	0.000957307	4063.485471	0.000211372	0	0.00020457	0	0.005884109	0	0.000911232	0	0.000202386	0	0.001041639	1531.850565	424487.2603	212.2436301
	Wise	0.002844488	41637.50351	0.002882008	0	0.002100781	0	0.00476997	20247.11274	0.001256075	0	0.000413241	0	0.004181914	0	0.014614274	0	0.004797945	0	0.025761411	37885.14354	99769.75979	49.88487989
	Young	0.006235856	91280.23405	0.006289085	0	0.004605458	0	0.010412491	44197.94041	0.002725836	0	0.000898531	0	0.008883468	0	0.030873859	0	0.010563634	0	0.056730171	83428.29783	218906.4723	109.4532361
	Total	**1.121837219**	**16421411.71**	**1.172570094**	**0**	**1.090766584**	**0**	**1.189130767**	**5047508.122**	**1.629360006**	**0**	**1.542362643**	**0**	**1.359385821**	**0**	**1.231642808**	**0**	**1.221806085**	**0**	**1.528786947**	2248258.546	**23717178.37**	**11858.58919**
Energy Savings by PCA (MWh)		14637963		0		0		4244704		0		0		0		0		0		1470616			

Table 5-4: OSD NOx Reductions using the 1999 Base Year and the 2007 eGrid (25%)

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)	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	0.00957217	320.4570925	0.011806715	0	0.007069474	0	0.004263638	39.71152172	0.071001767	0	0.016140391	0	0.006781035	0	0.005179719	0	0.126288049	0	0.008771659	27.86755947	388.0361737	0.194018087
	Chambers	0.021881395	732.545358	0.027103415	0	0.016160386	0	0.009125896	84.99859239	0.165843463	0	0.037677498	0	0.01513807	0	0.009605529	0	0.011581666	0	0.015905217	50.53087594	868.0748263	0.434037413
	Fort Bend	0.055695513	1864.574368	0.068987309	0	0.041133619	0	0.023228475	216.3500115	0.422127404	0	0.095901908	0	0.038531479	0	0.024449302	0	0.029479235	0	0.040484129	128.6180781	2209.542457	1.104771229
	Galveston	0.027555985	922.5192726	0.033893644	0	0.020351324	0	0.012791501	119.1400425	0.201446635	0	0.045812515	0	0.019823685	0	0.01677514	0	0.594656509	0	0.028709453	91.20993067	1132.869246	0.566434623
	Harris	0.077360573	2589.877264	0.09582276	0	0.057134232	0	0.032264145	300.5082477	0.586331222	0	0.1332069	0	0.053519883	0	0.033959864	0	0.040946397	0	0.056232096	178.6493701	3069.034882	1.534517441
	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	0.001763649	59.04343764	0.003151138	0	0.001302533	0	0.005050143	47.03702928	0.002085751	0	0.00060408	0	0.015958397	0	0.063788818	0	0.000846136	0	0.004013208	12.74996043	118.8304274	0.059415214
	Dallas	0.005045553	168.9150199	0.005305276	0	0.003726366	0	0.008757286	81.56536476	0.002413087	0	0.000782263	0	0.009310387	0	0.033672029	0	0.008209179	0	0.044002183	139.794937	390.2753216	0.195137661
	Denton	0.000635758	21.28390022	0.001170951	0	0.000469535	0	0.001874207	17.45636387	0.000785431	0	0.000226691	0	0.006095882	0	0.024399888	0	0.00025035	0	0.001139562	3.620389431	42.36065352	0.021180327
	Tarrant	0.015572243	521.3275598	0.015705165	0	0.011500796	0	0.026002176	242.1842713	0.006806985	0	0.002243821	0	0.022183886	0	0.077098512	0	0.026379614	0	0.141667156	450.0765548	1213.588386	0.606794193
	Ellis	0.003502824	117.2675292	0.003532723	0	0.002586991	0	0.005848935	54.47698012	0.001531165	0	0.000504725	0	0.004990048	0	0.017342555	0	0.005933836	0	0.031866639	101.2403134	272.9848227	0.136492411
	Johnson	0.000337176	11.28797921	0.000621017	0	0.00024902	0	0.000993991	9.258034027	0.000416556	0	0.000120226	0	0.003232969	0	0.012940552	0	0.000132774	0	0.00060437	1.920084205	22.46609744	0.011233049
	Kaufman	0.006492753	217.3643694	0.006548174	0	0.004795187	0	0.01084145	100.9772655	0.002838131	0	0.000935547	0	0.009249437	0	0.032145758	0	0.01099882	0	0.059067263	187.6566943	505.9983292	0.252999165
	Parker	0.000475952	15.93390765	0.000876616	0	0.000351511	0	0.0014031	13.06847368	0.000588002	0	0.000169709	0	0.0045636	0	0.01826665	0	0.000187421	0	0.000853118	2.710356198	31.71273753	0.015856369
	Rockwall	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Henderson	0.000950271	31.81317424	0.000958382	0	0.000701818	0	0.001586741	14.77890489	0.000415385	0	0.000136926	0	0.001353736	0	0.004704812	0	0.001609773	0	0.00864501	27.46519647	74.05727559	0.037028638
	Hood	0.012327882	412.712833	0.012433111	0	0.00910469	0	0.020584816	191.7269764	0.0053888	0	0.001776337	0	0.017562038	0	0.061035609	0	0.020883617	0	0.112151856	356.3064459	960.7462552	0.480373128
	Hunt	0.006351211	212.6258504	0.006405424	0	0.004690653	0	0.010605108	98.7759724	0.00277626	0	0.000915153	0	0.0090478	0	0.031444984	0	0.010759047	0	0.057779603	183.5657993	494.9676222	0.247483811
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	0.031128114	1042.106993	0.048234164	0	0.0229895	0	0.084461674	786.6760346	0.001063735	0	1.065346769	0	0.043667482	0	0.004350128	0	0.000484041	0	0.002332591	7.410640229	1836.193668	0.918096834
	Comal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Guadalupe	0.002007611	67.21078755	0.076651484	0	0.00148271	0	0.134326688	1251.118774	0.00124155	0	0.00356749	0	0.001065557	0	0.001862326	0	0.000403153	0	0.001841718	5.851138003	1324.180699	0.66209035
	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	0.004469515	149.6304095	0.170648096	0	0.003300936	0	0.299049574	2785.347729	0.002764046	0	0.007942252	0	0.002372235	0	0.004146069	0	0.000897533	0	0.00410019	13.02630437	2948.004443	1.474002221
	Caldwell	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hays	0.002469353	82.66899494	0.094281013	0	0.001823727	0	0.165221279	1538.870996	0.001527102	0	0.004387998	0	0.001310631	0	0.002290653	0	0.000495876	0	0.002265306	7.196875913	1628.736867	0.814368433
	Travis	0.000507609	16.99373869	0.298194277	0	0.000374892	0	0.033779905	314.6260314	0.000333135	0	0	0	0.000269863	0	0.000469526	0	0.000102841	0	0.000465139	1.47774508	333.0975152	0.166548758
	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	0.223524525	7483.154063	0.00447587	0	0.165082827	0	0.007477478	69.64522938	0.001651016	0	0.001597886	0	0.045960479	0	0.007117588	0	0.001580824	0	0.008136188	25.84866797	7578.64796	3.78932398
	San Patricio	0.055330886	1852.367407	0.001107949	0	0.040864326	0	0.001850962	17.23986328	0.00040869	0	0.000395538	0	0.01137698	0	0.001761876	0	0.000391315	0	0.002014018	6.398535917	1876.005806	0.938002903
Victoria Area	Victoria	0.020604752	689.8058896	0.002090584	0	0.015217528	0	0.003408874	31.75025655	0.001131941	0	0.000524055	0	0.495811308	0	0.030584062	0	0.000449952	0	0.002127635	6.759497116	728.3156433	0.364157822
Other ERCOT counties	Andrews	2.56527E-05	0.858799856	2.58716E-05	0	1.89456E-05	0	4.28342E-05	0.398958032	1.12134E-05	0	3.69632E-06	0	3.65442E-05	0	0.000127007	0	4.3456E-05	0	0.000233373	0.741425757	1.999183645	0.000999592
	Angelina	0.00032149	10.76284776	0.000324234	0	0.000237435	0	0.000536817	4.999912999	0.000140531	0	4.63239E-05	0	0.000457988	0	0.001591705	0	0.000544609	0	0.002924729	9.291865257	25.05462602	0.012527313
	Bosque	0.000939453	31.45099694	0.001730301	0	0.000693828	0	0.002769496	25.79508648	0.001160623	0	0.000334979	0	0.009007821	0	0.036055459	0	0.000369939	0	0.001683919	5.349811632	62.59589505	0.031297948
	Brazos	0.001913926	64.07442629	0.003525105	0	0.00141352	0	0.005642234	52.55176395	0.002364512	0	0.000682445	0	0.018351436	0	0.073454996	0	0.00075367	0	0.003430612	10.89905391	127.5252441	0.063762622
	Calhoun	0.088525246	2963.648188	0.001772635	0	0.065379841	0	0.0029614	27.58248141	0.000653873	0	0.000632831	0	0.01820231	0	0.002818869	0	0.000626074	0	0.003222277	10.23717504	3001.467844	1.500733922
	Cameron	0.054672288	1830.318843	0.001094762	0	0.285623104	0	0.001828931	17.03465873	0.000403825	0	0.00039083	0	0.011241561	0	0.001740904	0	0.000386657	0	0.001990046	6.322374718	1853.675877	0.926837938
	Cherokee	0.003512995	117.6080512	0.003542982	0	0.002594504	0	0.005865919	54.63517065	0.001535611	0	0.000506191	0	0.005004538	0	0.017392915	0	0.005951066	0	0.031959174	101.5342955	273.7775174	0.136888759
	Coke	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Coleman	0.001355099	45.36601596	2.71346E-05	0	0.001000801	0	4.53316E-05	0.422218567	1.00092E-05	0	9.68705E-06	0	0.000278632	0	4.31498E-05	0	9.58362E-06	0	4.9325E-05	0.156705458	45.94493998	0.02297247
	Crockett	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ector	0.003629264	121.500486	0.003660242	0	0.002680373	0	0.006060061	56.4434128	0.001586434	0	0.000522944	0	0.005170172	0	0.017968562	0	0.006148027	0	0.033016916	104.8947425	282.8386412	0.141419321
	Fannin	0.007628516	255.3874648	0.007693632	0	0.005633999	0	0.012737922	118.6410078	0.003334599	0	0.001099201	0	0.010867422	0	0.037768948	0	0.012922821	0	0.069399776	220.4830881	594.5115607	0.29725578
	Fayette	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Freestone	0.003774434	126.3605054	0.003806652	0	0.002787588	0	0.006302464	58.70114931	0.001649892	0	0.000543862	0	0.005376978	0	0.018687305	0	0.006393948	0	0.034337593	109.0905322	294.1521869	0.147076093
	Frio	0.014763838	494.2637764	0.001497957	0	0.010903753	0	0.002442547	22.74988072	0.000811065	0	0.000375499	0	0.355261637	0	0.021914272	0	0.000322402	0	0.001524506	4.843354662	521.8570118	0.260928506
	Grimes	0.000554424	18.56101408	0.001021149	0	0.000409467	0	0.001634436	15.22314107	0.000684949	0	0.00019769	0	0.005316025	0	0.021278368	0	0.000218322	0	0.000993776	3.157226755	36.94138191	0.018470691
	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	0.239736996	8025.915141	0.004800509	0	0.177056459	0	0.008019827	74.69667152	0.001770766	0	0.001713782	0	0.049294041	0	0.007633834	0	0.001695483	0	0.008726314	27.72349919	8128.335311	4.064167656
	Howard	0.000585081	19.58733722	0.000590075	0	0.000432108	0	0.000976955	9.099355873	0.000255752	0	8.43049E-05	0	0.000833494	0	0.002896748	0	0.000991136	0	0.005322723	16.91029198	45.59698508	0.022798493
	Jack	0.002177558	72.90029158	0.002196145	0	0.001608224	0	0.003636037	33.86604768	0.000951861	0	0.000313767	0	0.003102103	0	0.010781137	0	0.003688816	0	0.01981015	62.93684548	169.7031847	0.084851592
	Jones	0.042500124	1422.819142	0.000851025	0	0.031388236	0	0.00142174	13.24208544	0.000313918	0	0.000303816	0	0.008738755	0	0.001353312	0	0.000300572	0	0.001546985	4.914769796	1440.975997	0.720487998
	Lamar	0.00107998	36.15558603	0.001089199	0	0.000797614	0	0.001803327	16.79618523	0.000472084	0	0.000155616	0	0.001538517	0	0.005347007	0	0.001829503	0	0.00982503	31.21412112	84.16589238	0.042082946
	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	41.62855075	0.047475864	0	0.000918351	0	0.083198331	774.9092558	0.000768983	0	0.002209607	0	0.000659977	0	0.001153474	0	0.000249702	0	0.00114071	3.624037215	820.1618438	0.410080922
	McLennan	0.023031368	771.0441526	0.023227961	0	0.017009692	0	0.038457253	358.1908586	0.01006754	0	0.003318614	0	0.032809997	0	0.114028801	0	0.039015483	0	0.209525912	665.6638216	1794.898833	0.897449416
	Milam	0.001652492	55.32213052	0.001666598	0	0.001220439	0	0.002759294	25.70006058	0.000722342	0	0.000238109	0	0.002354105	0	0.008181524	0	0.002799346	0	0.015033406	47.76113105	128.7833222	0.064391661
	Mitchell	0.016961453	567.8355242	0.017106233	0	0.012526789	0	0.028321847	263.7896848	0.00741424	0	0.002443993	0	0.024162925	0	0.083976519	0	0.028732956	0	0.154305373	490.2281715	1321.85338	0.66092669
	Nolan	0.000603273	20.19636985	0.000608422	0	0.000445544	0	0.001007331	9.382283796	0.000263704	0	8.69262E-05	0	0.00085941	0	0.002986817	0	0.001021953	0	0.005488224	17.43608676	47.01474041	0.02350737
	Palo Pinto	0.003074879	102.9408098	0.00566337	0	0.002270935	0	0.00906471	84.42870969	0.003798781	0	0.001096403	0	0.029483083	0	0.118011463	0	0.001210832	0	0.005511559	17.51022209	204.8797415	0.102439871
	Pecos	4.22618E-05	1.414839924	4.26225E-05	0	3.12122E-05	0	7.05678E-05	0.657268103	1.84736E-05	0	6.08954E-06	0	6.02052E-05	0	0.000209239	0	7.15921E-05	0	0.000384473	1.221470584	3.293578611	0.001646789
	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	0.000359257	12.027222	0.000406685	0	0.000265328	0	0.000358385	3.338001981	0.001533867	0	0.00035593	0	0.000370532	0	0.000908875	0	0.09332343	0	0.00165467	5.256885453	20.62210944	0.010311055
	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	1.0792621	3.25131E-05	0	2.38092E-05	0	5.38302E-05	0.501374425	1.40919E-05	0	4.6452E-06	0	4.59255E-05	0	0.000159611	0	5.46116E-05	0	0.000293282	0.931756932	2.512393456	0.001256197
	Ward	0.019807626	663.1196923	0.0199767	0	0.014628815	0	0.033074321	308.054229	0.008658368	0	0.002854101	0	0.028217522	0	0.098067981	0	0.033554415	0	0.180198187	572.489639	1543.66356	0.77183178
	Webb	0.014180046	474.7195677	0.000283942	0	0.010472596	0	0.000474359	4.418184219	0.000104738	0	0.000101367	0	0.002915661	0	0.000451529	0	0.000100285	0	0.000516147	1.639798991	480.7775509	0.240388775
	Wharton	0.00015439	5.168667944	0.000191235	0	0.000114024	0	6.43902E-05	0.599730099	0.001170153	0	0.000265844	0	0.000106811	0	6.77744E-05	0	8.17175E-05	0	0.000112223	0.356533989	6.124932031	0.003062466
	Wichita	0.000219843	7.359902086	0.000221719	0	0.000162364	0	0.000367089	3.419064445	9.60984E-05	0	3.16774E-05	0	0.000313184	0	0.001088447	0	0.000372417	0	0.002000002	6.354007786	17.13297432	0.008566487
	Wilbarger	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Wise	0.002918471	97.70456939	0.002955932	0	0.002155421	0	0.004892446	45.56824281	0.001287753	0	0.000423725	0	0.004280539	0	0.014952843	0	0.004924352	0	0.026440527	84.00155505	227.2743673	0.113637184
	Young	0.00549666	184.0171896	0.005543579	0	0.004059529	0	0.009178198	85.48573378	0.002402716	0	0.000792019	0	0.007830425	0	0.027214083	0	0.009311425	0	0.050005398	158.8671482	428.3700717	0.214185036
	Total	**1.143037355**	**38266.60456**	**1.154658244**	**0**	**1.089429227**	**0**	**1.180868675**	**10998.61084**	**1.539350626**	**0**	**1.443063194**	**0**	**1.48172714**	**0**	**1.269705424**	**0**	**1.151968562**	**0**	**1.517782624**	**4821.995395**	**54087.21079**	**27.0436054**
Energy Savings by PCA (MWh)		33478		0		0		9314		0		0		0		0		0		3177			

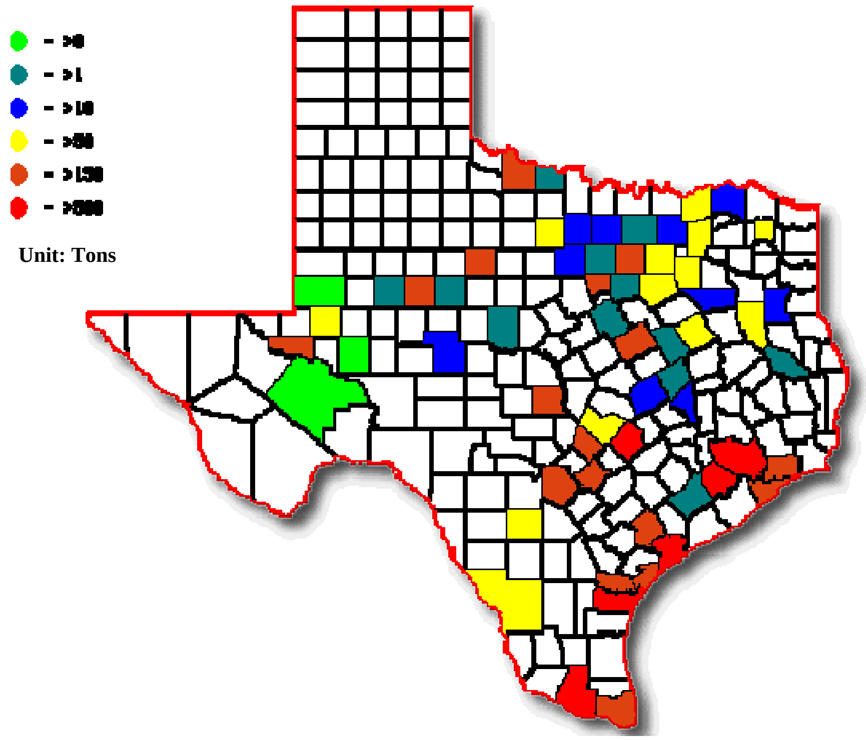


Figure 5-4: 1999 Predicted Annual NOx Reductions from Wind Power in Texas Map

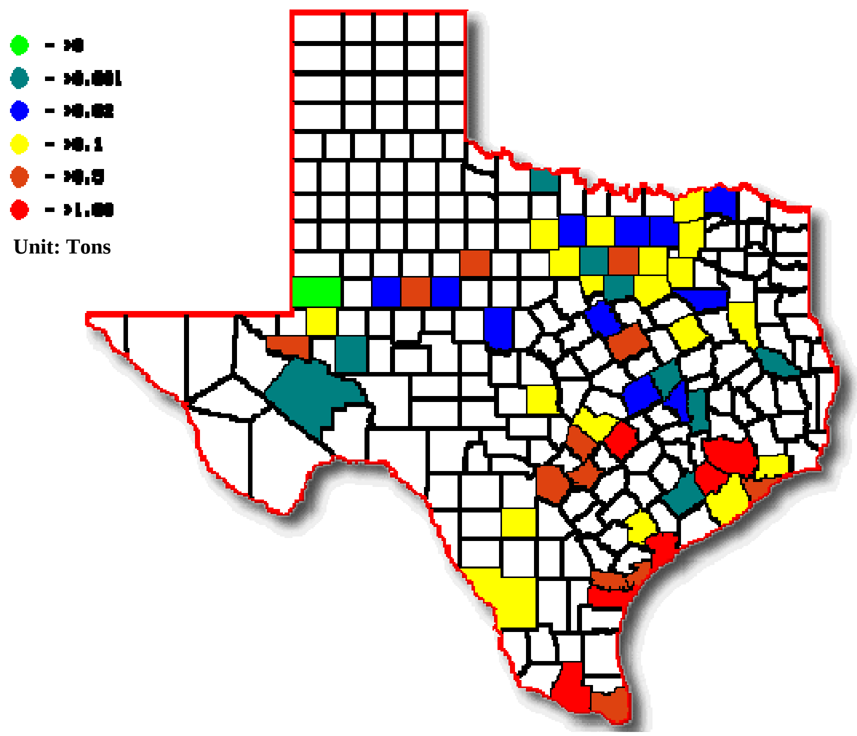


Figure 5-5: 1999 Predicted OSD NOx Reductions from Wind Power in Texas Map

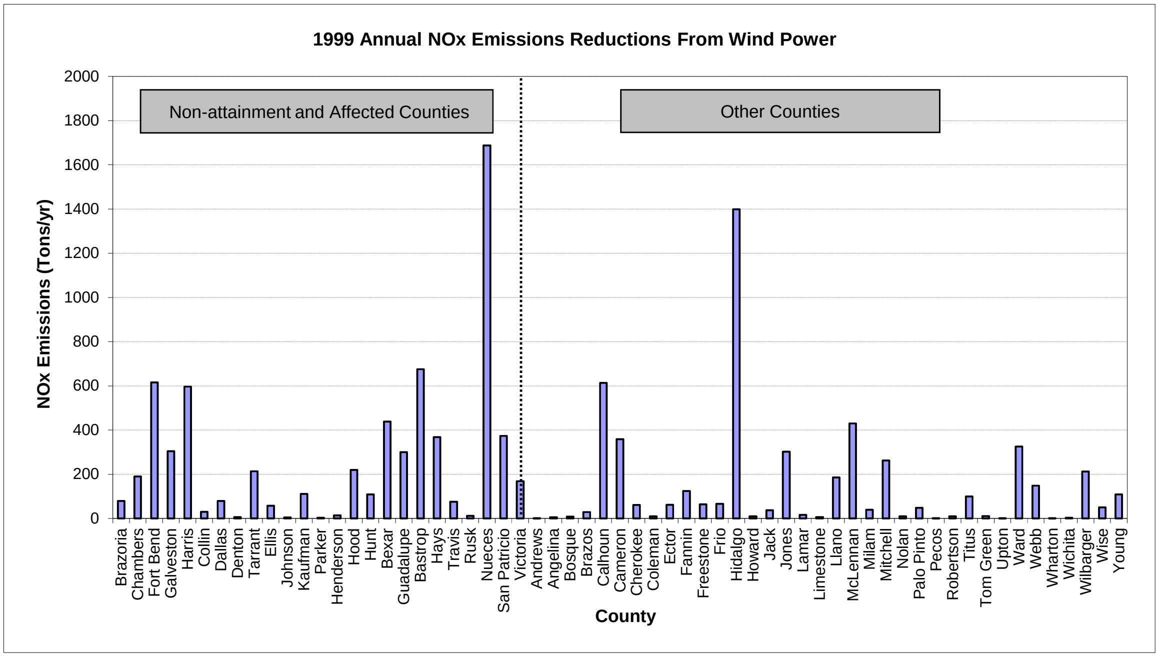


Figure 5-6: 1999 Predicted Annual NOx Reductions from Wind Power

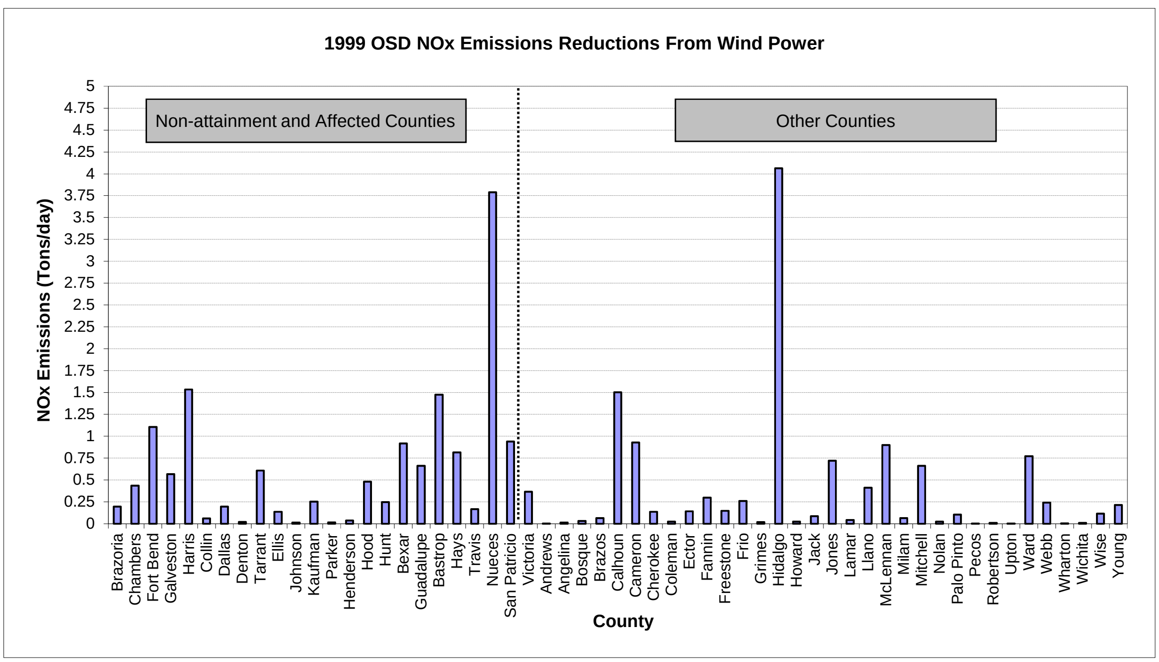


Figure 5-7: 1999 Predicted OSD NOx Reductions from Wind Power

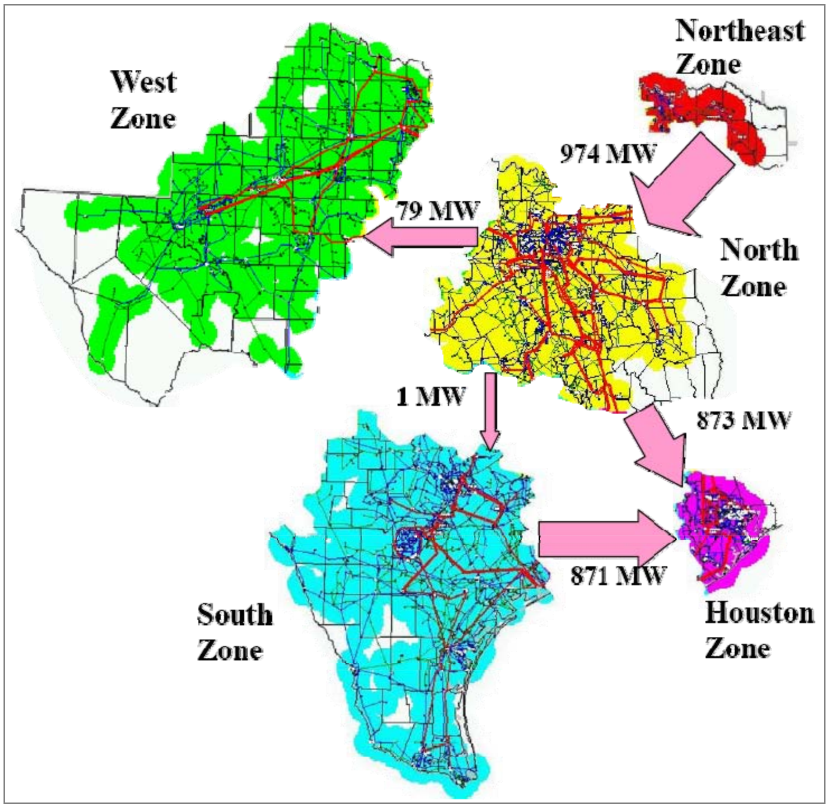


Figure 5-8: Average Modeled Flows on Commercially Significant Constrains for 2006

Table 5-5: Distribution of the Emission Reductions per CM Zone for each County (Year 2010)

County	CM Zones H (lb/MWh)*	H lb	N (lb/MWh)*	N lb	W (lb/MWh)*	W lb	S (lb/MWh)*	S lb	Total (lbs)	Total (Tons)
Andrews	0.000004	1.740	0.000023	4.897	0.003900	130.146	0.000000	0.019	136.8028	0.0684
Atascosa	0.000204	94.703	0.000014	2.930	0.000001	0.022	0.001627	130.854	228.5091	0.1143
Bastrop	0.003378	1,570.200	0.000228	48.577	0.000011	0.367	0.026980	2,169.605	3788.7491	1.8944
Bexar	0.013891	6,456.359	0.000937	199.738	0.000045	1.510	0.110936	8,920.999	15578.6051	7.7893
Bosque	0.002220	1,032.054	0.013621	2,904.167	0.000658	21.954	0.000139	11.175	3969.3500	1.9847
Brazoria	0.056203	26,123.269	0.000007	1.520	0.000000	0.011	0.000527	42.342	26167.1433	13.0836
Brazos	0.002409	1,119.647	0.011231	2,394.456	0.000542	18.101	0.004783	384.623	3916.8262	1.9584
Calhoun	0.000947	439.972	0.000064	13.611	0.000003	0.103	0.007560	607.926	1061.6125	0.5308
Cameron	0.006354	2,953.170	0.000429	91.361	0.000021	0.691	0.050742	4,080.508	7125.7301	3.5629
Chambers	0.020450	9,505.171	0.000003	0.553	0.000000	0.004	0.000192	15.407	9521.1349	4.7606
Cherokee	0.002739	1,273.160	0.016803	3,582.633	0.000812	27.083	0.000171	13.786	4896.6619	2.4483
Coke	0.000000	0.000	0.000000	0.000	0.000000	0.000	0.000000	0.000	0.0000	0.0000
Collin	0.001293	601.065	0.007933	1,691.378	0.000383	12.786	0.000081	6.508	2311.7371	1.1559
Dallas	0.002483	1,153.917	0.015230	3,247.086	0.000736	24.546	0.000155	12.495	4438.0449	2.2190
Denton	0.000127	58.873	0.000777	165.667	0.000038	1.252	0.000008	0.637	226.4306	0.1132
Ector	0.001922	893.118	0.000660	140.794	0.091135	3,041.027	0.014653	1,178.311	5253.2503	2.6266
Ellis	0.002992	1,390.679	0.018354	3,913.326	0.000887	29.583	0.000187	15.059	5348.6469	2.6743
Fannin	0.000004	1.885	0.000025	5.304	0.000001	0.040	0.000000	0.020	7.2488	0.0036
Fayette	0.005187	2,410.781	0.010322	2,200.682	0.000499	16.636	0.028399	2,283.760	6911.8595	3.4559
Fort Bend	0.031346	14,569.784	0.000004	0.848	0.000000	0.006	0.000294	23.616	14594.2536	7.2971
Freestone	0.004764	2,214.467	0.029227	6,231.438	0.001412	47.106	0.000298	23.979	8516.9894	4.2585
Frio	0.000000	0.000	0.000000	0.000	0.000000	0.000	0.000000	0.000	0.0000	0.0000
Galveston	0.022662	10,533.291	0.000003	0.613	0.000000	0.005	0.000212	17.073	10550.9817	5.2755
Goliad	0.000000	0.000	0.000000	0.000	0.000000	0.000	0.000000	0.000	0.0000	0.0000
Grimes	0.000000	0.000	0.000000	0.000	0.000000	0.000	0.000000	0.000	0.0000	0.0000
Guadalupe	0.003203	1,488.704	0.000216	46.055	0.000010	0.348	0.025579	2,057.000	3592.1074	1.7961
Harris	0.148691	69,111.694	0.000019	4.022	0.000001	0.030	0.001393	112.021	69227.7678	34.6139
Hays	0.000833	387.239	0.000056	11.980	0.000003	0.091	0.006654	535.062	934.3715	0.4672
Henderson	0.000691	321.073	0.004238	903.489	0.000205	6.830	0.000043	3.477	1234.8689	0.6174
Hidalgo	0.005372	2,496.710	0.000362	77.240	0.000017	0.584	0.042899	3,449.801	6024.3347	3.0122
Hood	0.005077	2,359.836	0.031145	6,640.503	0.001504	50.199	0.000318	25.553	9076.0903	4.5380
Howard	0.000241	112.072	0.000764	162.907	0.128394	4,284.322	0.000949	76.314	4635.6151	2.3178
Hunt	0.008846	4,111.780	0.004707	1,003.501	0.000227	7.586	0.065282	5,249.745	10372.6119	5.1863
Jack	0.003078	1,430.801	0.018884	4,026.229	0.000912	30.436	0.000193	15.493	5502.9592	2.7515
Johnson	0.000726	337.259	0.004451	949.035	0.000215	7.174	0.000045	3.652	1297.1199	0.6486
Kaufman	0.005972	2,775.718	0.036634	7,810.780	0.001769	59.045	0.000374	30.056	10675.5988	5.3378
Lamar	0.004000	1,859.268	0.024539	5,231.919	0.001185	39.551	0.000250	20.133	7150.8695	3.5754
Limestone	0.000000	0.000	0.000000	0.000	0.000000	0.000	0.000000	0.000	0.0000	0.0000
Llano	0.004031	1,873.818	0.000272	57.970	0.000013	0.438	0.032197	2,589.127	4521.3529	2.2607
McLennan	0.005658	2,629.665	0.034707	7,399.793	0.001676	55.939	0.000354	28.475	10113.8712	5.0569
Milam	0.001269	589.649	0.000086	18.242	0.000004	0.138	0.010132	814.740	1422.7685	0.7114
Mitchell	0.000031	14.469	0.000191	40.714	0.032426	1,082.006	0.000002	0.157	1137.3460	0.5687
Nolan	0.000029	13.598	0.000179	38.264	0.030474	1,016.888	0.000002	0.147	1068.8972	0.5344
Nueces	0.012858	5,976.301	0.000867	184.886	0.000042	1.398	0.102687	8,257.684	14420.2686	7.2101
Palo Pinto	0.003613	1,679.295	0.022164	4,725.483	0.001071	35.722	0.000226	18.184	6458.6840	3.2293
Parker	0.000001	0.571	0.000008	1.608	0.000000	0.012	0.000000	0.006	2.1980	0.0011
Pecos	0.000002	0.916	0.000012	2.577	0.002052	68.473	0.000000	0.010	71.9753	0.0360
Reagan	0.000006	2.751	0.000036	7.742	0.006166	205.744	0.000000	0.030	216.2668	0.1081
Robertson	0.003951	1,836.228	0.005575	1,188.745	0.000269	8.986	0.024617	1,979.599	5013.5587	2.5068
Rusk	0.000000	0.000	0.000000	0.000	0.000000	0.000	0.000000	0.000	0.0000	0.0000
San Patricio	0.001510	701.827	0.000102	21.712	0.000005	0.164	0.012059	969.741	1693.4447	0.8467
Scurry	0.000027	12.461	0.000164	35.064	0.027926	931.838	0.000002	0.135	979.4977	0.4897
Tarrant	0.000474	220.400	0.002909	620.199	0.000141	4.688	0.000030	2.387	847.6746	0.4238
Titus	0.000000	0.000	0.000000	0.000	0.000000	0.000	0.000000	0.000	0.0000	0.0000
Travis	0.005179	2,406.985	0.000349	74.464	0.000017	0.563	0.041358	3,325.824	5807.8359	2.9039
Upton	0.000003	1.182	0.000016	3.327	0.002649	88.408	0.000000	0.013	92.9292	0.0465
Victoria	0.002119	984.984	0.000143	30.472	0.000007	0.230	0.016924	1,360.991	2376.6777	1.1883
Ward	0.000200	92.737	0.001224	260.958	0.207834	6,935.095	0.000012	1.004	7289.7940	3.6449
Webb	0.004202	1,952.964	0.000283	60.418	0.000014	0.457	0.033557	2,698.485	4712.3240	2.3562
Wharton	0.002110	980.503	0.000142	30.333	0.000007	0.229	0.016847	1,354.798	2365.8632	1.1829
Wichita	0.000012	5.631	0.000074	15.845	0.012619	421.077	0.000001	0.061	442.6130	0.2213
Wilbarger	0.017971	8,352.932	0.110243	23,504.881	0.005325	177.685	0.001125	90.447	32125.9453	16.0630
Wise	0.001020	474.180	0.006258	1,334.328	0.000302	10.087	0.000064	5.135	1823.7299	0.9119
Young	0.007105	3,302.593	0.043588	9,293.391	0.002105	70.253	0.000445	35.761	12701.9989	6.3510
Total	**0.441687**	**205,296.100**	**0.481501**	**102,660.654**	**0.568671**	**18,975.696**	**0.684564**	**55,049.947**	**381,982.398**	**190.99120**
Energy Savings (MWh)	437,747.6		200,800.3		31,426.4		75,735.6			

Total Energy Savings (MWh)	745,709.8
% T&D Loss	6.18 %

* (lb/MWh) are pounds of NOx reduced from one megawatt-hour of electricity savings in that CM Zone.
(lb) are mass of projected NOx emissions reductions from multiplying the total energy savings for the CM Zone at the bottom of the chart by the (lb/MWh) factor in the column to the left.

Table 5-6: Distribution of the Emission Reductions per CM Zone for each County (Year 2015)

County	CM Zones H		CM Zones N		CM Zones W		CM Zones S			
	(lb/MWh)*	lb	(lb/MWh)*	lb	(lb/MWh)*	lb	(lb/MWh)*	lb	Total (lbs)	Total (Tons)
Andrews	0.000004	3.596	0.000023	15.655	0.003900	417.998	0.000000	0.035	437.2851	0.2186
Atascosa	0.000202	194.058	0.000014	9.287	0.000001	0.071	0.001614	242.418	445.8337	0.2229
Bastrop	0.003350	3217.538	0.000226	153.981	0.000011	1.169	0.026753	4019.366	7392.0548	3.6960
Bexar	0.013774	13229.894	0.000929	633.142	0.000045	4.809	0.110002	16526.858	30394.7029	15.1974
Bosque	0.002149	2064.419	0.013185	8986.465	0.000637	68.252	0.000135	20.210	11139.3454	5.5697
Brazoria	0.052595	50518.480	0.001053	717.602	0.000051	5.450	0.000068	10.223	51251.7555	25.6259
Brazos	0.002346	2252.898	0.010872	7409.883	0.000525	56.278	0.004740	712.139	10431.1973	5.2156
Calhoun	0.000939	901.558	0.000063	43.146	0.000003	0.328	0.007496	1126.232	2071.2635	1.0356
Cameron	0.006300	6051.418	0.000425	289.602	0.000021	2.200	0.050315	7559.466	13902.6855	6.9513
Chambers	0.019075	18321.635	0.000002	1.649	0.000000	0.013	0.000179	26.849	18350.1453	9.1751
Cherokee	0.002651	2546.704	0.016265	11085.866	0.000786	84.196	0.000166	24.931	13741.6977	6.8708
Coke	0.000000	0.000	0.000000	0.000	0.000000	0.000	0.000000	0.000	0.0000	0.0000
Collin	0.001252	1202.311	0.007679	5233.689	0.000371	39.750	0.000078	11.770	6487.5200	3.2438
Dallas	0.002403	2308.182	0.014742	10047.574	0.000712	76.311	0.000150	22.596	12454.6625	6.2273
Denton	0.000123	117.764	0.000752	512.631	0.000036	3.893	0.000008	1.153	635.4412	0.3177
Ector	0.001906	1830.818	0.000659	449.376	0.091135	9767.029	0.014529	2182.922	14230.1454	7.1151
Ellis	0.002896	2781.777	0.017766	12109.144	0.000858	91.968	0.000181	27.232	15010.1212	7.5051
Fannin	0.000004	3.770	0.000024	16.411	0.000001	0.125	0.000000	0.037	20.3426	0.0102
Fayette	0.005104	4902.695	0.009997	6813.496	0.000483	51.748	0.028158	4230.482	15998.4210	7.9992
Fort Bend	0.029238	28083.898	0.000004	2.528	0.000000	0.019	0.000274	41.154	28127.6000	14.0638
Freestone	0.004612	4429.600	0.028290	19282.157	0.001366	146.447	0.000289	43.364	23901.5672	11.9508
Frio	0.000000	0.000	0.000000	0.000	0.000000	0.000	0.000000	0.000	0.0000	0.0000
Galveston	0.021138	20303.381	0.000003	1.828	0.000000	0.014	0.000198	29.753	20334.9758	10.1675
Goliad	0.017491	16800.188	0.000002	1.512	0.000000	0.011	0.000164	24.619	16826.3314	8.4132
Grimes	0.000000	0.000	0.000000	0.000	0.000000	0.000	0.000000	0.000	0.0000	0.0000
Guadalupe	0.003176	3050.543	0.000214	145.990	0.000010	1.109	0.025364	3810.755	7008.3963	3.5042
Harris	0.138692	133215.829	0.000018	11.993	0.000001	0.091	0.001299	195.215	133423.1280	66.7116
Hays	0.000826	793.501	0.000056	37.975	0.000003	0.288	0.006598	991.246	1823.0094	0.9115
Henderson	0.000669	642.243	0.004102	2795.699	0.000198	21.233	0.000042	6.287	3465.4619	1.7327
Hidalgo	0.005326	5116.075	0.000359	244.840	0.000017	1.860	0.042538	6391.029	11753.8035	5.8769
Hood	0.004914	4720.382	0.030147	20547.941	0.001456	156.060	0.000308	46.211	25470.5944	12.7353
Howard	0.000240	230.645	0.000764	520.730	0.128394	13760.193	0.000941	141.388	14652.9560	7.3265
Hunt	0.008756	8410.184	0.004569	3114.040	0.000221	23.651	0.064732	9725.418	21273.2926	10.6366
Jack	0.002980	2862.033	0.018279	12458.501	0.000883	94.621	0.000186	28.018	15443.1741	7.7216
Johnson	0.000702	674.619	0.004309	2936.633	0.000208	22.304	0.000044	6.604	3640.1592	1.8201
Kaufman	0.005781	5552.271	0.035460	24169.171	0.001713	183.563	0.000362	54.354	29959.3589	14.9797
Lamar	0.003872	3719.095	0.023753	16189.311	0.001147	122.957	0.000242	36.408	20067.7705	10.0339
Limestone	0.000172	164.730	0.001052	717.073	0.000051	5.446	0.000011	1.613	888.8621	0.4444
Llano	0.003998	3839.690	0.000270	183.756	0.000013	1.396	0.031926	4796.563	8821.4046	4.4107
McLennan	0.009476	9101.765	0.033595	22897.785	0.001623	173.907	0.000380	57.124	32230.5814	16.1153
Milam	0.001258	1208.265	0.000085	57.824	0.000004	0.439	0.010046	1509.371	2775.8985	1.3879
Mitchell	0.000031	29.900	0.000191	130.154	0.032426	3475.139	0.000002	0.293	3635.4857	1.8177
Nolan	0.000029	28.100	0.000179	122.321	0.030474	3265.995	0.000002	0.275	3416.6916	1.7083
Nueces	0.012750	12246.195	0.000860	586.065	0.000042	4.451	0.101823	15298.015	28134.7255	14.0674
Palo Pinto	0.003497	3359.096	0.021453	14622.228	0.001036	111.055	0.000219	32.884	18125.2628	9.0626
Parker	0.000001	1.143	0.000007	4.976	0.000000	0.038	0.000000	0.011	6.1682	0.0031
Pecos	0.000002	1.892	0.000012	8.237	0.002052	219.919	0.000000	0.019	230.0664	0.1150
Reagan	0.000006	5.685	0.000036	24.749	0.006166	660.799	0.000000	0.056	691.2891	0.3456
Robertson	0.003897	3742.805	0.005402	3681.717	0.000261	27.962	0.024409	3667.169	11119.6535	5.5598
Rusk	0.000000	0.000	0.000000	0.000	0.000000	0.000	0.000000	0.000	0.0000	0.0000
San Patricio	0.001497	1438.132	0.000101	68.825	0.000005	0.523	0.011958	1796.523	3304.0024	1.6520
Scurry	0.000027	25.750	0.000164	112.091	0.027926	2992.837	0.000002	0.252	3130.9295	1.5655
Tarrant	0.000459	440.867	0.002816	1919.105	0.000136	14.575	0.000029	4.316	2378.8630	1.1894
Titus	0.000000	0.000	0.000000	0.000	0.000000	0.000	0.000000	0.000	0.0000	0.0000
Travis	0.005135	4932.217	0.000346	236.041	0.000017	1.793	0.041010	6161.353	11331.4027	5.6657
Upton	0.000003	2.443	0.000016	10.635	0.002649	283.943	0.000000	0.024	297.0448	0.1485
Victoria	0.002101	2018.358	0.000142	96.592	0.000007	0.734	0.016782	2521.343	4637.0270	2.3185
Ward	0.000200	191.642	0.001224	834.220	0.207834	22273.828	0.000012	1.876	23301.5659	11.6508
Webb	0.004166	4001.870	0.000281	191.517	0.000014	1.455	0.033274	4999.158	9193.9994	4.5970
Wharton	0.002092	2009.174	0.000141	96.153	0.000007	0.730	0.016706	2509.871	4615.9274	2.3080
Wichita	0.000012	11.636	0.000074	50.651	0.012619	1352.396	0.000001	0.114	1414.7965	0.7074
Wilbarger	0.017395	16708.378	0.106711	72731.982	0.005154	552.394	0.001089	163.568	90156.3224	45.0782
Wise	0.000987	948.503	0.006058	4128.859	0.000293	31.358	0.000062	9.285	5118.0059	2.5590
Young	0.006878	6606.181	0.042191	28756.867	0.002038	218.406	0.000430	64.672	35646.1265	17.8231
Total	**0.441552**	**424118.419**	**0.468411**	**319259.869**	**0.568038**	**60877.526**	**0.678325**	**101912.488**	**906,168.302**	**453.08415**
Energy Savings (MWh)	904,611.9		641,911.0		100,933.8		141,496.8			
Total Energy Savings (MWh)	1,788,953.5									
% T&D Loss	6.18	%								

* (lb/MWh) are pounds of NOx reduced from one megawatt-hour of electricity savings in that CM Zone.
(lb) are mass of projected NOx emissions reductions from multiplying the total energy savings for the CM Zone at the bottom of the chart by the (lb/MWh) factor in the column to the left.

6 OTHER RENEWABLE SOURCES

Renewable energy projects throughout the state of Texas were found to determine NOx emissions reduction. Five specific categories were determined to search within: solar photovoltaic, solar thermal, geothermal, hydroelectric, and Landfill Gas-Fired Power Plants. The criteria for each project to be included in the data collection were that the installation date was after the year 2000 and the project was installed within the state of Texas. However, projects installed before the year 2000 were also included in order to provide a complete record.

6.1 Implementation

This report included a lot of newly located renewable energy projects in three of the five main categories as already discussed.

The information was collected using the following modes:

- Information from the websites of manufacturers, distributors, and consultants related with renewable energy products.
- Some information was collected by personally emailing individuals, who were either manufacturers, distributors or consultants.
- Information from the internet - websites of environmental agencies like ERCOT, EIA, NREL publish information which is available to the general public.

It was mainly the same methodology/protocol followed for data collection used in the previous report. Almost all of the information collected was sourced from websites of manufacturers, distributors, consultants etc. Most of the project descriptions did not include system specifications data. In most cases the information obtained was very limited.

To collect more information we emailed manufacturers, consultants, distributors or officers in environmental agencies. Unfortunately we were not able to elicit a response from the people whom we contacted.

6.2 Renewable Energy Projects

6.2.1 Solar Photovoltaic

Apart from about 356 projects which were reported in the previous report, we were able to locate about 64 new projects. The website of the company Imperial Electric reports about 25 new projects in its project gallery (http://www.imperialelectric.com/). Another company, CAMsolar, reports about 17 new projects (http://www.gocamsolar.com/). Some projects were picked from the updated project galleries of Meridian Solar and Standard Renewable Energy (http://www.meridiansolar.com/ and http://www.sre3.com/). These websites provide only the important details like capacity and location. Most of the new projects sourced from this website were residential-type small projects. They did not contain system specification data.

One important new project, the Blue Wing Solar Project was reported by “Juwi solar (http://www.juwisolar.com/). The company undertook Texas’s largest solar project to date. The total output of the project is about 16 MW. It is about two-thirds of the total installed photovoltaic energy capacity currently in Texas. Spread over 112 acres, the project has about 214,500 ground- mounted, thin film solar panels.

All other sources used in earlier reports had no updates apart from the previously reported projects, which were included in the earlier versions of this report.

A summary of the different projects and their outputs of ECALC can be found in Table 6-2. This annual electric savings per county due to these projects are presented in Figure 6-6 and the respective emission reductions are shown in Figure 6-8. The number of projects per county is presented in Figure 6-1.

6.2.2 Solar Thermal

Only three solar thermal projects could be identified for this report from various sources.

A summary of the different projects and their outputs of ECALC, can be found in Table 6-4 and Table 6-5. This annual electric savings per county, due to these projects, are presented in Figure 6-10 and the respective emission reductions are shown in Figure 6-12. The number of projects per county is presented in Figure 6-2.

6.2.3 Hydroelectric

Apart from the 45 projects reported in the previous report no new projects were identified as far as hydroelectric power plants are concerned. No new hydroelectric projects were installed in the State of Texas after the year 2000. All hydroelectric projects located and their information is found in Table 6-7. Figure 6-3 is a map of Texas which shows the location of the different projects per county. .

6.2.4 Geothermal

Information provided by Image Engineering Group, LLC, a consultant group, listed about 150 different geothermal heat pump projects installed in the State of Texas in different schools and organizations (http://www.iegltd.com/) . Theseprojectswere described in our previous reports. They have been listed out in Table 6-8. This forms a major portion of the projects reported to date. Thanks to Mr. Don Penn of Image Engineering Group and Dr.Greg Tinkler, consulting engineer, RLB Consulting Engineers, for their assistance.

In addition, the “Office of the Secretary of Defense report to Congress, about Ground-Source Heat Pumps at the Department of Defense Facilities” reports about five new projects installed in the State of Texas. Other sources reported four new projects. This information was also used in creating the report. The resulting information can be found in Table 6-8 with a corresponding map in Figure 6-4, which shows the number of projects in different counties.

6.2.5 Landfill Gas-Fired Power Plants

The main of information for the landfill gas-fired power plant section of the previous report was provided by the Environmental Protection Agency’s (EPA’s) project data base for Landfill Methane Outreach Program (LMOP). At this time, we were not able to locate any new projects for this report.

The implemented, candidate, and potential projects are listed in Table 6-10 and Table 6-11, respectively. Figure 6-5 shows the location of these operational projects implemented throughout Texas.

6.3 Results

We were able to considerably increase the number of renewable energy projects identified in the State of Texas to date. Some 76 new projects were identified, located and included in the new report (which was not a part of the report published in February 2010). The details the new project can be found in Table 6-1.

Table 6-1: New Projects Reported in March 2011

S.No	Renewable Energy Source	No Of New Projects Reported in March 2011
1	Solar Photo-Voltaic	64
2	Solar Thermal	3
3	Land fill gas	0
4	Hydro-Electric	0
5	Geothermal	9

The report also includes the emission reduction calculations included in the previous report.

6.4 References

Haberl, J.; Culp, C.; Yazdani, B.; Gilman, D.; Liu, Z.; Baltazar-Cervantes; J.C.; Claridge, D.; Mao, C.; Sun, Y.; Narayanaswamy, A.; Do, S.; Kim, K.; "Statewide Air Emissions Calculations from Wind and Other Renewable", December 2010, Energy Systems Laboratory Report No. ESL-TR-10-12-04.

Useful information was obtained from the following websites:

- http://www.soltrex.com/systems.cfm?state=tx
- http://www.meridiansolar.com/portfolio_commercial/commerical.html
- http://www.sre3.com/projectGallery.jsp
- http://www.sre3.com/index.jsp
- http://apowersolutions.com/pdf/Commercial%20Solar%20Pool%20Heating%20Case%20Studies.pdf
- http://www.eia.doe.gov/cneaf/electricity/page/eia860.html
- http://www.iegltd.com/project.refer.geo.master.pdf
- http://www.iegltd.com/html/information.html
- http://geoheat.oit.edu/state/tx/tx.htm
- http://data.memberclicks.com/site/treia/Maria_RichardsSchools.pdf
- http://www.southwestpv.com/SolarSite/SolarSiteMain.aspx
- http://www.fhp-mfg.com/
- http://www.solarsanantonio.org/localrenewable.html
- http://www.txspc.com/renewable-energy-links.html
- http://www.solarsanantonio.org/localinstallers.html
- http://www.cincosolar.com/history.php
- http://www.solarcommunity.net/examples.htm
- http://www.sunrisesolartx.com/commercial/
- http://apps1.eere.energy.gov/buildings/publications/pdfs/building_america/ba_bc_imagine_hot-humid.pdf
- http://www.abengoasolar.com/corp/web/en/our_projects/usa/texas/index.html
- http://geo-energy.org/plants_dev.aspx#Texas
- http://www.woodheatandair.com/trane/ground-source_design.pdf
- http://www.energyhomes.org/projects.html
- http://www.acq.osd.mil/ie/energy/library/GSHP-Report_JAN242007.pdf
- http://greenteamacgeothermal.com/commercial-geothermal-installation/
- http://www.imperialelectricinc.com/products/installations-map.html
- http://www.amerescosolar.com/SolarSite/About/CaseStudies.aspx?CaseID=61

- http://www.lighthousesolar.com/node/186
- http://www.gocamsolar.com/ProjectsNonProfit.shtml
- http://www.juwisolar.com/blue-wing-solar/

Table 6-2: Solar Photovoltaic Cell Projects: Data and Information

Project No	Solar Project	City/Town	County	County for ECALC	Date	PV Modules	Capacity (kW)	Total Area (sqft)	Slope	Azimuth (South=180)
1	Giddings Middle School	Giddings, TX	Lee	Bastrop	Jun-05	GE Energy GEPV-050-M	1	121.4	30	180
2	La Grange Intermediate School	La Grange, TX	Fayette	Bastrop	May-05	GE Energy GEPV-050-M	1	121.4	30	180
3	Schulenburg Elementary School	Schulenburg, TX	Fayette	Bastrop	Jun-05	GE Energy GEPV-050-M	1	121.4	30	180
4	Smithville Junior High School	Smithville, TX	Bastrop	Bastrop	Jun-05	GE Energy GEPV-050-M	1	121.4	30	180
5	Bastrop Intermediate School	Bastrop, TX	Bastrop	Bastrop	May-07	Sharp Electronics NE-170-U1	1.02	84	35	180
6	Eagle Pass High School - CC Winn Campus	Eagle Pass, TX	Maverick	Bexar	Feb-02	Siemens SP 75	0.9	81.84	25	180
7	East Central ISD	San Antonio, TX	Bexar	Bexar	Nov-03	Shell SP-140-PC	1.12	113.92	60	180
8	James Madison High School	San Antonio, TX	Bexar	Bexar	Feb-02	Siemens SP 75	0.9	81.84	25	180
9	John Jay High School	San Antonio, TX	Bexar	Bexar	Dec-01	Siemens SP 75	0.9	81.84	60	180
10	Roosevelt High School	San Antonio, TX	Bexar	Bexar	Mar-04	Shell SP140PC	1.12	113.92	30	180
11	Utopia ISD	Utopia, TX	Uvalde	Bexar	Jun-05	GE Energy GEPV-050-M	1	121.4	30	180
12	City Public Services of San Antonio, Northsid	San Antonio, TX	Bexar	Bexar	Jul-02	MSX-120	17.28	1699.2	30*	180*
13	Del Rio High School	Del Rio, TX	Kinney	Bexar	Jul-99	ASE Americas ASE-300-DG/50	4.56	418.08	25	180
14	Kendall Elementary School	Boerne, TX	Kendall	Bexar	Apr-07	Sharp Electronics NE-170-U2	1.02	84	35	180
15	Uvalde Junior High School	Uvalde, TX	Uvalde	Bexar	Jul-99	ASE Americas ASE-300-DG/50	4.56	418.08	25	180
16	City Public Services Primary Control Center	San Antonio, TX	Bexar	Bexar	Jun-04	BP MSX-120	17.28	1699.2	30*	N/A
17	Institute of Texan Cultures	San Antonio, TX	Bexar	Bexar	N/A	N/A	15	N/A	N/A	N/A
18	Ft. Sam Houston Bldg. 1350	San Antonio, TX	Bexar	Bexar	Apr-06	N/A	181	N/A	N/A	N/A
19	Bexar County Jail Annex	San Antonio, TX	Bexar	Bexar	N/A	N/A	N/A	N/A	N/A	N/A
20	Alvin High School	Alvin, TX	Brazoria	Brazoria	Nov-03	Shell SP-140-PC	1.12	113.92	30	180
21	El Campo Middle School	El Campo, TX	Wharton	Brazoria	Jul-99	ASE Americas ASE-300-DG/50	4.56	418.08	25	180
22	Bluebonnet Elementary School	Lockhart, TX	Caldwell	Caldwell	Jul-05	GE Energy GEPV-050-M	1	121.4	30	180
23	Flatonia Elementary School	Flatonia, TX	Gonzales	Caldwell	May-07	Sharp Electronics NE-170-U1	1.02	84	35	180

Table 6-2: Solar Photovoltaic Cell Projects: Data and Information (cont.)

Project No	Solar Project	City/Town	County	County for ECALC	Date	PV Modules	Capacity (kW)	Total Area (sqft)	Slope	Azimuth (South=180)
24	Waelder ISD	Waelder, TX	Gonzales	Caldwell	May-07	Sharp Electronics NE-170-U5	1.02	64.08	35	180
25	Blue Ridge ISD	Blue Ridge, TX	Collin	Collin	Oct-03	Siemens SP 75	0.9	81.84	25	180
26	McKinney Green Building	McKinney, TX	Collin	Collin	Mar-06	ASE-300-DG-FT	45	3749.76	30*	N/A
27	Canyon High School	New Braunfels, TX	Comal	Comal	Feb-04	Shell SP140PC	1.12	113.92	20	230
28	Dallas ISD Environmental Education Center	Seagoville, TX	Dallas	Dallas	Feb-04	Shell Solar SP140PC	1.12	113.92	30	180
29	The Winston School	Dallas, TX	Dallas	Dallas	N/A	BP XXXXXXX	71	N/A	0	N/A
30	Childress High School	Childress, TX	Childress	Denton	Jul-99	ASE Americas ASE-300-DG/50	4.56	418.08	25	180
31	Cordova Middle School	El Paso, TX	El Paso	El Paso	Jan-03	Shell SP140PC	1.12	113.92	25	180
32	Gene Roddenberry Planetarium	El Paso, TX	El Paso	El Paso	Jun-02	4-kW ASE SunSine AC	3.42	313.44	25	180
33	Monahans High School	Monahans, TX	Ward	El Paso	Dec-01	Siemens SP 75	0.9	81.84	60	180
34	Presidio High School	Presidio, TX	Presidio	El Paso	Dec-99	ASE Americas ASE-300-DG/50	4.56	418.08	25	180
35	Weimar High School	Weimar, TX	Colorado	Fort Bend	May-05	GE Energy GEPV-050-M	1	121.4	30	180
36	Univeresity of Texas Medical Branch at Galveston	Galveston, TX	Galveston	Galveston	Mar-02	Solarex SX-80U	19.2	1892.88	30*	180*
37	Pine Tree Junior High School	Longview, TX	Gregg	Gregg	Mar-00	ASE Americas ASE-300-DG/50	4.56	417.92	25	180
38	Marion Middle School	Marion, TX	Guadalupe	Guadalupe	May-05	GE Energy GEPV-050-M	1	121.4	30	180
39	Seabrook Intermediate School	Seabrook, TX	Harris	Harris	Nov-03	Shell SP-140-PC	1.12	113.92	60	180
40	NASA Johnson Space Center	Houston, TX	Harris	Harris	Oct-04	MSX-121	9.72	955.8	30*	180*
41	UT Health Science Center	Houston, TX	Harris	Harris	Feb-00	Solarex SJ-7500	1.5	271	30*	180*
42	Aircraft Obstruction Light	Houston, TX	Harris	Harris	N/A	SX65U	N/A	162.6	30*	180*
43	Learning Center at Sheldon Lake State Park	Houston, TX	Harris	Harris	N/A	BP Solar	170	108.4	40	180*
44	Learning Center at Sheldon Lake State Park	Houston, TX	Harris	Harris	N/A	N/A	N/A	81.3	25	180*
45	Hempstead Middle School	Hempstead, TX	Washington	Harris	Apr-07	Sharp Electronics NE-170-U1	1.02	84	35	180
46	Houston Ship Channel	Houston, TX	Harris	Harris	Sep-00	BP SX65U	0.78	72	30*	N/A

Table 6-2: Solar Photovoltaic Cell Projects: Data and Information (cont.)

Project No	Solar Project	City/Town	County	County for ECALC	Date	PV Modules	Capacity(kW)	Total Area (sqft)	Slope	Azimuth (South=180)
47	La Grange Intermediate School	La Grange, TX	Fayette	Bastrop	05/01/05	GE Energy GEPV-050-M	1	6.07	30	180
48	Weimar High School	Weimar, TX	Colorado	Fort Bend	5/5/2008	GE Energy GEPV-050-M	1	121.4	30	180
49	Marion Middle School	Marion, TX	Guadalupe	Guadalupe	5/5/2008	GE Energy GEPV-050-M	1	121.4	30	180
50	Giddings Middle School	Giddings, TX	Lee	Bastrop	6/5/2008	GE Energy GEPV-050-M	1	121.4	30	180
51	Schulenburg Elementary School	Schulenburg, TX	Fayette	Bastrop	6/5/2008	GE Energy GEPV-050-M	1	121.4	30	180
52	Smithville Junior High School	Smithville, TX	Bastrop	Bastrop	6/5/2008	GE Energy GEPV-050-M	1	121.4	30	180
53	Utopia ISD	Utopia, TX	Uvalde	Bexar	6/5/2008	GE Energy GEPV-050-M	1	121.4	30	180
54	Brenham Middle School	Brenham, TX	Washington	Montgomery	6/5/2008	GE Energy GEPV-050-M	1	121.4	30	180
55	Cuero Junior High School	Cuero, TX	DeWitt	Victoria	6/5/2008	GE Energy GEPV-050-M	1	121.4	30	180
56	Bluebonnet Elementary School	Lockhart, TX	Caldwell	Caldwell	7/5/2008	GE Energy GEPV-050-M	1	121.4	30	180
57	McKinney Green Building	McKinney, TX	Collin	Collin	3/6/2008	ASE-300-DG-FT	45	3749.76	30*	N/A
58	Ft. Sam Houston Bldg. 1350	San Antonio, TX	Bexar	Bexar	4/6/2008	N/A	181	N/A	N/A	N/A
59	Bedichek Middle Shool	Austin, TX	Travis	Travis	10/6/2008	Sharp ND-L3EJEA	4.059	352.44	30	180
60	Blanton Elementary School	Austin, TX	Travis	Travis	10/6/2008	Sharp ND-L3EJEA	4.059	352.44	30	180
61	Cunningham elementary School	Austin, TX	Travis	Travis	10/6/2008	Sharp ND-L3EJEA	4.059	352.44	30	180
62	Garza High School	Austin, TX	Travis	Travis	10/6/2008	Sharp ND-L3EJEA	4.059	352.44	30	180
63	Martin Middle School	Austin, TX	Travis	Travis	10/6/2008	Sharp ND-L3EJEA	4.059	352.44	30	180
64	Murchison Middle School	Austin, TX	Travis	Travis	10/6/2008	Sharp ND-L3EJEA	4.059	352.44	30	180
65	O'Henry Middle School	Austin, TX	Travis	Travis	10/6/2008	Sharp ND-L3EJEA	4.059	352.44	30	180
66	Pond Springs Elementary School	Austin, TX	Travis	Travis	10/6/2008	Sharp ND-L3EJEA	4.059	352.44	30	180
67	Westwood High School	Austin, TX	Travis	Travis	10/6/2008	Sharp ND-L3EJEA	4.059	352.44	30	225
68	Zilker Elementary School	Austin TX	Travis	Travis	10/6/2008	Sharp ND-L3EJEA	4.059	352.44	30	180
69	Davis Elementary School	Round Rock, TX	Williamson	Williamson	10/6/2008	Sharp ND-L3EJEA	4.059	352.44	30	180

Table 6-2: Solar Photovoltaic Cell Projects: Data and Information (cont.)

Project No	Solar Project	City/Town	County	County for ECALC	Date	PV Modules	Capacity (kW)	Total Area (sqft)	Slope	Azimuth (South=180)
70	Bedichek Middle Shool	Austin, TX	Travis	Travis	Oct-06	Sharp ND-L3EJEA	4.059	352.44	30	180
71	Blanton Elementary School	Austin, TX	Travis	Travis	Oct-06	Sharp ND-L3EJEA	4.059	352.44	30	180
72	Cunningham elementary School	Austin, TX	Travis	Travis	Oct-06	Sharp ND-L3EJEA	4.059	352.44	30	180
73	Garza High School	Austin, TX	Travis	Travis	Oct-06	Sharp ND-L3EJEA	4.059	352.44	30	180
74	Harper School	Harper, TX	Gillespie	Travis	Mar-07	Sharp Electronics NE-170-U1	1.02	84	35	180
75	Llano Junior High School	Llano, TX	Llano	Travis	Apr-07	Sharp Electronics NE-170-U5	1.02	84	35	180
76	Martin Middle School	Austin, TX	Travis	Travis	Oct-06	Sharp ND-L3EJEA	4.059	352.44	30	180
77	Murchison Middle School	Austin, TX	Travis	Travis	Oct-06	Sharp ND-L3EJEA	4.059	352.44	30	180
78	O'Henry Middle School	Austin, TX	Travis	Travis	Oct-06	Sharp ND-L3EJEA	4.059	352.44	30	180
79	Pond Springs Elementary School	Austin, TX	Travis	Travis	Oct-06	Sharp ND-L3EJEA	4.059	352.44	30	180
80	San Marcos Electric Utility	San Marcos, TX	Travis	Travis	Apr-07	Sharp Electronics NE-170-U5	1.02	64.08	35	180
81	Sonora High School	Sonora, TX	Sutton	Travis	Dec-99	ASE Americas ASE-300-DG/50	4.56	418.08	15	220
82	Vliet Residence	Austin, TX	Travis	Travis	Jan-99	Siemens SP 75	1.8	163.92	20	260
83	Westwood High School	Austin, TX	Travis	Travis	Oct-06	Sharp ND-L3EJEA	4.059	352.44	30	225
84	Zilker Elementary School	Austin TX	Travis	Travis	Oct-06	Sharp ND-L3EJEA	4.059	352.44	30	180
85	Courtyard Tennis Club	Austin, TX	Travis	Travis	N/A	N/A	23	N/A	N/A	N/A
86	Escarpment Village	Austin, TX	Travis	Travis	N/A	N/A	7	N/A	N/A	N/A
87	IBM	Austin, TX	Travis	Travis	N/A	N/A	22	N/A	N/A	N/A
88	Hines Pool and Spa	Austin, TX	Travis	Travis	N/A	N/A	21	N/A	N/A	N/A
89	Centex Beverage Inc.	Austin, TX	Travis	Travis	N/A	N/A	22	N/A	N/A	N/A
90	Lake Austin Marina	Austin , TX	Travis	Travis	N/A	N/A	21	N/A	N/A	N/A
91	Habitat Suites	Austin, TX	Travis	Travis	N/A	N/A	17	N/A	N/A	N/A
92	Palmer events Center	Austin, TX	Travis	Travis	N/A	N/A	36	N/A	N/A	N/A

Table 6-2: Solar Photovoltaic Cell Projects: Data and Information (cont.)

Project No	Solar Project	City/Town	County	County for ECALC	Date	PV Modules	Capacity(kW)	Total Area (sqft)	Slope	Azimuth (South=180)
93	Hines Pool and Spa	Austin, TX	Travis	Travis	N/A	N/A	21	N/A	N/A	N/A
94	Centex Beverage Inc.	Austin, TX	Travis	Travis	N/A	N/A	22	N/A	N/A	N/A
95	Lake Austin Marina	Austin , TX	Travis	Travis	N/A	N/A	21	N/A	N/A	N/A
96	Habitat Suites	Austin, TX	Travis	Travis	N/A	N/A	17	N/A	N/A	N/A
97	Palmer events Center	Austin, TX	Travis	Travis	N/A	N/A	36	N/A	N/A	N/A
98	LCRA Environmental Laboratory	Austin, TX	Travis	Travis	N/A	N/A	22	N/A	N/A	N/A
99	Austin Bergstrom International Airport	Austin, TX	Travis	Travis	N/A	N/A	32	N/A	N/A	N/A
100	Sand Hill power Plant, Control Building	Austin, TX	Travis	Travis	N/A	N/A	15	N/A	N/A	N/A
101	Spring Terrace	Austin, TX	Travis	Travis	N/A	N/A	18	N/A	N/A	N/A
102	American YouthWorks	Austin, TX	Travis	Travis	N/A	N/A	21	N/A	N/A	N/A
103	Town Lake Trail Foundation	Austin, TX	Travis	Travis	N/A	N/A	0.5	N/A	N/A	N/A
104	Garden Terrace	Austin, TX	Travis	Travis	N/A	N/A	21	N/A	N/A	N/A
105	Vintage Creek learning Center	Austin, TX	Travis	Travis	N/A	N/A	11	N/A	N/A	N/A
106	Ebeneezer Baptist Church	Austin, TX	Travis	Travis	N/A	N/A	8.4	N/A	N/A	N/A
107	Sierra Ridge	Austin, TX	Travis	Travis	N/A	N/A	17	N/A	N/A	N/A
108	Westcave Preserve	Round Mountain, TX	Llano	Travis	N/A	N/A	1.7	N/A	N/A	N/A
109	St. Andrews Episcopal School	Austin, TX	Travis	Travis	N/A	N/A	22	N/A	N/A	N/A
110	St. Gabriel Catholic Church	Austin, TX	Travis	Travis	N/A	N/A	21	N/A	N/A	N/A
111	Hornsby Bend Birding Shelter	Austin, TX	Travis	Travis	N/A	N/A	0.3	N/A	N/A	N/A
112	Casa Verde	Austin, TX	Travis	Travis	N/A	N/A	1.5	N/A	N/A	N/A
113	Solar Powered Water Purification	Matagorda Island, TX	Calhoun	Victoria	N/A	BP585U	N/A	111.23	30*	180*
114	Austin Clint Small middle school	Austin TX	Travis	Travis	9/12/2008	Kyrocera 6T130	3.12	N/A	30	180
115	City Hall, Austin, Texas	Austin, TX	Travis	Travis	xxx-04	PROSOL (type-austin)***	9.74	894.3	30*	180*
116	Austin Dessau Elementary	Austin TX	Travis	Travis	9/12/2008	Kyrocera 6T130	3.12	N/A	30	180
117	Austin Gus Garcia Middle School	Austin TX	Travis	Travis	9/12/2008	Kyrocera 6T131	3.12	N/A	30	180
118	Austin Lake Travis Elementary	Austin TX	Travis	Travis	9/12/2008	Kyrocera 6T132	3.12	N/A	30	180

Table 6-2: Solar Photovoltaic Cell Projects: Data and Information (cont.)

Project No	Solar Project	City/Town	County	County for ECALC	Date	PV Modules	Capacity(kW)	Total Area (sqft)	Slope	Azimuth (South=180)
119	Austin Lake Travis High School	Austin TX	Travis	Travis	9/12/2008	Kyrocera 6T132	3.12	N/A	30	180
120	Greenville ISD Bowie elementary	Greenville, TX	Hunt		2/9/2009	Sharp NE170	4.08	336	32	180
121	Greenville ISD Carver elementary	Greenville, TX	Hunt		2/9/2009	Sharp NE170	4.08	336	32	180
122	Greenville ISD Crockett elementary	Greenville, TX	Hunt		2/9/2009	sharp SH170	4.08	336	32	180
123	Greenville ISDLamar elementary	Greenville, TX	Hunt		2/9/2009	sharp SH170	4.08	336	32	180
124	Greenville ISD Middle Sxhool	Greenville, TX	Hunt		2/9/2009	sharp SH170	4.08	336	32	180
125	Greenville ISD Travis Elementary	Greenville, TX	Hunt		2/9/2009	sharp SH170	4.08	336	32	180
126	Manor Middle Sxhool	Manor,TX	Travis	Travis	10/24/2007	Sharp NE170	1.02	84	35	180
127	McKinney Roughs Nature Center	Cedar Creek, TX	Henderon		3/24/2008	Sharp NE170	1.02	84	35	180
128	San Saba Middle School	San Saba, TX	San Saba		6/18/2007	Sharp NE170	1.02	84	35	180
	Note: (*) = Assumed									
129	Villas on 6th	Austin, TX	Travis	Travis	N/A	N/A	9.1	N/A	N/A	N/A
130	Installation for a an electronics equipment	Austin, TX	Travis	Travis	N/A	N/A	9.1	N/A	N/A	N/A
131	Solar Decathlon	Austin,TX	Travis	Travis	N/A	N/A	3.7	N/A	N/A	N/A
132	Bracken Cave	Bracken ,TX	Comal		N/A	N/A	0.5	N/A	N/A	N/A
133	Residential project #163 by Meridian Energy	Austin, TX	Travis	Travis	N/A	N/A	3	N/A	N/A	N/A
134	Residential project #157 by Meridian Energy	Plano, TX	Collin	Collin	N/A	N/A	2	N/A	N/A	N/A
135	Residential project #126 by Meridian Energy	Austin, TX	Travis	Travis	N/A	N/A	1.9	N/A	N/A	N/A
136	Residential project #224 by Meridian Energy	Austin, TX	Travis	Travis	N/A	N/A	1.75	N/A	30	115
137	Residential project #228 by Meridian Energy	Austin, TX	Travis	Travis	N/A	N/A	3.34	N/A	15	210
138	Residential project #229 by Meridian Energy	Austin, TX	Travis	Travis	N/A	Sharp 167W	3.34	N/A	12	175
139	Residential project #233 by Meridian Energy	Austin, TX	Travis	Travis	N/A	N/A	3.34	N/A	30	185
140	Residential project #234 by Meridian Energy	Austin, TX	Travis	Travis	N/A	N/A	6.68	N/A	15	120
141	Residential project #238 by Meridian Energy	Austin, TX	Travis	Travis	N/A	N/A	4	N/A	30	180
142	Residential project #243 by Meridian Energy	Austin, TX	Travis	Travis	N/A	sharp 165W	3.3	N/A	28	170
143	Residential project #246 by Meridian Energy	Austin, TX	Travis	Travis	N/A	N/A	2.7	N/A	28	170
144	Residential project #247 by Meridian Energy	Austin, TX	Travis	Travis	N/A	N/A	3	N/A	45	210

Table 6-2: Solar Photovoltaic Cell Projects: Data and Information (cont.)

Project No	Solar Project	City/Town	County	County for ECALC	Date	PV Modules	Capacity(kW)	Total Area (sqft)	Slope	Azimuth (South=180)
145	Residential project #252 by Meridian Energy	Austin, TX	Travis	Travis	N/A	sharp 170w	3.1	N/A	20	200
146	Residential project #268 by Meridian Energy	Austin, TX	Travis	Travis	N/A	sanyo 200w	3.2	N/A	25	210
147	Residential project #272 by Meridian Energy	Austin, TX	Travis	Travis	N/A	N/A	3.1	N/A	20	200
148	Residential project #219 by Meridian Energy	Austin, TX	Travis	Travis	N/A	N/A	3	N/A	N/A	N/A
149	Residential project #221 by Meridian Energy	Del Valle, TX	Travis	Travis	N/A	N/A	3.1	N/A	N/A	N/A
150	Residential project #239 by Meridian Energy	Austin, TX	Travis	Travis	N/A	N/A	3.1	N/A	N/A	N/A
151	Residential project #244 by Meridian Energy	Austin, TX	Travis	Travis	N/A	N/A	3	N/A	N/A	N/A
152	Residential project #256 by Meridian Energy	Austin, TX	Travis	Travis	N/A	N/A	3	N/A	N/A	N/A
153	Residential project #266 by Meridian Energy	Austin, TX	Travis	Travis	N/A	N/A	3	N/A	N/A	N/A
154	Residential project #281 by Meridian Energy	New Braunfels, TX	Guadalupe	Guadalupe	N/A	N/A	3	N/A	N/A	N/A
155	Residential project #289 by Meridian Energy	Austin, TX	Travis	Travis	N/A	N/A	3	N/A	N/A	N/A
156	Residential project #214 by Meridian Energy	Austin, TX	Travis	Travis	N/A	N/A	3	N/A	N/A	N/A
157	Residential project #212 by Meridian Energy	Austin, TX	Travis	Travis	N/A	N/A	3	N/A	N/A	N/A
158	Residential project #210 by Meridian Energy	Austin, TX	Travis	Travis	N/A	N/A	3	N/A	N/A	N/A
159	Residential project #208 by Meridian Energy	Austin, TX	Travis	Travis	N/A	N/A	3	N/A	N/A	N/A
160	Residential project #207 by Meridian Energy	Austin, TX	Travis	Travis	N/A	N/A	3	N/A	N/A	N/A
161	Residential project #206 by Meridian Energy	Austin, TX	Travis	Travis	N/A	N/A	3	N/A	N/A	N/A
162	Residential project #205 by Meridian Energy	Austin, TX	Travis	Travis	N/A	N/A	1	N/A	N/A	N/A
163	Residential project #204 by Meridian Energy	Austin, TX	Travis	Travis	N/A	N/A	3	N/A	N/A	N/A
164	Residential project #200 by Meridian Energy	Austin, TX	Travis	Travis	N/A	N/A	3	N/A	N/A	N/A
165	Residential project #195 by Meridian Energy	Austin, TX	Travis	Travis	N/A	N/A	2	N/A	N/A	N/A
166	Residential project #194 by Meridian Energy	Austin, TX	Travis	Travis	N/A	N/A	3	N/A	N/A	N/A
167	Residential project #192 by Meridian Energy	Austin, TX	Travis	Travis	N/A	N/A	3	N/A	N/A	N/A
168	Residential project #190 by Meridian Energy	Austin, TX	Travis	Travis	N/A	N/A	3	N/A	N/A	N/A
169	Residential project #188 by Meridian Energy	Austin, TX	Travis	Travis	N/A	N/A	3	N/A	N/A	N/A
170	Residential project #187 by Meridian Energy	Austin, TX	Travis	Travis	N/A	N/A	1.3	N/A	N/A	N/A

Table 6-2: Solar Photovoltaic Cell Projects: Data and Information (cont.)

Project No	Solar Project	City/Town	County	County for ECALC	Date	PV Modules	Capacity(kW)	Total Area (sqft)	Slope	Azimuth (South=180)
171	Residential project #184 by Meridian Energy	Frisco, TX	collin	collin	N/A	N/A	6	N/A	N/A	N/A
172	Residential project #183 by Meridian Energy	Spicewood, TX	Burnet		N/A	N/A	1.8	N/A	N/A	N/A
173	Residential project #181 by Meridian Energy	San Antonio, TX	Bexar	Bexar	N/A	N/A	3	N/A	N/A	N/A
174	Residential project #180 by Meridian Energy	Llano, TX	Llano		N/A	N/A	3	N/A	N/A	N/A
175	Residential project #165 by Meridian Energy	Blanco, TX	Blanco		N/A	N/A	1	N/A	N/A	N/A
176	Residential project #119 by Meridian Energy	Wimberly, TX	Hays		N/A	N/A	1.4	N/A	N/A	N/A
177	Residential project #102 by Meridian Energy	Mexia, TX	Limestone		N/A	N/A	1.5	N/A	N/A	N/A
178	Residential project #279 by Meridian Energy	Fischer, TX	Comal	Comal	N/A	N/A	6	N/A	N/A	N/A
179	Residential project #105 by Meridian Energy	Brenham, TX	Washington		N/A	N/A	3.2	N/A	N/A	N/A
180	Residential project #127 by Meridian Energy	Jonestown, TX	Travis	Travis	N/A	N/A	1.08	N/A	N/A	N/A
181	Residential project #161 by Meridian Energy	Alpine, TX	Brewster		N/A	N/A	3.96	N/A	N/A	N/A
182	Residential project #174 by Meridian Energy	Ft.Davis, TX	Jeff Davis		N/A	N/A	2.64	N/A	N/A	N/A
183	Residential project #162 by Meridian Energy	Spicewood, TX	Burnet		N/A	N/A	0.15	N/A	N/A	N/A
184	Residential project #160 by Meridian Energy	Elgin, TX	Travis	Travis	N/A	N/A	0.308	N/A	N/A	N/A
185	Tarrant regional water district	Ft Worth, TX	Travis		N/A	N/A	238	N/A	N/A	N/A
186	City of Austin, Service center# 5	Austin, TX	Travis	Travis	N/A	N/A	23.4	N/A	N/A	N/A
187	City of Austin, Service center# 6	Austin, TX	Travis	Travis	N/A	N/A	55900	N/A	N/A	N/A
188	City of Austin, fire station #27	Austin, TX	Travis	Travis	N/A	N/A	4.16	N/A	N/A	N/A
189	City of Austin, St.John's	Austin, TX	Travis	Travis	N/A	N/A	4.94	N/A	N/A	N/A
190	City of Austin, Far South Austin Public Health	Austin, TX	Travis	Travis	N/A	N/A	5.72	N/A	N/A	N/A
191	waco chamber of commerce building	Austin, TX	Travis	Travis	N/A	N/A	9.6	N/A	N/A	N/A
192	Houston Code Building	Houston, TX	Harris	Harris	N/A	N/A	6.6	N/A	N/A	N/A
193	city of houston annex building	Houston, TX	Harris	Harris	N/A	N/A	6.6	N/A	N/A	N/A
194	Kirby junior high school, Wichita falls	Wichita Falls, TX	Wichita		N/A	N/A	1	N/A	N/A	N/A
195	Garnell Construction	Wichita Falls, TX	Wichita		N/A	N/A	4.2	N/A	N/A	N/A
196	Green Builders	Austin, TX	Travis	Travis	N/A	N/A	2.8	N/A	N/A	N/A

Table 6-2: Solar Photovoltaic Cell Projects: Data and Information (cont.)

Project No	Solar Project	City/Town	County	County for ECALC	Date	PV Modules	Capacity(kW)	Total Area (sqft)	Slope	Azimuth (South=180)
197	Green Builders	Austin, TX	Travis	Travis	N/A	N/A	1.6	N/A	N/A	N/A
198	Children's museum of Houston	Houston, TX	Harris	Harris	N/A	N/A	8.8	N/A	N/A	N/A
199	Chipotle Mexican Grill	Austin, TX	Travis	Travis	N/A	N/A	3.2	N/A	N/A	N/A
200	Discovery Green	Houston, TX	Harris	Harris	N/A	N/A	49.9	N/A	N/A	N/A
201	Jason's Deli	Austin, TX	Travis	Travis	N/A	N/A	8.8	N/A	N/A	N/A
202	Tejas securities building	Austin, TX	Travis	Travis	N/A	N/A	22.4	N/A	N/A	N/A
203	Jason's Deli	Beaumont, TX	Jefferson		N/A	N/A	7.7	N/A	N/A	N/A
204	Chipotle Mexican Grill	Austin, TX	Travis	Travis	N/A	N/A	3.8	N/A	N/A	N/A
205	Residential project by Standard Renewable Energy	Dallas, TX	Dallas	Dallas	N/A	N/A	3.5	N/A	N/A	N/A
206	Residential project by Standard Renewable Energy	Carrollton, TX	Denton		N/A	N/A	2	N/A	N/A	N/A
207	Residential project by Standard Renewable Energy	Galveston, TX	Galveston		N/A	N/A	3.8	N/A	N/A	N/A
208	Residential project by Standard Renewable Energy	Austin, TX	Travis	Travis	N/A	N/A	3.1	N/A	N/A	N/A
209	Residential project by Standard Renewable Energy	Bellaire, TX	Harris		N/A	N/A	3.2	N/A	N/A	N/A
210	Residential project by Standard Renewable Energy	Austin, TX	Travis	Travis	N/A	N/A	3.1	N/A	N/A	N/A
211	Residential project by Standard Renewable Energy	Austin, TX	Travis	Travis	N/A	N/A	3.2	N/A	N/A	N/A
212	Residential project by Standard Renewable Energy	Galveston, TX	Galveston		N/A	N/A	3.2	N/A	N/A	N/A
213	Residential project by Standard Renewable Energy	Austin, TX	Travis	Travis	N/A	N/A	3.2	N/A	N/A	N/A
214	Residential project by Standard Renewable Energy	Austin, TX	Travis	Travis	N/A	N/A	3.2	N/A	N/A	N/A
215	Residential project by Standard Renewable Energy	Austin, TX	Travis	Travis	N/A	N/A	3.2	N/A	N/A	N/A
216	Residential project by Standard Renewable Energy	Austin, TX	Travis	Travis	N/A	N/A	3.2	N/A	N/A	N/A
217	Residential project by Standard Renewable Energy	Houston, TX	Harris	Harris	N/A	N/A	3.4	N/A	N/A	N/A
218	Residential project by Standard Renewable Energy	Houston, TX	Harris	Harris	N/A	N/A	3.4	N/A	N/A	N/A
219	Residential project by Standard Renewable Energy	Houston, TX	Harris	Harris	N/A	N/A	3.5	N/A	N/A	N/A
220	Residential project by Standard Renewable Energy	Dallas, TX	Dallas	Dallas	N/A	N/A	3.1	N/A	N/A	N/A
221	Residential project by Standard Renewable Energy	Shavano Park, TX	Bexar		N/A	N/A	4.6	N/A	N/A	N/A
222	Residential project by Standard Renewable Energy	Katy, TX	Harris		N/A	N/A	4.8	N/A	N/A	N/A

Table 6-2: Solar Photovoltaic Cell Projects: Data and Information (cont.)

Project No	Solar Project	City/Town	County	County for ECALC	Date	PV Modules	Capacity(kW)	Total Area (sqft)	Slope	Azimuth (South=180)
223	Residential project by Standard Renewable Energy	Houston, TX	Harris	Harris	N/A	N/A	4.8	N/A	N/A	N/A
224	Residential project by Standard Renewable Energy	Dallas, TX	Dallas	Dallas	N/A	N/A	4.6	N/A	N/A	N/A
225	Residential project by Standard Renewable Energy	Wimberly, TX	Hays		N/A	N/A	5.1	N/A	N/A	N/A
226	Residential project by Standard Renewable Energy	Houston, TX	Harris	Harris	N/A	N/A	6	N/A	N/A	N/A
227	Residential project by Standard Renewable Energy	Austin, TX	Travis	Travis	N/A	N/A	6.4	N/A	N/A	N/A
228	Residential project by Standard Renewable Energy	Austin, TX	Travis	Travis	N/A	N/A	6.4	N/A	N/A	N/A
229	Residential project by Standard Renewable Energy	Austin, TX	Travis	Travis	N/A	N/A	6.4	N/A	N/A	N/A
230	Residential project by Standard Renewable Energy	Houston, TX	Harris	Harris	N/A	N/A	6.1	N/A	N/A	N/A
231	Residential project by Standard Renewable Energy	Texas City, TX	Galveston		N/A	N/A	8.5	N/A	N/A	N/A
232	Colorado acres	Webb county, Tx	Webb		N/A	N/A	7.2	N/A	N/A	N/A
233	Austin Parmer Elementary	Austin, TX	Travis	Travis	N/A	N/A	3.12	N/A	N/A	N/A
234	Residential project by Meridian Energy Systems	Dallas, TX	Dallas	Dallas	N/A	N/A	3.4	N/A	N/A	N/A
235	Residential project by Meridian Energy Systems	Austin, TX	Travis	Travis	N/A	N/A	3.4	N/A	N/A	N/A
236	Residential project by Meridian Energy Systems	Austin, TX	Travis	Travis	N/A	N/A	9	N/A	N/A	N/A
237	Residential project by Meridian Energy Systems	Grapevine, TX	Tarrant		N/A	N/A	2.7	N/A	N/A	N/A
238	Residential project by Meridian Energy Systems	Austin, TX	Travis	Travis	N/A	N/A	5	N/A	N/A	N/A
239	Residential project by Meridian Energy Systems	Austin, TX	Travis	Travis	N/A	N/A	5.2	N/A	N/A	N/A
240	Residential project by Meridian Energy Systems	Austin, TX	Travis	Travis	N/A	N/A	3.8	N/A	N/A	N/A
241	Residential project by Meridian Energy Systems	Austin, TX	Travis	Travis	N/A	N/A	7.9	N/A	N/A	N/A
242	Residential project by Meridian Energy Systems	Austin, TX	Travis	Travis	N/A	N/A	3.1	N/A	N/A	N/A
243	Residential project by Meridian Energy Systems	Plano, TX	Collin	Collin	N/A	N/A	7.2	N/A	N/A	N/A
244	Residential project by Meridian Energy Systems	Wimberly, TX	Hays		N/A	N/A	6	N/A	N/A	N/A
245	Residential project by Meridian Energy Systems	Colleyville,TX	Tarrant		N/A	N/A	3.1	N/A	N/A	N/A
246	Residential project by Meridian Energy Systems	Farmers Branch, TX	Dallas		N/A	N/A	24.3	N/A	N/A	N/A
247	Residential project by Meridian Energy Systems	Austin, TX	Travis	Travis	N/A	N/A	3.3	N/A	N/A	N/A
248	Residential project by Meridian Energy Systems	Austin, TX	Travis	Travis	N/A	N/A	3.1	N/A	N/A	N/A
249	Residential project by Meridian Energy Systems	Austin, TX	Travis	Travis	N/A	N/A	25.3	N/A	N/A	N/A

Table 6-2: Solar Photovoltaic Cell Projects: Data and Information (cont.)

Project No	Solar Project	City/Town	County	County for ECALC	Date	PV Modules	Capacity(kW)	Total Area (sqft)	Slope	Azimuth (South=180)
250	Residential project by Meridian Energy Systems	Austin, TX	Travis	Travis	N/A	N/A	5.2	N/A	N/A	N/A
251	Residential project by Meridian Energy Systems	Wimberly, TX	Hays		N/A	N/A	3.2	N/A	N/A	N/A
252	Residential project by Meridian Energy Systems	Austin, TX	Travis	Travis	N/A	N/A	7.8	N/A	N/A	N/A
253	Residential project by Meridian Energy Systems	Austin, TX	Travis	Travis	N/A	N/A	3.3	N/A	N/A	N/A
254	Residential project by Meridian Energy Systems	Cibolo, TX	Guadalupe		N/A	N/A	3.9	N/A	N/A	N/A
255	Frisco zero energy home	Frisco, TX	collin	collin	N/A	N/A	6	N/A	N/A	N/A
256	Residential project by Meridian Energy Systems	Austin, TX	Travis	Travis	N/A	N/A	2.7	N/A	N/A	N/A
257	Residential project by Meridian Energy Systems	Garland, TX	Dallas		N/A	N/A	4.6	N/A	N/A	N/A
258	Residential project by Meridian Energy Systems	San Antonio, TX	Bexar	Bexar	N/A	N/A	9.3	N/A	N/A	N/A
259	Residential project by Meridian Energy Systems	Austin, TX	Travis	Travis	N/A	N/A	2.9	N/A	N/A	N/A
260	Residential project by Meridian Energy Systems	Austin, TX	Travis	Travis	N/A	N/A	3.3	N/A	N/A	N/A
261	Residential project by Meridian Energy Systems	Austin, TX	Travis	Travis	N/A	N/A	5.8	N/A	N/A	N/A
262	Residential project by Meridian Energy Systems	Spicewood, TX	Burnet		N/A	N/A	5.8	N/A	N/A	N/A
263	Residential project by Meridian Energy Systems	Austin, TX	Travis	Travis	N/A	N/A	3.2	N/A	N/A	N/A
264	Residential project by Meridian Energy Systems	Austin, TX	Travis	Travis	N/A	N/A	6.4	N/A	N/A	N/A
265	Residential project by Meridian Energy Systems	Plano, TX	Collin	Collin	N/A	N/A	8.1	N/A	N/A	N/A
266	Residential project by Meridian Energy Systems	Austin, TX	Travis	Travis	N/A	N/A	5.3	N/A	N/A	N/A
267	Residential project by Meridian Energy Systems	Burnet, TX	Burnet	Burnet	N/A	N/A	2.9	N/A	N/A	N/A
268	Residential project by Meridian Energy Systems	Austin, TX	Travis	Travis	N/A	N/A	3.2	N/A	N/A	N/A
269	Residential project by Meridian Energy Systems	Austin, TX	Travis	Travis	N/A	N/A	5.3	N/A	N/A	N/A
270	Residential project by Meridian Energy Systems	Corsicana, TX	Navarro		N/A	N/A	3.2	N/A	N/A	N/A
271	Residential project by Meridian Energy Systems	Austin, TX	Travis	Travis	N/A	N/A	5.6	N/A	N/A	N/A
272	Residential project by Meridian Energy Systems	Dallas, TX	Dallas	Dallas	N/A	N/A	3.3	N/A	N/A	N/A
273	Residential project by Meridian Energy Systems	Austin, TX	Travis	Travis	N/A	N/A	2.5	N/A	N/A	N/A
274	Residential project by Meridian Energy Systems	Austin, TX	Travis	Travis	N/A	N/A	3.1	N/A	N/A	N/A
275	Residential project by Meridian Energy Systems	Austin, TX	Travis	Travis	N/A	N/A	10.9	N/A	N/A	N/A
276	Residential project by Meridian Energy Systems	Austin, TX	Travis	Travis	N/A	N/A	5.8	N/A	N/A	N/A

Table 6-2: Solar Photovoltaic Cell Projects: Data and Information (cont.)

Project No	Solar Project	City/Town	County	County for ECALC	Date	PV Modules	Capacity(kW)	Total Area (sqft)	Slope	Azimuth (South=180)
277	Residential project by Meridian Energy Systems	Austin, TX	Travis	Travis	N/A	N/A	3.3	N/A	N/A	N/A
278	Residential project by Meridian Energy Systems	Austin, TX	Travis	Travis	N/A	N/A	3	N/A	N/A	N/A
279	Residential project by Meridian Energy Systems	Bastrop, TX	Bastrop		N/A	N/A	0.2	N/A	N/A	N/A
280	Residential project by Meridian Energy Systems	Austin, TX	Travis	Travis	N/A	N/A	19	N/A	N/A	N/A
281	Residential project by Meridian Energy Systems	Fortworth, TX	Tarrant		N/A	N/A	2.1	N/A	N/A	N/A
282	Residential project by Meridian Energy Systems	Dallas, TX	Dallas	Dallas	N/A	N/A	2.1	N/A	N/A	N/A
283	Residential project by Meridian Energy Systems	Austin, TX	Travis	Travis	N/A	N/A	3.2	N/A	N/A	N/A
284	Residential project by Meridian Energy Systems	Austin, TX	Travis	Travis	N/A	N/A	1.7	N/A	N/A	N/A
285	Residential project by Meridian Energy Systems	Dallas, TX	Dallas	Dallas	N/A	N/A	4.4	N/A	N/A	N/A
286	Residential project by Meridian Energy Systems	Austin, TX	Travis	Travis	N/A	N/A	3.1	N/A	N/A	N/A
287	Residential project by Meridian Energy Systems	Austin, TX	Travis	Travis	N/A	N/A	3.2	N/A	N/A	N/A
288	Residential project by Meridian Energy Systems	Austin, TX	Travis	Travis	N/A	N/A	3.3	N/A	N/A	N/A
289	Residential project by Meridian Energy Systems	Austin, TX	Travis	Travis	N/A	N/A	6.8	N/A	N/A	N/A
290	Residential project by Meridian Energy Systems	Austin, TX	Travis	Travis	N/A	N/A	3.4	N/A	N/A	N/A
291	Residential project by Meridian Energy Systems	Austin, TX	Travis	Travis	N/A	N/A	4	N/A	N/A	N/A
292	Residential project by Meridian Energy Systems	Grapevine, TX	Tarrant		N/A	N/A	6	N/A	N/A	N/A
293	Residential project by Meridian Energy Systems	Spicewood, TX	Burnet		N/A	N/A	0.2	N/A	N/A	N/A
294	Residential project by Meridian Energy Systems	Austin, TX	Travis	Travis	N/A	N/A	2.3	N/A	N/A	N/A
295	Residential project by Meridian Energy Systems	Fortworth, TX	Tarrant		N/A	N/A	3.9	N/A	N/A	N/A
296	Residential project by Meridian Energy Systems	Austin, TX	Travis	Travis	N/A	N/A	6.3	N/A	N/A	N/A
297	American Bank Of Commerce	Austin, TX	Travis	Travis	N/A	N/A	23.3	N/A	N/A	N/A
298	Applied Materials	Austin, TX	Travis	Travis	N/A	N/A	24.4	N/A	N/A	N/A
299	Bluffs Landing senior village	Round Rock, TX	Williamson	Williamson	N/A	N/A	102	N/A	N/A	N/A
300	Castlerock Pet Hospital	Georgetown, TX	Williamson		N/A	N/A	3.8	N/A	N/A	N/A
301	H-E-B #23	Austin, TX	Travis	Travis	N/A	N/A	23.3	N/A	N/A	N/A
302	Lower physical fitness center	Texas City, TX	Galveston		N/A	N/A	45.4	N/A	N/A	N/A
303	Oak Creek plaza	Austin, TX	Travis	Travis	N/A	N/A	6.3	N/A	N/A	N/A

Table 6-2: Solar Photovoltaic Cell Projects: Data and Information (cont.)

Project No	Solar Project	City/Town	County	County for ECALC	Date	PV Modules	Capacity(kW)	Total Area (sqft)	Slope	Azimuth (South=180)
304	Pearl Brewery	San Antonio, TX	Bexar	Bexar	N/A	N/A	200.3	N/A	N/A	N/A
305	Pfluger Associates Architects	Austin, TX	Travis	Travis	N/A	N/A	24.5	N/A	N/A	N/A
306	REI	Round Rock, TX	Williamson	Williamson	N/A	N/A	17	N/A	N/A	N/A
307	Stricty Pediatrics	Austin, TX	Travis	Travis	N/A	N/A	23.4	N/A	N/A	N/A
308	The overlook	Austin, TX	Travis	Travis	N/A	N/A	46.2	N/A	N/A	N/A
309	University Federal Credit union	Austin, TX	Travis	Travis	N/A	N/A	24.6	N/A	N/A	N/A
310	Austin Community College	Austin, TX	Travis	Travis	N/A	N/A	2.4	N/A	N/A	N/A
311	Friends Meeting	Austin, TX	Travis	Travis	N/A	N/A	11.2	N/A	N/A	N/A
312	Maktab Tarighat Oveyssi Shahmaghsoudi	Frisco, TX	collin	collin	N/A	N/A	52.4	N/A	N/A	N/A
313	McLennan Community College Emergency services	Waco, TX	Mc Lennan		N/A	N/A	47.3	N/A	N/A	N/A
314	Shangrila Botanical gardens and nature center	Orange, TX	Orange		N/A	N/A	10.1	N/A	N/A	N/A
315	State Energy Conservation Office-Solar fro Schools	Austin, TX	Travis	Travis	N/A	N/A	1.8	N/A	N/A	N/A
316	State Energy Conservation Office-Solar fro Schools	Austin, TX	Travis	Travis	N/A	N/A	4.1	N/A	N/A	N/A
317	TXU Energy Solar Academy	Dallas, TX	Dallas	Dallas	N/A	N/A	1	N/A	N/A	N/A
318	Winston School	Dallas, TX	Dallas	Dallas	N/A	N/A	73	N/A	N/A	N/A
319	Project by Standard renewable energy	Austin, TX	Travis	Travis	N/A	N/A	14	N/A	N/A	N/A
320	Project by Standard renewable energy	Austin, TX	Travis	Travis	N/A	N/A	14	N/A	N/A	N/A
321	Project by Standard renewable energy	Austin, TX	Travis	Travis	N/A	N/A	14	N/A	N/A	N/A
322	Project by Standard renewable energy	Marfa, TX	Presidio		N/A	N/A	5	N/A	N/A	N/A
323	Project by Standard renewable energy	Frankston, TX	Anderson		N/A	N/A	1.2	N/A	N/A	N/A
324	Project by solar community	Austin, TX	Travis	Travis	N/A	N/A	3	N/A	N/A	N/A
325	Project by solar community	Palestine, TX	Anderson		N/A	N/A	4	N/A	N/A	N/A
326	Project by solar community	Austin, TX	Travis	Travis	N/A	N/A	10	N/A	N/A	N/A
327	Project by solar community	Austin, TX	Travis	Travis	N/A	N/A	3	N/A	N/A	N/A
328	Project by solar community	Austin, TX	Travis	Travis	N/A	N/A	3	N/A	N/A	N/A
329	Project by solar community	Austin, TX	Travis	Travis	N/A	N/A	3	N/A	N/A	N/A
330	Project by solar community	Palestine, TX	Anderson		N/A	N/A	6	N/A	N/A	N/A

Table 6-2: Solar Photovoltaic Cell Projects: Data and Information (cont.)

Project No	Solar Project	City/Town	County	County for ECALC	Date	PV Modules	Capacity(kW)	Total Area (sqft)	Slope	Azimuth (South=180)
331	Project by solar community	Austin, TX	Travis	Travis	N/A	N/A	3.15	N/A	N/A	N/A
332	Project by solar community	Austin, TX	Travis	Travis	N/A	N/A	3	N/A	N/A	N/A
333	Project by solar community	Austin, TX	Travis	Travis	N/A	N/A	3	N/A	N/A	N/A
334	Project by solar community	Marble falls, TX	Burnet		N/A	N/A	3	N/A	N/A	N/A
335	Project by solar community	Dallas, TX	Dallas	Dallas	N/A	N/A	4.2	N/A	N/A	N/A
336	Project by solar community	Austin, TX	Travis	Travis	N/A	N/A	5	N/A	N/A	N/A
337	Project by solar community	Palestine, TX	Anderson		N/A	N/A	7	N/A	N/A	N/A
338	Project by solar community	Austin, TX	Travis	Travis	N/A	N/A	8.4	N/A	N/A	N/A
339	Project by solar community	Georgetown, TX	Williamson		N/A	N/A	4.2	N/A	N/A	N/A
340	Project by solar community	Austin, TX	Travis	Travis	N/A	N/A	20	N/A	N/A	N/A
341	Project by solar community	Austin, TX	Travis	Travis	N/A	N/A	6.2	N/A	N/A	N/A
342	Project by solar community	Austin, TX	Travis	Travis	N/A	N/A	6.3	N/A	N/A	N/A
343	Project by solar community	Austin, TX	Travis	Travis	N/A	N/A	3.15	N/A	N/A	N/A
344	Project by solar community	Austin, TX	Travis	Travis	N/A	N/A	6.3	N/A	N/A	N/A
345	Project by solar community	Austin, TX	Travis	Travis	N/A	N/A	6.3	N/A	N/A	N/A
346	Project by solar community	Austin, TX	Travis	Travis	N/A	N/A	6.3	N/A	N/A	N/A
347	Project by solar community	Austin, TX	Travis	Travis	N/A	N/A	3	N/A	N/A	N/A
348	Project by solar community	Austin, TX	Travis	Travis	N/A	N/A	6	N/A	N/A	N/A
349	Project by solar community	Austin, TX	Travis	Travis	N/A	N/A	3.15	N/A	N/A	N/A
350	Project by solar community	Austin, TX	Travis	Travis	N/A	N/A	6	N/A	N/A	N/A
351	Project by solar community	Austin, TX	Travis	Travis	N/A	N/A	6.5	N/A	N/A	N/A
352	Project by solar community	Austin, TX	Travis	Travis	N/A	N/A	4.2	N/A	N/A	N/A
353	Project by solar community	Austin, TX	Travis	Travis	N/A	N/A	3.2	N/A	N/A	N/A
354	Project by solar community	Austin, TX	Travis	Travis	N/A	N/A	5	N/A	N/A	N/A
355	Project by solar community	Marble falls, TX	Burnet		N/A	N/A	4.5	N/A	N/A	N/A
356	Project by solar community	Austin, TX	Travis	Travis	N/A	N/A	3	N/A	N/A	N/A

Table 6-2: Solar Photovoltaic Cell Projects: Data and Information (cont.)

Project No	Solar Project	City/Town	County	County for ECALC	Date	PV Modules	Capacity(kW)	Total Area (sqft)	Slope	Azimuth (South=180)
357	abundant grace community church	Edinburg	Hidalgo	Nueces	7/1/1905	N/A	105.3	N/A	N/A	N/A
358	acc riverside /rio grande	Austin,TX	Travis	Travis	7/1/1905	N/A	2.4	N/A	N/A	N/A
359	city of allen	Allen,TX	collin	collin	7/2/1905	N/A	20	N/A	N/A	N/A
360	fort stockton, tx	Fort Stockton	Pecos		7/2/1905	N/A	25.2	N/A	N/A	N/A
361	episcopal church of reconciliation	san antonio, TX	Bexar	Bexar	7/1/1905	N/A	14.8	N/A	N/A	N/A
362	st gabriels school	Austin, TX	Travis	Travis	6/23/1905	N/A	21	N/A	N/A	N/A
363	univ of north texas dallas	Dallas, TX	Dallas	Dallas	7/2/1905	N/A	100.4	N/A	N/A	N/A
364	george R brown convention center	Houston, TX	Harris	Harris	N/A	N/A	24	N/A	N/A	N/A
365	st alban's church	Austin, TX	Travis	Travis	N/A	N/A	24	N/A	N/A	N/A
366	jason's deli	Austin, TX	Travis	Travis	N/A	N/A	8.8	N/A	N/A	N/A
367	Residential project	Wichita Falls, TX	Wichita		N/A	N/A	4.2	N/A	N/A	N/A
368	Residential project by Green Life Tech Inc Electric Inc	Flint, TX	Smith	Smith	N/A	N/A	10	N/A	N/A	N/A
369	Residential project by Green Life Tech Inc Electric Inc	Tyler,TX	Smith	Smith	N/A	N/A	7.875	N/A	N/A	N/A
370	Residential project by Imperial Electric Inc	Odessa,TX	Midland	Midland	N/A	N/A	10.12	N/A	N/A	N/A
371	Residential project by Imperial Electric Inc	Leakey, TX	Real		N/A	N/A	0.375	N/A	N/A	N/A
372	Residential project by Imperial Electric Inc	Sweetwater, TX	Nolan		N/A	N/A	10.12	N/A	N/A	N/A
373	Residential project by Imperial Electric Inc	Abilene, TX	Taylor	Hood	N/A	N/A	4	N/A	N/A	N/A
374	Residential project by Imperial Electric Inc	Belton, TX	Bell		N/A	N/A	3.12	N/A	N/A	N/A
375	Residential project by Imperial Electric Inc	Lufkin, TX	Angelina		N/A	N/A	6.9	N/A	N/A	N/A
376	Residential project by Imperial Electric Inc	Temple, TX	Bell		N/A	N/A	3.5	N/A	N/A	N/A
377	Residential project by Imperial Electric Inc	Bayview, TX	Cameron		N/A	N/A	10	N/A	N/A	N/A
378	Residential project by Imperial Electric Inc	Lufkin, TX	Angelina		N/A	N/A	6.9	N/A	N/A	N/A
379	Residential project by Imperial Electric Inc	Leakey, TX	Real		N/A	N/A	0.375	N/A	N/A	N/A
380	Residential project by Imperial Electric Inc	Krum, TX	Denton		N/A	N/A	4	N/A	N/A	N/A
381	Residential project by Imperial Electric Inc	Lufkin, TX	Angelina		N/A	N/A	6.912	N/A	N/A	N/A
382	Residential project by Imperial Electric Inc	Belton, TX	Bell		N/A	N/A	3.12	N/A	N/A	N/A

Table 6-2: Solar Photovoltaic Cell Projects: Data and Information (cont.)

Project No	Solar Project	City/Town	County	County for ECALC	Date	PV Modules	Capacity(kW)	Total Area (sqft)	Slope	Azimuth (South=180)
383	Residential project by Imperial Electric Inc	Lufkin, TX	Angelina		N/A	N/A	6.912	N/A	N/A	N/A
384	Residential project by Imperial Electric Inc	Rose, TX	Orange		N/A	N/A	4	N/A	N/A	N/A
385	Residential project by Imperial Electric Inc	Flower mound, TX	Denton		N/A	N/A	3.5	N/A	N/A	N/A
386	Residential project by Imperial Electric Inc	Dallas, TX	Dallas	Dallas	N/A	N/A	6.93	N/A	N/A	N/A
387	Residential project by Imperial Electric Inc	Merkel, TX	Taylor	Hood	N/A	N/A	2.6	N/A	N/A	N/A
388	Residential project by Imperial Electric Inc	Fort worth, TX	Tarrant		N/A	N/A	5	N/A	N/A	N/A
389	Residential project by Imperial Electric Inc	Haslet, TX	Tarrant		N/A	N/A	6.44	N/A	N/A	N/A
390	Residential project by Imperial Electric Inc	Palmhurst, TX	Hidalgo	Nueces	N/A	N/A	10.12	N/A	N/A	N/A
391	Residential project by Imperial Electric Inc	Sweetwater, TX	Nolan		N/A	N/A	10.12	N/A	N/A	N/A
392	Residential project by Imperial Electric Inc	Odessa, TX	Midland		N/A	N/A	10.12	N/A	N/A	N/A
393	Residential project by Imperial Electric Inc	Scurry, TX	Kaufman		N/A	N/A	3.5	N/A	N/A	N/A
394	Traffic control	Carrollton, TX	Denton		N/A	N/A	0.12	N/A	N/A	N/A
395	dallas medical center	Dallas, TX	Dallas	Dallas	N/A	N/A	337	N/A	N/A	N/A
396	Blue wing solar energy generation facility	San Antonio, TX	Bexar	Bexar	N/A	N/A	16000	N/A	N/A	N/A
397	Tesoros trading company	Austin, TX	Travis	Travis	N/A	N/A	22.94	N/A	N/A	N/A
398	South by southwest inc	Austin, TX	Travis	Travis	N/A	N/A	6.91	N/A	N/A	N/A
399	Solar management group	Austin, TX	Travis	Travis	N/A	N/A	23.1	N/A	N/A	N/A
400	Residential project by lighthouse solar	Austin, TX	Travis	Travis	N/A	N/A	69.6	N/A	N/A	N/A
401	Residential project by lighthouse solar	Austin, TX	Travis	Travis	N/A	N/A	3.45	N/A	N/A	N/A
402	Residential project by lighthouse solar	Austin, TX	Travis	Travis	N/A	N/A	3	N/A	N/A	N/A
403	Residential project by lighthouse solar	Austin, TX	Travis	Travis	N/A	N/A	3.04	N/A	N/A	N/A
404	Residential project by gocamsolar	Hurst,TX	Tarrant		N/A	N/A	5.88	N/A	N/A	N/A
405	Residential project by gocamsolar	Dallas, TX	Dallas	Dallas	N/A	N/A	3.78	N/A	N/A	N/A
406	Residential project by gocamsolar	Grapevine, TX	Tarrant		N/A	N/A	2.73	N/A	N/A	N/A
407	Residential project by gocamsolar	Carrollton, TX	Denton		N/A	N/A	5.88	N/A	N/A	N/A
408	Residential project by gocamsolar	Dallas, TX	Dallas	Dallas	N/A	N/A	1	N/A	N/A	N/A

Table 6-2: Solar Photovoltaic Cell Projects: Data and Information (cont.)

Project No	Solar Project	City/Town	County	County for ECALC	Date	PV Modules	Capacity(kW)	Total Area (sqft)	Slope	Azimuth (South=180)
409	Residential project by gocamsolar	Dallas, TX	Dallas	Dallas	N/A	N/A	1.5	N/A	N/A	N/A
410	Residential project by gocamsolar	Dallas, TX	Dallas	Dallas	N/A	N/A	2	N/A	N/A	N/A
411	Residential project by gocamsolar	Dallas, TX	Dallas	Dallas	N/A	N/A	1	N/A	N/A	N/A
412	Residential project by gocamsolar	Dallas, TX	Dallas	Dallas	N/A	N/A	1.5	N/A	N/A	N/A
413	Residential project by gocamsolar	Dallas, TX	Dallas	Dallas	N/A	N/A	2	N/A	N/A	N/A
414	Residential project by gocamsolar	Dallas, TX	Dallas	Dallas	N/A	N/A	1	N/A	N/A	N/A
415	Residential project by gocamsolar	Dallas, TX	Dallas	Dallas	N/A	N/A	1.5	N/A	N/A	N/A
416	Residential project by gocamsolar	Lowry crossing, TX	Collin	collin	N/A	N/A	5.59	N/A	N/A	N/A
417	Residential project by gocamsolar	Dallas, TX	Dallas	Dallas	N/A	N/A	5.46	N/A	N/A	N/A
418	Residential project by gocamsolar	Hurst,TX	Tarrant		N/A	N/A	5.88	N/A	N/A	N/A
419	Residential project by gocamsolar	Dallas, TX	Dallas	Dallas	N/A	N/A	2	N/A	N/A	N/A
420	Residential project by gocamsolar	Dallas, TX	Dallas	Dallas	N/A	N/A	1.5	N/A	N/A	N/A

Table 6-3: Solar Photovoltaic Cell Projects: Energy and NOx Reductions

Proj. No	Project	County For Ecalc	Annual Energy Savings (for base year conditions) and Emissions Reduction In lbs/year							Annual Energy Savings (for base year conditions) and Average Emissions Reduction In lbs/day Per Ozone Season						
			Annual Energy Consumptio	1999			2007			Annual Energy Consumpti	1999			2007		
				NO_x	SO_x	CO_2	NO_x	SO_x	CO_2		NO_x	SO_x	CO_2	NO_x	SO_x	CO_2
1	Vliet Residence	Travis	2415	9.27	5.22	3465	3.92	2.17	3109	8	0.03	0.02	11	0.01	0	9
2	Del Rio High School	Bexar	6165	16.26	5.85	9155	10.17	10.1	10013	19	0.05	0.02	28	0.03	0.02	30
3	Uvalde Junior High School	Bexar	6165	16.26	5.85	9155	10.17	10.1	10013	19	0.05	0.02	28	0.03	0.02	30
4	El Campo Middle School	Brazoria	5513	13.31	11.41	8670	9.54	7.4	7790	17	0.04	0.03	26	0.03	0.02	23
5	Childress High School	Denton	6284	24.12	13.98	9081	10.22	5.71	8103	20	0.08	0.04	28	0.03	0.01	24
6	Central High School	Williamson	6151	23.62	13.29	8824	9.99	5.53	7917	19	0.07	0.04	27	0.03	0.01	23
7	Abilene School District Planetarium	Hood	6284	24.12	19.98	9081	10.22	5.71	8103	20	0.08	0.04	28	0.03	0.01	24
9	Martin High School	Nueces	5373	14.91	3.09	7478	6.45	2.15	6320	18	0.05	0.01	25	0.02	0	20
11	Calallen High School	Nueces	5567	15.45	3.2	7748	6.68	2.23	6549	17	0.05	0.01	24	0.02	0	20
12	Spring Hill Junior High School	Smith	5749	22.35	12.69	8258	9.4	5.26	7408	18	0.07	0.04	26	0.03	0.01	22
15	Sonora High School	Travis	6131	23.54	13.25	8795	9.96	5.51	7891	20	0.07	0.04	28	0.03	0.01	24
16	UT Health Science Center	Harris	3545	5.92	5.01	3835	4.26	3.33	3464	11	0.02	0.01	11	0.01	0.01	10
17	Mission High School	Nueces	5565	15.45	3.2	7746	6.68	2.23	6546	17	0.05	0.01	24	0.02	0	20
19	Rio Hondo High School	Nueces	5565	15.45	3.2	7746	6.68	2.23	6546	17	0.05	0.01	24	0.02	0	20
20	Houston Ship Channel	Harris	942	1.57	1.33	1019	1.13	0.89	920	3	0	0	3	0	0	3
21	Maplewood Elementary School	Travis	2408	9.25	5.2	3455	3.91	2.17	3100	7	0.03	0.02	11	0.01	0	9
22	Brooksmith ISD	Hood	670	2.57	1.49	969	1.09	0.61	864	1	0.01	0	2	0	0	2
23	Hamlin ISD	Parker	1230	4.78	2.71	1766	2.01	1.13	1585	4	0.01	0.01	6	0.01	0	5
24	Ira ISD	Parker	1047	4.07	2.31	1504	1.71	0.96	1349	3	0.01	0.01	4	0	0	3
25	John Jay High School	Bexar	1013	2.67	0.96	1505	1.67	1.66	1646	3	0.01	0	4	0	0	4
27	Holliday ISD	Parker	1047	4.07	2.31	1504	1.71	0.96	1349	3	0.01	0.01	4	0	0	3
28	River Road ISD	Parker	1047	4.07	2.31	1504	1.71	0.96	1349	3	0.01	0.01	4	0	0	3
29	Eagle Pass High School - CC Winn	Bexar	1207	3.18	1.15	1792	1.99	1.98	1960	4	0.01	0	6	0.01	0	6
30	James Madison High School	Bexar	1207	3.18	1.15	1792	1.99	1.98	1960	4	0.01	0	6	0.01	0	6
31	Univeresity of Texas Medical Branch	Galveston	24763	59.8	51.24	38942	42.85	33.23	34990	74	0.18	0.15	116	0.12	0.08	101
33	City Public Services of San Antonio, Northside	Bexar	24895	65.67	23.63	36970	41.08	40.79	40436	75	0.2	0.07	112	0.12	0.08	120

Table 6-3: Solar Photovoltaic Cell Projects: Energy and NOx Reductions (cont.)

Proj. No	Project	County For Ecalc	Annual Energy Savings (for base year conditions) and Emissions Reduction In lbs/year							Annual Energy Savings (for base year conditions) and Average Emissions Reduction In lbs/day Per Ozone Season						
			Annual Energy Consumptio	1999			2007			Annual Energy Consumpti	1999			2007		
				NO_x	SO_x	CO_2	NO_x	SO_x	CO_2		NO_x	SO_x	CO_2	NO_x	SO_x	CO_2
35	Blue Ridge ISD	Collin	1230	4.72	2.73	1777	2	1.12	1586	4	0.01	0.01	6	0.01	0	5
36	Bryker Woods Elementary School	Travis	1404	5.39	3.03	2014	2.28	1.26	1807	4	0.01	0.01	5	0.01	0	5
37	East Central ISD	Bexar	1411	3.72	1.34	2096	2.33	2.31	2292	4	0.01	0	6	0.01	0	6
38	Alvin High School	Brazoria	1490	3.6	3.08	2344	2.58	2	2106	4	0.01	0.01	7	0.01	0	6
39	Seabrook Intermediate School	Harris	1255	2.1	1.77	1358	1.51	1.18	1226	3	0.01	0	4	0	0	3
40	Kealing Middle School	Travis	1404	5.39	3.03	2014	2.28	1.26	1807	4	0.01	0.01	5	0.01	0	5
41	Canyon High School	Comal	1681	4.43	1.6	2496	2.77	2.75	2730	5	0.01	0.01	8	0.01	0.01	8
42	Dallas ISD Environmental Education	Dallas	1704	6.62	3.76	2448	2.79	1.56	2196	5	0.02	0.01	7	0.01	0	6
43	Junction High School	Travis	1404	5.39	3.03	2014	2.28	1.26	1807	4	0.01	0.01	5	0.01	0	5
44	Roosevelt High School	Bexar	1669	4.4	1.58	2478	2.75	2.73	2711	5	0.01	0	7	0.01	0.01	8
45	City Public Services Primary Control	Bexar	24895	65.67	23.63	36970	41.08	40.79	40436	75	0.2	0.07	112	0.12	0.08	120
46	NASA Johnson Space Center	Harris	12504	20.87	17.66	13.53	15.04	11.75	12216	37	0.06	0.05	40	0.04	0.03	35
47	La Grange Intermediate School	Bastrop	1774	6.9	3.92	2548	2.9	1.62	2286	5	0.02	0.01	8	0.01	0	7
48	Weimar High School	Fort Bend	1588	3.84	3.25	2490	2.77	2.16	2249	5	0.01	0.01	7	0.01	0.01	7
49	Marion Middle School	Guadalupe	1779	4.69	1.69	2641	2.94	2.91	2889	5	0.01	0.01	8	0.01	0.01	9
50	Giddings Middle School	Bastrop	1774	6.9	3.92	2548	2.9	1.62	2286	5	0.02	0.01	8	0.01	0	7
51	Schulenburg Elementary School	Bastrop	1774	6.9	3.92	2548	2.9	1.62	2286	5	0.02	0.01	8	0.01	0	7
52	Smithville Junior High School	Bastrop	1774	6.9	3.92	2548	2.9	1.62	2286	5	0.02	0.01	8	0.01	0	7
53	Utopia ISD	Bexar	1779	4.69	1.69	2641	2.94	2.91	2889	5	0.01	0.01	8	0.01	0.01	9
54	Brenham Middle School	Montgomery	1588	2.65	2.24	1718	1.91	1.49	1552	5	0.01	0.01	5	0.01	0	4
55	Cuero Junior High School	Victoria	1624	4.51	0.93	2260	1.95	0.65	1910	5	0.01	0	7	0.01	0	6
56	Bluebonnet Elementary School	Caldwell	1774	4.93	1.02	2469	2.13	0.71	2087	5	0.01	0	7	0.01	0	6
57	McKinney Green Building	Collin	56096	215.35	124.75	81061	91.21	50.98	72330	171	0.66	0.38	248	0.28	0.07	213
59	Bedichek Middle Shool	Travis	5150	19.78	11.13	7389	8.37	4.63	6629	16	0.06	0.03	22	0.03	0.01	19
60	Blanton Elementary School	Travis	5150	19.78	11.13	7389	8.37	4.63	6629	16	0.06	0.03	22	0.03	0.01	19
61	Cunningham elementary School	Travis	5150	19.78	11.13	7389	8.37	4.63	6629	16	0.06	0.03	22	0.03	0.01	19

Table 6-3: Solar Photovoltaic Cell Projects: Energy and NOx Reductions (cont.)

Proj. No	Project	County For Ecalc	Annual Energy Savings (for base year conditions) and Emissions Reduction In lbs/year							Annual Energy Savings (for base year conditions) and Average Emissions Reduction In lbs/day Per Ozone Season						
			Annual Energy Consumptio	1999			2007			Annual Energy Consumpti	1999			2007		
				NO_x	SO_x	CO_2	NO_x	SO_x	CO_2		NO_x	SO_x	CO_2	NO_x	SO_x	CO_2
62	Garza High School	Travis	5150	19.78	11.13	7389	8.37	4.63	6629	16	0.06	0.03	22	0.03	0.01	19
63	Martin Middle School	Travis	5150	19.78	11.13	7389	8.37	4.63	6629	16	0.06	0.03	22	0.03	0.01	19
64	Murchison Middle School	Travis	5150	19.78	11.13	7389	8.37	4.63	6629	16	0.06	0.03	22	0.03	0.01	19
65	O'Henry Middle School	Travis	5150	19.78	11.13	7389	8.37	4.63	6629	16	0.06	0.03	22	0.03	0.01	19
66	Pond Springs Elementary School	Travis	5150	19.78	11.13	7389	8.37	4.63	6629	16	0.06	0.03	22	0.03	0.01	19
67	Westwood High School	Travis	5150	19.78	11.13	7389	8.37	4.63	6629	16	0.06	0.03	22	0.03	0.01	19
68	Zilker Elementary School	Travis	5150	19.78	11.13	7389	8.37	4.63	6629	16	0.06	0.03	22	0.03	0.01	19
69	Davis Elementary School	Williamson	5150	19.78	11.13	7389	8.37	4.63	6629	16	0.06	0.03	22	0.03	0.01	19
70	Brenham Jr. High School	Harris	826	1.38	1.17	893	0.99	0.78	807	2	0	0	3	0	0	2
71	Harper School	Travis	1212	4.65	2.62	1739	1.97	1.09	1560	4	0.01	0.01	5	0.01	0	4
72	Kendall Elementary School	Bexar	1215	3.21	1.15	1805	2.01	1.99	1974	4	0.01	0	5	0.01	0	6
73	Leonard Shanklin Elementary School	Caldwell	1212	3.36	0.7	1687	1.46	0.49	1426	4	0.01	0	5	0	0	4
74	Hempstead Middle School	Harris	1083	1.81	1.53	1171	1.3	1.02	1058	3	0.01	0	3	0	0	3
75	Llano Junior High School	Travis	1212	4.65	2.62	1739	1.97	1.09	1560	4	0.01	0.01	5	0.01	0	4
76	San Marcos Electric Utility	Travis	925	3.55	2	1326	1.5	0.83	1190	3	0.01	0.01	4	0	0	3
77	Lampasas Middle School	Williamson	1212	4.65	2.62	1739	1.97	1.09	1560	4	0.01	0.01	5	0.01	0	4
78	Bastrop Intermediate School	Bastrop	1212	4.71	2.67	1741	1.98	1.11	1562	4	0.01	0.01	5	0.01	0	4
79	Flatonia Elementary School	Caldwell	1212	3.36	0.7	1687	1.46	0.49	1426	4	0.01	0	5	0	0	4
80	Waelder ISD	Caldwell	925	2.57	0.53	1287	1.11	0.37	1088	3	0.01	0	4	0	0	3
84	Aircraft Obstruction Light	Harris	2127	3.65	3	2301	2.56	2	2078	6	0.01	0.01	7	0.01	0	6
85	Learning Center at Sheldon Lake State Park	Harris	1372	2.29	1.94	1484	1.65	1.29	1340	4	0.01	0.01	4	0	0	4
86	Learning Center at Sheldon Lake State Park	Harris	1072	1.79	1.51	1160	1.29	1.01	1048	3	0.01	0	4	0	0	3
88	Solar Powered Water Pumping	Montgomery	3545	5.92	5.01	3835	4.26	3.33	3464	11	0.02	0.01	11	0.01	0.01	10
89	Solar Powered Reverse Osmosis in	Nueces	8187	22.73	4.7	11395	9.83	3.28	9630	25	0.07	0.01	35	0.03	0.01	28
113	Solar Powered Water Purification	Victoria	1488	4.13	0.86	2071	1.79	0.6	1750	4	0.01	0	6	0.01	0	5
114	City Hall, Austin, Texas	Travis	13069	50.19	28.24	18747	21.23	11.75	16821	39	0.15	0.09	57	0.06	0.02	49
	TOTAL		**362212**	**9074.6**	**594.79**	**465535**	**8558.3**	**360.65**	**449179**	**1101**	**7999.2**	**1.72**	**1446**	**8029.6**	**0.62**	**1310**

Table 6-4: Solar Thermal Projects

Project No	City	County	County for eCalc	Project Purpose	Model	Collector Area (sqft)	Number of collectors	Total Area (sqft)	Slope (degree)	Azimuth (i.e. South=0, West (-) and East (+))	Fluid
1	Austin	Travis	Travis	Domestic Hot Water (DHW)	N/A	N/A	2	N/A	N/A	0	Antifreeze
2	Austin	Travis	Travis	Domestic Hot Water (DHW)	SS HX Drainback	26.25	3	78.75	20	0	Water
3	Round Rock	Willamson	Willamson	Domestic Hot Water (DHW)	SS HX Drainback	26.25	2	52.5	20	-90	Water
4	Dripping Springs	Hays	Hays	Domestic Hot Water (DHW)	SS HX Drainback	26.25	2	52.5	20	20	Water
5	San Antonio	Bexar	Bexar	Domestic Hot Water (DHW)	SS HX Drainback	26.25	2	52.5	20	0	Water
6	San Antonio	Bexar	Bexar	Pool Heating System	FS collector	32	8	256	20	-45	Water
7	N/A	N/A	N/A	Domestic Hot Water (DHW)	SS HX Drainback	26.25	3	78.75	20	-45	Water
8	N/A	N/A	N/A	Domestic Hot Water (DHW)	SS HX Drainback	26.25	2	52.5	20	-45	Water
9	Midland	Midland	N/A	Pool Heating System-city of midland aquatic center	make:APS	50	256	12800	N/A	N/A	Water
10	Lubbock	Lubbock	N/A	Pool Heating System-Lubbock TX State School	make:APS	50	36	1800	N/A	N/A	Water
11	Christi	Nueces	N/A	Pool Heating System-Corpus Christi TX State School	make:APS	50	36	1800	N/A	N/A	Water
12	Richmond	Fort Bend	N/A	Pool Heating System-Richmond TX State School	make:APS	50	36	1800	N/A	N/A	Water
13	Elpaso	Elpaso	N/A	Pool Heating System-University of Elpaso recreation facility	make:APS	50	120	6000	N/A	N/A	Water
14	Elpaso	Elpaso	N/A	Pool Heating System-University of Elpaso recreation facility	make:APS	50	128	6400	N/A	N/A	Water
15	edinburg	Hidalgo	N/A	Pool heating system for Gym spa	make : APS	N/A	34	600+	N/A	N/A	Water
16	pearland	Brazoria	N/A	Pool heating system-residential	make : APS	N/A	7	N/A	N/A	N/A	water
17	cleveland	Liberty	N/A	Domestic Hot Water (DHW)	make : APS	N/A	N/A	N/A	N/A	N/A	water
18	Austin	Travis	Travis	Pool hating system at the Jester Club	make: FAFCO	N/A	N/A	N/A	N/A	N/A	water
19	Austin	Travis	Travis	pool heating at Quenciera@Barton Creek	make: FAFCO	N/A	N/A	N/A	N/A	N/A	water
20	Laredo	Webb	Nueces	Pool heating at Tijerina Ranch	make: FAFCO	N/A	N/A	N/A	N/A	N/A	water
21	San Antonio	Bexar	Bexar	DHW system-Apartment high rise-The army resident community	collectors	25.8	180	4644	N/A	N/A	water
22	San Antonio	Bexar	Bexar	DHW system-Assisted Living Facility-The army resident community	collectors	25.8	5	129	N/A	N/A	water
23	Victoria	Victoria		Domestic Hot Water (DHW)	collectors	25.8	2	51.6	N/A	N/A	water
24	San Antonio	Bexar	Bexar	sutainability lab	N/A	N/A	N/A	N/A	N/A	N/A	water
25	San Antonio	Bexar	Bexar	Domestic Hot Water (DHW at city public service-northside	N/A	N/A	N/A	5000	N/A	N/A	water
26	San Antonio	Bexar	Bexar	Domestic Hot Water (DHW)-Bexar County Adult Jail Annex	N/A	N/A	N/A	N/A	N/A	N/A	water
27	San Antonio	Bexar	Bexar	Domestic Hot Water (DHW)	Technology Pt-50	N/A	N/A	N/A	N/A	N/A	water
28	San Antonio	Bexar	Bexar	Historic Gardens phase II project by SADA	N/A	N/A	N/A	N/A	N/A	N/A	water
29	San Antonio	Bexar	Bexar	supply	RMT modules	N/A	29	1377.95	N/A	N/A	water
30	San Antonio	Bexar	Bexar	Domestic Hot Water (DHW)-Imagine homes	N/A	N/A	N/A	54	N/A	N/A	water
31	San Antonio	Bexar	Bexar	Domestic Hot Water (DHW)Veterans Administration Hospitals	EC-40-1.5	N/A	320	N/A	N/A	N/A	water

Table 6-5: Solar Thermal Projects Emissions Reductions

		Annual Energy Savings (for base year conditions) and Emissions Reduction							Average per Ozone Season Day (for base year conditions) and Emissions Reduction						
		Annual Energy Consumption (kWh/yr)	1999			2007			Annual Energy Consumption (kWh/yr)	1999			2007		
Project	County for ECALC		NO_x	SO_x	CO_2	NO_x	SO_x	CO_2		NO_x	SO_x	CO_2	NO_x	SO_x	CO_2
2	Travis	4134	15.87	8.93	5930	6.71	3.72	5320	14	0.05	0.03	20	0.02	0.01	17
3	Willamson	3211	12.33	6.94	4606	5.22	2.89	4133	13	0.05	0.03	18	0.02	0	16
4	Hays	3469	9.16	2.44	4791	4.41	1.14	4234	12	0.03	0.01	17	0.02	0	15
5	Bexar	3469	9.15	3.29	5152	5.73	5.68	5635	12	0.03	0.01	18	0.02	0.01	19
6	Bexar	26235	69.2	24.9	38960	43.3	42.98	42.612	87	0.23	0.08	130	0.14	0.09	140
TOTAL		**40518**	**115.71**	**46.5**	**59439**	**65.37**	**56.41**	**19364.6**	**138**	**0.39**	**0.16**	**203**	**0.22**	**0.11**	**207**

Table 6-6: Solar Thermal Special Project

Special Case	
Location	Fort Sam Houston, San Antonio TX
Date	3-Jun
Collector	Roof Mounted Parabolic Trough
Number of collectors	129
Total Aperture area (sqft)	4515
Maximum operation temperature (°F)	400
Annual Energy Consumption (KWh/yr)	270583
Annual Energy Consumption OSD (KWh/yr) (KWh/yr)	741.3

Table 6-7: Hydropower Plant Information

S.No	Utility Name	Plant Name	County	Initial Year Of Operation	Capacity in MW	STATUS
1	Guadalupe Blanco River Auth	Abbott TP 3	Victoria	1927	1.4	operational
2	Guadalupe Blanco River Auth	Abbott TP 3	Victoria	1927	1.4	operational
3	Guadalupe Blanco River Auth	Dunlap TP 1	Guadalupe	1927	1.8	operational
4	Guadalupe Blanco River Auth	Dunlap TP 1	Guadalupe	1927	1.8	operational
5	Guadalupe Blanco River Auth	Nolte	Williamson	1927	1.2	operational
6	Guadalupe Blanco River Auth	Nolte	Williamson	1927	1.2	operational
7	Guadalupe Blanco River Auth	H 4	Guadalupe	1931	2.4	operational
8	Guadalupe Blanco River Auth	H 5	Guadalupe	1931	2.4	operational
9	Guadalupe Blanco River Auth	TP 4	Guadalupe	1932	2.4	operational
10	Maverick Cty Water Control & Improvement	Eagle Pass	Maverick	1932	3.2	operational
11	Maverick Cty Water Control & Improvement	Eagle Pass	Maverick	1932	3.2	operational
12	Maverick Cty Water Control & Improvement	Eagle Pass	Maverick	1932	3.2	operational
13	Lower Colorado River Authority	Buchanan	Burnet	1938	18.3	operational
14	Lower Colorado River Authority	Buchanan	Burnet	1938	18.3	operational
15	Lower Colorado River Authority	Buchanan	Burnet	1938	11.2	operational
16	Lower Colorado River Authority	Inks	Burnet	1938	15	operational
17	Lower Colorado River Authority	Austin	Lampasas	1941	8	operational
18	Lower Colorado River Authority	Austin	Lampasas	1941	8	operational
19	Lower Colorado River Authority	Marshall Ford	Travis	1941	34	operational
20	Lower Colorado River Authority	Marshall Ford	Travis	1941	34.5	operational
21	Lower Colorado River Authority	Marshall Ford	Travis	1941	34	operational
22	Brazos River Authority	Morris Sheppard	Palo Pinto	1942	12.5	operational
23	Brazos River Authority	Morris Sheppard	Palo Pinto	1942	12.5	operational

Table 6-7:Hydropower Plant Information (cont.)

S.No	Utility Name	Plant Name	County	Initial Year Of Operation	Capacity in MW	STATUS
24	USCE-Tulsa District	Denison	Grayson	1945	35	operational
25	USCE-Tulsa District	Denison	Grayson	1949	35	operational
26	Lower Colorado River Authority	Granite Shoals	Burnet	1951	30	operational
27	Lower Colorado River Authority	Granite Shoals	Burnet	1951	30	operational
28	Lower Colorado River Authority	Marble Falls	Burnet	1951	15	operational
29	Lower Colorado River Authority	Marble Falls	Burnet	1951	15	operational
30	USCE-Fort Worth District	Whitney	Bosque	1953	15	operational
31	USCE-Fort Worth District	Whitney	Bosque	1953	15	operational
32	International Bound & Wtr Comm	Falcon Dam & Power	Zapata	1954	10.5	operational
33	International Bound & Wtr Comm	Falcon Dam & Power	Zapata	1954	10.5	operational
34	International Bound & Wtr Comm	Falcon Dam & Power	Zapata	1954	10.5	operational
35	USCE-Fort Worth District	Sam Rayburn	Jasper	1965	26	operational
36	USCE-Fort Worth District	Sam Rayburn	Jasper	1965	26	operational
37	Entergy Gulf States Inc	Toledo Bend	Newton	1969	40.5	operational
38	Entergy Gulf States Inc	Toledo Bend	Newton	1969	40.5	operational
39	International Bound & Wtr Comm	Amistad Dam & Power	Valverde	1983	33	operational
40	International Bound & Wtr Comm	Amistad Dam & Power	Valverde	1983	33	Operational
41	Guadalupe Blanco River Auth	Canyon	Randall	1989	3	Operational
42	Guadalupe Blanco River Auth	Canyon	Randall	1989	3	Operational
43	USCE-Fort Worth District	Robert D Willis	Harris	1989	4	Operational
44	USCE-Fort Worth District	Robert D Willis	Harris	1989	4	Operational
45	City of Garland	Lewisville	Denton	1992	2.8	Operational
				Total	669.2	MW

Table 6-8: Geothermal Heat Pump Energy Projects

S.No	Project	County	Implementation Date	Capacity (ton)	Area (sqft)
1	Birdville High School Campus	Denton	2001	N/A	N/A
2	Texas Motor Speedway	Denton	1998	N/A	N/A
3	George W. Bush's ranch	McLennan	2001	14	N/A
4	Esperanza del Sol, Dallas (Hope of the Sun)	Dallas	1994	18	15,276
5	Hillside Oaks, East Dallas	Dallas	1997	366	276,120
6	Pease Elementary School, Austin	Travis	1997	90	39,162
7	Brooke Elementary School	Travis	1997	150	51,605
8	Govalle Elementary School	Travis	1997	230	89,319
9	Bailey Middle School, Austin	Travis	1997	512	200,000
10	Home in Iowa Park	Wichita	1997	1	1,668
11	The Home of the Future	Dallas	1997	13	4,573
12	Birdville Athletic Complex / Stadium	Tarrant	post 1992	N/A	60,000
13	Frisco ISD Administration Building and Network Operations	Collin	post 1992	N/A	20,000+
14	Aubrey Athletic Complex / Stadium	Denton	post 2002	64	25,807
15	Lake Dallas Athletic Complex / Stadium	Denton	post 2001	63	43,500
16	Wakeland High School	Collin	post 1992	1010.25	335,932
17	Lovejoy High School	Collin	post 2004	792.5	216,290
18	Grand Prairie High Ninth Grade Center	Dallas	post 2000	598	150,000+
19	South Grand Prairie High Ninth Grade Center	Dallas	post 2001	atleast 133	100,000+
20	Renovations to HVAC System at South Grand Prairie High	Dallas	post 2001	69	12,500
21	Renovations to HVAC System at South Grand Prairie High	Dallas	post 2002	64	49,000
22	David Daniels Elementary	Dallas	post 1992	N/A	70,000+
23	Edelweiss Daniels Elementary	Dallas	post 2000	305	72,872
24	Crockett Elementary	Dallas	post 2000	305	72,872
25	Kirby Elementary	Dallas	post 2000	305	72,872
26	Renovations to HVAC System at Lee Middle School	Dallas	post 1992	214	136,600 +

Table 6-8: Geothermal Heat Pump Energy Projects (cont.)

S.No	Project	County	Implementation Date	Capacity (ton)	Area (sqft)
27	Rebuild of Lee Middle School (Fire Damage)	Dallas	post 2000	64	2,800
28	Renovations/Additions to Adams Middle School	Dallas	post 1992	N/A	N/A
29	Renovations/Additions to North Oaks Middle School	Tarrant	post 1992	N/A	71,000+
30	Renovations/Additions to North Richland Middle School	Tarrant	post 1992	273	80,000+
31	Watauga Middle School	Tarrant	post 2000	N/A	80,000+
32	HVAC Renovation for Watauga Middle School	Tarrant	post 1992	23	1987 added
33	Renovations to HVAC System at Eisenhower Elementary	Dallas	post 1992	N/A	N/A
34	Renovations/Additions to Rayburn Elementary	Dallas	post 1992	N/A	38,000+
35	Renovations/Additions to Watauga Elementary School	Tarrant	post 1992	N/A	56,000+
36	Renovations/Additions to Smithfield Elementary School	Tarrant	post 1992	N/A	56,000+
37	Renovations to David E. Smith Elementary School	Tarrant	2003	30	45,000+
38	Renovations/Additions to Green Valley Elementary School	Tarrant	post 2000	8	50,000+
39	Renovations/Additions to Richland Elementary School	Tarrant	post 1992	221	38,000+
40	Renovations/Additions to Birdville Elementary School	Tarrant	post 1992	N/A	32,000+
41	Renovations/Additions to Grace Hardeman Elementary	Tarrant	post 2000	12	N/A
42	W.A. Porter Elementary School	Tarrant	post 2000	N/A	48,000+
43	Renovations/Additions to W.A. Porter Elementary School	Tarrant	post 2000	12	1963 added
44	Haltom Middle School	Tarrant	post 1992	N/A	109,000
45	HVAC Renovation for Haltom Middle School	Tarrant	post 2000	22	6730 added
46	HVAC Renovation for Richland Middle School`	Tarrant	post 1992	N/A	91,000
47	HVAC Renovation for North Oaks Middle School	Tarrant	post 1992	N/A	70,000
48	HVAC Renovation for North Richland Middle School	Tarrant	post 1992	N/A	75,000
49	Holiday Heights Elementary	Tarrant	post 2000	N/A	40,000
50	HVAC Renovation for Holiday Heights Elementary	Tarrant	post 2000	12	2923 added
51	HVAC Renovation for Watuaga Elementary	Tarrant	post 1992	N/A	40,000
52	HVAC Renovation for David E. Smith Elementary	Tarrant	post 1992	N/A	35,000

Table 6-8: Geothermal Heat Pump Energy Projects (cont.)

S.No	Project	County	Implementation Date	Capacity (ton)	Area (sqft)
53	HVAC Renovation for West Birdville Elementary	Tarrant	post 1992	N/A	42,000
54	HVAC Renovation for Glenview Elementary	Tarrant	post 1992	N/A	40,000
55	HVAC Renovation for South Birdville Elementary	Tarrant	post 1992	149	38,000
56	HVAC Renovation for WT Francisco Elementary	Tarrant	post 2000	26	31,000
57	HVAC Renovation for Foster Village Elementary	Tarrant	post 2000	12	66,000
58	Snow Heights Elementary	Tarrant	post 2000	124	33,000
59	Renovations/Additions to Snow Heights Elementary School	Tarrant	post 2000	8	1963 added
60	HVAC Renovation for OH Stowe Elementary	Tarrant	post 1992	N/A	40,000
61	Jackson Middle School	Dallas	post 2000	365	100,000+
62	Renovations to HVAC System at Jackson Middle School	Dallas	post 2000	N/A	N/A
63	Renovations/Additions to Richland Elementary School	Tarrant	post 1992	N/A	38,000+
64	Renovations/Additions to Birdville Elementary School	Tarrant	post 1992	N/A	32,000+
65	HVAC Renovation for Rayburn Elementary School	Dallas	post 1992	N/A	N/A
66	HVAC Renovation for North Oaks Middle School	Tarrant	post 1992	204	70,000
67	HVAC Renovation for Watuaga Elementary	Tarrant	post 2000	26	40,000
68	Anchor Church	Tarrant	post 1992	N/A	40,000+
69	Little Elm Elementary	Denton	post 2001	218	70,000+
70	Griffen Parc Middle School	Collin	2004	383	151,566
71	Riddle Elementary	Collin	2003	238	70,000+
72	Boals Elementary	Collin	2003	238	74,300
73	Lake Dallas Middle School	Denton	post 2003	537.5	250,000+
74	North Elementary	Tarrant	post 1992	N/A	110,000+
75	Isbell Elementary	Collin	2004	279	75,904
76	Bledsoe Elementary	Collin	2005	279	75,904
77	Roach Middle School	Collin	post 1992	N/A	120,000+
78	Fowler Middle School	Collin	2006	488	138,651

Table 6-8: Geothermal Heat Pump Energy Projects (cont.)

S.No	Project	County	Implementation Date	Capacity (ton)	Area (sqft)
79	North Star Elementary	Tarrant	post 1992	N/A	70,000+
80	Hometown Elementary School	Tarrant	post 1992	N/A	70,000+
81	Liberty High School	Collin	2007	1051	306,179
82	Ashley Elementary	Collin	2005	279	75,325
83	Ogle Elementary	Collin	2006	279	75,904
84	Sem Elementary	Collin	post 1992	N/A	70,000+
85	Corbell Elementary	Collin	2005	279	76,814
86	Taylor Elementary	Collin	post 1992	N/A	70,000+
87	Middle School #5	Tarrant	post 1992	N/A	1,40,000+
88	Intermediate School #5	Tarrant	post 1992	N/A	1,20,000+
89	Liberty Elementary	Tarrant	post 1992	N/A	70,000+
90	Stafford Middle School	Collin	2008	509	142,108
91	Scoggins Middle School	Collin	2008	512	124,108
92	Elementary #10	Tarrant	post 1992	N/A	70,000+
93	Elementary #11	Tarrant	post 1992	N/A	70,000+
94	Elementary #12	Tarrant	post 1992	N/A	70,000+
95	Elementary #13	Tarrant	post 1992	N/A	70,000+
96	Middle School #4	Tarrant	2006	624	151,417
97	Robertson Elementary	Collin	2007	291	75,902
98	Mooneyham Elementary	Collin	2007	291	75,902
99	Carrol Elementary	Collin	2007	291.5	75,902
100	Brookstone Elementary	Collin	2008	291.5	75,902
101	Tadlock Elementary	Collin	2008	306.5	77,184
102	Aubrey Intermediate/Middle School	Denton	post 2004	209.5	80,000+
103	Florence Hill Elementary	Dallas	post 2003	160	70,000+
104	Garner Elementary	Dallas	post 2004	160	70,000+

Table 6-8: Geothermal Heat Pump Energy Projects (cont.)

S.No	Project	County	Implementation Date	Capacity (ton)	Area (sqft)
105	Bowie Elementary	Dallas	post 2004	44	25,000+
106	High School #5	Collin	post 1992	N/A	300,000+
107	High School #6	Collin	post 1992	N/A	300,000+
108	Memorial Stadium Field House	Collin	2004	27	10,000+
109	Rogers Elementary	Collin	post 2006	221	63,000+
110	Camp Wisdom Elementary	Dallas	post 1992	N/A	70,000+
111	Additions to Anderson Elementary	Collin	2003	30	9,000+
112	Additions to Borchardt Elementary	Collin	post 1992	N/A	9,000+
113	Bright Elementary	Collin	2004	30	9,000+
114	Additions to Christi Elementary	Collin	2004	29.5	9,000+
115	Additions to Curtsinger Elementary	Collin	post 1992	N/A	9,000+
116	Additions to Fisher Elementary	Collin	2003	30	9,000+
117	Additions to Shawnee Trail Elementary	Collin	post 1992	N/A	9000 +
118	CATE Center (Career and Technology)	Collin	2008	401.5	100, 000+
119	CTE at Centennial High School (Career and Technology)	Collin	2007	16	9000+
120	Staley Middle School Field House	Collin	2004	12	6000+
121	West Transportation Facility	Collin	2008	80	26,148
122	McKinney Lofts	Dallas	N/A	N/A	N/A
123	Havana Club Apartments	Bexar	N/A	N/A	N/A
124	Hogg Palace Lofts	Harris	N/A	N/A	N/A
125	South Main Baptist Church	Harris	N/A	N/A	N/A
126	The Tower	Tarrant	N/A	N/A	N/A
127	Edgemere	Dallas	N/A	N/A	N/A
128	Radisson Carlson Park	Bexar	N/A	N/A	N/A
129	Biggs Field Project	El Paso	N/A	N/A	N/A
130	Denison Housing Authority	Grayson	N/A	N/A	N/A
131	Fort Sam Houston Barracks	Bexar	N/A	N/A	N/A

Table 6-8: Geothermal Heat Pump Energy Projects (cont.)

S.No	Project	County	Implementation Date	Capacity (ton)	Area (sqft)
132	Fort Sam Houston Building 905/906	Bexar	N/A	N/A	N/A
133	Fort Walters	Palo pinto	N/A	N/A	N/A
134	Drury Inn & Suites	Bexar	N/A	N/A	N/A
135	Lexington Hotel Suites	Tarrant	N/A	N/A	N/A
136	Arnold Middle School	Dallas	N/A	N/A	N/A
137	Shaner Hotel	Bexar	N/A	N/A	N/A
138	Holiday Inn Northwest	Bexar	N/A	N/A	N/A
139	2ND Home Suites	Dallas	N/A	N/A	N/A
140	Homewood Suites	Bexar	N/A	N/A	N/A
141	Air Dynamics	Dallas	N/A	N/A	N/A
142	Radiatas	Webb	N/A	N/A	N/A
143	Hensley Field Operations Center	Dallas	N/A	N/A	N/A
144	Southwest Plaza Base Bldg	Dallas	N/A	N/A	N/A
145	Air Performance	Dallas	N/A	N/A	N/A
146	Meadwest VA Co.	Harris	N/A	N/A	N/A
147	Gap #1550 Mockingbird Station	Dallas	N/A	N/A	N/A
148	Kirby Building	Dallas	N/A	N/A	N/A
149	USSA Towers	Bexar	N/A	N/A	N/A
150	Trinity Towers	Nueces	N/A	N/A	N/A
151	Sonny Bryans BBQ	Dallas	N/A	N/A	N/A
152	L'Etoile Restaurant	Bexar	N/A	N/A	N/A
153	Sweeny Ind.Sch. Dist.Warehouse	Brazoria	N/A	N/A	N/A
154	Freylands Elementary	Chambers	N/A	N/A	N/A
155	Mustang Mech. Montwood High	El Paso	N/A	N/A	N/A
156	Boerne Elementary School	Kendall	N/A	N/A	N/A
157	City View Schools	Wichita	N/A	N/A	N/A
158	Montwood High School Addition	El Paso	N/A	N/A	N/A

Table 6-8: Geothermal Heat Pump Energy Projects (cont.)

S.No	Project	County	Implementation Date	Capacity (ton)	Area (sqft)
159	Montwood High School Auditorium	El Paso	N/A	N/A	N/A
160	The Island on Lake Travis	Travis	N/A	N/A	N/A
161	Allen Campus	Brazos	N/A	N/A	N/A
162	Judson Lofts	Bexar	N/A	N/A	N/A
163	pink elemtary school	collin	2005	286	75,904
164	Griffin middle school	collin	2002	N/A	N/A
165	Joslin Elementary	Travis	1991	N/A	N/A
166	Brent wood Elementary	Travis	1991	N/A	N/A
167	Walnut Creek Elementary	Travis	1991	N/A	N/A
168	Sims Elementary	Travis	1991	N/A	N/A
169	F R Rice Elementary	Travis	1991	N/A	N/A
170	T A Brown Elementary	Travis	1991	N/A	N/A
171	Canyon Ridge Middle School	William	2004	N/A	N/A
172	Vista Ridge High School	William	2004	N/A	N/A
173	Pleasant Hill Elemtary	William	2005	N/A	N/A
174	Good Night Middle school	Hays	1985	N/A	N/A
175	Santa Teresa Elementary	Hays	N/A	125	N/A
176	Santa Teresa Middle School	Hays	N/A	200	N/A
177	Esconreras primary kindergarten	Hays	N/A	105	N/A
178	Mullendore Elementary	Tarrant	post 1995	N/A	N/A
179	O.H. Stowe Elementary	Tarrant	post 1995	N/A	N/A
180	Austin Elementary School GPISD	Dallas	post 2000	91	atleast 21,100
181	Fannin Elementary School GPISD	Dallas	2004	220.5	N/A
182	Peaster Elementary	Parker	post 1995	N/A	N/A
183	Frisco Elementary School #15	collin	post 1995	N/A	N/A
184	Lone Star Elementary - Frisco ISD	collin	post 1995	N/A	N/A
185	Woodland Springs Elementary - Keller ISD	Tarrant	post 1995	N/A	N/A

Table 6-8: Geothermal Heat Pump Energy Projects (cont.)

S.No	Project	County	Implementation Date	Capacity (ton)	Area (sqft)
186	Bette Perot Elementary - Keller ISD	Tarrant	post 1995	N/A	N/A
187	Granbury Middle School East Site	Hood	post 1995	N/A	N/A
188	Frisco Elementary #18 - Shaddock	collin	post 2007	N/A	N/A
189	Shiver Road Elementary #18 Keller ISD	Tarrant	post 2007	N/A	N/A
190	Woodland Springs Elementary #17 Keller ISD	Tarrant	post 2007	N/A	N/A
191	McDonwell Elementary (Keller ISD)	Tarrant	post 2007	N/A	N/A
192	Keller Intermediate School #5 Keller ISD	Tarrant	post 2007	N/A	N/A
193	Shady Shores Elementary	Denton	post 2007	392.75	75,904
194	Alta Vista Middle School #5 Keller ISD	Tarrant	post 2007	N/A	N/A
195	Brewer High School (White Settlement ISD)	Tarrant	post 2007	N/A	N/A
196	Leaky High school	Gillespie	N/A	120	N/A
197	Canutillo High School	El Paso	N/A	1200	N/A
198	Lubbock Christian University	Lubbock	N/A	N/A	N/A
199	Rice University	Harris	N/A	N/A	N/A
200	brown building lofts	Travis	N/A	N/A	N/A
201	Wheeler county Court House	wheeler	N/A	N/A	N/A
202	Ballinger housing authority	runnels	N/A	N/A	N/A
203	Project under category miscellaneous cited by FHP	Travis	N/A	N/A	N/A
204	Foreman independent school district	Bowie	N/A	N/A	N/A
205	Timber Creek High School #4	Tarrant	post '2008	116.5	361,141
206	Ed Wilkie Middle School #5: Geothermal Design Services	Travis	post '2008	643	
207	William & Abbie Allen Elementary School	Collin	post '2008	339	83,960
208	Career & Technology Education Center	N/A	post '2008	799	247,880
209	Early Childhood School	Collin	post '2008	385	54,861
210	Burleson Elementary School #11	N/A	post '2008	283.5	
211	Killeen Police Headquarters: Geothermal Design	Bell	post '2008	208	88,663
212	Burleson High School #2	Tarrant	post '2008	2126	490,447

Table 6-8: Geothermal Heat Pump Energy Projects (cont.)

S.No	Project	County	Implementation Date	Capacity (ton)	Area (sqft)
213	Secondary Instructional Facility	Travis	post '2008	745	184,824
214	Lamar & Norma Hunt Middle School #10	Collin	post '2008	512	147,096
215	Elizabeth Cash Maus Middle School #11	Collin	post '2008	512	147,096
216	Robert Cobb Middle School #12	Collin	post '2008	512	147,096
217	New ES	Collin	post '2008	310	77,184
218	Aubrey High School	Denton	post '2008	225	N/A
219	DFW Airport: EAD Annex	Travis	post 2009	18	N/A
220	2009 Capital Improvements @ Various Campuses	Travis	post 2009	147.5	N/A
221	Pre-Kindergarten School	Denton	post 2009	164	60,391
222	George & Debra Purefoy Elementary School #30	N/A	post 2009	304	N/A
223	Elementary School #14: Geothermal Design Services	N/A	post 2009	Y	N/A
224	Patricia Dean Boswell McCall Elementary School	Parker	2007	367	89,642
225	Aubrey Intermediate:Add/Reno	Denton	2007	234	69,519
226	Sam Carter Service Center	Collin	2007	116	49,377
227	Dr. Monaco Elementary School	Denton	2007	263	74,544
228	Caprock Elementary School #20	Tarrant	2007	303.5	92,768
229	Trinity Springs Middle School: Add.	Tarrant	2007	120.5	36,136
230	Milam Elementary School: 2007 Bond HVAC Replacement	Dallas	2008	131	N/A
231	Truman Middle School: HVAC Retrofit Phase 2	Dallas	under progress	146	N/A
232	Alta Vista Elementary School	Tarrant	under progress	572.5	N/A
233	Sandshell Elementary School #21	Travis	under progress	278	N/A
234	Corinth Primary	Denton	under progress	238	N/A
235	All Saints Episcopal School	Travis	under progress	337	N/A
236	Alliance for Children	Travis	under progress	33	N/A
237	Faithbridge Presbyterian Church	Collin	under progress	165	N/A
238	Heritage High School	Collin	2007	1041.5	325,693
239	Cotulla High School	La Salle	N/A	N/A	N/A
240	Marlin Hospital	Falls	N/A	N/A	N/A
241	Stacy Park Pool	Travis	N/A	N/A	N/A
242	1505, elm street	Dallas	N/A	N/A	N/A
243	Covington high school	Hill	N/A	N/A	N/A

Table 6-8: Geothermal Heat Pump Energy Projects (cont.)

S.No	Project	County	Implementation Date	Capacity (ton)	Area (sqft)
244	Residential project by energyhomes.org	N/A	N/A	50	N/A
245	Residential project by reported Trane	Coryell	N/A	4	N/A
246	Golden Sands disaster recovery dome, Texas	Travis	N/A	N/A	N/A
247	Liberty county co production	Liberty	N/A	N/A	N/A
248	Department of defense-Fort Bliss project	El Paso	N/A	N/A	N/A
249	Department of defense-Fort Bliss project (Family housing)	El Paso	N/A	N/A	N/A
250	Department of defense-Fort Hood project (Family housing)	Bell	N/A	N/A	N/A
251	Department of defense-Fort Hood project (Administrative)	Bell	N/A	N/A	40,782
252	Department of defense-Dyes AFB project	Taylor	N/A	N/A	N/A

Table 6-9: Landfill Gas-Fired Power Plants: Operational

Project No	Landfill Name	City	County	Waste In Place (tons)	Landfill Owner Organization	Project Status	Project Start Date	MW Capacity	LFG Flow to Project (SCFD)	Emission Reductions (MTCO2)
1	McCarty Road LF	Houston	Harris	28,918,718	Allied Waste Services	Operational	1/1/1986	N/A	N/A	0.797
2	DFW Gas Recovery	Lewisville	Denton	N/A	WM Renewable Energy LLC	Operational	5/1/1988	3	N/A	N/A
3	DFW Gas Recovery	Lewisville	Denton	N/A	WM Renewable Energy LLC	Operational	5/1/1988	3	N/A	N/A
4	Dallas-Fort Worth LF	Dallas	Denton	18,388,100	Waste Management, Inc.	Operational	1/1/1992	6.6	N/A	0.286
5	Sunset Farms	Austin	Travis	N/A	Gas Recovery Systems Inc	Operational	12/1/1996	1	N/A	N/A
6	Sunset Farms	Austin	Travis	N/A	Gas Recovery Systems Inc	Operational	12/1/1996	1	N/A	N/A
7	Sunset Farms	Austin	Travis	N/A	Gas Recovery Systems Inc	Operational	12/1/1996	1	N/A	N/A
8	Sunset Farms	Austin	Travis	9,600,000	Allied Waste Services	Operational	12/1/1996	3	1.5	0.13
9	Austin Community LF	Austin	Travis	10,380,188	Waste Management, Inc.	Shutdown	1/1/1998	N/A	N/A	N/A
10	City of Brownwood Landfill	Brownwood	Brown	1,300,100	City of Brownwood	Operational	1/1/1998	N/A	N/A	0.035
11	McCommas Bluff LF/City of Dallas	Dallas	Dallas	26,470,000	City of Dallas, TX	Operational	1/1/2000	N/A	N/A	0.772
12	Rosenberg Landfill	Rosenberg	Fort Bend	2,649,100	Fort Bend County, TX	Operational	1/1/2000	N/A	1	0.082
13	Castle Road Landfill	Garland	Dallas	4,012,500	City of Garland	Operational	5/1/2000	N/A	N/A	0.089
14	Arlington LF	Arlington	Tarrant	13,981,144	City of Arlington	Operational	6/1/2001	5	1.584	0.217
15	BFI - Tessman Road Landfill	San Antonio	Bexar	11,300,000	Allied Waste Services	Operational	10/10/2002	5.4	2.9	0.234
16	Coastal Plains LF	Alvin	Galveston	6,546,410	Waste Management, Inc.	Operational	1/10/2003	6.7	N/A	0.289
17	Sanifill Of Texas-Baytown LF	Baytown	Chambers	6,290,000	Waste Management, Inc.	Operational	1/24/2003	3.9	1.73	0.169
18	Blue Bonnet LF	Houston	Harris	2,526,000	Waste Management, Inc.	Operational	3/1/2003	1.9	0.928	0.084
19	City of Conroe LF	Conroe	Montgomery	3,146,000	City of Conroe	Operational	3/1/2003	2.9	N/A	0.126
20	Atascosita	Atascosita	Harris	N/A	Viridis Energy	Operational	3/3/2008	1.3	N/A	N/A
21	Atascosita	Atascosita	Harris	N/A	Viridis Energy	Operational	3/3/2008	1.3	N/A	N/A
22	Atascosita	Atascosita	Harris	N/A	Viridis Energy	Operational	3/2/2008	0.3	N/A	N/A
23	Atascosita	Atascosita	Harris	N/A	Viridis Energy	Operational	3/3/2008	1.3	N/A	N/A
24	Atascosita	Atascosita	Harris	N/A	Viridis Energy	Operational	3/3/2008	1.3	N/A	N/A
25	Coastal Plains	Alvin	Galveston	N/A	Viridis Energy	Operational	3/3/2008	1.3	N/A	N/A
26	Coastal Plains	Alvin	Galveston	N/A	Viridis Energy	Operational	3/3/2008	1.3	N/A	N/A
27	Coastal Plains	Alvin	Galveston	N/A	Viridis Energy	Operational	3/3/2008	1.3	N/A	N/A

Table 6-9: Landfill Gas-Fired Power Plants: Operational (cont.)

Project No	Landfill Name	City	County	Waste In Place (tons)	Landfill Owner Organization	Project Status	Project Start Date	MW Capacity	LFG Flow to Project (SCFD)	Emission Reductions (MTCO2)
28	Coastal Plains	Alvin	Galveston	N/A	Viridis Energy	Operational	3/3/2008	1.3	N/A	N/A
29	BFI - Tessman Road Landfill	San Antonio	Bexar	11,300,000	Allied Waste Services	Operational	5/1/2003	2.7	1.45	0.117
30	Security Recycling and Disposal LF	Cleveland	Montgomery	4,014,800	Waste Management, Inc.	Operational	5/1/2003	5	N/A	0.217
31	BFI Tessman Rd Landfill	San Antonio	Bexar	N/A	Energy Developments Inc	Operational	5/3/2008	1.4	N/A	N/A
32	WMI/Atascocita LF	Humble	Harris	9,628,700	Waste Management, Inc.	Operational	6/1/2003	8.5	3.09	0.368
33	Bluebonnet	Houston	Harris	N/A	Viridis Energy	Operational	8/3/2008	1	N/A	N/A
34	Bluebonnet	Houston	Harris	N/A	Viridis Energy	Operational	8/3/2008	1	N/A	N/A
35	Bluebonnet	Houston	Harris	N/A	Viridis Energy	Operational	8/3/2008	1	N/A	N/A
36	Bluebonnet	Houston	Harris	N/A	Viridis Energy	Operational	8/3/2008	1	N/A	N/A
37	Conroe	Conroe	Montgomery	N/A	Viridis Energy	Operational	8/3/2008	1	N/A	N/A
38	Conroe	Conroe	Montgomery	N/A	Viridis Energy	Operational	8/3/2008	1	N/A	N/A
39	Conroe	Conroe	Montgomery	N/A	Viridis Energy	Operational	8/3/2008	1	N/A	N/A
40	Baytown	Baytown	Chambers	N/A	Viridis Energy	Operational	12/3/2008	1.3	N/A	N/A
41	Baytown	Baytown	Chambers	N/A	Viridis Energy	Operational	12/3/2008	1.3	N/A	N/A
42	Security	Houston	Montgomery	N/A	Viridis Energy	Operational	12/3/2008	1.3	N/A	N/A
43	Security	Houston	Montgomery	N/A	Viridis Energy	Operational	12/3/2008	1.3	N/A	N/A
44	Baytown	Baytown	Chambers	N/A	Viridis Energy	Operational	12/3/2008	1.3	N/A	N/A
45	Sunset Farms	Austin	Travis	N/A	Gas Recovery Systems Inc	Operational	1/4/2008	1	N/A	N/A
46	WMI/Atascocita LF	Humble	Harris	9,628,700	Waste Management, Inc.	Operational	1/1/2004	1.7	0.62	0.074
47	City of Austin LF	Austin	Travis	4,858,500	City of Austin, TX	Operational	2/1/2004	0.2	N/A	0.009
48	City of Waco LF	Woodway	McLennan	2,225,000	City of Waco	Operational	3/1/2004	1.5	1	0.065
49	Atascosita	Atascosita	Harris	N/A	Viridis Energy	Operational	7/4/2008	1.7	N/A	N/A
50	Denton Sanitary Landfill	Denton	Denton	2,266,664	City of Denton, TX	Operational	2/1/2005	N/A	0.432	0.035
51	Covel Gardens LF	San Antonio	Bexar	12,007,000	Waste Management, Inc.	Operational	12/1/2005	9.6	N/A	0.416
52	Fort Worth Regional LF	Haltom City	Tarrant	N/A	Allied Waste Services	Construction	3/15/2006	1.6	0.72	0.069
53	McCommas Bluff LF/City of Dallas	Dallas	Dallas	26,470,000	City of Dallas, TX	Construction	7/1/2006	22	N/A	0.953
54	Denton Sanitary Landfill	Denton	Denton	2,266,664	City of Denton, TX	Construction	9/1/2006	1.5	0.86	0.065

Table 6-10: Landfill Gas-Fired Power Plants: Candidates

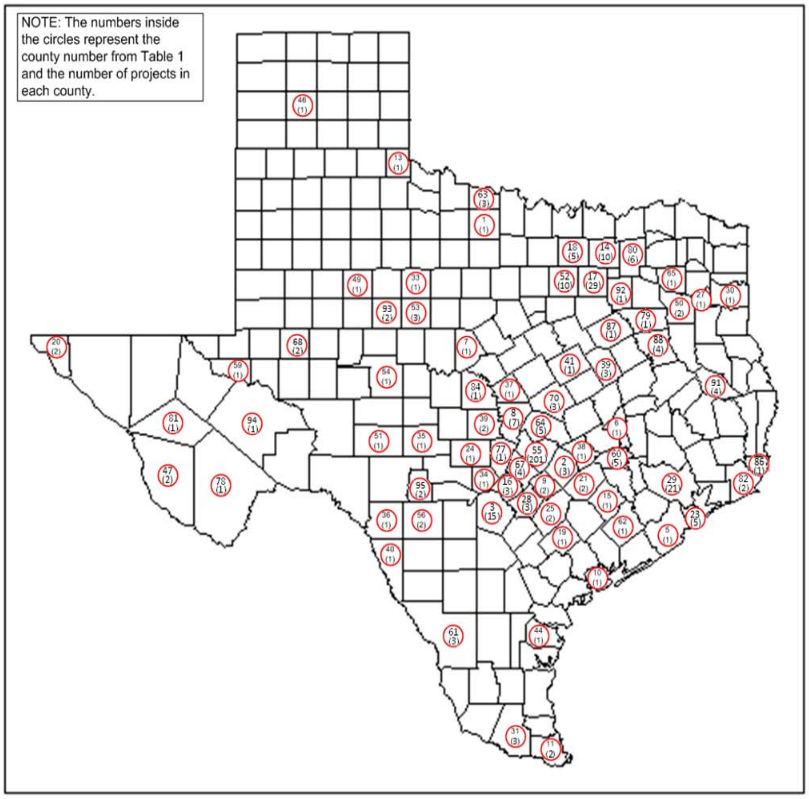
Project.No	Landfill Name	County	Waste In Place (tons)	Year Landfill Opened	Landfill Closure Year	Landfill Owner Organization
1	Skyline LF	Ellis	8,191,000	1942	2040	Waste Management, Inc.
2	Trinity Oaks Landfill	Dallas	6,838,600	1969	2003	Allied Waste Services
3	J.C. Elliot LF	Nueces	5,717,100	1972	2005	City of Corpus Christi, TX
4	Galveston County LF	Galveston	7,822,500	1973	2025	Allied Waste Services
5	Mill Creek LF	Tarrant	4,815,500	1973	2002	Allied Waste Services
6	City of Lubbock LF	Lubbock	2,177,800	1975	2008	City of Lubbock
7	City of Pampa LF	Gray	1,176,200	1975	2007	City of Pampa
8	Colorado City Landfill	Mitchell	1,545,200	1975	2020	City of Colorado City
9	Comal County LF	Comal	3,817,620	1975	2010	Waste Management, Inc.
10	Amarillo LF	Potter	7,031,400	1976	2050	City of Amarillo
11	C&T Landfill	Hidalgo	3,844,000	1976	2004	Duncan Disposal, Inc.
12	City Of Sweetwater LF	Nolan	1,283,800	1976	2040	City of Sweetwater
13	City Of Weatherford LF	Parker	1,079,000	1976	2060	IESI, Inc.
14	Fort Worth Southeast Landfill	Tarrant	5,299,400	1976	2036	City of Fort Worth, TX
15	Tricil Environmental Response/Altar SLF	Colorado	1,980,400	1976	2002	Safety Clean
16	Austin Community LF	Travis	10,380,188	1977	2001	Waste Management, Inc.
17	City of Grand Prairie LF	Dallas	2,835,800	1977	2021	City of Grand Prairie
18	City of Nacogdoches Landfill	Nacogdoches	1,296,200	1977	2033	City of Nacogdoches
19	Westside Sanitary LF	Tarrant	9,955,600	1977	2005	Waste Management, Inc.
20	Whispering Pines LF	Harris	6,405,000	1978	2017	Allied Waste Services
21	City of Perryton Landfill	Ochiltree	1,631,100	1979	2006	City of Perryton
22	City of McKinney LF	Collin	3,957,000	1980	2004	City of McKinney
23	Nelson Gardens LF	Bexar	11,800,000	1980	1993	City of San Antonio
24	Camelot Landfill	Denton	6,044,700	1981	2019	City of Farmers Branch
25	City of Irving Landfill	Dallas	2,063,900	1981	2065	City of Irving, TX
26	Hillside Landfill	Grayson	2,526,400	1981	2023	Waste Management, Inc.
27	Sprint Fort Bend County LF	Fort Bend	1,664,372	1981	2020	The Sprint Companies

Table 6-10: Landfill Gas-Fired Power Plants: Candidates (cont.)

Project.No	Landfill Name	County	Waste In Place (tons)	Year Landfill Opened	Landfill Closure Year	Landfill Owner Organization
28	Williamson County LF	Williamson	2,134,700	1981	2040	Waste Management, Inc.
29	BFI - Abilene Landfill	Jones	7,921,300	1982	2067	Ray Knowles
30	City of Victoria Landfill	Victoria	2,556,000	1982	2040	City of Victoria
31	City of Wichita Falls LF	Wichita	4,073,200	1982	2021	City of Wichita Falls
32	North Texas Waste/Maxwell Creek LF	Collin	6,083,700	1982	2004	North Texas Municipal Water
33	Pine Hill LF	Gregg	12,141,700	1982	2060	4S Oil Company
34	City of Beaumont LF	Jefferson	2,868,800	1983	2021	City of Beaumont
35	Clint LF	El Paso	4,904,400	1983	2006	City of El Paso
36	Royal Oaks Landfill	Cherokee	1,044,200	1983	2030	Allied Waste Services
37	Turkey Creek LF	Johnson	3,733,200	1983	2025	Allied Waste Services
38	McCombs LF	El Paso	4,137,100	1984	2046	City of El Paso
39	CSC Disposal and Landfill	Ellis	4,254,250	1985	2100	Republic Services, Inc.
40	Lacy-Lakeview LF	McLennan	1,306,200	1985	2020	Waste Management, Inc.
41	City of Laredo LF	Webb	3,180,000	1986	2015	City of Laredo
42	City of Port Arthur Landfill	Jefferson	1,802,100	1986	2044	City of Port Arthur
43	Southwest Landfill (Amarillo)	Randall	3,393,200	1987	2025	Allied Waste Services
44	Sprint LF	Harris	2,041,600	1987	2005	Landfill Owner
45	Altair Disposal Services LLC	Colorado	9,195,000	1988	2004	Clean Harbors
46	Greenwood Farms Landfill	Smith	3,087,300	1989	2020	City of Tyler
47	Texas Disposal Systems LF	Travis	4,408,900	1990	2050	Texas Disposal Systems
48	Golden Triangle Landfill	Jefferson	2,310,400	1991	2021	Allied Waste Services
49	Blue Ridge LF	Fort Bend	4,113,900	1993	2025	Allied Waste Services
50	Brazoria County Disposal LF	Brazoria	6,279,700	1993	2050	Republic Services, Inc.
51	WMI/E & D Waste Systems Inc. LF	Galveston	3,202,900	1994	2022	Waste Management, Inc.
52	Charter Waste Landfill	Ector	1,300,000	N/A	N/A	Republic Services, Inc.
53	City of Temple Landfill	Bell	3,600,000	N/A	N/A	City of Temple
54	Eastside Landfill	Tarrant	N/A	N/A	N/A	Waste Management, Inc.

Table 6-11: Landfill Gas-Fired Power Plants: Potential

Project.No	Landfill Name	City	County	Waste In Place (tons)	Year Landfill Opened	Landfill Closure Year	Landfill Owner Organization
1	Pleasant Oaks Landfill	Mount Pleasant	Titus	N/A	1960	2012	City of Mount Pleasant
2	Sinton	Sinton	San Patricio	N/A	1972	2002	Allied Waste Services
3	City of Richardson LF	Richardson	Collin	825,218	1975	1990	City of Richardson
4	City of Cleburne Landfill	Cleburne	Johnson	1,583,200	1976	N/A	Landfill Owner
5	Itasca Landfill	Itasca	Hill	N/A	1977	2017	Allied Waste Services
6	Quail Canyon	Lubbock	Lubbock	200,200	1977	1993	Allied Waste Services
7	Hutchins Landfill	Hutchins	Dallas	1,000,000	1978	1992	Allied Waste Services
8	Maloy Landfill	Commerce	Hunt	610,000	1979	2030	Republic Services, Inc.
9	Mexia Landfill	Mexia	Limestone	N/A	1983	2019	Allied Waste Services
10	Pecan Prairie Landfill	Kingston	Hunt	1,479,900	1984	1998	Waste Management, Inc.
11	Trashaway San Angelo Landfill	San Angelo	Tom Green	790,000	1984	N/A	Republic Services, Inc.
12	Kerrville Landfill	Kerrville	Kerr	N/A	1985	2006	City of Kerrville
13	Lewisville Landfill	Lewisville	Denton	N/A	1986	2003	Allied Waste Services
14	ECD Landfill	Ennis	Ellis	N/A	1988	2089	Allied Waste Services
15	Bell Processing Inc. LF	Wichita Falls	Wichita	N/A	1990	2001	Bell Processing Inc
16	Laidlaw/Wilmer LF	Wilmer	Dallas	686,400	1992	2001	Landfill Owner
17	BFI LF	Abilene	Taylor	745,888	1993	1997	Pine Street Salvage Company
18	City of Corsicana LF	Corsicana	Navarro	788,100	1993	2100	Landfill Owner
19	Gulfwest Facility	Anahuac	Chambers	N/A	1993	2017	Allied Waste Services
20	Bell County/Sparks LF	Belton	Bell	343,200	1994	2001	Bell County
21	Ellis County LF	Palmer	Ellis	892,320	1994	N/A	Waste Management, Inc.
22	El Centro Landfill	Robstown	Nueces	N/A	2000	2013	Allied Waste Services
23	Best Pak Disposal Inc. LF	Pattison	Waller	N/A	N/A	2001	Waste Management, Inc.
24	Hazelwood Enterprises, Inc. LF	N/A	N/A	N/A	N/A	N/A	Landfill Owner
25	New Boston Landfill	New Boston	Bowie	N/A	N/A	N/A	N/A
26	Newton County Landfill	Mauriceville	Newton	N/A	N/A	N/A	N/A
27	North County C&D Landfill	League City	Galveston	N/A	N/A	N/A	Republic Services, Inc.
28	Paris Landfill	Paris	Lamar	N/A	N/A	N/A	N/A
29	Rio Grande Valley	Donna	Hidalgo	N/A	N/A	N/A	Allied Waste Services



County	County No	No Of Projects
Anderson	88	4
Archer	1	1
Bastrop	2	3
Bexar	3	15
Blanco	77	1
Brazoria	5	1
Brazos	6	1
Brewster	78	1
Brown	7	1
Burnet	8	7
Caldwell	9	2
Calhoun	10	1
Cameron	11	2
Childress	13	1
collin	14	10
Colorado	15	1
Comal	16	3
Dallas	17	29
Denton	18	5

County	County No	No Of Projects
DeWitt	19	1
El Paso	20	2
Fayette	21	2
Galveston	23	5
Gillespie	24	1
Gonzales	25	2
Gregg	27	1
Guadalupe	28	3
Harris	29	21
Harrison	30	1
Hays	67	4
Henderson	79	1
Hidalgo	31	3
Hunt	80	6
Jeff Davis	81	1
Jefferson	82	1
Jones	33	1
Kendall	34	1
Kimble	35	1

County	County No	No Of Projects
Kinney	36	1
Lampasas	37	1
Lee	38	1
Limestone	39	1
Llano	39	3
Maverick	40	1
McLennan	41	1
Navarro	87	1
Nueces	44	1
Orange	86	2
Potter	46	1
Presidio	47	2
San Saba	84	1
Scurry	49	1
Smith	50	3
Sutton	51	1
Tarrant	52	10
Taylor	53	3
Tom Green	54	1

County	County No	No Of Projects
Travis	55	201
Uvalde	56	2
Ward	59	1
Washington	60	5
Webb	61	3
Wharton	62	1
Wichita	63	3
Williamson	64	5
Wood	65	1
Angelina	91	4
Kaufman	92	1
Nolan	93	2
Pecos	94	1
Real	95	2
Bell	70	3
Midland	68	2

Figure 6-1: Solar Photovoltaic Projects throughout Texas

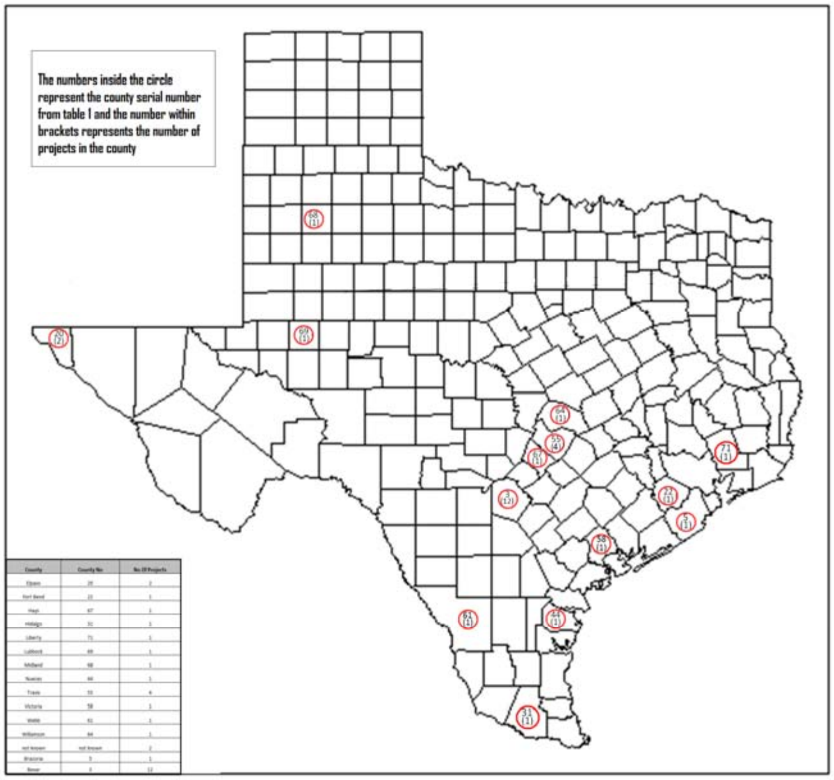


Figure 6-2: Solar Thermal Projects throughout Texas

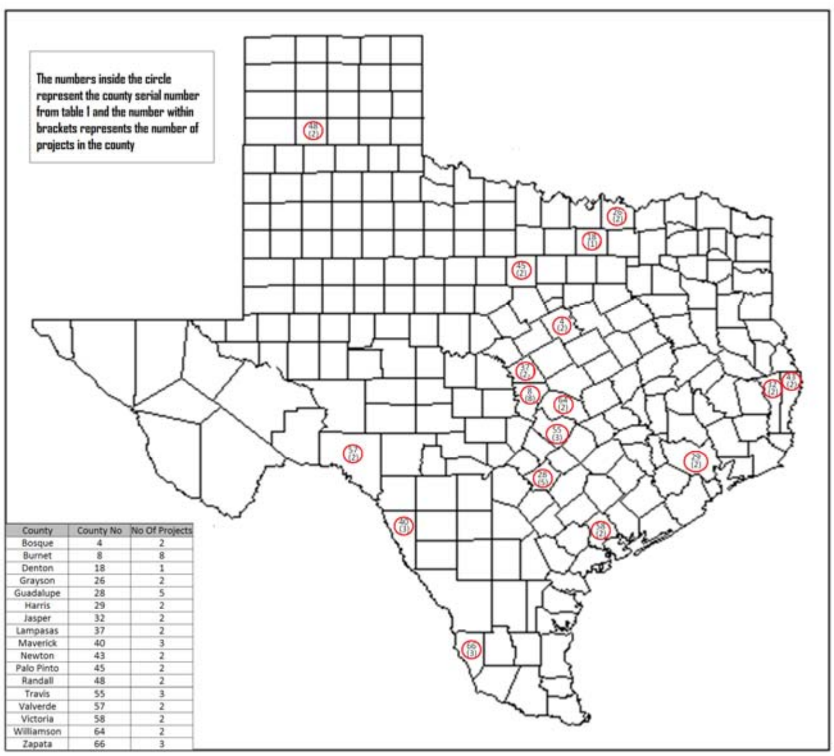
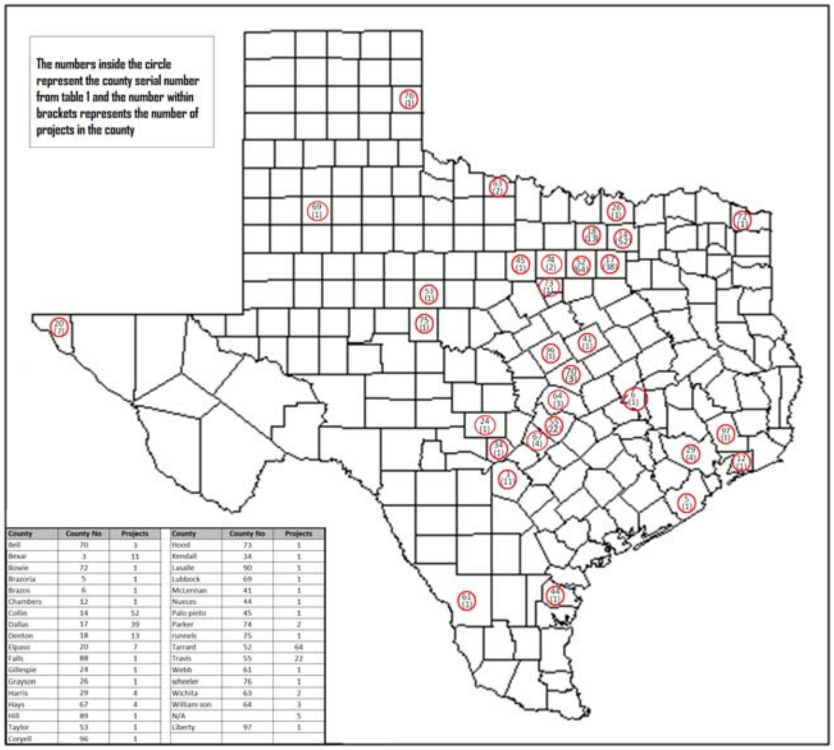
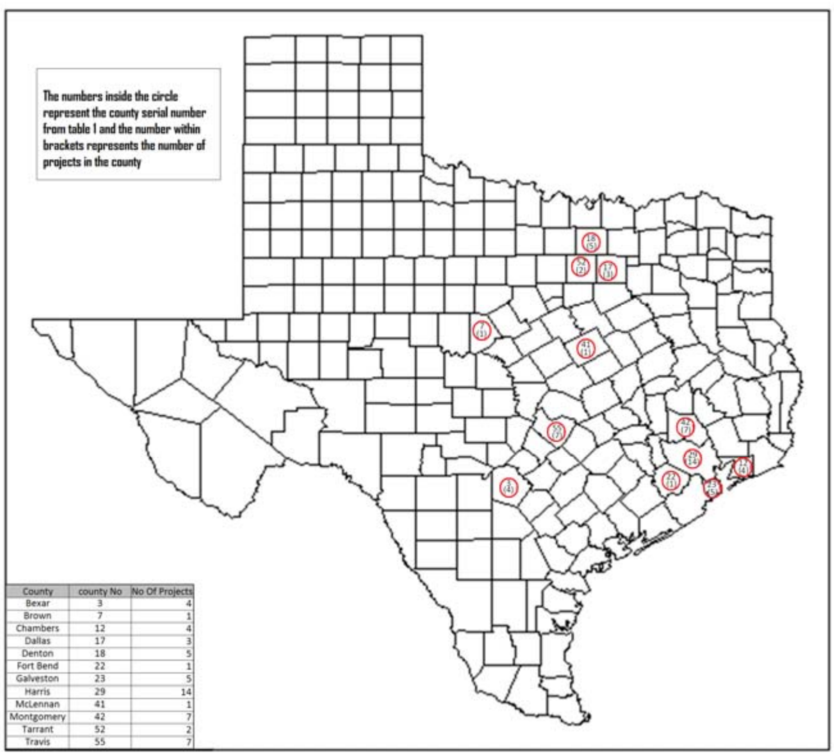


Figure 6-3: Hydropower Plants throughout Texas



County	County No	Projects	County	County No	Projects
Bell	70	3	Hood	73	1
Bexar	3	11	Kendall	34	1
Bowie	72	1	Lasalle	90	1
Brazoria	5	1	Lubbock	69	1
Brazos	6	1	McLennan	41	1
Chambers	12	1	Nueces	44	1
Collin	14	52	Palo pinto	45	1
Dallas	17	39	Parker	74	2
Denton	18	13	runnels	75	1
Elpaso	20	7	Tarrant	52	64
Falls	88	1	Travis	55	22
Gillespie	24	1	Webb	61	1
Grayson	26	1	wheeler	76	1
Harris	29	4	Wichita	63	2
Hays	67	4	William son	64	3
Hill	89	1	N/A		5
Taylor	53	1	Liberty	97	1
Coryell	96	1			

Figure 6-4: Geothermal Projects Installed throughout Texas



County	county No	No Of Projects
Bexar	3	4
Brown	7	1
Chambers	12	4
Dallas	17	3
Denton	18	5
Fort Bend	22	1
Galveston	23	5
Harris	29	14
McLennan	41	1
Montgomery	42	7
Tarrant	52	2
Travis	55	7

Figure 6-5: Landfill Gas-Fired Power Projects Installed throughout Texas

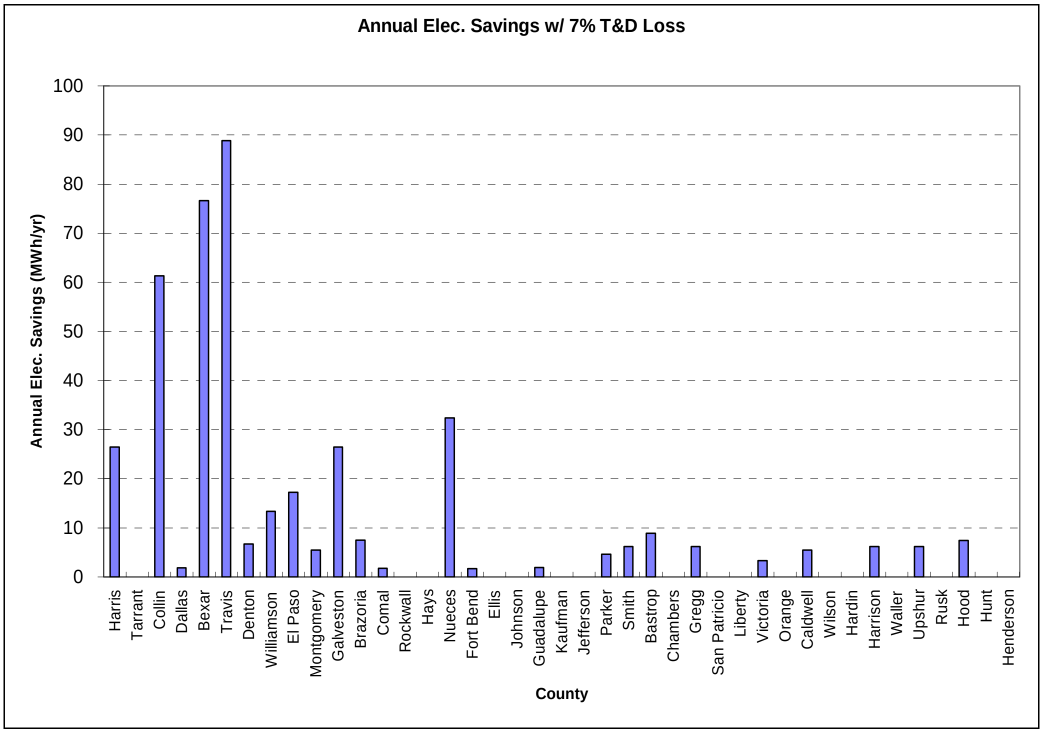


Figure 6-6: Annual Electric Savings per County from PV Projects

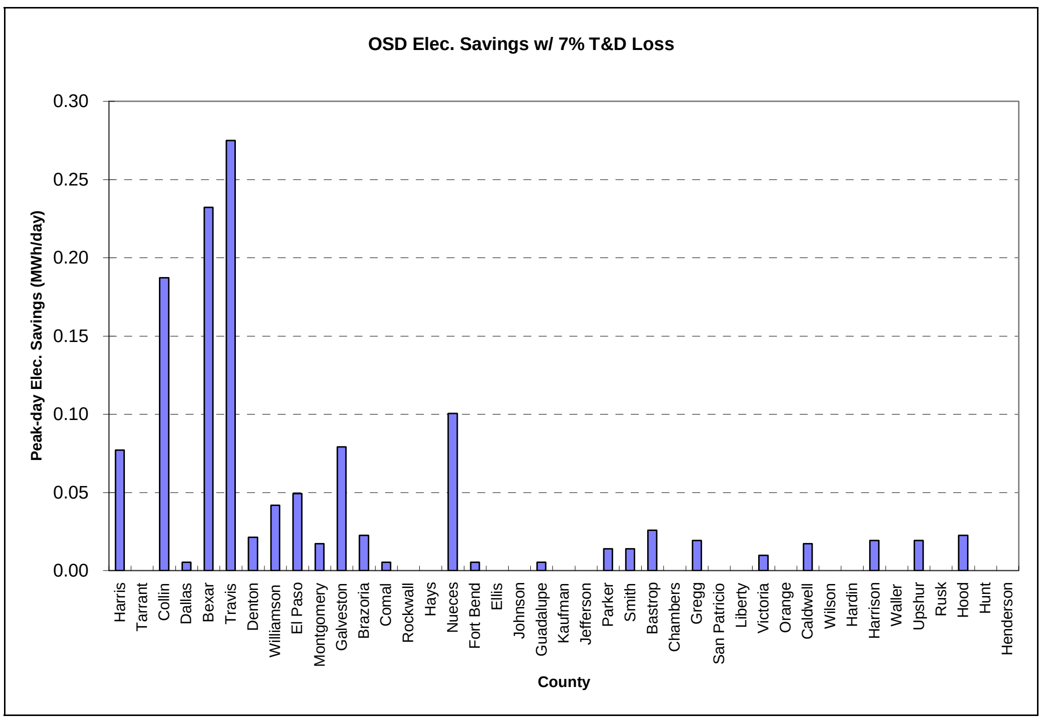


Figure 6-7: Ozone Season Day Electric Savings per County from PV Projects

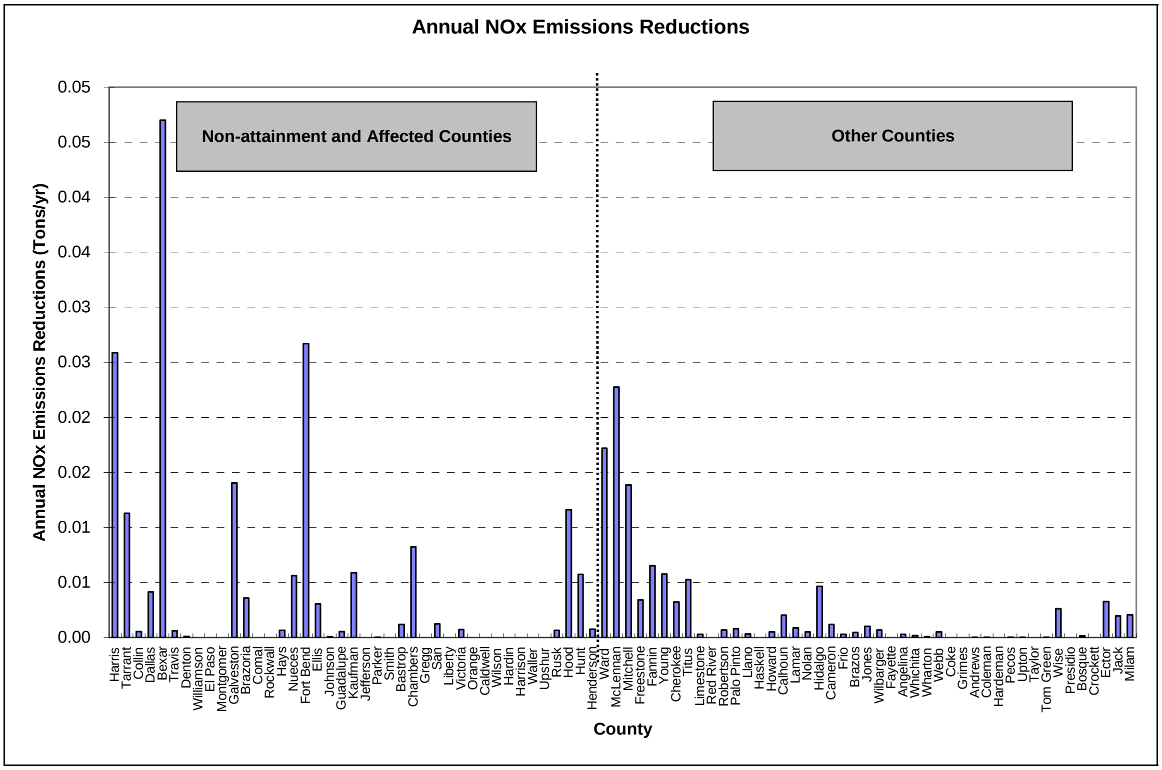


Figure 6-8: NOx Emissions Reductions per County from PV Projects

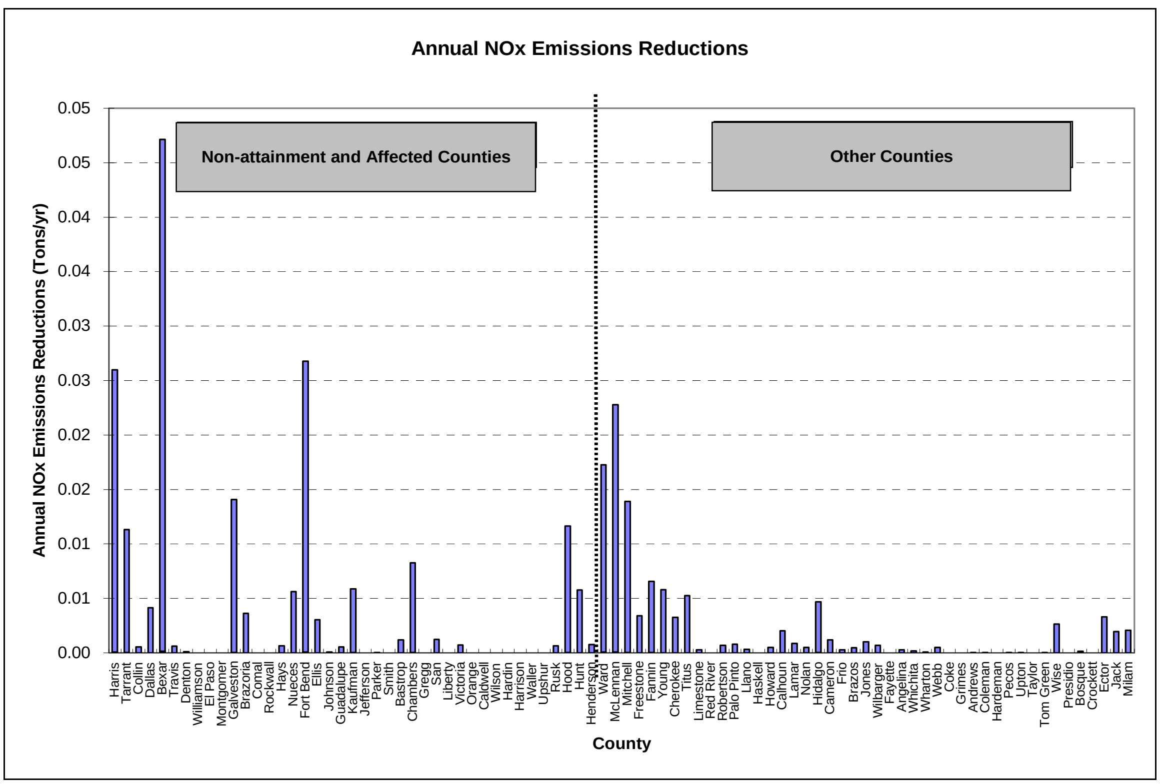


Figure 6-9: Ozone Season Day NOx Emissions Reductions per County from PV Projects

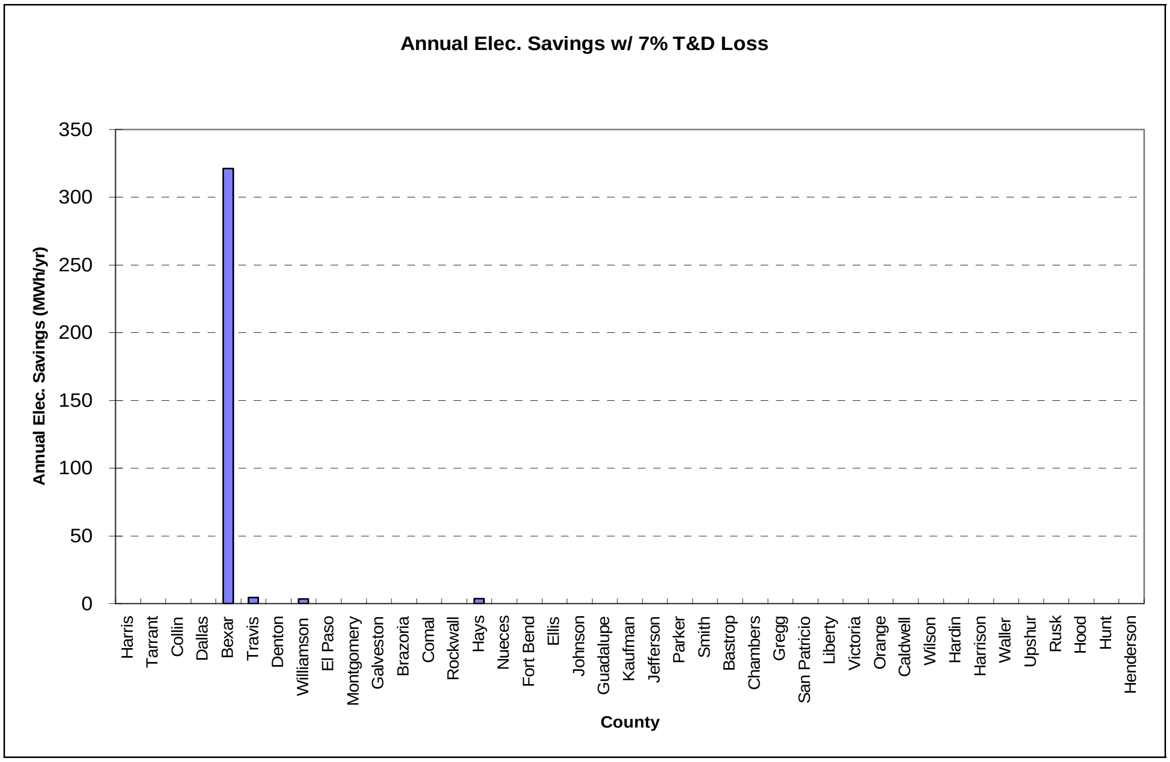


Figure 6-10: Annual Electric Savings per County from Solar Thermal Projects

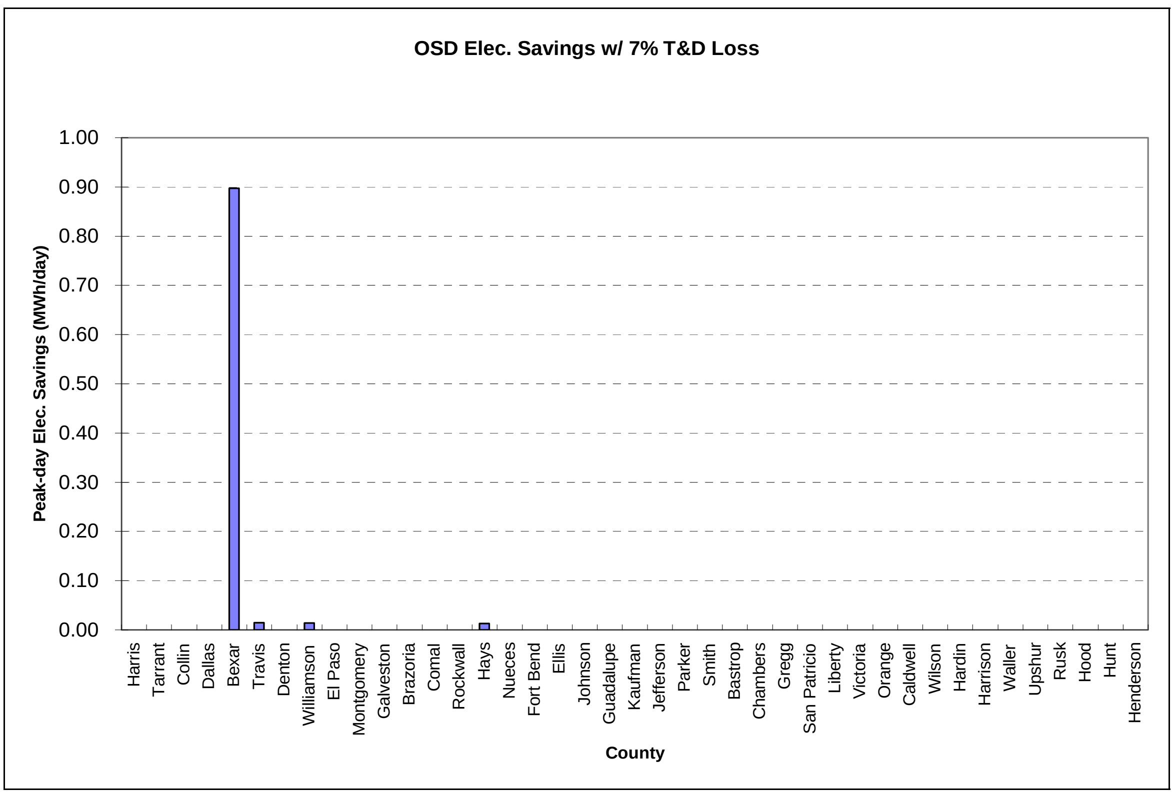


Figure 6-11: Ozone Season Day Electric Savings per County from Solar Thermal Projects

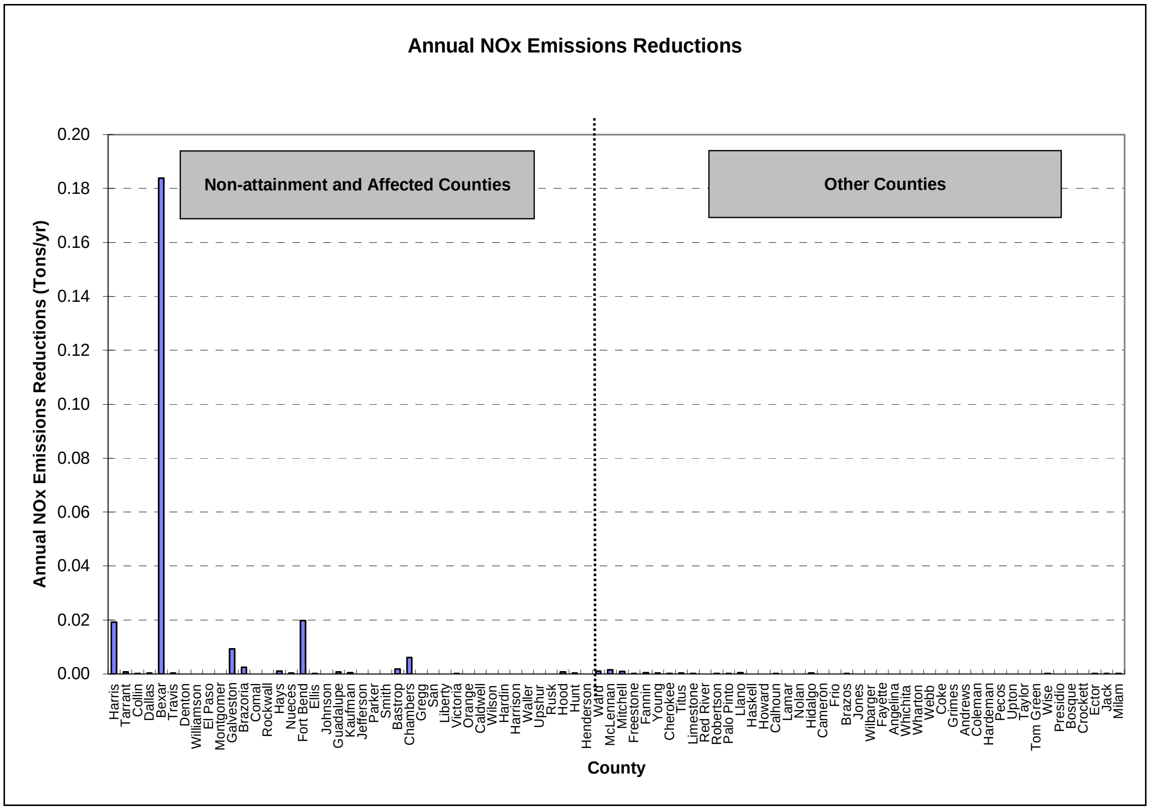


Figure 6-12: NOx Emissions Reductions per County from Solar Thermal Projects

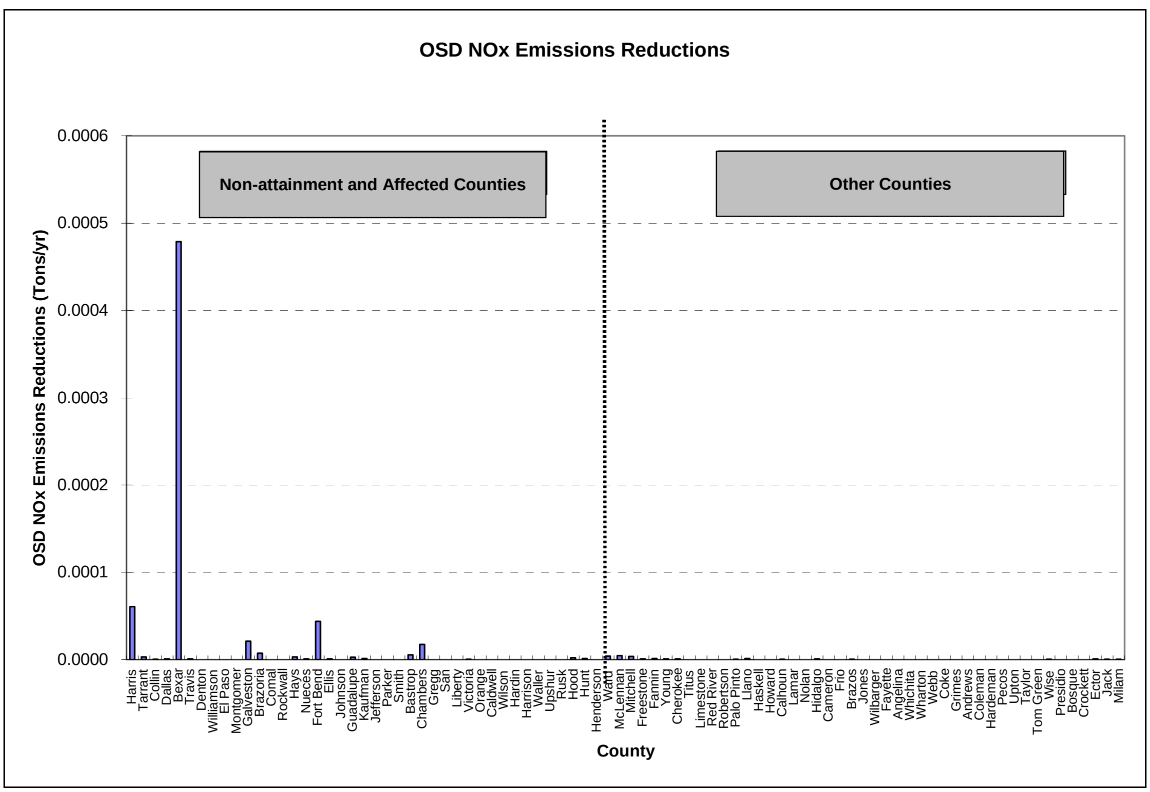


Figure 6-13: Ozone Season Day NOx Emissions Reduction per County from Solar Thermal Projects

7 REVIEW OF ERCOT'S RENEWABLE ENERGY CREDIT PROGRAM INFORMATION

7.1 Introduction

In this section, the information posted on ERCOT's Renewable Energy Credit Program site, www.texasrenewables.com ,was reviewed for use in the Laboratory's report to the TCEQ. In particular, information posted under the "Public Reports" tab was downloaded and assembled into an appropriate format for review. This includes ERCOT's 2001 through 2010 reports to the Legislature, which were converted into tabular format for analysis and insertion into this report. Similarly, information from ERCOT's listing of REC generators was inspected to determine how it compared with other sources of information the Laboratory has assembled.

7.2 Summary of Renewable Projects in Texas

Each year ERCOT is required to compile a list of grid-connected sources that generate electricity from renewable energy and report to the Legislature.

Table 7-3 contain the data reported by ERCOT from 2001 through 2010.Figure 7-1, Figure 7-2 and Figure 7-3 have been included to better illustrate the annual data collected by ERCOT. In the figures and tables it is clear to see that the electricity generated by wind each year is the largest single source of renewable energy in Texas, which has grown from 565,597 MWh in 2001 to 26,828,660 MWh in 2010. This is followed by

- Landfill gas, which has grown from 29,412 MWh in 2002 to 464,904 MWh in 2010;
- Hydroelectric: 30,639 MWh in 2001 to 609,257MWh in 2010;
- Biomass: 39,496 MWh in 2003 to 97,535 MWh in 2010; and
- Solar: 87 MWh in 2002 to 14,449 MWh in 2009.

Table 7-1: ERCOT REC Generator List

Company Name	Power Generating Company Name	Power Generating Company Code	Generator Site Name	Generator Site Code	Facility Identification Number	Unit Contact Information	Technology Type	Facility Noncompetitive Certification Data
El Paso Electric Company	El Paso Electric	EPE	Hueco Mountain Wind Ranch	EPE1	1	Monica Garcia	Wind	23631
FPL Pecos Wind 1, LLC	FPL Pecos Wind I II, LP	93	WOODWARD1	WOODWRD1	2	Jesse Nevarez	Wind	24296
Guadalupe-Blanco River Authority	Guadalupe-Blanco River Authority	05-631-1608-3000	DG_Schumansville	DG_Schum	3	Allen Ognoskie	Hydro	20028
Guadalupe-Blanco River Authority	Guadalupe-Blanco River Authority	05-631-1608-3000	DG-MCQUEENEY	DG_MCQUE	4	Allen Ognoskie	Hydro	20028
Trent Wind Farm, L.P.	Trent Wind Farm, L.P.	70	TRENT MESA WIND FARM	TRENT	5	Richard Walker	Wind	24322
FPL Energy Upton Wind I, LLC	FPL Energy Upton Wind I, LP	94	KING MOUNTAIN SW	KING_SW	6	Jesse Nevarez	Wind	24538
FPL Energy Upton Wind II, LLC	FPL Energy Upton Wind II, LP	96	KING MOUNTAIN NW	KING_NW	7	Jesse Nevarez	Wind	24539
FPL Pecos Wind 2, LLC	FPL Energy Pecos Wind I&II, LP	93	WOODWARD 2	WOODWRD2	8	Jesse Nevarez	Wind	24296
Delaware Mountain Wind Farm LP	DELAWARE MOUNTAIN WIND FARM LP	16	DELAWARE MOUNTAIN	DELAWARE	9	Linda Brandi	Wind	23705
Indian Mesa, LLC	NWP INDIAN MESA WIND FARM LP	17	INDIAN MESA NWP	INDNNWP	10	Linda Brandi	Wind	23745
Guadalupe-Blanco River Authority	Guadalupe-Blanco River Authority	05-631-1608-3000	DG_LAKEWOOD TAP	DG_LKWDT	11	Allen Ognoskie	Hydro	20028
Guadalupe-Blanco River Authority	Guadalupe-Blanco River Authority	05-631-1608-3000	CANYON	DG_CANYON	12	Allen Ognoskie	Hydro	20028
Small Hydro of Texas, Inc.	Small Hydro of Texas, Inc.	71	DG_CUERO CSW	CUECPL	13	Linda A. Parker	Hydro	24191
FPLE Energy Upton Wind III, LLC	FPL Energy Upton Wind III, LP	96	KING MOUNTAIN NE	KING_NE	14	Jesse Nevarez	Wind	24540
FPL Energy Upton Wind IV, LLC	FPL Energy Upton Wind IV, LP	96	KING MOUNTAIN SE	KING_SE	15	Jesse Nevarez	Wind	24541
Desert Sky Wind Farm 1 LP	Indian Mesa Power Parners I, L.P.	999	Indian Mesa I Wind Power	INDNENR	16	Richard Walker	Wind	24921
Desert Sky Wind Farm 2 LP	Indian Mesa Power Parners II, L.P.	999	Indian Mesa II Wind Power	INDNENR	17	Richard Walker	Wind	24922
Llano Estacado	Llano Estacado Wind Ranch at White Deer	Shell	White Deer	White Deer Wind	18	Craig Dencklau	Wind	23633
Renewable Ventures	Nuon Renewable Ventures	NRV	Green Mountain Solar at Upper Kirby	USAPV003	19	Nuon Renewable Ventures	Solar	26410

Table 7-1: ERCOT REC Generator List (cont.)

Company Name	Power Generating Company Name	Power Generating Company Code	Generator Site Name	Generator Site Code	Facility Identification Number	Unit Contact Information	Technology Type	Facility Noncompetitive Certification Data
Renewable Ventures	Nuon Renewable Ventures	NRV	Green Mountain Solar at The Winston School	USAPV002	20	Nuon Renewable Ventures	Solar	26411
TX LFG Energy, LP - Atascocita	Viridis Energy, LP - Atascocita	93-01-87393	ATASCOCITA	HB	29	Sharon Frank	Landfill gas	26813
TX LFG Energy, LP- Coastal Plains	Viridis Energy, LP - Coastal Plains	93-01-16145	COASTAL PLAINS	ALVIN	32	Sharon Frank	Landfill gas	26812
TX LFG Energy, LP - Baytown	Viridis Energy, LP - Baytown	01-62-16561	BAYTOWN	TRM	33	Sharon Frank	Landfill gas	26811
TX LFG Energy, LP - Blue Bonnet	Viridis Energy, LP - Blue Bonnet	93-01-27472	BLUE BONNET	LB	34	Sharon Frank	Landfill gas	26809
TX LFG Energy, LP - Conroe	Viridis Energy, LP - Conroe	Conroe	Conroe	Conroe	35	Sharon Frank	Landfill gas	26808
TX LFG Energy, LP - Security	Viridis Energy, LP - Security	SECURITY	SECURITY	SECURITY	36	Sharon Frank	Landfill gas	26810
Gas Recovery Systems, Inc.	Gas Recovery Systems	20066	Sunset Farms Electric	Sunset Farms Electric	37	Michael Caplan	Landfill gas	24199
Bio Energy (Austin) LLC	Bio Energy Austin LLC	DG_WALZE	DG_WALZE	DG_WALZE	38	Dennis Bollinger	Biomass	25512
The University of Texas - Houston	University of Texas - Houston	UTHSC	University Center Tower	University Center Tower	42	Rahsaan Arscott	Solar	No. 77027
Sweetwater Wind Power LLC	Sweetwater Wind power LLC	137899477	Sweetwater Wind 1	SWEETWND	43	Kim Takayesu	Wind	28924
Brazos Wind, LP	Brazos Wiind LP	Brazos Wind	Green Mountain Energy Wind Farm at Brazos	BRAZ_WND1	44	Scott McBride	Wind	29025
Brazos Wind, LP	Brazos Wind LP	Brazos Wind	Green Mountain Energy Wind Farm at Brazos	BRAZ_WND2	45	Scott McBride	Wind	29025
Aeolus Wind	Aeolus Wind, LLC	Aeolus Wind, LLC	North Texas	NA	51	Sarah Adams	Wind	29341
Sweetwater Wind Power LLC	Sweetwater Wind Power	Sweet Wind 2	Sweetwater Wind 2	SWEETWND2	52	Kim Takayesu	Wind	30462
Renovar Arlington, Ltd.	Renovar Arlington, Ltd.	Rnvr-1	Village Creek	Vcreek	53	Lisette Cowger	Landfill gas	31083
Renovar Arlington, Ltd.	Renovar Arlington, Ltd.	Rnvr-2	Village Creek	Vcreek	54	Lisette Cowger	Landfill gas	31083
Callahan Divide	FPL Energy Callahan Divide	30385	Callahan Wind Energy	30385	55	David Gonzalez	Wind	30385
Buffalo Gap Wind Farm LLC	Buffalo Gap Wind Farm, LLC	Buffalo Gap	Buffalo Gap Wind Farm	Buffalo Gap	56	Gabe Vaca	Wind	31412

Table 7-1: ERCOT REC Generator List (cont.)

Company Name	Power Generating Company Name	Power Generating Company Code	Generator Site Name	Generator Site Code	Facility Identification Number	Unit Contact Information	Technology Type	Facility Noncompetitive Certification Data
Horse Hollow	FPL Energy Horse Hollow Wind	0	Horse Hollow Wind Energy	0	57	John Mantyh	Wind	31594
Sw eetw ater Wind Pow er LLC	Sw eetw ater Wind Pow er	603943148	Sw eetw ater Wind 3 LLC_AE	SWEETWND3	58	Kim Takayesu	Wind	31983
Sw eetw ater Wind Pow er LLC	Sw eetw ater Wind Pow er	603943148-3000	Sw eetw ater Wind 3 LLC_CPS	SWEETWND3	59	Kim Takayesu	Wind	31983
American Wind Pow er Center	American Wind Pow er Center	Lubbock	AWPC	AWPC#1	60	Coy F. Harris	Wind	32470
Bio Energy (Texas), LLC	Bio Energy (Texas) LLC	32079	Covel Gardens Landfill Gas Pow er Station	DG_MEDIN	61	John M. Love	Landfill gas	20140
MeadWestvaco Texas LP	MeadWestvaco Texas LP	Evadale Opertions	MeadWestvaco Evadale Pulp and Paper Mill	Evadale Texas	63	JiNia Bradford	Biomass	31646
Fort Worth Methane LLC	G2 Energy (FW Regional) LLC	77-998-1765	DG_RDLML_1 Unit	FW Regional	64	Michael Caplan	Landfill gas	32558
Exelon Wind 1 LLC	JD Wind 1	20137	JD Wind 1	JD Wind 1	65	Steve Maller	Wind	32802
Exelon Wind 2 LLC	JD Wind 2	20138	JD Wind 2	JD Wind 2	66	Steve Maller	Wind	32803
Exelon Wind 3 LLC	JD Wind 3	20139	JD Wind 3	JD Wind 3	67	Steve Maller	Wind	32804
Mesquite Wind, LLC	Mesquite Wind LLC	Horizon Wind	Horizon Wind	Horizon Wind	68	Brian Hayes	Wind	32936
FPL Energy Horse Hollow Wind II, LP	FPL Energy Horse Hollow II, LP	Horse Hollow II	Horse Hollow II	Horse Hollow II	69	John Mantyh	Wind	32524
Post Wind Farm LP	Post Wind Farm, LP	Post Wind	Post Wind	Post Wind	70	John Cote	Wind	32525
Exelon Wind 5 LLC	JD Wind 5	20154	JD Wind 5	JD Wind 5	71	Steven Maller	Wind	32912
Exelon Wind 6 LLC	JD Wind 6	20155	JD Wind 6	JD Wind 6	72	Steven Maller	Wind	32913
Forest Creek Wind Farm, LLC	Airtricity Forest Creek Wind Farm, LLC	210	Forest Creek Wind Farm	MCDLD	74	John Franklin	Wind	20166
Exelon Wind 4 LLC	JD Wind 4	20153	JD Wind 4	JD Wind 4	75	Steven Maller	Wind	33760
Cromeco, Inc.	Cromeco, Inc.	Cromeco, Inc.	Cromeco, Inc.	Cromeco, Inc.	76	Steve Cromeens	Landfill gas	29520
Sand Bluff Wind Farm, LLC	Airtricity Sand Bluff Wind Farm, LLC	211	Sand Bluff Wind Farm	MCDLD	77	Phil Dutton	Wind	20165

Table 7-1: ERCOT REC Generator List (cont.)

Company Name	Power Generating Company Name	Power Generating Company Code	Generator Site Name	Generator Site Code	Facility Identification Number	Unit Contact Information	Technology Type	Facility Noncompetitive Certification Data
Post Oak Wind, LLC	Post Oak Wind	Post Oak Wind	Post Oak Wind	Post Oak Wind	78	Brian Hayes	Wind	33801
Sw eetw ater Wind Pow er LLC	Sw eetw ater Wind 4 LLC	Sw eetw ater Wind 4 LLC	Sw eetw ater Wind 4 LLC	Sw eetw ater Wind 4 LLC	79	Kim Takayesu	Wind	34058
Scurry County Wind, L.P.	Scurry County Wind, L.P.	scurry county w ind	Camp Springs Energy Center	CSEC	80	Scott Ebner	Wind	33902
Buffalo Gap Wind Farm 2, LLC	Buffalo Gap Wind Farm 2, LLC	603768792	Buffalo Gap Wind Farm	BUFF_GAP	81	William Barnes	Wind	33477
Sw eetw ater Wind Pow er LLC	Sw eetw ater Wind 5 LLC	Sw eetw ater Wind 5 LLC	Sw eetw ater Wind 5 LLC	SWEETWN5	82	Kim Takayesu	Wind	34709
WM Renew able Energy, LLC	WM Renew able Energy, L.L.C.	Skyline	Skyline	DG_FERIS	83	Josh Kuba	Landfill gas	20161
Maverick County Water Control	Maverick County Water	Maverick County	Maverick County Water	20141	92	Maverick County Water	Hydro	34674
Capricorn Ridge Wind, LLC	Capricorn Ridge Wind, LLC	Capricorn Ridge Wind	Capricorn Ridge	CAPRIDGE	93	Brian Harris	Wind	34549
Mission Wind LLC	Wildorado Wind, LLC	Mission Wind	Mission Wind	Mission Wind	94	Maria Litos	Wind	32900
WM Renew able Energy, LLC	WM Renew able Energy II, LLC	Austin	Austin	DG_SPRIN	95	Steven Korsgaard	Landfill gas	20161
Snyder Wind Farm, LLC	Snyder Wind Farm, LLC	20187	Snyder Wind Farm	ENAS	96	Eric Barreveld	Wind	34754
Rio Grande Valley Sugar Grow ers, In	RGV Sugar	RGV Sugar	RGV Sugar	RGV Sugar	97	Steve Bearden	Biomass	33421
Goat Wind, LP	Goat Wind, LP	809226603	GOAT WIND LP	GOAT WIND	98	Johnny Johnson	Wind	35439
Champion Wind Farm, LLC	Airtricity Champion Wind Farm, LLC	242	Champion Wind Farm	TKWSW	99	Audrey Fogarty	Wind	20182
Roscoe Wind Farm, LLC	Airtricity Roscoe Wind Farm, LLC	243	Roscoe Wind Farm	TKWSW1	100	Audrey Fogarty	Wind	20180
Scurry County Wind II LLC	Scurry County Wind II LLC	scurry county w ind II	Camp Springs Energy Center	CSEC	101	Scott Ebner	Wind	35290
Stanton Wind Energy LLC	Stanton Wind Energy LLC	stanton w ind	Stanton Wind Energy LLC	SWEC	102	Scott Ebner	Wind	35206
Whirlw ind Energy, LLC	Whirlw ind Energy, LLC	WELLC	Whirlw ind Energy Center	WEC	103	Matthew Burt	Wind	33835
Exelon Wind 9 LLC	JD Wind 9	20189	JD Wind 9	JD Wind 9	104	Steve Maller	Wind	34924

Table 7-1: ERCOT REC Generator List (cont.)

Company Name	Power Generating Company Name	Power Generating Company Code	Generator Site Name	Generator Site Code	Facility Identification Number	Unit Contact Information	Technology Type	Facility Noncompetitive Certification Data
Exelon Wind 8 LLC	JD Wind 8	20194	JD Wind 8	JD Wind 8	105	Steven Maller	Wind	34991
Exelon Wind 10 LLC	JD Wind 10	20195	JD Wind 10	JD Wind 10	106	Steven Maller	Wind	34992
Exelon Wind 11 LLC	JD Wind 11	20196	JD Wind 11	JD Wind 11	107	Steven Maller	Wind	34993
Exelon Wind 7 LLC	JD Wind 7	20193	JD Wind 7	JD Wind 7	108	Steven Maller	Wind	34990
Snider Industries, LLP	Snider Industries, LLP	Snider_1	Snider_1	Snider_1	109	Julianna Parr	Biomass	35526
Buffalo Gap Wind Farm 3, LLC	Buffalo Gap Wind Farm 3, LLC	Buffalo Gap Wind Farm 3, LLC	Buffalo Gap Wind Farm	BUFF_GAP	110	Fang Qing	Wind	35247
High Plains Wnd Power LLC	High Plains Wind Power LLC	20197	High Plains Wind Power	High Plains Wind Power	111	Steven Maller	Wind	34994
Texas Gulf Wind LLC	Texas Gulf Wind LLC	Texas Gulf Wind LLC	Texas Gulf Wind LLC	TGW	112	Kim Takayesu	Wind	35810
ECR Panther Creek Wind Farm I and II,	ECR Panther Creek Wind Farm I, LLC.	259	PANTHER CREEK	PC_NORTH	113	Crystal Walton	Wind	20208
Capricorn Ridge Wind II, LLC	Capricorn Ridge Wind II, LLC	CR4	CR4	CR4	114	Daniel Sexton	Wind	20210
South Trent Wind LLC	South Trent Wind LLC	35778	South Trent Wind Farm	STWF	115	Kim Takayesu	Wind	35750
Biofuels Power Corporation	Biofuels Power Inc.	20174	BFP Conroe	35861	116	Christopher Dufour	Biomass	35861
Majestic Wind Power LLC	Majestic Wind Power LLC	Majestic Wind Power LLC	Majestic Wind Power LLC	Majestic Wind Power LLC	117	Kim Takayesu	Wind	35871
Biofuels Power Corporation	Biofuels Power Corporation	20174	Oak Ridge North	DG_RA	118	Chris Dufour	Biomass	34211
McAdoo Wind Energy LLC	McAdoo Wind Energy LLC	McAdoo Wind	McAdoo Wind Energy Center	MWEC	119	Scott Ebner	Wind	35935
Noble Great Plains Windpark, LLC	Noble Great Plains Windpark, LLC	Noble Great Plains Windpark, LLC	Noble Great Plains Windpark, LLC	Noble Great Plains Windpark, LLC	120	Harry Silton	Wind	20227
Sherbino I Wind Farm LLC	Sherbino I Wind Farm, LLC	20220	Sherbino I Wind Farm	KEO	121	James Holly	Wind	35887
Ocotillo Windpower, LP	Ocotillo Windpower LP	Ocotillo Windpower	Ocotillo Windfarm	OWF	122	Jason Allen	Wind	35453
Silver Star I Power Partners, LLC	Silver Star I Power Partners LLC	20186	Silver Star Wind	FLTCK	123	James C Holly	Wind	35551

Table 7-1: ERCOT REC Generator List (cont.)

Company Name	Power Generating Company Name	Power Generating Company Code	Generator Site Name	Generator Site Code	Facility Identification Number	Unit Contact Information	Technology Type	Facility Noncompetitive Certification Data
Hackberry Wind, LLC	Hackberry Wind LLC	HWFLLC	Hackberry Wind Farm	HWF	124	Matthew Burt	Wind	20185
PYCO Industries, Inc.	PYCO Industries, Inc.	70047	PYCO Industries Plant #2	2	125	PYCO Industries, Inc. Wind Farm	Wind	36175
ECR Panther Creek Wind Farm I and II,	EC and R Panther Creek Wind Farm II, LLC	259	PANTHER CREEK	PC_SOUTH	126	Dean Tuel	Wind	35779
Elbow Creek Wind Project, LLC	Elbow Creek Wind Project LLC	Elbow Creek	Elbow Creek	Elbow Creek	127	Scott McBride	Wind	36188
Turkey Track Wind Energy LLC	Turkey Track Wind Energy LLC	Turkey Track Wind	Turkey Track Wind Energy Center	TTWEC	128	Scott Ebner	Wind	36369
Wolf Ridge Wind, LLC	Wolf Ridge Wind, LLC	C41483	WOLF RIDGE	WLFRIDGE	129	Rory Robinson	Wind	36015
Bull Creek Wind LLC	Bull Creek Wind LLC	Bull Creek Wind LLC	Bull Creek Wind LLC	Bull Creek Wind LLC	131	Michael Adcock	Wind	36239
Sunray Wind	Sunray Wind, LLC	20234	Sunray Wind, LLC Wind Farm	Sunray Wind, LLC	132	William Root	Wind	36672
Texas State Technical College	Texas State Technical College West Texas	TSTC	TSTC West Texas	DG ROSC2	133	Ray Fried	Wind	36692
Inadale Wind Farm, LLC	Inadale Wind Farm, LLC	Inadale Wind Farm, LLC	Inadale Wind Farm, LLC	INDL_INADALE1	134	Dean Tuel	Wind	36500
Pyron Wind Farm, LLC	Pyron Wind Farm, LLC	Pyron Wind Farm, LLC	Pyron Wind Farm, LLC	PYR_PYRON1	135	Dean Tuel	Wind	36501
Trinity Oaks LLC	G2 Energy (Trinity Oaks) LLC	828961529	Trinity Oaks LFG Generating Facility	DG KLBRG	136	Michael Caplan	Landfill gas	36679
Notrees Windpower, LP	Notrees Windpower LP	Notrees	Notrees Windfarm	NWF	137	Jason Allen	Wind	36350
Iberdrola Renewables, Inc.	Barton Chapel Wind LLC	Barton Chapel	Barton Chapel	Barton Chapel	138	Bobby Clark	Wind	36825
Iberdrola Renewables, Inc.	Penascal Wind Power LLC	Penascal	Penascal	Penascal	139	Dan Pitts	Wind	36829
Denton Power, LLC	Denton Power, LLC	Denton Power	Denton Power	Denton Power	140	Chad Howard	Landfill gas	36717
ECR Panther Creek Wind Farm III, LLC	ECR Panther Creek Creek Wind Farm III, LLC	ECR Panther Creek Creek Wind Farm III, LLC	PANTHER3	PANTHER3	141	Dean Tuel	Wind	37092
Iberdrola Renewables, Inc.	Penascal Wind Power LLC	Penascal/STEC	Penascal/STEC	Penascal/STEC	142	Dan Pitts	Wind	36829
WM Renewable Energy, LLC	WM Renewable Energy, L.L.C.	???	DFW II	DG_BIO2	143	Jim Kilpatrick	Landfill gas	36832

Table 7-1: ERCOT REC Generator List (cont.)

Company Name	Power Generating Company Name	Power Generating Company Code	Generator Site Name	Generator Site Code	Facility Identification Number	Unit Contact Information	Technology Type	Facility Noncompetitive Certification Data
ECR Papalote I, LLC	ECR Papalote I, LLC	ECR Papalote I, LLC	ECR Papalote I, LLC	ECR Papalote I, LLC	144	John Franklin	Wind	37352
Langford Wind Power, LLC	Langford Wind Power, LLC	Langford Wind Power, LLC	Langford	Langford	145	Scott McBride	Wind	37206
Capricorn Ridge Wind, LLC	Capricorn Ridge Wind, LLC	Capricorn Ridge Wind	Capricorn Ridge	CAPRIDGE	146	Brian Harris	Wind	34549
Capricorn Ridge Wind, LLC	Capricorn Ridge Wind, LLC	Capricorn Ridge Wind	Capricorn Ridge	CAPRIDGE	147	Brian Harris	Wind	34549
Michael Laurie Blank	Michael Laurie Blank	Solar	Michael Laurie Blank	Texas	148	Michael Laurie Blank	Solar	37542
Orange County Container LLC	Orange County Container Group LLC	Corrugated Services Inc	Liner Mill Bio-boiler	Liner Mill Bio-boiler	149	David Garrick	Biomass	37531
Loraine Windpark Project, LLC	LORAINE WINDPARK PROJECT LLC	LORAINE WINDPARK PROJECT LLC	LORAINE WINDPARK PROJECT LLC	LONEWOLF	150	John R. Hartzog	Wind	37533
Pattern Gulf Wind LLC	Pattern Gulf Wind LLC	Pattern Gulf Wind LLC	Texas Gulf Wind	TGW	151	Kim Takayesu	Wind	37781
Rio Grande Valley Sugar Growers, In	RGVSG	2	Santa Rosa	2	152	Mark Nittler	Biomass	39181
TX Solar I LLC	TX Solar I LLC	TX Solar I	TX Solar I	DG BROOK	153	Dreama Brower	Solar	38359
TX Solar I LLC	TX Solar I LLC	TX Solar I	TX Solar I	DG ELMEN	154	Dreama Brower	Solar	38359
WM Renewable Energy, LLC	WM Renewable Energy, LLC IV	Westside	Westside	DG_WSTHL	155	Phil Keim	Landfill gas	37711
Aspen Power LLC	Aspen Power LLC	7.91294E+12	Lufkin Biomass	LFBIO	156	Rod Danielson	Biomass	38864
WM Renewable Energy, LLC	WM Renewable Energy, LLC VI	DG_HBR	Farmers Branch Landfill gas-to-energy	DG_HBR	157	LaToya Glenn	Landfill gas	38696
Cedro Hill Wind, LLC	Cedro Hill Wind, LLC	CEDROHIL	Cedro Hill Wind Farm	CEDROHIL	158	Joe LoCoco	Wind	38336
ECR Papalote Creek II, LLC	ECR Papalote Creek II, LLC	Papalote II	ECR Papalote Creek II, LLC	Papalote II	159	JohnFranklin	Wind	38252
McKinney LFG, LLC	McKinney LFG, LLC	McKinney LFG, LLC	McKinney LFG, LLC	DG_MKNSW	160	Sharon R. Frank	Landfill gas	39210

Table 7-2: Quarterly Electricity Generation by Renewable Sources, in MWh, for 2001–2010

Technology Type	Year	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total MWh
Biomass	2001					
Hydro	2001	0	0	11293	19346	30639
Landfill gas	2001					
Solar	2001					
Wind	2001	0	0	201,118	364,479	565,597
Totals		0	0	212,411	383,825	596,236

Technology Type	Year	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total MWh
Biomass	2002					
Hydro	2002	105,817	69,165	80,154	56,956	312,093
Landfill gas	2002	8,216	7,073	6,986	7,137	29,412
Solar	2002	0	29	37	21	87
Wind	2002	611,708	716,896	622,262	500,618	2,451,484
Totals		725,741	793,163	709,439	564,732	2,793,076

Technology Type	Year	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total MWh
Biomass	2003	8,876	11,253	10,999	8,368	39,496
Hydro	2003	92,680	52,592	71,699	22,713	239,684
Landfill gas	2003	29,995	44,629	39,920	39,662	154,206
Solar	2003	32	70	69	49	220
Wind	2003	561,994	670,248	617,794	665,446	2,515,482
Totals		693,577	778,792	740,481	736,238	2,949,088

Technology Type	Year	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total MWh
Biomass	2004	6,274	11,459	11,482	7,725	36,940
Hydro	2004	55,638	52,735	52,350	74,067	234,791
Landfill gas	2004	52,801	47,964	53,659	49,018	203,443
Solar	2004	31	67	70	44	211
Wind	2004	815,010	1,014,396	610,157	770,066	3,209,629
Totals		929,755	1,126,621	727,718	900,920	3,685,014

Table 7-2: Quarterly Electricity Generation by Renewable Sources, in MWh, for 2001–2010 (cont.)

Technology Type	**Year**	**Quarter 1**	**Quarter 2**	**Quarter 3**	**Quarter 4**	**Total MWh**
Biomass	2005	13,921	15,069	14,764	14,883	58,637
Hydro	2005	108,974	106,893	61,189	33,246	310,302
Landfill gas	2005	52,118	51,193	56,166	54,301	213,777
Solar	2005	46	69	67	46	227
Wind	2005	801,232	1,246,182	869,508	1,304,646	4,221,568
Totals		976,291	1,419,406	1,001,694	1,407,122	4,804,511

Technology Type	**Year**	**Quarter 1**	**Quarter 2**	**Quarter 3**	**Quarter 4**	**Total MWh**
Biomass	2006	16,327	10,479	17,152	16,610	60,569
Hydro	2006	55,000	83,064	44,870	27,143	210,077
Landfill gas	2006	69,191	78,650	75,665	82,580	306,087
Solar	2006	26	43	41	360	470
Wind	2006	1,478,927	1,584,166	1,376,540	2,091,295	6,530,928
Totals		1,619,471	1,756,402	1,514,268	2,217,988	7,108,131

Technology Type	**Year**	**Quarter 1**	**Quarter 2**	**Quarter 3**	**Quarter 4**	**Total MWh**
Biomass	2007	13,052	15,870	13,073	12,105	54,101
Hydro	2007	66,084	120,486	139,965	56,346	382,882
Landfill gas	2007	84,367	86,372	85,612	99,987	356,339
Solar	2007	339	503	541	461	1,844
Wind	2007	1,961,153	2,029,807	2,020,870	3,339,338	9,351,168
Totals		2,124,995	2,253,039	2,260,062	3,508,238	10,146,334

Technology Type	**Year**	**Quarter 1**	**Quarter 2**	**Quarter 3**	**Quarter 4**	**Total MWh**
Biomass	2008	21,154	14,019	12,564	23,095	70,833
Hydro	2008	98,510	177,051	78,751	91,116	445,428
Landfill gas	2008	105,217	97,361	88,470	95,558	386,606
Solar	2008	446	862	992	1,038	3,338
Wind	2008	4,030,973	4,737,188	2,639,509	4,878,770	16,286,440
Totals		4,256,300	5,026,481	2,820,287	5,089,577	17,192,645

Table 7-2 Quarterly Electricity Generation by Renewable Sources, in MWh, for 2001–2010 (cont.)

Technology Type	Year	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total MWh
Biomass	2009	25,083	18,938	17,187	12,156	73,364
Hydro	2009	76,480	179,512	88,491	163,024	507,507
Landfill gas	2009	94,382	101,709	104,854	111,981	412,926
Solar	2009	101	1,409	1,761	1,222	4,492
Wind	2009	5,413,648	5,385,203	4,248,223	5,548,915	20,595,989
Totals		5,609,694	5,686,771	4,460,516	5,837,298	21,594,278

Technology Type	Year	Quarter1	Quarter2	Quarter3	Quarter4	Total MWh
Biomass	2010	20,974	27,769	17,407	31,385	97,535
Hydro	2010	196,238	133,408	192,252	87,358	609,257
Landfill gas	2010	110,511	114,893	116,789	122,711	464,904
Solar	2010	1384.67	2,042	3,483	7,539	14,449
Wind	2010	6,459,442	7,806,011	5,307,840	7,255,367	26,828,660
Totals		6,788,550	8,084,123	5,637,771	7,504,361	28,014,805

Table 7-3: Annual Electricity Generation by Renewable Sources (MWh, ERCOT: 2001–2010 by Quarter)

Technology Type	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Wind	565,597	2,451,484	2,515,482	3,209,629	4,221,568	6,530,928	9,351,168	16,286,440	20,595,989	26,828,660
Hydro	30,639	312,093	239,684	234,791	310,302	210,077	382,882	445,428	507,507	609,257
Landfill gas		29,412	154,206	203,443	213,777	306,087	356,339	386606	412,926	464,904
Biomass			39,496	36,940	58,637	60,569	54101	70,833	73,364	97,535
Solar		87	220	211	227	470	1,844	3,338	4,492	14,449
Total (MWh)	596,236	2,793,076	2,949,088	3,685,014	4,804,511	7,108,131	10,146,334	17,192,645	21,594,278	28,014,805

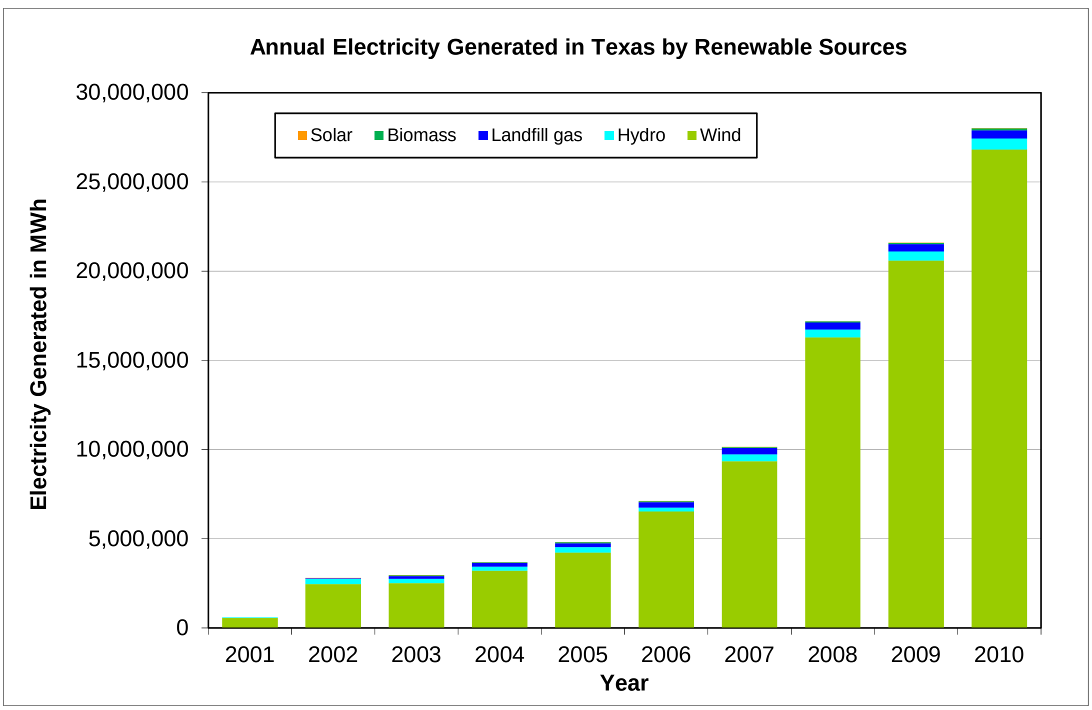


Figure 7-1: Electricity Generation by Renewable Sources (ERCOT: 2001–2010 Annually)

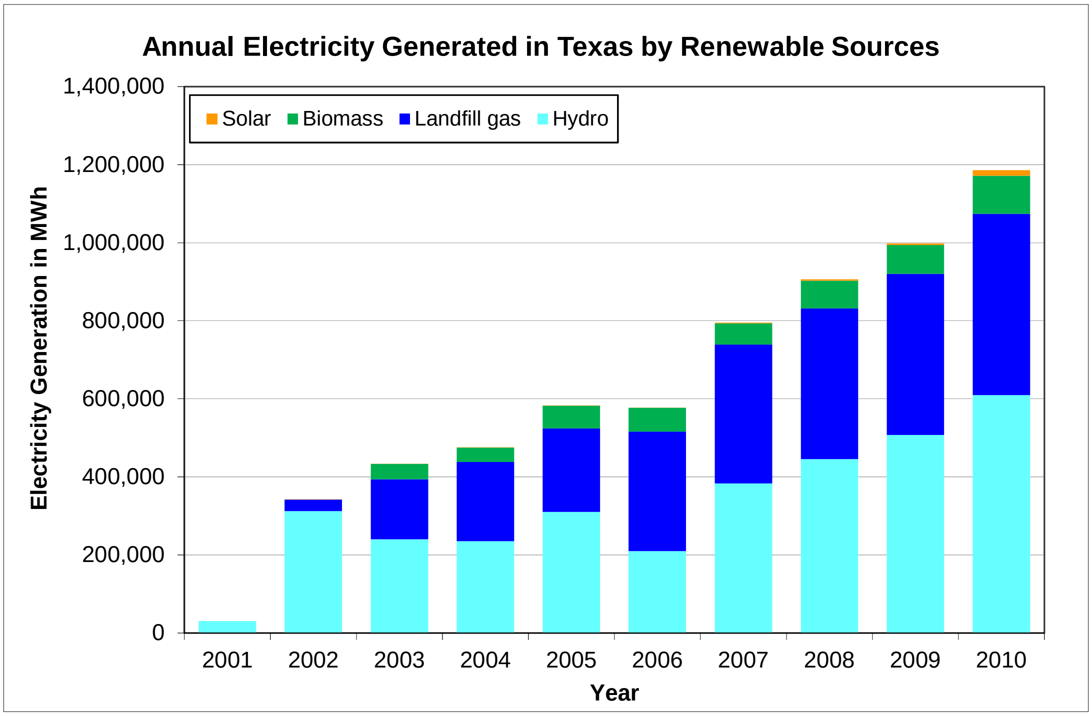


Figure 7-2: Electricity Generation by Renewable Sources Other Than Wind (ERCOT: 2001–2010 Annually)

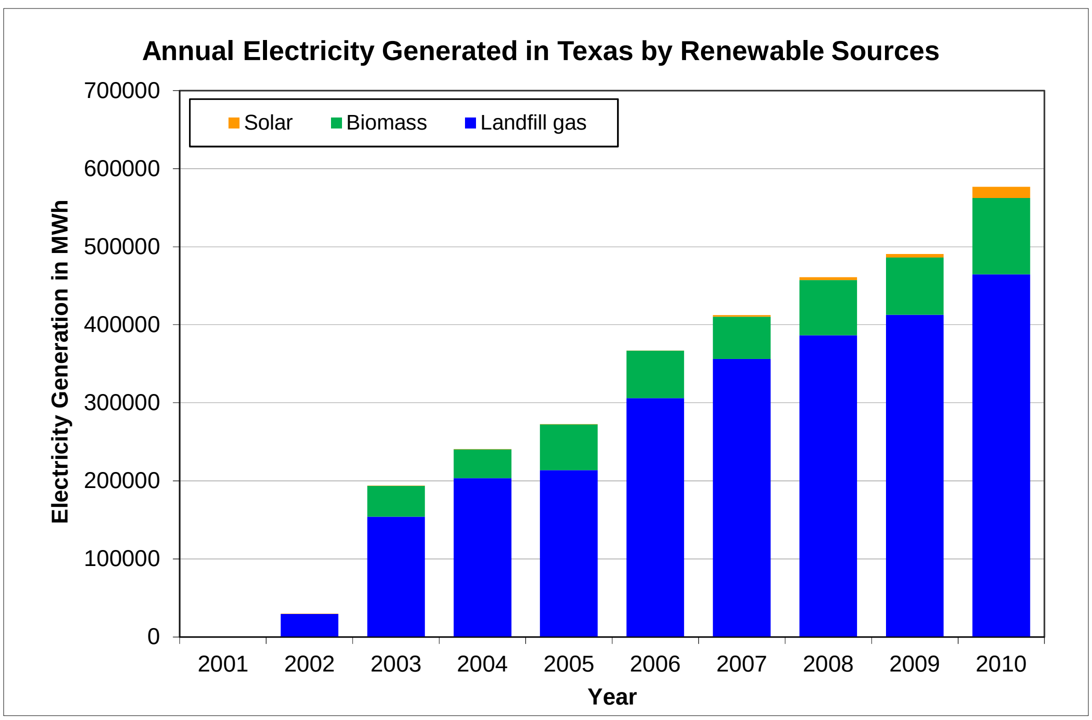


Figure 7-3: Electricity Generation by Renewable Sources from Landfill gas, Solar and Biomass (ERCOT: 2001–2010 Annually)

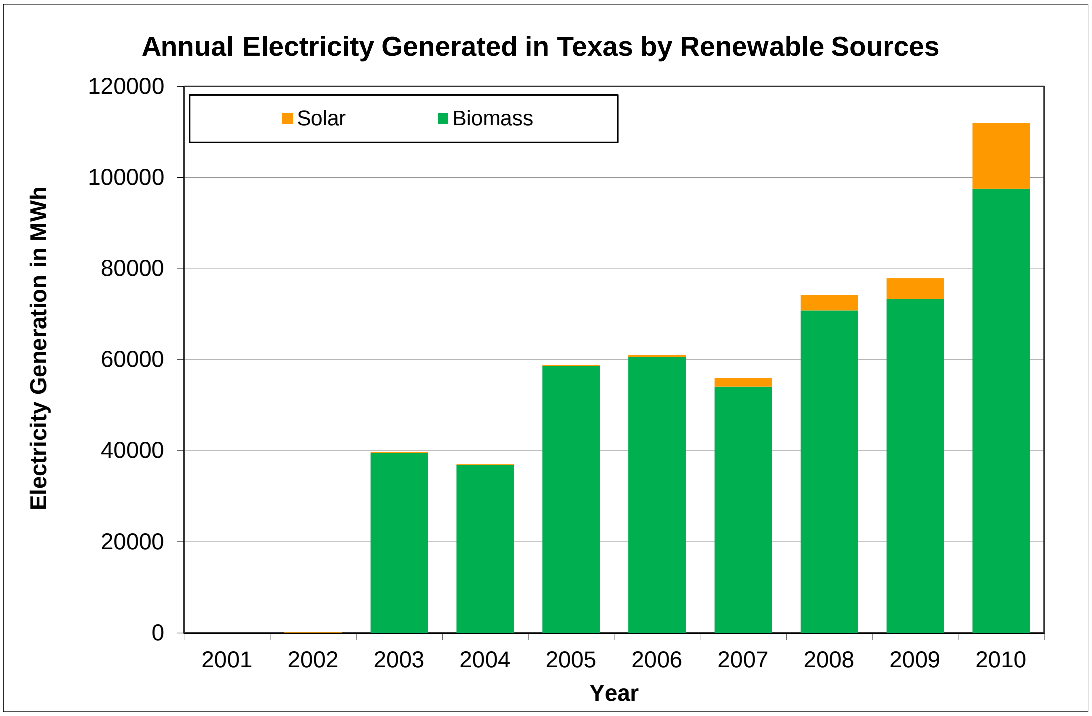


Figure 7-4: Electricity Generation by Renewable Sources from Solar and Biomass (ERCOT: 2001–2010 Annually)

8 COMBINED HEAT AND POWER PROJECTS IN TEXAS

Texas leads the United States in Combined Heat and Power (CHP) applications, which is also known as cogeneration. About 23% of all CHP generation capacity in the US is located in Texas[7]. This capacity produces 20% of the electricity in Texas[8]. In Texas, typical power plants built by electric utilities are steam plants that are 25%-35% efficient. The natural gas combined cycle power plants operate at about 50% efficiency. CHP technologies generate electrical and thermal energy in a single, integrated system close to the point of customer energy demand. A typical CHP system consists of a prime mover to generate electricity, a heat recovery system to capture heat, a control system, an exhaust system, and an acoustic enclosure. The thermal energy recovered in a CHP system can be used for heating or cooling in industry or buildings. Thus, CHP facilities are a major energy conservation technique with a high efficiency falling to the 70%-85% range.

The ESL is working on developing a procedure to calculate annually creditable NOx emissions reductions from CHP facilities for the State Implementation Plan (SIP) credits. The ESL is collecting new, or updating, information which be presented in the next annual report.

[7] USDOE, Energy Information Agency (EIA), 2005 data
[8] USDOE, Energy Information Agency (EIA), 2006 data

9 REPORTING OF NOx EMISSIONS CREDITS TO THE TCEQ (PRELIMINARY)

9.1 Introduction

The Energy Systems Laboratory (Laboratory), at the Texas Engineering Experiment Station of the Texas A&M University System, in fulfillment of its responsibilities under Texas Health and Safety Code Ann. § 388.003 (e), Vernon Supp. 2002, submits this sixth annual report, Energy Efficiency/Renewable Energy (EE/RE) Impact in the Texas Emissions Reduction Plan (Preliminary Report) to the Texas Commission on Environmental Quality.

In this preliminary report, the NOx emissions savings from the energy-efficiency programs from multiple Texas State Agencies working under Senate Bill 5 and Senate Bill 7 in a uniform format to allow the TCEQ to consider the combined savings for Texas' State Implementation Plan (SIP) planning purposes. This required that the analysis should include the cumulative savings estimates from all projects projected through 2020 for both the annual and Ozone Season Day [9] (OSD) NOx reductions. The NOx emissions reduction from all these programs were 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.

In 2010, the cumulative total electricity savings from all programs are:

- Annual electricity savings of 31,731,502 MWh/year (18,907 tons-NOx/year) and
- OSD electricity savings equal to 84,150 MWh/day, which would be a 3,506 MW average hourly load reduction during the OSD period (51.58 tons-NOx/day).

By 2013, the projected cumulative total electricity savings from all programs will be:

- Annual electricity savings will be 35,758,047 MWh/year (21,396 tons-NOx/year) and
- OSD electricity savings will be 98,298 MWh/day, which would be a 4,096 MW average hourly load reduction during the OSD period (60.61 tons-NOx/day).

A summary of the savings for 2010 and 2013 is presented in the table below.

	2010	2013
Annual Electricity Savings (MWh/yr)	31,731,502	35,758,047
Annual Emissions reductions (tons NOx/yr)	18,907	21,396
OSD Electricity Savings (MWh/day)	84,150	98,298
OSD Emissions reductions (tons NOx/day)	51.58	60.61

[9] An ozone season day (OSD) represents the daily average emissions during the period that runs from mid-July to mid -September.

9.2 Legislative Background

In 2001, the Texas Emissions Reduction Plan (TERP), established by the 77th Texas Legislature with the enactment of Senate Bill 5 (SB 5), identified that Energy Efficiency and Renewable Energy (EE/RE) measures make an important contribution to a comprehensive approach for meeting the minimum federal ambient air quality standards. In 2003 through 2011, the 78th through 81st Legislatures enhanced the use of EE/RE programs for meeting the TERP. The 78th Legislature enhanced the use of EE/RE programs for meeting TERP goals by requiring the Texas Commission on Environmental Quality (TCEQ) to promote EE/RE as a means to improve air quality standards and to develop a methodology for computing emissions reduction for use in the State Implementation Plan (SIP) from EE/RE programs.

The 79th Legislature expanded the scope of the SIP-eligible credits by adding savings from the State Renewable Portfolio Standards from the generation of electricity from renewable sources; specifically requiring the TCEQ to develop methods to quantify emissions reductions from renewable energy; and required the Laboratory to develop at least three alternative methods for achieving a 15 percent greater potential energy savings in residential, commercial and industrial construction.

In the 80th Legislature several new energy efficiency initiatives were introduced, including:

- Requiring the Laboratory to provide written recommendations to the State Energy Conservation Office (SECO) about whether or not the energy efficiency provisions of latest published edition of the International Residential Code (IRC), or the International Energy Conservation Code (IECC), are equivalent to or better than the energy efficiency and air quality achievable under the editions adopted under the 2001 IRC/IECC;
- Requiring the Laboratory to develop a standardized report format to be used by providers of home energy ratings; and
- Encouraging the Laboratory to cooperate with an industry organization or trade association to develop guidelines for home energy ratings, including training.

9.3 Calculation of Integrated NOx Emissions Reductions from Multiple State Agencies Participating in the Texas Emissions Reduction Plan (TERP)

In January 2005, the Laboratory was asked by the Texas Commission on Environmental Quality (TCEQ) to develop a method by which the NOx emissions savings from the energy-efficiency programs from multiple Texas State Agencies working under Senate Bill 5 and Senate Bill 7 could be reported in a uniform format to allow the TCEQ to consider the combined savings for Texas' State Implementation Plan (SIP) planning purposes. This required that the analysis should include the cumulative savings estimates from all projects projected through 2020 for both the annual and Ozone Season Day (OSD) NOx reductions. The NOx emissions reduction from all these programs were calculated using estimated emissions factors for 2007 from the US Environmental Protection Agency (US EPA) eGRID database, which had been especially prepared for this purpose. The different programs included in this 2010 cumulative analysis are:

- ESL Single-family new construction
- ESL Multi-family new construction
- ESL Commercial new construction
- Federal Buildings
- Furnace Pilot Light Program
- PUC Senate Bill 7 and Senate Bill 5 Program
- SECO Senate Bill 5 Program
- Electricity generated by wind farms in Texas (ERCOT) [10]
- SEER13 upgrades to Single-family and Multi-family residences

[10] ERCOT is the Electric Reliability Council of Texas.

The Laboratory's single-family and multi-family programs include the energy savings attained by constructing new residences in Texas according to the 2000/2001 IECC building code (2000 IECC). The baseline for comparison for the code programs is the published data on residential construction characteristics by the National Association of Home Builders (NAHB) for 1999 (NAHB 1999). Annual electricity (MWh) and natural gas (MMBtu) savings are from the Laboratory's Annual Reports to the TCEQ (Haberl et al., 2002-2010).

The Texas Public Utility Commission's (PUC) Senate Bill and Senate Bill 7 programs include their incentive and rebates programs managed by the different Utilities for Texas (PUC 2007). These include the Residential Energy Efficiency Programs (REEP) as well as the Commercial & Industrial Standard Offer Programs (C&I SOP). The energy efficiency measures include high efficiency HVAC equipment, variable speed drives, increased insulation levels, infiltration reduction, duct sealing, Energy Star Homes, etc. Annual electricity savings according to the utilities (or Power Control Authorities – PCAs) were reported for the different programs completed in the years 2001 through 2010. The PUC also reported the savings from the Senate Bill 5 grant program which was conducted in 2002 and 2003.

The Texas State Energy Conservation Office (SECO) funded energy-efficiency programs are directed toward school districts, government agencies, city and county governments, private industries and residential energy consumers. For the 2010 reporting year SECO submitted annual energy savings values for projects funded by SECO and by Energy Service projects.

The Electric Reliability Council of Texas (ERCOT) electricity production from currently installed green power generation (wind) in Texas is reported herein. The projections through 2013 include projects planned by ERCOT, in which include the annual growth factors beyond 2013 comply with the Legislative requirements. Actual measured electricity production for 2001 through 2010 are included.

Finally, NOx emissions reductions from several other programs are also reported, including: *energy efficiency measures applied to Federal buildings in Texas, reductions from the elimination of pilot lights in residential furnaces, and reductions from the installation of SEER 13 air conditioners in existing residences.*

9.4 Description of the Analysis Method

Annual and Ozone Season Day (OSD) NOx emissions reduction were calculated for 2010 and cumulatively from 2006 to 2020 using several factors to discount the potential savings. These factors include an annual degradation factor, a transmission and distribution factor, a discount factor and growth factors as shown in Table 9-1 and are described as follows:

Annual degradation factor: This factor was used to account for an assumed decrease in the performance of the measures installed as the equipment wears down and degrades. With the exception of electricity generated from wind, an annual degradation factor of 5% was used for all the programs[11] . This value was taken from a study by Kats et al. (1996).

Transmission and distribution loss: This factor adjusts the reported savings to account for the loss in energy resulting from the transmission and distribution of the power from the electricity producers to the electricity consumers. For this calculation, the energy savings reported at the consumer level are increased by 7% to give credit for the actual power produced that is lost in the transmission and distribution system on its way to the customer. In the case of electricity generated by wind, the T&D losses were assumed to cancel out since wind energy is displacing power produced by conventional power plants; therefore, there is no net increase or decrease in T&D losses.

[11] A degradation of 5% per year would accumulate as a 5%, 10%, 15%...etc, degradation in performance. Although the assumption of this high level of degradation may not actually occur, it was chosen as a conservative estimate. For wind energy, a degradation factor of 0% was used. The choice of a 0% degradation factor for wind is based on two year's of analysis of measured wind data from all Texas wind farms that shows no degradation, on average, for a two year period after the wind farms became operational.

Initial discount factor: This factor was used to discount the reported savings for any inaccuracies in the assumptions and methods employed in the calculation procedures. For the Laboratory's single- and multi-family program, the discount factor was assumed to be 20%. For PUC's Senate Bill 5 and Senate Bill 7 programs and electricity from wind, the discount factor was taken as 25%. For the savings in the SECO program, the discount factor was 60%.

Growth factor: The growth factors shown in Table 9-1 were used to account for several different factors. Growth factors for single-family (3.25%) and multi-family residential (1.54%) construction are projections based on the average growth rate for these housing types from recent U.S. Census data for Texas. Growth factors for wind energy are from the Texas Public Utilities Commission[12]. No growth was assumed for Federal buildings, pilot lights, PUC programs and SECO entries.

Figure 9-1 shows the overall information flow that was used to calculate the NOx emissions savings from the annual and Ozone Season Day (OSD) electricity savings (MWh) from all programs. For the Laboratory's single-family and multi-family code-implementation programs, the annual and ozone season savings were calculated from DOE-2 hourly simulation models[13]. The base case is taken as the average characteristics of single- and multi-family residences for Texas published by the National Association of Home Builders for 1999 (NAHB 1999). The OSD consumption is the average daily consumption for the period between July 15 and September 15, 1999. The annual electricity savings from PUC programs were calculated using deemed savings tables and spreadsheets created for the utilities incentive programs by Frontier Associates in Austin, Texas (PUC 2007).

The SECO electricity savings were submitted as annual savings by project[14]. A description of the measures completed for the project was also submitted for information purposes. The electricity production from wind farms in Texas was from the actual on-site metered data measured at 15-minute intervals.

Integration of the savings from the different programs into a uniform format allowed for creditable NOx emissions to be evaluated using different criteria as shown in Table 9-1. These include evaluation across programs, evaluation across individual counties by program, evaluation by SIP area, evaluation for all ERCOT counties except Houston/Galveston, and evaluation within a 200 km radius of Dallas/Ft.Worth.

9.5 Calculation Procedure

ESL Single-family and Multi-family. The calculation of the annual and OSD electricity savings reported for the years 2002 through 2010 included the savings from code-compliant new housing in all 41 non-attainment and affected counties as reported in the Laboratory's annual report submitted by the Laboratory to the Texas Commission of Environmental Quality (TCEQ). The savings for 2001 were also incorporated, since some of the programs were reporting savings from September to December 2001. From 2005 to 2010, the annual and OSD electricity savings were calculated for new residential construction in all the counties in ERCOT region, which includes the 41 non-attainment and affected counties. These savings were then tabulated by county and program. Using the calculated values through 2010, savings were then projected to 2020 by incorporating the different adjustment factors mentioned above.

In these calculations, it was assumed that the same amount of electricity savings from the code-complaint construction would be achieved for each year after 2010 through 2020[15]. The projected energy savings through 2020, according to county, were then divided into the different Power Control Authorities (PCA) in

[12] The growth factors for wind energy through 2012 are based on permitted wind farms registered with the Texas Public Utilities Commission, http://www.puc.state.tx.us/industry/maps/Electricity.aspx .Growth factors for 2013 through 2020 assume a linear projection based on the permits for 2011 and 2012.

[13] These values are based on a performance analysis as defined by Chapter 4 of IECC 2000/2001. This analysis is discussed in the Laboratory's annual reports to the TCEQ.

[14] The reporting requirements to the SECO did not require energy savings by project type, although for selected sites, energy savings by project type was available. Annual savings were reported by SECO in 2004. Values for 2005 to 2010 use the adjusted values from 2004.

[15] This would include the appropriate discount and degradation factors for each year.

eGRID. To determine which PCA was to be used, or in counties with multiple PCA, the allocation to each PCA by county was obtained from PUC's listing published in the Laboratory's 2009 annual report[16] .

For the 2010 annual and OSD NOx emissions calculations, the US EPA's 2007 eGRID were used[17] . An example of the eGRID spreadsheet[18] is given in Table 9-2. The total electricity savings for each PCA were used to calculate the NOx emissions reduction for each of the different counties using the emissions factors contained in eGRID. Similar calculations were performed for each year for which the analysis was required. The cumulative NOx emissions reduction for the electricity savings from residential new construction for 2005 through 2020 is provided in Table 9-3. NOx emissions reduction is provided in Table 9-4.

ESL-Commercial Buildings. The annual and OSD electricity savings for 2004 through 2009 for commercial buildings were obtained from the annual reports for 2004 through 2009 submitted by the Laboratory to TCEQ[19]. These savings were also tabulated by county and program. Using the calculated values through 2010, savings were then projected to 2020 by incorporating the different adjustment factors mentioned above[20]. In the projected annual electricity savings, it was assumed that the same 2010 amount of electricity savings would be achieved for each year through 2020. Similarly to the single family calculations, the projected energy saving numbers through 2020, by county, were allocated into the appropriate Power Control Authorities (PCA).

Federal Buildings. Energy savings achieved from Energy Savings Performance Contracts (ESPCs) were also reported in 2010. This includes savings (estimated) from energy conservation measures implemented in Federal Buildings in Texas. The 2010 savings include projects implemented in 13 Federal buildings reported by the regional office of the Department of Energy. Annual kWh savings reported for each of the projects were divided by 365 to obtain the average Ozone Season Day savings[21]. In the calculation for 2010, it was assumed that the electricity savings from 2005 would also be achieved for each year from 2006 through 2020 after the appropriate degradation factors and T&D loss were applied. Similarly to the single family calculations, the projected energy saving numbers through 2020, by county, were proportioned into the PUC's Power Control Authorities (PCA) and the cumulative NOx emission reduction values calculated.

Furnace Pilot Light Program. For the furnace pilot light program savings, the natural gas (N.G.) energy savings achieved by retrofitting existing furnaces in single-family and multi-family residences for the entire residential stock for Texas have been projected until 2020. Pilot light removal saves an estimated 500 Btu/hr of natural gas for each hour of operation for the entire life of the furnace when the furnace is replaced with a code-compliant replacement. The energy savings for the Ozone Season Day (OSD) are calculated by dividing the annual number by 365. It is also being assumed that of the total furnaces that were retrofitted, 75% are operational during the Ozone Season Period. Cumulative NOx emissions reduction for the N.G. savings from the removal of furnace pilot lights were also calculated by county for 2006 through 2020 by SIP area[22].

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[16] Haberl et al., 2010, pp. 265.
[17] This required two separate versions of the 2007 eGRID, which were specially prepared for Texas by Mr. Art Diem at the US EPA. One of the versions contains estimates of annual SOx, NOx and CO2 data for 2007, using a 25% capacity factor. The second version contains estimates of SOx, NOx and CO2 data for 2007 for an average day in the ozone season period, which runs from Mid July to Mid September.
[18] To use this spreadsheet electricity savings for each PCA is entered in the bottom row of the spreadsheet (MWh). The spreadsheet then allocates the MWh of electricity savings according to the counties (blue columns) where the PCA owned and operated a power plant. Totals for all PCAs are then listed on the far right columns (white columns). Similar spreadsheets for the 2007 eGRID exist for SOx and CO2.
[19] These savings include new construction in office, assembly, education, retail, food, lodging and warehouse construction as defined by Dodge building type (Dodge 2005), using energy savings from the Pacific Northwest National Laboratory (USDOE 2004), and data from CBECS (1995 - 2003).
[20] This also includes the appropriate discount and degradation factors for each year.
[21] This method yields suitable OSD values for lighting retrofits and/or retrofits that are not weather dependent. In the case of retrofits to cooling systems, weather normalization would increase the OSD savings substantially. Retrofits to heating systems would be reduced by weather normalization.
[22] These use the NOx/MMBtu values provided in the US EPA AP 42 guideline.

PUC-Senate Bill 7. For the PUC Senate Bill 7 program savings, the annual electricity savings for 2001 through 2010 were obtained from the Public Utilities Commission[23]. Using these values savings were projected through 2020 by incorporating the different adjustment factors mentioned above. Similar savings were assumed for each year after 2010 until 2020. The 2007 annual and OSD eGRID was also used to calculate the NOx emissions savings for the PUC-Senate Bill 7 program. The total electricity savings for each PCA was used to calculate the NOx emissions reduction for each county using the emissions factors contained in the US EPA's eGRID spreadsheet. The cumulative NOx emissions reduction for each county, by SIP area, for the different programs was then calculated.

PUC-Senate Bill 5 Grants Program. To calculate the annual electricity savings from the PUC's Senate Bill 5 program, electricity savings were also obtained from the Public Utilities Commission[24]. The annual and average day electricity savings were then proportioned according to the PCA and program. Using the actual reported numbers through 2003, savings through 2020 were projected incorporating the different adjustment factors mentioned above[25]. The 2007 annual and OSD eGRID were used to calculate the NOx emissions savings for PUC-Senate Bill 5 Grants Program. The total electricity savings for each PCA were used to calculate the NOx emissions reduction for each of the different counties.

SECO Savings. The annual electricity savings from energy conservation projects reported by political subdivisions for 39 counties through 2005 were obtained from the State Energy Conservation Office[26]. These submittals included information gathered from SECO's website[27] and paper submittals[28]. The annual and average day electricity values were then summarized according to county and program. Using the actual reported numbers for 2005, savings through 2020 were projected using the different adjustment factors mentioned above. In a similar fashion to the previous programs, it was assumed that the same amount of electricity savings will be achieved for each year through 2020. The 2007 annual and OSD eGRID were then used to calculate the NOx emissions savings for the SECO program.

Electricity Generated by Wind Farms. The measured electricity production from all the wind farms in Texas for 2001 through 2010 was obtained from the Energy Reliability Council of Texas (ERCOT). To obtain the annual production, the 15-minute data were summed for the 12 months, while for the OSD period the data were converted to average daily electricity production during the months of July, August and September. Using the reported numbers for 2010, savings through 2020 were projected incorporating the different adjustment factors mentioned above. The 2007 annual and OSD eGRID were then used to calculate the NOx emissions reduction for the electricity generated by Texas' wind farms[29]. The total electricity savings for each PCA was used to calculate the NOx emissions reduction for each of the different counties.

SEER 13 Single-Family and Multi-family. In January of 2006, Federal regulations mandated that the minimum efficiency for residential air conditioners be increased to SEER 13 from the previous SEER 10. Although the electricity savings from new construction reflected this change in values, the annual and OSD

[23] In a similar fashion to the previous programs, to obtain the Ozone Season Day (OSD) savings, the annual electricity savings were divided by 365.
[24] In a similar fashion as the PUC's Senate Bill 7 program, the annual electricity savings numbers were then divided by 365 to get average electricity savings per day for OSD calculations. The preferred approach would be to weather-normalize the savings and then calculate savings for the OSD period. However, only annual values were obtained for the 2005 report to the TCEQ. Dividing the annual values by 365 is probably a reasonable approach for lighting projects. However, this undercounts potential savings from electric loads associated with the cooling season.
[25] Since the savings for the PUC's Senate Bill 5 were only reported for two years these savings actually reduced due to the imposed degradation factor.
[26] In a similar fashion as the PUC's Senate Bill 5 and 7 programs, these annual electricity savings numbers were divided by 365 to get average electricity savings per day for the OSD calculations.
[27] This web site was developed for SECO by the Laboratory, at the request of the TCEQ.
[28] In these submittals, there were several municipalities whose electricity or natural consumption increased in 2004 as compared to 2001, which caused the reported savings from these municipalities to be negative. Since no additional information was reported from these projects that might have indicated what the cause of this was, it was assumed that the energy conservation projects were working as designed, but that other factors had changed the energy consumption. Therefore, in the final values of electricity savings from the political subdivisions that reported to SECO for the calculation of annual and OSD NOx reductions, the negative savings were omitted.
[29] This credited the electricity generated by the wind farm to the utility that either owned the wind farm or was associated with the wind farm owner.

electricity savings from the replacement of the air conditioning units by air conditioners with an efficiency of SEER 13 in existing residences needed to be calculated.

In the 2010 report to the TCEQ, the annual and OSD electricity savings for all the counties in ERCOT region as well as the 41 non-attainment and affected counties were calculated. Using the numbers for 2010, the savings through 2020 were projected by incorporating the appropriate adjustment factors[30]. In this analysis it was assumed that an equal number of existing houses had their air conditioners replaced by the air conditioner manufacturers. This replacement rate continued until all the existing air conditioner stock was replaced with SEER 13 air conditioners. The total electricity savings for each PCA were used to calculate the NOx emissions reduction for each of the different county using the emissions factors contained in the 2007 eGRID. Cumulative NOx emissions reduction for each county by SIP area was also calculated.

9.6 Results

The total cumulative annual and OSD electricity savings for all the different programs in the integrated format was calculated using the adjustment factors shown in Table 9-1 for 2005 through 2020 as shown in Table 9-3. NOx emissions reduction from the electricity and natural gas savings for the annual and OSD for all the programs in the integrated format is shown in Table 9-4. In Table 9-3 and Table 9-4 annual integrated values are shown for 2006 through 2020. The OSD NOx emissions reduction is also shown in Figure 9-2 as stacked bar charts and in Figure 9-3 for the individual components

In 2010 (Table 9-3), the total cumulative annual savings from all programs in 2010 is 31,731,502 MWh/year (30,984,680 MWh/year and 2,548,904 MMBtu/year). The annual integrated electricity savings[31] from all the different programs is:

- Savings from code-compliant residential and commercial construction is 1,854,699 MWh/year (5.8% of the total electricity savings),
- Savings from retrofits to Federal buildings is 293,659 MWh/year (0.9%),
- Savings from furnace pilot light retrofits is 2,548,904 MMBtu/year (2.4%), which is equivalent to 746,822 MWh/year,
- Savings from the PUC’s Senate Bill 5 and Senate Bill 7 programs is 2,595,953 MWh/year (8.2%),
- Savings from SECO’s Senate Bill 5 program is 468,611 MWh/year (1.5%),
- Electricity savings from green power purchases (wind) is 24,210,883 MWh/year (76.3%), and
- Savings from residential air conditioner retrofits[32] is 1,560,875 MWh/year (4.9%).

In 2010, the total cumulative OSD savings from all programs in 2010 is 84,150 MWh/day (82,104 MWh/day and 6,983 MMBtu/day), which would be a 3,506 MW average hourly load reduction during the OSD period. The cumulative OSD electricity savings from all the different programs is:

- Savings from code-compliant residential and commercial construction is 10,641 MWh/day (12.6%),
- Savings from retrofits to Federal buildings is 805 MWh/day (1.0%),
- Savings from furnace pilot light retrofits is 6,983 MMBtu/day (2.4%), which is equivalent to 2,046 MWh/day,
- Savings from the PUC’s Senate Bill 5 and Senate Bill 7 programs is 7,113 MWh/day (8.5%),
- Savings from SECO’s Senate Bill 5 program is 1,284 MWh/day (1.5%),
- Electricity savings from green power purchases (wind) are 51,190 MWh/day (60.8%), and
- Savings from residential air conditioner retrofits are 11,071 MWh/day (13.2%).

[30] Additional details about this calculation are contained in the Laboratory’s 2006 Annual Report to the TCEQ, available at the ESL’s web site “esl.tamu.edu”, under TERP.
[31] This includes the savings from 2005 through 2010.
[32] This assumes air conditioners in existing homes are replaced with the more efficient SEER 13 units, versus an average of SEER 11, which is slightly more efficient than the previous minimum standard of SEER 10.

By 2013, the total cumulative annual savings from all programs will be 35,758,047 MWh/year (35,011,225 MWh/year and 2,548,904 MMBtu/year). The cumulative annual electricity savings from all the different programs is:

- Savings from code-compliant residential and commercial construction will be 2,311,539 MWh/year (6.5% of the total electricity savings),
- Savings from retrofits to Federal buildings will be 402,732 MWh/year (1.1%),
- Savings from furnace pilot light retrofits will remain at 2,548,904 MMBtu/year (2.1%), which is equivalent to 746,822 MWh/year,
- Savings from the PUC's Senate Bill 5 and Senate Bill 7 programs will be 3,224,560 MWh/year (9.0%),
- Savings from SECO's Senate Bill 5 program will be 489,440 MWh/year (1.4%),
- Electricity savings from green power purchases (wind) will be 26,296,721 MWh/year (73.5%), and
- Savings from residential air conditioner retrofits[33] will be 2,286,233 MWh/year (6.4%).

By 2013, the total cumulative OSD savings from all programs will be 98,298 MWh/day (96,252 MWh/day and 6,983 MMBtu/day), which would be a 4,096 MW average hourly load reduction during the OSD period. The cumulative OSD electricity savings from all the different programs is:

- Savings from code-compliant residential and commercial construction will be 13,157 MWh/day (13.4%),
- Savings from retrofits to Federal buildings will be 1,103 MWh/day (1.1%),
- Savings from furnace pilot light retrofits will remain at 6,983 MMBtu/day (2.1%), which is equivalent to 2,046 MWh/day,
- Savings from the PUC's Senate Bill 5 and Senate Bill 7 programs will be 8,835 MWh/day (9.0%),
- Savings from SECO's Senate Bill 5 program will be 1,341 MWh/day (1.4%),
- Electricity savings from green power purchases (wind) will be 55,600 MWh/day (56.6%), and
- Savings from residential air conditioner retrofits will be 16,216 MWh/day (16.5%).

In 2010 (Table 9-4), the total cumulative annual NOx emissions reduction from all programs is 18,907 tons-NOx/year. The cumulative annual NOx emissions reduction[34] from all the different programs is:

- NOx emissions reduction from code-compliant residential and commercial construction is 1,303 tons-NOx/year (6.9% of the total NOx savings),
- NOx emissions reduction from retrofits to Federal buildings is 225 tons-NOx/year (1.2%),
- NOx emissions reduction from furnace pilot light retrofits is 117 tons-NOx/year (0.6%),
- NOx emissions reduction from the PUC's Senate Bill 5 and Senate Bill 7 programs is 1,783 tons-NOx/year (9.4%),
- NOx emissions reduction from SECO's Senate Bill 5 program is 357 tons-NOx/year (1.9%),
- NOx emissions reduction from green power purchases (wind) is 14,047 tons-NOx/year (74.3%), and
- NOx emissions reduction from residential air conditioner retrofits is 1,075 tons-NOx/year (5.7%).

In 2010, the total cumulative OSD NOx emissions reduction from all programs is 51.58 tons-NOx/day. The cumulative OSD NOx emissions reduction from all the different programs is:

- NOx emissions reduction from code-compliant residential and commercial construction is 7.34 tons-NOx/day (14.2%),
- NOx emissions reduction from retrofits to Federal buildings is 0.59 tons-NOx/day (1.1%),
- NOx emissions reduction from furnace pilot light retrofits is 0.32 tons-NOx/day (0.6%),
- NOx emissions reduction from the PUC's Senate Bill 5 and Senate Bill 7 programs is 4.79 tons-NOx/day (9.3%),
- NOx emissions reduction from SECO's Senate Bill 5 program is 0.97 tons-NOx/day (1.9%),

[33] This assumes air conditioners in existing homes are replaced with the more efficient SEER 13 units, versus an average of SEER 11, which is slightly more efficient than the previous minimum standard of SEER 10.
[34] These NOx emissions reductions were calculated with the US EPA's 2007 eGRID for annual (25% capacity factor) and Ozone Season Day OSD.

- NOx emissions reduction from green power purchases (wind) are 30.04 tons-NOx/day (58.2%), and
- NOx emissions reduction from residential air conditioner retrofits are 7.53 tons-NOx/day (14.6%).

By 2013, the total cumulative annual NOx emissions reduction from all programs will be 21,396 tons-NOx/year. The cumulative annual NOx emissions reduction from all the different programs is:

- NOx emissions reduction from code-compliant residential and commercial construction will be 1,620 tons-NOx/year (7.6% of the total NOx savings),
- NOx emissions reduction from retrofits to Federal buildings will be 308 tons-NOx/year (1.4%),
- NOx emissions reduction from furnace pilot light retrofits will be 117 tons-NOx/year (0.5%),
- NOx emissions reduction from the PUC's Senate Bill 5 and Senate Bill 7 programs will be 2,147 tons-NOx/year (10.0%),
- NOx emissions reduction from SECO's Senate Bill 5 program will be 373 tons-NOx/year (1.7%),
- NOx emissions reduction from green power purchases (wind) will be 15,257 tons-NOx/year (71.3%), and
- NOx emissions reduction from residential air conditioner retrofits will be 1,574 tons-NOx/year (7.4%).

By 2013, the total cumulative OSD NOx emissions reduction from all programs is 60.61 tons-NOx/day. The cumulative OSD NOx emissions reduction from all the different programs is:

- NOx emissions reduction from code-compliant residential and commercial construction will be 9.03 tons-NOx/day (14.9%),
- NOx emissions reduction from retrofits to Federal buildings will be 0.81 tons-NOx/day (1.3%),
- NOx emissions reduction from furnace pilot light retrofits will be 0.32 tons-NOx/day (0.5%),
- NOx emissions reduction from the PUC's Senate Bill 5 and Senate Bill 7 programs will be 5.78 tons-NOx/day (9.5%),
- NOx emissions reduction from SECO's Senate Bill 5 program will be 1.01 tons-NOx/day (1.7%),
- NOx emissions reduction from green power purchases (wind) will be 32.63 tons-NOx/day (53.8%), and
- NOx emissions reduction from residential air conditioner retrofits will be 11.03 tons-NOx/day (18.2%).

9.7 Summary

This preliminary report on the NOx emissions savings from the energy-efficiency programs from multiple Texas State Agencies working under Senate Bill 5 and Senate Bill 7 in a uniform format allows the TCEQ to consider the combined savings for Texas' State Implementation Plan (SIP) planning purposes. This required that the analysis should include the cumulative savings estimates from all projects projected through 2020 for both the annual and Ozone Season Day (OSD) NOx reductions. The NOx emissions reduction from all these programs were 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.

In 2010, the cumulative total electricity savings from all programs are:

- Annual electricity savings is 31,731,502 MWh/year (18,907 tons-NOx/year) and
- OSD electricity savings is 84,150 MWh/day, which would be a 3,506 MW average hourly load reduction during the OSD period (51.58 tons-NOx/day).

By 2013, the projected cumulative total electricity savings from all programs will be:

- Annual electricity savings will be 35,758,047 MWh/year (21,396 tons-NOx/year) and
- OSD electricity savings will be 98,298 MWh/day, which would be a 4,096 MW average hourly load reduction during the OSD period (60.61 tons-NOx/day).

The Laboratory has and will continue to provide leading-edge technical assistance to counties and communities working toward obtaining full SIP credit for the energy efficiency and renewable energy projects that are lowering emissions and improving the air for all Texans. The Laboratory will continue to provide superior technology to the State of Texas through efforts with the TCEQ and US EPA. The efforts taken by the Laboratory have produced significant success in bringing EE/RE closer to US EPA acceptance in the SIP.

Table 9-1: Final Adjustment Factors used for the Calculation of the Annual and OSD NOx Savings for the Different Programs

	ESL-Single Family[16]	ESL-Multifamily[16]	ESL-Commercial[16]	Federal Buildings[15]	Furnace Pilot Light Program[15]	PUC (SB7)[15]	PUC (SB5 Grant Program)[15]	SECO[15]	Wind-ERCOT[8]	SEER13 Single Family	SEER13 Multifamily
Annual Degradation Factor [11]	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	0.00%	5.00%	5.00%
T&D Loss [9]	7.00%	7.00%	7.00%	7.00%	0.00%	7.00%	7.00%	7.00%	0.00%	7.00%	7.00%
Initial Discount Factor [12]	20.00%	20.00%	20.00%	20.00%	20.00%	25.00%	25.00%	60.00%	25.00%	20.00%	20.00%
Growth Factor	3.25%	1.54%	3.25%	0.00%	0.00%	0.00%	0.00%	0.00%	Actual Rates	N.A.	N.A.
Weather Normalized	Yes	Yes	Yes	No	No	No	No	No	See note 7	Yes	Yes

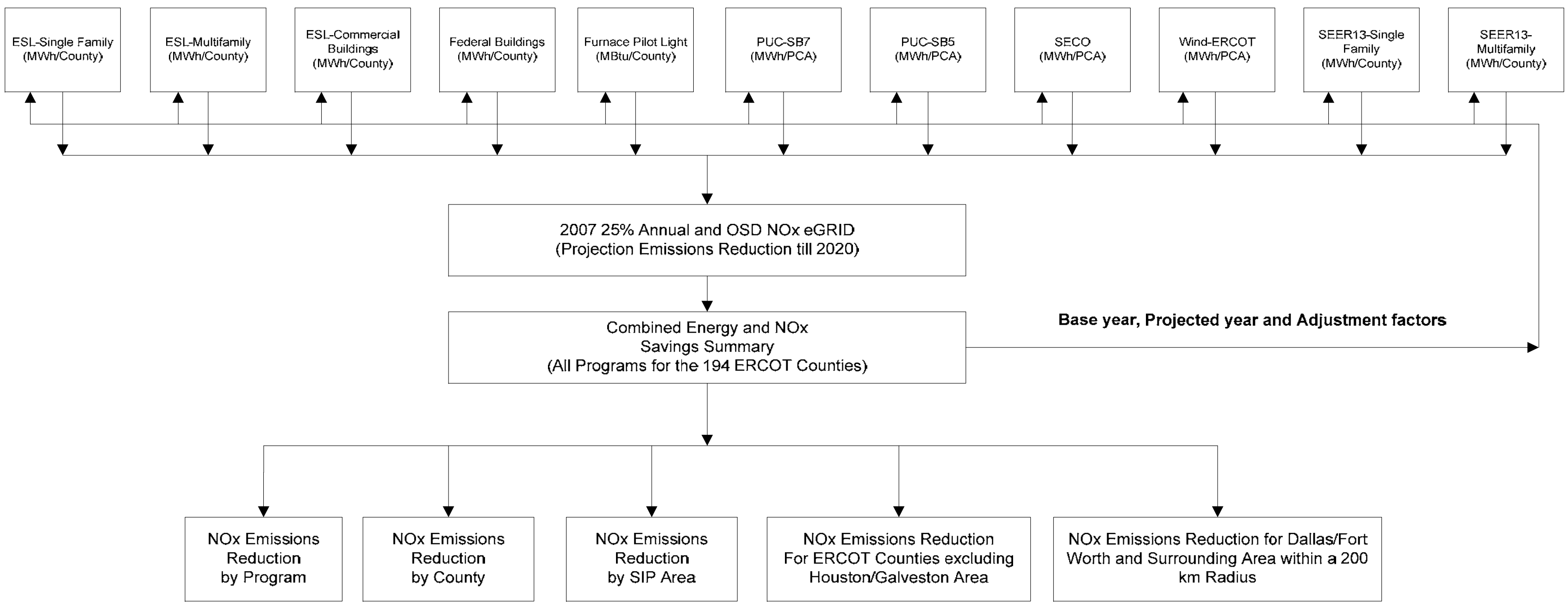

Figure 9-1: Process Flow Diagram of the NOx Emissions Reduction Calculations

Table 9-2: Example of NOx Emissions Reduction Calculations using eGRID

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)	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	0.008831132	226.0465792	0.010890729	8.193488679	0.006522185	0	0.003944232	14.32402746	0.065444292	3035.079423	0.014877434	272.3666894	0.006262315	0	0.004817148	0	0.121274957	139.7235344	0.00816387	940.7285451	4636.462287	2.318231144
	Chambers	0.021762222	557.0379581	0.026955801	20.27982242	0.016072371	0	0.009076193	32.96145962	0.164940225	7649.355979	0.037472294	686.0191605	0.015055623	0	0.009553214	0	0.011518588	13.2708178	0.015818592	1822.787617	10781.71281	5.390856407
	Fort Bend	0.070431234	1802.797078	0.087239726	65.63359654	0.052016606	0	0.029374182	106.6764342	0.533812376	24756.36787	0.121275295	2220.231709	0.048726002	0	0.030918012	0	0.037278747	42.94966114	0.051195276	5899.267979	34893.92432	17.44696216
	Galveston	0.033856739	866.6159501	0.041710519	31.3803294	0.025004711	0	0.015351589	55.75143316	0.249587379	11574.99759	0.056747051	1038.889275	0.024143087	0	0.019297151	0	0.567751219	654.118618	0.032836887	3783.817742	18005.57093	9.002785467
	Harris	0.068267332	1747.408655	0.084559408	63.61709594	0.050418468	0	0.028471701	103.3989497	0.517411736	23995.76304	0.117549281	2152.01819	0.047228963	0	0.029968099	0	0.03613341	41.63009278	0.049622373	5718.021208	33821.85723	16.91092861
	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	0.002039135	52.19483875	0.003716345	2.795940278	0.001505992	0	0.005950953	21.61171382	0.002481478	115.0823578	0.000717051	13.12731328	0.019166247	0	0.07668094	0	0.00086441	0.995905867	0.004000199	460.945804	666.7538738	0.333376937
	Dallas	0.004539471	116.1948312	0.004683963	3.523914222	0.003352602	0	0.00774211	28.1165509	0.002085611	96.72341896	0.00068106	12.46842352	0.007502816	0	0.026717045	0	0.007524933	8.669640256	0.040370454	4651.916039	4917.612818	2.458806409
	Denton	0.00047388	12.12970385	0.000872802	0.656640103	0.000349982	0	0.001396994	5.073377767	0.000585443	27.15083393	0.000168971	3.093405773	0.00454374	0	0.018187155	0	0.000186605	0.214992277	0.000849405	97.87758499	146.1965387	0.073098269
	Tarrant	0.012162492	311.3179263	0.012266309	9.228387517	0.008982543	0	0.020308652	73.75369976	0.005316504	246.5610524	0.001752506	32.08377752	0.017326428	0	0.060216761	0	0.020603444	23.73767965	0.110647237	12749.95959	13446.64211	6.723321056
	Ellis	0.003279814	83.95193355	0.003307809	2.488584531	0.002422289	0	0.005476558	19.88888265	0.001433682	66.48919108	0.000472592	8.651911537	0.004672353	0	0.016238427	0	0.005556053	6.401250735	0.029837824	3438.233618	3626.105373	1.813052686
	Johnson	0.000286058	7.322112154	0.000526868	0.396381687	0.000211267	0	0.000843297	3.062551359	0.000353404	16.38963767	0.000101999	1.867338584	0.002742835	0	0.010978701	0	0.000112645	0.129780379	0.000512745	59.08393672	88.25173856	0.044125869
	Kaufman	0.006325453	161.9098051	0.006379446	4.799487271	0.004671629	0	0.010562096	38.3577242	0.002765	128.2311379	0.000911441	16.68608752	0.009011105	0	0.031317452	0	0.010715411	12.34546025	0.057545265	6630.9817	6993.311403	3.496655701
	Parker	0.000217489	5.566981877	0.000400576	0.301367914	0.000160626	0	0.000641157	2.328449436	0.000268692	12.46099677	7.75498E-05	1.419732426	0.00208537	0	0.008347076	0	8.56434E-05	0.098671668	0.000389838	44.92135575	67.09755584	0.033548778
	Rockwall	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Henderson	0.000819895	20.98648722	0.000826893	0.622101782	0.000605529	0	0.001369042	4.971866208	0.000358395	16.62111282	0.00011814	2.162823693	0.001168005	0	0.004059317	0	0.001388914	1.600198603	0.007458924	859.4971295	906.4617199	0.45323086
	Hood	0.01252711	320.6508812	0.012634039	9.505044007	0.009251829	0	0.020917482	75.96475123	0.005475887	253.9526704	0.001805044	33.04561243	0.017845854	0	0.062021991	0	0.021221112	24.4493081	0.113964315	13132.18878	13849.75705	6.924878523
	Hunt	0.006187558	158.3801895	0.006240374	4.694858985	0.004569788	0	0.010331844	37.5215301	0.002704724	125.4357135	0.000891572	16.32233268	0.008814664	0	0.030634735	0	0.010481817	12.0763306	0.056290785	6486.427041	6840.857996	3.420428998
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	0.033413751	855.276978	0.051775843	38.95283667	0.024677545	0	0.090663423	329.2568536	0.001141841	52.95463998	1.143571754	20935.7914	0.046873844	0	0.004669544	0	0.000519582	0.598622181	0.002503865	288.5221599	22501.3535	11.25067675
	Comal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Guadalupe	0.002000467	51.20507169	0.076378745	57.46248772	0.001477434	0	0.133848731	486.0903138	0.001237133	57.37392999	0.003554796	65.07897116	0.001061766	0	0.001855699	0	0.000401718	0.462828487	0.001835165	211.4673431	929.140946	0.464570473
	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	0.004502334	115.2442433	0.171901148	129.3274415	0.003325174	0	0.301245466	1094.014881	0.002784342	129.1281298	0.008000571	146.4694129	0.002389654	0	0.004176513	0	0.000904124	1.041660856	0.004130298	475.937112	2091.162881	1.04558144
	Caldwell	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hays	0.002458599	62.93167289	0.093870431	70.62211537	0.001815785	0	0.164501762	597.4110691	0.001520452	70.51327681	0.004368889	79.98286869	0.001304924	0	0.002280677	0	0.000493717	0.568821994	0.00225544	259.8960069	1141.925832	0.570962916
	Travis	0.000510007	13.05442349	0.299602906	225.4020851	0.000376663	0	0.033939476	123.2559365	0.000334709	15.52263338	0.000906121	16.58869273	0.000271138	0	0.000471744	0	0.000103327	0.119045148	0.000467336	53.85143207	447.7942484	0.223897124
	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	0.000685965	17.55833805	0.00069182	0.520481264	0.000506616	0	0.001145408	4.159710327	0.000299851	13.90604891	9.88414E-05	1.809525774	0.000977211	0	0.003396227	0	0.001162035	1.338805667	0.006240507	719.0980079	758.3909179	0.379195459
	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	5824.975938	0.004556851	3.428283791	0.168069652	0	0.007612767	27.64682441	0.001680888	77.95375313	0.001626796	29.78235622	0.046792036	0	0.007246366	0	0.001609426	1.854254911	0.008283395	954.5014455	6920.142856	3.460071428
	San Patricio	0.050313351	1287.848557	0.001007478	0.757961986	0.037158653	0	0.001683113	6.112458369	0.000371629	17.2348572	0.00035967	6.584604794	0.010345288	0	0.001602105	0	0.000355829	0.409958691	0.001831382	211.0314828	1529.979881	0.76498994
Victoria Area	Victoria	0.021836736	558.9452467	0.002215582	1.666862472	0.016127403	0	0.003612695	13.12000619	0.001199621	55.63426979	0.000555389	10.16770824	0.52545648	0	0.032412721	0	0.000476855	0.549395481	0.002254849	259.8278678	899.9113567	0.449955678
Other ERCOT counties	Andrews	2.47421E-05	0.633312124	2.49533E-05	0.018773251	1.82731E-05	0	4.13138E-05	0.150036693	1.08153E-05	0.501577618	3.56511E-06	0.065267829	3.5247E-05	0	0.000122499	0	4.19135E-05	0.048289414	0.000225089	25.93716362	27.35442055	0.01367721
	Angelina	0.00031082	7.955919749	0.000313473	0.235837079	0.000229554	0	0.000519	1.884820844	0.000135867	6.301018286	4.47864E-05	0.81992053	0.000442787	0	0.001538876	0	0.000526534	0.606630902	0.002827658	325.8330045	343.6371519	0.171818576
	Bosque	0.000595392	15.23997933	0.001096604	0.825014503	0.000439723	0	0.001755208	6.374283599	0.000735562	34.11279889	0.000212298	3.88661097	0.005708837	0	0.02285067	0	0.000234455	0.270120186	0.001067208	122.9751683	183.6839758	0.091841988
	Brazos	0.001939725	49.65028649	0.003572622	2.687812467	0.001432574	0	0.005718288	20.7667609	0.002396384	111.1359931	0.000691644	12.66217912	0.018598805	0	0.074445136	0	0.000763829	0.880023807	0.003476855	400.6404605	598.4235164	0.299211758
	Calhoun	0.082699809	2116.830355	0.001655986	1.245858399	0.061077496	0	0.002766524	10.04701783	0.000610844	28.32885022	0.000591187	10.8230826	0.0170045	0	0.002633372	0	0.000584875	0.673847089	0.003010234	346.8714129	2514.820424	1.257410212
	Cameron	0.048371747	1238.150172	0.000968599	0.728712051	0.297964476	0	0.001618161	5.876577133	0.000357288	16.56975992	0.00034579	6.330503314	0.009946061	0	0.001540279	0	0.000342098	0.394138287	0.001760709	202.8877272	1470.93759	0.735468795
	Cherokee	0.003503899	89.68774747	0.003533808	2.658611083	0.002587786	0	0.00585073	21.24774271	0.001531635	71.03190513	0.00050488	9.243032581	0.00499158	0	0.017347879	0	0.005935657	6.838600793	0.031876422	3673.14266	3873.8503	1.93692515
	Coke	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Coleman	0.001298787	33.24447222	2.6007E-05	0.019566001	0.000959212	0	4.34478E-05	0.157786761	9.59321E-06	0.444899929	9.2845E-06	0.16997473	0.000267053	0	4.13567E-05	0	9.18536E-06	0.010582658	4.72752E-05	5.447558433	39.49484073	0.01974742
	Crockett	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ector	0.003535748	90.50296541	0.003565928	2.682776563	0.002611307	0	0.005903911	21.44087434	0.001545556	71.67755054	0.00050947	9.327047245	0.005036951	0	0.017505563	0	0.00598961	6.900760344	0.032166163	3706.529738	3909.061712	1.954530856
	Fannin	0.007056315	180.6173605	0.007116546	5.354034748	0.005211403	0	0.011782473	42.78969328	0.003084477	143.0473568	0.001016752	18.61404924	0.010052276	0	0.034935966	0	0.011953503	13.77189259	0.064194222	7397.14566	7801.340048	3.900670024
	Fayette	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Freestone	0.003677178	94.12308402	0.003708565	2.790087625	0.00271576	0	0.006140067	22.29850932	0.001607379	74.54465257	0.000529848	9.700129134	0.005238429	0	0.018205785	0	0.006229194	7.176790757	0.033452809	3854.790927	4065.42418	2.03271209
	Frio	0.008588335	219.8317964	0.000871383	0.655572927	0.006342868	0	0.001420864	5.160066298	0.000471808	21.88082203	0.000218433	3.998934744	0.206660746	0	0.012747844	0	0.000187546	0.216075897	0.000886827	102.189664	353.9329323	0.176966466
	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	0.188527456	4825.653746	0.003775086	2.840133709	0.139235931	0	0.006306735	22.9037859	0.001392518	64.58015017	0.001347706	24.6729498	0.0387644	0	0.006003193	0	0.001333316	1.536142338	0.006862311	790.7489276	5732.935836	2.866467918
	Howard	0.000555113	14.20898268	0.000559851	0.421196428	0.000409976	0	0.000926915	3.366221326	0.000242653	11.25338899	7.99868E-05	1.464348181	0.000790802	0	0.002748377	0	0.00094037	1.083420679	0.005050094	581.9258697	613.723428	0.306861714
	Jack	0.002121449	54.30177924	0.002139557	1.609665938	0.001566784	0	0.003542346	12.86452461	0.000927334	43.00653033	0.000305682	5.596228347	0.00302217	0	0.010503338	0	0.003593766	4.140456206	0.019299698	2223.917843	2345.437027	1.17271851
	Jones	0.040718722	1042.259088	0.000815354	0.613420549	0.030072592	0	0.001362147	4.946827986	0.00030076	13.94821343	0.000291082	5.32893728	0.008372468	0	0.001296587	0	0.000287974	0.331780603	0.001482142	170.7883116	1238.216579	0.61910829
	Lamar	0.000950838	24.33817497	0.000958954	0.721455757	0.000702236	0	0.001587687	5.765907769	0.000415633	19.27561996	0.000137007	2.508241656	0.001354543	0	0.004707619	0	0.001610734	1.855761432	0.008650166	996.7647898	1051.229951	0.525614976
	Limestone	0.000719757	18.42329542	0.000891528	0.670728366	0.000531572	0	0.000300183	1.090156782	0.00545518	252.9923553	0.001239347	22.68917849	0.000497945	0	0.00031596	0	0.000380962	0.438914787	0.000523179	60.28629516	356.5909243	0.178295462
	Llano	0.001238174	31.69299001	0.047274044	35.56597012	0.000914447	0	0.082844655	300.8619059	0.000765714	35.51115798	0.002200214	40.28013466	0.000657172	0	0.001148571	0	0.000248641	0.286464175	0.001135861	130.8861051	575.0847279	0.287542364
	McLennan	0.024534317	627.9940467	0.024743738	18.61560781	0.018119687	0	0.040966843	148.7767984	0.010724513	497.3657473	0.003535175	64.71975936	0.034951066	0	0.121469933	0	0.041561501	47.88391622	0.22319886	25719.36288	27124.71876	13.56235938
	Milam	0.002245405	57.4746346	0.002264571	1.703718789	0.001658332	0	0.003749326	13.61619935	0.000981518	45.51940379	0.000323543	5.923216216	0.003198756	0	0.011117048	0	0.00380375	4.382383245	0.02042738	2353.86146	2482.481016	1.241240508
	Mitchell	0.014943169	382.493668	0.015070721	11.3382478	0.011036196	0	0.024951762	90.61580067	0.006532002	302.9316123	0.002153177	39.41900132	0.02128772	0	0.07398395	0	0.025313952	29.16475857	0.135944204	15664.94698	16520.91007	8.260455036
	Nolan	0.000564654	14.45319062	0.000569473	0.428435476	0.000417022	0	0.000942846	3.424076134	0.000246823	11.44679952	8.13615E-05	1.489515743	0.000804394	0	0.002795613	0	0.000956532	1.102041289	0.005136889	591.9273539	624.2714127	0.312135706
	Palo Pinto	0.003206998	82.08811543	0.005906709	4.443830552	0.002368511	0	0.009454195	34.33422818	0.003962005	183.7440401	0.001143513	20.93471146	0.030749889	0	0.123082087	0	0.001262858	1.454966345	0.005748375	662.3893373	989.3892293	0.494694615
	Pecos	4.09677E-05	1.048631523	4.13174E-05	0.031084551	3.02565E-05	0	6.84069E-05	0.248429171	1.79079E-05	0.830506919	5.90308E-06	0.108069782	5.83617E-05	0	0.000202832	0	6.93999E-05	0.079957102	0.0003727	42.94648142	45.29316047	0.02264658
	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	0.000737708	18.88277792	0.000835096	0.628273174	0.00054483	0	0.000735917	2.67258533	0.003149678	146.0711407	0.000730875	13.38040458	0.00076086	0	0.001866305	0	0.191632518	220.7840225	0.003397737	391.5236901	793.9428943	0.396971447
	Taylor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Titus	0.005696437	145.8091831	0.005745061	4.322217039	0.004207073	0	0.009511781	34.54335843	0.002490043	115.4795873	0.000820806	15.02679093	0.008115023	0	0.028203184	0	0.00964985	11.11780398	0.051822854	5971.584145	6297.883086	3.148941543
	Tom Green	0.001482448	37.94556586	2.96846E-05	0.022332825	0.001094854	0	4.95918E-05	0.180099353	1.09498E-05	0.507813132	1.05974E-05	0.19401082	0.000304817	0	4.72049E-05	0	1.04843E-05	0.012079149	5.39604E-05	6.217896494	45.07979763	0.022539899
	Upton	3.11661E-05	0.797745539	3.14322E-05	0.023647546	2.30176E-05	0	5.20405E-05	0.188992281	1.36234E-05	0.631807433	4.49076E-06	0.082213995	4.43986E-05	0	0.000154304	0	5.27959E-05	0.060827297	0.000283531	32.67149923	34.45673333	0.017228367
	Ward	0.018559529	475.0600294	0.01871795	14.08218954	0.013707039	0	0.030990277	112.54551	0.008112796	376.2433542	0.002674262	48.95869786	0.026439509	0	0.091888626	0	0.03144012	36.22285079	0.16884373	19455.98267	20519.0953	10.25954765
	Webb	0.020014327	512.2978652	0.000400768	0.301512399	0.014781473	0	0.000669531	2.431496589	0.000147832	6.855915242	0.000143074	2.619313398	0.004115289	0	0.000637307	0	0.000141547	0.163078928	0.000728512	83.94696529	608.6161471	0.304308074
	Wharton	0.00014434	3.694599265	0.000178787	0.134507561	0.000106601	0	6.01986E-05	0.218619544	0.001093979	50.7349716	0.000248538	4.550077512	9.98576E-05	0	6.33625E-05	0	7.6398E-05	0.088019771	0.000104918	12.08978615	71.5105814	0.035755291
	Wichita	0.000207633	5.314695266	0.000209406	0.157543345	0.000153346	0	0.000346701	1.259093698	9.07612E-05	4.209191786	2.99181E-05	0.547721432	0.00029579	0	0.001027996	0	0.000351734	0.405240184	0.001888925	217.6622165	229.5557022	0.114777851
	Wilbarger	0.028616818	732.4920115	0.000573025	0.431107444	0.021134796	0	0.000957307	3.476594279	0.000211372	9.802701684	0.00020457	3.745137877	0.005884109	0	0.000911232	0	0.000202386	0.233172965	0.001041639	120.0287677	870.2094935	0.435104747
	Wise	0.002844488	72.80908734	0.002882008	2.16823872	0.002100781	0	0.00476997	17.32281236	0.001256075	58.25242144	0.000413241	7.565361234	0.004181914	0	0.014614274	0	0.004797945	5.527817073	0.025761411	2968.505674	3132.151412	1.566075706
	Young	0.006235856	159.6164509	0.006289085	4.731505443	0.004605458	0	0.010412491	37.81441029	0.002725836	126.4148216	0.000898531	16.44973921	0.008883468	0	0.030873859	0	0.010563634	12.17059429	0.056730171	6537.057865	6894.255386	3.447127693
	Total	**1.121837219**	**28715.17018**	**1.172570094**	**882.1668247**	**1.090766584**	**0**	**1.189130767**	**4318.494059**	**1.629360006**	**75564.06999**	**1.542362643**	**28236.60382**	**1.359385821**	**0**	**1.231642808**	**0**	**1.221806085**	**1407.669558**	**1.528786947**	**176163.2035**	**315287.3779**	**157.643689**
Energy Savings by PCA (MWh)		25,597		752		0		3,632		46,377		18,307		0		0		1,152		115,231			

Table 9-3: Annual and OSD Electricity Savings for the Different Programs

PROGRAM	ANNUAL															
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
ESL-Single Family (MWh)	225,389	1,001,051	1,197,537	1,256,764	1,252,530	1,280,624	1,306,878	1,331,121	1,353,183	1,372,892	1,390,077	1,404,569	1,416,195	1,424,785	1,430,169	1,432,174
ESL-Multifamily (MWh)	9,228	37,821	51,312	63,156	165,765	265,891	362,247	454,747	543,309	627,848	708,280	784,522	856,489	924,098	987,265	1,045,906
ESL-Commercial (MWh)	63,456	129,063	192,036	231,649	270,392	308,184	344,944	380,592	415,047	448,228	480,055	510,445	539,320	566,597	592,196	616,037
Federal Buildings (MWh)	52,276	109,073	159,415	206,960	251,708	293,659	332,813	369,171	402,732	433,496	461,464	486,635	509,009	528,586	545,366	559,350
Furnace Pilot Light Program (MMBtu)	2,209,050	2,548,904	2,548,904	2,548,904	2,548,904	2,548,904	2,548,904	2,548,904	2,548,904	2,548,904	2,548,904	2,548,904	2,548,904	2,548,904	2,548,904	2,548,904
PUC (SB7) (MWh)	302,192	1,362,701	1,630,383	2,003,432	2,336,446	2,585,544	2,815,265	3,025,606	3,216,569	3,388,154	3,540,360	3,673,187	3,786,636	3,880,707	3,955,399	4,010,712
PUC (SB5 grant program) (MWh)	0	13,633	12,827	12,021	11,215	10,409	9,603	8,797	7,991	7,186	6,380	5,574	4,768	3,962	3,156	2,350
SECO (MWh)	115,360	293,764	353,701	445,357	457,921	468,611	477,428	484,371	489,440	492,636	493,959	493,408	490,983	486,685	480,513	472,468
Wind-ERCOT (MWh)	2,867,049	6,699,696	9,193,504	15,171,518	18,808,351	24,210,883	24,773,552	25,523,777	26,296,721	27,093,073	27,913,540	28,758,854	29,629,768	30,527,055	31,451,515	32,403,970
SEER13-Single Family (MWh)	0	374,246	624,639	913,010	1,185,311	1,441,594	1,681,860	1,906,108	2,114,339	2,306,551	2,482,746	2,642,923	2,787,083	2,915,224	2,803,568	2,590,509
SEER13-Multifamily (MWh)	0	31,634	52,532	76,375	98,620	119,281	138,371	155,904	171,894	186,354	199,298	210,738	220,690	229,165	219,722	202,900
Total Annual (MWh)	3,634,950	10,052,682	13,467,886	20,380,242	24,838,259	30,984,680	32,242,961	33,640,194	35,011,225	36,356,418	37,676,159	38,970,855	40,240,941	41,486,864	42,468,869	43,336,376
Total Annual (MMBtu)	2,209,050	2,548,904	2,548,904	2,548,904	2,548,904	2,548,904	2,548,904	2,548,904	2,548,904	2,548,904	2,548,904	2,548,904	2,548,904	2,548,904	2,548,904	2,548,904

PROGRAM	OZONE SEASON DAY - OSD															
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
ESL-Single Family (MWh)	776	5,537	6,519	6,904	6,981	7,335	7,488	7,630	7,759	7,875	7,977	8,063	8,133	8,185	8,219	8,234
ESL-Multifamily (MWh)	36	192	271	351	829	1,340	1,825	2,291	2,738	3,163	3,569	3,953	4,315	4,656	4,974	5,270
ESL-Commercial (MWh)	0	800	1,189	1,447	1,700	1,966	2,205	2,436	2,660	2,876	3,082	3,280	3,467	3,645	3,811	3,967
Federal Buildings (MWh)	0	299	437	567	690	805	912	1,011	1,103	1,188	1,264	1,333	1,395	1,448	1,494	1,532
Furnace Pilot Light Program (MMBtu)	5,819	6,983	6,983	6,983	6,983	6,983	6,983	6,983	6,983	6,983	6,983	6,983	6,983	6,983	6,983	6,983
PUC (SB7) (MWh)	828	3,733	4,467	5,489	6,401	7,084	7,713	8,289	8,813	9,283	9,700	10,064	10,374	10,632	10,837	10,988
PUC (SB5 grant program) (MWh)	0	37	35	33	31	29	26	24	22	20	17	15	13	11	9	6
SECO (MWh)	316	805	969	1,220	1,255	1,284	1,308	1,327	1,341	1,350	1,353	1,352	1,345	1,333	1,316	1,294
Wind-ERCOT (MWh)	5,836	14,936	20,763	25,575	41,403	51,190	52,380	53,966	55,600	57,284	59,019	60,806	62,648	64,545	66,499	68,513
SEER13-Single Family (MWh)	0	2,666	4,449	6,503	8,442	10,268	11,979	13,576	15,059	16,428	17,683	18,824	19,851	20,764	19,969	18,451
SEER13-Multifamily (MWh)	0	213	354	514	664	803	931	1,049	1,157	1,254	1,341	1,418	1,485	1,542	1,479	1,365
Total OSD (MWh)	7,792	29,218	39,453	48,603	68,396	82,104	86,767	91,599	96,252	100,721	105,005	109,108	113,026	116,761	118,607	119,620
Total OSD (MMBtu)	5,819	6,983	6,983	6,983	6,983	6,983	6,983	6,983	6,983	6,983	6,983	6,983	6,983	6,983	6,983	6,983

Table 9-4: Annual and OSD NOx Emissions Reduction Values for the Different Programs

PROGRAM	ANNUAL (in tons NOx)															
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
ESL-Single Family	158	708	843	883	879	898	916	932	947	960	971	980	988	993	996	997
ESL-Multifamily	6	26	35	44	119	187	254	317	378	436	491	543	593	639	682	722
ESL-Commercial	44	90	136	164	192	218	245	270	295	319	341	363	384	403	421	438
Federal Buildings	40	84	122	158	193	225	255	283	308	332	353	373	390	405	418	428
Furnace Pilot Light Program	102	117	117	117	117	117	117	117	117	117	117	117	0	0	0	0
PUC (SB7)	237	1,074	1,157	1,421	1,633	1,779	1,913	2,035	2,144	2,242	2,327	2,400	2,461	2,510	2,547	2,950
PUC (SB5 grant program)	0	6	5	5	5	4	4	4	3	3	3	2	2	2	1	1
SECO	67	224	270	340	349	357	364	369	373	376	377	376	374	371	366	360
Wind-ERCOT	2,465	4,152	5,688	8,914	10,957	14,047	14,373	14,808	15,257	15,719	16,195	16,685	17,191	17,711	18,248	18,800
SEER13-Single Family	0	258	430	629	816	993	1,158	1,313	1,456	1,589	1,710	1,820	1,920	2,008	1,931	1,784
SEER13-Multifamily	0	22	36	53	68	82	95	107	118	128	137	145	152	158	151	140
Total Annual (Tons NOx)	3,119	6,761	8,839	12,728	15,328	18,907	19,694	20,555	21,396	22,221	23,022	23,804	24,455	25,200	25,761	26,620

PROGRAM	OZONE SEASON DAY - OSD (in tons NOx/day)															
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
ESL-Single Family	0.76	3.85	4.50	4.76	4.81	5.05	5.15	5.24	5.32	5.40	5.46	5.52	5.56	5.59	5.61	5.62
ESL-Multifamily	0.03	0.13	0.18	0.24	0.58	0.93	1.26	1.57	1.87	2.15	2.43	2.69	2.93	3.16	3.37	3.57
ESL-Commercial	0.26	0.55	0.82	1.00	1.17	1.36	1.52	1.68	1.84	1.98	2.13	2.26	2.39	2.52	2.63	2.74
Federal Buildings	0.11	0.22	0.32	0.42	0.51	0.59	0.67	0.74	0.81	0.87	0.93	0.98	1.02	1.06	1.10	1.12
Furnace Pilot Light Program	0.28	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.00	0.00	0.00	0.00
PUC (SB7)	0.64	2.61	3.10	3.81	4.38	4.78	5.14	5.47	5.77	6.03	6.26	6.46	6.63	6.76	6.86	6.93
PUC (SB5 grant program)	0.00	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00
SECO	0.18	0.61	0.73	0.92	0.95	0.97	0.99	1.00	1.01	1.02	1.02	1.02	1.02	1.01	0.99	0.98
Wind-ERCOT	5.85	9.27	12.98	15.13	24.35	30.04	30.74	31.67	32.63	33.62	34.64	35.68	36.77	37.88	39.03	40.21
SEER13-Single Family	0.00	1.81	3.03	4.42	5.74	6.98	8.15	9.23	10.24	11.17	12.03	12.80	13.50	14.12	13.58	12.55
SEER13-Multifamily	0.00	0.15	0.24	0.35	0.45	0.55	0.63	0.71	0.79	0.85	0.91	0.97	1.01	1.05	1.01	0.93
Total OSD (Tons NOx)	8.11	19.54	26.24	31.38	43.27	51.58	54.58	57.64	60.61	63.42	66.14	68.71	70.84	73.15	74.18	74.65

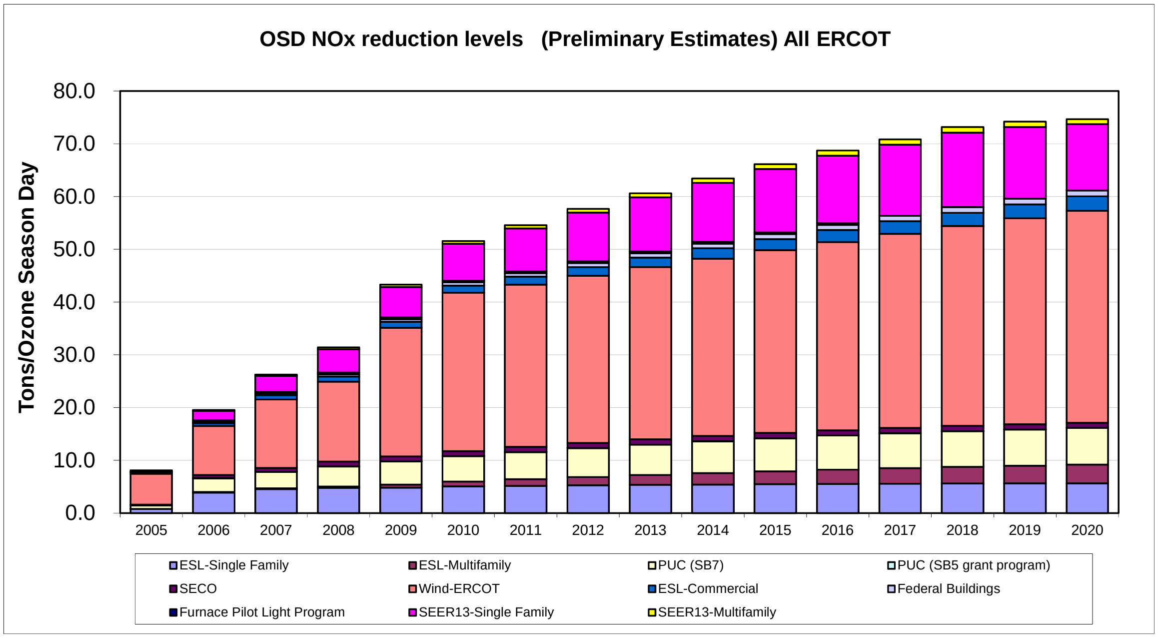

Figure 9-2: Cumulative OSD NOx Emissions Reduction Projections through 2020

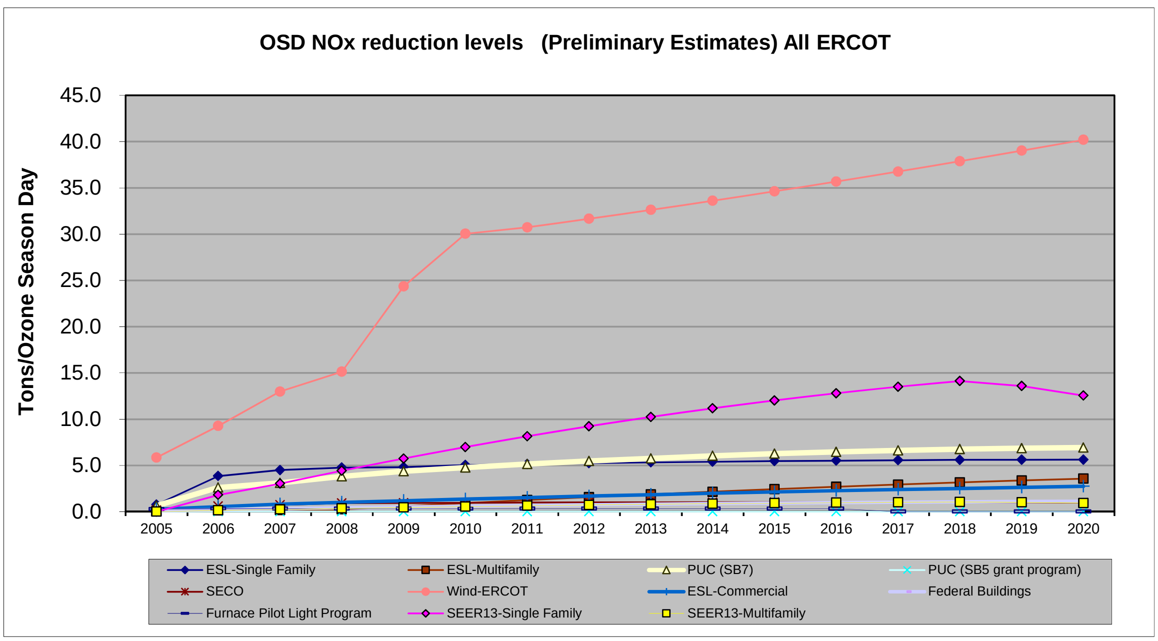

Figure 9-3: Cumulative OSD NOx Emissions Reduction Projections through 2020

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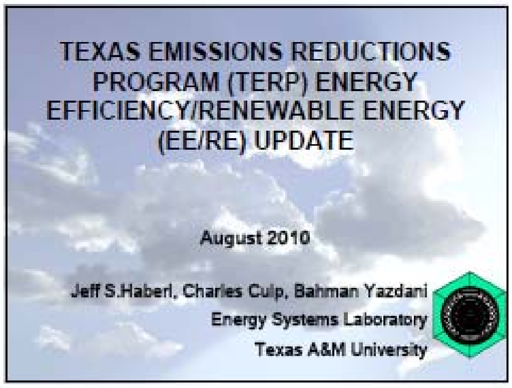
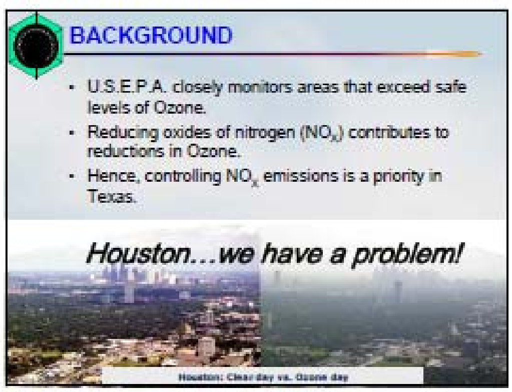
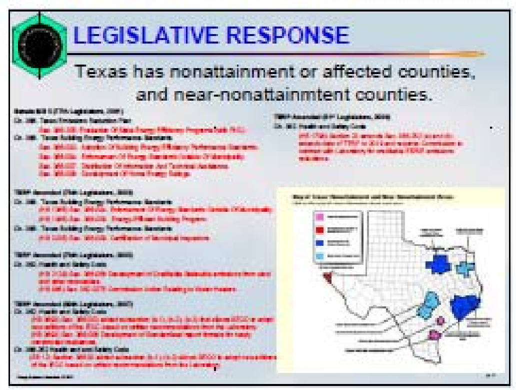
10 APPENDIX A

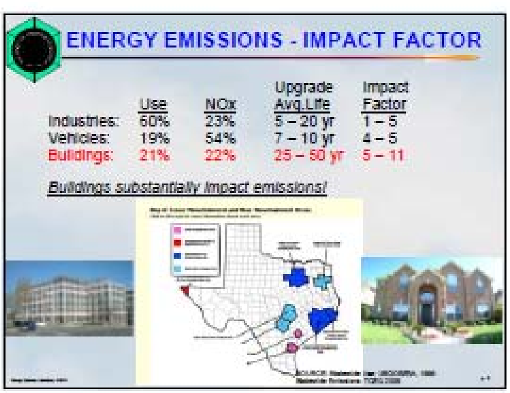
10.1 Presentation to CATEE, Austin, Texas (August 2010)

In August of 2010, the Energy Systems Lab made a presentation at the CATEE conference about TEXAS Emissions Reductions Program (TERP) Energy Efficiency/Renewable Energy (EE/RE) Update in Texas Austin, Texas.









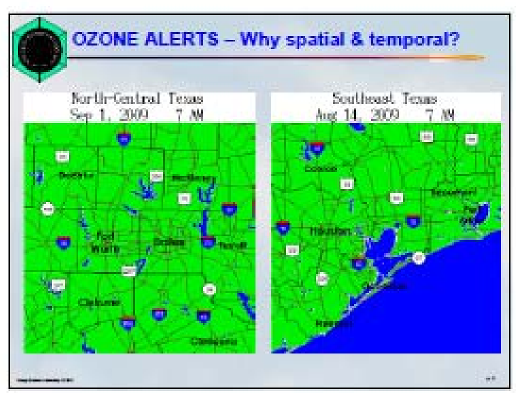


Figure 10-1: Presentation at CATEE Conference, Austin, TX (August 2010) (Part 1)

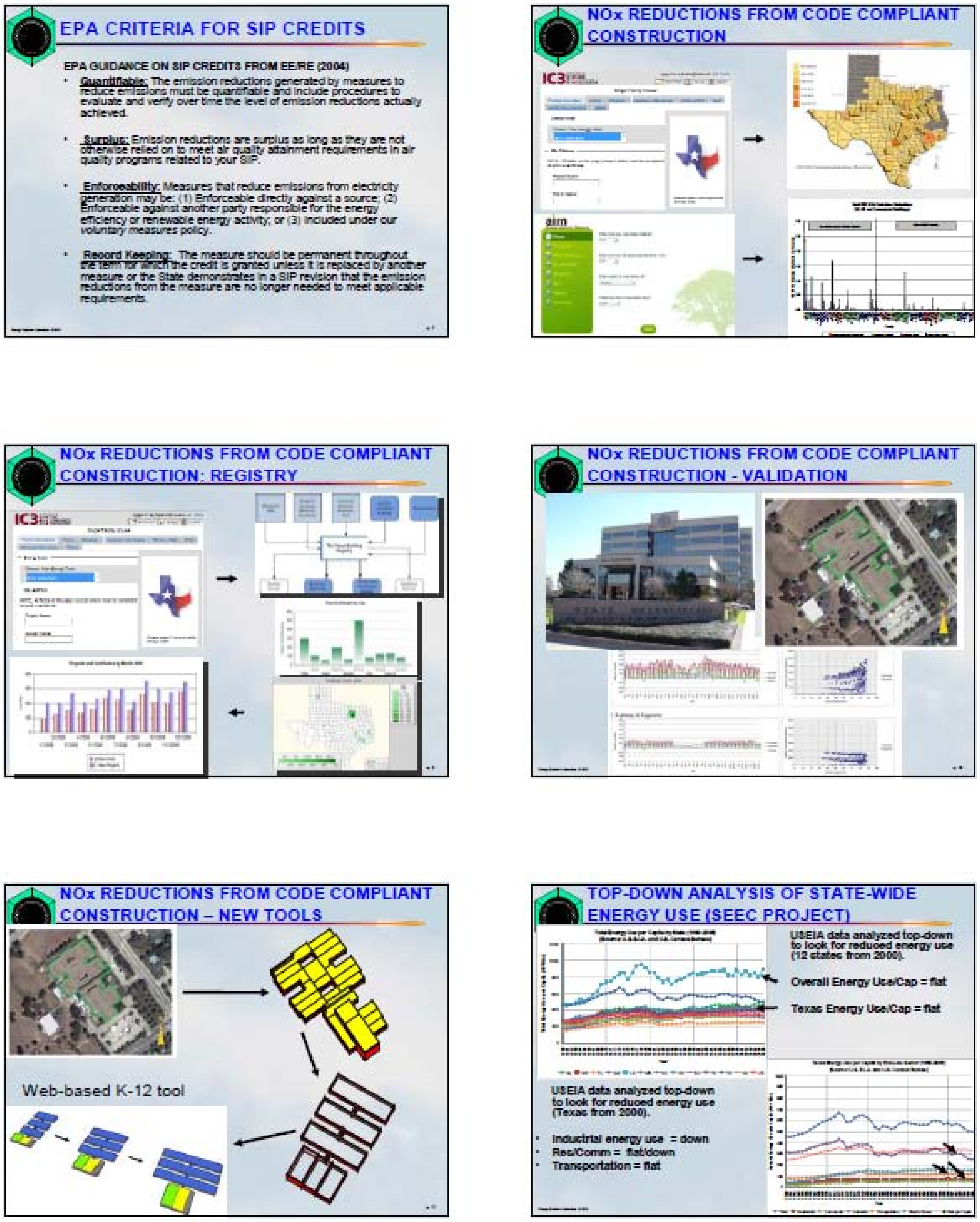
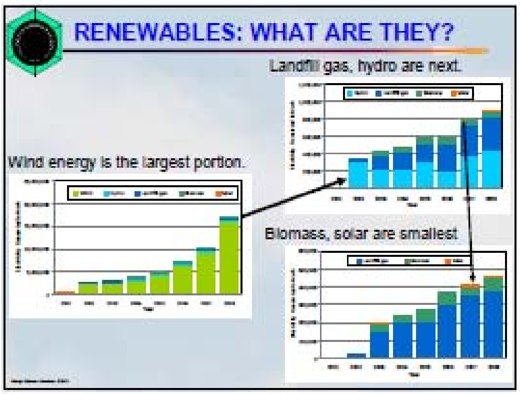
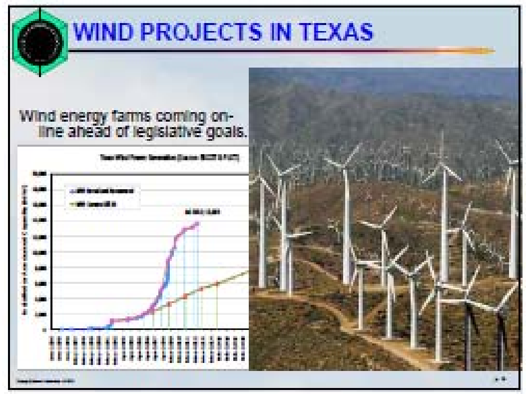
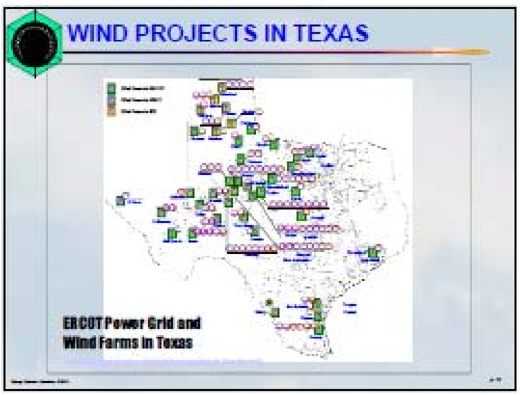
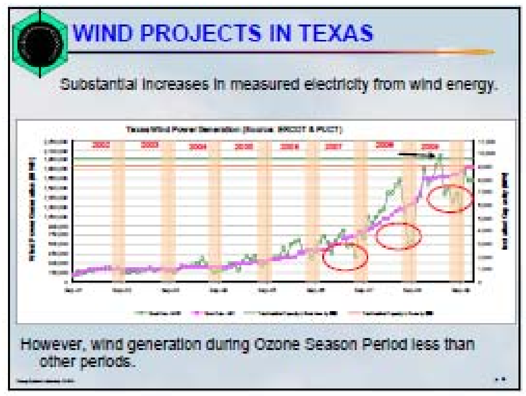


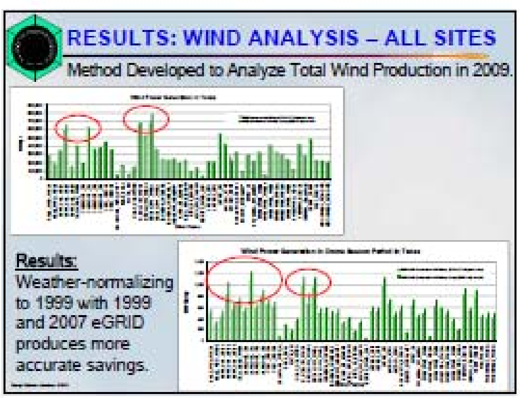
Figure 10-2: Presentation at CATEE Conference, Austin, TX (August 2010) (Part 2)











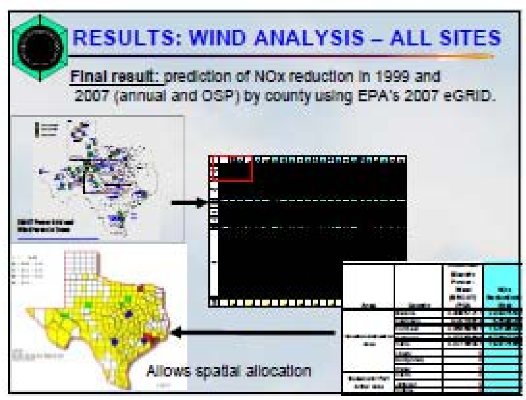
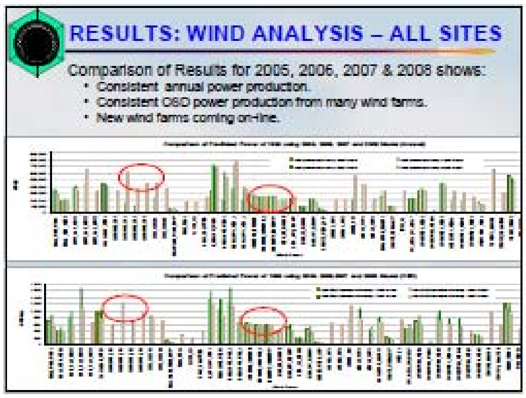
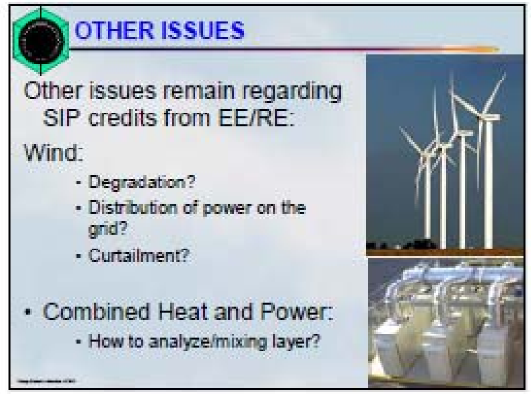
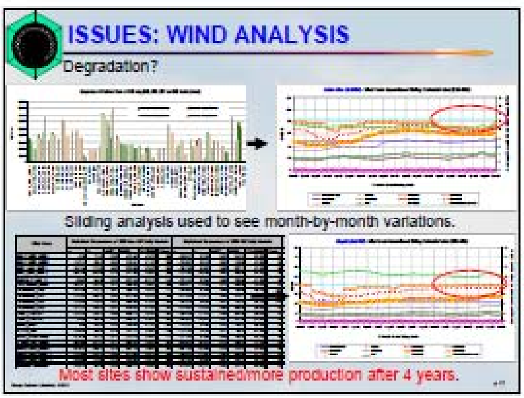
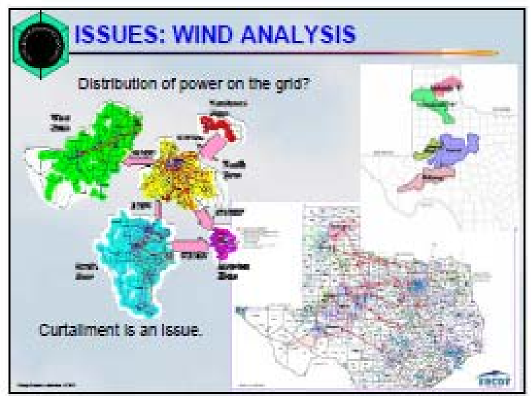


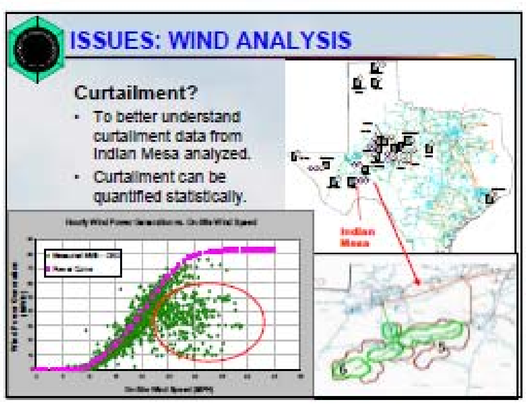
Figure 10-3: Presentation at CATEE Conference, Austin, TX (August 2010) (Part 3)











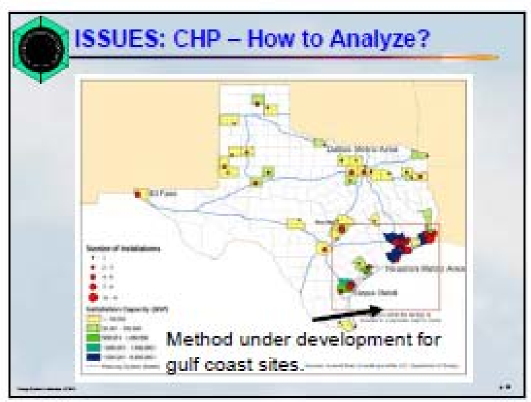
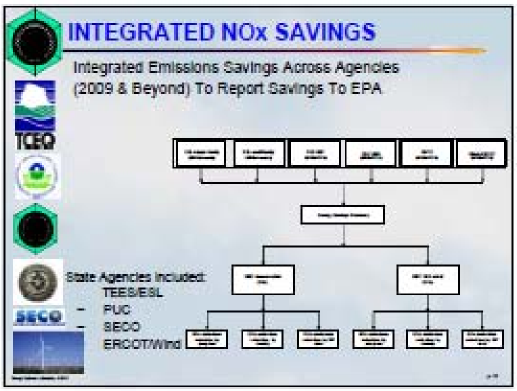
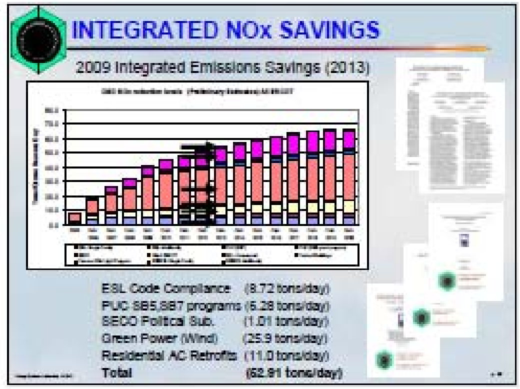
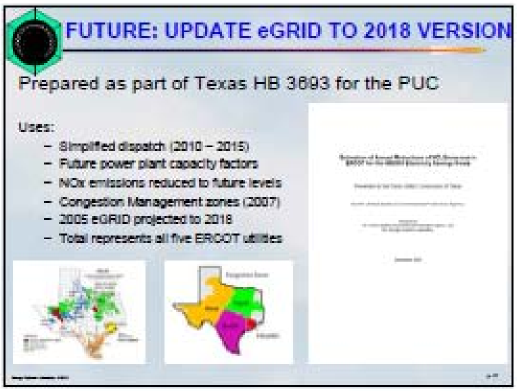


Figure 10-4: Presentation at CATEE Conference, Austin, TX (August 2010) (Part 4)







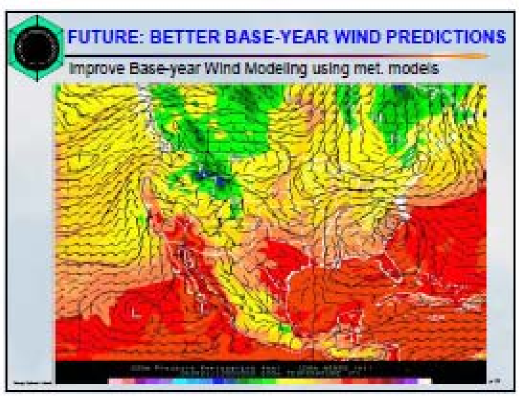


Figure 10-5: Presentation at CATEE Conference, Austin, TX (August 2010) (Part 5)

Figure 10-6: Presentation at CATEE Conference, Austin, TX (August 2010) (Part 6)

11 APPENDIX B

In this section, the linear regression models developed, based on 2009 wind power generation data, are presented for each wind farm. The estimated 1999 annual and OSP power productions using 2009 daily models and the resulting emissions reduction are also shown in details for each wind farm. A listing of the wind farms analyzed in this year's report is illustrated in Table 11-1.

Table 11-1: Listing of Wind Farms Analyzed for Base-year Calculations

No.	Wind Farms
1	Brazos Wind Ranch
2	Barton Chapel Wind 1
3	Buffalo Gap 1
4	Buffalo Gap 2
5	Buffalo Gap 3
6	Bull Creek Wind Plant
7	Callahan Divide Wind Energy Center
8	Capricorn Ridge Wind Expansion
9	Capricorn Ridge Wind
10	Camp Springs Wind Energy Center
11	Camp Springs Wind Energy Expansion
12	Delaware Mountain Wind Farm
13	Elbow Creek Wind
14	Snyder Wind Project
15	Silver Star Phase I
16	Goat Wind & Goat Wind Phase 2
17	Horse Hollow Phase 1
18	Horse Hollow Phase 2
19	Horse Hollow Phase 3
20	Horse Hollow Phase 4
21	Hackberry Wind Farm
22	Inadale
23	Desert Sky(Indian Mesa II)
24	Indian Mesa
25	Sherbino Mesa Wind Farm
26	King Mountain Wind Ranch
27	Texas Wind Power Project
28	Lone Star - Post Oak Wind
29	Lone-Star Mesquite Wind
30	Forest Creek Wind Farm
31	Sand Bluff Wind Farm
32	McAdoo Wind Energy
33	Notrees Windpower
34	Ocotillo Windpower 1
35	Panther Creek
36	Panther Creek 2
37	Panther Creek 3
38	Penascal Wind Farm
39	Pyron
40	Red Canyon 1
41	Big Spring Wind Power
42	South Trent Wind Farm
43	Stanton Wind Energy
44	Southwest Mesa Wind Project
45	Sweetwater Wind 1
46	Sweetwater Wind 2
47	Sweet Wind 24
48	Sweetwater Wind 3
49	Sweetwater Wind 4
50	Sweetwater Wind 5
51	Gulf Wind 1
52	Roscoe Wind Farm 1
53	Champion Wind Farm
54	Trent Mesa
55	Turkey Track Energy
56	Whirlwind
57	Wolf Ridge Wind Farm
58	Woodward Mountain Ranch

11.1 Brazos Wind Ranch

Table 11-2: Site Information for Brazos Wind Ranch

GENSITECODE_ERCOT	Renewable Energy	City	County	Date in Service	Capacity (MW)	Company	Facility	Wind Turbine Information	Region	PCA	Interconnection	Weather Station
BRAZ_WIND	WIND	Fluvana	SCURRY	Dec-03	160	Cielo/Orion/Green Mountain	Brazos Wind Ranch	Mitsubishi 1000 (160)	ERCOT	AEP-West	ONCOR	ABI

SUBGENCODE_ERCOT	GENSITECODE_ERCOT	Capacity (MW)
BRAZ_WND_WND1	BRAZ_WIND	99
BRAZ_WND_WND2	BRAZ_WIND	61

11.1.1 Brazos Wind Ranch – BRAZ_WND_WND1

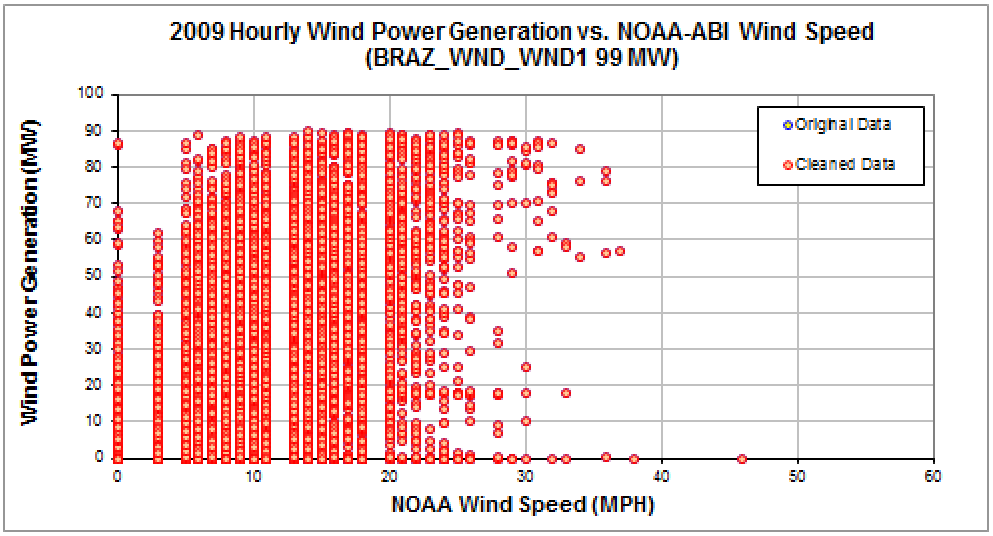


Figure 11-1: BRAZ_WND_WND1 - Hourly Wind Power vs. NOAA Wind Speed (2009)

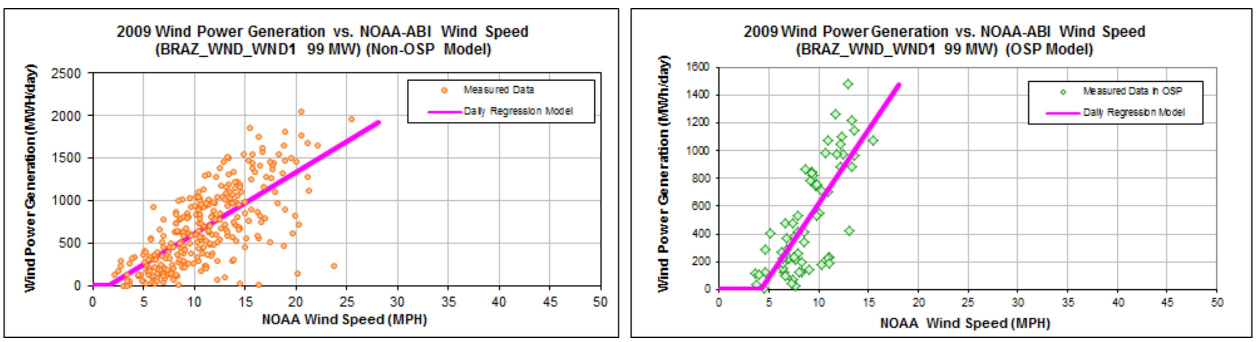


Figure 11-2: BRAZ_WND_WND1 - Daily Wind Power vs. NOAA Wind Speed (Using OSP and Non OSP Model)

Table 11-3: BRAZ_WND_WND1 – Model Coefficients

Using Non-OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-116.3356
Left Slope (MWh/mph-day)	72.3568
RMSE (MWh/day)	321.6166
R2	0.4993
CV-RMSE	47.3%

Using OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-439.2283
Left Slope (MWh/mph-day)	106.1774
RMSE (MWh/day)	251.2514
R2	0.5817
CV-RMSE	49.5%

Table 11-4: BRAZ_WND_WND1 – Comparison of Predicted Power vs. Measured Power

Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-09	31	10.70	23,447	20,397	13.01%	32%	28%
Feb-09	28	12.91	27,720	22,903	17.37%	42%	34%
Mar-09	31	13.29	30,391	26,208	13.77%	41%	36%
Apr-09	29	14.65	23,042	27,373	-18.80%	33%	40%
May-09	31	10.10	17,478	19,053	-9.01%	24%	26%
Jun-09	30	11.31	18,978	21,069	-11.02%	27%	30%
Jul-09	31	8.90	15,170	15,757	-3.87%	21%	21%
Aug-09	31	9.59	20,803	17,984	13.55%	28%	24%
Sep-09	30	8.61	14,279	14,453	-1.22%	20%	20%
Oct-09	31	10.66	16,941	20,294	-19.79%	23%	28%
Nov-09	30	8.39	16,190	14,718	9.09%	23%	21%
Dec-09	30	8.81	11,592	15,637	-34.89%	16%	22%
Total	363	10.63	236,032	235,846	0.08%	27%	27%
Total in OSP (07/15-09/15)	63	8.91	31,951	32,056	-0.33%	21%	21%

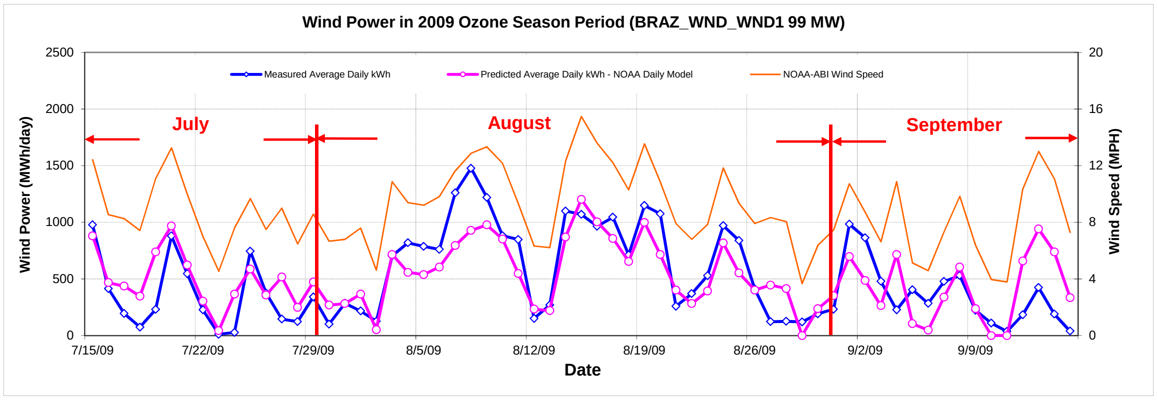


Figure 11-3: BRAZ_WND_WND1 - Predicted Wind Power in OSP Using NOAA Wind Speed (2009)

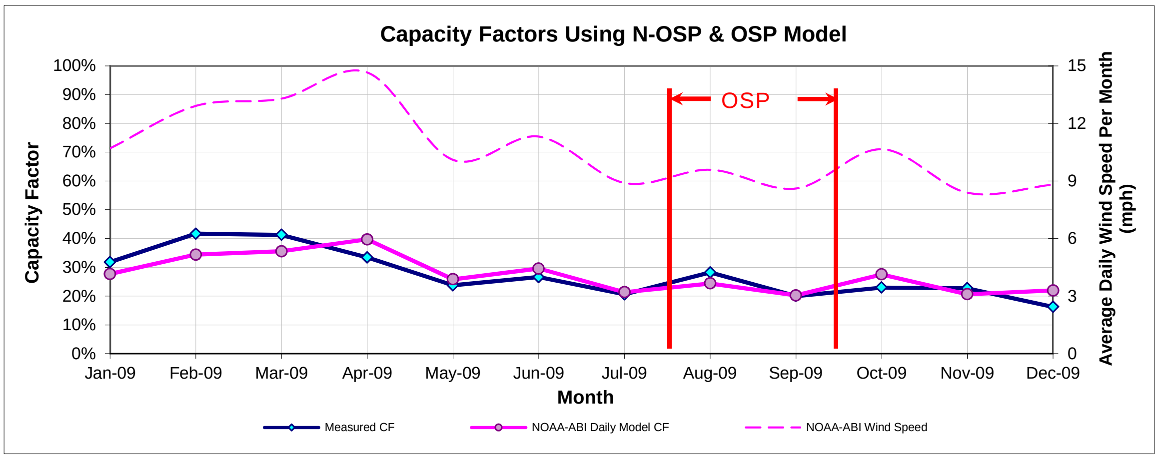


Figure 11-4: BRAZ_WND_WND1 – Predicted Capacity Factors Using Daily Models (2009)

Table 11-5: BRAZ_WND_WND1 – Predicted Power Production in 1999

Annual

1999 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
256,109	237,332

OSD

1999 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
592	507

11.1.2 Brazos Wind Ranch – BRAZ_WND_WND2

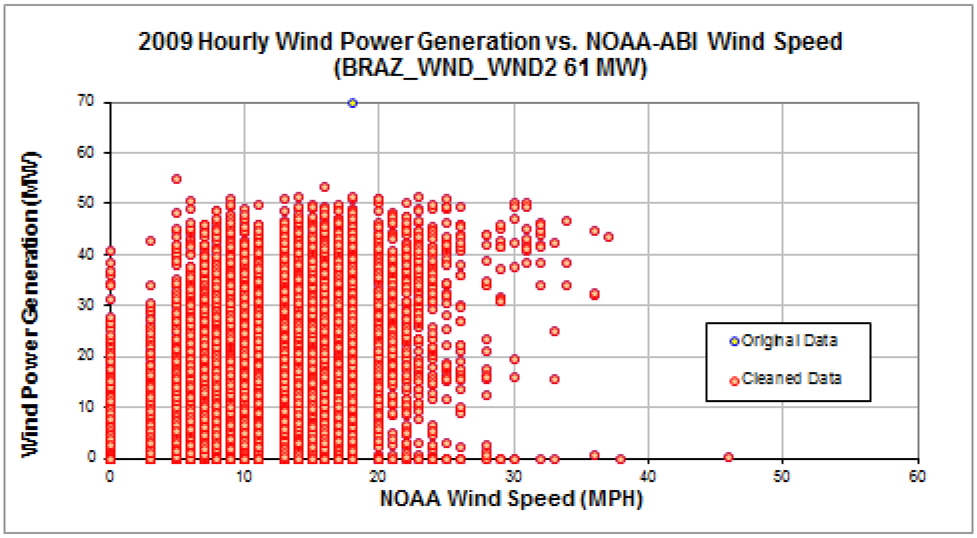
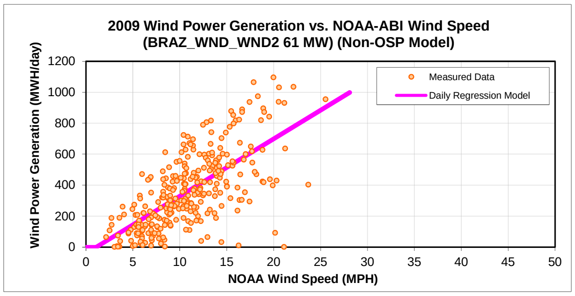


Figure 11-5: BRAZ_WND_WND2 - Hourly Wind Power vs. NOAA Wind Speed (2009)



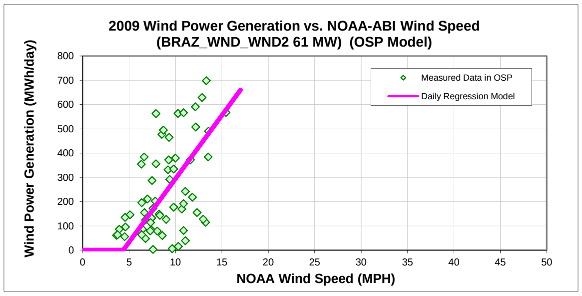


Figure 11-6: BRAZ_WND_WND2 – Daily Wind Power vs. NOAA Wind Speed (Using OSP and Non-OSP Model)

Table 11-6: BRAZ_WND_WND2 – Model Coefficients

Using Non-OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-39.6539
Left Slope (MWh/mph-day)	36.9227
RMSE (MWh/day)	177.4865
R2	0.4585
CV-RMSE	48.2%

Using OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-229.1797
Left Slope (MWh/mph-day)	52.2949
RMSE (MWh/day)	118.5583
R2	0.6024
CV-RMSE	50.0%

Table 11-7: BRAZ_WND_WND2 – Comparison of Predicted Power vs. Measured Power

Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-09	31	10.70	13,621	11,019	19.10%	30%	24%
Feb-09	28	12.91	15,246	12,239	19.72%	37%	30%
Mar-09	31	13.29	15,326	13,984	8.75%	34%	31%
Apr-09	29	14.65	11,653	14,540	-24.77%	27%	34%
May-09	31	10.10	8,211	10,334	-25.85%	18%	23%
Jun-09	30	11.31	8,139	11,343	-39.37%	19%	26%
Jul-09	31	8.90	6,688	7,958	-18.99%	15%	18%
Aug-09	31	9.59	10,015	8,472	15.41%	22%	19%
Sep-09	30	8.61	7,430	7,394	0.48%	17%	17%
Oct-09	31	10.66	10,442	10,967	-5.03%	23%	24%
Nov-09	30	8.39	10,497	8,102	22.82%	24%	18%
Dec-09	28	9.09	7,386	8,290	-12.23%	18%	20%
Total	361	10.67	124,653	124,641	0.01%	24%	24%
Total in OSP (07/15-09/15)	63	8.88	14,927	15,018	-0.60%	16%	16%

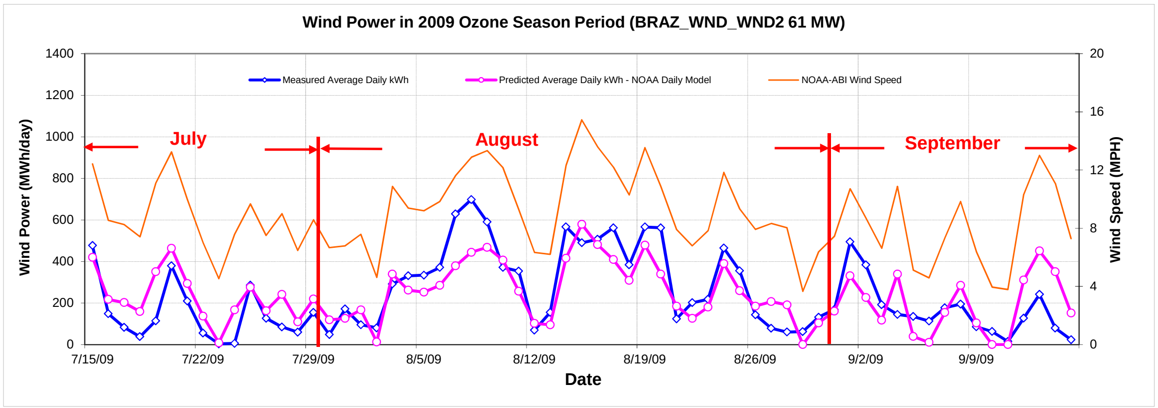


Figure 11-7: BRAZ_WND_WND2 – Predicted Wind Power in OSP Using NOAA Wind Speed (2009)

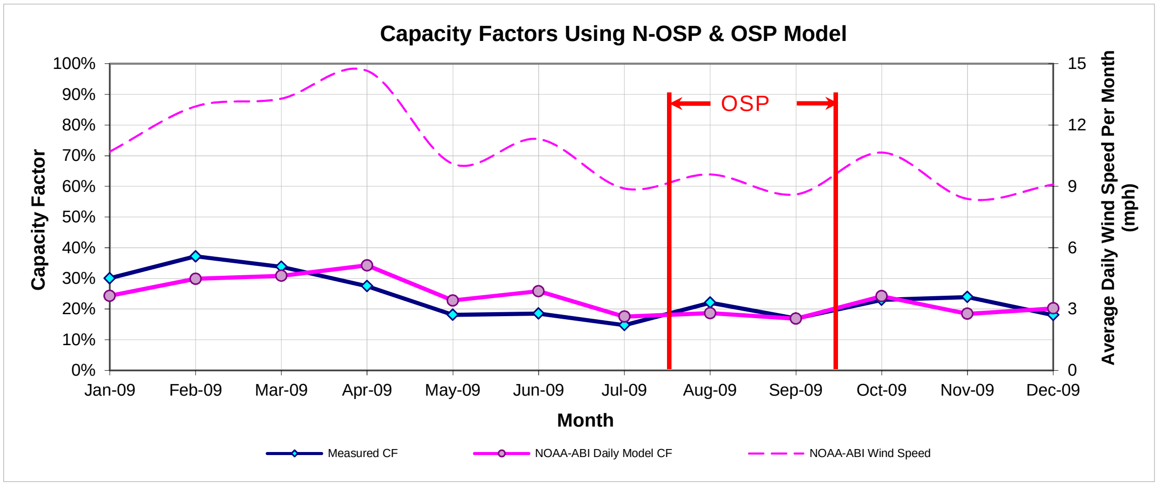


Figure 11-8: BRAZ_WND_WND2 – Predicted Capacity Factors Using Daily Models (2009)

Table 11-8: BRAZ_WND_WND2 – Predicted Power Production in 1999

Annual

1999 Estimated MWh/yr (2009Daily Model)	2009 Measured MWh/yr
135,170	126,034

OSD

1999 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
279	237

11.2 Barton Chapel Wind1

Table 11-9: Site Information for Barton Chapel Wind 1

GENSITECODE_ERCOT	Renewable Energy	City	County	Date in Service	Capacity (MW)	Company	Facility	Wind Turbine Information	Region	PCA	Interconnection	Weather Station
BRTSW_BCW1	WIND		JACK	Dec-07	120	Gamesa Energy	Barton Chapel Wind 1		ERCOT	AEP-West	ONCOR	ABI

SUBGENCODE_ERCOT	GENSITECODE_ERCOT	Capacity (MW)
BRTSW_BCW1	BRTSW_BCW1	120

11.2.1 Barton Chapel Wind 1– BRTSW_BCW1

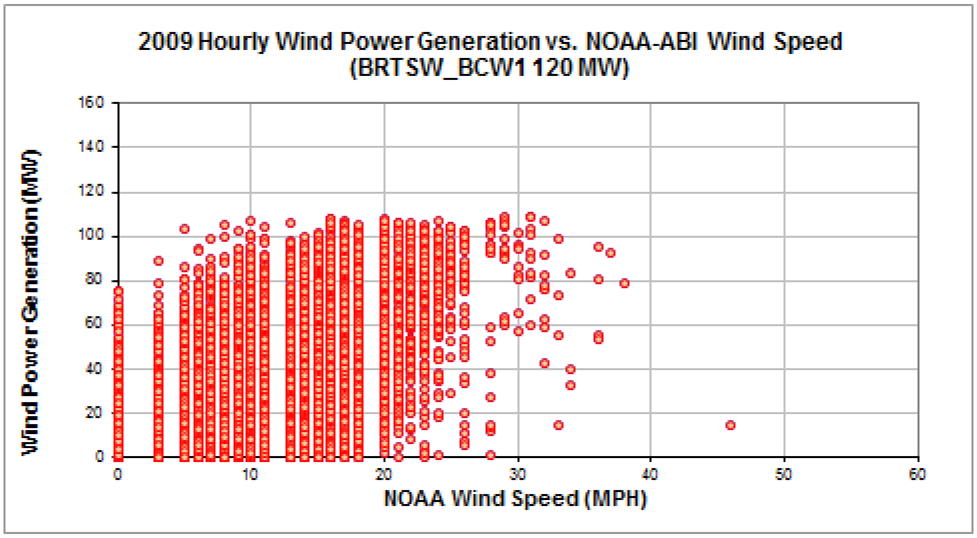
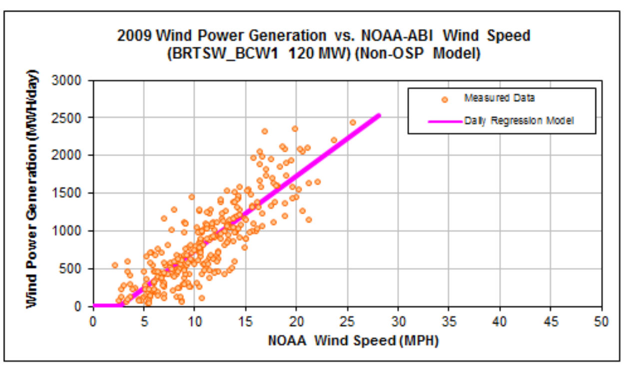


Figure 11-9: BRTSW_BCW1 – Hourly Wind Power vs. NOAA Wind Speed (2009)



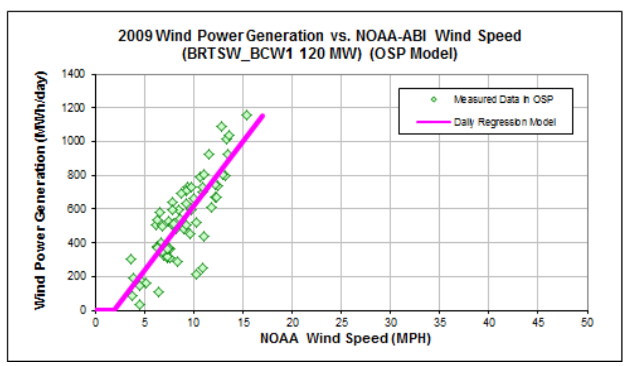


Figure 11-10: BRTSW_BCW1 – Daily Wind Power vs. NOAA Wind Speed (Using OSP and Non-OSP Model)

Table 11-10: BRTSW_BCW1 – Model Coefficients

Using Non-OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-249.8732
Left Slope (MWh/mph-day)	98.7412
RMSE (MWh/day)	283.0714
R2	0.7095
CV-RMSE	33.7%

Using OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-144.5233
Left Slope (MWh/mph-day)	76.1542
RMSE (MWh/day)	143.7551
R2	0.6860
CV-RMSE	26.9%

Table 11-11: BRTSW_BCW1 – Comparison of Predicted Power vs. Measured Power

Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-09	26	10.88	17,354	21,439	-23.54%	23%	29%
Feb-09	28	12.91	29,442	28,740	2.38%	37%	36%
Mar-09	31	13.29	36,628	32,939	10.07%	41%	37%
Apr-09	30	14.82	35,161	36,396	-3.51%	41%	42%
May-09	31	10.10	19,857	23,176	-16.72%	22%	26%
Jun-09	30	11.31	20,806	26,018	-25.05%	24%	30%
Jul-09	31	8.90	16,417	18,009	-9.69%	18%	20%
Aug-09	31	9.59	19,568	18,148	7.25%	22%	20%
Sep-09	30	8.61	15,991	16,880	-5.56%	19%	20%
Oct-09	31	10.66	27,639	24,870	10.02%	31%	28%
Nov-09	30	8.39	21,420	17,351	19.00%	25%	20%
Dec-09	30	8.81	22,096	18,605	15.80%	26%	22%
Total	359	10.67	282,379	282,572	-0.07%	27%	27%
Total in OSP (07/15-09/15)	63	8.91	33,659	33,658	0.00%	19%	19%

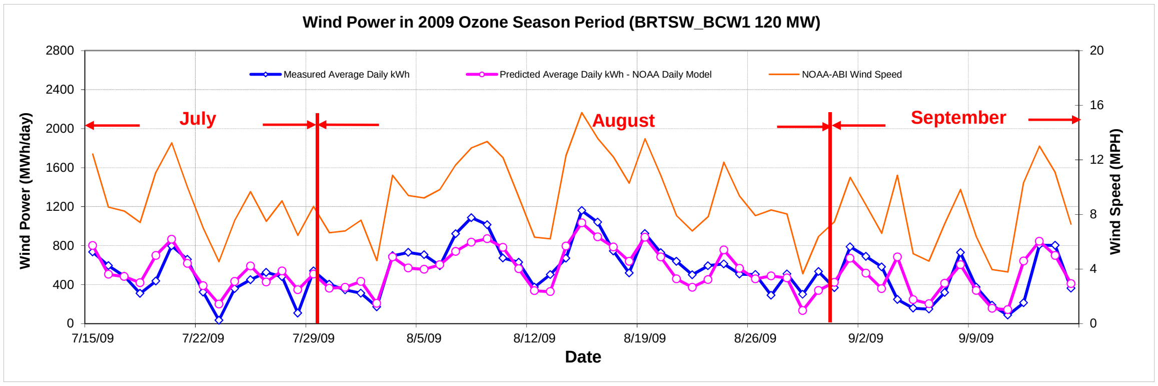


Figure 11-11: BRTSW_BCW1 – Predicted Wind Power in OSP Using NOAA Wind Speed (2009)

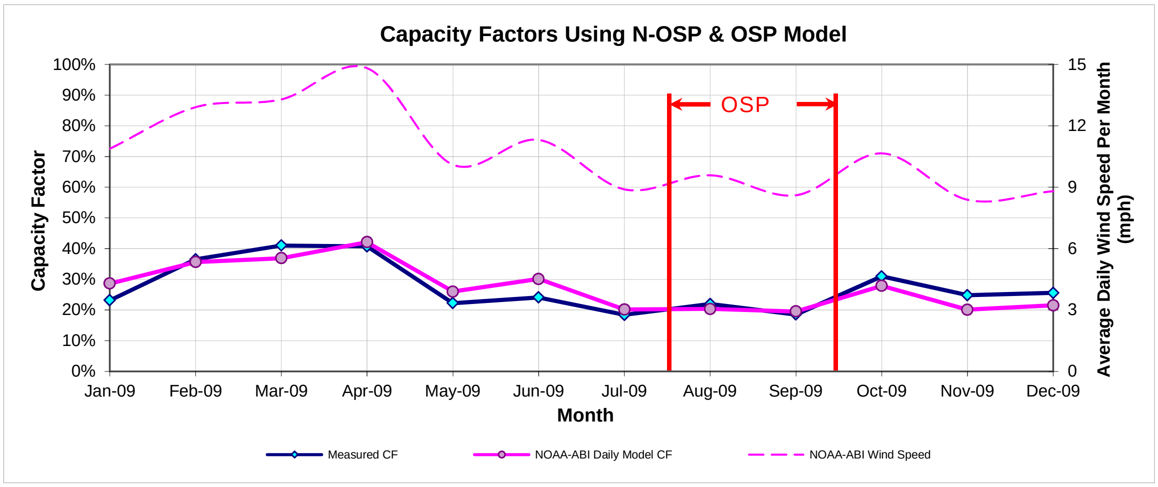


Figure 11-12: BRTSW_BCW1 – Predicted Capacity Factors Using Daily Models (2009)

Table 11-12: BRTSW_BCW1 – Predicted Power Production in 1999

Annual

1999 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
308,589	287,099

OSD

1999 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
595	534

11.3 Buffalo Gap 1

Table 11-13: Site Information for Buffalo Gap 1

GENSITECODE_ERCOT	Renewable Energy	City	County	Date in Service	Capacity (MW)	Company	Facility	Wind Turbine Information	Region	PCA	Interconnection	Weather Station
BUFF_CAP	WIND	Abilene	TAYLOR	Sep-05	120	AES Corporation	Buffalo Gap1	Vestas 1.8 MW (67)	ERCOT	AEP-West	AEP-TNC	ABI

SUBGENCODE_ERCOT	GENSITECODE_ERCOT	Capacity (MW)
BUFF_GAP_UNIT1	BUFF_CAP	120

11.3.1 Buffalo Gap 1 – BUFF_GAP_UNIT1

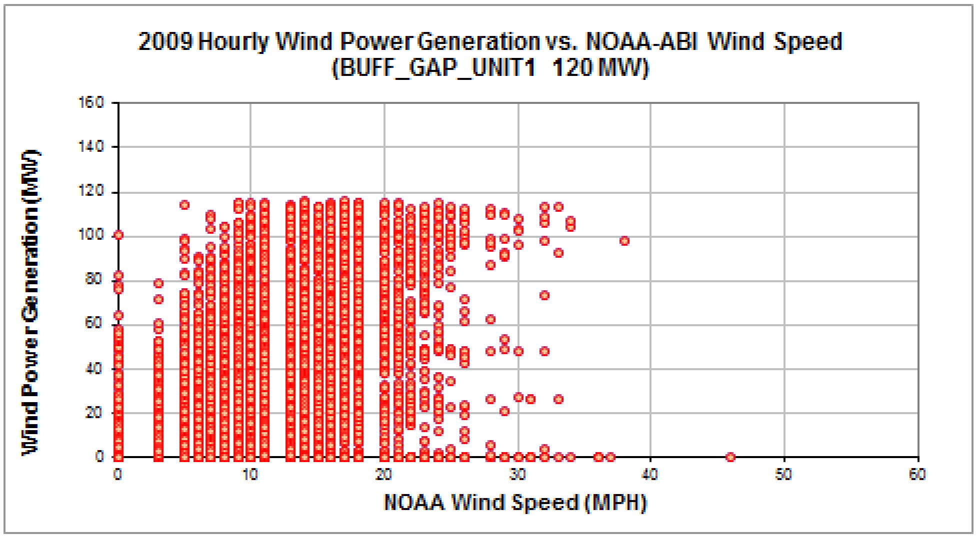
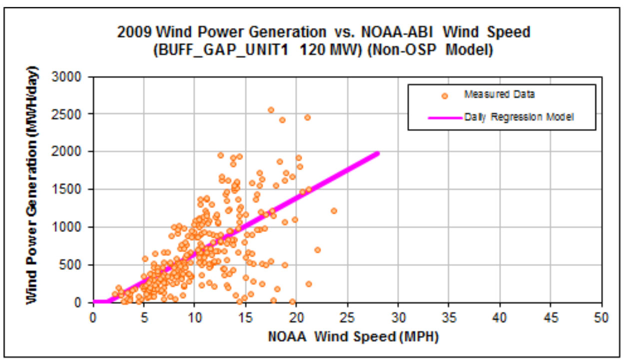


Figure 11-13: BUFF_GAP_UNIT1 – Hourly Wind Power vs. NOAA Wind Speed (2009)



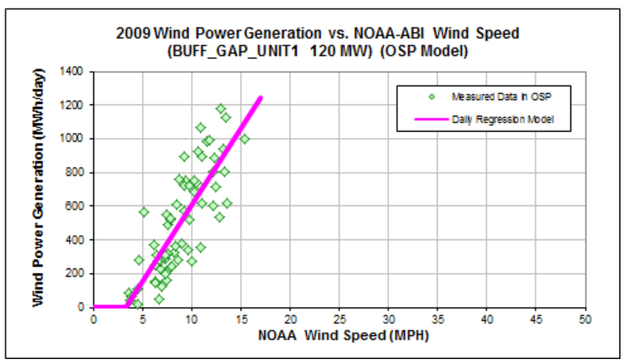


Figure 11-14: BUFF_GAP_UNIT1 – Daily Wind Power vs. NOAA Wind Speed (Using OSP and Non-OSP Model)

Table 11-14: BUFF_GAP_UNIT1 – Model Coefficients

Using Non-OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-105.4815
Left Slope (MWh/mph-day)	74.5880
RMSE (MWh/day)	398.2075
R2	0.3901
CV-RMSE	56.6%

Using OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-302.7477
Left Slope (MWh/mph-day)	90.7448
RMSE (MWh/day)	182.9415
R2	0.6570
CV-RMSE	36.1%

Table 11-15: BUFF_GAP_UNIT1 – Comparison of Predicted Power vs. Measured Power

Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-09	31	10.70	20,905	21,473	-2.72%	23%	24%
Feb-09	26	12.45	14,094	21,400	-51.84%	19%	29%
Mar-09	27	12.54	23,481	22,400	4.60%	30%	29%
Apr-09	28	14.60	23,934	27,530	-15.02%	30%	34%
May-09	31	10.10	20,260	20,089	0.84%	23%	23%
Jun-09	30	11.31	18,064	22,152	-22.63%	21%	26%
Jul-09	30	8.73	13,145	15,358	-16.83%	15%	18%
Aug-09	31	9.59	18,126	17,579	3.02%	20%	20%
Sep-09	30	8.61	15,114	15,070	0.29%	17%	17%
Oct-09	31	10.66	21,613	21,368	1.14%	24%	24%
Nov-09	30	8.39	24,277	15,605	35.72%	28%	18%
Dec-09	29	9.00	23,380	16,403	29.84%	28%	20%
Total	354	10.50	236,393	236,426	-0.01%	23%	23%
Total in OSP (07/15-09/15)	63	8.91	31,884	31,882	0.00%	18%	18%

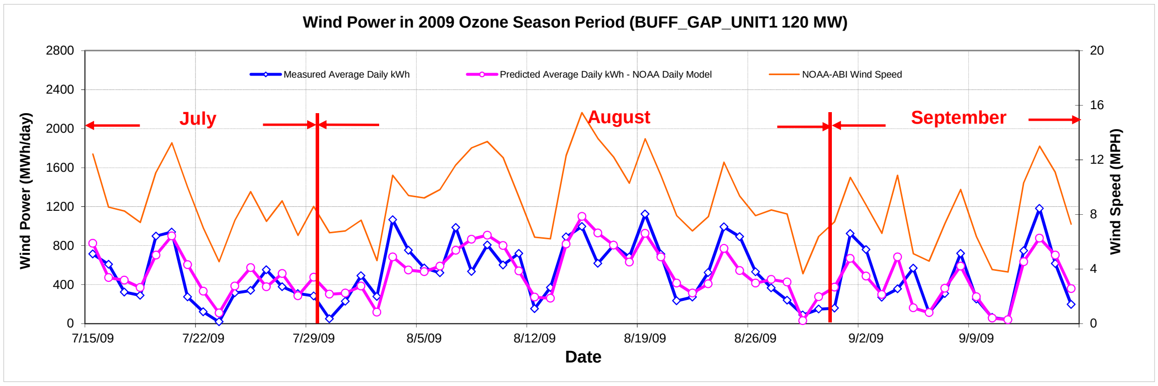


Figure 11-15: BUFF_GAP_UNIT1 – Predicted Wind Power in OSP Using NOAA Wind Speed (2009)

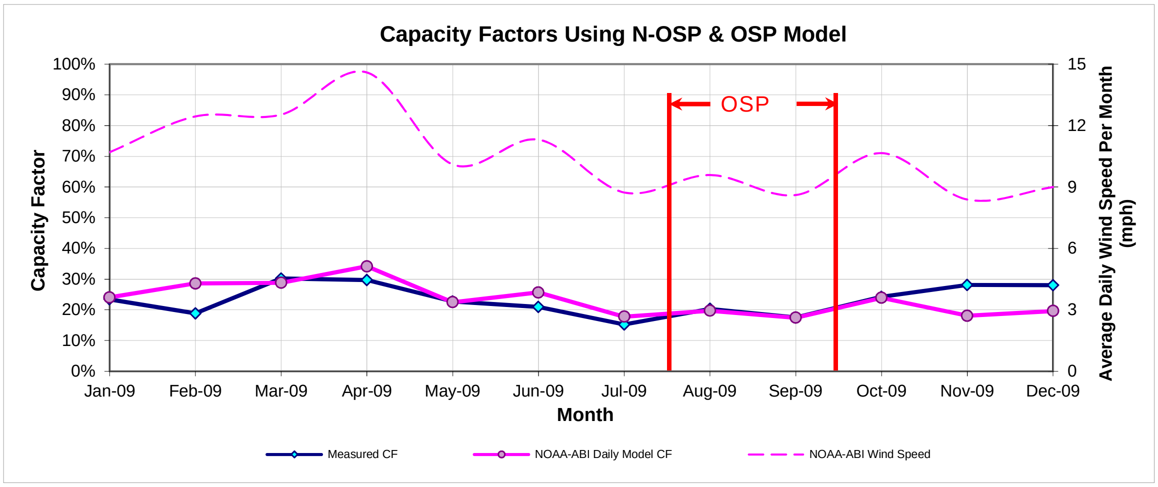


Figure 11-16: BUFF_GAP_UNIT1 – Predicted Capacity Factors Using Daily Models (2009)

Table 11-16: BUFF_GAP_UNIT1 – Predicted Power Production in 1999

1999 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
266,376	243,738

1999 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
578	506

11.4 Buffalo Gap 2

Table 11-17: Site Information for Buffalo Gap 2

GENSITECODE_ERCOT	Renewable Energy	City	County	Date in Service	Capacity (MW)	Company	Facility	Wind Turbine Information	Region	PCA	Interconnection	Weather Station
BUFF_GAP 2	WIND	Abilene	TAYLOR	Aug-07	233	AES Corporation	Buffalo Gap2	Vestas 1.8 MW (67)	ERCOT	AEP-West	AEP-TNC	ABI

SUBGENCODE_ERCOT	GENSITECODE_ERCOT	Capacity (MW)
BUFF_GAP_UNIT2	BUFF_CAP	233

11.4.1 Buffalo Gap 2-BUFF_GAP_UNIT2

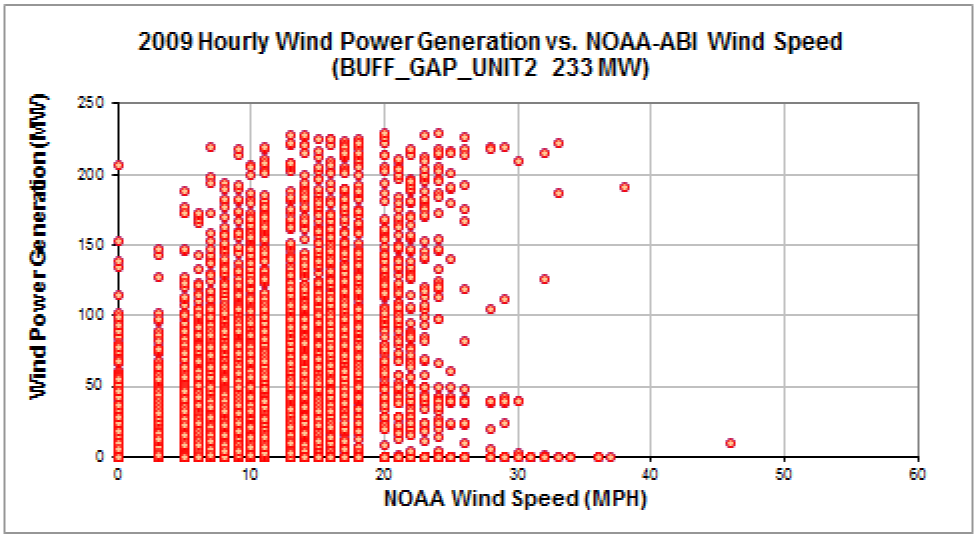
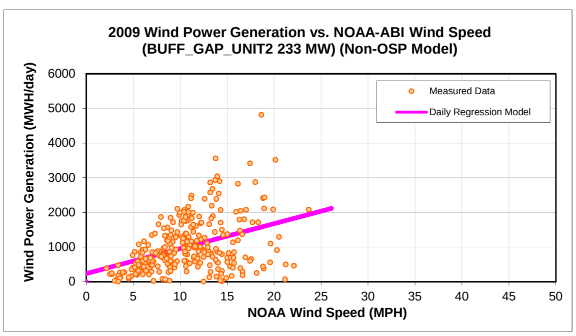


Figure 11-17: BUFF_GAP 2_UNIT2 – Hourly Wind Power vs. NOAA Wind Speed (2009)



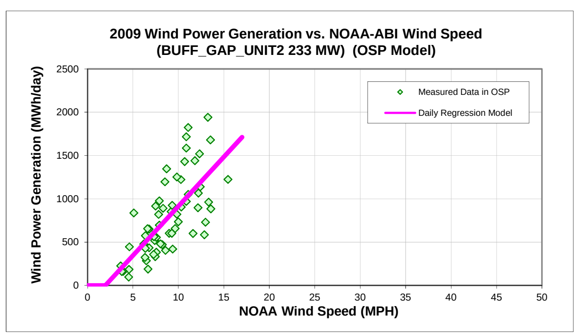


Figure 11-18: BUFF_GAP 2_UNIT2 – Daily Wind Power vs. NOAA Wind Speed (Using OSP and Non-OSP Model)

Table 11-18: BUFF_GAP 2_UNIT2 – Model Coefficients

Using Non-OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	232.0609
Left Slope (MWh/mph-day)	72.1562
RMSE (MWh/day)	685.8635
R2	0.1667
CV-RMSE	67.9%

Using OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-223.5444
Left Slope (MWh/mph-day)	113.7505
RMSE (MWh/day)	318.5613
R2	0.4982
CV-RMSE	40.3%

Table 11-19: BUFF_GAP 2_UNIT2 – Comparison of Predicted Power vs. Measured Power

Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-09	30	10.80	33,655	30,346	9.83%	20%	18%
Feb-09	26	12.45	17,327	29,389	-69.61%	12%	20%
Mar-09	29	12.62	33,021	33,133	-0.34%	20%	20%
Apr-09	27	14.35	30,788	34,231	-11.18%	20%	23%
May-09	31	10.10	30,979	29,791	3.84%	18%	17%
Jun-09	28	10.95	22,483	28,629	-27.34%	14%	18%
Jul-09	31	8.90	21,879	25,371	-15.96%	13%	15%
Aug-09	31	9.59	26,237	26,870	-2.41%	15%	16%
Sep-09	30	8.61	22,744	23,736	-4.36%	14%	14%
Oct-09	31	10.66	32,523	31,028	4.59%	19%	18%
Nov-09	30	8.39	31,302	25,119	19.75%	19%	15%
Dec-09	30	8.81	40,620	26,036	35.91%	24%	16%
Total	354	10.45	343,559	343,679	-0.03%	17%	17%
Total in OSP (07/15-09/15)	63	8.91	49,792	49,790	0.00%	14%	14%

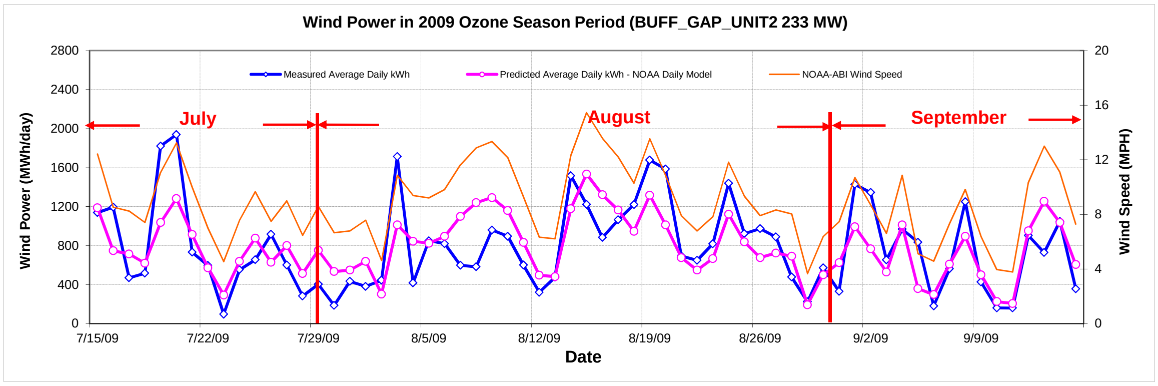


Figure 11-19: BUFF_GAP 2_UNIT2 – Predicted Wind Power in OSP Using NOAA Wind Speed (2009)

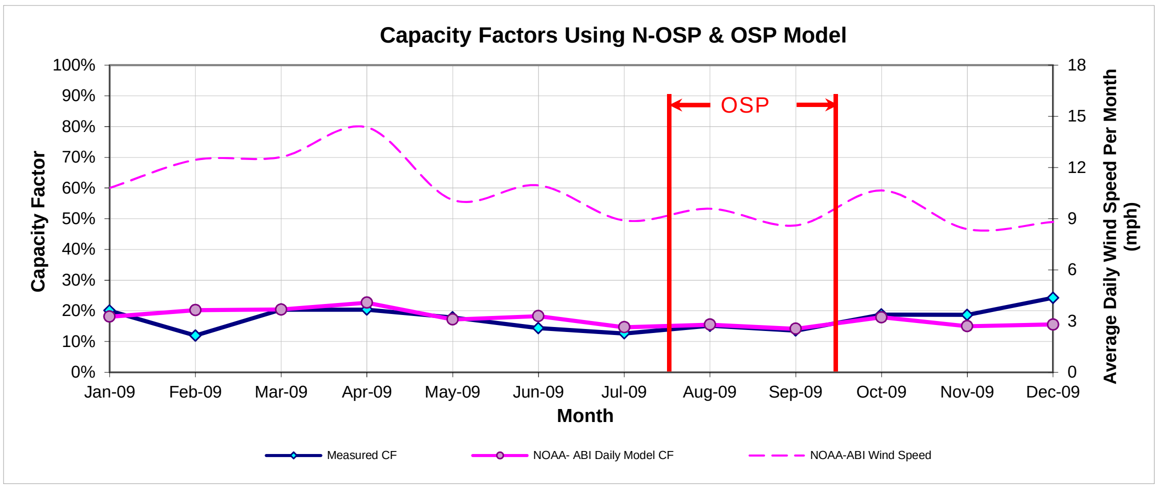


Figure 11-20: BUFF_GAP 2_UNIT2 – Predicted Capacity Factors Using Daily Models (2009)

Table 11-20: BUFF_GAP 2_UNIT2 – Predicted Power Production in 1999

Annual

1999 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
378,841	354,234

OSD

1999 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
881	790

.

11.5 Buffalo Gap 3

Table 11-21: Site Information for Buffalo Gap 3

GENSITECODE_ERCOT	Renewable Energy	City	County	Date in Service	Capacity (MW)	Company	Facility	Wind Turbine Information	Region	PCA	Interconnection	Weather Station
BUFF_GAP 3	WIND	Abilene	Taylor	Apr-08	170	AES Corporation	Buffalo Gap3		ERCOT	AEP-West	AEP-TNC	ABI

SUBGENCODE_ERCOT	GENSITECODE_ERCOT	Capacity (MW)
BUFF_GAP_UNIT3	BUFF_GAP	170

11.5.1 Buffalo Gap 3-BUFF_GAP_UNIT3

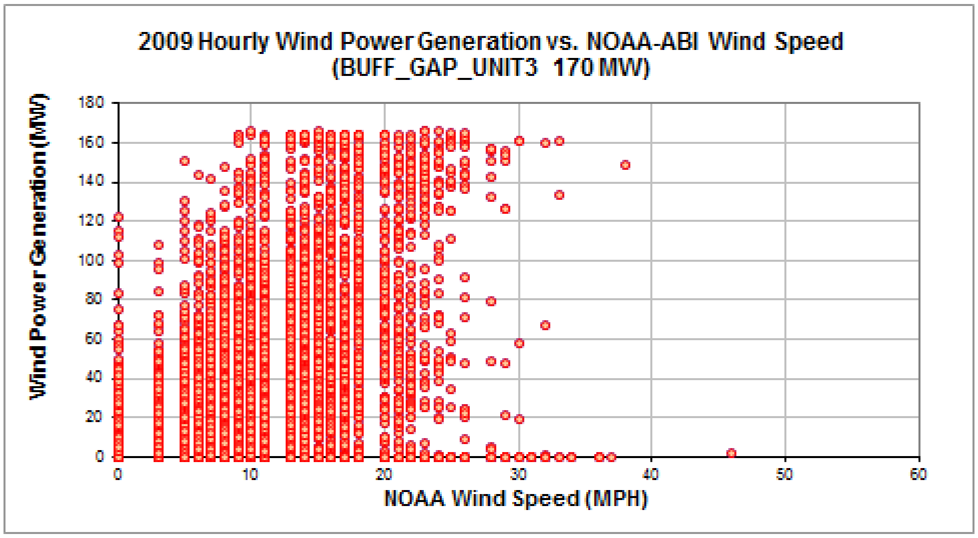
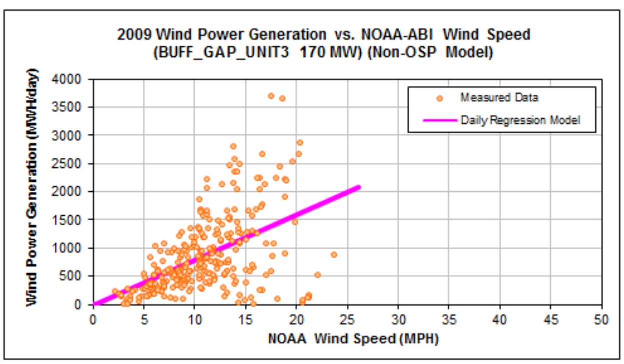


Figure 11-21: BUFF_GAP 3_UNIT3 – Hourly Wind Power vs. NOAA Wind Speed (2009)



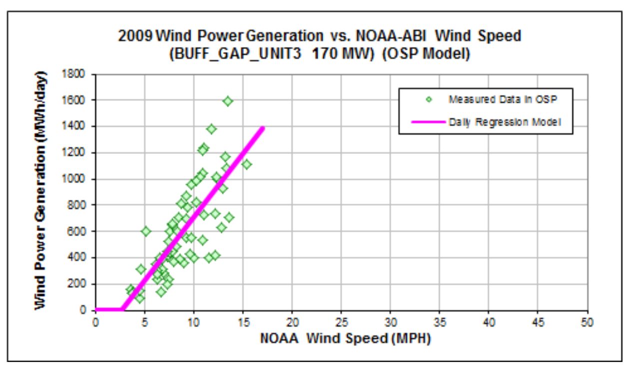


Figure 11-22: BUFF_GAP 3_UNIT3 – Daily Wind Power vs. NOAA Wind Speed (Using OSP and Non-OSP Model)

Table 11-22: BUFF_GAP 3_UNIT3 – Model Coefficients

Using Non-OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-22.5422
Left Slope (MWh/mph-day)	80.6936
RMSE (MWh/day)	574.8925
R2	0.2654
CV-RMSE	67.9%

Using OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-264.4553
Left Slope (MWh/mph-day)	97.1382
RMSE (MWh/day)	219.7951
R2	0.6033
CV-RMSE	36.5%

Table 11-23: BUFF_GAP 3_UNIT3 – Comparison of Predicted Power vs. Measured Power

Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-09	30	10.58	24,530	24,927	-1.62%	20%	20%
Feb-09	26	12.45	14,034	25,533	-81.93%	13%	24%
Mar-09	28	12.82	30,183	28,345	6.09%	26%	25%
Apr-09	27	14.41	24,802	30,790	-24.14%	23%	28%
May-09	31	10.10	23,683	24,572	-3.75%	19%	19%
Jun-09	28	10.95	18,849	24,118	-27.96%	16%	21%
Jul-09	30	8.73	16,396	18,728	-14.22%	13%	15%
Aug-09	31	9.59	20,916	20,666	1.20%	17%	16%
Sep-09	30	8.61	16,430	18,499	-12.59%	13%	15%
Oct-09	31	10.66	30,787	25,956	15.69%	24%	21%
Nov-09	30	8.39	29,961	19,629	34.48%	24%	16%
Dec-09	30	8.81	31,767	20,654	34.98%	26%	17%
Total	352	10.43	282,338	282,416	-0.03%	20%	20%
Total in OSP (07/15-09/15)	63	8.91	37,886	37,885	0.00%	15%	15%

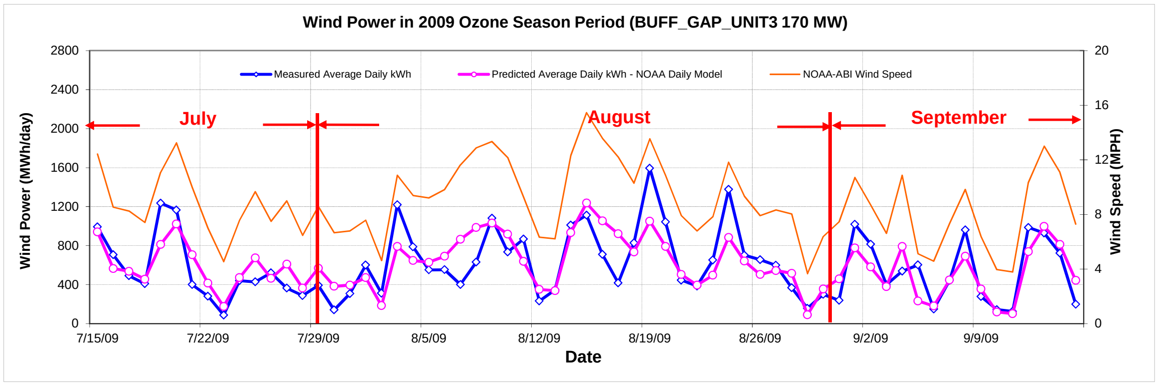


Figure 11-23: BUFF_GAP 3_UNIT3 – Predicted Wind Power in OSP Using NOAA Wind Speed (2009)

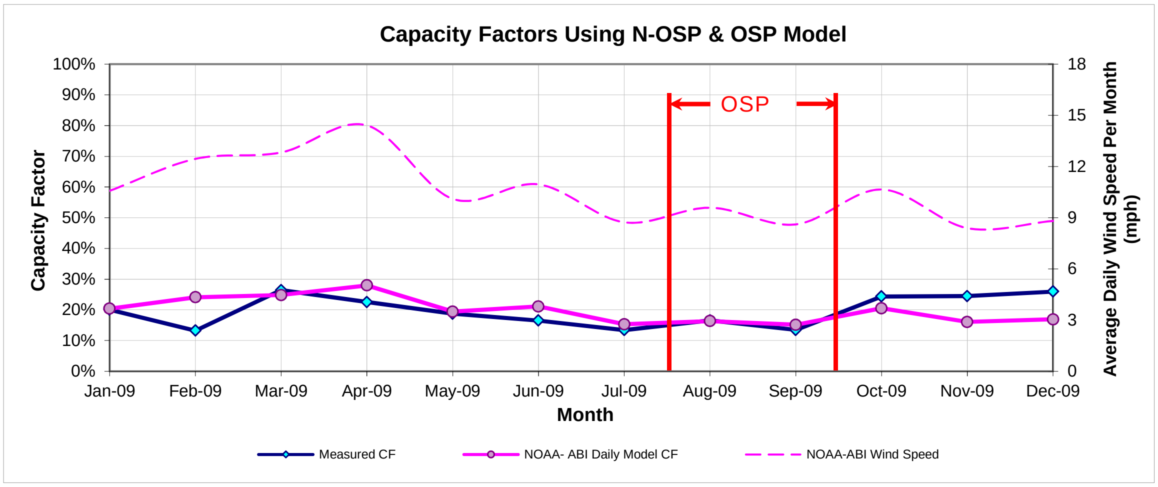


Figure 11-24: BUFF_GAP 3_UNIT3 – Predicted Capacity Factors Using Daily Models (2009)

Table 11-24: BUFF_GAP 3_UNIT3 – Predicted Power Production in 1999

Annual

1999 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
319,177	292,765

OSD

1999 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
679	601

11.6 Bull Creek Wind Plant

Table 11-25: Site Information for Bull Creek Wind Plant

GENSITECODE_ERCOT	Renewable Energy	City	County	Date in Service	Capacity (MW)	Company	Facility	Wind Turbine Information	Region	PCA	Interconnection	Weather Station
BULLCRK_WND1	WIND		Borden	Nov-08	180	Eurus Energy Holdings	Bull Creek Wind Plant		ERCOT			LBB

SUBGENCODE_ERCOT	GENSITECODE_ERCOT	Capacity (MW)
BULLCRK_WND1	BULLCRK_WND1	91
BULLCRK_WND2	BULLCRK_WND2	89

11.6.1 Bull Creek Wind Plant – BULLCRK_WND1

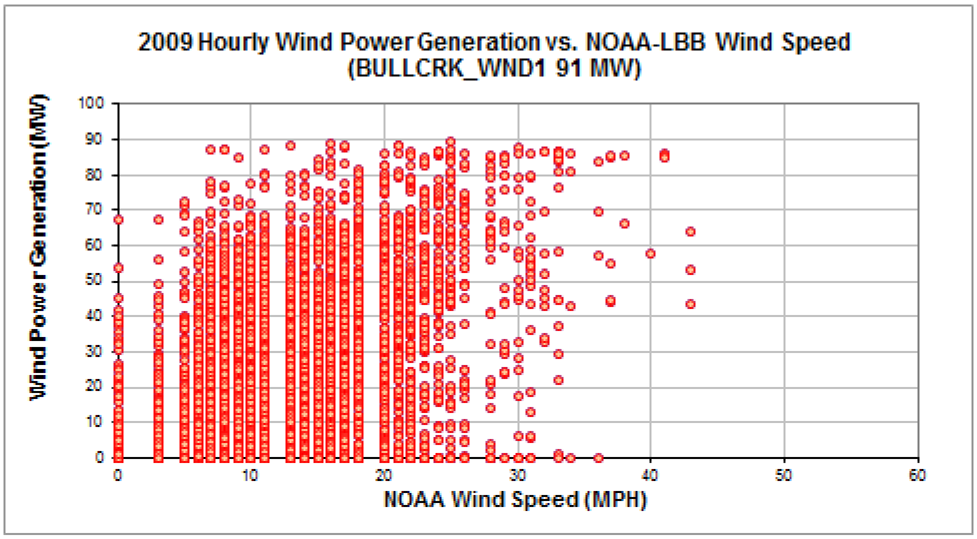
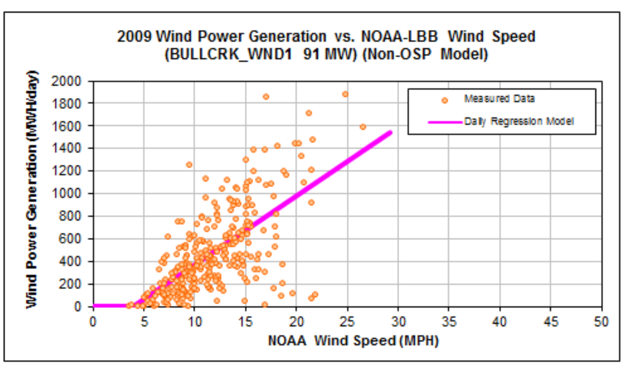


Figure 11-25: BULLCRK_WND1 - Hourly Wind Power vs. NOAA Wind Speed (2009)



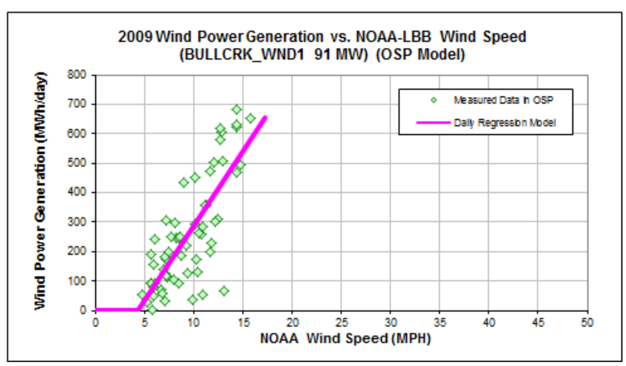


Figure 11-26: BULLCRK_WND1 - Daily Wind Power vs. NOAA Wind Speed (Using OSP and Non OSP Model)

Table 11-26: BULLCRK_WND1 – Model Coefficients

Using Non-OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-243.8492
Left Slope (MWh/mph-day)	60.9787
RMSE (MWh/day)	279.0084
R2	0.4236
CV-RMSE	59.1%

Using OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-222.6337
Left Slope (MWh/mph-day)	50.6223
RMSE (MWh/day)	118.0327
R2	0.6081
CV-RMSE	46.4%

Table 11-27: BULLCRK_WND1 – Comparison of Predicted Power vs. Measured Power

Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-09	31	11.22	18,998	13,643	28.18%	28%	20%
Feb-09	28	12.79	16,695	15,008	10.11%	27%	25%
Mar-09	31	14.10	19,838	19,091	3.77%	29%	28%
Apr-09	30	15.46	20,967	20,966	0.00%	32%	32%
May-09	31	11.64	8,659	14,443	-66.81%	13%	21%
Jun-09	30	11.23	10,917	13,237	-21.25%	17%	20%
Jul-09	30	9.89	8,604	9,658	-12.25%	13%	15%
Aug-09	31	10.36	8,996	9,359	-4.03%	13%	14%
Sep-09	30	9.16	9,350	8,502	9.07%	14%	13%
Oct-09	30	11.32	11,867	13,394	-12.87%	18%	20%
Nov-09	30	9.70	14,283	10,429	26.98%	22%	16%
Dec-09	30	9.28	8,223	9,707	-18.05%	13%	15%
Total	362	11.34	157,397	157,438	-0.03%	20%	20%
Total in OSP (07/15-09/15)	62	9.42	15,761	15,758	0.02%	12%	12%

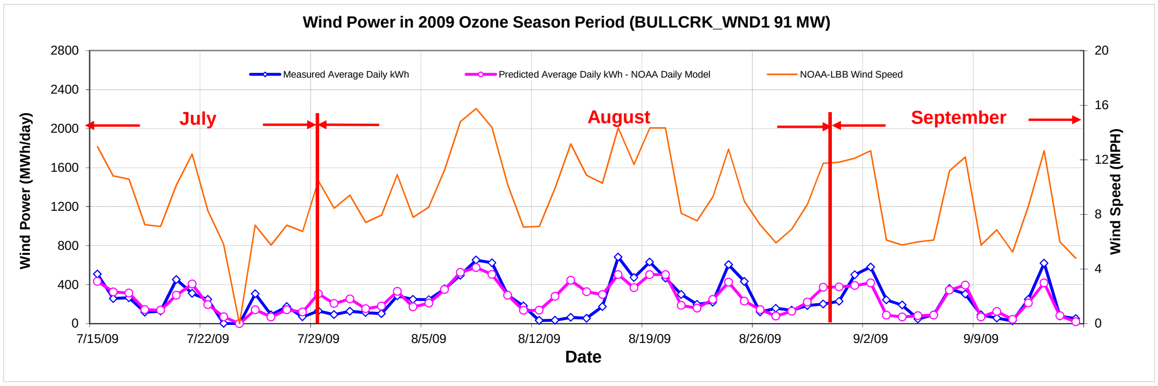


Figure 11-27: BULLCRK_WND1 - Predicted Wind Power in OSP Using NOAA Wind Speed (2009)

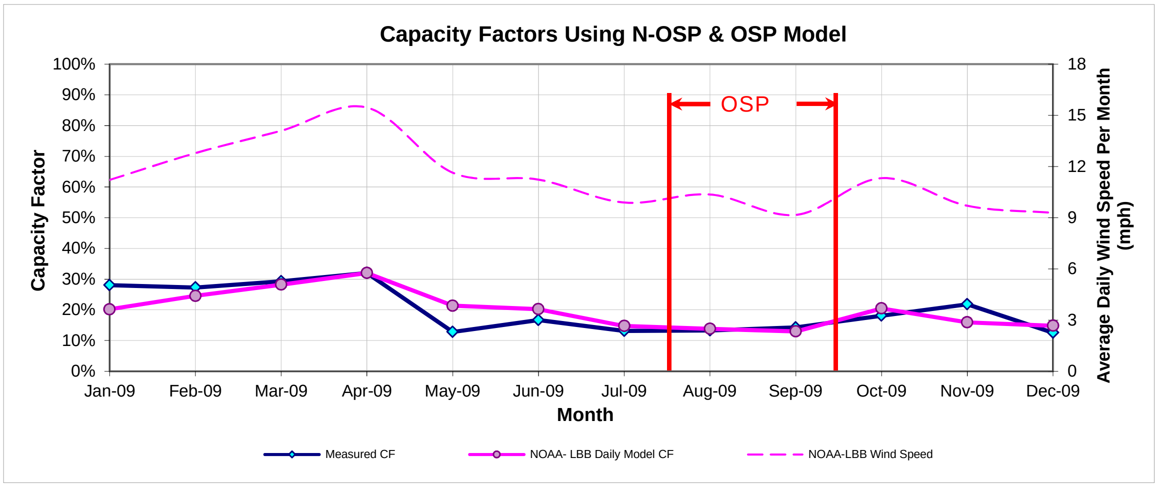


Figure 11-28: BULLCRK_WND1 – Predicted Capacity Factors Using Daily Models (2009)

Table 11-28: BULLCRK_WND1 – Predicted Power Production in 1999

Annual

1999 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
173,688	158,701

OSD

1999 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
276	254

11.6.2 Bull Creek Wind Plant – BULLCRK_WND2

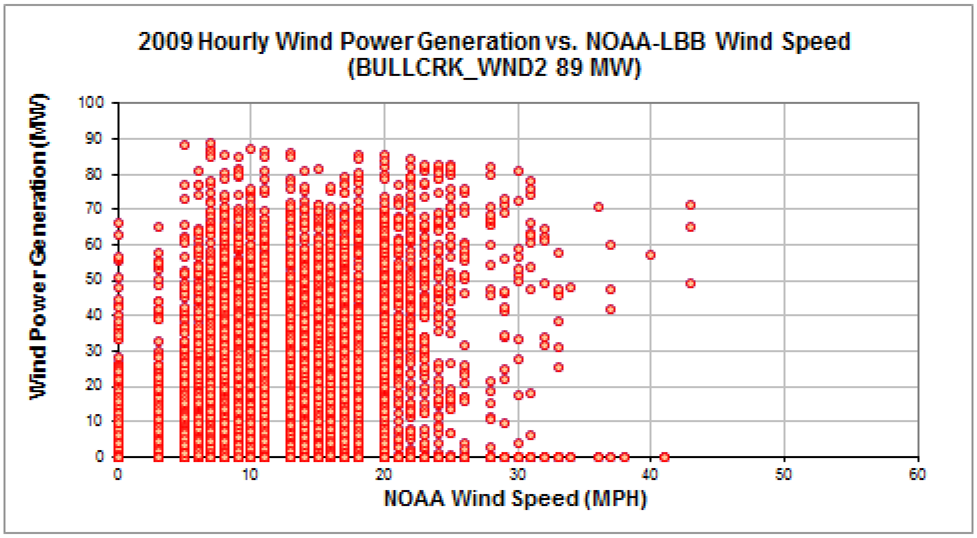
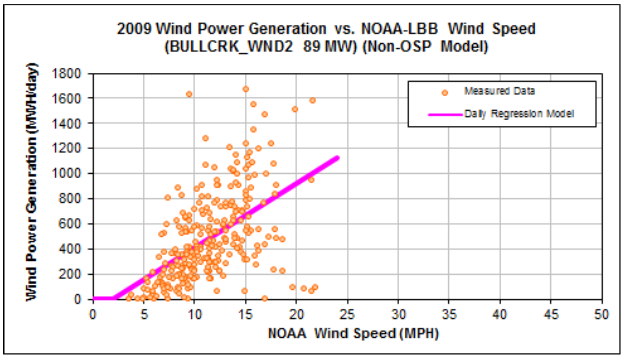


Figure 11-29: BULLCRK_WND2- Hourly Wind Power vs. NOAA Wind Speed (2009)



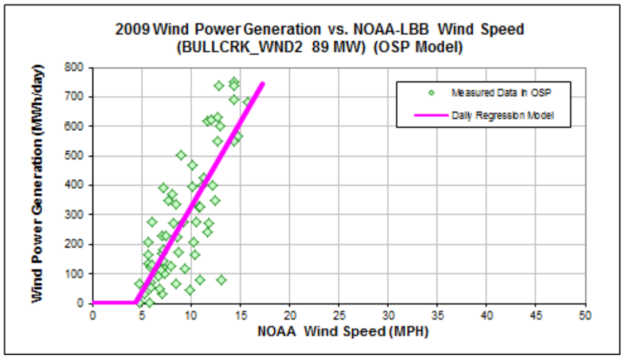


Figure 11-30: BULLCRK_WND2– Daily Wind Power vs. NOAA Wind Speed (Using OSP and Non-OSP Model)

Table 11-29: BULLCRK_WND2– Model Coefficients

Using Non-OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-101.1106
Left Slope (MWh/mph-day)	51.0944
RMSE (MWh/day)	297.6519
R2	0.2749
CV-RMSE	62.1%

Using OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-247.4178
Left Slope (MWh/mph-day)	57.2536
RMSE (MWh/day)	134.4932
R2	0.6104
CV-RMSE	46.8%

Table 11-30: BULLCRK_WND2– Comparison of Predicted Power vs. Measured Power

Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-09	31	11.22	21,978	14,632	33.43%	33%	22%
Feb-09	28	12.79	18,121	15,465	14.66%	30%	26%
Mar-09	25	13.14	14,241	14,255	-0.09%	27%	27%
Apr-09	16	14.41	6,366	10,159	-59.58%	19%	30%
May-09	31	11.64	10,258	15,302	-49.17%	15%	23%
Jun-09	30	11.23	12,141	14,188	-16.86%	19%	22%
Jul-09	31	9.72	9,939	10,677	-7.43%	15%	16%
Aug-09	31	10.36	10,512	10,720	-1.98%	16%	16%
Sep-09	30	9.16	10,147	9,571	5.67%	16%	15%
Oct-09	30	11.32	12,945	14,320	-10.62%	20%	22%
Nov-09	30	9.70	16,087	11,835	26.43%	25%	18%
Dec-09	30	9.28	9,622	11,196	-16.36%	15%	17%
Total	343	10.99	152,357	152,319	0.02%	21%	21%
Total in OSP (07/15-09/15)	63	9.35	18,124	18,121	0.02%	13%	13%

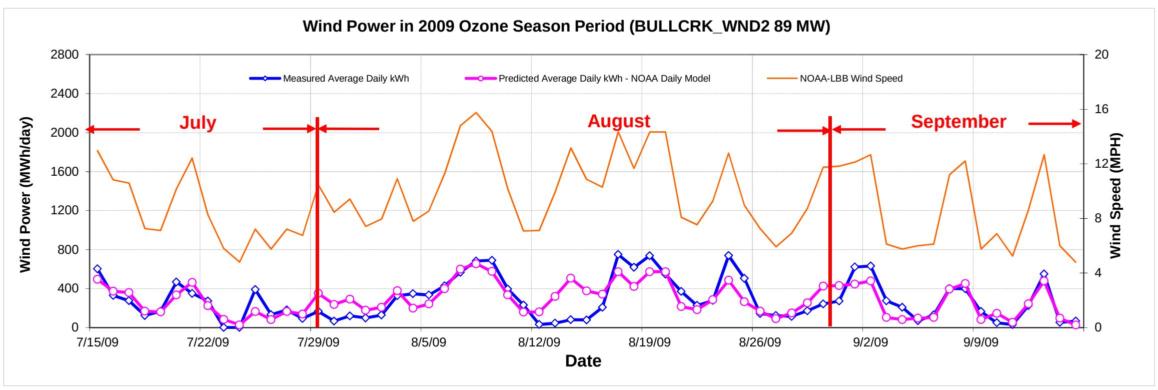


Figure 11-31: BULLCRK_WND2– Predicted Wind Power in OSP Using NOAA Wind Speed (2009)

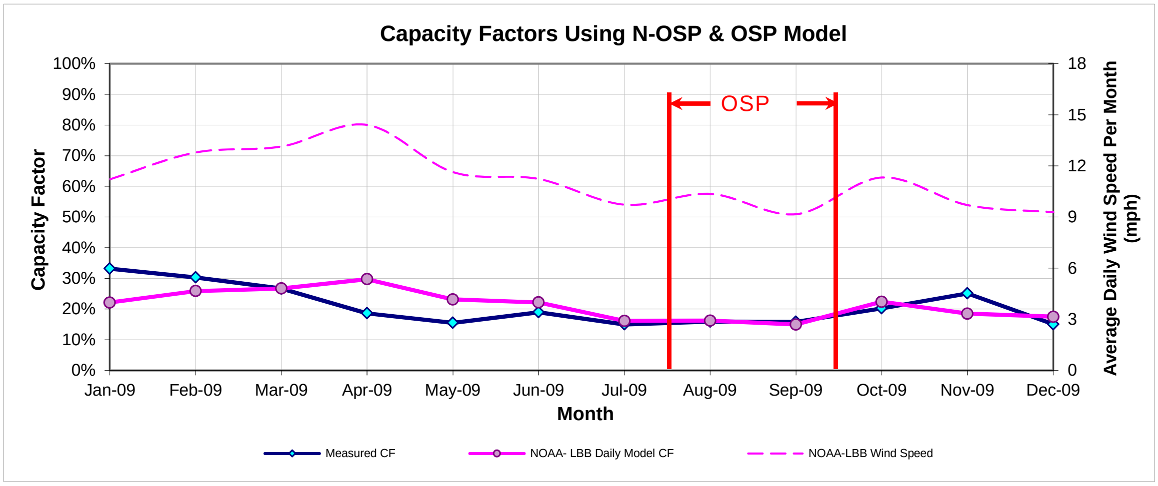


Figure 11-32: BULLCRK_WND2– Predicted Capacity Factors Using Daily Models (2009)

Table 11-31: BULLCRK_WND2– Predicted Power Production in 1999

Annual

1999 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
182,074	162,129

OSD

1999 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
316	288

11.7 Callahan Divide Wind Energy Center

Table 11-32: Site Information for Callahan Divide

GENSITECODE_ERCOT	Renewable Energy	City	County	Date in Service	Capacity (MW)	Company	Facility	Wind Turbine Information	Region	PCA	Interconnection	Weather Station
CALLAHAN	WIND	Abilene	TAYLOR	Feb-07	114	FPL Energy	Callahan Divide Wind Energy Center	GE Wind 1500 (76)	ERCOT	AEP-West	AEP-TNC	ABI

SUBGENCODE_ERCOT	GENSITECODE_ERCOT	Capacity (MW)
CALLAHAN_WND1	CALLAHAN	114

11.7.1 Callahan Divide Wind Energy Center – CALLAHAN_WIND1

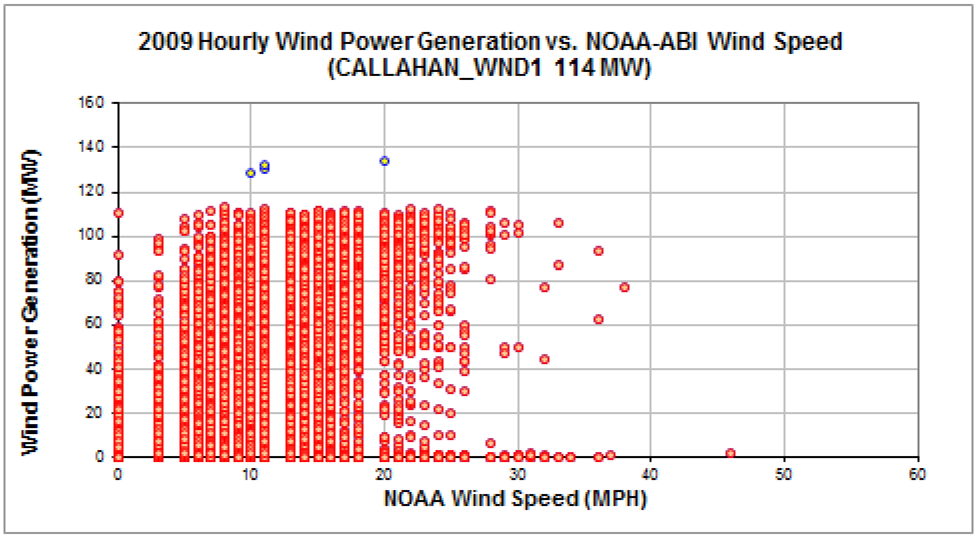
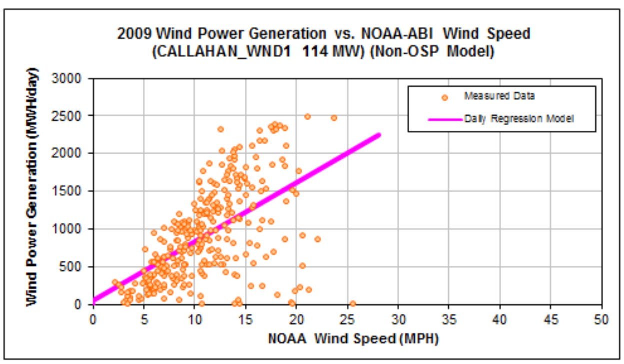


Figure 11-33:CALLAHAN WIND1 – Hourly Wind Power vs. NOAA Wind Speed (2009)



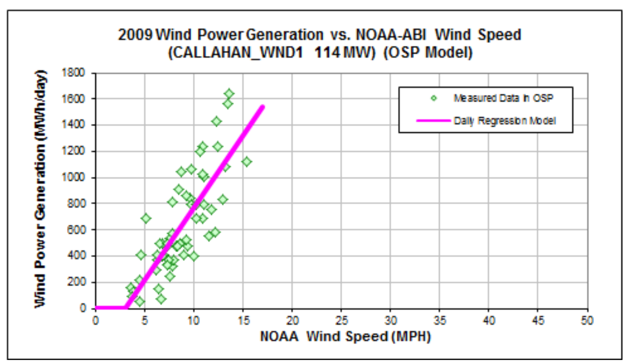


Figure 11-34: CALLAHAN WIND1 – Daily Wind Power vs. NOAA Wind Speed (Using OSP and Non-OSP Model)

Table 11-33: CALLAHAN WIND1 – Model Coefficients

Using Non-OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	51.8566
Left Slope (MWh/mph-day)	78.2060
RMSE (MWh/day)	506.2129
R2	0.3190
CV-RMSE	55.6%

Using OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-334.8672
Left Slope (MWh/mph-day)	110.5708
RMSE (MWh/day)	229.3357
R2	0.6359
CV-RMSE	36.2%

Table 11-34: CALLAHAN WIND1 – Comparison of Predicted Power vs. Measured Power

Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-09	31	10.70	34,243	27,551	19.54%	40%	32%
Feb-09	28	12.91	26,100	29,728	-13.90%	34%	39%
Mar-09	31	13.29	32,234	33,832	-4.96%	38%	40%
Apr-09	28	14.54	25,114	33,287	-32.54%	33%	43%
May-09	30	10.14	22,325	25,340	-13.51%	27%	31%
Jun-09	30	11.31	28,111	28,100	0.04%	34%	34%
Jul-09	31	8.90	18,014	21,289	-18.18%	21%	25%
Aug-09	26	9.35	18,267	18,178	0.49%	26%	26%
Sep-09	30	8.61	18,296	19,821	-8.34%	22%	24%
Oct-09	31	10.66	29,458	27,440	6.85%	35%	32%
Nov-09	30	8.39	30,510	21,235	30.40%	37%	26%
Dec-09	30	8.81	25,475	22,229	12.74%	31%	27%
Total	356	10.62	308,147	308,029	0.04%	32%	32%
Total in OSP (07/15-09/15)	58	8.75	36,697	36,695	0.00%	23%	23%

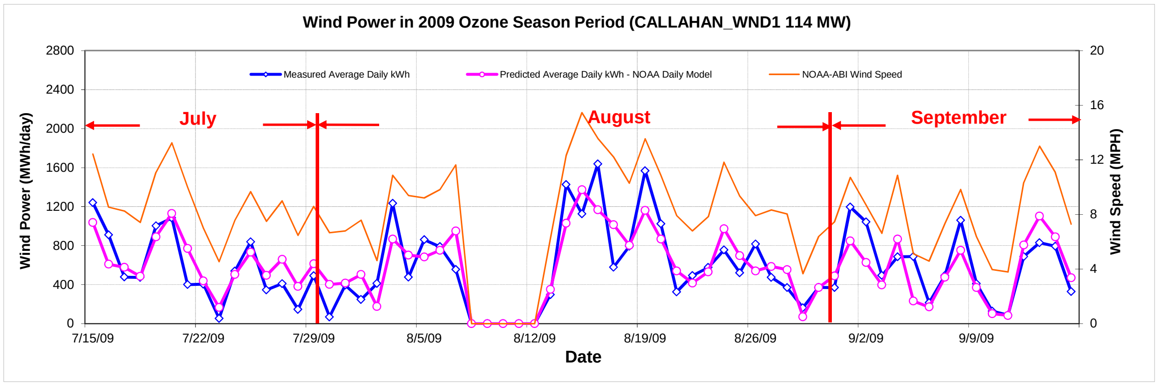


Figure 11-35: CALLAHAN WIND1 – Predicted Wind Power in OSP Using NOAA Wind Speed (2009)

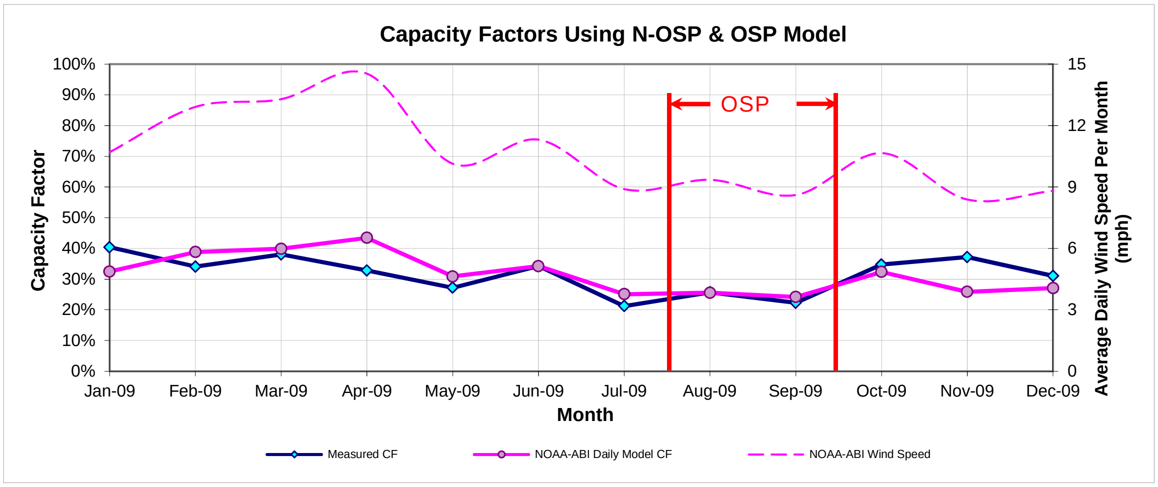


Figure 11-36: CALLAHAN WIND1 – Predicted Capacity Factors Using Daily Models (2009)

Table 11-35: CALLAHAN WIND1 – Predicted Power Production in 1999

Annual

1999 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
336,695	315,937

OSD

1999 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
739	633

Note: In 2009, the name of CALLAHAN WIND1 was changed into HHGT_CALLAHAN based on ERCOT original data. In this report, the previous name of this wind farm was used for all analysis in order to keep consistence.

11.8 Capricorn Ridge Wind Expansion

Table 11-36: Site Information for Capricorn Ridge Wind Expansion

GENSITECODE_ERCOT	Renewable Energy	City	County	Date in Service	Capacity (MW)	Company	Facility	Wind Turbine Information	Region	PCA	Interconnection	Weather Station
CAPRIDGE_CR3	WIND	Abilene	STERLING	May-08	298.5	FPL Energy	Capricorn Ridge Wind exp.		ERCOT	LCRA	LCRA	ABI

SUBGENCODE_ERCOT	GENSITECODE_ERCOT	Capacity (MW)
CAPRIDGE_CR3	CAPRIDGE_CR3	186
CAPRIDG4_CR4	CAPRIDG4_CR4	112.5

11.8.1 Capricorn Ridge Wind Expansion – CAPRIDGE_CR3

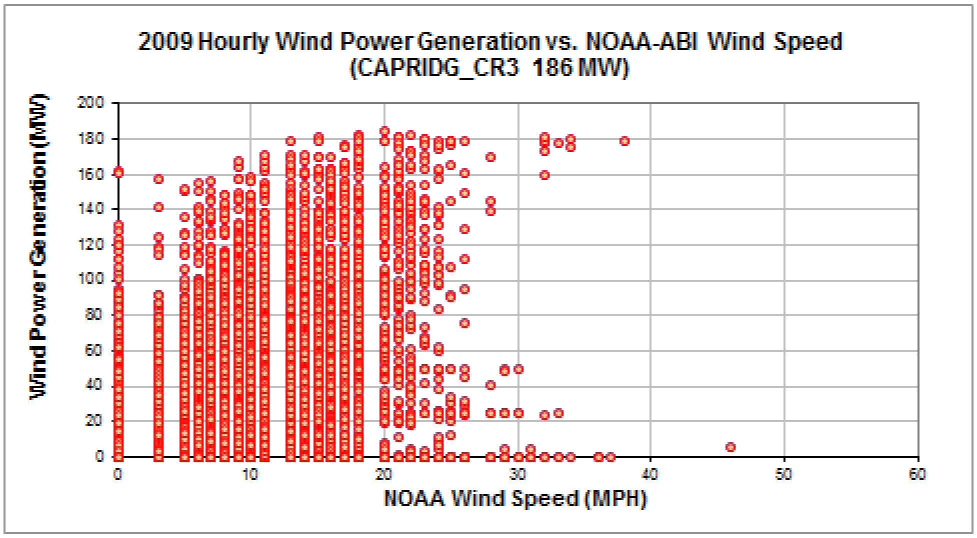


Figure 11-37: CAPRIDGE_CR3– Hourly Wind Power vs. NOAA Wind Speed (2009)

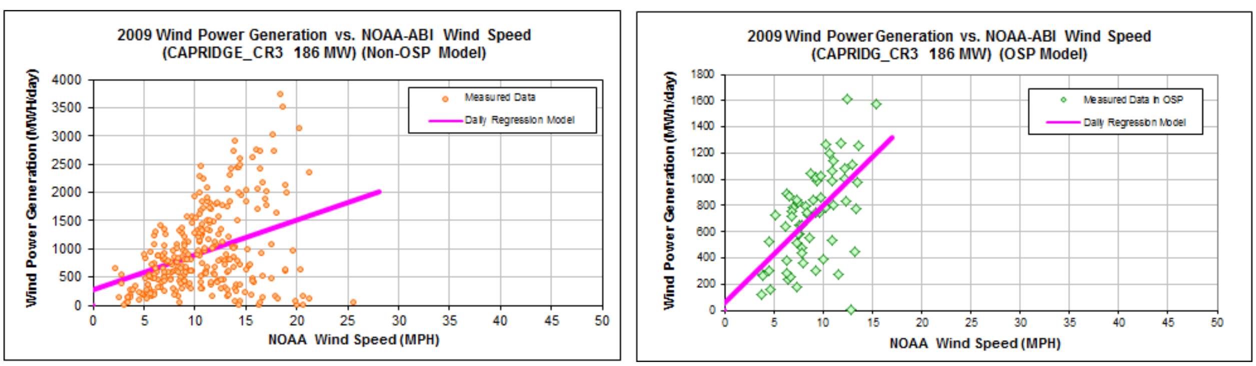


Figure 11-38: CAPRIDGE_CR3– Daily Wind Power vs. NOAA Wind Speed (Using OSP and Non-OSP Model)

Table 11-37: CAPRIDGE_CR3– Model Coefficients

Using Non-OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	276.5369
Left Slope (MWh/mph-day)	61.9450
RMSE (MWh/day)	675.8860
R2	0.1321
CV-RMSE	71.7%

Using OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	55.7116
Left Slope (MWh/mph-day)	74.0319
RMSE (MWh/day)	291.0275
R2	0.3350
CV-RMSE	40.7%

Table 11-38: CAPRIDGE_CR3– Comparison of Predicted Power vs. Measured Power

Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-09	31	10.70	33,246	29,122	12.40%	24%	21%
Feb-09	26	12.45	19,977	27,240	-36.36%	17%	23%
Mar-09	30	13.10	27,228	32,643	-19.89%	20%	24%
Apr-09	26	13.87	32,897	29,525	10.25%	28%	25%
May-09	31	10.10	27,178	27,972	-2.92%	20%	20%
Jun-09	28	10.95	19,057	26,742	-40.33%	15%	21%
Jul-09	30	8.73	19,915	22,517	-13.07%	15%	17%
Aug-09	31	9.59	23,506	23,725	-0.93%	17%	17%
Sep-09	30	8.61	19,208	22,425	-16.75%	14%	17%
Oct-09	31	10.66	30,824	29,034	5.81%	22%	21%
Nov-09	30	8.39	30,689	23,884	22.17%	23%	18%
Dec-09	30	8.81	35,409	24,671	30.33%	26%	18%
Total	354	10.43	319,134	319,501	-0.11%	20%	20%
Total in OSP (07/15-09/15)	63	8.91	45,082	45,081	0.00%	16%	16%

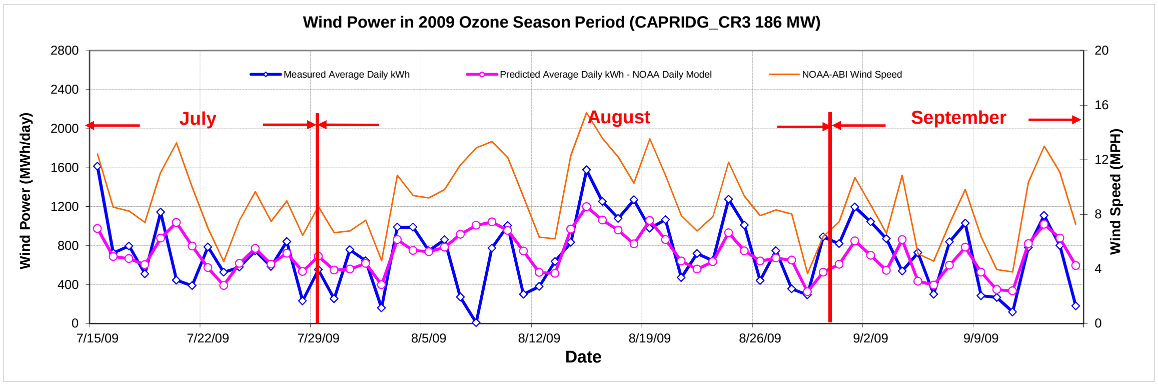


Figure 11-39: CAPRIDGE_CR3– Predicted Wind Power in OSP Using NOAA Wind Speed (2009)

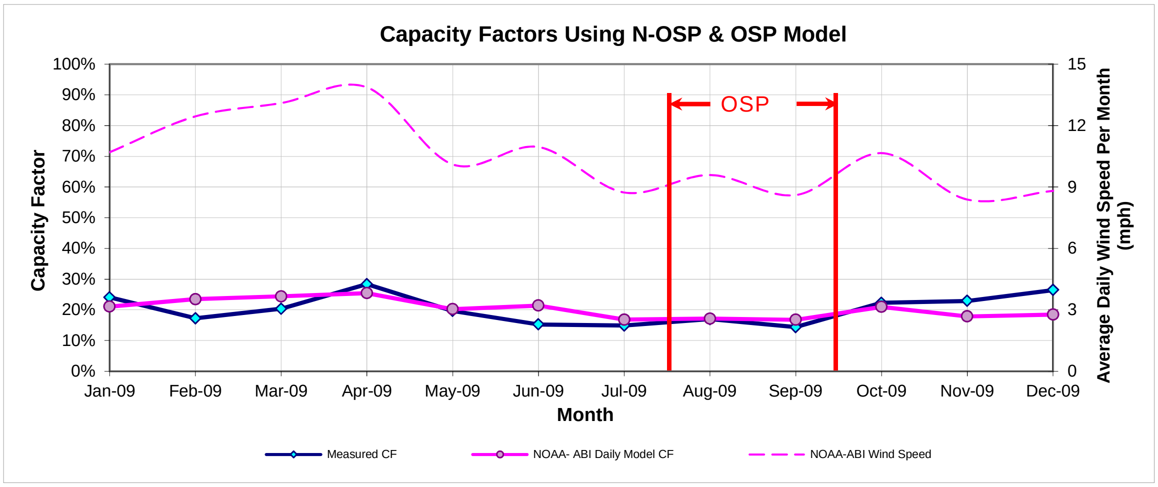


Figure 11-40: CAPRIDGE_CR3– Predicted Capacity Factors Using Daily Models (2009)

Table 11-39: CAPRIDGE_CR3– Predicted Power Production in 1999

Annual

1999 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
349,730	329,051

OSD

1999 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
775	716

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11.8.2 Capricorn Ridge Wind Expansion – CAPRIDGE4_CR4

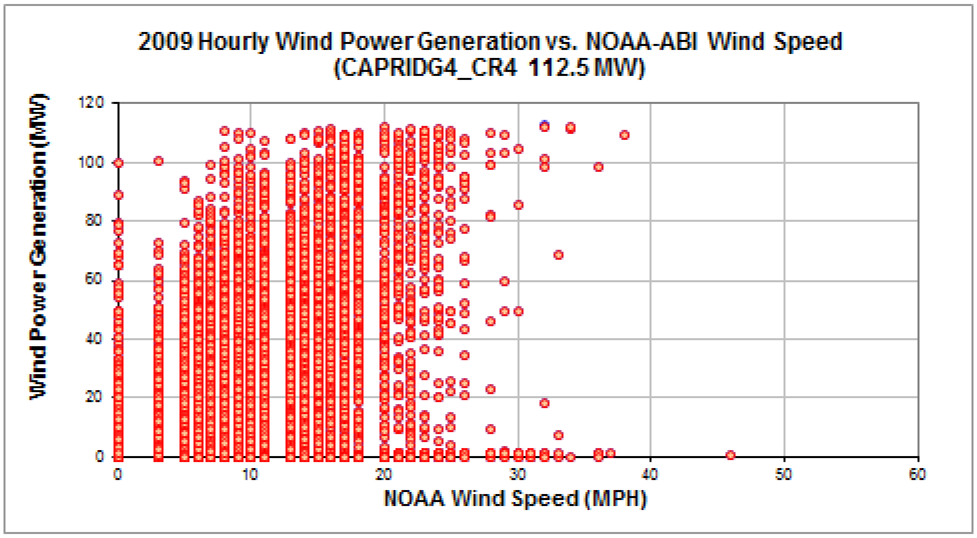
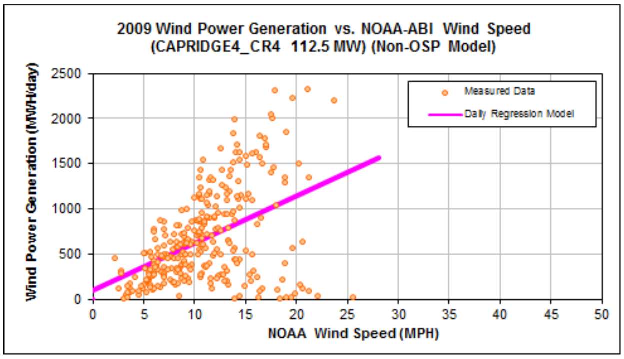


Figure 11-41: CAPRIDGE4_CR4 – Hourly Wind Power vs. NOAA Wind Speed (2009)



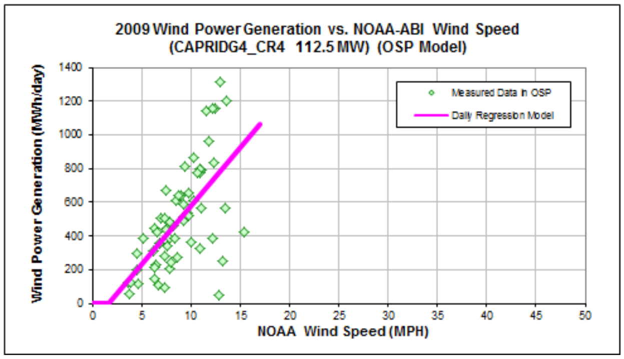


Figure 11-42: CAPRIDGE4_CR4 – Daily Wind Power vs. NOAA Wind Speed (Using OSP and Non-OSP Model)

Table 11-40: CAPRIDGE4_CR4 – Model Coefficients

Using Non-OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	95.6711
Left Slope (MWh/mph-day)	52.4059
RMSE (MWh/day)	451.0208
R2	0.2095
CV-RMSE	67.6%

Using OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-116.0035
Left Slope (MWh/mph-day)	69.5315
RMSE (MWh/day)	236.7587
R2	0.3955
CV-RMSE	47.5%

Table 11-41: CAPRIDGE4_CR4 – Comparison of Predicted Power vs. Measured Power

Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-09	31	10.70	23,801	20,351	14.50%	28%	24%
Feb-09	25	12.37	17,647	18,592	-5.36%	26%	28%
Mar-09	31	13.29	19,965	24,559	-23.01%	24%	29%
Apr-09	30	14.82	30,784	26,166	15.00%	38%	32%
May-09	31	10.10	16,716	19,378	-15.93%	20%	23%
Jun-09	26	10.77	13,958	17,168	-23.00%	20%	24%
Jul-09	31	8.90	14,474	16,301	-12.62%	17%	19%
Aug-09	30	9.46	16,144	16,253	-0.68%	20%	20%
Sep-09	30	8.61	12,849	15,276	-18.88%	16%	19%
Oct-09	31	10.66	18,158	20,276	-11.66%	22%	24%
Nov-09	30	8.39	22,344	16,058	28.14%	28%	20%
Dec-09	30	8.81	20,151	16,723	17.01%	25%	21%
Total	356	10.55	226,991	227,100	-0.05%	24%	24%
Total in OSP (07/15-09/15)	62	8.84	30,926	30,924	0.00%	18%	18%

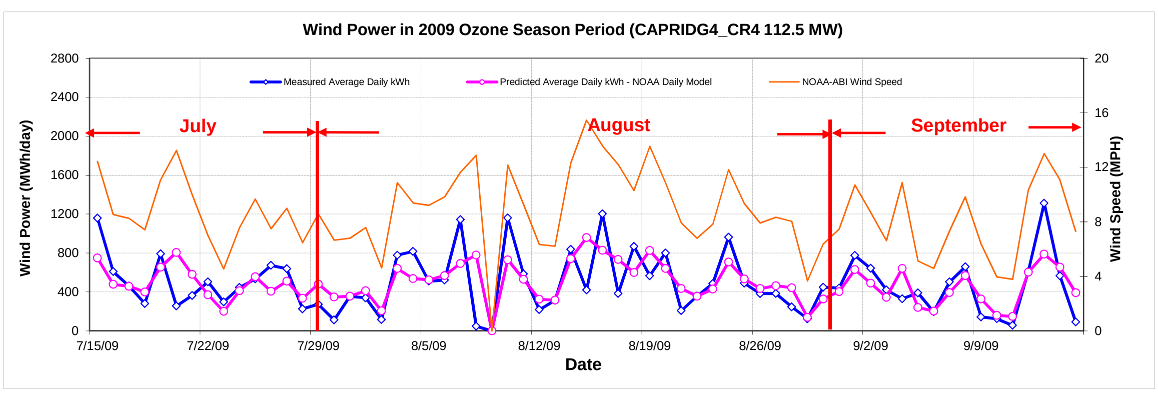


Figure 11-43: CAPRIDGE4_CR4 – Predicted Wind Power in OSP Using NOAA Wind Speed (2009)

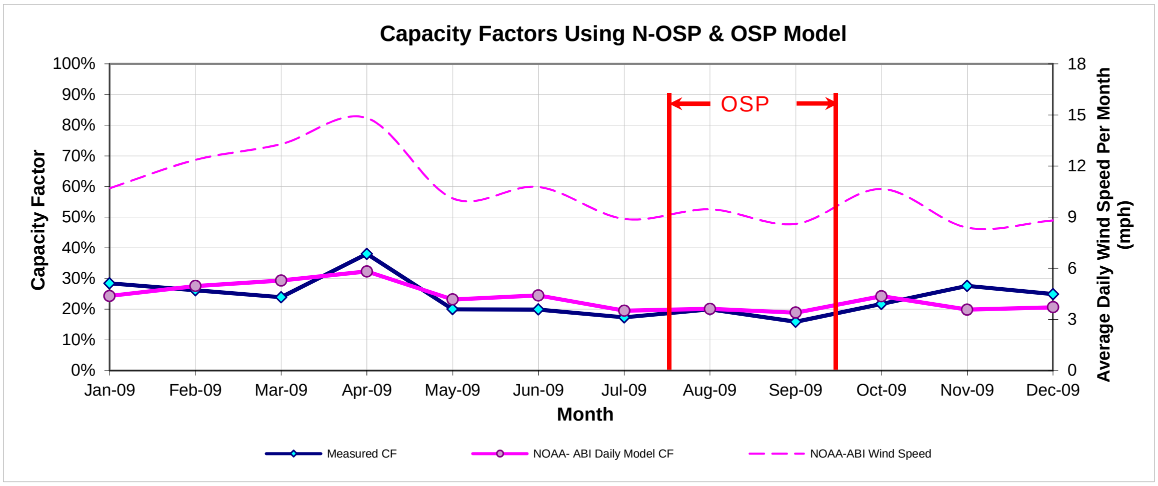


Figure 11-44: CAPRIDGE4_CR4 – Predicted Capacity Factors Using Daily Models (2009)

Table 11-42: CAPRIDGE4_CR4 – Predicted Power Production in 1999

Annual

1999 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
248,056	232,730

OSD

1999 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
559	499

11.9 Capricorn Ridge Wind

Table 11-43: Site Information for Capricorn Ridge Wind – CAPRIDGE_CR1

GENSITECODE_ERCOT	Renewable Energy	City	County	Date in Service	Capacity (MW)	Company	Facility	Wind Turbine Information	Region	PCA	Interconnection	Weather Station
CAPRIDGE_CR1	WIND	ABILENE	Sterling	Sep-07	364	FPL Energy	Capricorn Ridge Wind	FPL Energy	ERCOT		LCRA	ABI

SUBGENCODE_ERCOT	GENSITECODE_ERCOT	Capacity (MW)
CAPRIDGE_CR1	CAPRIDGE_CR1	214.5
CAPRIDGE_CR2	CAPRIDGE_CR2	149.5

11.9.1 Capricorn Ridge Wind – CAPRIDGE_CR1

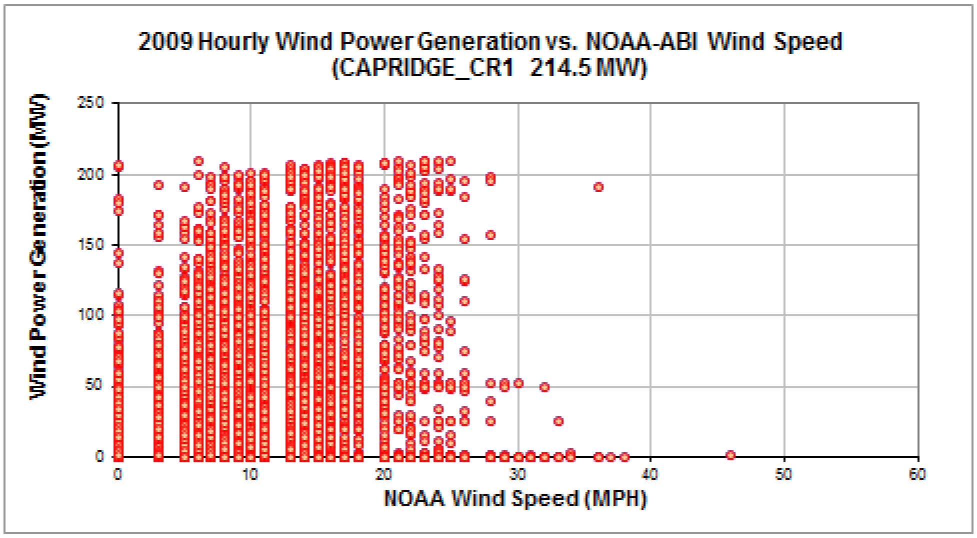


Figure 11-45: CAPRIDGE_CR1– Hourly Wind Power vs. NOAA Wind Speed (2009)

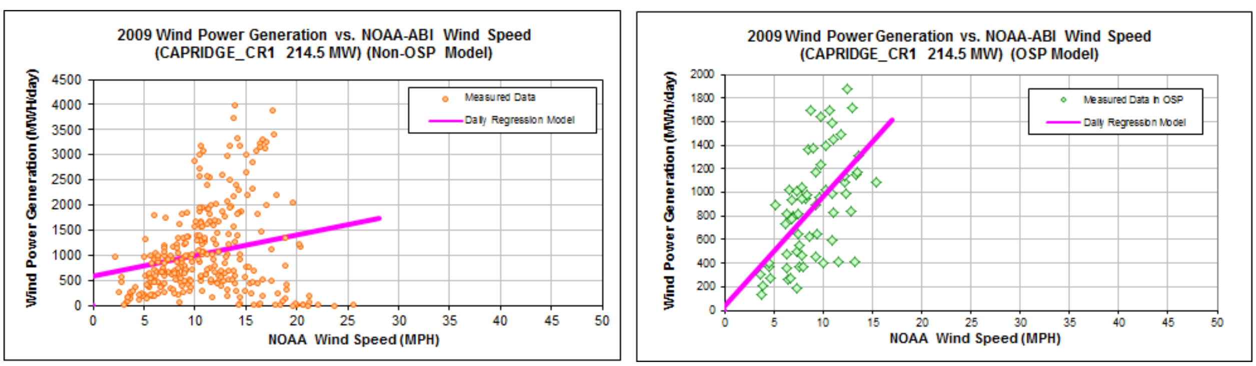


Figure 11-46: CAPRIDGE_CR1– Daily Wind Power vs. NOAA Wind Speed (Using OSP and Non-OSP Model)

Table 11-44: CAPRIDGE_CR1– Model Coefficients

Using Non-OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	588.4121
Left Slope (MWh/mph-day)	41.1080
RMSE (MWh/day)	843.3064
R2	0.0446
CV-RMSE	81.2%

Using OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	41.1401
Left Slope (MWh/mph-day)	92.5305
RMSE (MWh/day)	368.1926
R2	0.3296
CV-RMSE	42.5%

Table 11-45: CAPRIDGE_CR1– Comparison of Predicted Power vs. Measured Power

Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-09	31	10.70	38,836	31,878	17.92%	24%	20%
Feb-09	28	12.91	19,681	31,338	-59.23%	14%	22%
Mar-09	31	13.29	36,338	35,179	3.19%	23%	22%
Apr-09	29	14.65	37,486	34,534	7.87%	25%	23%
May-09	31	10.10	29,628	31,114	-5.02%	19%	19%
Jun-09	29	11.09	22,542	30,287	-34.36%	15%	20%
Jul-09	30	8.73	24,309	26,561	-9.26%	16%	17%
Aug-09	31	9.59	27,568	28,770	-4.36%	17%	18%
Sep-09	30	8.61	22,996	26,209	-13.98%	15%	17%
Oct-09	31	10.66	27,262	31,819	-16.72%	17%	20%
Nov-09	30	8.39	37,078	27,997	24.49%	24%	18%
Dec-09	30	8.81	39,963	28,519	28.64%	26%	18%
Total	361	10.61	363,686	364,206	-0.14%	20%	20%
Total in OSP (07/15-09/15)	63	8.91	54,551	54,550	0.00%	17%	17%

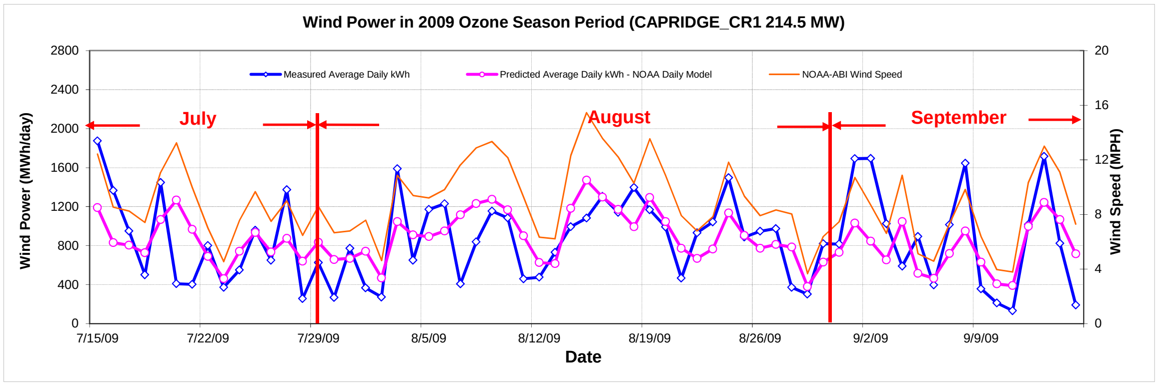


Figure 11-47: CAPRIDGE_CR1– Predicted Wind Power in OSP Using NOAA Wind Speed (2009)

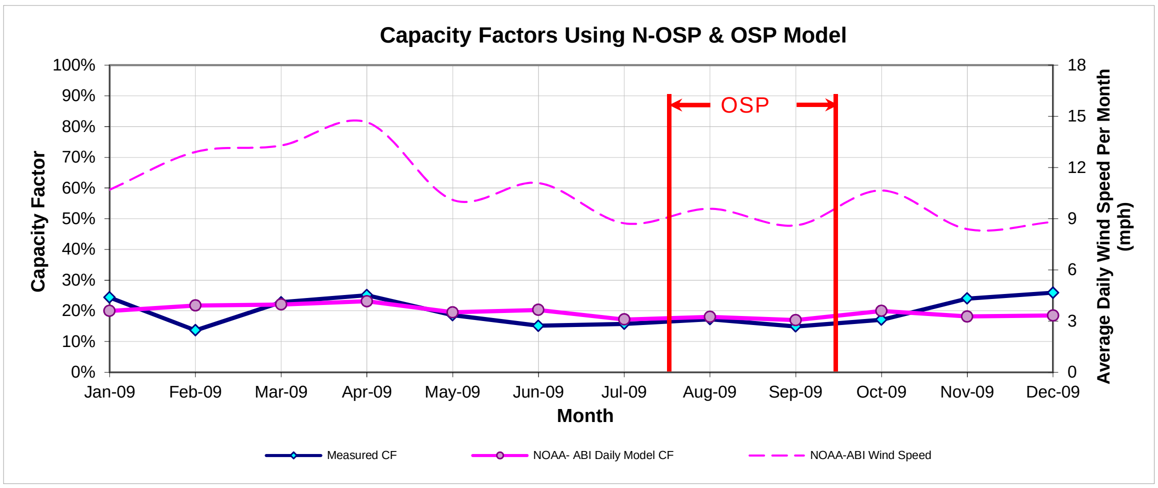


Figure 11-48: CAPRIDGE_CR1– Predicted Capacity Factors Using Daily Models (2009)

Table 11-46: CAPRIDGE_CR1– Predicted Power Production in 1999

Annual

1999 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
381,177	367,716

OSD

1999 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
940	866

11.9.2 Capricorn Ridge Wind – CAPRIDGE_CR2

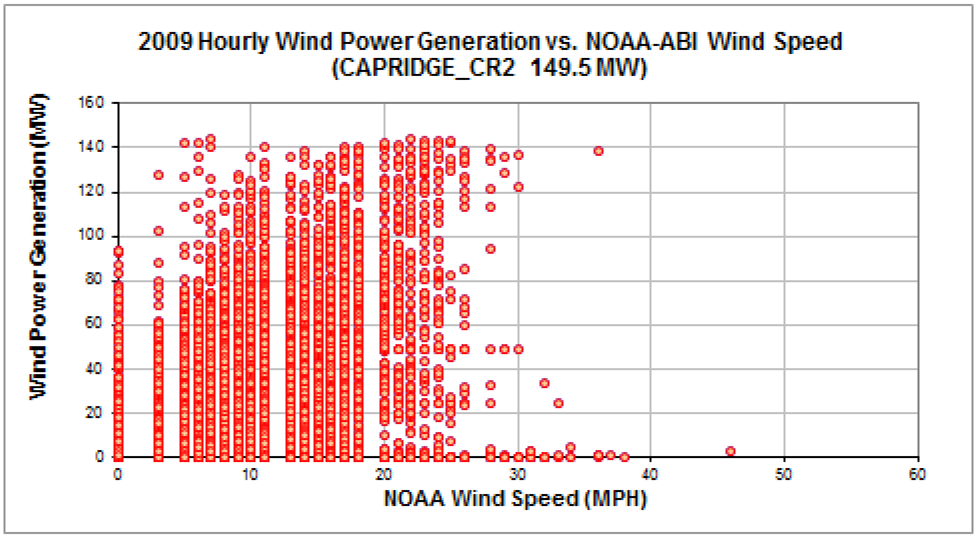


Figure 11-49: CAPRIDGE_CR2– Hourly Wind Power vs. NOAA Wind Speed (2009)

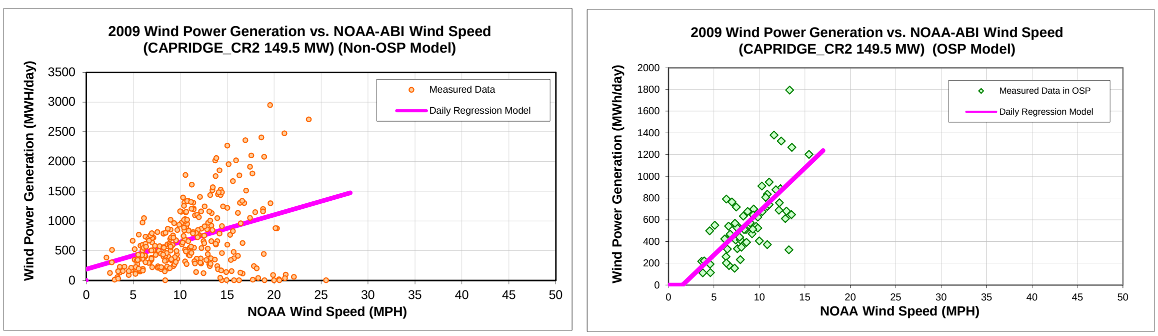


Figure 11-50: CAPRIDGE_CR2– Daily Wind Power vs. NOAA Wind Speed (Using OSP and Non-OSP Model)

Table 11-47: CAPRIDGE_CR2– Model Coefficients

Using Non-OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	187.8978
Left Slope (MWh/mph-day)	45.7360
RMSE (MWh/day)	497.6694
R2	0.1429
CV-RMSE	72.1%

Using OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-125.3328
Left Slope (MWh/mph-day)	80.1667
RMSE (MWh/day)	233.4872
R2	0.4786
CV-RMSE	39.6%

Table 11-48: CAPRIDGE_CR2– Comparison of Predicted Power vs. Measured Power

Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-09	31	10.70	24,519	20,997	14.36%	22%	19%
Feb-09	28	12.91	15,494	21,797	-40.69%	15%	22%
Mar-09	31	13.29	20,608	24,670	-19.71%	19%	22%
Apr-09	29	14.65	34,797	24,886	28.48%	33%	24%
May-09	31	10.10	19,150	20,148	-5.21%	17%	18%
Jun-09	30	11.31	13,452	21,161	-57.30%	12%	20%
Jul-09	30	8.73	16,639	17,276	-3.83%	15%	16%
Aug-09	31	9.59	20,669	19,936	3.55%	19%	18%
Sep-09	30	8.61	14,258	16,867	-18.30%	13%	16%
Oct-09	31	10.66	21,761	20,932	3.81%	20%	19%
Nov-09	30	8.39	19,247	17,146	10.92%	18%	16%
Dec-09	30	8.81	22,624	17,727	21.64%	21%	16%
Total	362	10.63	243,218	243,542	-0.13%	19%	19%
Total in OSP (07/15-09/15)	63	8.91	37,121	37,120	0.00%	16%	16%

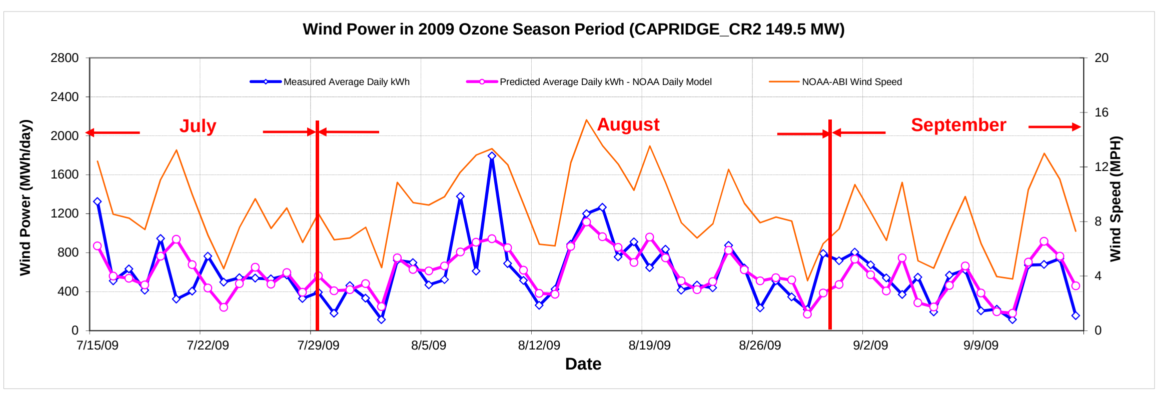


Figure 11-51: CAPRIDGE_CR2– Predicted Wind Power in OSP Using NOAA Wind Speed (2009)

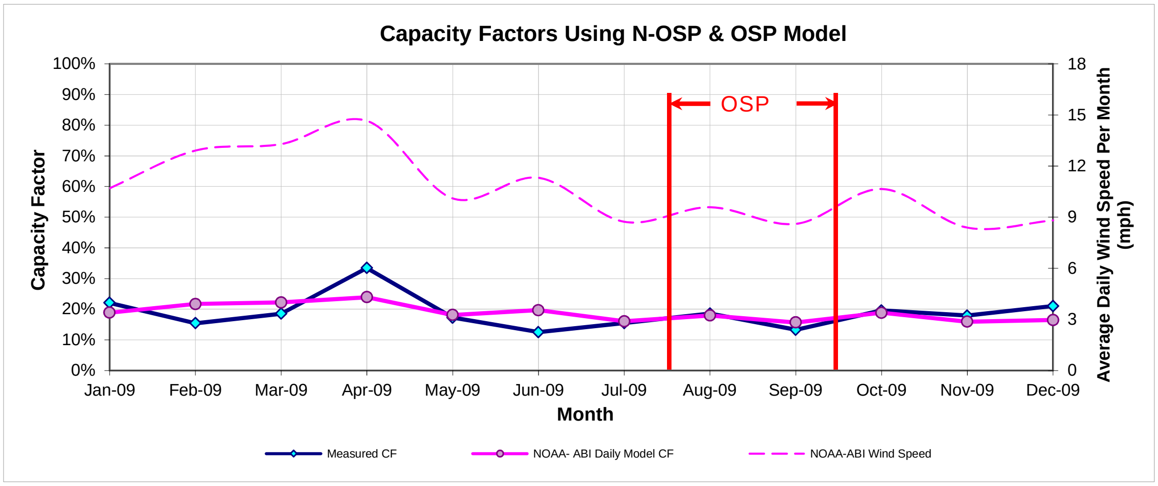


Figure 11-52: CAPRIDGE_CR2– Predicted Capacity Factors Using Daily Models (2009)

Table 11-49: CAPRIDGE_CR2– Predicted Power Production in 1999

Annual

1999 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
258,415	245,234

OSD

1999 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
653	589

11.10 Camp Springs Wind Energy Center

Table 11-50: Site Information for Camp Springs Wind Energy Center

GENSITECODE_ERCOT	Renewable Energy	City	County	Date in Service	Capacity (MW)	Company	Facility	Wind Turbine Information	Region	PCA	Interconnection	Weather Station
CSEC_CSECG1	WIND	Lubbock	Scurry	Jul-07	130	Invenergy	Camp Springs Wind Energy Center	GE Energy	ERCOT		Oncor	LBB

SUBGENCODE_ERCOT	GENSITECODE_ERCOT	Capacity (MW)
CSEC_CSECG1	CSEC_CSEC	130

11.10.1 Camp Springs Wind Energy Center – CSEC_CSECG1

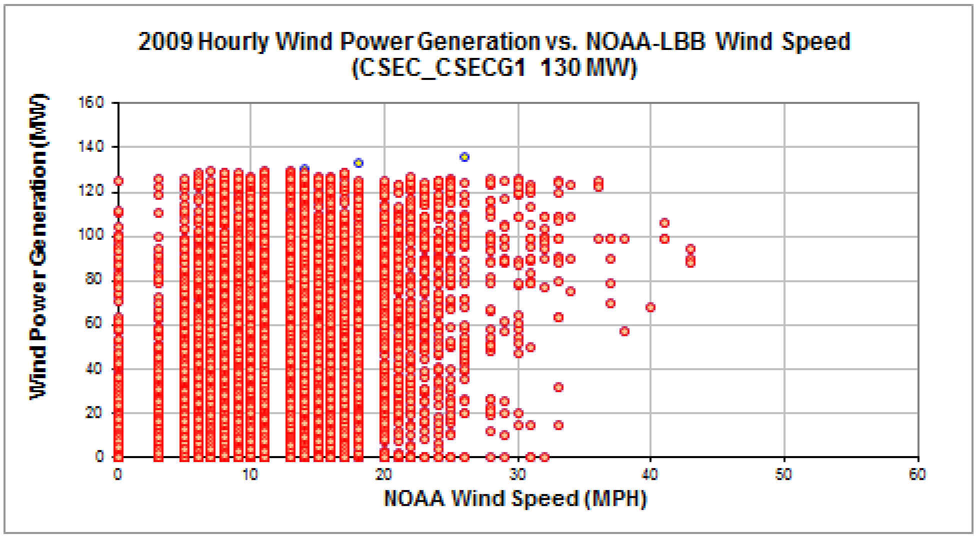


Figure 11-53: CSEC_CSECG1 – Hourly Wind Power vs. NOAA Wind Speed (2009)

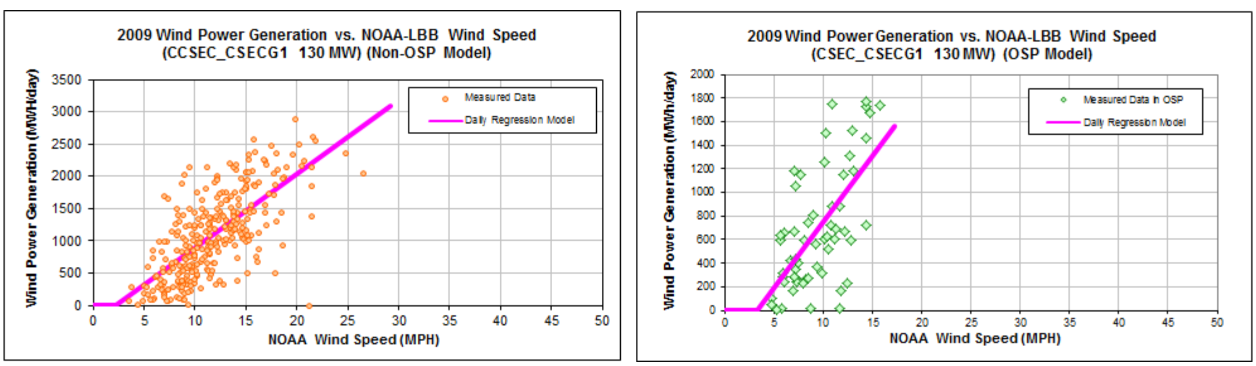


Figure 11-54: CSEC_CSECG1 – Daily Wind Power vs. NOAA Wind Speed (Using OSP and Non-OSP Model)

Table 11-51: CSEC_CSECG1 – Model Coefficients.

Using Non-OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-254.2759
Left Slope (MWh/mph-day)	114.2273
RMSE (MWh/day)	468.5390
R2	0.4777
CV-RMSE	43.1%

Using OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-379.5733
Left Slope (MWh/mph-day)	112.3242
RMSE (MWh/day)	396.4140
R2	0.4100
CV-RMSE	58.0%

Table 11-52: CSEC_CSECG1 – Comparison of Predicted Power vs. Measured Power

Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-09	31	11.22	39,044	31,835	18.46%	40%	33%
Feb-09	28	12.79	39,183	33,783	13.78%	45%	39%
Mar-09	31	14.10	44,421	42,040	5.36%	46%	43%
Apr-09	30	15.46	40,843	45,349	-11.03%	44%	48%
May-09	31	11.64	27,028	33,333	-23.33%	28%	34%
Jun-09	30	11.23	31,777	30,871	2.85%	34%	33%
Jul-09	31	9.72	21,841	24,145	-10.55%	23%	25%
Aug-09	31	10.36	25,416	24,313	4.34%	26%	25%
Sep-09	25	9.40	17,251	19,082	-10.62%	22%	24%
Oct-09	31	11.46	26,671	32,711	-22.64%	28%	34%
Nov-09	30	9.70	27,858	25,612	8.06%	30%	27%
Dec-09	30	9.28	26,137	24,183	7.47%	28%	26%
Total	359	11.38	367,471	367,258	0.06%	33%	33%
Total in OSP (07/15-09/15)	58	9.46	39,642	39,637	0.01%	22%	22%

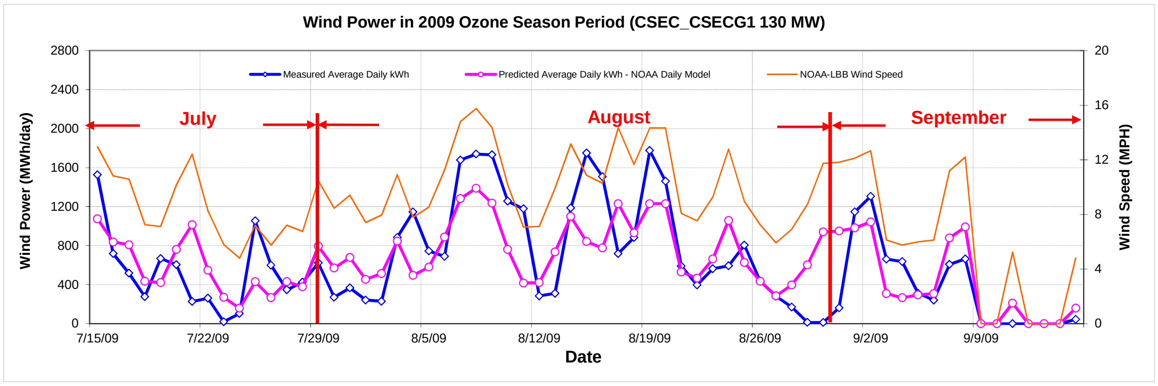


Figure 11-55: CSEC_CSECG1 – Predicted Wind Power in OSP Using NOAA Wind Speed (2009)

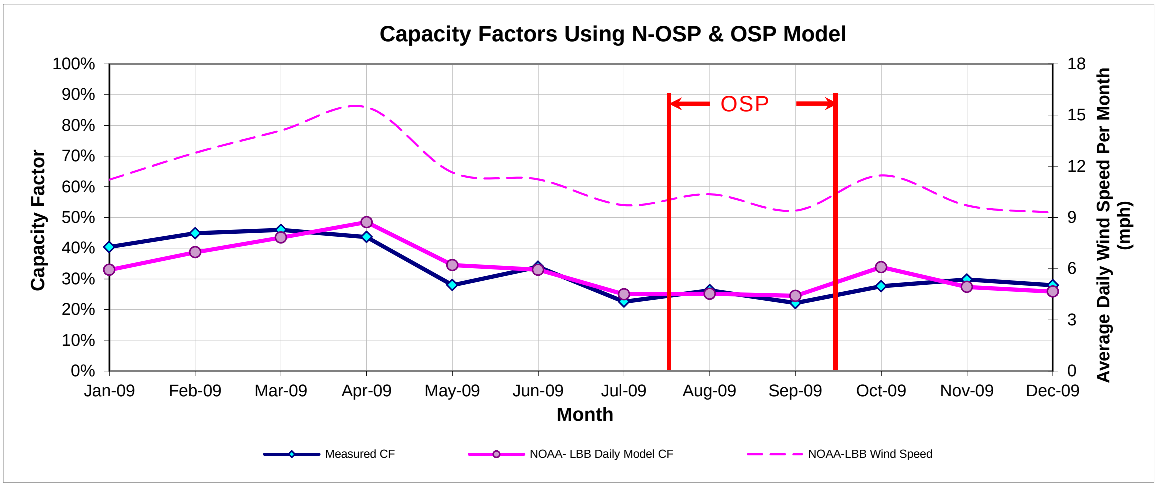


Figure 11-56: CSEC_CSECG1 – Predicted Capacity Factors Using Daily Models (2009)

Table 11-53: CSEC_CSECG1 – Predicted Power Production in 1999

Annual

1999 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
399,731	373,612

OSD

1999 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
727	683

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11.11 _Camp Springs Energy Expansion

Table 11-54: Site Information for Camp Springs Energy Expansion

GENSITECODE_ERCOT	Renewable Energy	City	County	Date in Service	Capacity (MW)	Company	Facility	Wind Turbine Information	Region	PCA	Interconnection	Weather Station
CSEC_CSECG2	WIND	Lubbock	Scurry	Jan-08	120	Invenergy	Camp Springs Wind Energy Center		ERCOT		Oncor	LBB

SUBGENCODE_ERCOT	GENSITECODE_ERCOT	Capacity (MW)
CSEC_CSECG2	CSEC_CSEC	120

11.11.1 Camp Springs Energy Expansion – CSEC_CSECG2

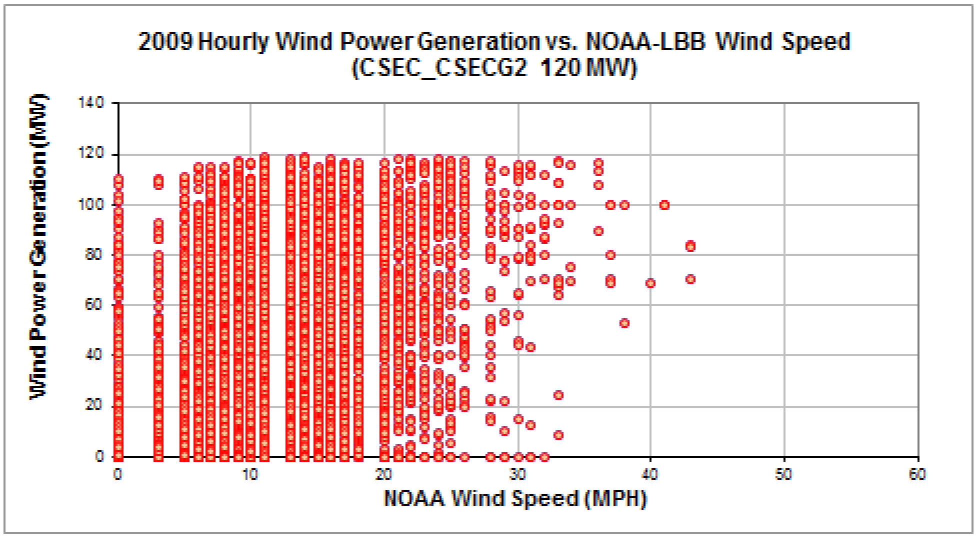
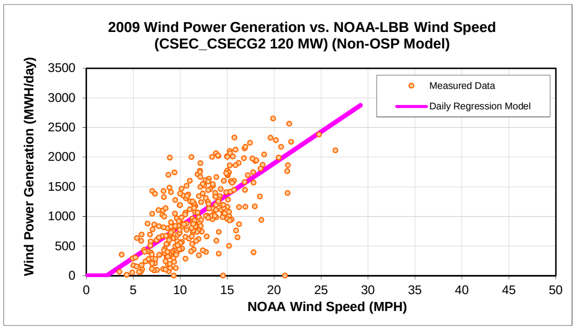


Figure 11-57: CSEC_CSECG2 – Hourly Wind Power vs. NOAA Wind Speed (2009)



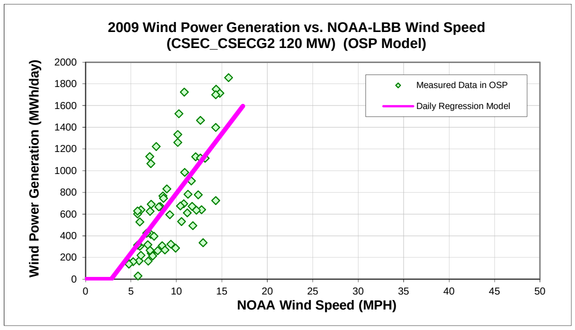


Figure 11-58: CSEC_CSECG2 – Daily Wind Power vs. NOAA Wind Speed (Using OSP and Non-OSP Model).

Table 11-55: CSEC_CSECG2 – Model Coefficients

Using Non-OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-232.3214
Left Slope (MWh/mph-day)	106.4177
RMSE (MWh/day)	431.0572
R2	0.4839
CV-RMSE	42.3%

Using OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-311.4659
Left Slope (MWh/mph-day)	110.1994
RMSE (MWh/day)	350.0267
R2	0.4614
CV-RMSE	48.7%

Table 11-56: CSEC_CSECG2 – Comparison of Predicted Power vs. Measured Power

Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-09	31	11.22	36,169	29,800	17.61%	41%	33%
Feb-09	28	12.79	35,379	31,601	10.68%	44%	39%
Mar-09	31	14.10	42,835	39,307	8.24%	48%	44%
Apr-09	30	15.46	39,600	42,386	-7.04%	46%	49%
May-09	31	11.64	26,169	31,196	-19.21%	29%	35%
Jun-09	30	11.23	29,921	28,898	3.42%	35%	33%
Jul-09	31	9.72	19,340	24,083	-24.52%	22%	27%
Aug-09	31	10.36	27,150	25,742	5.19%	30%	29%
Sep-09	30	9.16	20,325	21,561	-6.08%	24%	25%
Oct-09	31	11.46	24,970	30,616	-22.61%	28%	34%
Nov-09	30	9.70	26,627	23,998	9.87%	31%	28%
Dec-09	30	9.28	23,564	22,667	3.81%	27%	26%
Total	364	11.34	352,048	351,855	0.05%	34%	34%
Total in OSP (07/15-09/15)	63	9.35	45,263	45,258	0.01%	25%	25%

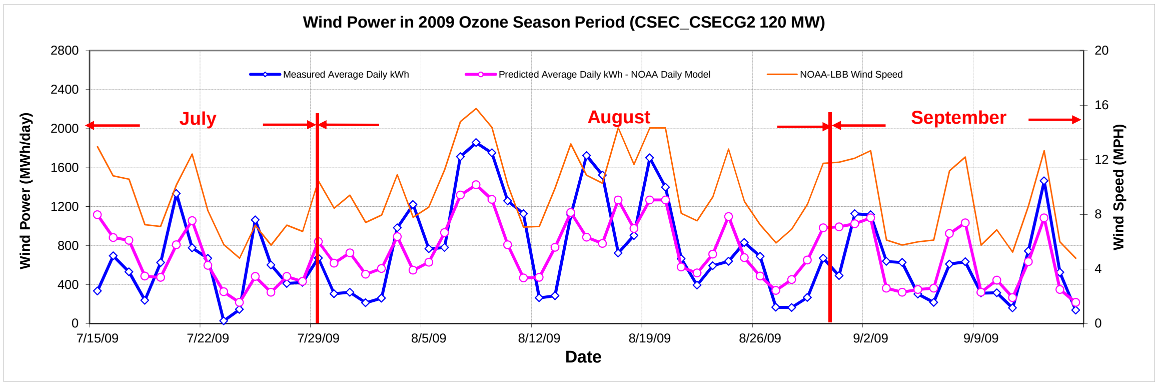


Figure 11-59: CSEC_CSECG2 – Predicted Wind Power in OSP Using NOAA Wind Speed (2009)

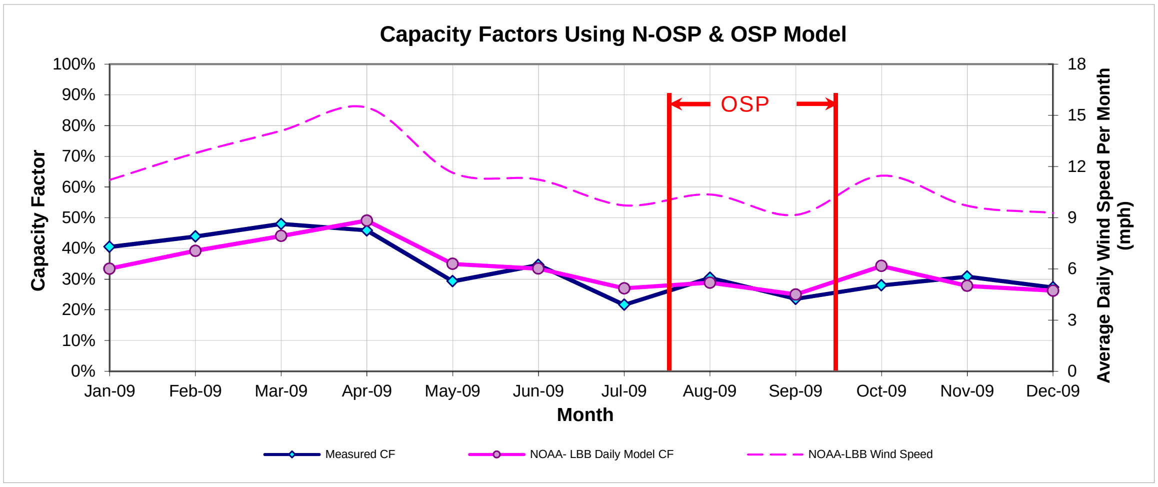


Figure 11-60: CSEC_CSECG2 – Predicted Capacity Factors Using Daily Models (2009)

Table 11-57: CSEC_CSECG2 – Predicted Power Production in 1999

Annual

1999 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
379,884	353,015

OSD

1999 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
774	718

11.12 Delaware Mountain Wind Farm

Table 11-58: Site Information for Delaware Mountain Wind Farm

GENSITECODE_ERCOT	Renewable Energy	City	County	Date in Service	Capacity (MW)	Company	Facility	Wind Turbine Information	Region	PCA	Interconnection	Weather Station
DELAWARE	WIND		CULBERSON	Jun-99	28.5	American National Wind Power	Delaware Mountain Wind Farm	Zond (40)	ERCOT	TXU	TXU	GDP

SUBGENCODE_ERCOT	GENSITECODE_ERCOT	Capacity (MW)
DELAWARE_WIND_NWP	DELAWARE	28.5

11.12.1 Delaware Mountain Wind Farm – DELAWARE_WIND_NWP

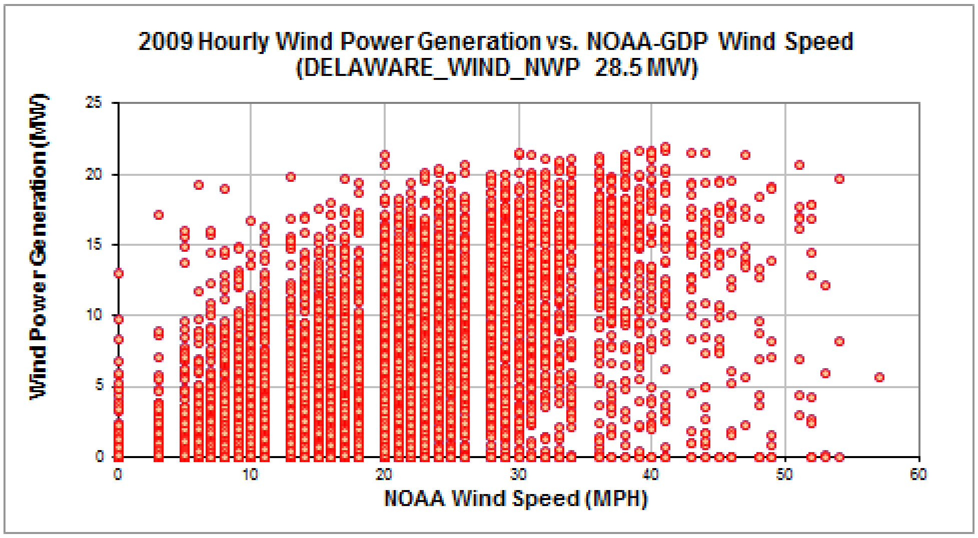


Figure 11-61: DELAWARE_WIND_NWP – Hourly Wind Power vs. NOAA Wind Speed (2009)

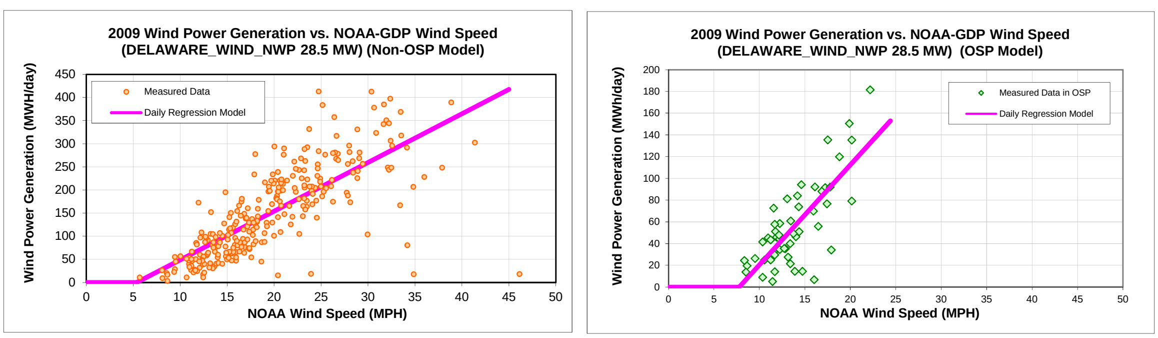


Figure 11-62: DELAWARE_WIND_NWP – Daily Wind Power vs. NOAA Wind Speed (Using OSP and Non-OSP Model)

Table 11-59: DELAWARE_WIND_NWP – Model Coefficients

Using Non-OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-56.9606
Left Slope (MWh/mph-day)	10.5450
RMSE (MWh/day)	62.4222
R2	0.5755
CV-RMSE	41.9%

Using OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-71.3854
Left Slope (MWh/mph-day)	9.1908
RMSE (MWh/day)	25.3079
R2	0.5815
CV-RMSE	45.4%

Table 11-60: DELAWARE_WIND_NWP – Comparison of Predicted Power vs. Measured Power

Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-09	31	20.57	6,490	4,959	23.60%	31%	23%
Feb-09	28	21.26	5,166	4,682	9.37%	27%	24%
Mar-09	31	22.19	5,306	5,487	-3.40%	25%	26%
Apr-09	28	23.39	5,113	5,311	-3.87%	27%	28%
May-09	29	17.56	3,359	3,718	-10.67%	17%	19%
Jun-09	30	15.63	2,797	3,235	-15.63%	14%	16%
Jul-09	21	14.62	1,703	1,687	0.94%	12%	12%
Aug-09	28	13.34	1,340	1,435	-7.07%	7%	7%
Sep-09	29	16.23	2,934	2,853	2.78%	15%	14%
Oct-09	31	19.92	4,454	4,747	-6.60%	21%	22%
Nov-09	30	17.83	3,461	3,932	-13.62%	17%	19%
Dec-09	24	20.34	3,705	3,781	-2.05%	23%	23%
Total	340	18.66	45,830	45,827	0.01%	20%	20%
Total in OSP (07/15-09/15)	52	13.83	2,898	2,897	0.02%	8%	8%

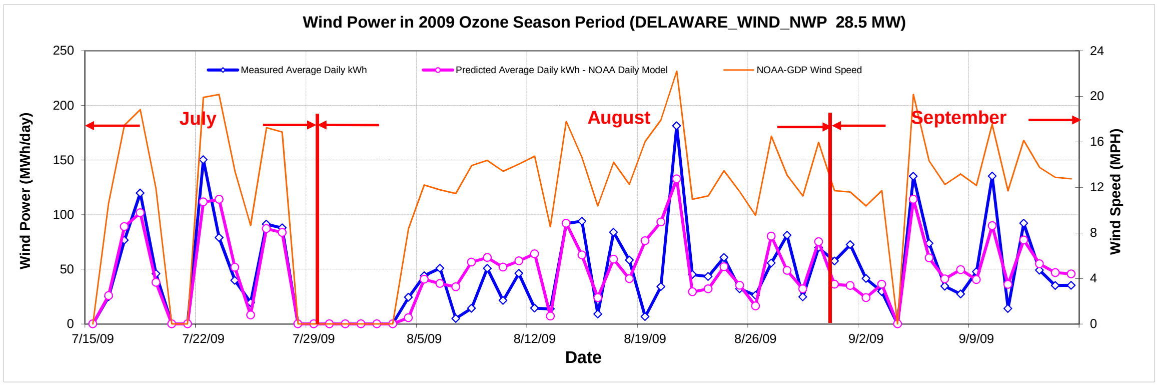


Figure 11-63: DELAWARE_WIND_NWP – Predicted Wind Power in OSP Using NOAA Wind Speed (2009)

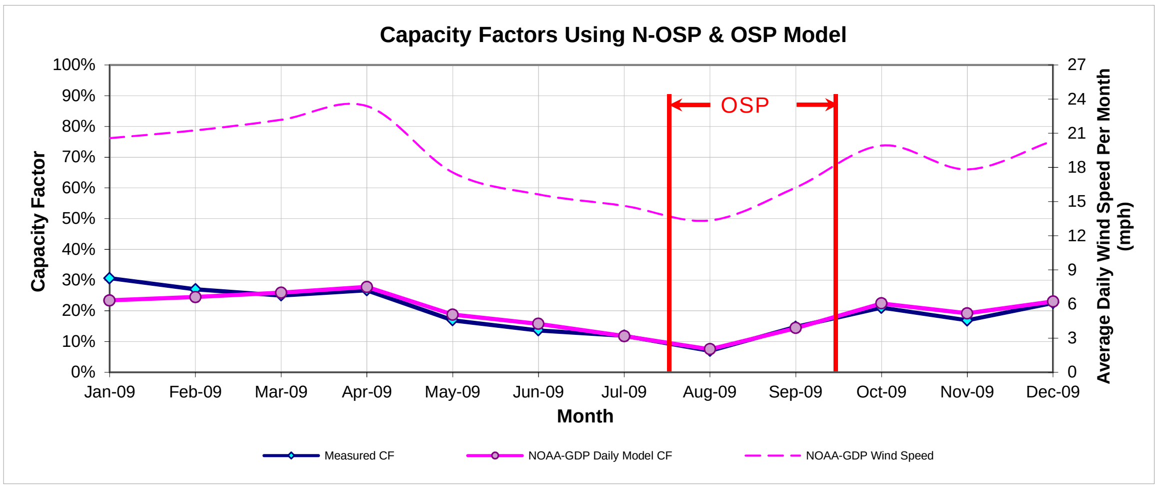


Figure 11-64: DELAWARE_WIND_NWP – Predicted Capacity Factors Using Daily Models (2009)

Table 11-61: DELAWARE_WIND_NWP – Predicted Power Production in 1999

Annual

1999 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
47,708	49,200

OSD

1999 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
56	56

11.13 Elbow Creek Wind

Table 11-62: Site Information for Elbow Creek Wind

GENSITECODE_ERCOT	Renewable Energy	City	County	Date in Service	Capacity (MW)	Company	Facility	Wind Turbine Information	Region	PCA	Interconnection	Weather Station
ELB_ELBCREEK	WIND		Howard	Nov-08	121.9	NRG Padoma Wind	Elbow Creek Wind	Siemens(53)	ERCOT	AEP-West	ONCOR	MAF

SUBGENCODE_ERCOT	GENSITECODE_ERCOT	Capacity (MW)
ELB_ELBCREEK	ELB_ELBCREEK	121.9

11.13.1 Elbow Creek Wind – ELB_ELBCREEK

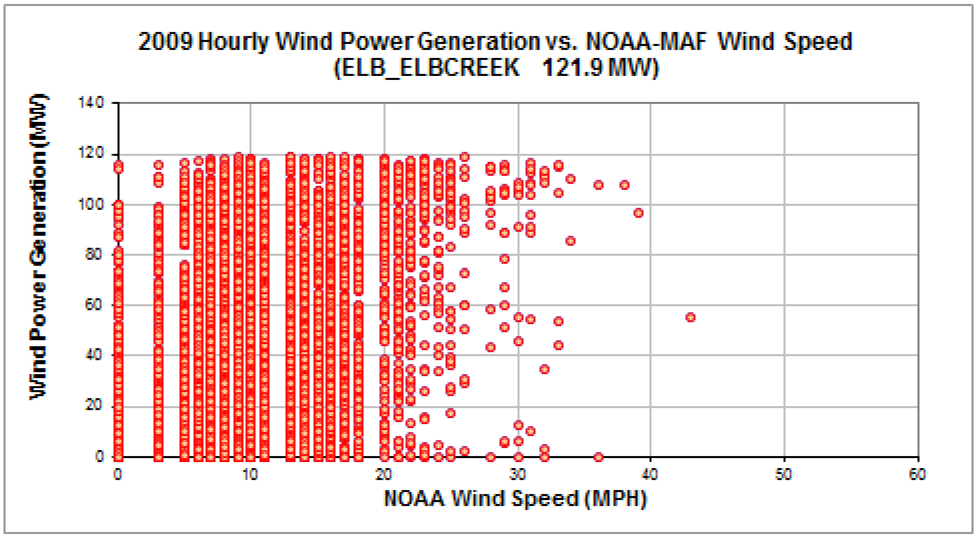


Figure 11-65: ELB_ELBCREEK – Hourly Wind Power vs. NOAA Wind Speed (2009)

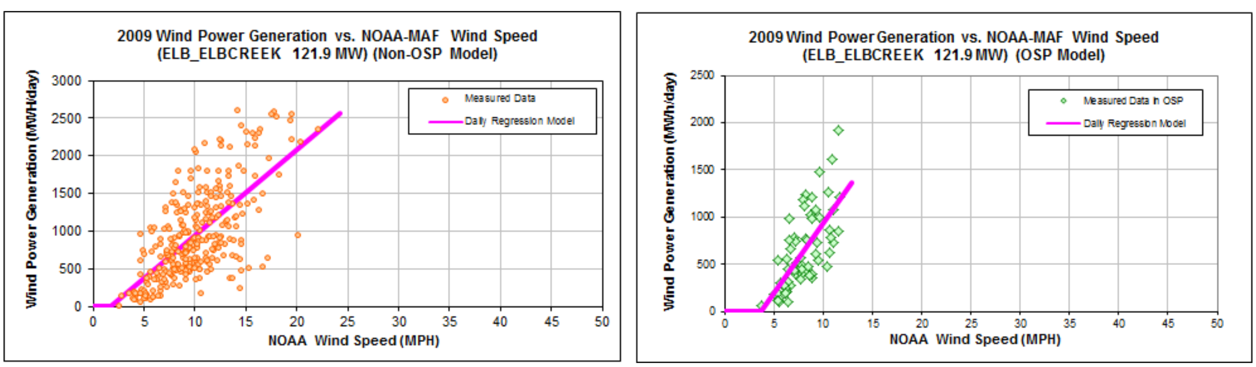


Figure 11-66: ELB_ELBCREEK – Daily Wind Power vs. NOAA Wind Speed (Using OSP and Non-OSP Model)

Table 11-63: ELB_ELBCREEK – Model Coefficients

Using Non-OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-193.9225
Left Slope (MWh/mph-day)	114.0447
RMSE (MWh/day)	439.7172
R2	0.4563
CV-RMSE	46.4%

Using OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-549.4515
Left Slope (MWh/mph-day)	147.9510
RMSE (MWh/day)	294.0970
R2	0.4775
CV-RMSE	46.2%

Table 11-64: ELB_ELBCREEK – Comparison of Predicted Power vs. Measured Power

Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-09	30	9.40	29,327	26,327	10.23%	33%	30%
Feb-09	28	11.28	37,776	30,575	19.06%	46%	37%
Mar-09	30	11.09	34,936	32,135	8.02%	40%	37%
Apr-09	29	13.32	33,588	38,438	-14.44%	40%	45%
May-09	31	10.53	21,063	31,222	-48.23%	23%	34%
Jun-09	30	10.16	23,448	28,947	-23.45%	27%	33%
Jul-09	31	8.18	19,122	21,418	-12.00%	21%	24%
Aug-09	31	8.31	23,084	21,080	8.68%	25%	23%
Sep-09	30	8.06	16,576	20,272	-22.30%	19%	23%
Oct-09	31	10.08	31,608	29,638	6.23%	35%	33%
Nov-09	30	7.49	26,894	19,800	26.38%	31%	23%
Dec-09	30	8.34	25,362	22,714	10.44%	29%	26%
Total	361	9.66	322,784	322,566	0.07%	31%	31%
Total in OSP (07/15-09/15)	63	8.01	40,078	40,068	0.02%	22%	22%

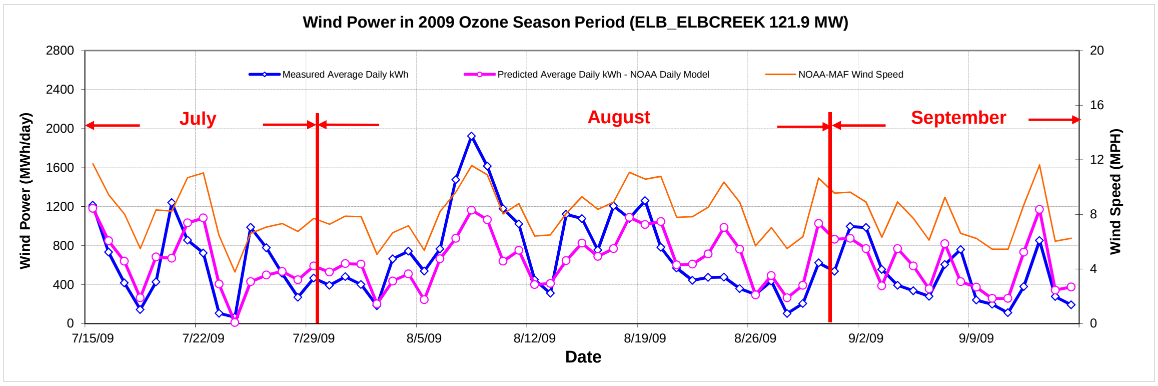


Figure 11-67: ELB_ELBCREEK – Predicted Wind Power in OSP Using NOAA Wind Speed (2009)

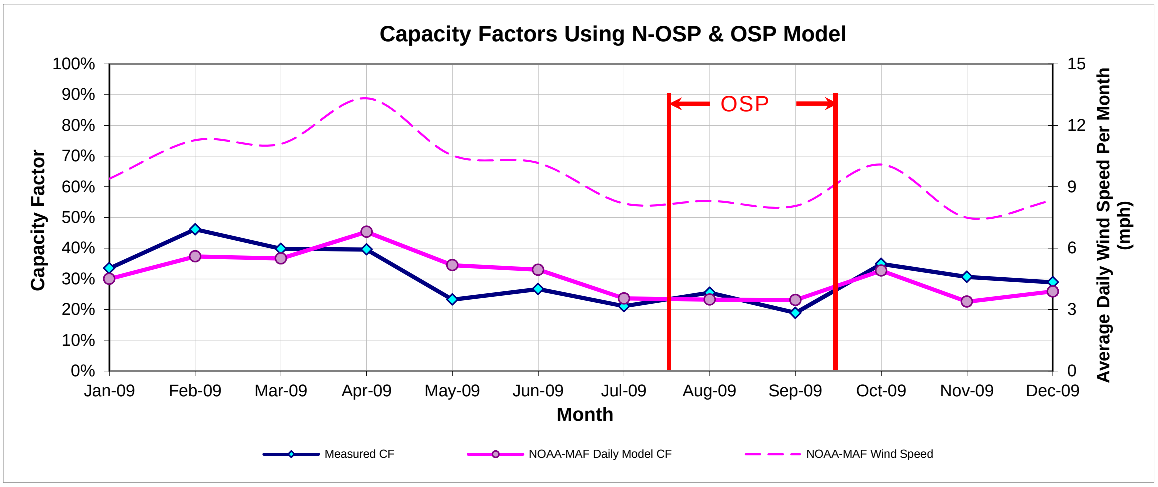


Figure 11-68: ELB_ELBCREEK – Predicted Capacity Factors Using Daily Models (2009)

Table 11-65: ELB_ELBCREEK – Predicted Power Production in 1999

Annual

1999 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
380,916	326,361

OSD

1999 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
852	636

11.14 Snyder Wind Project

Table 11-66: Site Information for Snyder Wind Project

GENSITECODE_ERCOT	Renewable Energy	City	County	Date in Service	Capacity (MW)	Company	Facility	Wind Turbine Information	Region	PCA	Interconnection	Weather Station
ENAS_ENA1	WIND	Snyder	Scurry	Dec-07	63	Enel North America/WKN USA	Snyder Wind Project	Vestas (21)	ERCOT		BCEC	LBB

SUBGENCODE_ERCOT	GENSITECODE_ERCOT	Capacity (MW)
ENAS_ENA1	ENAS_ENA1	63

11.14.1 Snyder Wind Project – ENAS_ENA1

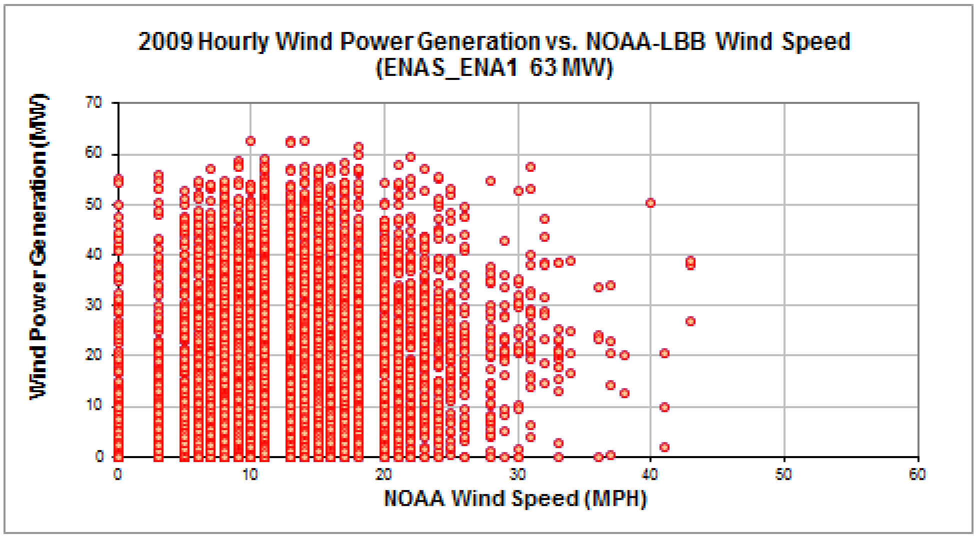
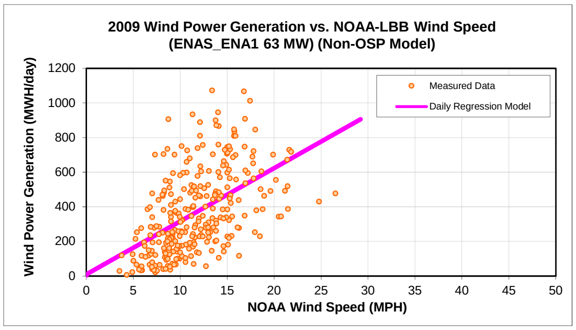


Figure 11-69: ENAS_ENA1– Hourly Wind Power vs. NOAA Wind Speed (2009)



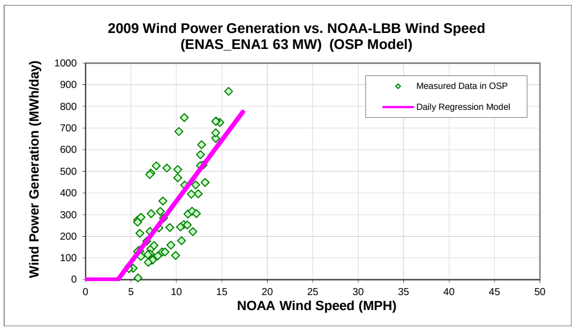


Figure 11-70: ENAS_ENA1– Daily Wind Power vs. NOAA Wind Speed (Using OSP and Non-OSP Model)

Table 11-67: ENAS_ENA1– Model Coefficients

Using Non-OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	8.9680
Left Slope (MWh/mph-day)	30.6809
RMSE (MWh/day)	205.3900
R2	0.2575
CV-RMSE	55.5%

Using OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-201.0620
Left Slope (MWh/mph-day)	56.3747
RMSE (MWh/day)	142.2839
R2	0.5757
CV-RMSE	43.7%

Table 11-68: ENAS_ENA1– Comparison of Predicted Power vs. Measured Power

Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-09	30	11.28	13,395	10,651	20.49%	30%	23%
Feb-09	25	13.00	11,431	10,195	10.81%	30%	27%
Mar-09	31	14.10	11,380	13,687	-20.28%	24%	29%
Apr-09	30	15.46	8,217	14,499	-76.45%	18%	32%
May-09	31	11.64	6,602	11,348	-71.88%	14%	24%
Jun-09	30	11.23	10,396	10,610	-2.06%	23%	23%
Jul-09	31	9.72	9,179	9,693	-5.60%	20%	21%
Aug-09	31	10.36	12,664	11,875	6.23%	27%	25%
Sep-09	30	9.16	10,307	8,691	15.68%	23%	19%
Oct-09	31	11.46	12,783	11,181	12.53%	27%	24%
Nov-09	30	9.70	13,595	9,197	32.35%	30%	20%
Dec-09	30	9.28	10,511	8,813	16.15%	23%	19%
Total	360	11.35	130,459	130,441	0.01%	24%	24%
Total in OSP (07/15-09/15)	63	9.35	20,527	20,524	0.01%	22%	22%

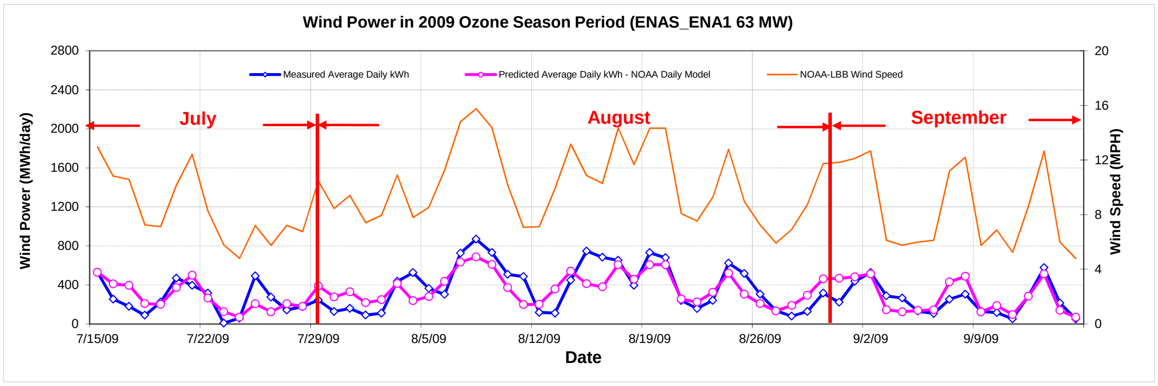


Figure 11-71: ENAS_ENA1– Predicted Wind Power in OSP Using NOAA Wind Speed (2009)

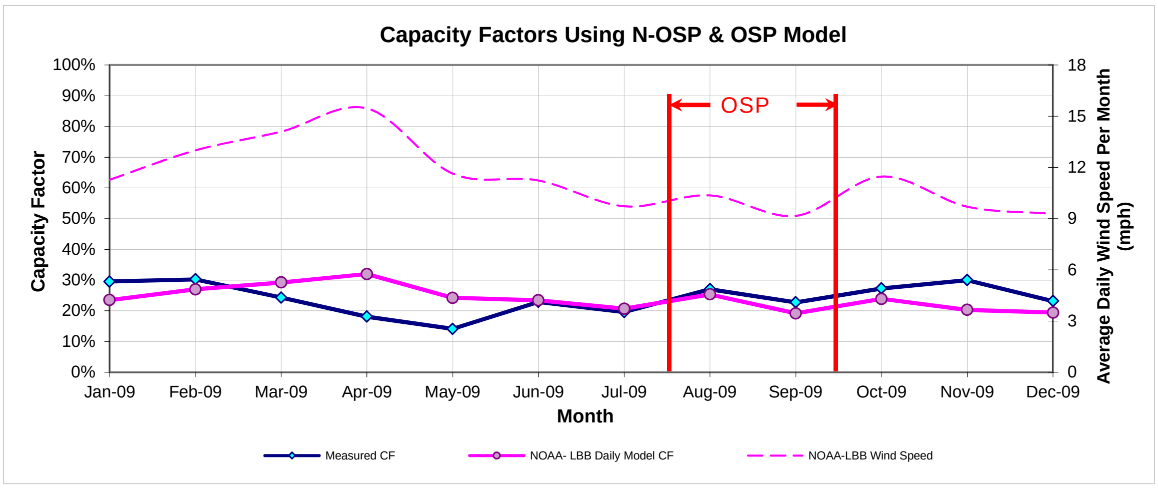


Figure 11-72: ENAS_ENA1– Predicted Capacity Factors Using Daily Models (2009)

Table 11-69: ENAS_ENA1– Predicted Power Production in 1999

Annual

1999 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
140,714	132,271

OSD

1999 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
354	326

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11.15 Silver Star Phase 1

Table 11-70: Site Information for Silver Star Phase 1

GENSITECODE_ERCOT	Renewable Energy	City	County	Date in Service	Capacity (MW)	Company	Facility	Wind Turbine Information	Region	PCA	Interconnection	Weather Station
FLTCK_SSI	WIND		Erath	Mar-08	60	BP/Clipper Windpower	Silver Star Phase I	Clipper Windpower(24)	ERCOT	AEP-West	ONCOR	ABI

SUBGENCODE_ERCOT	GENSITECODE_ERCOT	Capacity (MW)
FLTCK_SSI	FLTCK_SSI	60

11.15.1 Silver Star Phase1 – FLTCK_SSI

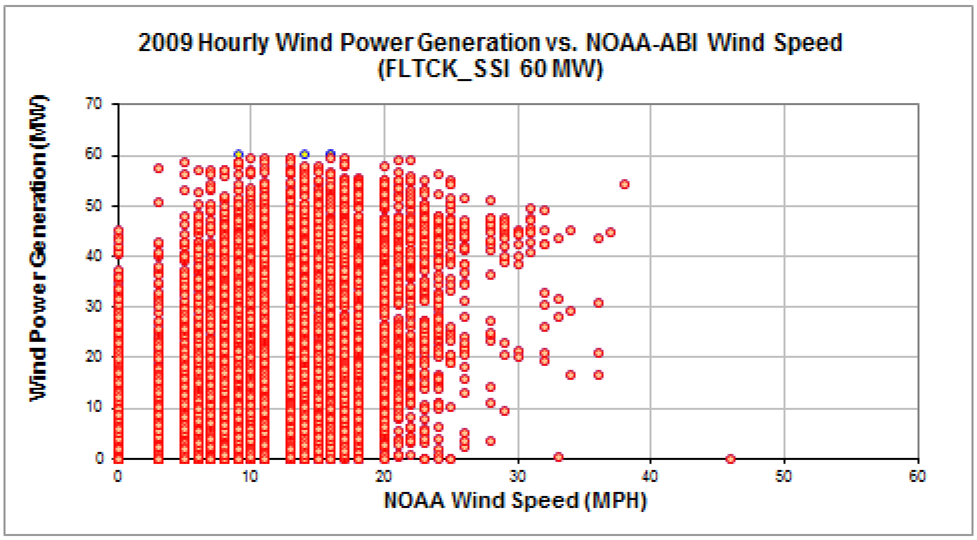


Figure 11-73: FLTCK_SSI – Hourly Wind Power vs. NOAA Wind Speed (2009)

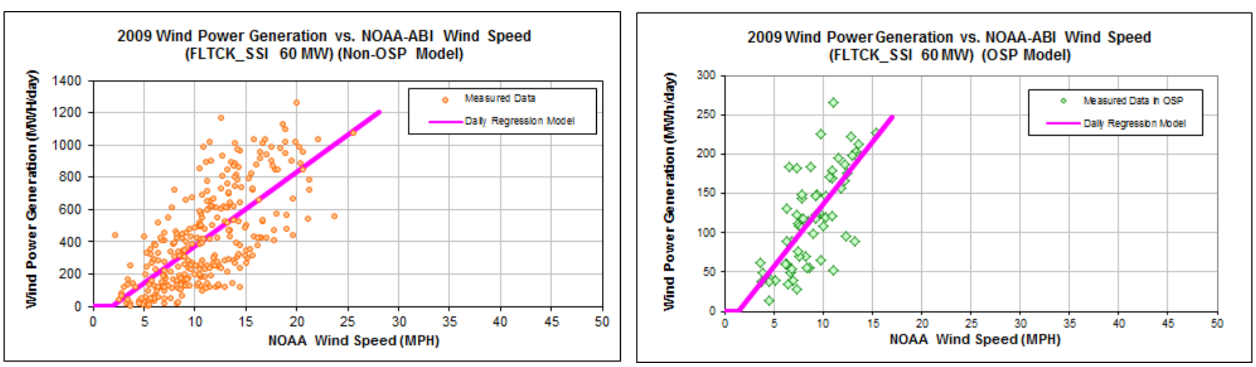


Figure 11-74: FLTCK_SSI – Daily Wind Power vs. NOAA Wind Speed (Using OSP and Non-OSP Model)

Table 11-71: FLTCK_SSI – Model Coefficients

Using Non-OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-83.4410
Left Slope (MWh/mph-day)	45.8422
RMSE (MWh/day)	212.9285
R2	0.4796
CV-RMSE	50.5%

Using OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-22.9274
Left Slope (MWh/mph-day)	15.8701
RMSE (MWh/day)	43.4282
R2	0.5097
CV-RMSE	36.6%

Table 11-72: FLTCK_SSI – Comparison of Predicted Power vs. Measured Power

Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-09	31	10.70	15,078	12,621	16.30%	34%	28%
Feb-09	28	12.91	18,653	14,238	23.67%	46%	35%
Mar-09	31	13.29	18,927	16,302	13.87%	42%	37%
Apr-09	30	14.82	12,267	17,875	-45.71%	28%	41%
May-09	31	10.10	5,987	11,770	-96.58%	13%	26%
Jun-09	30	11.31	7,078	13,057	-84.47%	16%	30%
Jul-09	31	8.90	3,508	6,747	-92.34%	8%	15%
Aug-09	31	9.59	4,088	4,005	2.02%	9%	9%
Sep-09	30	8.61	6,875	6,657	3.17%	16%	15%
Oct-09	31	10.66	14,178	12,556	11.44%	32%	28%
Nov-09	30	8.39	14,561	9,032	37.97%	34%	21%
Dec-09	30	8.81	13,297	9,615	27.69%	31%	22%
Total	364	10.66	134,497	134,473	0.02%	26%	26%
Total in OSP (07/15-09/15)	63	8.91	7,467	7,467	0.00%	8%	8%

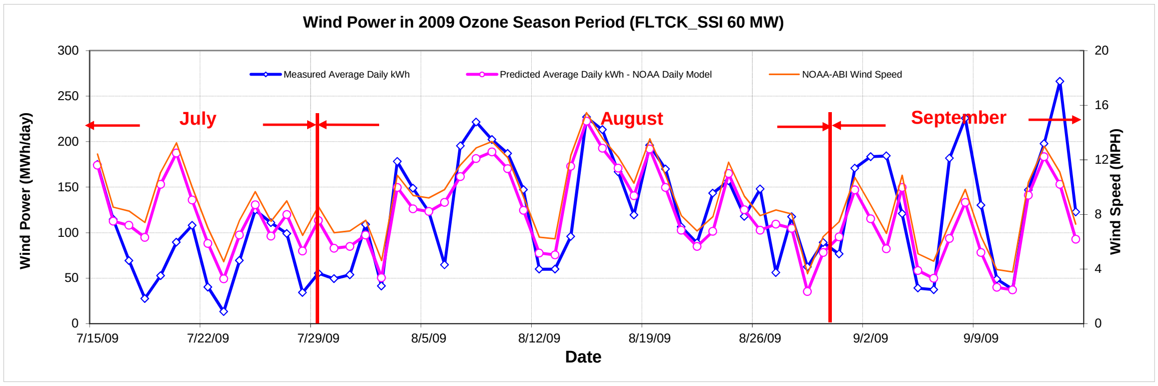


Figure 11-75: FLTCK_SSI – Predicted Wind Power in OSP Using NOAA Wind Speed (2009)

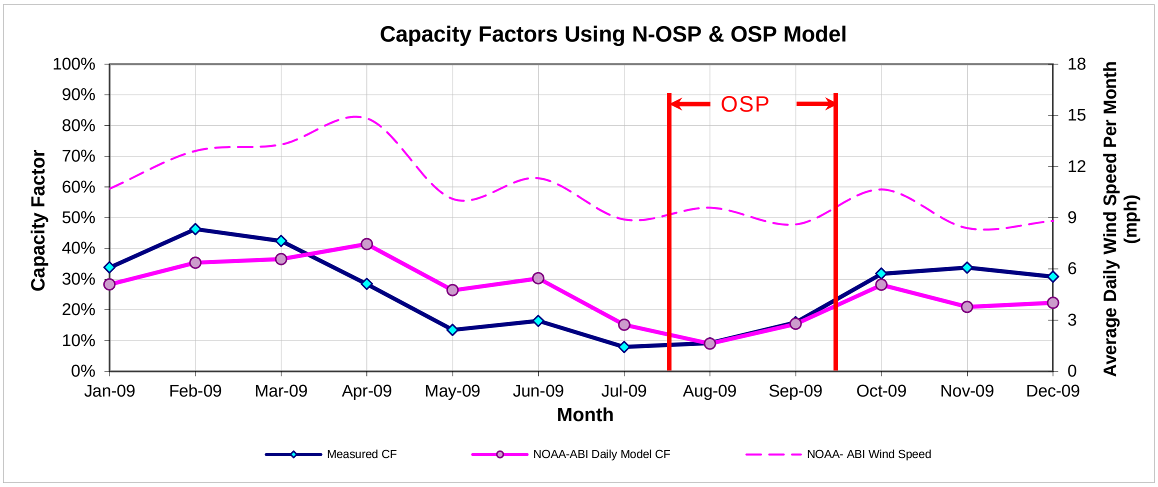


Figure 11-76: FLTCK_SSI – Predicted Capacity Factors Using Daily Models (2009)

Table 11-73: FLTCK_SSI - Predicted Power Production in 1999

Annual

1999 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
143,966	134,867

OSD

1999 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
131	119

11.16 Goat Wind and Goat Wind Phase 2

Table 11-74: Site Information for Goat Wind and Goat Wind Phase 2

GENSITECODE_ERCOT	Renewable Energy	City	County	Date in Service	Capacity (MW)	Company	Facility	Wind Turbine Information	Region	PCA	Interconnection	Weather Station
GOAT_GOATWIND	WIND		Sterling	Apr-08	150	Edison Mission Group	Goat Wind & Goat Wind Phase 2	Clipper Windpower(24)	ERCOT	LCRA	LCRA	ABI

SUBGENCODE_ERCOT	GENSITECODE_ERCOT	Capacity (MW)
GOAT_GOATWIND	GOAT_GOATWIND	150

11.16.1 Goat Wind and Goat Wind Phase 2 – GOAT_GOATWIND

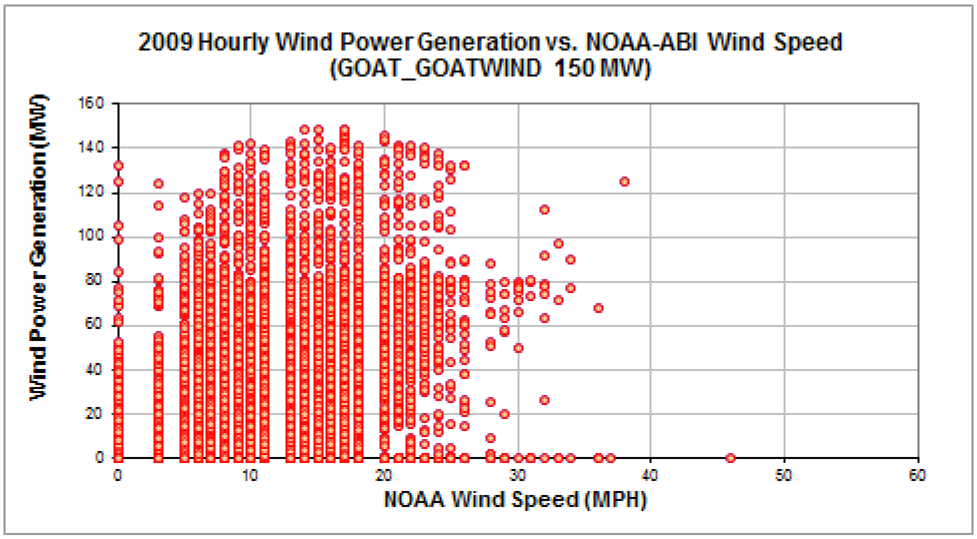


Figure 11-77: GOAT_GOATWIND – Hourly Wind Power vs. NOAA Wind Speed (2009)

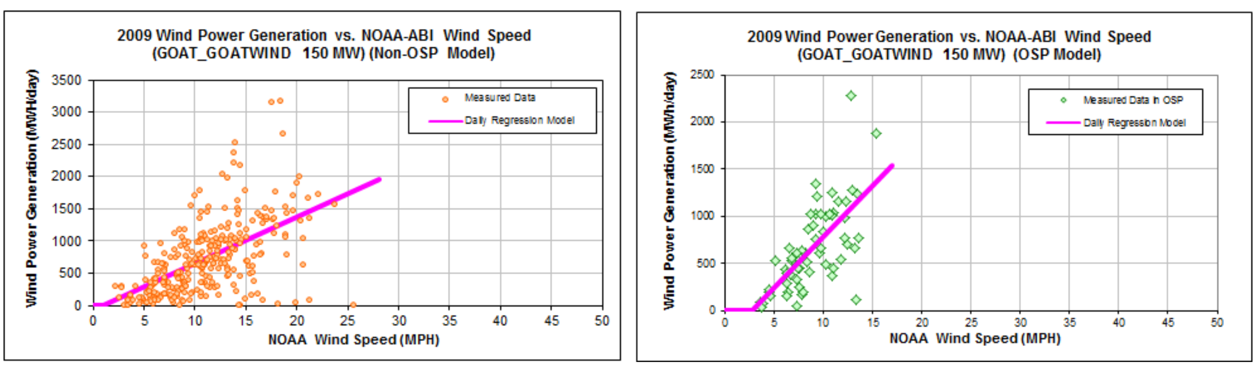


Figure 11-78: GOAT_GOATWIND – Daily Wind Power vs. NOAA Wind Speed (Using OSP and Non-OSP Model)

Table 11-75: GOAT_GOATWIND – Model Coefficients

Using Non-OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-73.1805
Left Slope (MWh/mph-day)	72.2055
RMSE (MWh/day)	461.1305
R2	0.3258
CV-RMSE	64.2%

Using OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-305.0153
Left Slope (MWh/mph-day)	108.2113
RMSE (MWh/day)	325.3357
R2	0.4628
CV-RMSE	49.3%

Table 11-76: GOAT_GOATWIND – Comparison of Predicted Power vs. Measured Power

Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-09	31	10.70	17,797	21,684	-21.84%	16%	19%
Feb-09	28	12.91	21,406	24,057	-12.39%	21%	24%
Mar-09	31	13.29	20,552	27,483	-33.72%	18%	25%
Apr-09	28	14.60	23,240	27,460	-18.16%	23%	27%
May-09	31	10.10	15,023	20,344	-35.42%	13%	18%
Jun-09	30	11.31	21,008	22,313	-6.21%	19%	21%
Jul-09	30	8.73	16,768	17,989	-7.28%	16%	17%
Aug-09	31	9.59	23,793	22,699	4.60%	21%	20%
Sep-09	30	8.61	16,683	17,279	-3.58%	15%	16%
Oct-09	31	10.66	28,449	21,582	24.14%	25%	19%
Nov-09	30	8.39	26,051	15,974	38.68%	24%	15%
Dec-09	30	8.81	24,882	16,891	32.11%	23%	16%
Total	361	10.61	255,652	255,756	-0.04%	20%	20%
Total in OSP (07/15-09/15)	63	8.91	41,549	41,547	0.00%	18%	18%

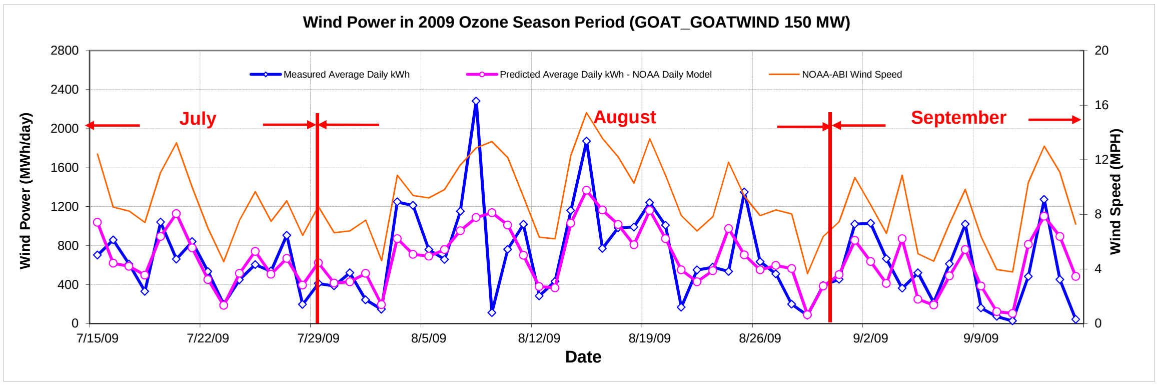


Figure 11-79: GOAT_GOATWIND – Predicted Wind Power in OSP Using NOAA Wind Speed (2009)

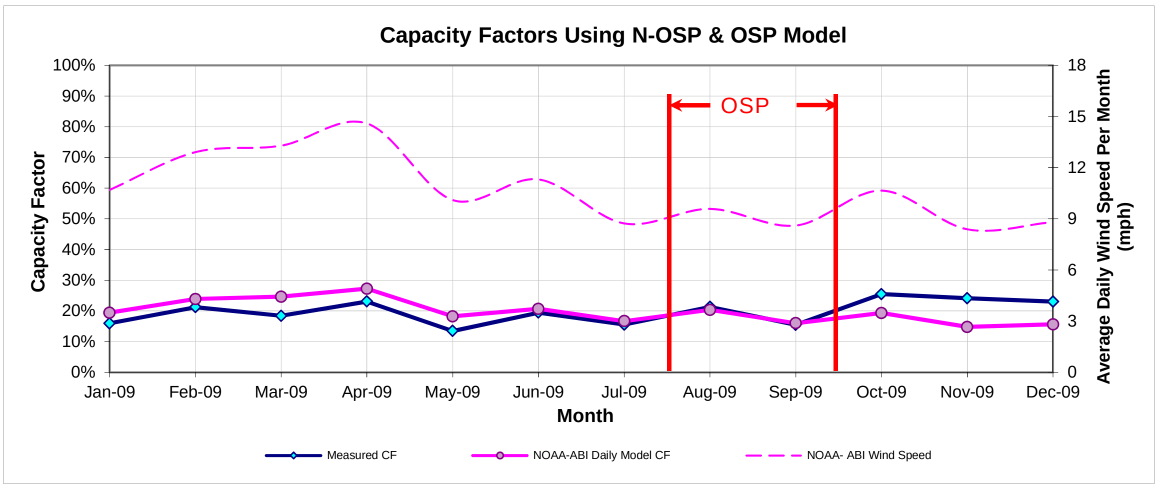


Figure 11-80: GOAT_GOATWIND - Predicted Capacity Factors Using Daily Models (2009)

Table 11-77: GOAT_GOATWIND – Predicted Power Production in 1999

Annual

1999 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
278,310	258,484

OSD

1999 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
746	660

11.17 Horse Hollow Phase 1

Table 11-78: Site Information for Horse Hollow Phase 1

GENSITECODE_ERCOT	Renewable Energy	City	County	Date in Service	Capacity (MW)	Company	Facility	Wind Turbine Information	Region	PCA	Interconnection	Weather Station
H_HOLLOW	WIND	Abilene	TAYLOR	Oct-05	213	FPL Energy	Horse Hollow 1	GE Energy 1.5 MW (142)	ERCOT	AEP-West	AEP-TNC	ABI

SUBGENCODE_ERCOT	GENSITECODE_ERCOT	Capacity (MW)
H_HOLLOW_WND1	H_HOLLOW	213

11.17.1 Horse Hollow Phase 1 – H_HOLLOW_WND1

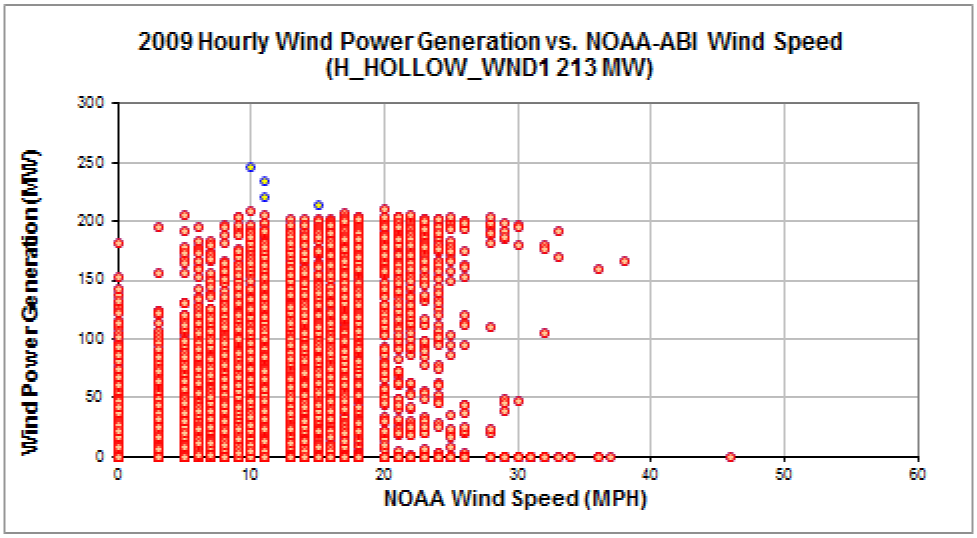
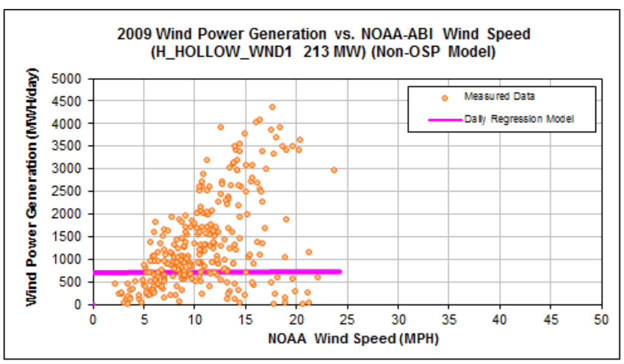


Figure 11-81: H_HOLLOW_WND1– Hourly Wind Power vs. NOAA Wind Speed (2009)



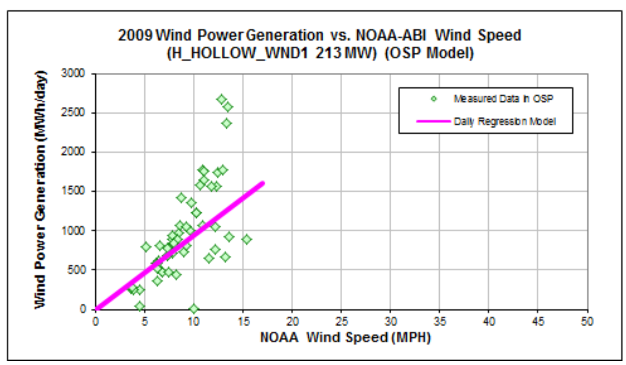


Figure 11-82: H_HOLLOW_WND1– Daily Wind Power vs. NOAA Wind Speed (Using OSP and Non-OSP Model)

Table 11-79: H_HOLLOW_WND1– Model Coefficients

Using Non-OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	704.5417
Left Slope (MWh/mph-day)	1.0107
RMSE (MWh/day)	414.7239
R2	0.0001
CV-RMSE	58.1%

Using OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-8.3075
Left Slope (MWh/mph-day)	95.2947
RMSE (MWh/day)	337.9237
R2	0.3812
CV-RMSE	41.0%

Table 11-80: H_HOLLOW_WND1– Comparison of Predicted Power vs. Measured Power

Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-09	31	10.70	43,652	22,176	49.20%	28%	14%
Feb-09	27	12.65	22,358	19,368	13.37%	16%	14%
Mar-09	29	12.62	44,631	20,802	53.39%	30%	14%
Apr-09	27	14.51	44,652	19,419	56.51%	32%	14%
May-09	30	10.07	35,452	21,441	39.52%	23%	14%
Jun-09	30	11.31	34,382	21,479	37.53%	22%	14%
Jul-09	28	8.86	21,751	21,634	0.54%	15%	15%
Aug-09	25	9.83	26,880	23,199	13.70%	21%	18%
Sep-09	29	8.72	24,762	21,272	14.09%	17%	14%
Oct-09	31	10.66	45,235	22,175	50.98%	29%	14%
Nov-09	30	8.39	50,333	21,391	57.50%	33%	14%
Dec-09	30	8.81	44,594	21,403	52.00%	29%	14%
Total	347	10.56	438,683	255,759	41.70%	25%	14%
Total in OSP (07/15-09/15)	55	9.02	53,080	46,830	11.77%	19%	17%

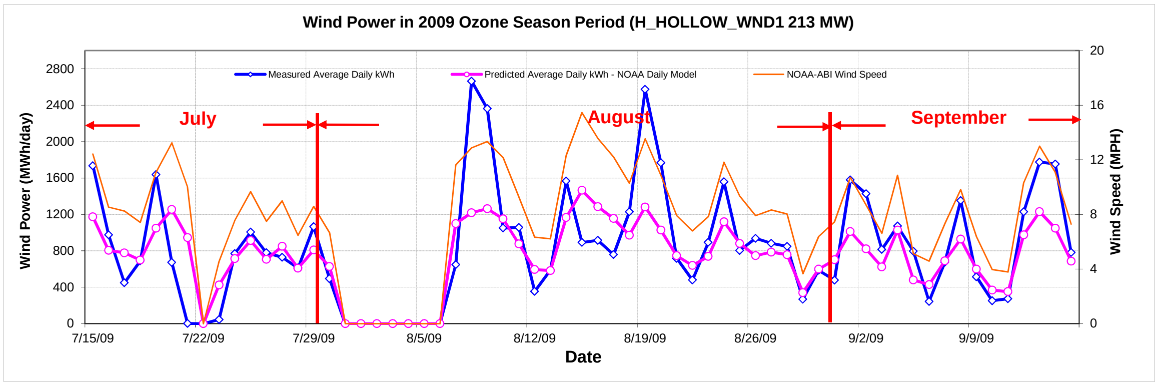


Figure 11-83: H_HOLLOW_WND1– Predicted Wind Power in OSP Using NOAA Wind Speed (2009)

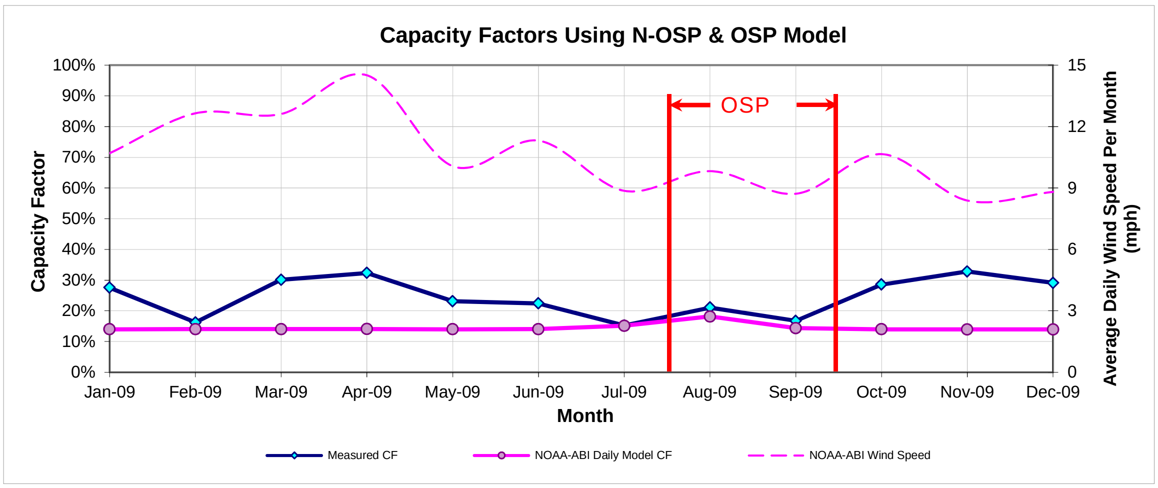


Figure 11-84: H_HOLLOW_WND1– Predicted Capacity Factors Using Daily Models (2009)

Table 11-81: H_HOLLOW_WND1– Predicted Power Production in 1999

Annual

1999 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
274,086	461,438

OSD

1999 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
917	965

Note: In 2009, the name of H_HOLLOW_WND1 was changed into HHGT_HHOLLOW1 based on ERCOT original data. In this report, the previous name of this wind farm was used for all analysis in order to keep consistence.

11.18 Horse Hollow Phase 2

Table 11-82: Site Information for Horse Hollow Phase 2

GENSITECODE_ERCOT	Renewable Energy	City	County	Date in Service	Capacity (MW)	Company	Facility	Wind Turbine Information	Region	PCA	Interconnection	Weather Station
HHOLLOW2_WIND1	WIND	Abilene	Taylor	Jul-06	184	FPL Energy	Horse Hollow Phase 2	Mitsubishi 1000 (160)	ERCOT	AEP-West	AEP/ TNC	ABI

SUBGENCODE_ERCOT	GENSITECODE_ERCOT	Capacity (MW)
HHOLLOW2_WIND1	HHOLLOW2_WIND1	184

11.18.1 Horse Hollow Phase 2 – HHOLLOW2_WIND1

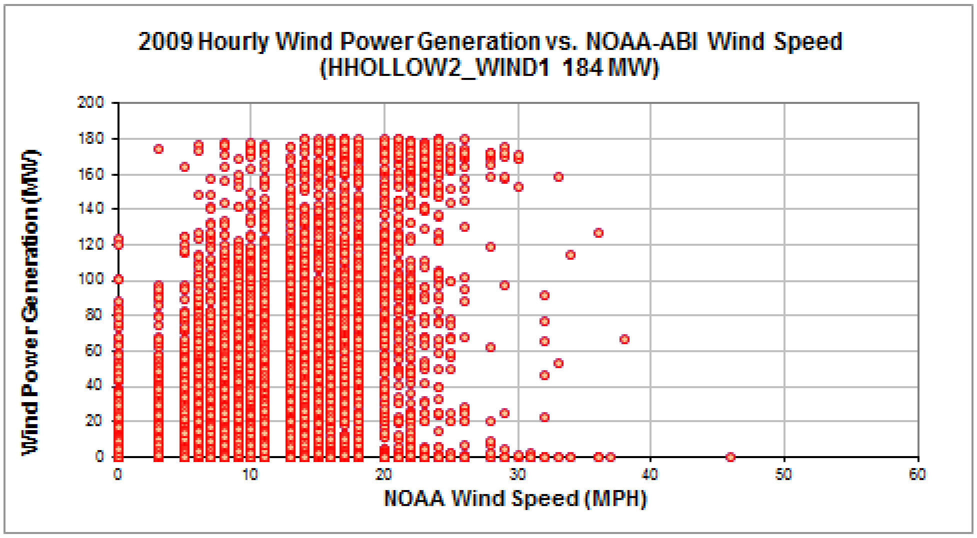


Figure 11-85: HHOLLOW2_WIND1– Hourly Wind Power vs. NOAA Wind Speed (2009)

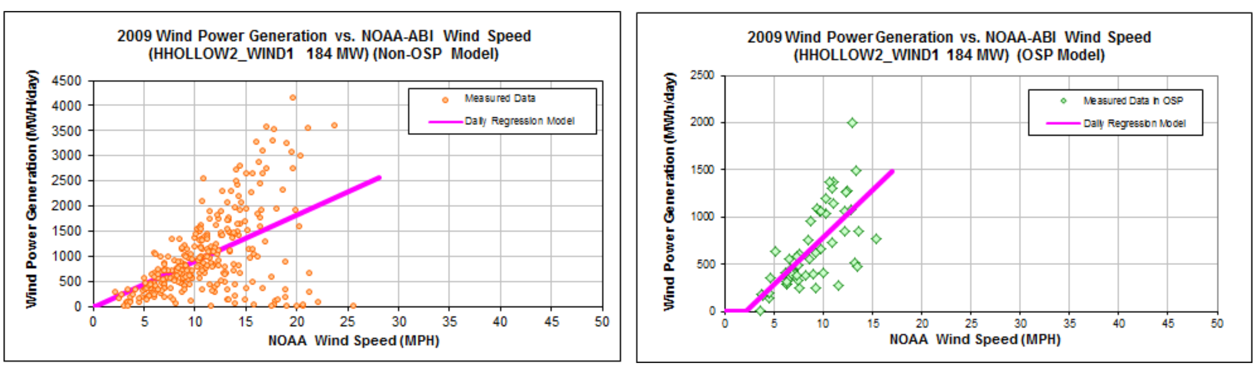


Figure 11-86: HHOLLOW2_WIND1– Daily Wind Power vs. NOAA Wind Speed (Using OSP and Non-OSP Model)

Table 11-83: HHOLLOW2_WIND1– Model Coefficients

Using Non-OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-24.0327
Left Slope (MWh/mph-day)	92.1419
RMSE (MWh/day)	693.4955
R2	0.2592
CV-RMSE	69.9%

Using OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-217.3499
Left Slope (MWh/mph-day)	99.9534
RMSE (MWh/day)	312.6496
R2	0.4713
CV-RMSE	46.2%

Table 11-84: HHOLLOW2_WIND1– Comparison of Predicted Power vs. Measured Power

Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-09	30	10.58	37,035	28,514	23.01%	28%	22%
Feb-09	28	12.91	15,862	32,641	-105.79%	13%	26%
Mar-09	28	13.73	30,940	34,740	-12.28%	25%	28%
Apr-09	30	14.82	58,296	40,238	30.98%	44%	30%
May-09	31	10.10	32,564	28,111	13.68%	24%	21%
Jun-09	30	11.31	27,515	30,554	-11.05%	21%	23%
Jul-09	31	8.90	18,897	22,513	-19.13%	14%	16%
Aug-09	22	9.92	14,985	17,035	-13.68%	15%	18%
Sep-09	30	8.61	20,637	21,107	-2.28%	16%	16%
Oct-09	28	10.55	17,586	26,554	-50.99%	14%	21%
Nov-09	30	8.39	29,003	22,466	22.54%	22%	17%
Dec-09	30	8.81	25,051	23,636	5.65%	19%	18%
Total	348	10.70	328,372	328,108	0.08%	21%	21%
Total in OSP (07/15-09/15)	54	8.94	36,508	36,506	0.01%	15%	15%

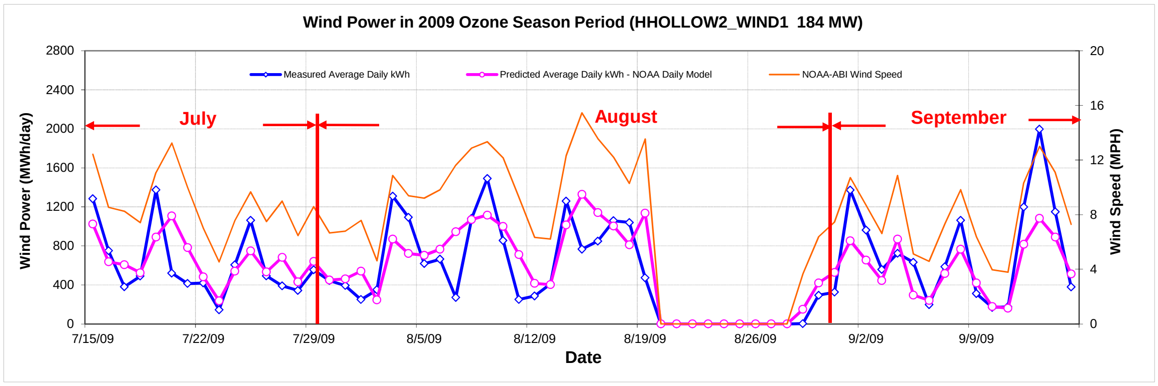


Figure 11-87: HHOLLOW2_WIND1– Predicted Wind Power in OSP Using NOAA Wind Speed (2009)

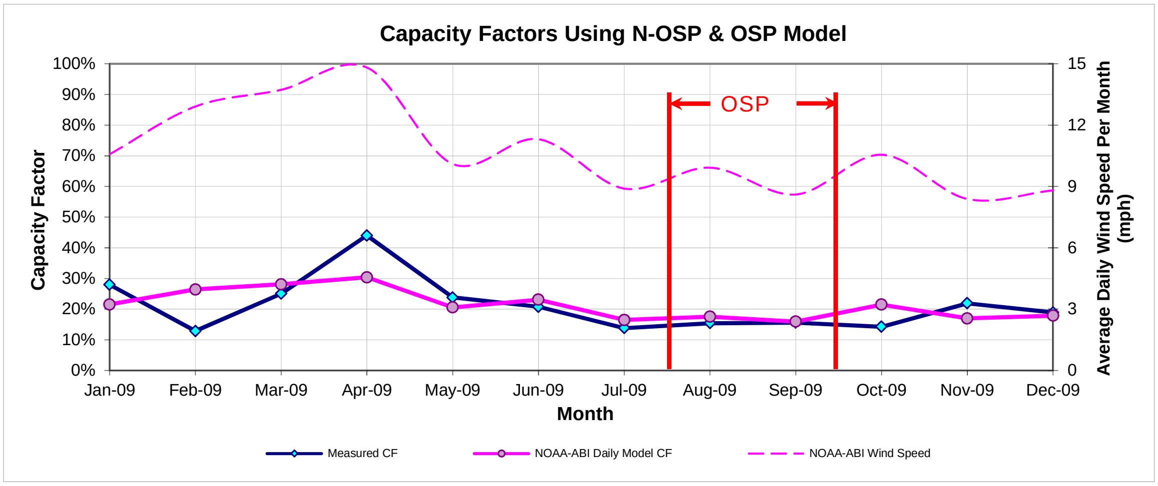


Figure 11-88: HHOLLOW2_WIND1– Predicted Capacity Factors Using Daily Models (2009)

Table 11-85: HHOLLOW2_WIND1– Predicted Power Production in 1999

Annual

1999 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
363,599	344,413

OSD

1999 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
753	676

Note: In 2009, the name of HHOLLOW2_WIND2 was changed into HHGT_HHOLLOW2 based on ERCOT original data. In this report, the previous name of this wind farm was used for all analysis in order to keep consistence.

11.19 Horse Hollow Phase 3

Table 11-86: Site Information for Horse Hollow Phase 3

GENSITECODE_ERCOT	Renewable Energy	City	County	Date in Service	Capacity (MW)	Company	Facility	Wind Turbine Information	Region	PCA	Interconnection	Weather Station
HHOLLOW3_WND_1	WIND	Abilene	Taylor	May-06	223.5	FPL Energy	Horse Hollow Phase 4	Mitsubishi 1000 (160)	ERCOT	AEP-West	AEP/ TNC	ABI

SUBGENCODE_ERCOT	GENSITECODE_ERCOT	Capacity (MW)
HHOLLOW3_WND_1	HHOLLOW3_WND_1	223.5

11.19.1 Horse Hollow Phase 3– HHOLLOW3_WND_3

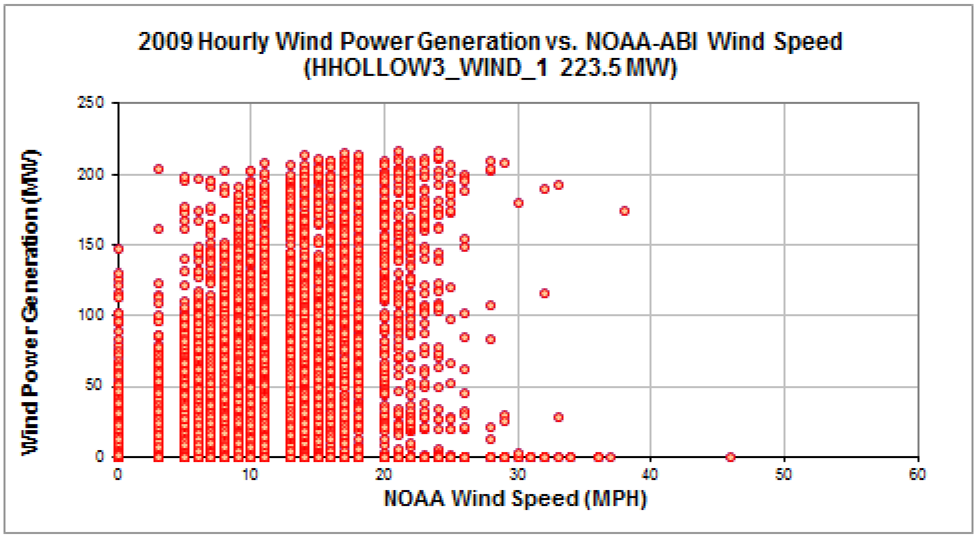
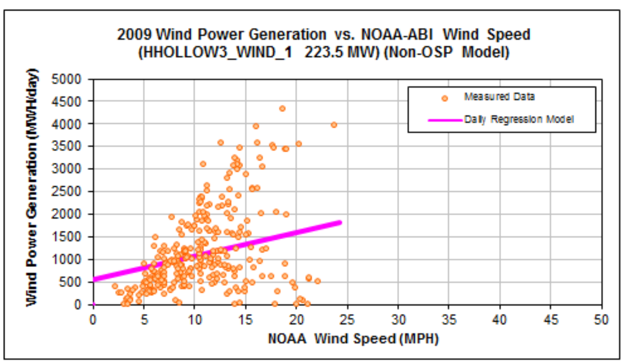


Figure 11-89: HHOLLOW3_WND_3 – Hourly Wind Power vs. NOAA Wind Speed (2009)



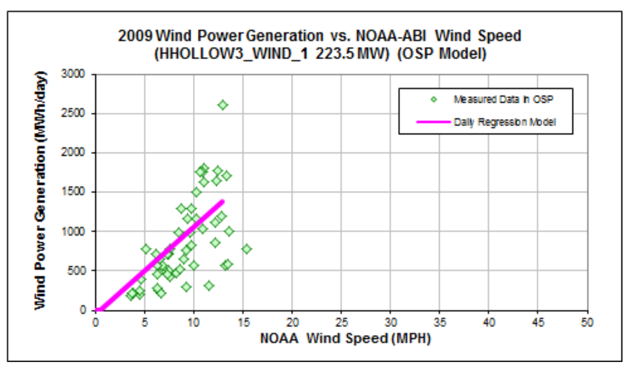


Figure 11-90: HHOLLOW3_WND_3 – Daily Wind Power vs. NOAA Wind Speed (Using OSP and Non-OSP Model)

Table 11-87: HHOLLOW3_WND_3 – Model Coefficients

Using Non-OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	554.3788
Left Slope (MWh/mph-day)	52.0558
RMSE (MWh/day)	709.9496
R2	0.0573
CV-RMSE	67.0%

Using OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-51.9186
Left Slope (MWh/mph-day)	111.3643
RMSE (MWh/day)	496.4390
R2	0.1576
CV-RMSE	59.1%

Table 11-88: HHOLLOW3_WND_3 – Comparison of Predicted Power vs. Measured Power

Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-09	31	10.70	40,595	34,454	15.13%	24%	21%
Feb-09	26	12.51	20,943	31,345	-49.67%	15%	22%
Mar-09	28	12.62	30,611	33,913	-10.79%	20%	23%
Apr-09	26	14.31	40,750	33,786	17.09%	29%	24%
May-09	31	10.10	36,756	33,488	8.89%	22%	20%
Jun-09	29	11.09	31,000	32,822	-5.88%	20%	21%
Jul-09	31	8.90	21,564	29,822	-38.30%	13%	18%
Aug-09	22	9.92	18,224	23,165	-27.11%	15%	20%
Sep-09	30	8.61	25,392	28,073	-10.56%	16%	17%
Oct-09	26	10.25	30,866	28,284	8.36%	22%	20%
Nov-09	30	8.39	46,382	29,731	35.90%	29%	18%
Dec-09	30	8.81	40,589	30,392	25.12%	25%	19%
Total	340	10.45	383,672	369,276	3.75%	21%	20%
Total in OSP (07/15-09/15)	54	8.94	45,349	50,946	-12.34%	16%	18%

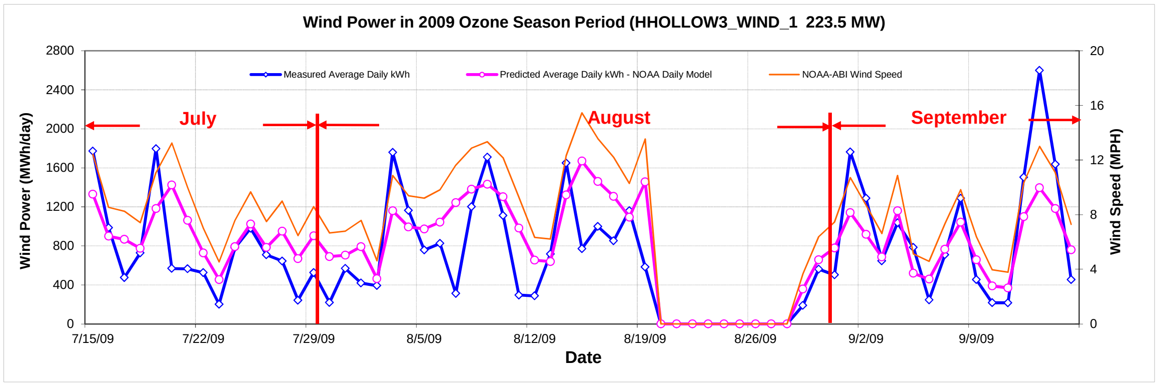


Figure 11-91: HHOLLOW3_WND_3 – Predicted Wind Power in OSP Using NOAA Wind Speed (2009)

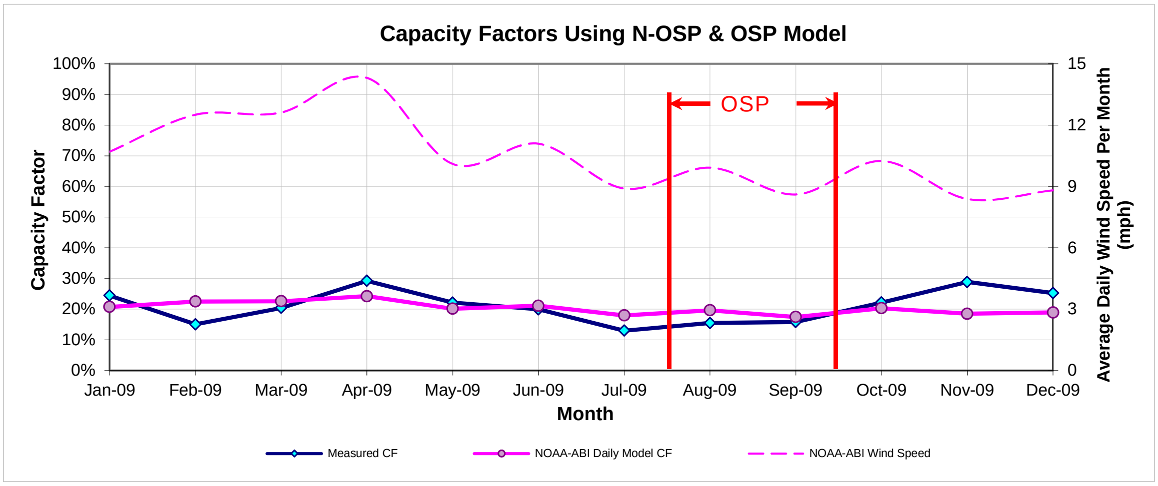


Figure 11-92: HHOLLOW3_WND_3 – Predicted Capacity Factors Using Daily Models (2009)

Table 11-89: HHOLLOW3_WND_3 – Predicted Power Production in 1999

Annual

1999 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
414,983	411,884

OSD

1999 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
1,029	840

Note: In 2009, the name of HHOLLOW3_WND3 was changed into HHGT_HHOLLOW3 based on ERCOT original data. In this report, the previous name of this wind farm was used for all analysis in order to keep consistence.

11.20 Horse Hollow Phase 4

Table 11-90: Site Information for Horse Hollow Phase 4

GENSITECODE_ERCOT	Renewable Energy	City	County	Date in Service	Capacity (MW)	Company	Facility	Wind Turbine Information	Region	PCA	Interconnection	Weather Station
HHOLLOW4_WND_1	WIND	Abilene	Taylor	May-06	115	FPL Energy	Horse Hollow Phase 4	Mitsubishi 1000 (160)	ERCOT	AEP-West	AEP/ TNC	ABI

SUBGENCODE_ERCOT	GENSITECODE_ERCOT	Capacity (MW)
HOLLOW4_WND	HOLLOW4_WND	115

11.20.1 Horse Hollow Phase 4 – HHOLLOW4_WND_1

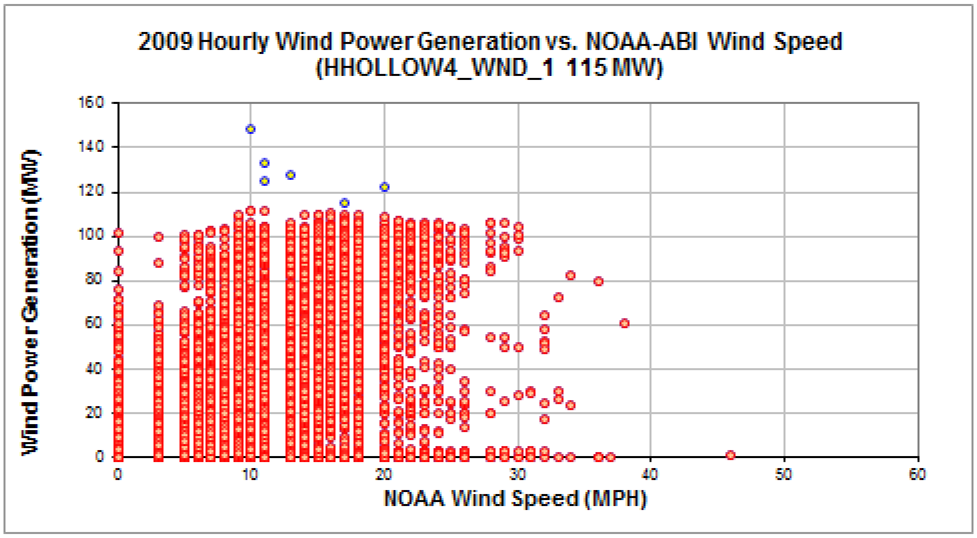
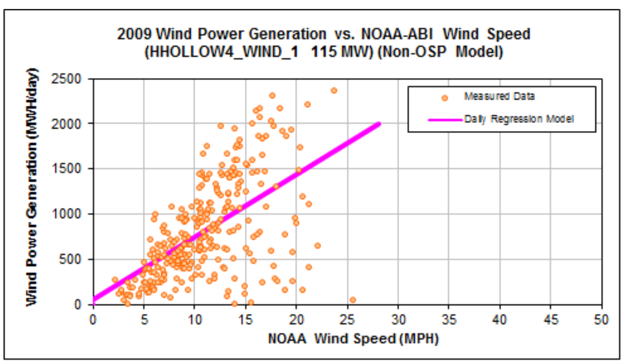


Figure 11-93: HHOLLOW4_WND_1 – Hourly Wind Power vs. NOAA Wind Speed (2009)



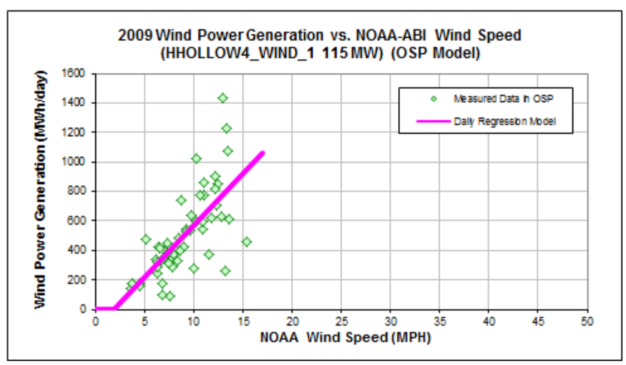


Figure 11-94: HHOLLOW4_WND_1 – Daily Wind Power vs. NOAA Wind Speed (Using OSP and Non-OSP Model)

Table 11-91: HHOLLOW4_WND_1 – Model Coefficients

Using Non-OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	49.5314
Left Slope (MWh/mph-day)	69.2651
RMSE (MWh/day)	445.5856
R2	0.3233
CV-RMSE	55.0%

Using OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-136.1422
Left Slope (MWh/mph-day)	70.3304
RMSE (MWh/day)	200.7341
R2	0.5009
CV-RMSE	40.7%

Table 11-92: HHOLLOW4_WND_1 – Comparison of Predicted Power vs. Measured Power

Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-09	30	10.58	28,638	23,463	18.07%	35%	28%
Feb-09	25	13.00	14,012	23,742	-69.44%	20%	34%
Mar-09	29	13.26	26,797	28,077	-4.78%	33%	35%
Apr-09	30	14.82	35,132	32,276	8.13%	42%	39%
May-09	30	10.07	20,307	22,404	-10.33%	25%	27%
Jun-09	30	11.31	20,315	24,996	-23.04%	25%	30%
Jul-09	31	8.90	13,461	17,637	-31.03%	16%	21%
Aug-09	25	9.83	12,852	13,871	-7.93%	19%	20%
Sep-09	30	8.61	18,807	16,714	11.13%	23%	20%
Oct-09	31	10.66	26,232	24,415	6.93%	31%	29%
Nov-09	30	8.39	26,092	18,916	27.50%	32%	23%
Dec-09	30	8.81	23,009	19,796	13.97%	28%	24%
Total	351	10.65	265,653	266,306	-0.25%	27%	27%
Total in OSP (07/15-09/15)	57	8.95	28,110	28,109	0.00%	18%	18%

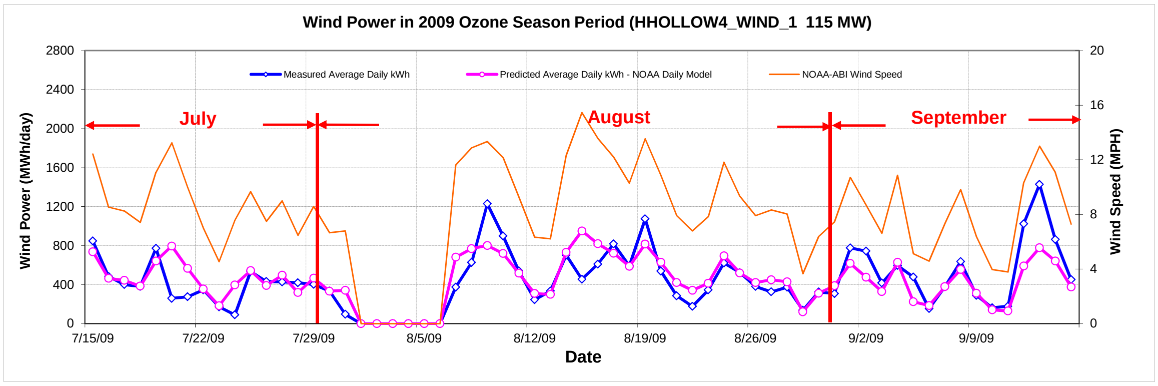


Figure 11-95: HHOLLOW4_WND_1 – Predicted Wind Power in OSP Using NOAA Wind Speed (2009)

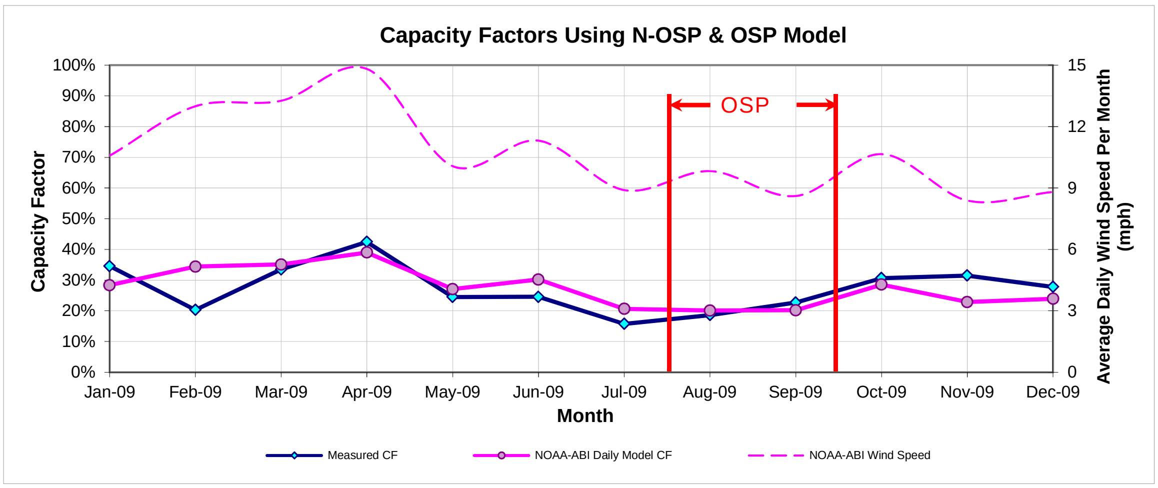


Figure 11-96: HHOLLOW4_WND_1 – Predicted Capacity Factors Using Daily Models (2009)

Table 11-93: HHOLLOW4_WND_1 – Predicted Power Production in 1999

Annual

1999 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
292,516	276,249

OSD

1999 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
547	493

Note: In 2009, the name of HHOLLOW4_WND1_1 was changed into HHGT_HHOLLOW4 based on ERCOT original data. In this report, the previous name of this wind farm was used for all analysis in order to keep consistence.

11.21 Hackberry Wind Farm

Table 11-94: Site Information for Hackberry Wind Farm

GENSITECODE_ERCOT	Renewable Energy	City	County	Date in Service	Capacity (MW)	Company	Facility	Wind Turbine Information	Region	PCA	Interconnection	Weather Station
HWF_HWFG1	WIND		Shackleford	Nov-08	165.5	Renewable Energy Systems	Hackberry Wind Farm	Siemens(72)	ERCOT			ABI

SUBGENCODE_ERCOT	GENSITECODE_ERCOT	Capacity (MW)
HWF_HWFG1	HWF_HWFG1	165.5

11.21.1 Hackberry Wind Farm – HWF_HWFG1

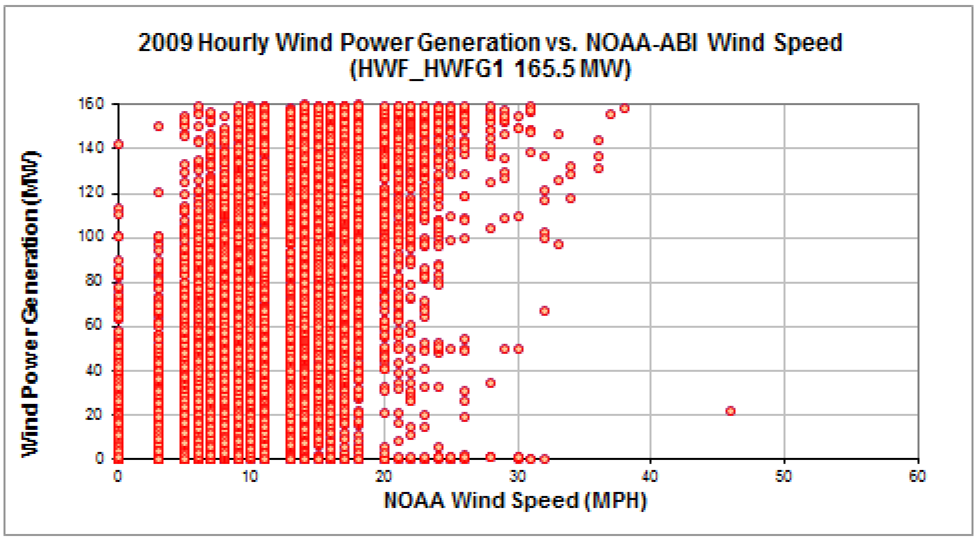


Figure 11-97: HWF_HWFG1 – Hourly Wind Power vs. NOAA Wind Speed (2009)

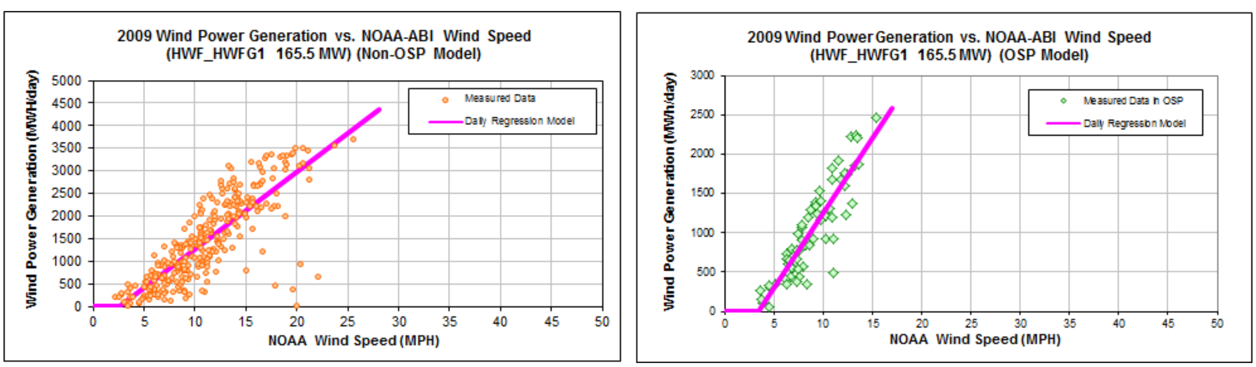


Figure 11-98: HWF_HWFG1 – Daily Wind Power vs. NOAA Wind Speed (Using OSP and Non-OSP Model)

Table 11-95: HWF_HWFG1 – Model Coefficients

Using Non-OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-445.3644
Left Slope (MWh/mph-day)	171.3312
RMSE (MWh/day)	548.4265
R2	0.6602
CV-RMSE	38.0%

Using OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-671.0867
Left Slope (MWh/mph-day)	191.6030
RMSE (MWh/day)	266.6908
R2	0.8008
CV-RMSE	25.7%

Table 11-96: HWF_HWFG1 – Comparison of Predicted Power vs. Measured Power

Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-09	30	10.58	45,176	41,000	9.24%	38%	34%
Feb-09	28	12.91	45,208	49,549	-9.60%	41%	45%
Mar-09	31	13.29	57,665	56,789	1.52%	47%	46%
Apr-09	30	14.82	62,586	62,799	-0.34%	53%	53%
May-09	31	10.10	33,005	39,849	-20.74%	27%	32%
Jun-09	30	11.31	44,316	44,792	-1.07%	37%	38%
Jul-09	31	8.90	33,560	32,546	3.02%	27%	26%
Aug-09	31	9.59	38,499	36,129	6.15%	31%	29%
Sep-09	30	8.61	29,218	29,920	-2.40%	25%	25%
Oct-09	31	10.66	45,054	42,787	5.03%	37%	35%
Nov-09	30	8.39	32,186	29,763	7.53%	27%	25%
Dec-09	30	8.81	31,827	31,929	-0.32%	27%	27%
Total	363	10.65	498,301	497,853	0.09%	35%	35%
Total in OSP (07/15-09/15)	63	8.91	65,314	65,311	0.00%	26%	26%

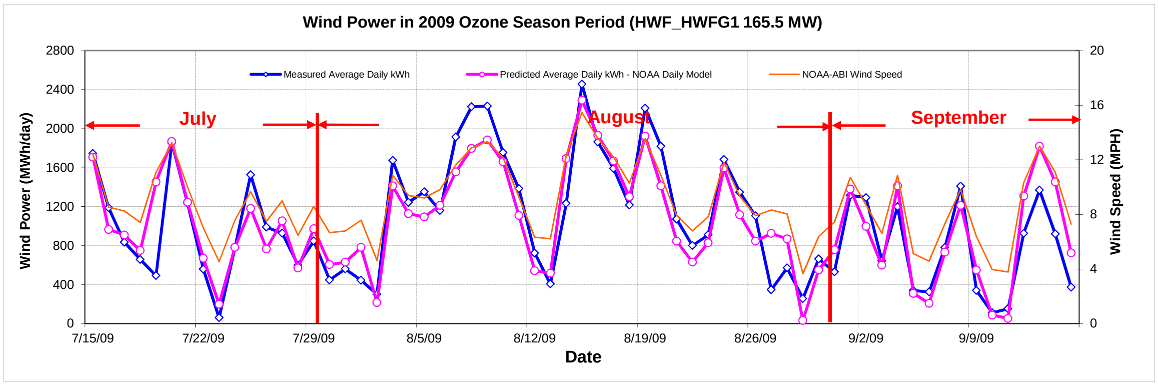


Figure 11-99: HWF_HWFG1 – Predicted Wind Power in OSP Using NOAA Wind Speed (2009)

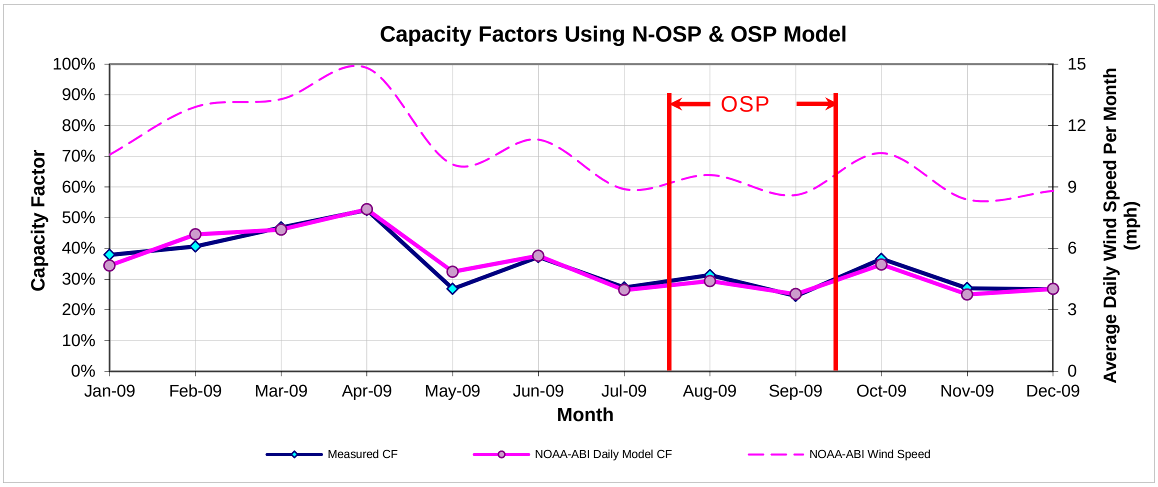


Figure 11-100: HWF_HWFG1 – Predicted Capacity Factors Using Daily Models (2009)

Table 11-97: HWF_HWFG1 – Predicted Power Production in 1999

Annual

1999 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
541,792	501,046

OSD

1999 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
1,189	1,037

11.22 Inadale

Table 11-98: Site Information for Inadale

GENSITECODE_ERCOT	Renewable Energy	City	County	Date in Service	Capacity (MW)	Company	Facility	Wind Turbine Information	Region	PCA	Interconnection	Weather Station
INDL_INADALE1	WIND		Nolan	Nov-08	197	E.On Climate & Renewables	Inadale	Mitsubishi (197)	ERCOT			ABI

SUBGENCODE_ERCOT	GENSITECODE_ERCOT	Capacity (MW)
INDL_INADALE1	INDL_INADALE1	197

11.22.1 Inadale – INDL_INADALE1

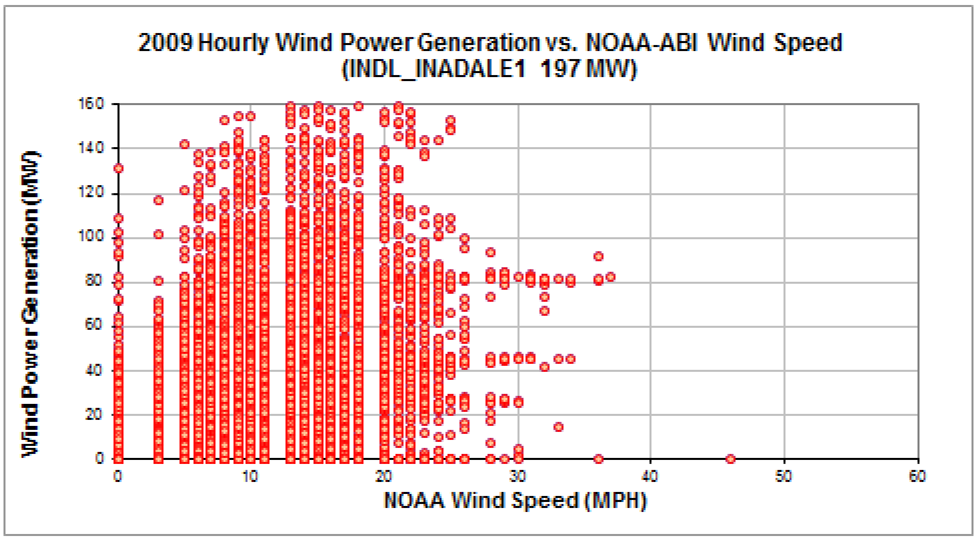


Figure 11-101: INDL_INADALE1 – Hourly Wind Power vs. NOAA Wind Speed (2009)

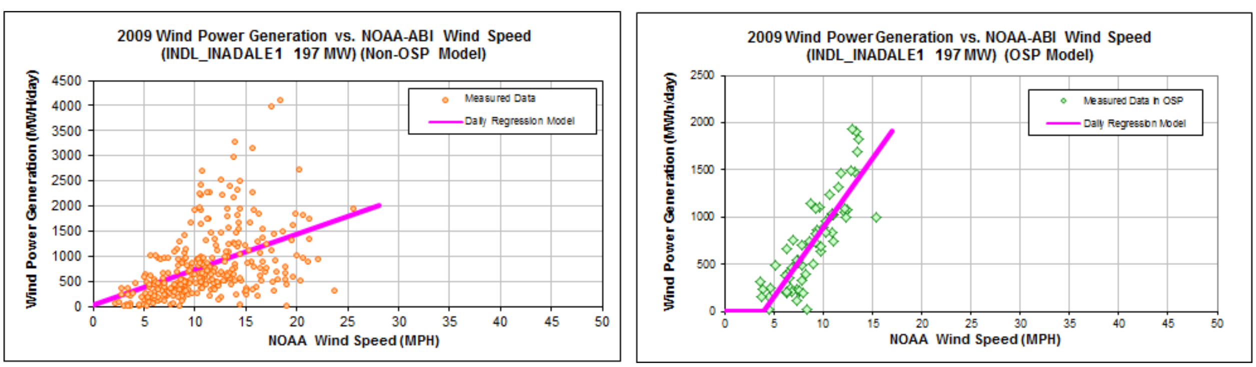


Figure 11-102: INDL_INADALE1 – Daily Wind Power vs. NOAA Wind Speed (Using OSP and Non-OSP Model)

Table 11-99: INDL_INADALE1 – Model Coefficients

Using Non-OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	27.6889
Left Slope (MWh/mph-day)	70.6260
RMSE (MWh/day)	609.4802
R2	0.2107
CV-RMSE	75.6%

Using OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-582.5843
Left Slope (MWh/mph-day)	147.0243
RMSE (MWh/day)	260.4734
R2	0.7127
CV-RMSE	35.8%

Table 11-100: INDL_INADALE1 – Comparison of Predicted Power vs. Measured Power

Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-09	31	10.70	11,659	24,287	-108.31%	8%	17%
Feb-09	28	12.91	14,842	26,310	-77.27%	11%	20%
Mar-09	31	13.29	20,419	29,959	-46.72%	14%	20%
Apr-09	30	14.82	25,206	32,225	-27.85%	18%	23%
May-09	31	10.10	16,417	22,976	-39.95%	11%	16%
Jun-09	30	11.31	22,979	24,803	-7.93%	16%	17%
Jul-09	31	8.90	20,118	21,023	-4.50%	14%	14%
Aug-09	31	9.59	25,490	25,670	-0.71%	17%	18%
Sep-09	30	8.61	24,320	19,079	21.55%	17%	13%
Oct-09	31	10.66	40,002	24,187	39.53%	27%	17%
Nov-09	30	8.39	34,844	18,603	46.61%	25%	13%
Dec-09	30	8.81	32,398	19,500	39.81%	23%	14%
Total	364	10.66	288,694	288,624	0.02%	17%	17%
Total in OSP (07/15-09/15)	63	8.91	45,857	45,926	-0.15%	15%	15%

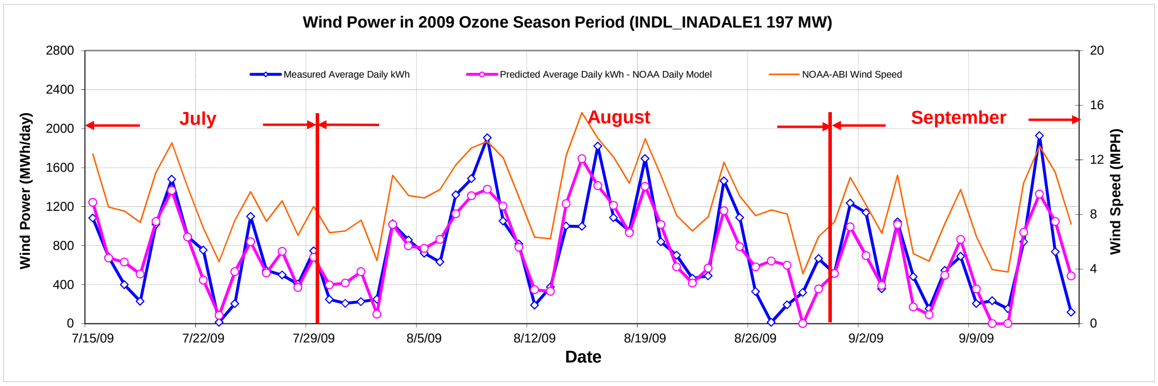


Figure 11-103: INDL_INADALE1 – Predicted Wind Power in OSP Using NOAA Wind Speed (2009)

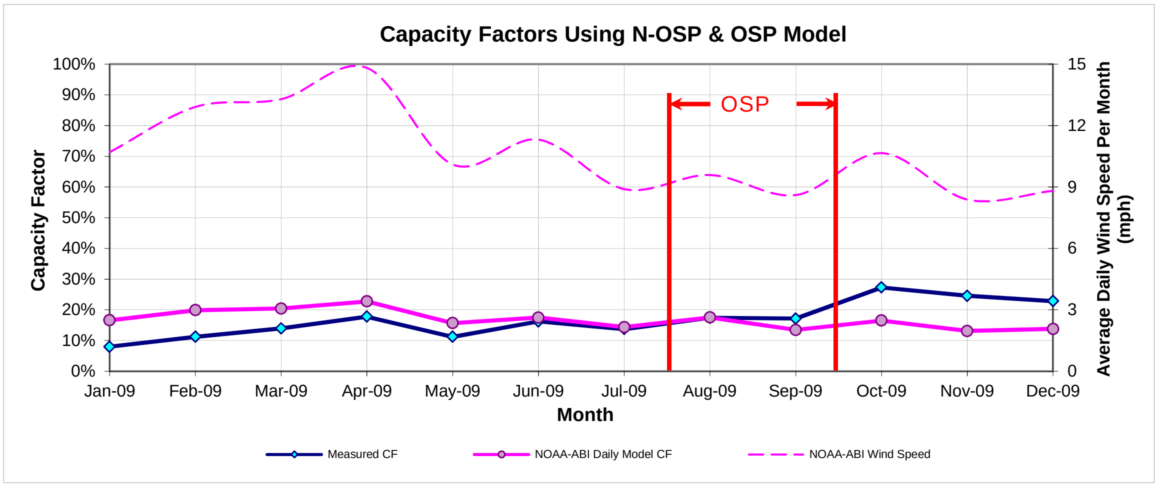


Figure 11-104: INDL_INADALE1 – Predicted Capacity Factors Using Daily Models (2009)

Table 11-101: INDL_INADALE1 – Predicted Power Production in 1999

Annual

1999 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
309,483	289,487

OSD

1999 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
845	728

11.23 Desert Sky

Table 11-102: Site Information for Desert Sky

GENSITECODE_ERCOT	Renewable Energy	City	County	Date in Service	Capacity (MW)	Company	Facility	Wind Turbine Information	Region	PCA	Interconnection	Weather Station
INDNENR	WIND	Iraan	PECOS	Dec-01	160	AEP	Desert Sky (Indian Mesa II)	Enron 1500 (107)	ERCOT	TXU	WTU	FST

SUBGENCODE_ERCOT	GENSITECODE_ERCOT	Capacity (MW)
INDNENR_INDNENR	INDNENR	80
INDNENR_INDNENR_2	INDNENR	80

11.23.1 Desert Sky – INDNENR_INDNENR

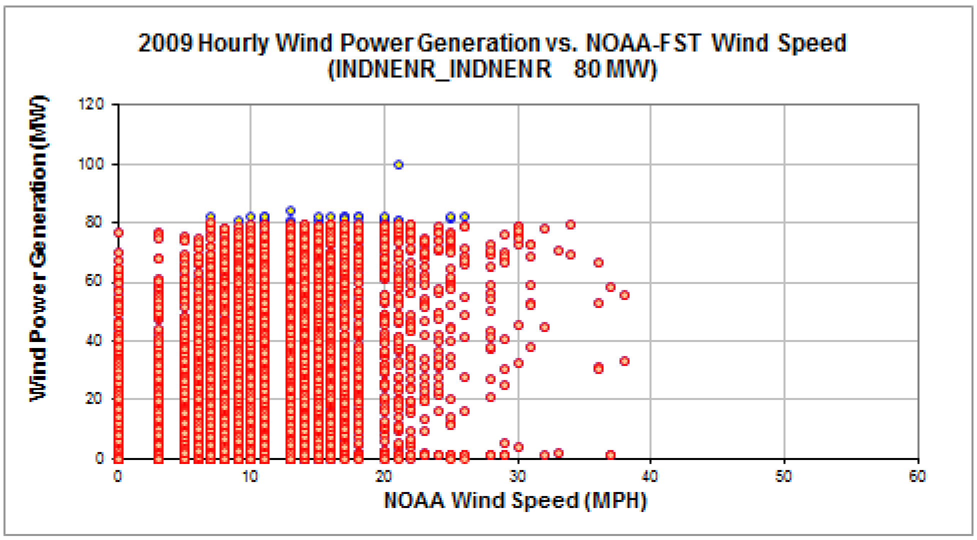


Figure 11-105: INDNENR_INDNENR – Hourly Wind Power vs. NOAA Wind Speed (2009)

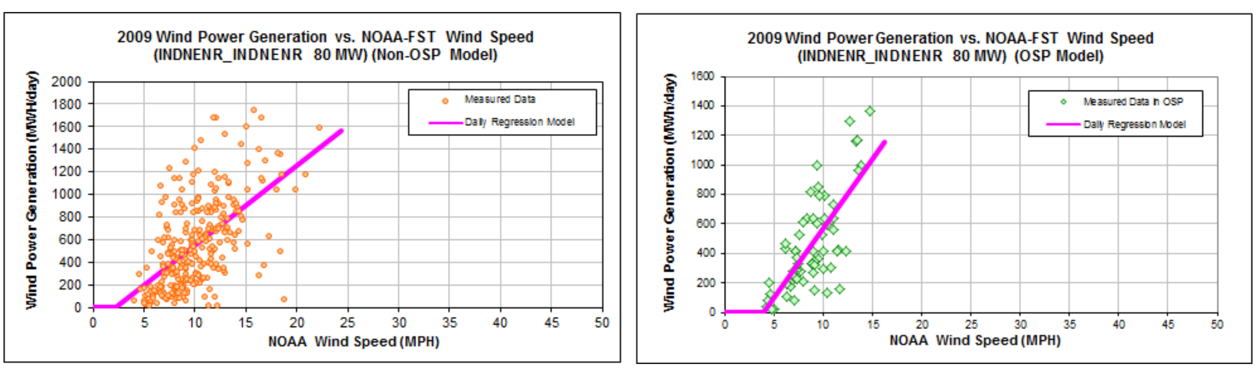


Figure 11-106: INDNENR_INDNENR – Daily Wind Power vs. NOAA Wind Speed (Using OSP and Non-OSP Model)

Table 11-103: INDNENR_INDNENR – Model Coefficients

Using Non-OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-156.4572
Left Slope (MWh/mph-day)	70.3858
RMSE (MWh/day)	317.0332
R2	0.3276
CV-RMSE	57.2%

Using OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-376.3255
Left Slope (MWh/mph-day)	94.0129
RMSE (MWh/day)	220.4647
R2	0.5371
CV-RMSE	48.0%

Table 11-104: INDNENR_INDNENR – Comparison of Predicted Power vs. Measured Power

Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-09	31	9.44	14,938	15,755	-5.47%	25%	26%
Feb-09	28	11.24	19,238	17,779	7.58%	36%	33%
Mar-09	30	10.41	20,911	17,283	17.35%	36%	30%
Apr-09	30	12.47	21,546	21,640	-0.43%	37%	38%
May-09	31	10.12	17,943	17,224	4.01%	30%	29%
Jun-09	24	10.47	11,819	13,932	-17.87%	26%	30%
Jul-09	31	9.38	14,536	15,432	-6.16%	24%	26%
Aug-09	30	9.67	15,984	15,987	-0.02%	28%	28%
Sep-09	30	8.09	10,285	11,707	-13.82%	18%	20%
Oct-09	30	10.18	13,044	16,795	-28.75%	23%	29%
Nov-09	30	8.93	15,346	14,173	7.65%	27%	25%
Dec-09	29	8.34	14,682	12,488	14.94%	26%	22%
Total	354	9.89	190,273	190,193	0.04%	28%	28%
Total in OSP (07/15-09/15)	62	8.89	28,498	28,494	0.01%	24%	24%

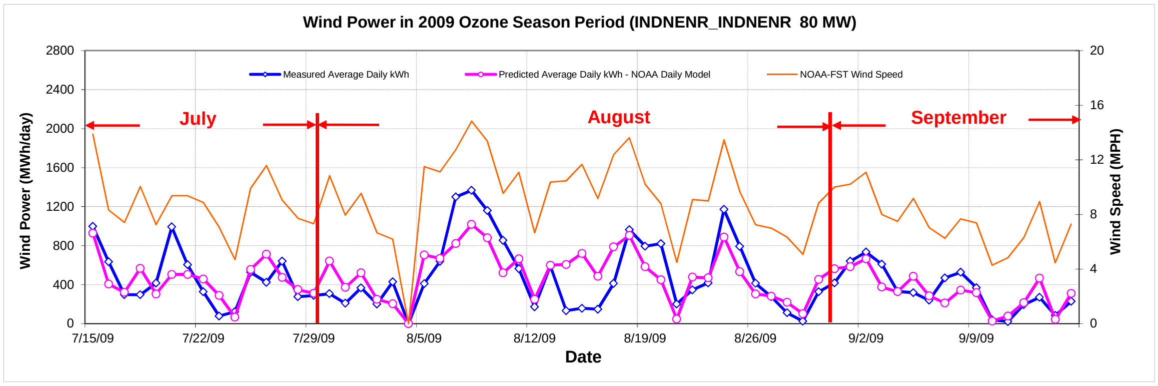


Figure 11-107: INDNENR_INDNENR – Predicted Wind Power in OSP Using NOAA Wind Speed (2009)

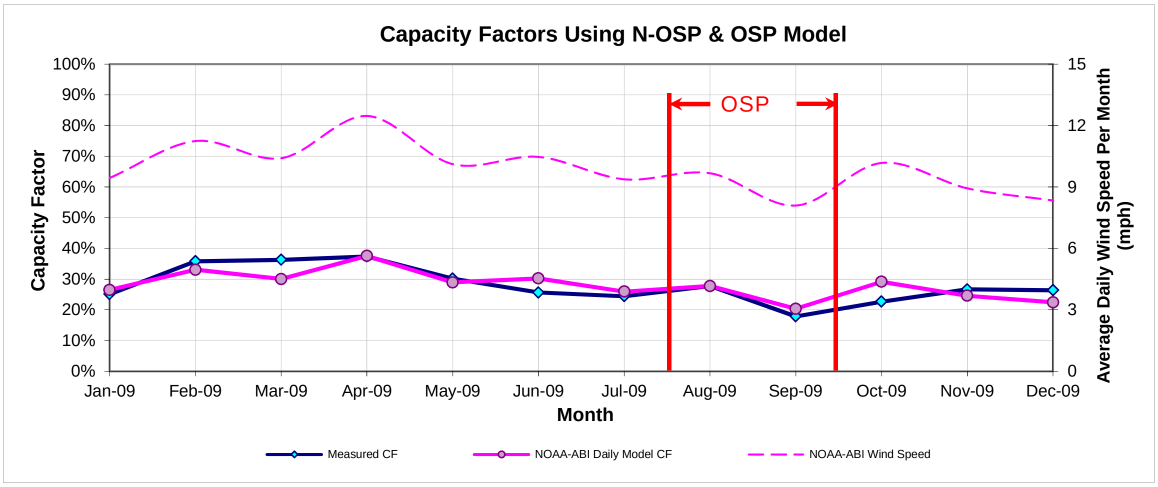


Figure 11-108: INDNENR_INDNENR – Predicted Capacity Factors Using Daily Models (2009)

Table 11-105: INDNENR_INDNENR – Predicted Power Production in 1999

Annual

1999 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
231,310	196,186

OSD

1999 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
560	460

11.23.2 Desert Sky – INDNENR_INDNENR2

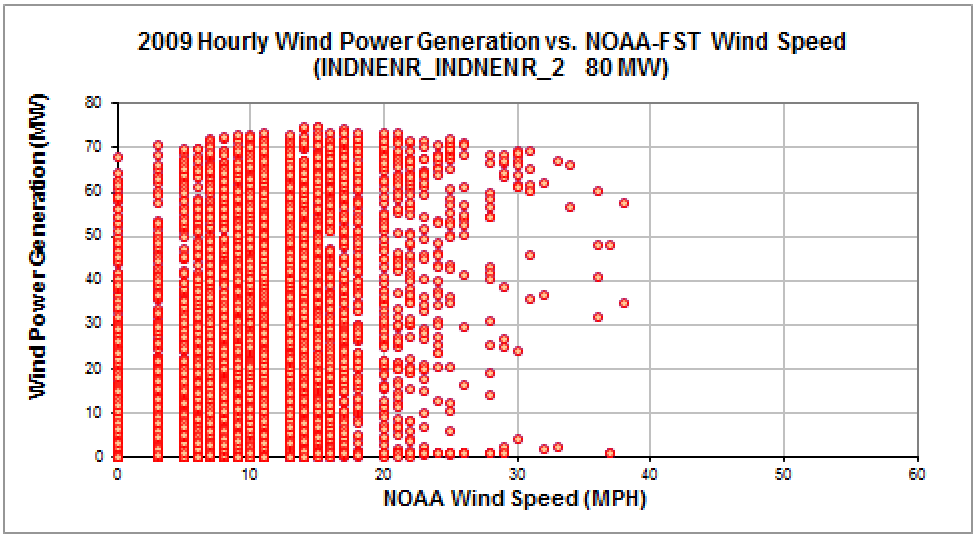
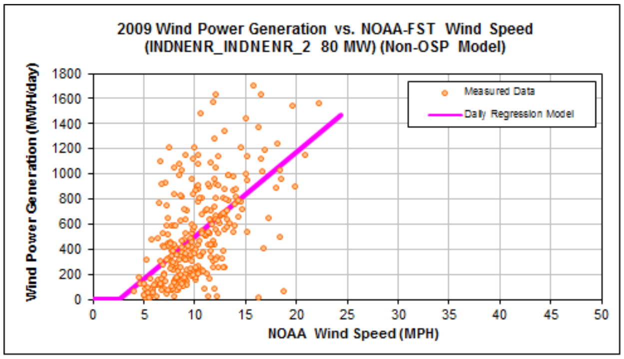


Figure 11-109: INDNENR_INDNENR2 – Hourly Wind Power vs. NOAA Wind Speed (2009)



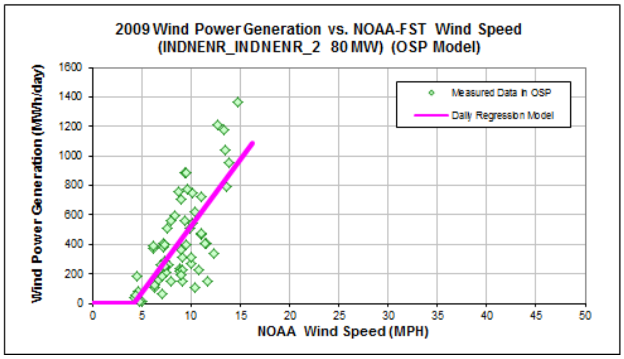


Figure 11-110: INDNENR_INDNENR2 – Daily Wind Power vs. NOAA Wind Speed (Using OSP and Non-OSP Model)

Table 11-106: INDNENR_INDNENR2 – Model Coefficients

Using Non-OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-179.1258
Left Slope (MWh/mph-day)	67.5955
RMSE (MWh/day)	304.8669
R2	0.3340
CV-RMSE	60.1%

Using OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-377.0234
Left Slope (MWh/mph-day)	89.5599
RMSE (MWh/day)	222.6025
R2	0.5081
CV-RMSE	53.1%

Table 11-107: INDNENR_INDNENR2 – Comparison of Predicted Power vs. Measured Power

Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-09	31	9.44	13,104	14,235	-8.63%	22%	24%
Feb-09	28	11.24	18,410	16,266	11.65%	34%	30%
Mar-09	30	10.41	19,207	15,731	18.10%	33%	27%
Apr-09	30	12.47	18,097	19,916	-10.05%	31%	35%
May-09	31	10.12	16,663	15,646	6.10%	28%	26%
Jun-09	24	10.47	11,625	12,687	-9.13%	25%	28%
Jul-09	31	9.38	13,138	14,041	-6.88%	22%	24%
Aug-09	30	9.67	14,742	14,674	0.46%	26%	25%
Sep-09	30	8.09	9,215	10,495	-13.89%	16%	18%
Oct-09	31	10.48	13,325	16,407	-23.14%	22%	28%
Nov-09	30	8.93	13,958	12,745	8.69%	24%	22%
Dec-09	30	8.56	13,369	11,994	10.29%	23%	21%
Total	356	9.93	174,852	174,837	0.01%	26%	26%
Total in OSP (07/15-09/15)	62	8.89	26,000	25,996	0.01%	22%	22%

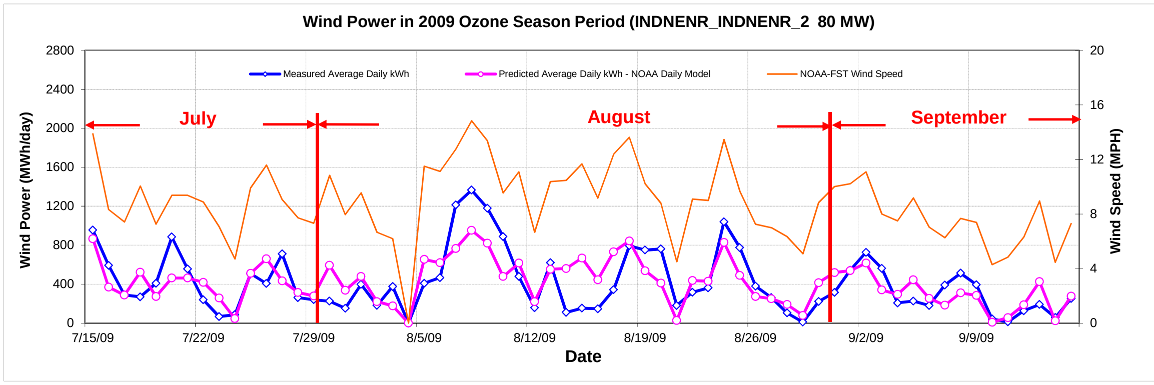


Figure 11-111: INDNENR_INDNENR2 – Predicted Wind Power in OSP Using NOAA Wind Speed (2009)

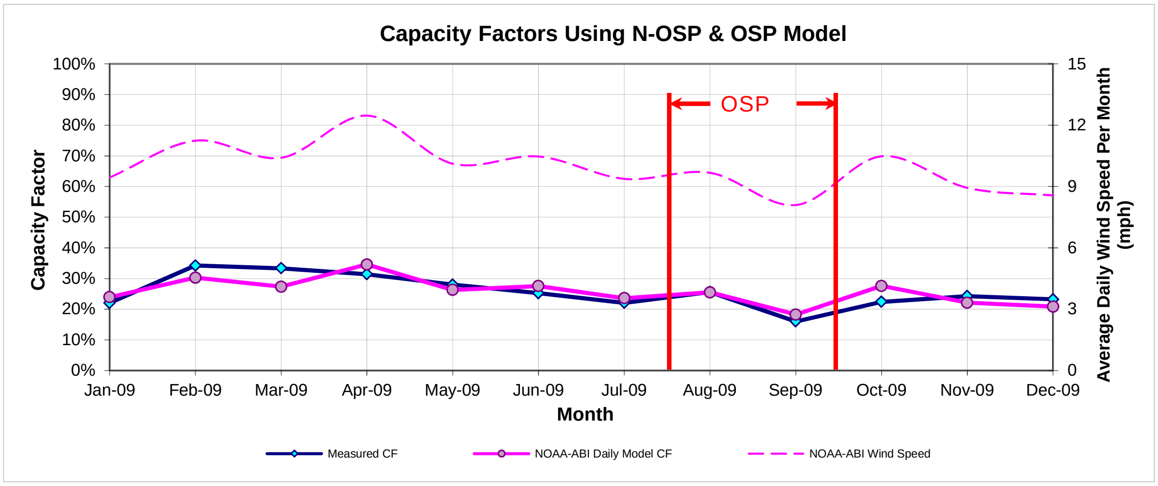


Figure 11-112: INDNENR_INDNENR2 – Predicted Capacity Factors Using Daily Models (2009)

Table 11-108: INDNENR_INDNENR2 – Predicted Power Production in 1999

Annual

1999 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
211,992	179,272

OSD

1999 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
515	419

11.24 Indian Mesa

Table 11-109: Site Information for Indian Mesa

GENSITECODE_ERCOT	Renewable Energy	City	County	Date in Service	Capacity (MW)	Company	Facility	Wind Turbine Information	Region	PCA	Interconnection	Weather Station
INDNNWP	WIND	Iraan	PECOS	Jun-01	82.5	Orion Energy/American National Wind Power	Indian Mesa I	Vestas V-47 (125)	ERCOT	AEP-West	WTU	FST

SUBGENCODE_ERCOT	GENSITECODE_ERCOT	Capacity (MW)
INDNNWP_INDNNWP	INDNNWP	82.5

11.24.1 Indian Mesa – INDNNWP_INDNNWP

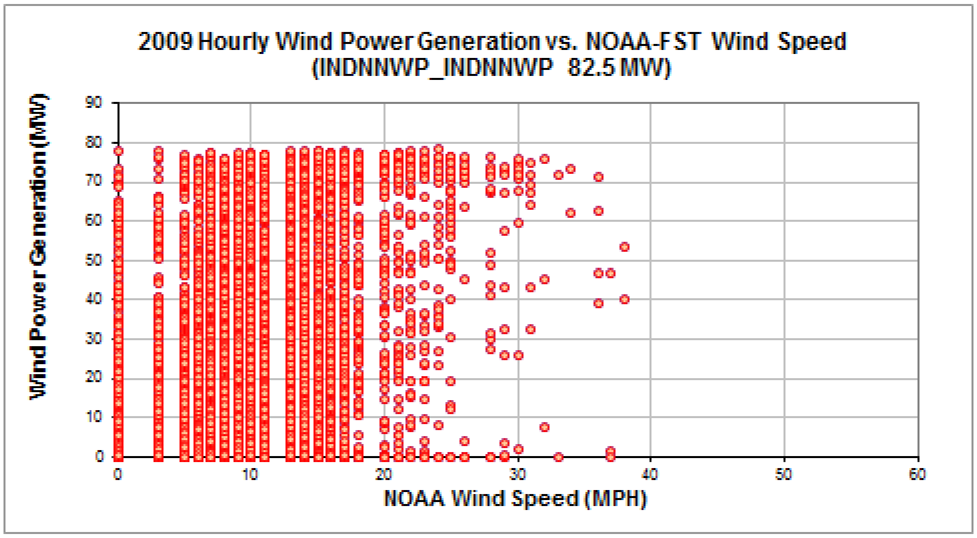


Figure 11-113: INDNNWP_INDNNWP – Hourly Wind Power vs. NOAA Wind Speed (2009)

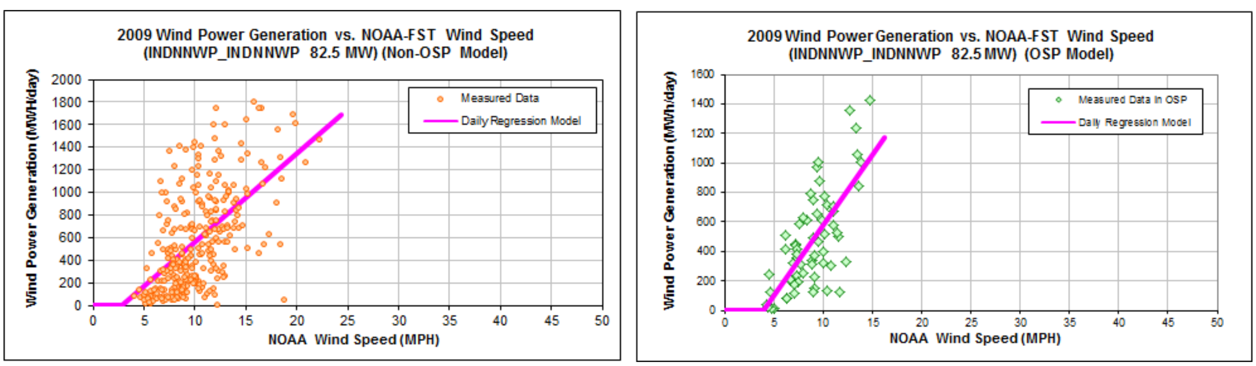


Figure 11-114: INDNNWP_INDNNWP – Daily Wind Power vs. NOAA Wind Speed (Using OSP and Non-OSP Model)

Table 11-110: INDNNWP_INDNNWP – Model Coefficients

Using Non-OSP Model:

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%

Using 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%

Table 11-111: INDNNWP_INDNNWP – Comparison of Predicted Power vs. Measured Power

Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-09	31	9.44	12,891	15,987	-24.01%	21%	26%
Feb-09	28	11.24	19,676	18,394	6.51%	35%	33%
Mar-09	30	10.41	21,661	17,740	18.10%	36%	30%
Apr-09	30	12.47	23,628	22,595	4.37%	40%	38%
May-09	31	10.12	19,792	17,624	10.95%	32%	29%
Jun-09	24	10.47	13,554	14,310	-5.57%	29%	30%
Jul-09	31	9.38	14,714	15,749	-7.03%	24%	26%
Aug-09	30	9.67	16,641	16,278	2.18%	28%	27%
Sep-09	29	7.98	9,656	11,193	-15.92%	17%	19%
Oct-09	31	10.48	14,130	18,507	-30.98%	23%	30%
Nov-09	30	8.93	15,237	14,275	6.32%	26%	24%
Dec-09	30	8.56	14,609	13,403	8.25%	25%	23%
Total	355	9.93	196,190	196,055	0.07%	28%	28%
Total in OSP (07/15-09/15)	62	8.89	29,049	29,044	0.01%	24%	24%

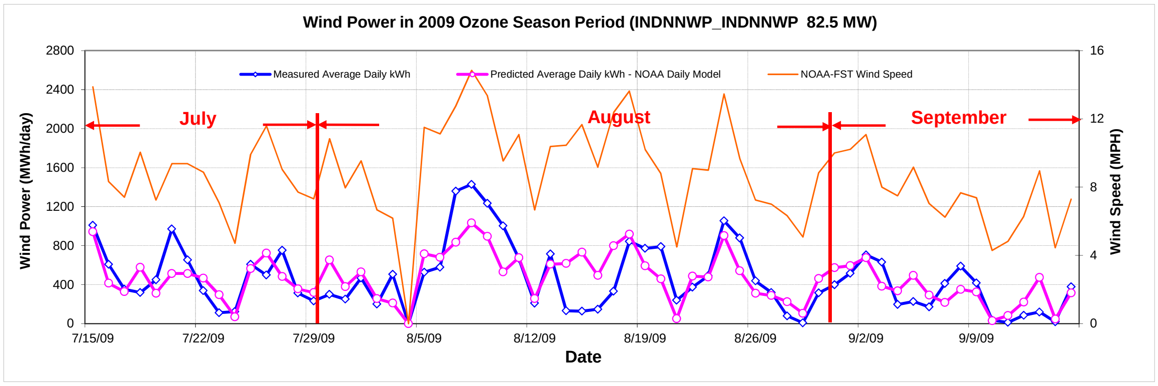


Figure 11-115: INDNNWP_INDNNWP – Predicted Wind Power in OSP Using NOAA Wind Speed (2009)

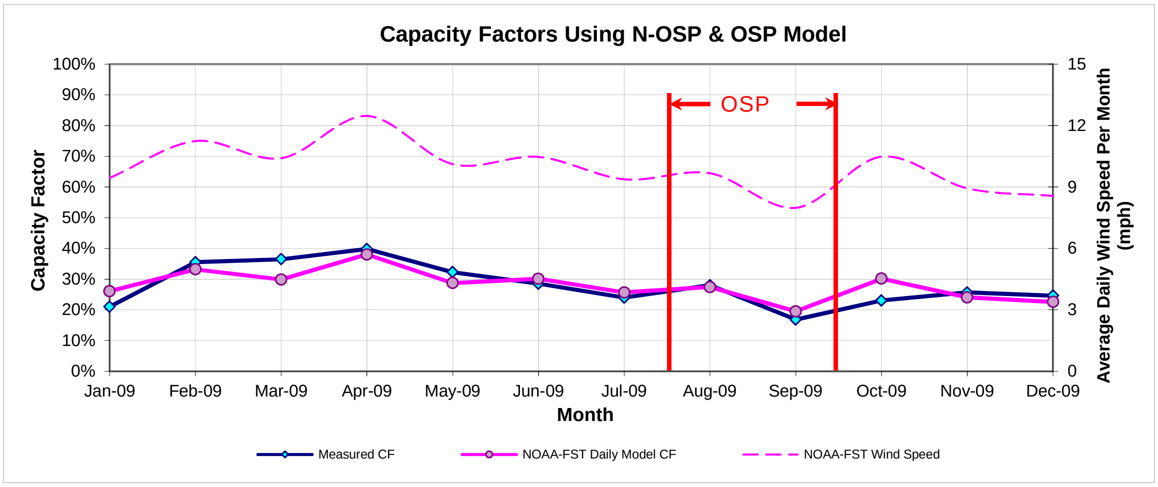


Figure 11-116: INDNNWP_INDNNWP – Predicted Capacity Factors Using Daily Models (2009)

Table 11-112: INDNNWP_INDNNWP – Predicted Power Production in 1999

Annual

1999 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
239,087	201,716

OSD

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

11.25 Sherbino Mesa Wind Farm

Table 11-113: Site Information for Sherbino Mesa Wind Farm

GENSITECODE_ERCOT	Renewable Energy	City	County	Date in Service	Capacity (MW)	Company	Facility	Wind Turbine Information	Region	PCA	Interconnection	Weather Station
KEO_KEO_SM1	WIND		Pecos	Sep-08	150	BP Alt. Energy - NRG	Sherbino Mesa Wind Farm	Vestas (50)	ERCOT			MAF

SUBGENCODE_ERCOT	GENSITECODE_ERCOT	Capacity (MW)
KEO_KEO_SM1	KEO_KEO_SM1	150

11.25.1 Sherbino Mesa Wind Farm – KEO_KEO_SM1

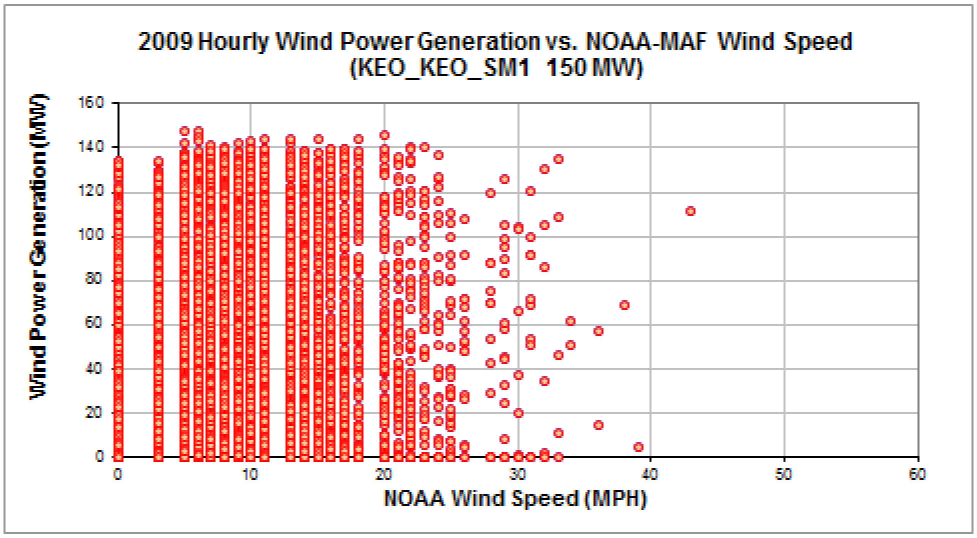


Figure 11-117: KEO_KEO_SM1 – Hourly Wind Power vs. NOAA Wind Speed (2009)

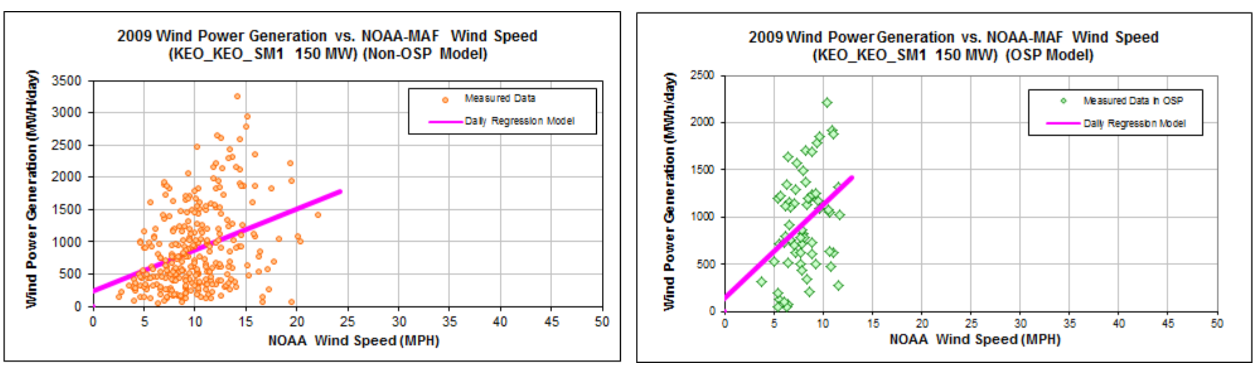


Figure 11-118: KEO_KEO_SM1 – Daily Wind Power vs. NOAA Wind Speed (Using OSP and Non-OSP Model)

Table 11-114: KEO_KEO_SM1 – Model Coefficients

Using Non-OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	238.8953
Left Slope (MWh/mph-day)	63.7534
RMSE (MWh/day)	594.6408
R2	0.1230
CV-RMSE	68.0%

Using OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	135.7926
Left Slope (MWh/mph-day)	98.9181
RMSE (MWh/day)	489.4615
R2	0.1285
CV-RMSE	52.7%

Table 11-115: KEO_KEO_SM1 – Comparison of Predicted Power vs. Measured Power

Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-09	31	9.45	20,343	26,079	-28.20%	18%	23%
Feb-09	28	11.28	30,579	26,817	12.30%	30%	27%
Mar-09	31	11.01	25,481	29,175	-14.50%	23%	26%
Apr-09	29	13.32	26,913	31,560	-17.26%	26%	30%
May-09	31	10.53	30,190	28,220	6.53%	27%	25%
Jun-09	30	10.16	30,865	26,601	13.81%	29%	25%
Jul-09	31	8.18	28,839	26,537	7.98%	26%	24%
Aug-09	31	8.31	32,555	29,692	8.80%	29%	27%
Sep-09	30	8.06	20,359	25,022	-22.90%	19%	23%
Oct-09	29	9.66	22,243	24,785	-11.43%	21%	24%
Nov-09	30	7.49	27,755	21,487	22.58%	26%	20%
Dec-09	30	8.34	22,910	23,117	-0.90%	21%	21%
Total	361	9.63	319,033	319,090	-0.02%	25%	25%
Total in OSP (07/15-09/15)	63	8.01	58,494	58,487	0.01%	26%	26%

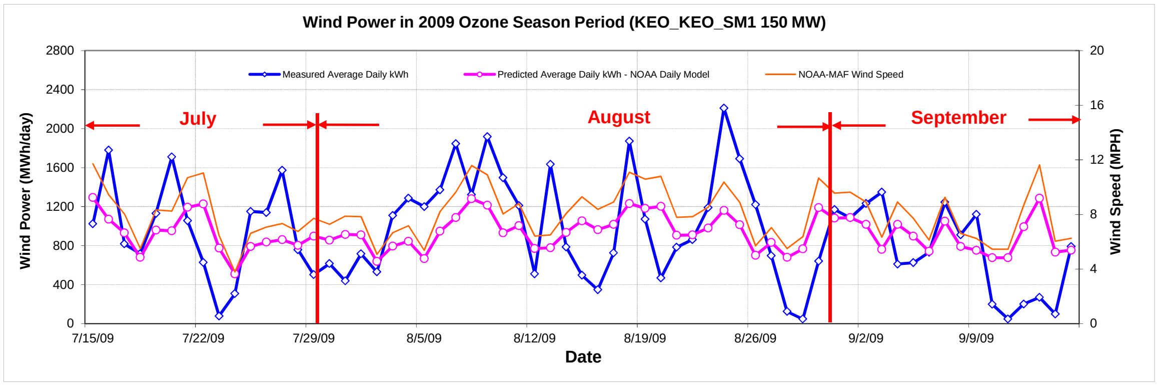


Figure 11-119: KEO_KEO_SM1 – Predicted Wind Power in OSP Using NOAA Wind Speed (2009)

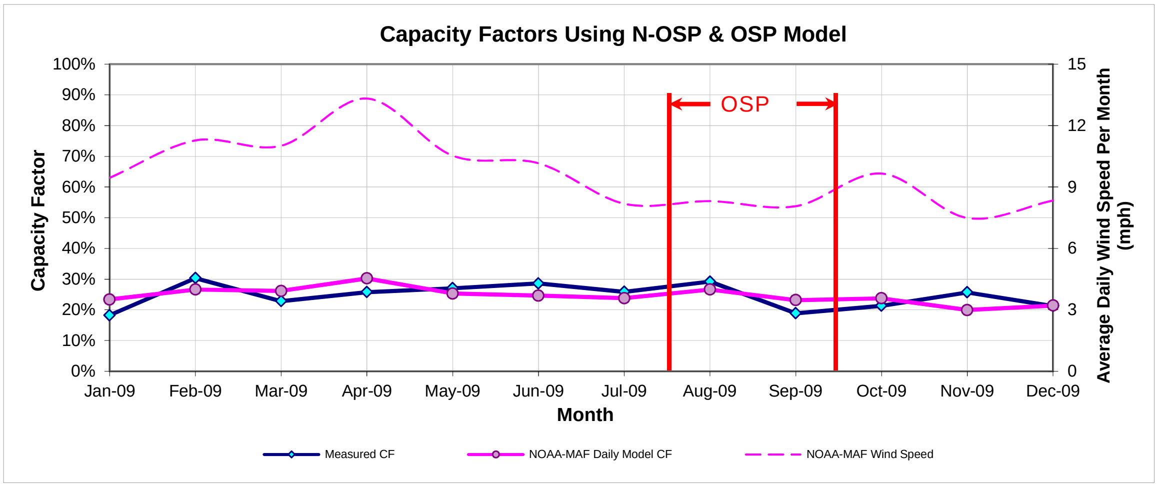


Figure 11-120: KEO_KEO_SM1 – Predicted Capacity Factors Using Daily Models (2009)

Table 11-116: KEO_KEO_SM1 – Predicted Power Production in 1999

Annual

1999 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
355,404	322,568

OSD

1999 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
1,073	928

11.26 King Mountain Wind Ranch

Table 11-117: Site Information for King Mountain Wind Ranch

GENSITECODE_ERCOT	Renewable Energy	City	County	Date in Service	Capacity (MW)	Company	Facility	Wind Turbine Information	Region	PCA	Interconnection	Weather Station
KING_NE	WIND	McCamey	UPTON	Dec-01	278.2	FPL/Cielo	King Mountain Wind Ranch	Bonus 1300 (61)	ERCOT	AEP-West	WTU	MAF

SUBGENCODE_ERCOT	GENSITECODE_ERCOT	Capacity (MW)
KING_NE_KINGNE	KING_NE	79.3
KING_NW_KINGNW	KING_NW	79.3
KING_SE_KINGSE	KING_SE	40.3
KING_SW_KINGSW	KING_SW	79.3

11.26.1 King Mountain Wind Ranch – King_NE_KINGNE

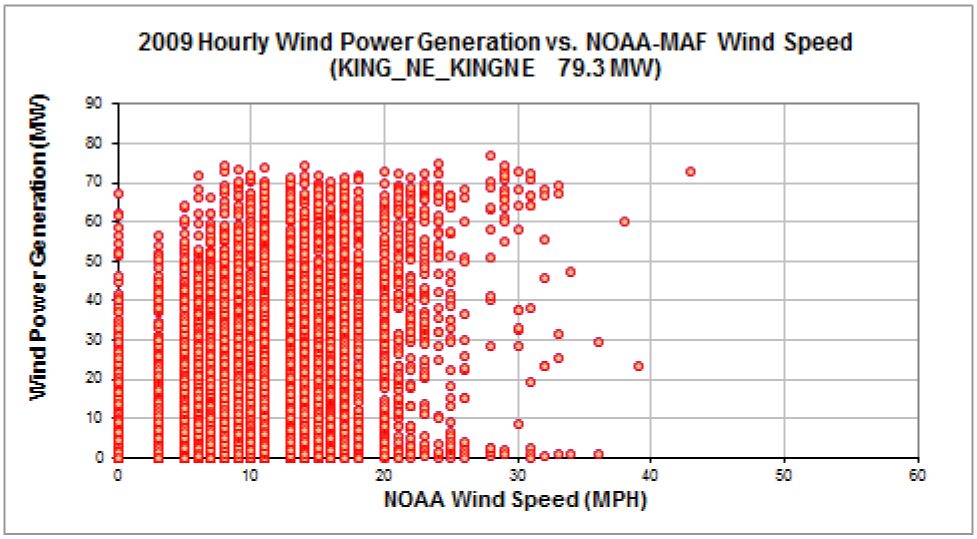


Figure 11-121: King_NE_KINGNE - Hourly Wind Power vs. NOAA Wind Speed (2009)

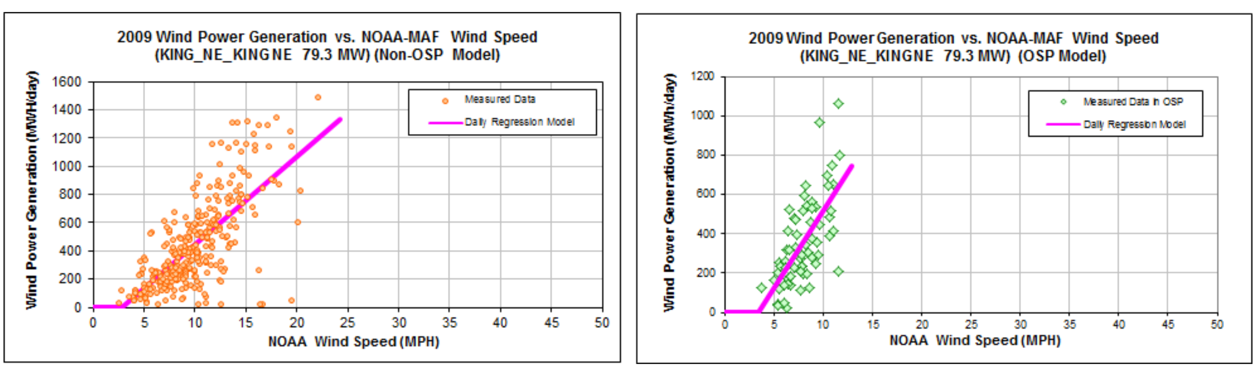


Figure 11-122: King_NE_KINGNE – Daily Wind Power vs. NOAA Wind Speed (Using OSP and Non-OSP Model)

Table 11-118: King_NE_KINGNE – Model Coefficients

Using Non-OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-177.8755
Left Slope (MWh/mph-day)	62.2937
RMSE (MWh/day)	219.9979
R2	0.4986
CV-RMSE	49.4%

Using OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-277.5438
Left Slope (MWh/mph-day)	79.0483
RMSE (MWh/day)	166.7960
R2	0.4478
CV-RMSE	46.9%

Table 11-119: King_NE_KINGNE – Comparison of Predicted Power vs. Measured Power

Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-09	31	9.45	12,068	12,732	-5.50%	20%	22%
Feb-09	28	11.28	15,738	14,686	6.68%	30%	28%
Mar-09	31	11.01	15,481	15,757	-1.78%	26%	27%
Apr-09	29	13.32	19,184	18,909	1.43%	35%	34%
May-09	31	10.53	13,308	14,824	-11.39%	23%	25%
Jun-09	30	10.16	12,321	13,653	-10.81%	22%	24%
Jul-09	31	8.18	11,529	10,839	5.98%	20%	18%
Aug-09	31	8.31	13,013	11,760	9.64%	22%	20%
Sep-09	30	8.06	8,637	10,133	-17.32%	15%	18%
Oct-09	31	10.08	15,078	13,962	7.40%	26%	24%
Nov-09	30	7.49	9,276	8,673	6.50%	16%	15%
Dec-09	30	8.34	10,131	10,248	-1.16%	18%	18%
Total	363	9.67	155,762	156,175	-0.27%	23%	23%
Total in OSP (07/15-09/15)	63	8.01	22,422	22,417	0.02%	19%	19%

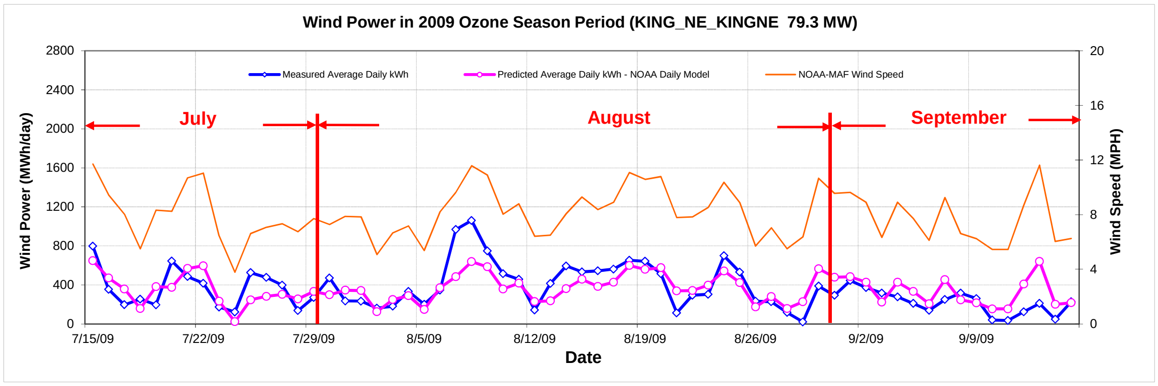


Figure 11-123: King_NE_KINGNE – Predicted Wind Power in OSP Using NOAA Wind Speed (2009)

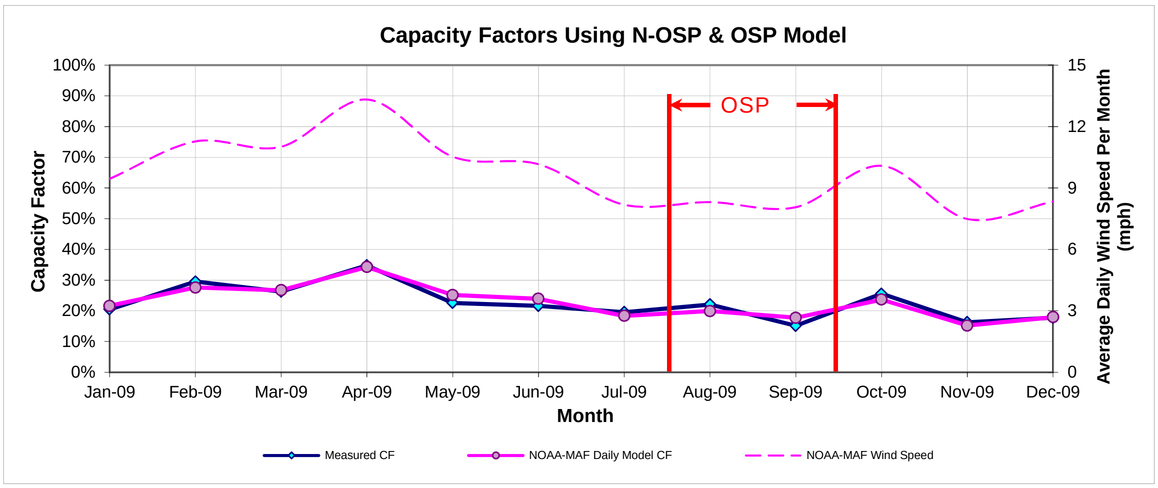


Figure 11-124: King_NE_KINGNE – Predicted Capacity Factors Using Daily Models (2009)

Table 11-120: King_NE_KINGNE – Predicted Power Production in 1999

Annual

1999 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
186,745	156,621

OSD

1999 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
471	356

11.26.2 King Mountain Wind Ranch – KING_NW_KINGNW

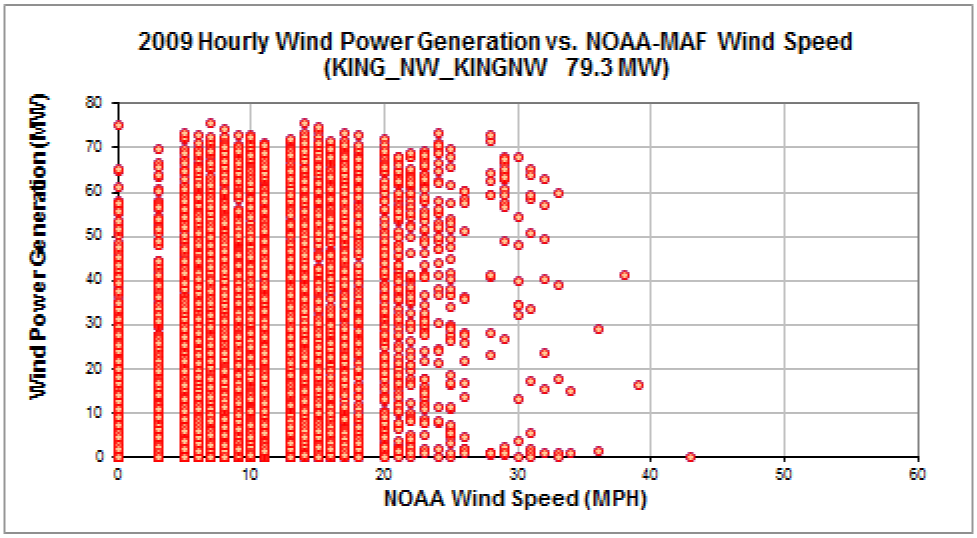
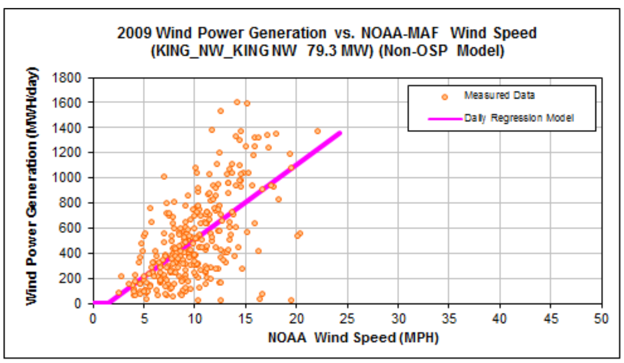


Figure 11-125: KING_NW_KINGNW – Hourly Wind Power vs. NOAA Wind Speed (2009)



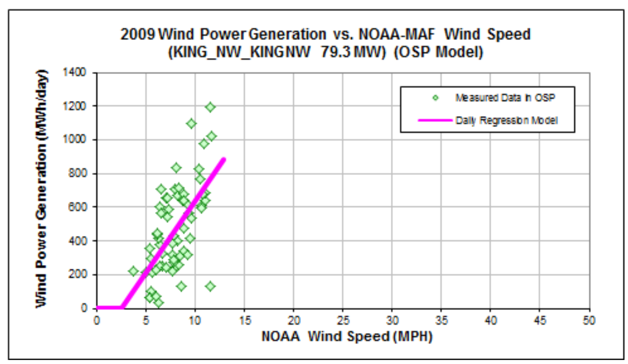


Figure 11-126: KING_NW_KINGNW – Daily Wind Power vs. NOAA Wind Speed (Using OSP and Non-OSP Model)

Table 11-121: KING_NW_KINGNW – Model Coefficients

Using Non-OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-86.5531
Left Slope (MWh/mph-day)	59.8653
RMSE (MWh/day)	272.2961
R2	0.3748
CV-RMSE	53.1%

Using OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-214.6395
Left Slope (MWh/mph-day)	85.3295
RMSE (MWh/day)	210.7894
R2	0.3718
CV-RMSE	44.9%

Table 11-122: KING_NW_KINGNW – Comparison of Predicted Power vs. Measured Power

Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-09	31	9.45	11,007	14,851	-34.93%	19%	25%
Feb-09	28	11.28	17,795	16,476	7.41%	33%	31%
Mar-09	31	11.01	17,077	17,758	-3.99%	29%	30%
Apr-09	29	13.32	20,597	20,619	-0.11%	37%	37%
May-09	31	10.53	17,879	16,862	5.69%	30%	29%
Jun-09	30	10.16	15,560	15,652	-0.60%	27%	27%
Jul-09	31	8.18	14,864	13,737	7.58%	25%	23%
Aug-09	31	8.31	16,614	15,328	7.74%	28%	26%
Sep-09	30	8.06	12,025	12,845	-6.82%	21%	22%
Oct-09	31	10.08	17,007	16,030	5.74%	29%	27%
Nov-09	30	7.49	11,040	10,851	1.71%	19%	19%
Dec-09	30	8.34	11,963	12,381	-3.49%	21%	22%
Total	363	9.67	183,427	183,391	0.02%	27%	27%
Total in OSP (07/15-09/15)	63	8.01	29,556	29,551	0.02%	25%	25%

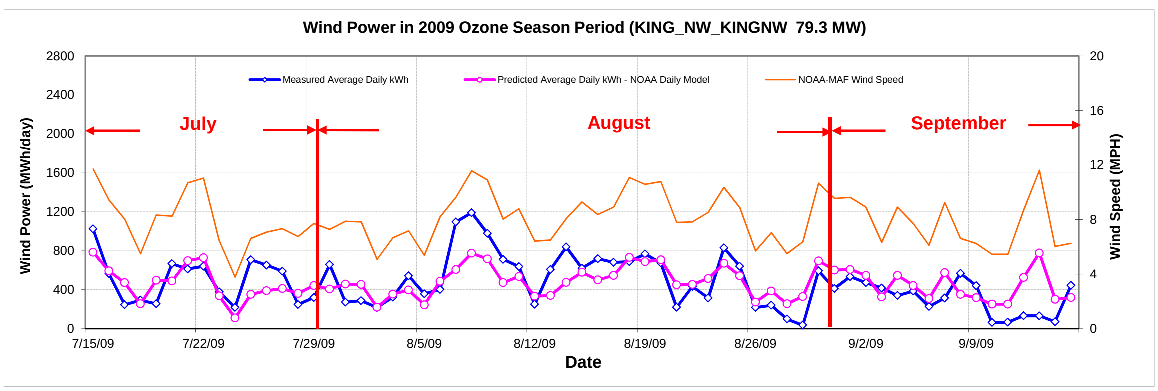


Figure 11-127: KING_NW_KINGNW – Predicted Wind Power in OSP Using NOAA Wind Speed (2009)

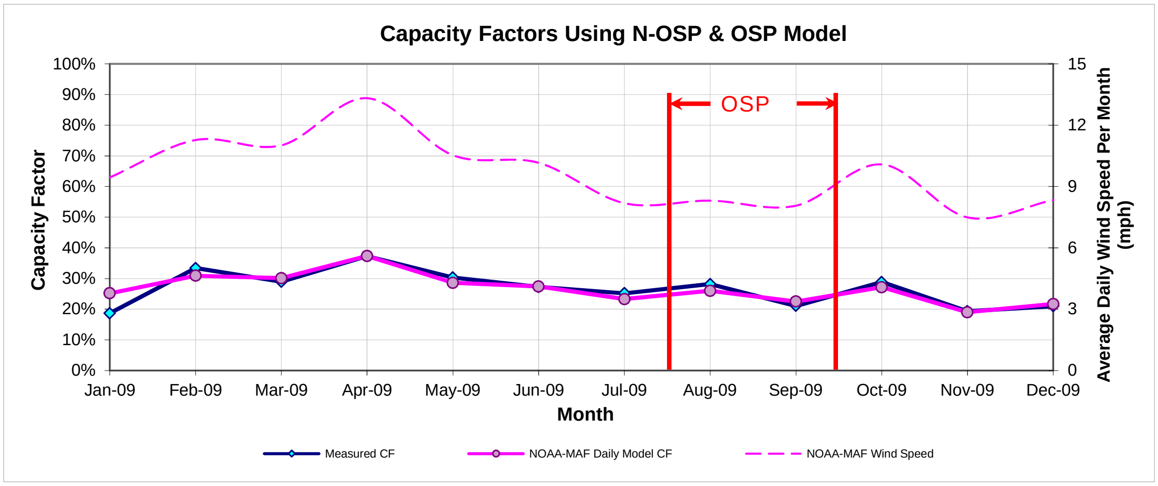


Figure 11-128: KING_NW_KINGNW – Predicted Capacity Factors Using Daily Models (2009)

Table 11-123: KING_NW_KINGNW – Predicted Power Production in 1999

Annual

1999 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
213,779	184,438

OSD

1999 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
594	469

11.26.3 King Mountain Wind Ranch – KING_SE_KINGSE

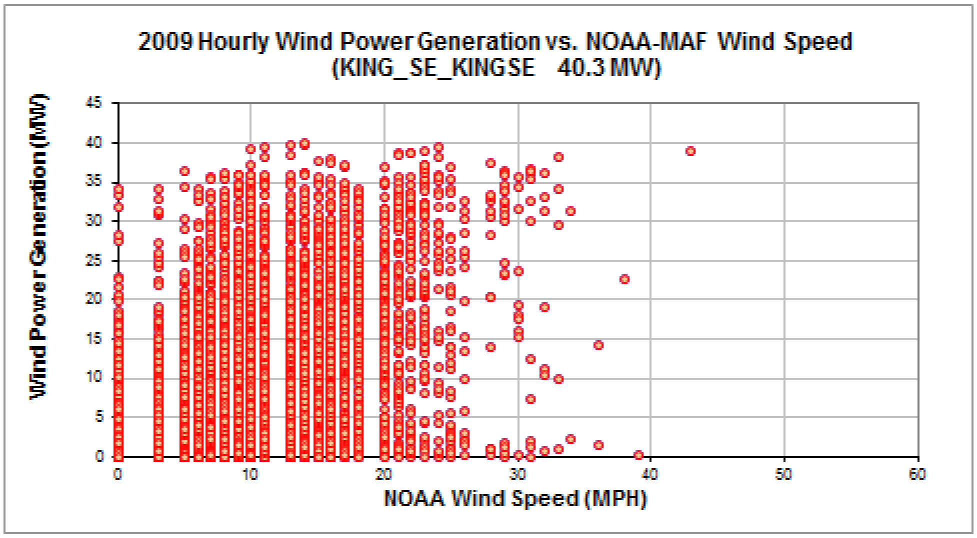


Figure 11-129: KING_SE_KINGSE – Hourly Wind Power vs. NOAA Wind Speed (2009)

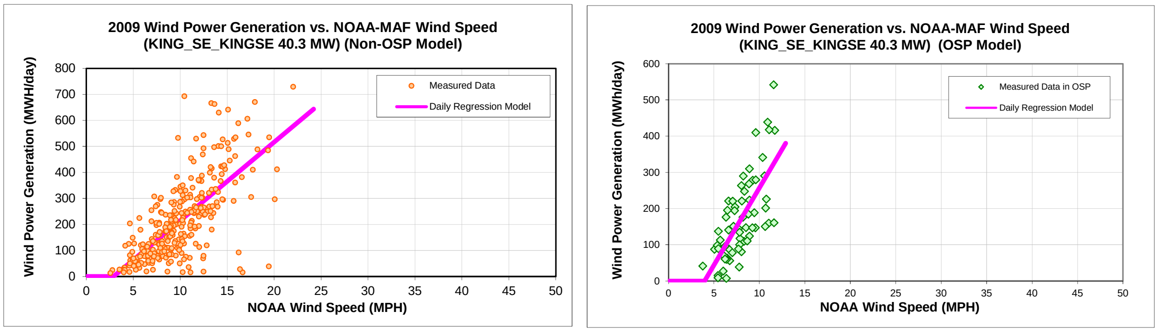


Figure 11-130: KING_SE_KINGSE – Daily Wind Power vs. NOAA Wind Speed (Using OSP and Non-OSP Model)

Table 11-124: KING_SE_KINGSE – Model Coefficients

Using Non-OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-88.3566
Left Slope (MWh/mph-day)	30.2537
RMSE (MWh/day)	110.0369
R2	0.4839
CV-RMSE	51.3%

Using OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-168.9386
Left Slope (MWh/mph-day)	42.5857
RMSE (MWh/day)	81.2785
R2	0.4978
CV-RMSE	47.2%

Table 11-125: KING_SE_KINGSE – Comparison of Predicted Power vs. Measured Power

Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-09	31	9.45	7,366	6,122	16.89%	25%	20%
Feb-09	28	11.28	7,561	7,077	6.39%	28%	26%
Mar-09	31	11.01	6,789	7,591	-11.82%	23%	25%
Apr-09	29	13.32	8,797	9,126	-3.75%	31%	33%
May-09	31	10.53	6,043	7,138	-18.12%	20%	24%
Jun-09	30	10.16	5,871	6,572	-11.93%	20%	23%
Jul-09	31	8.18	5,552	5,225	5.88%	19%	17%
Aug-09	31	8.31	6,292	5,733	8.88%	21%	19%
Sep-09	30	8.06	4,132	4,854	-17.48%	14%	17%
Oct-09	31	10.08	7,222	6,722	6.92%	24%	22%
Nov-09	30	7.49	4,612	4,155	9.91%	16%	14%
Dec-09	30	8.34	4,662	4,918	-5.51%	16%	17%
Total	363	9.67	74,899	75,235	-0.45%	21%	21%
Total in OSP (07/15-09/15)	63	8.01	10,856	10,861	-0.04%	18%	18%

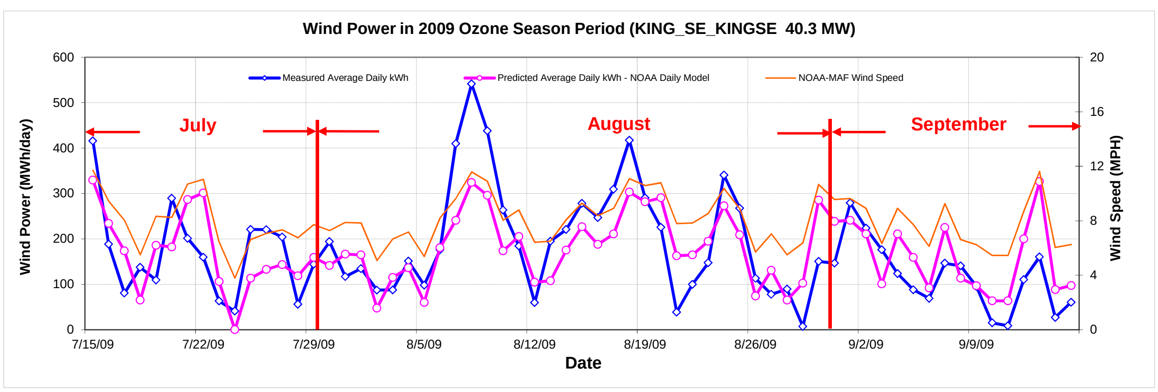


Figure 11-131: KING_SE_KINGSE – Predicted Wind Power in OSP Using NOAA Wind Speed (2009)

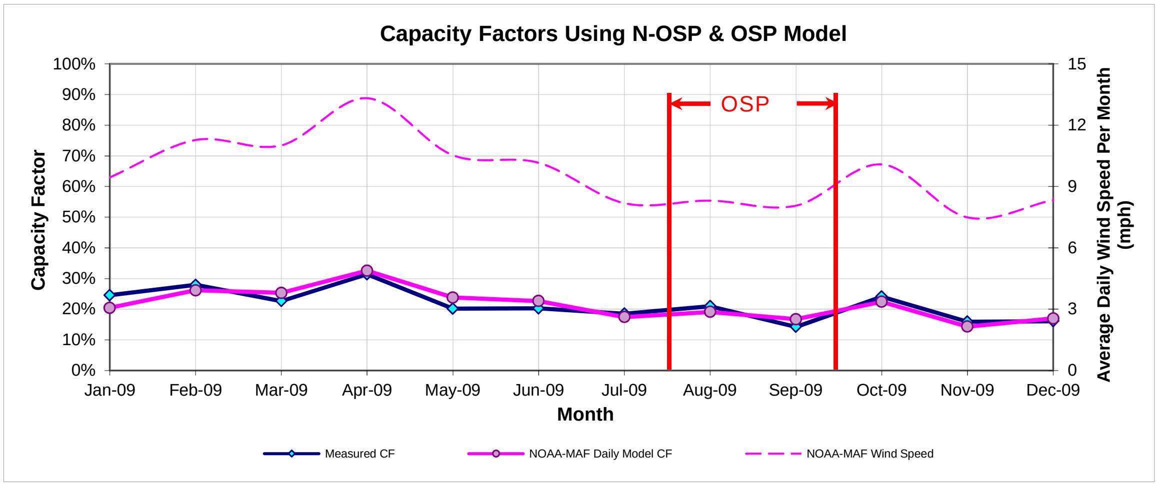


Figure 11-132: KING_SE_KINGSE – Predicted Capacity Factors Using Daily Models (2009)

Table 11-126: KING_SE_KINGSE – Predicted Power Production in 1999

Annual

1999 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
90,456	75,311

OSD

1999 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
234	172

11.26.4 King Mountain Wind Ranch – KING_SW_KINGSW

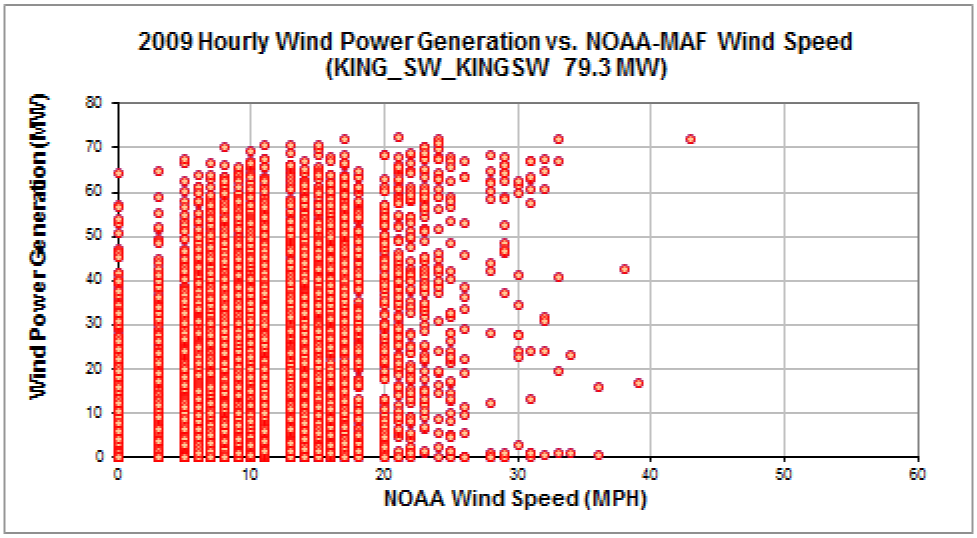


Figure 11-133: KING_SW_KINGSW - Hourly Wind Power vs. NOAA Wind Speed (2009)

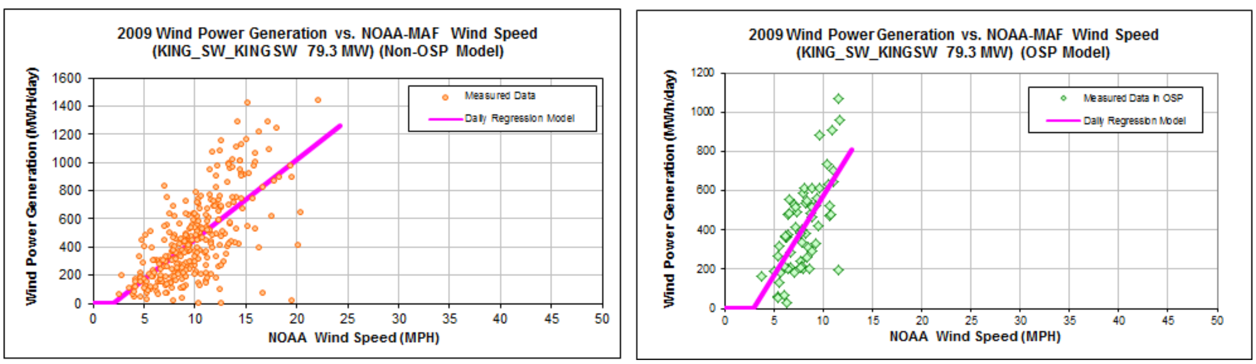


Figure 11-134: KING_SW_KINGSW – Daily Wind Power vs. NOAA Wind Speed (Using OSP and Non-OSP Model)

Table 11-127: KING_SW_KINGSW – Model Coefficients

Using Non-OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-110.1778
Left Slope (MWh/mph-day)	56.5656
RMSE (MWh/day)	219.9205
R2	0.4488
CV-RMSE	48.3%

Using OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-239.7599
Left Slope (MWh/mph-day)	81.3035
RMSE (MWh/day)	164.8181
R2	0.4677
CV-RMSE	40.0%

Table 11-128: KING_SW_KINGSW – Comparison of Predicted Power vs. Measured Power

Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-09	31	9.45	10,692	13,152	-23.01%	18%	22%
Feb-09	28	11.28	15,929	14,773	7.25%	30%	28%
Mar-09	30	10.84	13,974	15,083	-7.94%	24%	26%
Apr-09	29	13.32	17,665	18,659	-5.63%	32%	34%
May-09	31	10.53	15,736	15,052	4.34%	27%	26%
Jun-09	30	10.16	13,144	13,938	-6.04%	23%	24%
Jul-09	31	8.18	13,238	12,045	9.01%	22%	20%
Aug-09	31	8.31	14,118	13,512	4.29%	24%	23%
Sep-09	30	8.06	10,588	11,233	-6.10%	19%	20%
Oct-09	31	10.08	15,538	14,267	8.18%	26%	24%
Nov-09	30	7.49	9,874	9,401	4.80%	17%	16%
Dec-09	30	8.34	11,330	10,846	4.27%	20%	19%
Total	362	9.65	161,824	161,962	-0.09%	23%	24%
Total in OSP (07/15-09/15)	63	8.01	25,941	25,936	0.02%	22%	22%

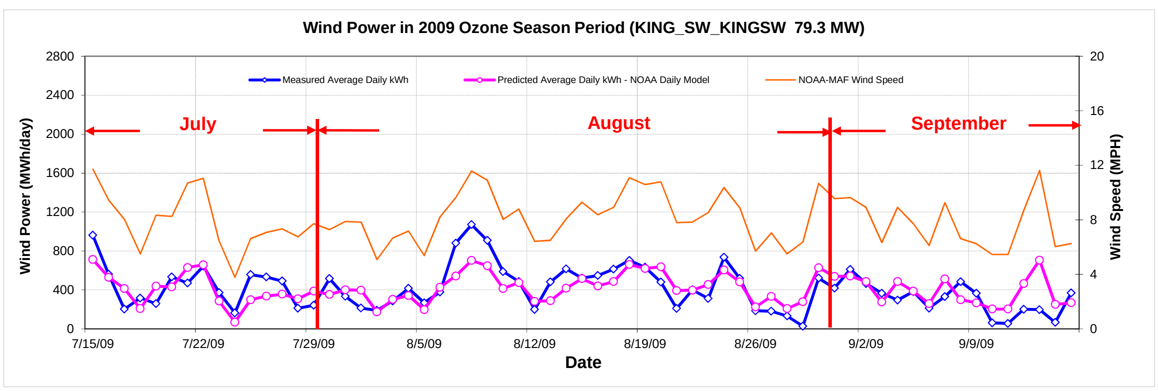


Figure 11-135: KING_SW_KINGSW – Predicted Wind Power in OSP Using NOAA Wind Speed (2009)

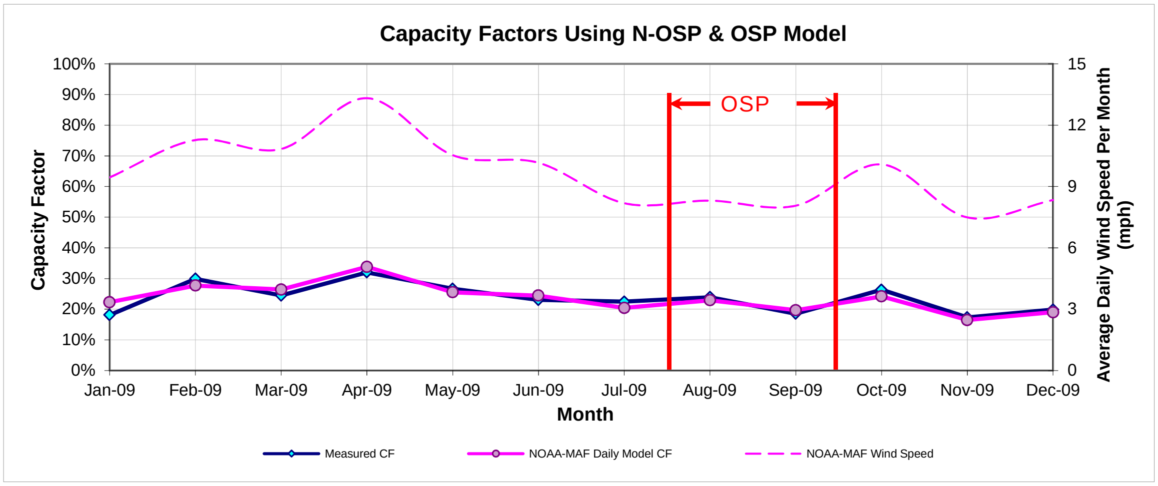


Figure 11-136: KING_SW_KINGSW – Predicted Capacity Factors Using Daily Models (2009)

Table 11-129: KING_SW_KINGSW – Predicted Power Production in 1999

Annual

1999 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
191,497	163,165

OSD

1999 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
530	412

11.27 Texas Wind Power Project

Table 11-130: Site Information for Texas Wind Power Project

GENSITECODE_ERCOT	Renewable Energy	City	County	Date in Service	Capacity (MW)	Company	Facility	Wind Turbine Information	Region	PCA	Interconnection	Weather Station
KUNITZ	WIND		CULBERSON	Jan-95	35	LG&E	Texas Wind Power Project	Kenetech (112)	ERCOT	Lower Colorado River Authority		GDP

SUBGENCODE_ERCOT	GENSITECODE_ERCOT	Capacity (MW)
KUNITZ_WIND_LGE	KUNITZ	35

11.27.1 Texas Wind Power Project – KUNITZ_WIND_LGE

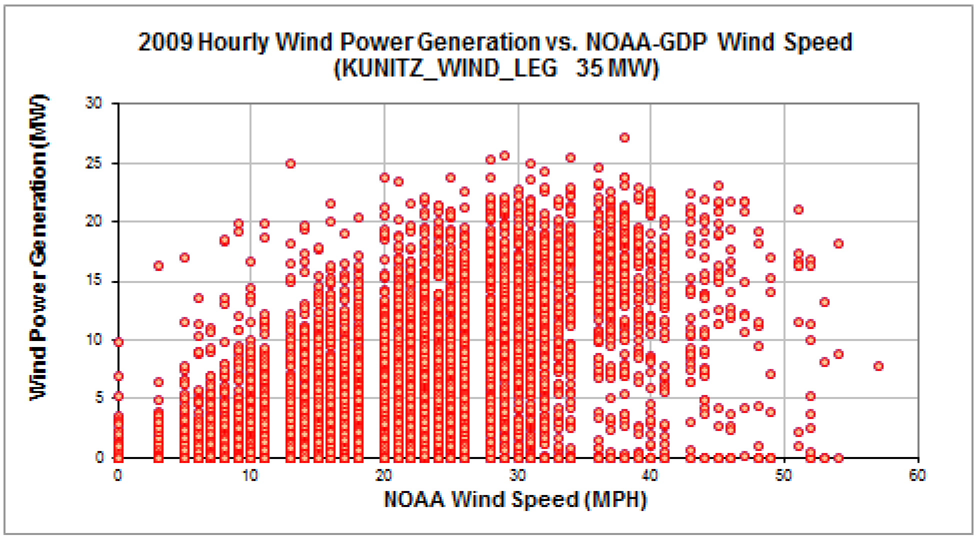
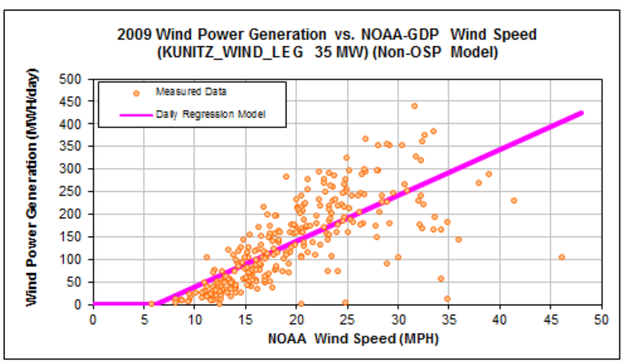


Figure 11-137: KUNITZ_WIND_LGE – Hourly Wind Power vs. NOAA Wind Speed (2009)



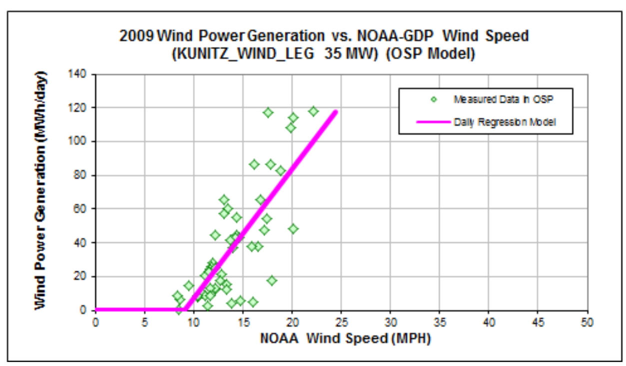


Figure 11-138: KUNITZ_WIND_LGE – Daily Wind Power vs. NOAA Wind Speed (Using OSP and Non-OSP Model)

Table 11-131: KUNITZ_WIND_LGE – Model Coefficients

Using Non-OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-61.9703
Left Slope (MWh/mph-day)	10.1185
RMSE (MWh/day)	63.5407
R2	0.5466
CV-RMSE	46.8%

Using OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-70.0342
Left Slope (MWh/mph-day)	7.6878
RMSE (MWh/day)	20.6104
R2	0.5945
CV-RMSE	56.8%

Table 11-132: KUNITZ_WIND_LGE – Comparison of Predicted Power vs. Measured Power

Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-09	31	20.57	4,849	4,532	6.55%	19%	17%
Feb-09	28	21.26	4,270	4,288	-0.41%	18%	18%
Mar-09	31	22.19	4,928	5,038	-2.23%	19%	19%
Apr-09	28	23.39	4,981	4,892	1.80%	21%	21%
May-09	29	17.56	2,892	3,355	-16.04%	12%	14%
Jun-09	30	15.63	2,507	2,889	-15.23%	10%	11%
Jul-09	21	14.62	983	1,352	-37.45%	6%	8%
Aug-09	28	13.34	780	921	-18.07%	3%	4%
Sep-09	29	16.23	2,593	2,391	7.81%	11%	10%
Oct-09	31	19.92	5,426	4,329	20.23%	21%	17%
Nov-09	30	17.83	3,988	3,554	10.88%	16%	14%
Dec-09	24	20.38	2,787	3,461	-24.19%	14%	17%
Total	340	18.67	40,985	41,000	-0.04%	14%	14%
Total in OSP (07/15-09/15)	52	13.83	1,887	1,900	-0.70%	4%	4%

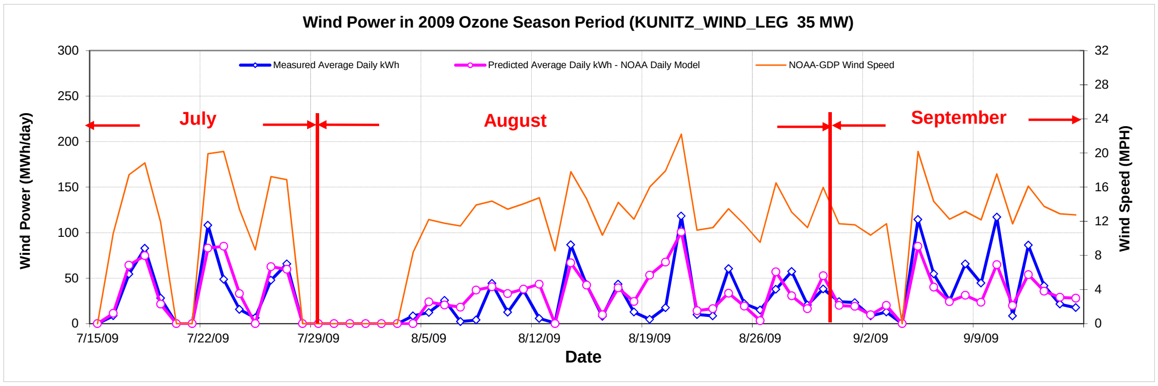


Figure 11-139: KUNITZ_WIND_LGE – Predicted Wind Power in OSP Using NOAA Wind Speed (2009)

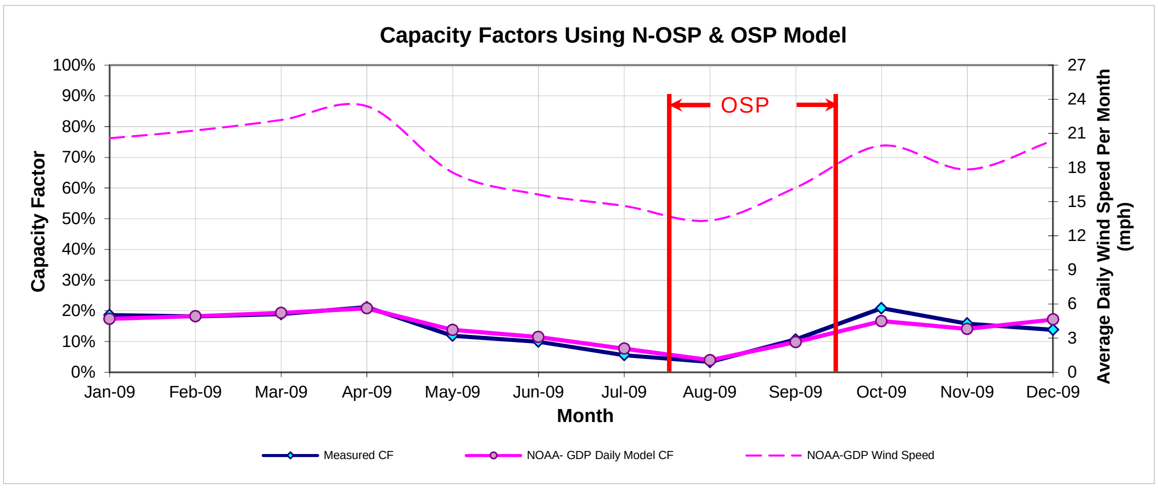


Figure 11-140: KUNITZ_WIND_LGE – Predicted Capacity Factors Using Daily Models (2009)

Table 11-133: KUNITZ_WIND_LGE – Predicted Power Production in 1999

Annual

1999 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
42,515	43,999

OSD

1999 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
37	36

11.28 Lone Star – Post Oak Wind

Table 11-134: Site Information for Lone Star – Post Oak Wind

GENSITECODE_ERCOT	Renewable Energy	City	County	Date in Service	Capacity (MW)	Company	Facility	Wind Turbine Information	Region	PCA	Interconnection	Weather Station
LNCRK2	WIND		Shackleford	Jan-08	200	Horizon Wind Energy	Lone Star-Post Oak Wind		ERCOT		ONCOR	ABI

SUBGENCODE_ERCOT	GENSITECODE_ERCOT	Capacity (MW)
LNCRK2_G871	LNCRK2_G871	100
LNCRK2_G872	LNCRK2_G872	100

11.28.1 Lone Star – Post Oak Wind (LNCRK_G871)

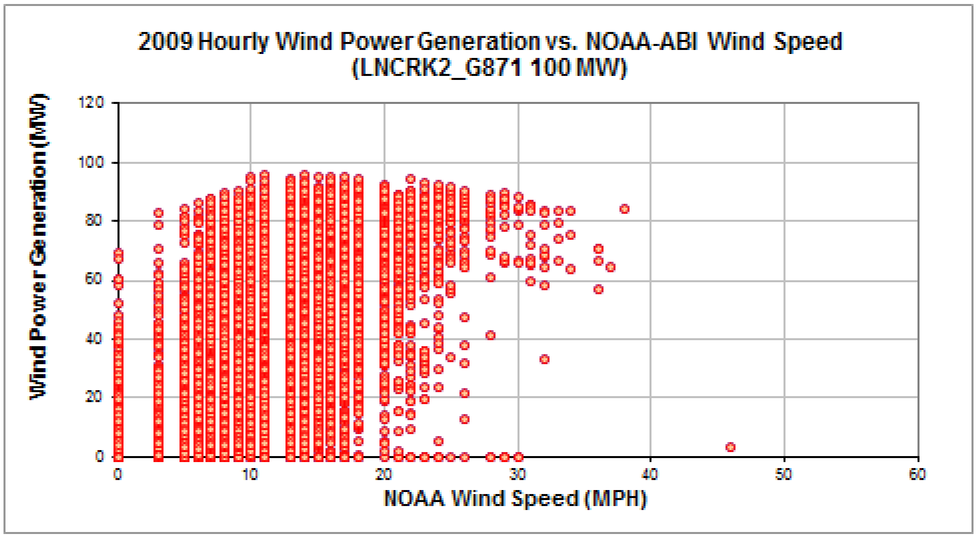


Figure 11-141: LNCRK_G871– Hourly Wind Power vs. NOAA Wind Speed (2009)

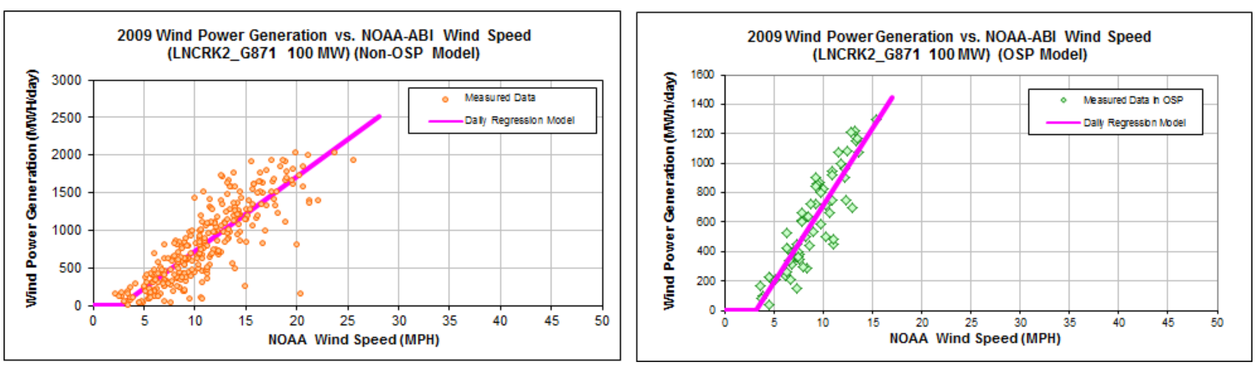


Figure 11-142: LNCRK_G871– Daily Wind Power vs. NOAA Wind Speed (Using OSP and Non-OSP Model)

Table 11-135: LNCRK_G871– Model Coefficients

Using Non-OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-263.4036
Left Slope (MWh/mph-day)	98.6784
RMSE (MWh/day)	280.9892
R2	0.7106
CV-RMSE	34.1%

Using OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-338.5272
Left Slope (MWh/mph-day)	105.0274
RMSE (MWh/day)	149.1995
R2	0.7942
CV-RMSE	25.0%

Table 11-136: LNCRK_G871– Comparison of Predicted Power vs. Measured Power

Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-09	30	10.58	26,138	23,407	10.45%	36%	33%
Feb-09	28	12.91	28,815	28,352	1.61%	43%	42%
Mar-09	31	13.29	31,795	32,494	-2.20%	43%	44%
Apr-09	30	14.82	33,781	35,962	-6.46%	47%	50%
May-09	31	10.10	20,050	22,737	-13.40%	27%	31%
Jun-09	30	11.31	24,471	25,591	-4.58%	34%	36%
Jul-09	31	8.90	19,174	18,693	2.51%	26%	25%
Aug-09	31	9.59	22,135	20,714	6.42%	30%	28%
Sep-09	30	8.61	16,421	17,212	-4.81%	23%	24%
Oct-09	31	10.66	25,591	24,430	4.54%	34%	33%
Nov-09	30	8.39	19,183	16,942	11.68%	27%	24%
Dec-09	30	8.81	17,827	18,183	-2.00%	25%	25%
Total	363	10.65	285,382	284,716	0.23%	33%	33%
Total in OSP (07/15-09/15)	63	8.91	37,650	37,648	0.00%	25%	25%

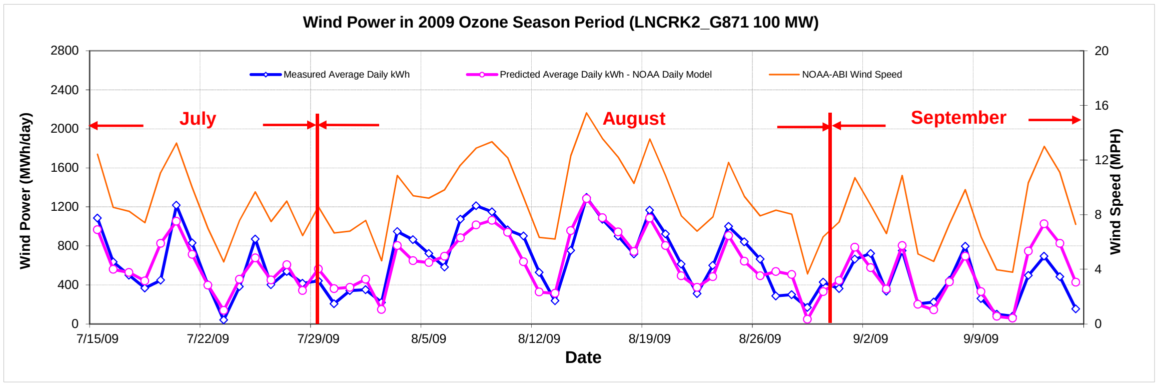


Figure 11-143: LNCRK_G871– Predicted Wind Power in OSP Using NOAA Wind Speed (2009)

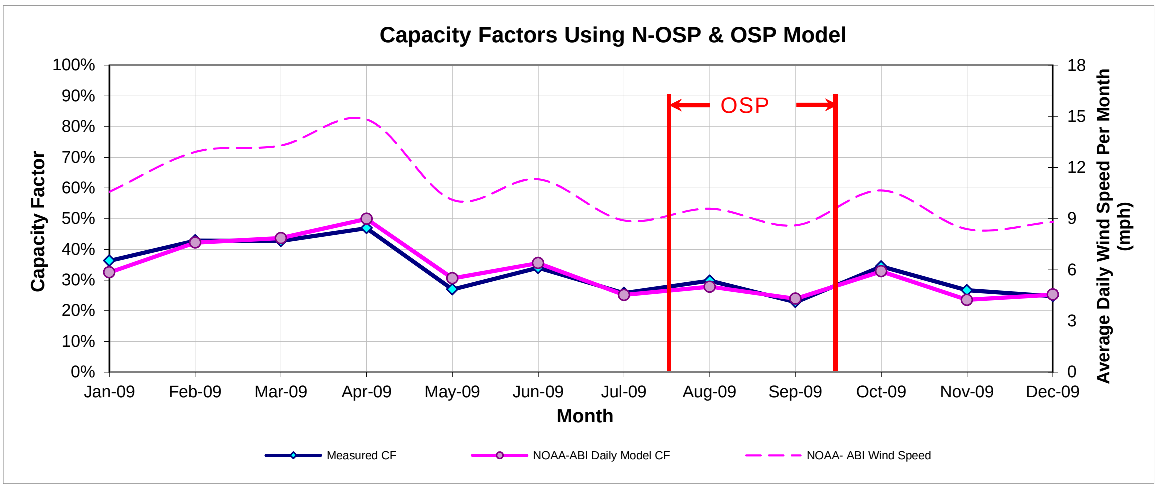


Figure 11-144: LNCRK_G871– Predicted Capacity Factors Using Daily Models (2009)

Table 11-137: LNCRK_G871– Predicted Power Production in 1999

Annual

1999 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
309,735	286,955

OSD

1999 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
681	598

11.28.2 Lone Star – Post Oak Wind (LNCRK_G872)

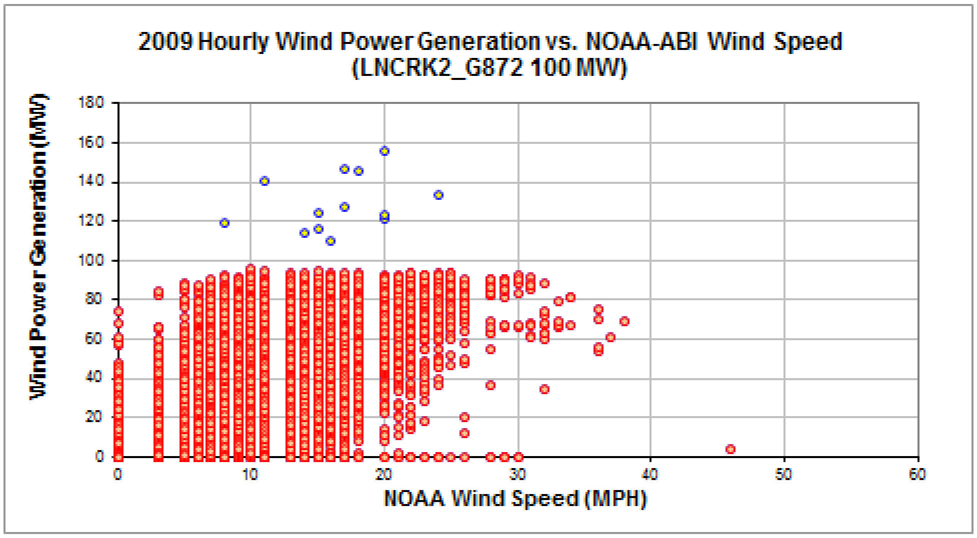
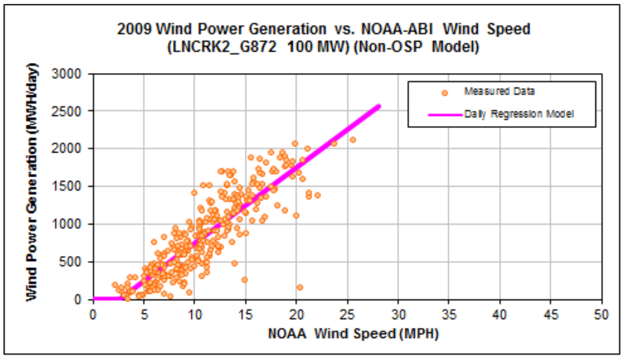


Figure 11-145: LNCRK_G872– Hourly Wind Power vs. NOAA Wind Speed (2009)



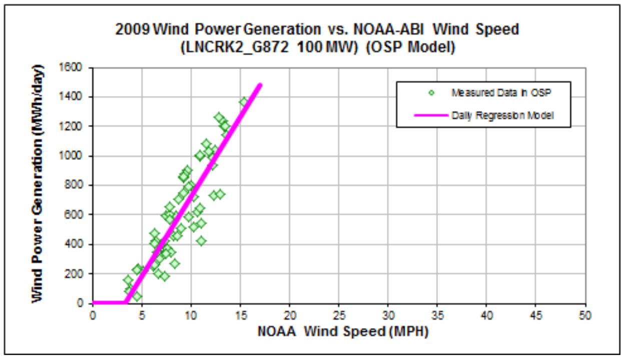


Figure 11-146: LNCRK_G872– Daily Wind Power vs. NOAA Wind Speed (Using OSP and Non-OSP Model)

Table 11-138: LNCRK_G872– Model Coefficients

Using Non-OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-256.2033
Left Slope (MWh/mph-day)	100.6668
RMSE (MWh/day)	273.5773
R2	0.7300
CV-RMSE	32.1%

Using OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-362.0635
Left Slope (MWh/mph-day)	108.5180
RMSE (MWh/day)	151.4886
R2	0.7998
CV-RMSE	25.0%

Table 11-139: LNCRK_G872– Comparison of Predicted Power vs. Measured Power

Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-09	30	10.58	27,076	24,254	10.42%	38%	34%
Feb-09	28	12.91	29,992	29,261	2.44%	45%	44%
Mar-09	31	13.29	33,007	33,537	-1.60%	44%	45%
Apr-09	30	14.82	35,029	37,062	-5.80%	49%	51%
May-09	31	10.10	20,457	23,583	-15.28%	27%	32%
Jun-09	30	11.31	25,231	26,482	-4.96%	35%	37%
Jul-09	31	8.90	19,059	19,160	-0.53%	26%	26%
Aug-09	31	9.59	22,577	21,021	6.89%	30%	28%
Sep-09	30	8.61	16,654	17,660	-6.04%	23%	25%
Oct-09	31	10.66	26,513	25,310	4.54%	36%	34%
Nov-09	30	8.39	19,569	17,646	9.83%	27%	25%
Dec-09	29	8.75	17,889	18,115	-1.26%	26%	26%
Total	362	10.65	293,053	293,090	-0.01%	34%	34%
Total in OSP (07/15-09/15)	63	8.91	38,127	38,126	0.00%	25%	25%

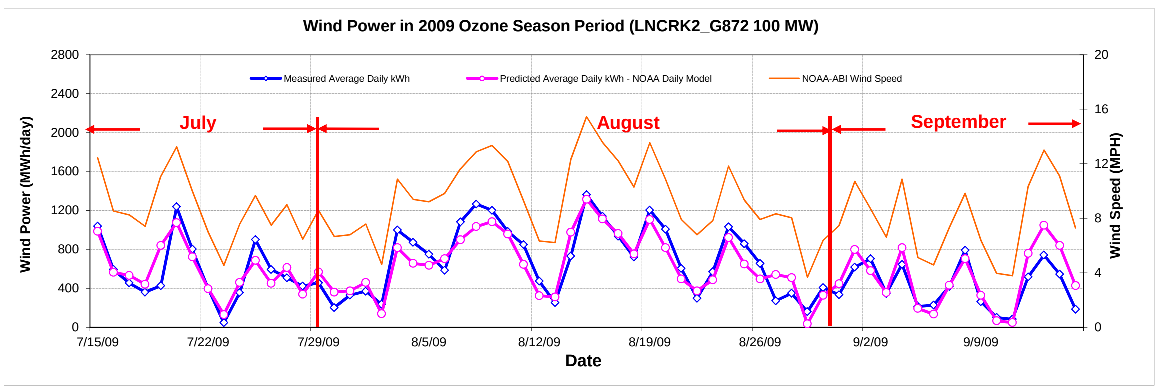


Figure 11-147: LNCRK_G872– Predicted Wind Power in OSP Using NOAA Wind Speed (2009)

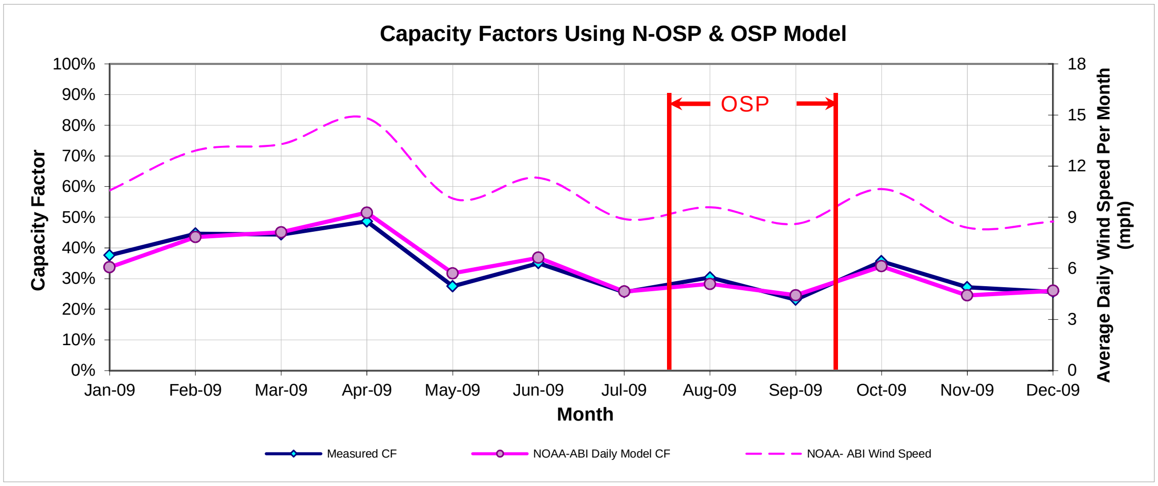


Figure 11-148: LNCRK_G872– Predicted Capacity Factors Using Daily Models (2009)

Table 11-140: LNCRK_G872 – Predicted Power Production in 1999

Annual

1999 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
319,529	295,482

OSD

1999 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
692	605

11.29 Lone Star – Mesquite Wind

Table 11-141: Site Information for Lone Star – Mesquite Wind

GENSITECODE_ERCOT	Renewable Energy	City	County	Date in Service	Capacity (MW)	Company	Facility	Wind Turbine Information	Region	PCA	Interconnection	Weather Station
LNCRK_G83	WIND	Abilene	Shackleford	Dec-07	200	Horizon Wind Energy	LNCRK_G83	Vestas 1.8 MW (67)	ERCOT		Oncor	ABI

SUBGENCODE_ERCOT	GENSITECODE_ERCOT	Capacity (MW)
LNCRK_G83	LNCRK_G83	200

11.29.1 Lone Star – Mesquite Wind (LNCRK_G83)

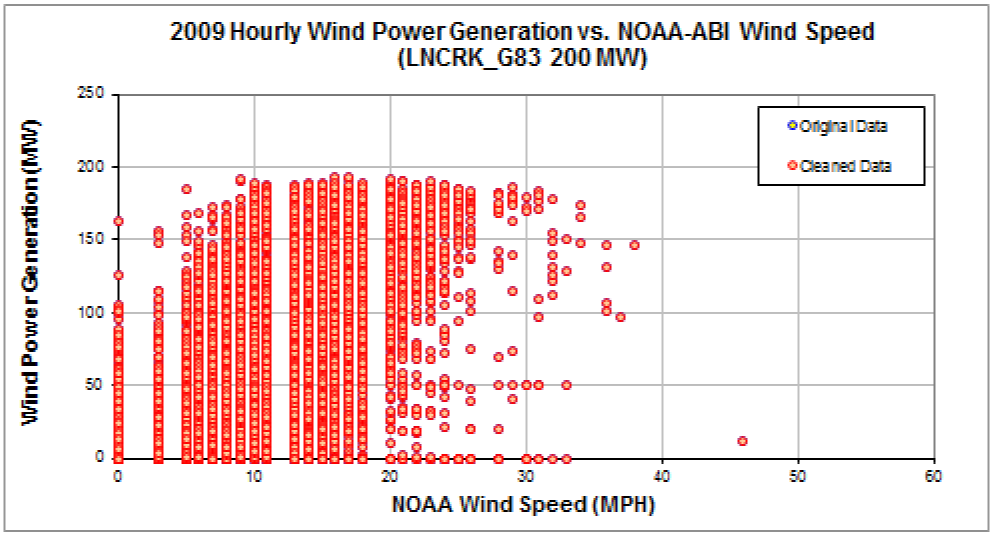
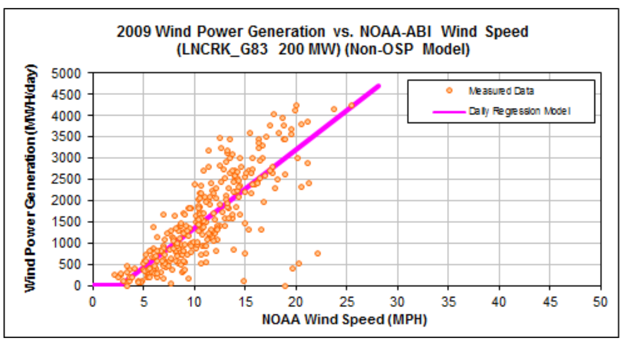


Figure 11-149: LNCRK_G83– Hourly Wind Power vs. NOAA Wind Speed (2009)



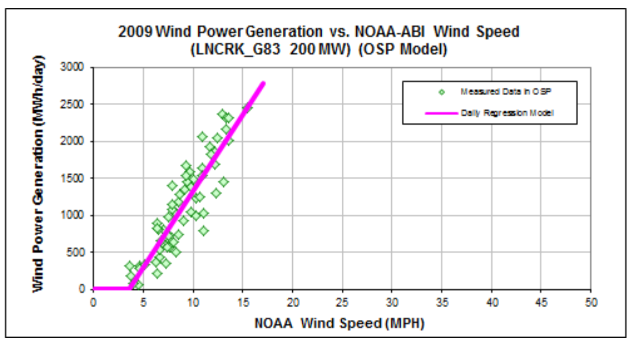


Figure 11-150: LNCRK_G83– Daily Wind Power vs. NOAA Wind Speed (Using OSP and Non-OSP Model)

Table 11-142: LNCRK_G83– Model Coefficients

Using Non-OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-491.5806
Left Slope (MWh/mph-day)	184.9723
RMSE (MWh/day)	630.1873
R2	0.6317
CV-RMSE	40.8%

Using OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-722.8022
Left Slope (MWh/mph-day)	205.8853
RMSE (MWh/day)	282.8690
R2	0.8049
CV-RMSE	25.4%

Table 11-143: LNCRK_G83– Comparison of Predicted Power vs. Measured Power

Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-09	30	10.58	51,553	43,941	14.76%	36%	31%
Feb-09	28	12.91	57,707	53,204	7.80%	43%	40%
Mar-09	31	13.29	54,121	60,977	-12.67%	36%	41%
Apr-09	30	14.82	67,073	67,476	-0.60%	47%	47%
May-09	31	10.10	37,634	42,688	-13.43%	25%	29%
Jun-09	30	11.31	39,559	48,036	-21.43%	27%	33%
Jul-09	31	8.90	35,705	34,875	2.32%	24%	23%
Aug-09	31	9.59	41,505	38,770	6.59%	28%	26%
Sep-09	30	8.61	29,541	32,050	-8.50%	21%	22%
Oct-09	31	10.66	49,816	45,861	7.94%	33%	31%
Nov-09	30	8.39	35,319	31,820	9.91%	25%	22%
Dec-09	30	8.81	34,547	34,148	1.16%	24%	24%
Total	363	10.65	534,079	533,847	0.04%	31%	31%
Total in OSP (07/15-09/15)	63	8.91	70,076	70,073	0.00%	23%	23%

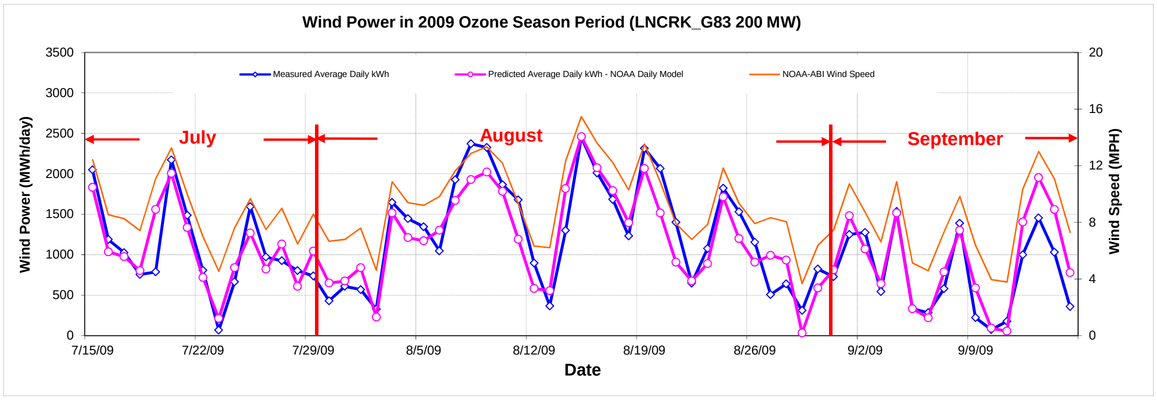


Figure 11-151: LNCRK_G83– Predicted Wind Power in OSP Using NOAA Wind Speed (2009)

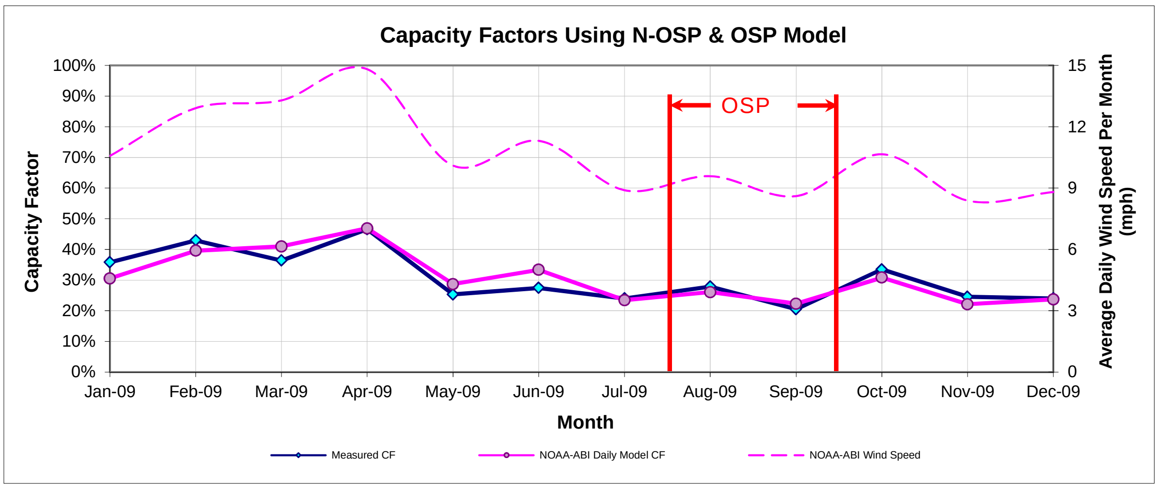


Figure 11-152: LNCRK_G83– Predicted Capacity Factors Using Daily Models (2009)

Table 11-144: LNCRK_G83– Predicted Power Production in 1999

Annual

1999 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
581,204	537,022

OSD

1999 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
1,276	1,112

11.30 Forest Creek Wind Farm

Table 11-145: Site Information for Forest Creek Wind Farm

GENSITECODE_ERCOT	Renewable Energy	City	County	Date in Service	Capacity (MW)	Company	Facility	Wind Turbine Information	Region	PCA	Interconnection	Weather Station
MDCDLD_FCW1	WIND	ABILENE	STERLING	Dec-06	124.2	Airtricity	Forest Creek Wind Farm	Siemens	ERCOT		TXU-ED	ABI

SUBGENCODE_ERCOT	GENSITECODE_ERCOT	Capacity (MW)
MCDLD_FCW1	MCDLD_FCW1	124.2

11.30.1 Forest Creek Wind Farm – MDCDLD_FCW1

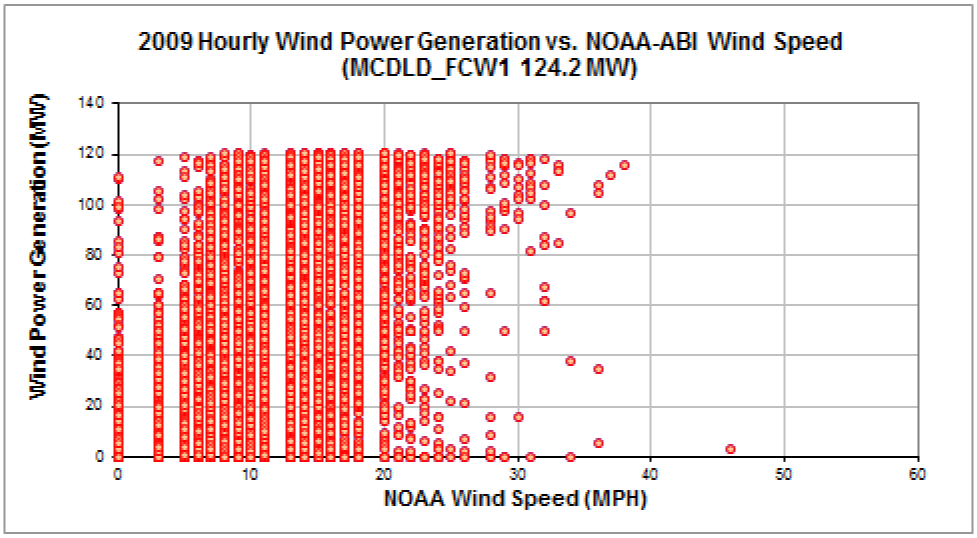


Figure 11-153: MDCDLD_FCW1– Hourly Wind Power vs. NOAA Wind Speed (2009)

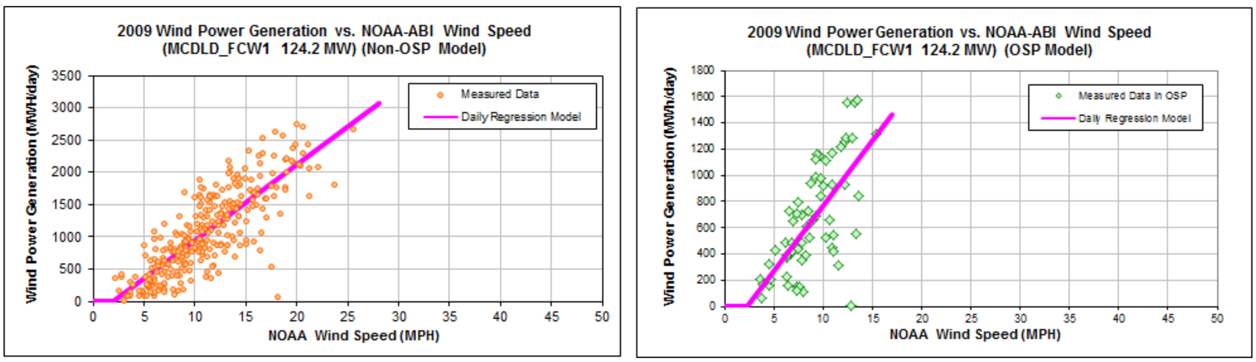


Figure 11-154: MDCDLD_FCW1– Daily Wind Power vs. NOAA Wind Speed (Using OSP and Non-OSP Model)

Table 11-146: MDCDLD_FCW1– Model Coefficients

Using Non-OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-231.0243
Left Slope (MWh/mph-day)	117.5899
RMSE (MWh/day)	368.9943
R2	0.6695
CV-RMSE	34.6%

Using OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-230.9907
Left Slope (MWh/mph-day)	99.9033
RMSE (MWh/day)	303.9670
R2	0.4568
CV-RMSE	46.1%

Table 11-147: MDCDLD_FCW1– Comparison of Predicted Power vs. Measured Power

Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-09	30	10.58	32,979	30,379	7.89%	37%	34%
Feb-09	28	12.91	38,228	36,046	5.71%	46%	43%
Mar-09	30	13.45	42,485	40,531	4.60%	48%	45%
Apr-09	30	14.82	43,982	45,340	-3.09%	49%	51%
May-09	31	10.10	27,291	29,663	-8.69%	30%	32%
Jun-09	30	11.31	29,599	32,982	-11.43%	33%	37%
Jul-09	31	8.90	22,180	22,711	-2.39%	24%	25%
Aug-09	31	9.59	22,618	22,525	0.41%	24%	24%
Sep-09	30	8.61	19,425	21,319	-9.75%	22%	24%
Oct-09	31	10.66	28,391	31,680	-11.58%	31%	34%
Nov-09	30	8.39	28,224	22,660	19.72%	32%	25%
Dec-09	30	8.81	24,754	24,153	2.43%	28%	27%
Total	362	10.66	360,156	359,989	0.05%	33%	33%
Total in OSP (07/15-09/15)	63	8.91	41,547	41,546	0.00%	22%	22%

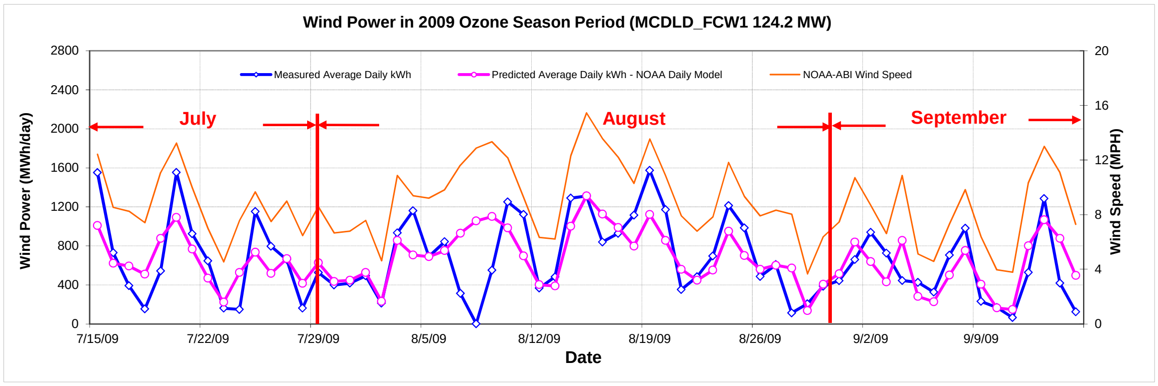


Figure 11-155: MDCDLD_FCW1– Predicted Wind Power in OSP Using NOAA Wind Speed (2009)

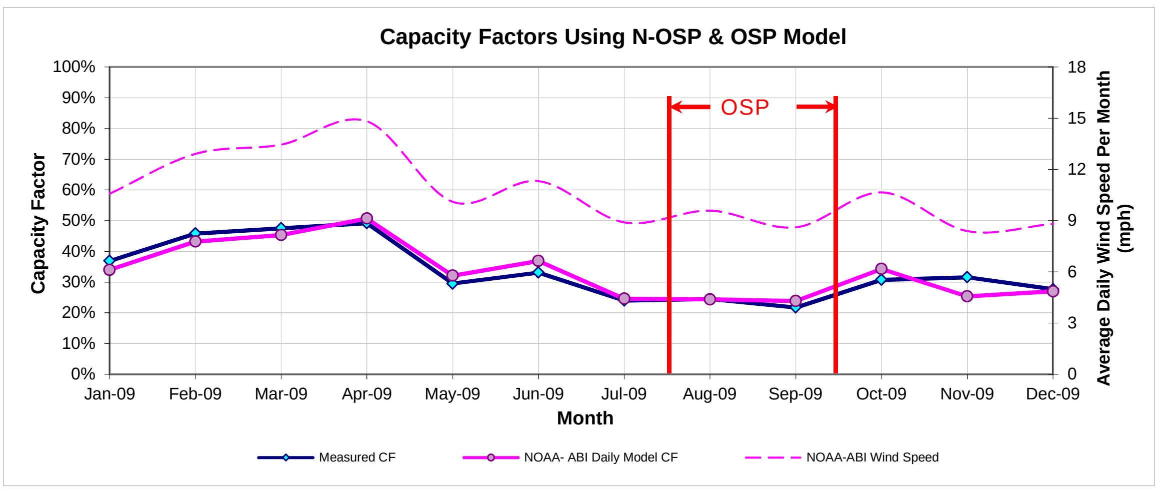


Figure 11-156: MDCDLD_FCW1– Predicted Capacity Factors Using Daily Models (2009)

Table 11-148: MDCDLD_FCW1– Predicted Power Production in 1999

Annual

1999 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
389,518	363,141

OSD

1999 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
739	659

11.31 Sand Bluff Wind Farm

Table 11-149: Site Information for Sand Bluff Wind Farm

GENSITECODE_ERCOT	Renewable Energy	City	County	Date in Service	Capacity (MW)	Company	Facility	Wind Turbine Information	Region	PCA	Interconnection	Weather Station
MDCDLD_SBW1	WIND	ABILENE	STERLING	Dec-06	90	Airtricity	Sand Bluff Wind Farm	Siemens	ERCOT		TXU-ED	ABI

SUBGENCODE_ERCOT	GENSITECODE_ERCOT	Capacity (MW)
MCDLD_SBW1	MCDLD_SBW2	90

11.31.1 Sand Bluff Wind Farm – MCDLDSBW1

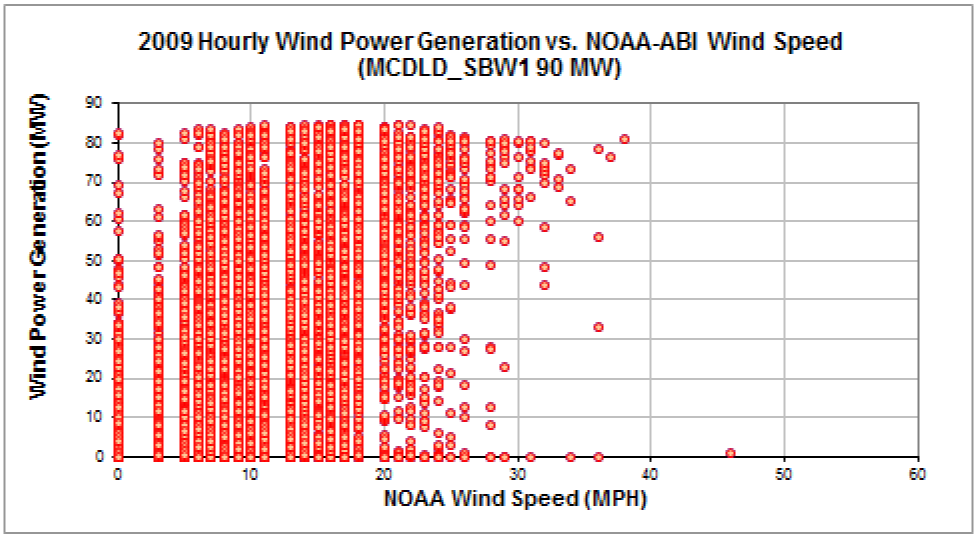


Figure 11-157: MCDLDSBW1– Hourly Wind Power vs. NOAA Wind Speed (2009)

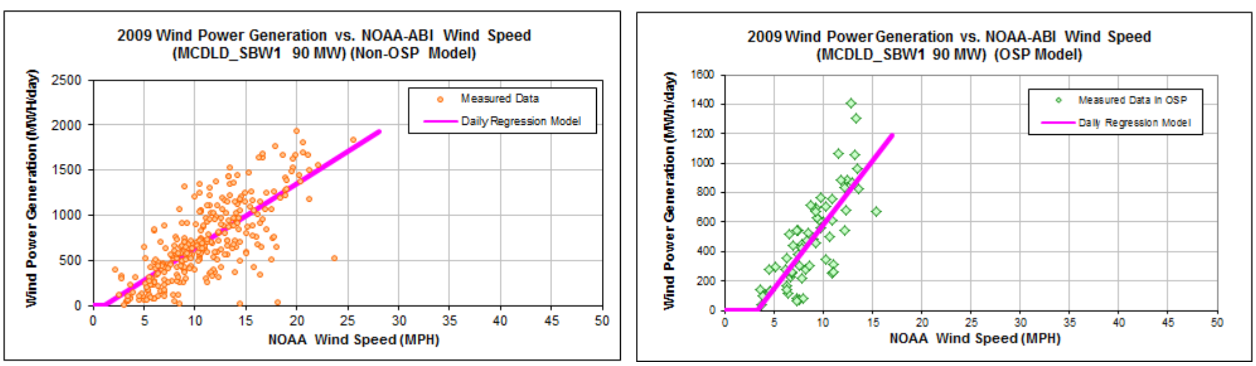


Figure 11-158: MCDLDSBW1– Daily Wind Power vs. NOAA Wind Speed (Using OSP and Non-OSP Model)

Table 11-150: MCDLDSBW1– Model Coefficients

Using Non-OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-80.8623
Left Slope (MWh/mph-day)	71.6914
RMSE (MWh/day)	282.0169
R2	0.5623
CV-RMSE	39.7%

Using OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-295.6690
Left Slope (MWh/mph-day)	87.5339
RMSE (MWh/day)	198.5718
R2	0.6021
CV-RMSE	41.0%

Table 11-151: MCDLDSBW1– Comparison of Predicted Power vs. Measured Power

Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-09	31	10.70	22,869	21,276	6.97%	34%	32%
Feb-09	28	12.91	26,908	23,656	12.09%	44%	39%
Mar-09	31	13.29	27,217	27,033	0.68%	41%	40%
Apr-09	30	14.82	28,732	29,442	-2.47%	44%	45%
May-09	31	10.10	17,422	19,945	-14.48%	26%	30%
Jun-09	30	11.31	18,513	21,908	-18.33%	29%	34%
Jul-09	31	8.90	14,123	15,908	-12.64%	21%	24%
Aug-09	31	9.59	17,936	16,844	6.09%	27%	25%
Sep-09	30	8.61	13,095	14,760	-12.71%	20%	23%
Oct-09	31	10.66	20,016	21,174	-5.79%	30%	32%
Nov-09	30	8.39	19,946	15,615	21.72%	31%	24%
Dec-09	30	8.81	17,389	16,525	4.97%	27%	26%
Total	364	10.66	244,165	244,085	0.03%	31%	31%
Total in OSP (07/15-09/15)	63	8.91	30,527	30,525	0.00%	22%	22%

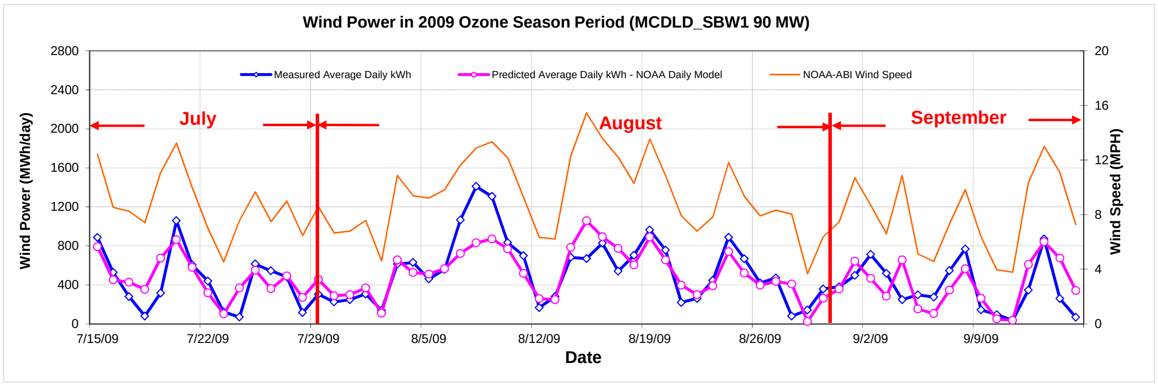


Figure 11-159: MCDLDSBW1– Predicted Wind Power in OSP Using NOAA Wind Speed (2009)

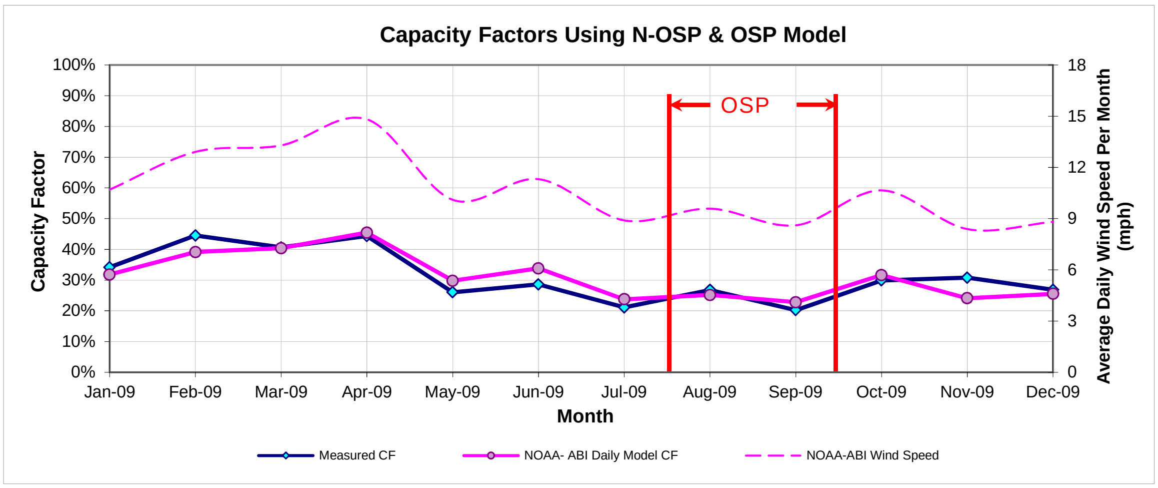


Figure 11-160: MCDLDSBW1– Predicted Capacity Factors Using Daily Models (2009)

Table 11-152: MCDLDSBW1– Predicted Power Production in 1999

Annual

1999 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
262,126	244,836

OSD

1999 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
554	485

11.32 McAdoo Wind Energy

Table 11-153: Site Information for Sand Bluff Wind Farm

GENSITECODE_ERCOT	Renewable Energy	City	County	Date in Service	Capacity (MW)	Company	Facility	Wind Turbine Information	Region	PCA	Interconnection	Weather Station
MWEC_G1	WIND		Dickens	May-08	150	McAdoo Wind Energy	McAdoo Wind Energy	GE Energy (100)	ERCOT	AEP-West	AEP	LBB

SUBGENCODE_ERCOT	GENSITECODE_ERCOT	Capacity (MW)
MWEC_G1	MWEC_G1	150

11.32.1 McAdoo Wind Energy – MWEC_G1

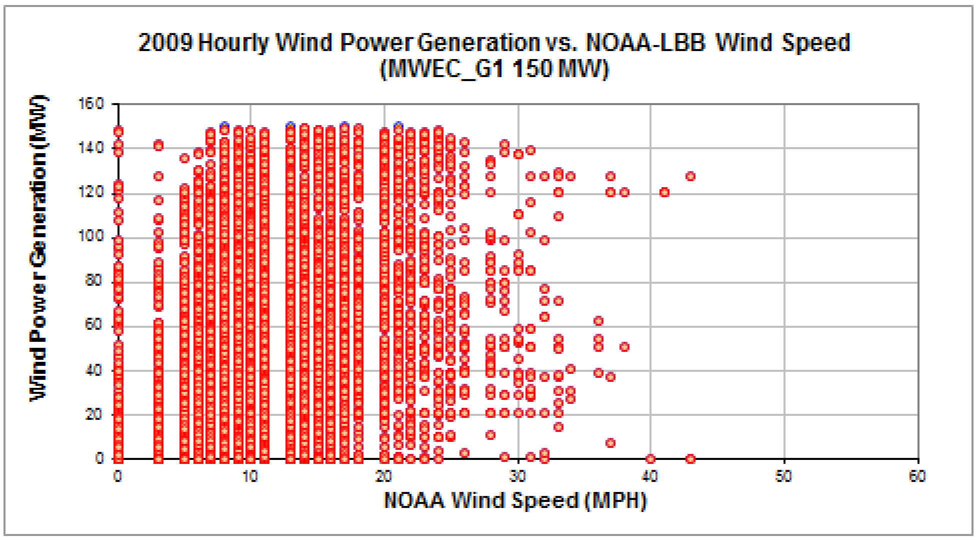


Figure 11-161: MWEC_G1 – Hourly Wind Power vs. NOAA Wind Speed (2009)

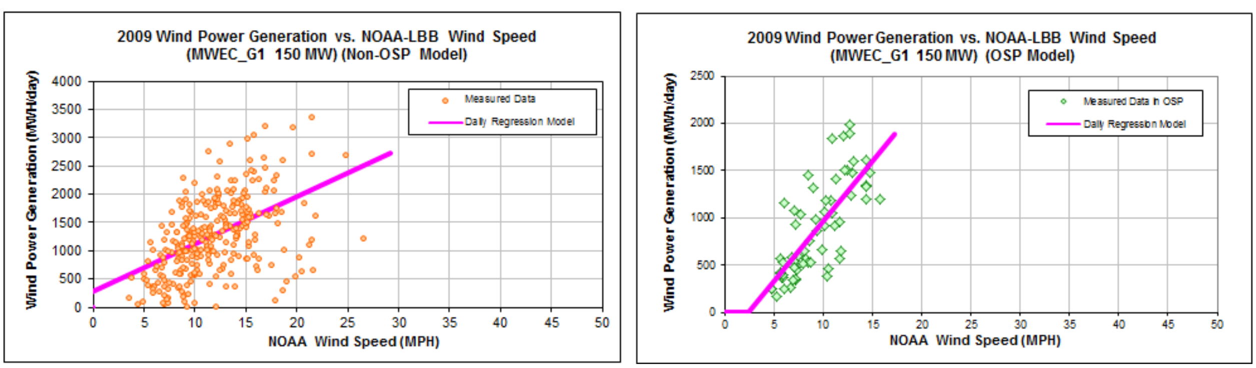


Figure 11-162: MWEC_G1 – Daily Wind Power vs. NOAA Wind Speed (Using OSP and Non-OSP Model)

Table 11-154: MWEC_G1 – Model Coefficients

Using Non-OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	284.0930
Left Slope (MWh/mph-day)	83.3376
RMSE (MWh/day)	583.0527
R2	0.2395
CV-RMSE	46.0%

Using OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-310.5992
Left Slope (MWh/mph-day)	127.0333
RMSE (MWh/day)	326.0509
R2	0.5675
CV-RMSE	37.2%

Table 11-155: MWEC_G1 – Comparison of Predicted Power vs. Measured Power

Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-09	30	11.28	39,109	36,722	6.10%	36%	34%
Feb-09	28	12.79	39,810	37,796	5.06%	39%	37%
Mar-09	31	14.10	31,489	45,229	-43.63%	28%	41%
Apr-09	30	15.46	51,408	47,174	8.24%	48%	44%
May-09	31	11.64	39,632	38,877	1.90%	36%	35%
Jun-09	29	11.36	31,338	35,698	-13.91%	30%	34%
Jul-09	30	9.78	26,016	29,206	-12.26%	24%	27%
Aug-09	31	10.36	30,394	31,176	-2.57%	27%	28%
Sep-09	30	9.16	29,779	27,850	6.48%	28%	26%
Oct-09	31	11.46	41,412	38,423	7.22%	37%	34%
Nov-09	30	9.70	38,543	32,774	14.97%	36%	30%
Dec-09	30	9.28	33,687	31,732	5.80%	31%	29%
Total	361	11.36	432,617	432,657	-0.01%	33%	33%
Total in OSP (07/15-09/15)	63	9.35	55,229	55,223	0.01%	24%	24%

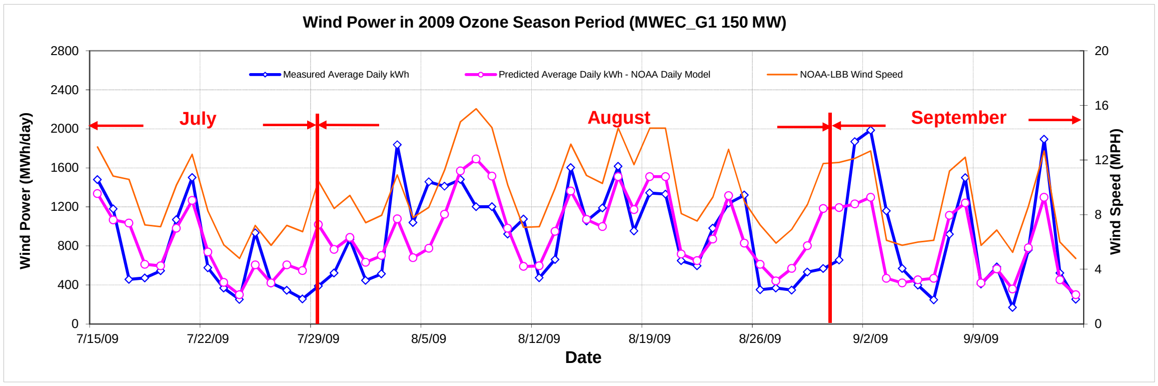


Figure 11-163: MWEC_G1 – Predicted Wind Power in OSP Using NOAA Wind Speed (2009)

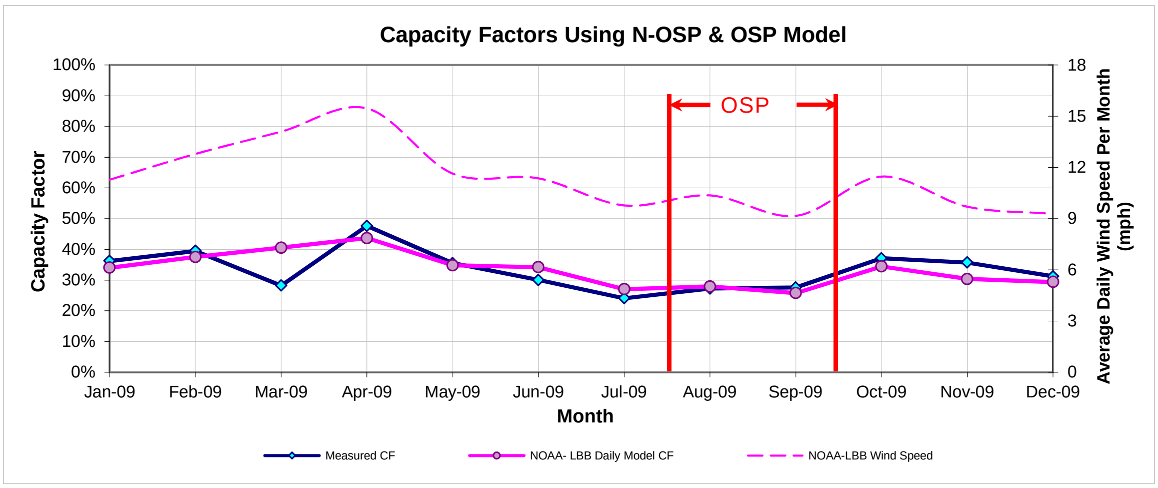


Figure 11-164: MWEC_G1 – Predicted Capacity Factors Using Daily Models (2009)

Table 11-156: MWEC_G1 – Predicted Power Production in 1999

Annual

1999 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
459,306	437,411

OSD

1999 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
940	877

11.33 Notrees Windpower

Table 11-157: Site Information for Notrees Windpower

GENSITECODE_ERCOT	Renewable Energy	City	County	Date in Service	Capacity (MW)	Company	Facility	Wind Turbine Information	Region	PCA	Interconnection	Weather Station
NWF_NWF1	WIND		Ector	Jan-09	153	Duke Energy	Notrees Windpower	Vestas (55) and GE Energy (40)	ERCOT			MAF

SUBGENCODE_ERCOT	GENSITECODE_ERCOT	Capacity (MW)
NWF_NWF1	NWF_NWF1	153

11.33.1 Notrees Windfarm – NWF_NWF1

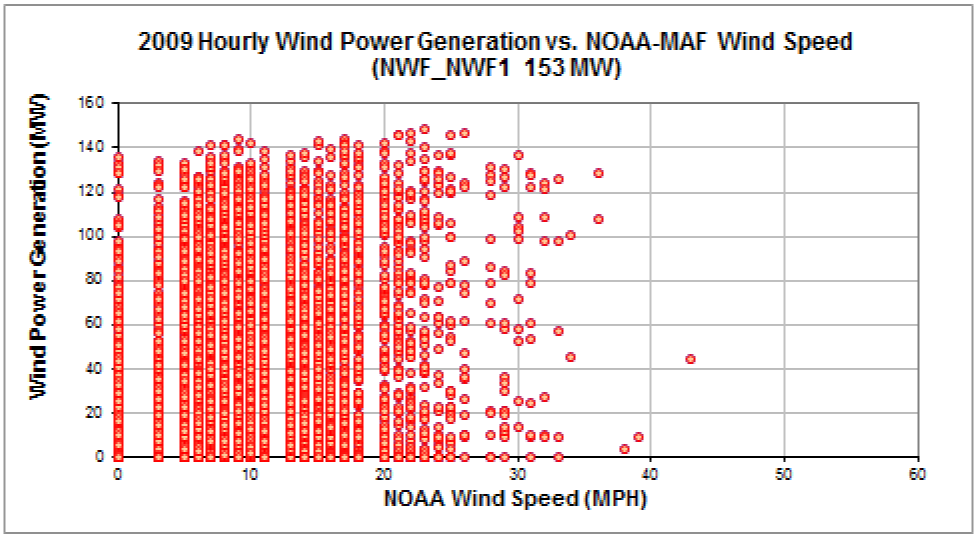


Figure 11-165: NWF_NWF1– Hourly Wind Power vs. NOAA Wind Speed (2009)

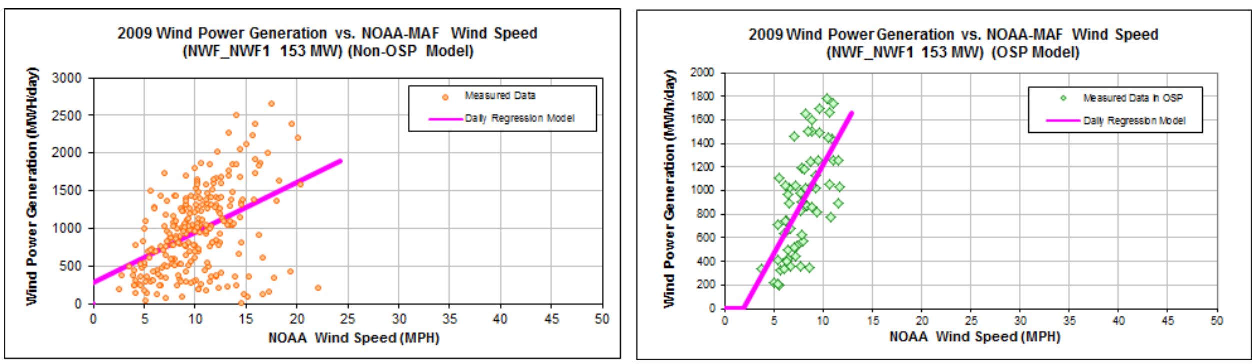


Figure 11-166: NWF_NWF1 – Daily Wind Power vs. NOAA Wind Speed (Using OSP and Non-OSP Model)

Table 11-158: NWF_NWF1 – Model Coefficients

Using Non-OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	279.1436
Left Slope (MWh/mph-day)	66.7122
RMSE (MWh/day)	492.4322
R2	0.1918
CV-RMSE	51.8%

Using OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-281.2108
Left Slope (MWh/mph-day)	150.1865
RMSE (MWh/day)	332.1552
R2	0.4247
CV-RMSE	36.0%

Table 11-159: NWF_NWF1 – Comparison of Predicted Power vs. Measured Power

Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-09							
Feb-09	22	11.49	6,800	23,000	-238.26%	8%	28%
Mar-09	29	10.83	20,725	29,057	-40.20%	19%	27%
Apr-09	29	13.32	38,379	33,870	11.75%	36%	32%
May-09	28	10.91	25,727	28,202	-9.62%	25%	27%
Jun-09	30	10.16	29,404	28,710	2.36%	27%	26%
Jul-09	31	8.18	28,254	27,232	3.62%	25%	24%
Aug-09	31	8.31	31,669	29,972	5.36%	28%	26%
Sep-09	30	8.06	28,352	25,557	9.86%	26%	23%
Oct-09	31	10.08	34,531	29,507	14.55%	30%	26%
Nov-09	30	7.49	31,393	23,360	25.59%	28%	21%
Dec-09	30	8.34	28,465	25,064	11.95%	26%	23%
Total	321	9.67	303,699	303,531	0.06%	26%	26%
Total in OSP (07/15-09/15)	63	8.01	58,105	58,096	0.02%	25%	25%

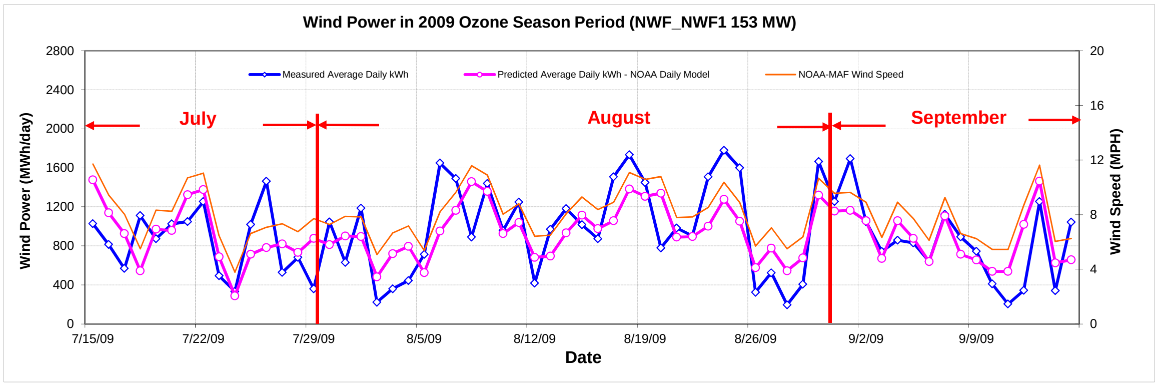


Figure 11-167: NWF_NWF1 – Predicted Wind Power in OSP Using NOAA Wind Speed (2009)

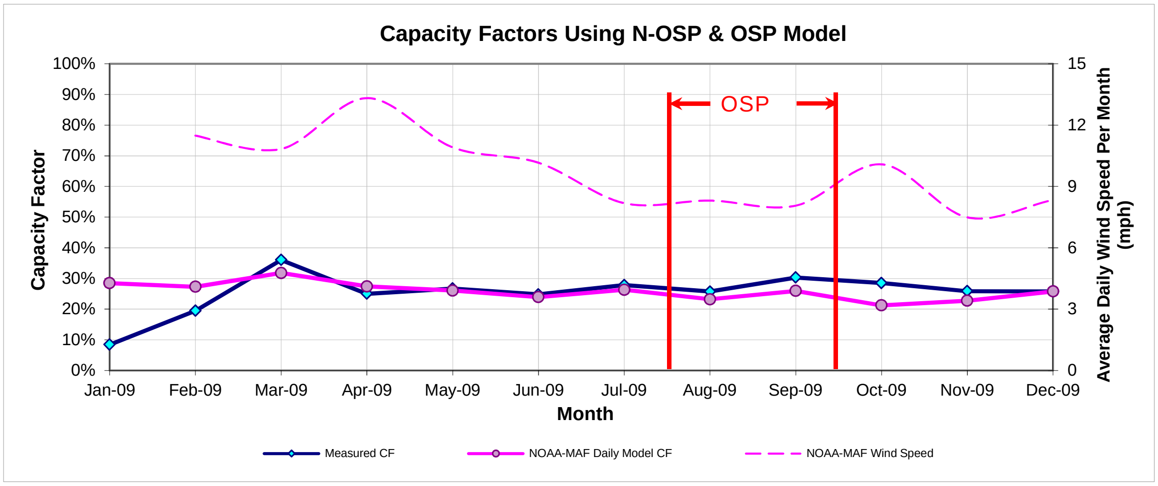


Figure 11-168: NWF_NWF1 – Predicted Capacity Factors Using Daily Models (2009)

Table 11-160: NWF_NWF1 – Predicted Power Production in 1999

Annual

1999 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
381,891	345,327

OSD

1999 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
1,141	922

Note: There is missing data in 2009 and the actual data period is Feburary-December 2009. The annual predicted power production shown above is an adjustment for one year.

11.34 Ocotillo Windpwer 1

Table 11-161: Site Information for Ocotillo Windpower 1

GENSITECODE_ERCOT	Renewable Energy	City	County	Date in Service	Capacity (MW)	Company	Facility	Wind Turbine Information	Region	PCA	Interconnection	Weather Station
OWF_OWF	WIND		Howard	Aug-08	58.8	Duke Energy	Ocotillo Windpower 1	Suzlon (28)	ERCOT	AEP-West	ONCOR	MAF

SUBGENCODE_ERCOT	GENSITECODE_ERCOT	Capacity (MW)
OWF_OWF	OWF_OWF	58.8

11.34.1 Ocotillo Windpower 1 – OWF_OWF

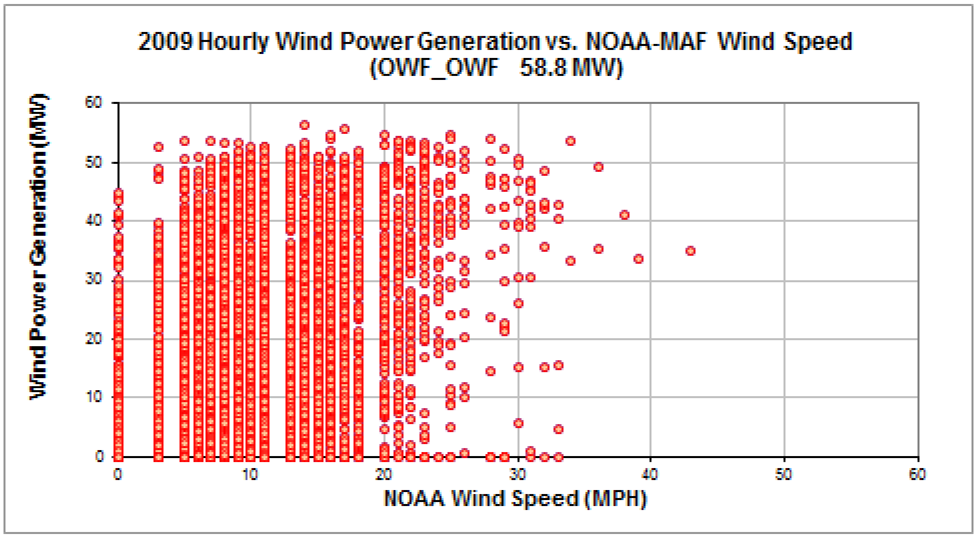
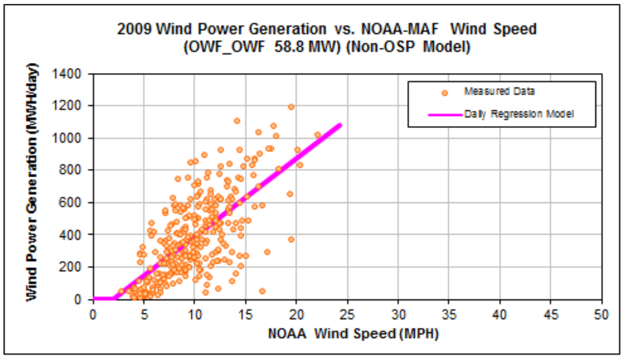


Figure 11-169: OWF_OWF – Hourly Wind Power vs. NOAA Wind Speed (2009)



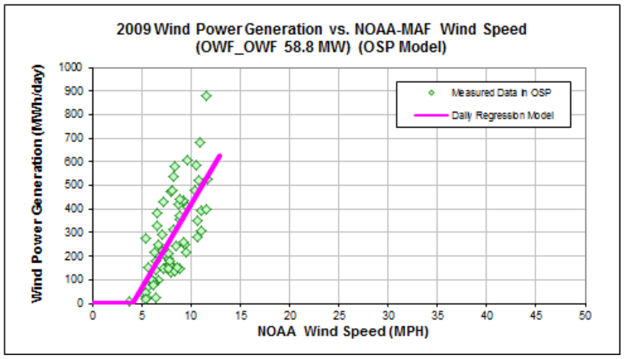


Figure 11-170: OWF_OWF – Daily Wind Power vs. NOAA Wind Speed (Using OSP and Non-OSP Model)

Table 11-162: OWF_OWF – Model Coefficients

Using Non-OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-93.3191
Left Slope (MWh/mph-day)	48.3011
RMSE (MWh/day)	185.1889
R2	0.4554
CV-RMSE	47.3%

Using OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-295.0680
Left Slope (MWh/mph-day)	71.3441
RMSE (MWh/day)	130.0148
R2	0.5209
CV-RMSE	47.0%

Table 11-163: OWF_OWF – Comparison of Predicted Power vs. Measured Power

Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-09	31	9.45	10,479	11,254	-7.40%	24%	26%
Feb-09	28	11.28	15,593	12,636	18.96%	39%	32%
Mar-09	30	11.09	16,170	13,275	17.90%	38%	31%
Apr-09	29	13.32	12,131	15,955	-31.52%	30%	39%
May-09	31	10.53	9,476	12,877	-35.89%	22%	29%
Jun-09	30	10.16	10,286	11,924	-15.92%	24%	28%
Jul-09	31	8.18	7,718	9,042	-17.15%	18%	21%
Aug-09	31	8.31	10,763	9,232	14.23%	25%	21%
Sep-09	30	8.06	8,061	8,466	-5.02%	19%	20%
Oct-09	31	10.08	12,621	12,206	3.29%	29%	28%
Nov-09	29	7.66	11,008	8,019	27.16%	27%	20%
Dec-09	30	8.34	9,938	9,284	6.58%	23%	22%
Total	361	9.69	134,245	134,169	0.06%	26%	26%
Total in OSP (07/15-09/15)	63	8.01	17,429	17,449	-0.11%	20%	20%

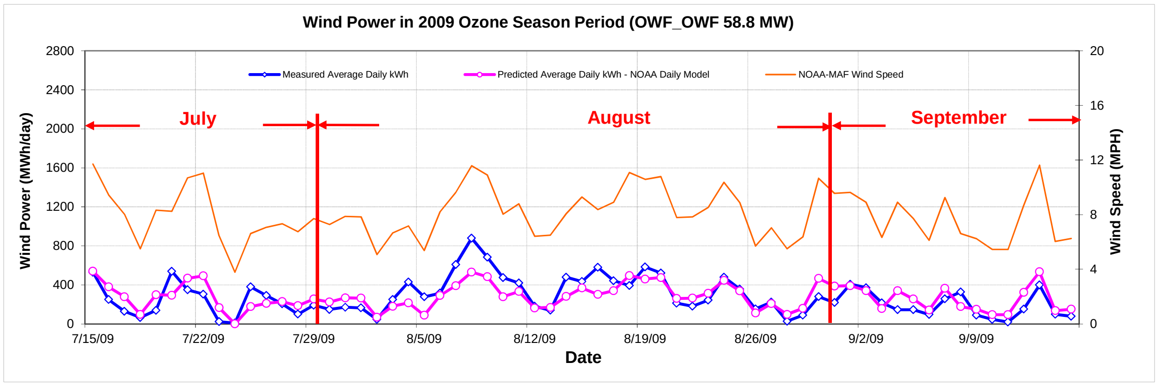


Figure 11-171: OWF_OWF – Predicted Wind Power in OSP Using NOAA Wind Speed (2009)

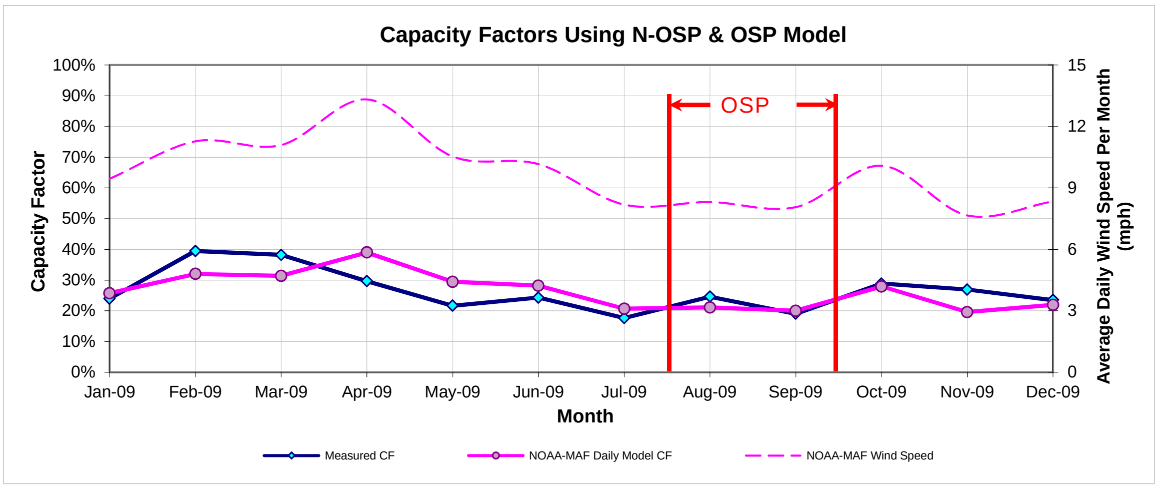


Figure 11-172: OWF_OWF – Predicted Capacity Factors Using Daily Models (2009)

Table 11-164: OWF_OWF – Predicted Power Production in 1999

Annual

1999 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
159,202	135,732

OSD

1999 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
381	277

11.35 Panther Creek

Table 11-165: Site Information for Panther Creek

GENSITECODE_ERCOT	Renewable Energy	City	County	Date in Service	Capacity (MW)	Company	Facility	Wind Turbine Information	Region	PCA	Interconnection	Weather Station
PC_NORTH_PANTHER1	WIND		Howard	Jun-08	142.5	Airtricity	Panther Creek	GE Energy (95)	ERCOT	AEP-West	ONCOR	MAF

SUBGENCODE_ERCOT	GENSITECODE_ERCOT	Capacity (MW)
PC_NORTH_PANTHER1	PC_NORTH_PANTHER1	142.5

11.35.1 Panther Creek – PC_NORTH_PANTHER1

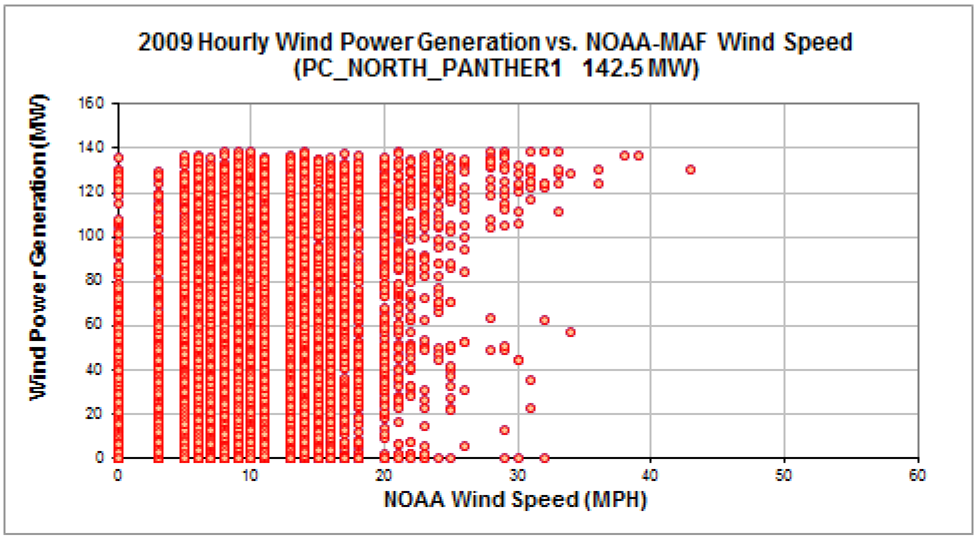


Figure 11-173: PC_NORTH_PANTHER1 – Hourly Wind Power vs. NOAA Wind Speed (2009)

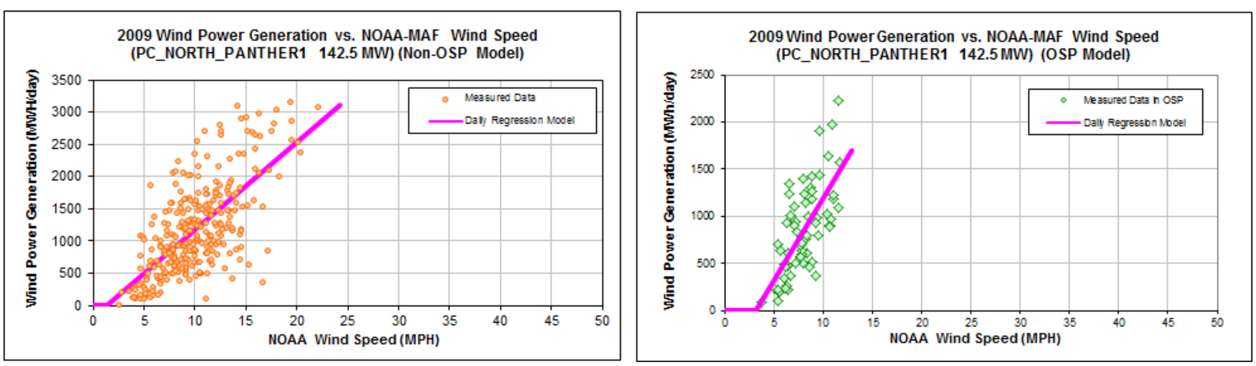


Figure 11-174: PC_NORTH_PANTHER1 – Daily Wind Power vs. NOAA Wind Speed (Using OSP and Non-OSP Model)

Table 11-166: PC_NORTH_PANTHER1 – Model Coefficients

Using Non-OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-176.4933
Left Slope (MWh/mph-day)	135.3965
RMSE (MWh/day)	513.7684
R2	0.4635
CV-RMSE	43.6%

Using OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-555.3921
Left Slope (MWh/mph-day)	174.4415
RMSE (MWh/day)	346.8890
R2	0.4773
CV-RMSE	41.2%

Table 11-167: PC_NORTH_PANTHER1 – Comparison of Predicted Power vs. Measured Power

Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-09	31	9.45	31,068	34,186	-10.04%	29%	32%
Feb-09	28	11.28	47,786	37,804	20.89%	50%	39%
Mar-09	30	11.09	42,145	39,764	5.65%	41%	39%
Apr-09	29	13.32	42,115	47,193	-12.06%	42%	48%
May-09	31	10.53	29,624	38,733	-30.75%	28%	37%
Jun-09	30	10.16	31,505	35,979	-14.20%	31%	35%
Jul-09	31	8.18	26,198	27,666	-5.60%	25%	26%
Aug-09	31	8.31	30,491	27,720	9.09%	29%	26%
Sep-09	30	8.06	21,151	26,191	-23.83%	21%	26%
Oct-09	31	10.08	38,614	36,853	4.56%	36%	35%
Nov-09	30	7.49	33,665	25,119	25.39%	33%	24%
Dec-09	30	8.34	31,667	28,579	9.75%	31%	28%
Total	362	9.67	406,029	405,786	0.06%	33%	33%
Total in OSP (07/15-09/15)	63	8.01	53,077	53,066	0.02%	25%	25%

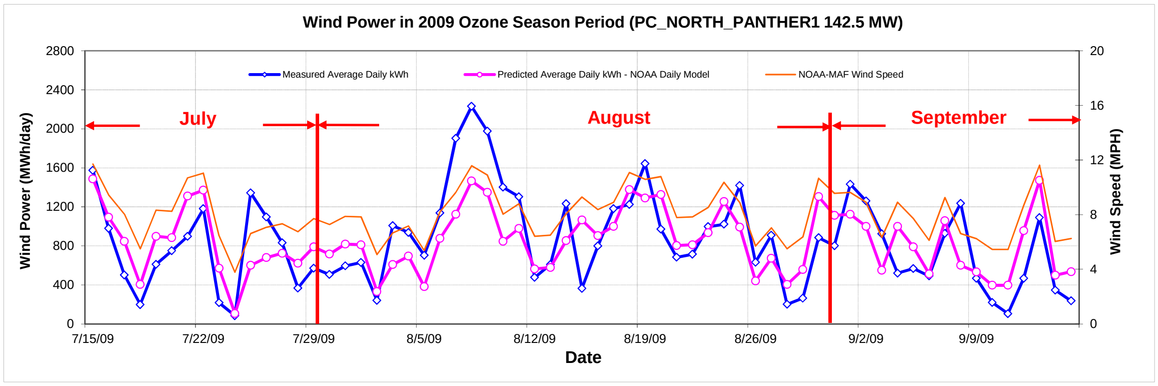


Figure 11-175: PC_NORTH_PANTHER1 – Predicted Wind Power in OSP Using NOAA Wind Speed (2009)

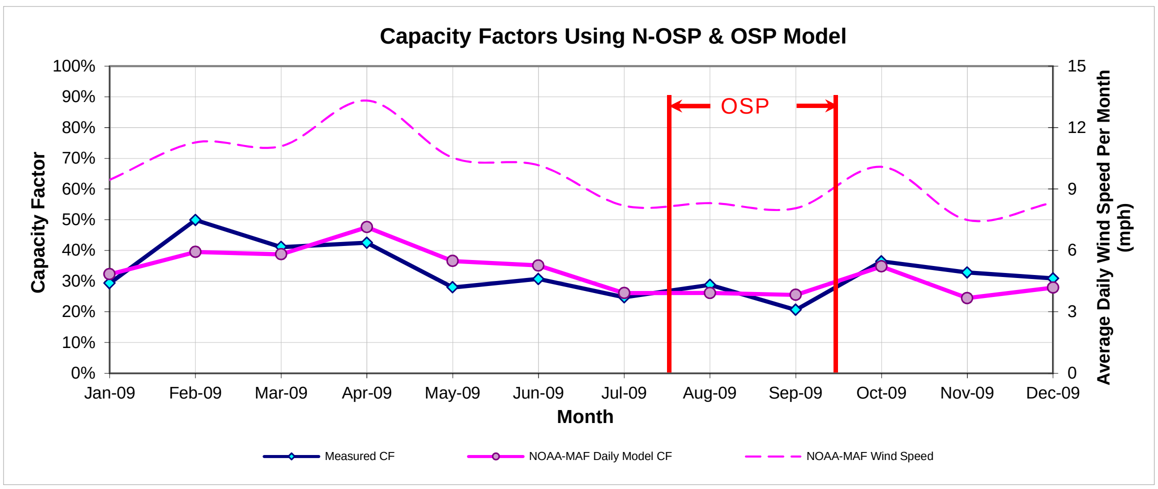


Figure 11-176: PC_NORTH_PANTHER1 – Predicted Capacity Factors Using Daily Models (2009)

Table 11-168: PC_NORTH_PANTHER1 – Predicted Power Production in 1999

Annual

1999 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
473,845	409,394

OSD

1999 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
1,097	842

11.36 Panther Creek 2

Table 11-169: Site Information for Panther Creek 2

GENSITECODE_ERCOT	Renewable Energy	City	County	Date in Service	Capacity (MW)	Company	Facility	Wind Turbine Information	Region	PCA	Interconnection	Weather Station
PC_SOUTH_PANTHER2	WIND		Howard	Nov-08	115.5	E.On Climate & Renewables	Panther Creek 2	GE Energy (77)	ERCOT			MAF

SUBGENCODE_ERCOT	GENSITECODE_ERCOT	Capacity (MW)
PC_SOUTH_PANTHER2	PC_SOUTH_PANTHER2	115.5

11.36.1 Panther Creek 2 – PC_SOUTH_PANTHER2

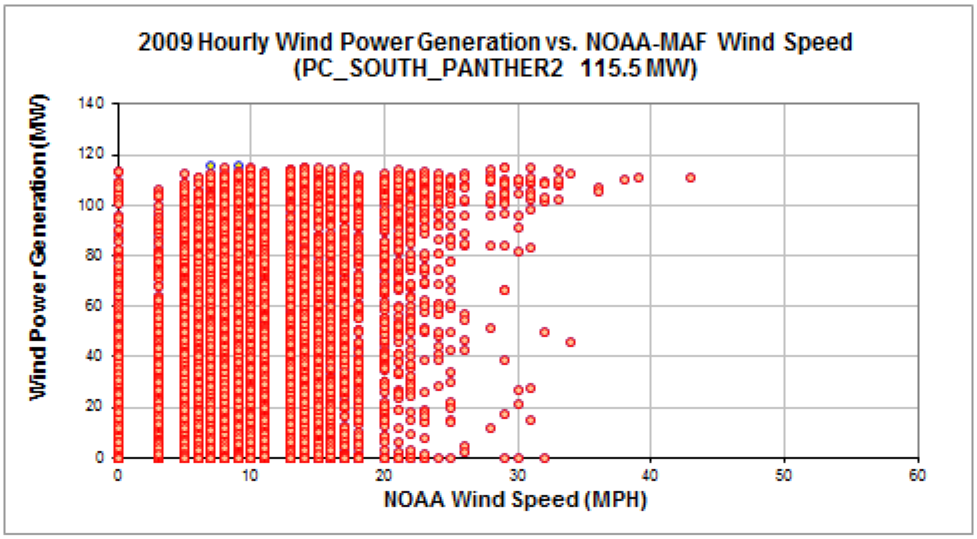


Figure 11-177: PC_SOUTH_PANTHER2 – Hourly Wind Power vs. NOAA Wind Speed (2009)

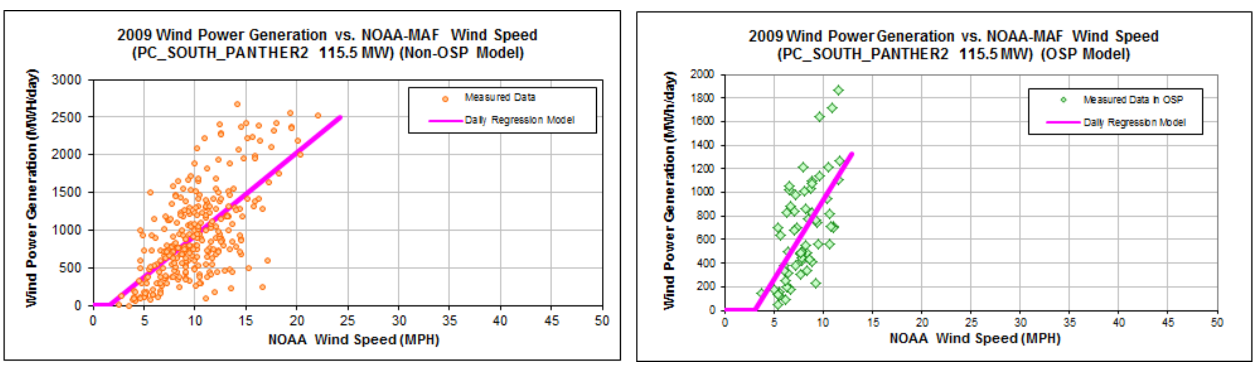


Figure 11-178: PC_SOUTH_PANTHER2 – Daily Wind Power vs. NOAA Wind Speed (Using OSP and Non-OSP Model)

Table 11-170: PC_SOUTH_PANTHER2 – Model Coefficients

Using Non-OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-170.3488
Left Slope (MWh/mph-day)	110.2248
RMSE (MWh/day)	444.0935
R2	0.4341
CV-RMSE	47.6%

Using OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-420.0372
Left Slope (MWh/mph-day)	135.1828
RMSE (MWh/day)	322.5920
R2	0.3881
CV-RMSE	48.6%

Table 11-171: PC_SOUTH_PANTHER2 – Comparison of Predicted Power vs. Measured Power

Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-09	31	9.45	26,799	27,004	-0.76%	31%	31%
Feb-09	28	11.28	39,107	30,029	23.21%	50%	39%
Mar-09	29	11.20	33,010	30,865	6.50%	41%	38%
Apr-09	29	13.32	32,979	37,646	-14.15%	41%	47%
May-09	31	10.53	22,151	30,706	-38.62%	26%	36%
Jun-09	29	10.03	20,997	27,117	-29.14%	26%	34%
Jul-09	31	8.18	20,474	21,780	-6.38%	24%	25%
Aug-09	31	8.31	23,717	21,803	8.07%	28%	25%
Sep-09	30	8.06	17,559	20,630	-17.49%	21%	25%
Oct-09	31	10.08	31,049	29,175	6.03%	36%	34%
Nov-09	30	7.49	27,704	19,649	29.08%	33%	24%
Dec-09	30	8.34	23,354	22,466	3.80%	28%	27%
Total	360	9.66	318,901	318,868	0.01%	32%	32%
Total in OSP (07/15-09/15)	63	8.01	41,785	41,776	0.02%	24%	24%

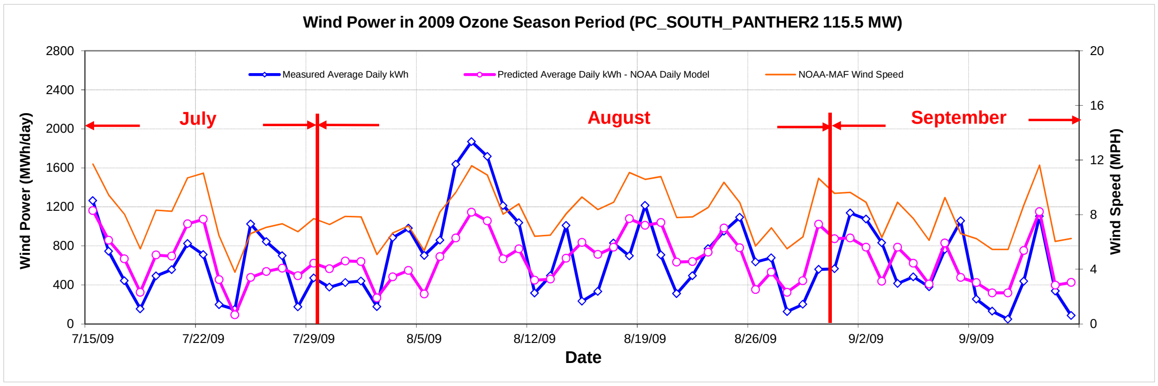


Figure 11-179: PC_SOUTH_PANTHER2 – Predicted Wind Power in OSP Using NOAA Wind Speed (2009)

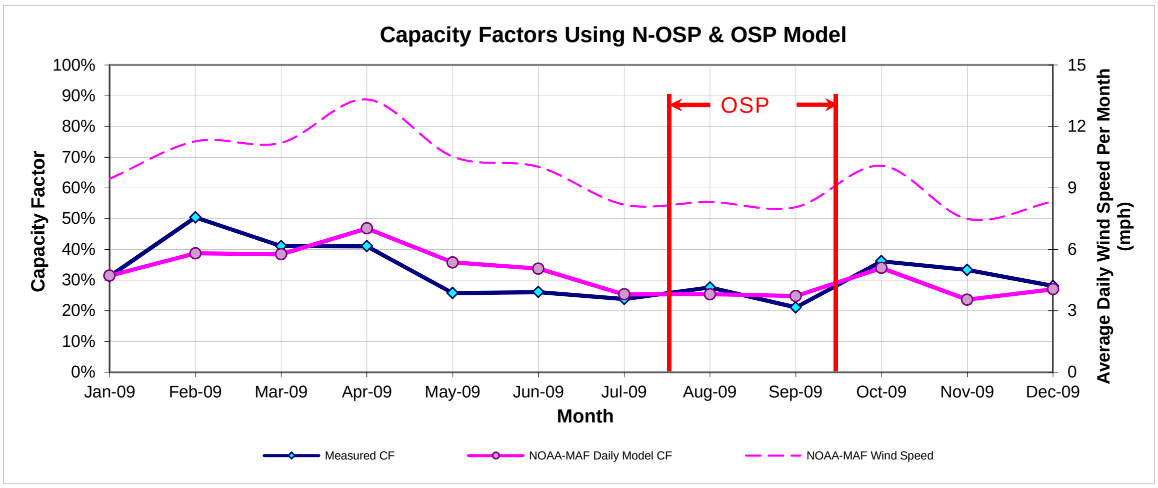


Figure 11-180: PC_SOUTH_PANTHER2 – Predicted Capacity Factors Using Daily Models (2009)

Table 11-172: PC_SOUTH_PANTHER2 – Predicted Power Production in 1999

Annual

1999 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
375,646	323,330

OSD

1999 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
860	663

11.37 Panther Creek 3

Table 11-173: Site Information for Panther Creek 3

GENSITECODE_ERCOT	Renewable Energy	City	County	Date in Service	Capacity (MW)	Company	Facility	Wind Turbine Information	Region	PCA	Interconnection	Weather Station
PC_SOUTH_PANTHER3	WIND		Concho	Aug-09	199.5	E.On Climate & Renewables	Panther Creek 3		ERCOT			ABI

SUBGENCODE_ERCOT	GENSITECODE_ERCOT	Capacity (MW)
PC_SOUTH_PANTHER3	PC_SOUTH_PANTHER3	199.5

11.37.1 Panther Creek 3 – PC_SOUTH_PANTHER3

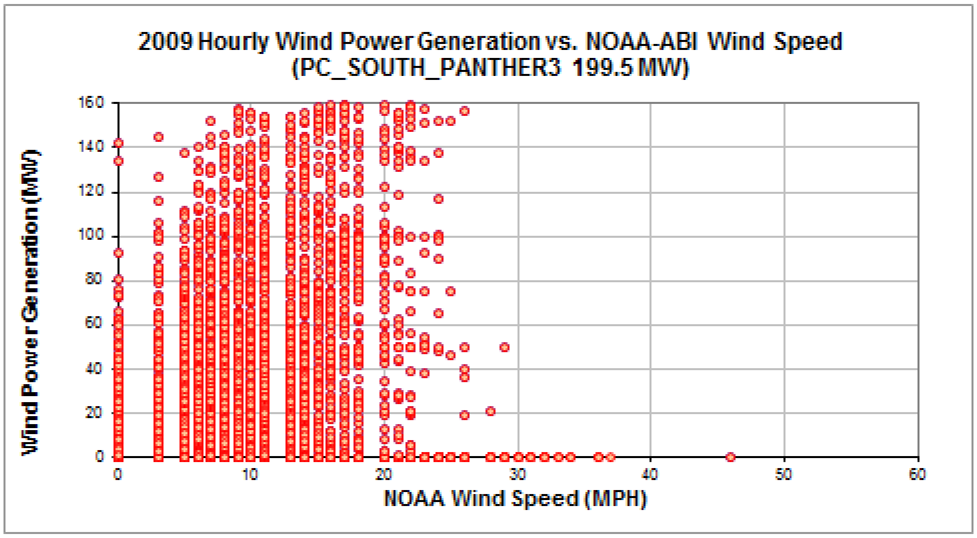


Figure 11-181: PC_SOUTH_PANTHER3 – Hourly Wind Power vs. NOAA Wind Speed (2009)

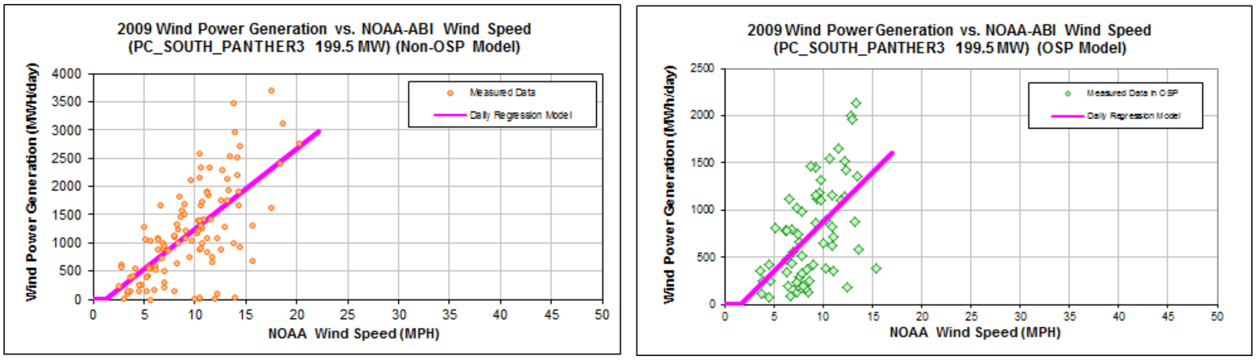


Figure 11-182: PC_SOUTH_PANTHER3 – Daily Wind Power vs. NOAA Wind Speed (Using OSP and Non-OSP Model)

Table 11-174: PC_SOUTH_PANTHER3 – Model Coefficients

Using Non-OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-179.2276
Left Slope (MWh/mph-day)	141.4868
RMSE (MWh/day)	620.8510
R2	0.4409
CV-RMSE	53.8%

Using OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-175.2184
Left Slope (MWh/mph-day)	104.3258
RMSE (MWh/day)	440.8250
R2	0.3037
CV-RMSE	58.4%

Table 11-175: PC_SOUTH_PANTHER3 – Comparison of Predicted Power vs. Measured Power

Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-09							
Feb-09							
Mar-09							
Apr-09							
May-09							
Jun-09							
Jul-09	22	9.25	6,380	19,552	-206.47%	6%	19%
Aug-09	31	9.59	28,540	25,568	10.41%	19%	17%
Sep-09	30	8.61	25,330	26,774	-5.70%	18%	19%
Oct-09	31	10.66	42,479	41,179	3.06%	29%	28%
Nov-09	30	8.39	40,064	30,227	24.55%	28%	21%
Dec-09	30	8.81	32,888	32,024	2.63%	23%	22%
Total	174	9.23	175,681	175,324	0.20%	21%	21%
Total in OSP (07/15-09/15)	63	8.91	47,544	47,543	0.00%	16%	16%

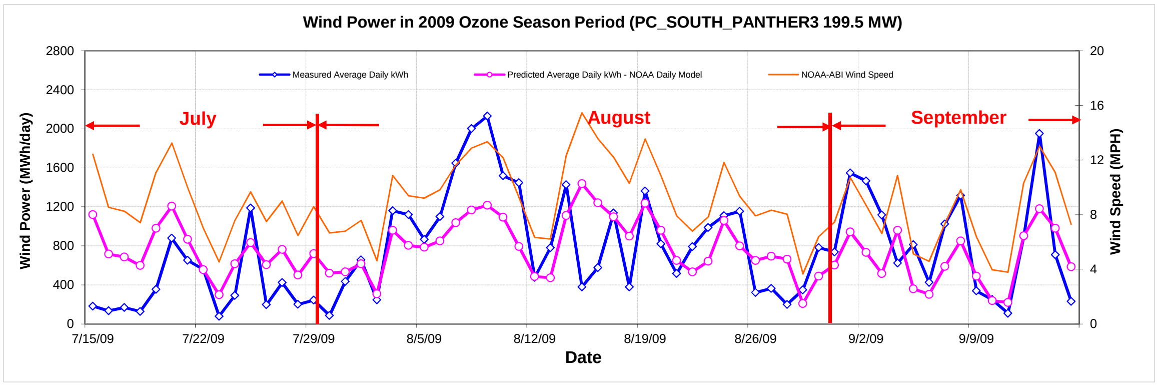


Figure 11-183: PC_SOUTH_PANTHER3 – Predicted Wind Power in OSP Using NOAA Wind Speed (2009)

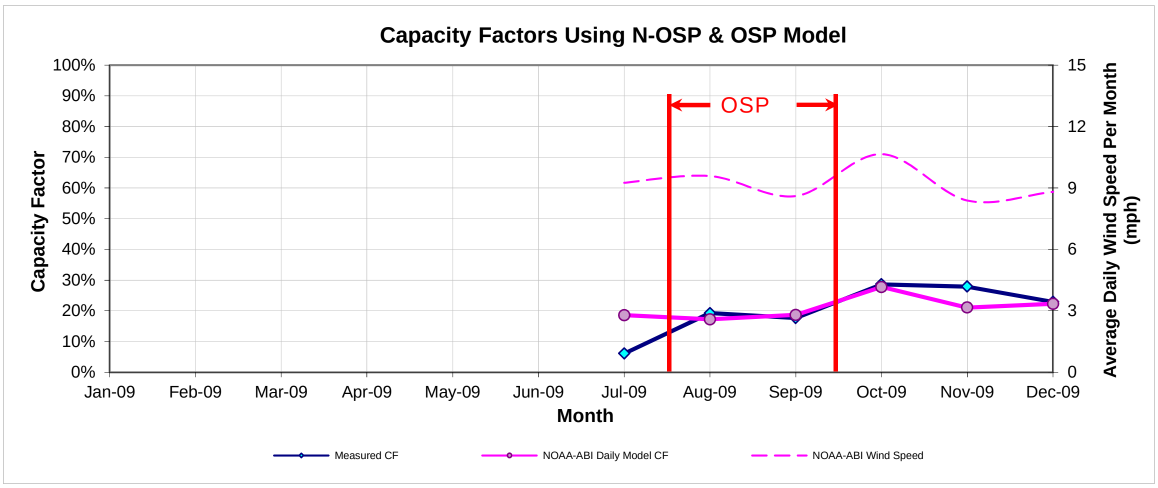


Figure 11-184: PC_SOUTH_PANTHER3 – Predicted Capacity Factors Using Daily Models (2009)

Table 11-176: PC_SOUTH_PANTHER3 – Predicted Power Production in 1999

Annual

1999 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
495,256	368,526

OSD

1999 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
838	755

Note: There is missing data in 2009 and the actual data period is July-December 2009. The annual predicted power production shown above is an adjustment for one year.

11.38 Penascal Wind Farm

Table 11-177: Site Information for Penascal Wind farm

GENCODE_ERCOT	Renewable Energy	City	County	Date in Service	Capacity (MW)	Company	Facility	Wind Turbine Information	Region	PCA	Interconnection	Weather Station
PENA	WIND		Kenedy	Nov-08	201.6	PPM Energy	Penascal Wind Farm	Mitsubishi(42)	ERCOT			CRP

SUBGENCODE_ERCOT	GENSITECODE_ERCOT	Capacity (MW)
PENA_UNIT1	PENA_UNIT1	100.8
PENA_UNIT2	PENA_UNIT2	100.8

11.38.1 Penascal Wind Farm – PENA_UNIT1

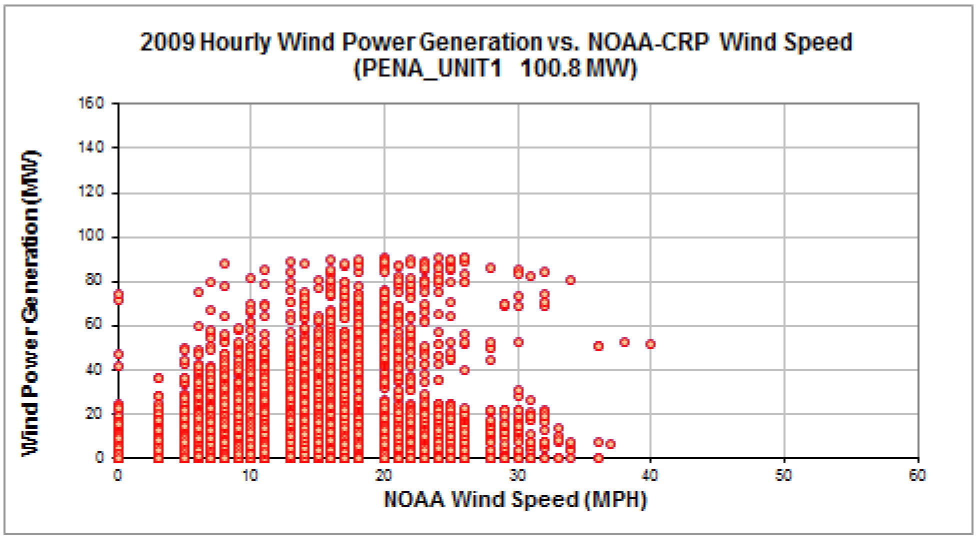
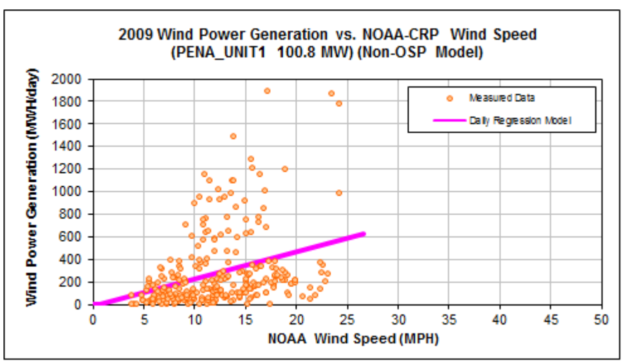


Figure 11-185: PENA_UNIT1– Hourly Wind Power vs. NOAA Wind Speed (2009)



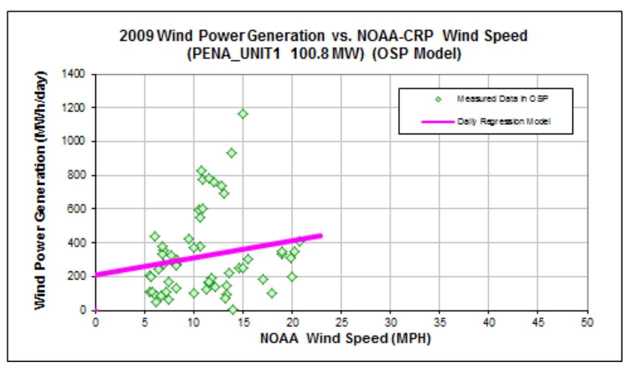


Figure 11-186: PENA_UNIT1 – Daily Wind Power vs. NOAA Wind Speed (Using OSP and Non-OSP Model)

Table 11-178: PENA_UNIT1 – Model Coefficients

Using Non-OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-13.5768
Left Slope (MWh/mph-day)	24.0765
RMSE (MWh/day)	317.1673
R2	0.1057
CV-RMSE	112.6%

Using OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	210.0264
Left Slope (MWh/mph-day)	10.1962
RMSE (MWh/day)	249.4537
R2	0.0307
CV-RMSE	76.7%

Table 11-179: PENA_UNIT1 – Comparison of Predicted Power vs. Measured Power

Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-09	31	11.19	2,688	7,933	-195.10%	4%	11%
Feb-09	27	13.96	3,397	8,707	-156.31%	5%	13%
Mar-09	8	14.01	400	2,590	-547.57%	2%	13%
Apr-09	25	15.33	3,009	8,889	-195.40%	5%	15%
May-09	31	13.44	3,849	9,610	-149.71%	5%	13%
Jun-09	29	13.01	5,636	8,692	-54.24%	8%	12%
Jul-09	28	14.56	6,304	9,392	-48.98%	9%	14%
Aug-09	28	11.06	11,901	9,038	24.06%	18%	13%
Sep-09	30	8.13	9,859	7,361	25.34%	14%	10%
Oct-09	31	12.67	25,558	9,038	64.64%	34%	12%
Nov-09	28	9.14	10,557	5,782	45.23%	16%	9%
Dec-09	30	10.76	11,244	7,365	34.50%	15%	10%
Total	326	12.09	94,402	94,397	0.01%	12%	12%
Total in OSP (07/15-09/15)	57	11.28	18,528	18,527	0.00%	13%	13%

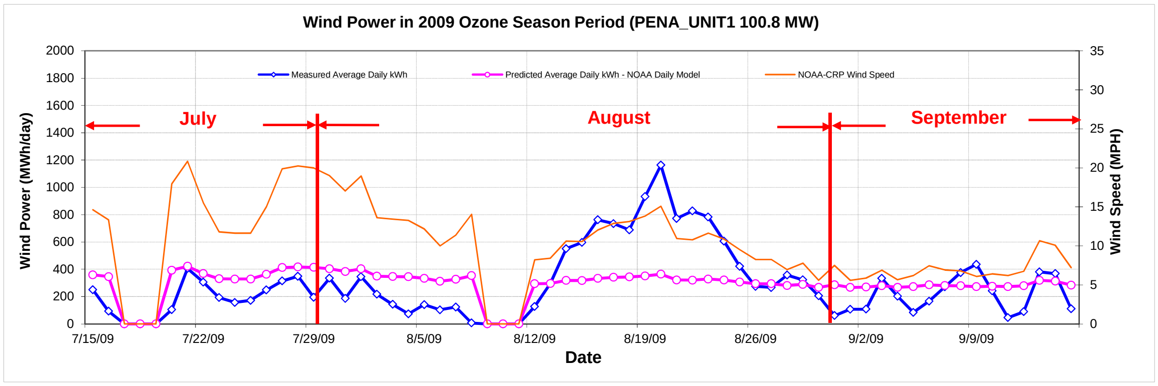


Figure 11-187: PENA_UNIT1 – Predicted Wind Power in OSP Using NOAA Wind Speed (2009)

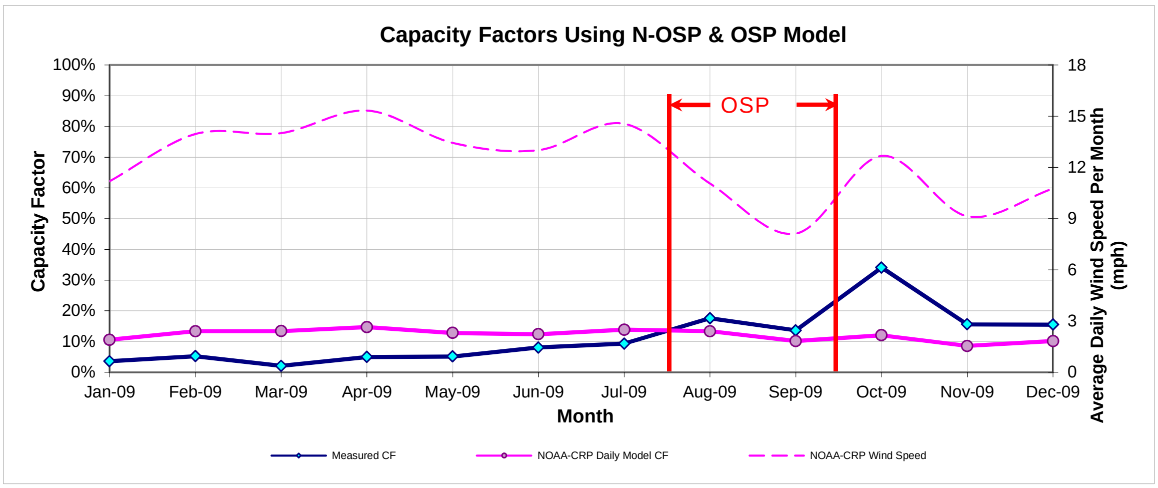


Figure 11-188: PENA_UNIT1 – Predicted Capacity Factors Using Daily Models (2009)

Table 11-180: PENA_UNIT1 – Predicted Power Production in 1999

Annual

1999 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
97,644	105,695

OSD

1999 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
295	325

Note: Seen from Figure 11-186, the data from ERCOT has two patterns, which results in high CV-RMSE value in Table 11-178. The meter problems are suspected.

11.38.2 Penascal Wind Farm – PENA_UNIT2

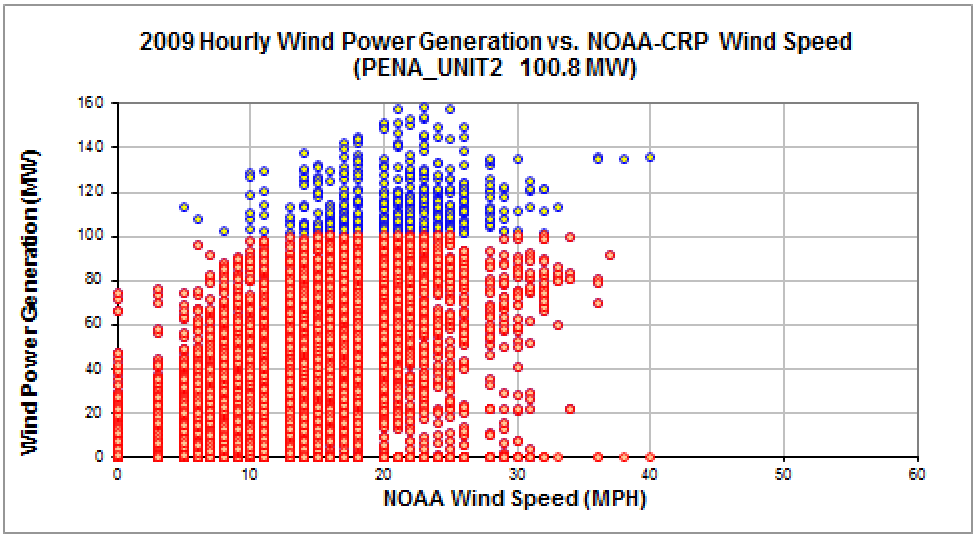
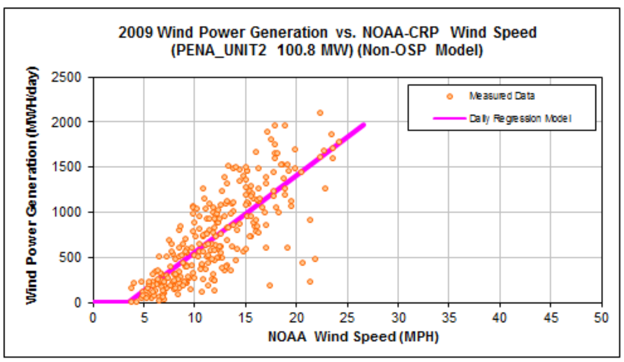


Figure 11-189: PENA_UNIT2 - Hourly Wind Power vs. NOAA Wind Speed (2009)



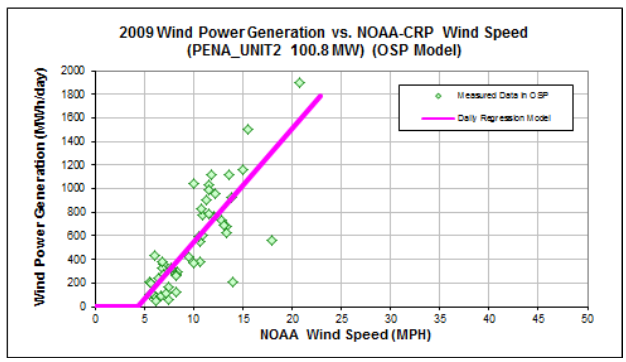


Figure 11-190: PENA_UNIT2 – Daily Wind Power vs. NOAA Wind Speed (Using OSP and Non-OSP Model)

Table 11-181: PENA_UNIT2 – Model Coefficients

Using Non-OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-296.7911
Left Slope (MWh/mph-day)	85.4015
RMSE (MWh/day)	306.7500
R2	0.6139
CV-RMSE	41.9%

Using OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-414.1860
Left Slope (MWh/mph-day)	95.9567
RMSE (MWh/day)	245.9844
R2	0.6515
CV-RMSE	44.3%

Table 11-182: PENA_UNIT2 – Comparison of Predicted Power vs. Measured Power

Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-09	31	11.19	14,286	20,430	-43.01%	19%	27%
Feb-09	27	14.20	18,463	24,724	-33.91%	28%	38%
Mar-09	31	14.28	26,876	28,618	-6.48%	36%	38%
Apr-09	23	14.82	21,521	22,278	-3.52%	39%	40%
May-09	28	12.65	25,702	21,947	14.61%	38%	32%
Jun-09	22	11.76	22,255	15,565	30.06%	42%	29%
Jul-09	13	12.63	12,826	10,424	18.73%	41%	33%
Aug-09	26	10.67	15,575	15,855	-1.80%	25%	25%
Sep-09	30	8.13	9,829	11,258	-14.54%	14%	16%
Oct-09	31	12.67	25,513	24,352	4.55%	34%	32%
Nov-09	28	9.14	13,827	13,549	2.01%	20%	20%
Dec-09	27	9.89	17,206	14,786	14.07%	26%	23%
Total	317	11.75	223,878	223,785	0.04%	29%	29%
Total in OSP (07/15-09/15)	48	10.10	26,655	26,650	0.02%	23%	23%

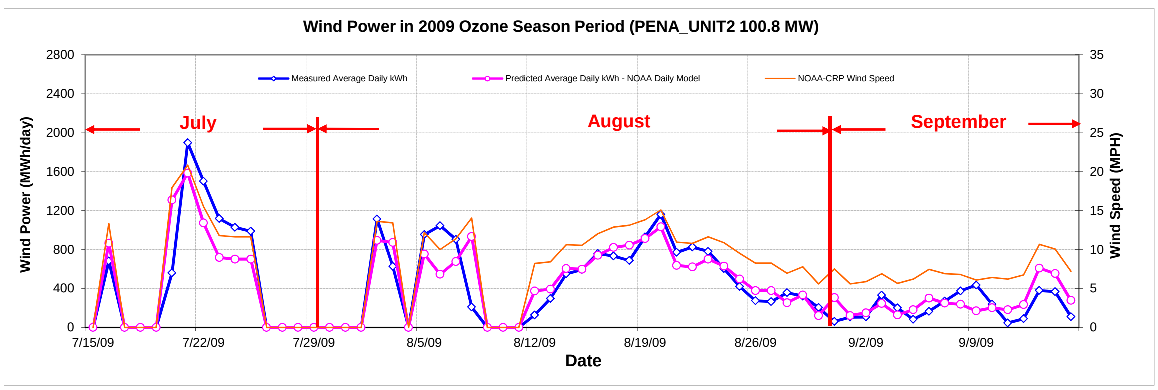


Figure 11-191: PENA_UNIT2 – Predicted Wind Power in OSP Using NOAA Wind Speed (2009)

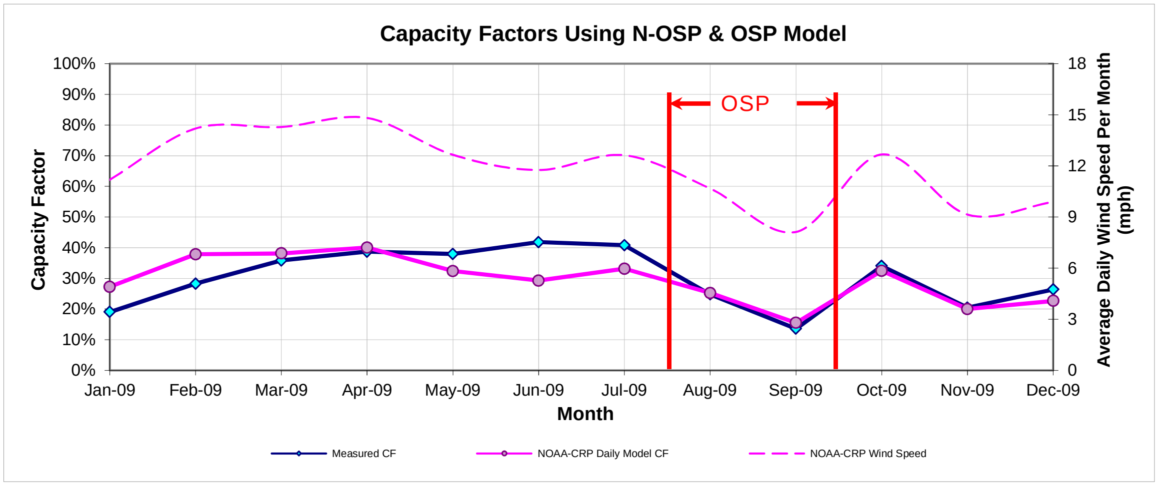


Figure 11-192: PENA_UNIT2 – Predicted Capacity Factors Using Daily Models (2009)

Table 11-183: PENA_UNIT2 – Predicted Power Production in 1999

Annual

1999 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
230,032	257,777

OSD

1999 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
389	555

11.39 Pyron

Table 11-184: Site Information for Pyron

GENSITECODE_ERCOT	Renewable Energy	City	County	Date in Service	Capacity (MW)	Company	Facility	Wind Turbine Information	Region	PCA	Interconnection	Weather Station
PYR_PYRON1	WIND		Scurry	Nov-08	249	E.On Climate & Renewables	Pyron		ERCOT			ABI

SUBGENCODE_ERCOT	GENSITECODE_ERCOT	Capacity (MW)
PYR_PYRON1	PYR_PYRON1	249

11.39.1 Pyron – PYR_PYRON1

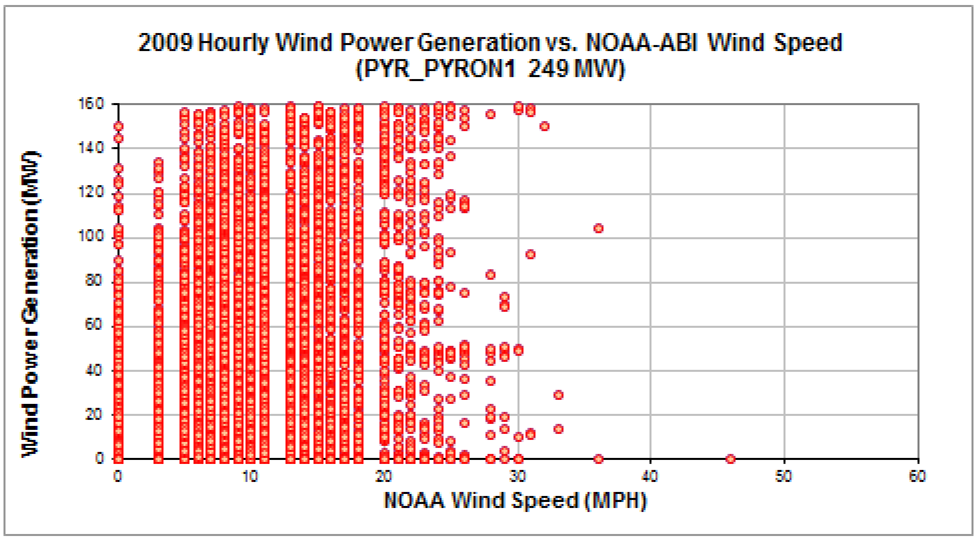


Figure 11-193: PYR_PYRON1 – Hourly Wind Power vs. NOAA Wind Speed (2009)

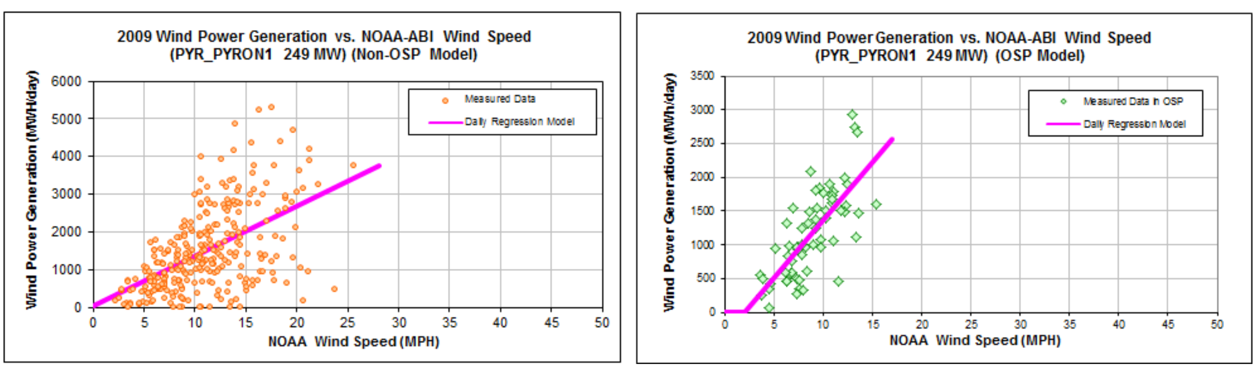


Figure 11-194: PYR_PYRON1 – Daily Wind Power vs. NOAA Wind Speed (Using OSP and Non-OSP Model)

Table 11-185: PYR_PYRON1 – Model Coefficients

Using Non-OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	40.4178
Left Slope (MWh/mph-day)	132.3260
RMSE (MWh/day)	915.7995
R2	0.2923
CV-RMSE	61.3%

Using OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-344.8913
Left Slope (MWh/mph-day)	170.7880
RMSE (MWh/day)	438.9447
R2	0.5366
CV-RMSE	37.6%

Table 11-186: PYR_PYRON1 – Comparison of Predicted Power vs. Measured Power

Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-09	29	10.51	10,188	41,518	-307.52%	6%	24%
Feb-09	28	12.91	52,516	48,975	6.74%	31%	29%
Mar-09	30	13.10	47,354	53,222	-12.39%	26%	30%
Apr-09	30	14.82	56,895	60,034	-5.52%	32%	33%
May-09	31	10.10	37,944	42,693	-12.52%	20%	23%
Jun-09	30	11.31	51,025	46,127	9.60%	28%	26%
Jul-09	31	8.90	40,046	36,768	8.19%	22%	20%
Aug-09	30	9.48	35,371	38,203	-8.01%	20%	21%
Sep-09	30	8.61	31,984	34,203	-6.94%	18%	19%
Oct-09	31	10.66	52,508	44,962	14.37%	28%	24%
Nov-09	30	8.39	52,593	34,511	34.38%	29%	19%
Dec-09	30	8.81	49,328	36,192	26.63%	28%	20%
Total	360	10.61	517,751	517,407	0.07%	24%	24%
Total in OSP (07/15-09/15)	62	8.85	72,321	72,320	0.00%	20%	20%

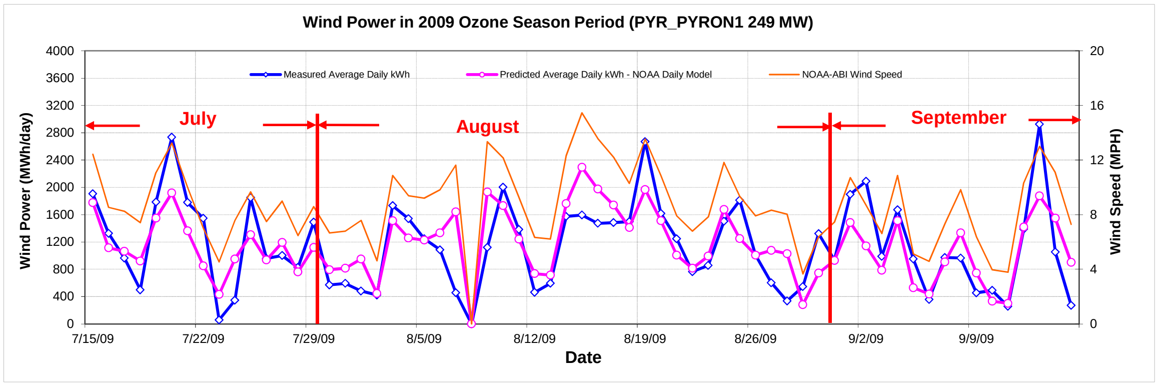


Figure 11-195: PYR_PYRON1 – Predicted Wind Power in OSP Using NOAA Wind Speed (2009)

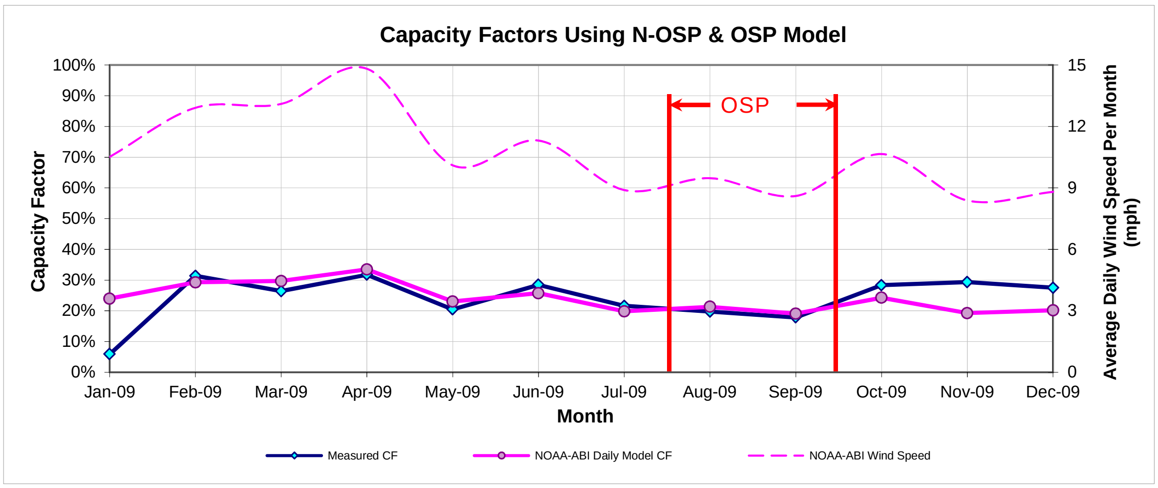


Figure 11-196: PYR_PYRON1 – Predicted Capacity Factors Using Daily Models (2009)

Table 11-187: PYR_PYRON1 – Predicted Power Production in 1999

Annual

1999 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
559,399	524,942

OSD

1999 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
1,313	1,166

11.40 Red Canyon 1

Table 11-188: Site Information for Red Canyon 1

GENSITECODE_ERCOT	Renewable Energy	City	County	Date in Service	Capacity (MW)	Company	Facility	Wind Turbine Information	Region	PCA	Interconnection	Weather Station
Red Canyon	WIND		BORDEN	Apr-06	84	FPL Energy	Red Canyon1		ERCOT		BEPC	ABI

SUBGENCODE_ERCOT	GENSITECODE_ERCOT	Capacity (MW)
Red Canyon 1	Red Canyon	84

11.40.1 Red Canyon 1 – RDCANYON_RDCNY1

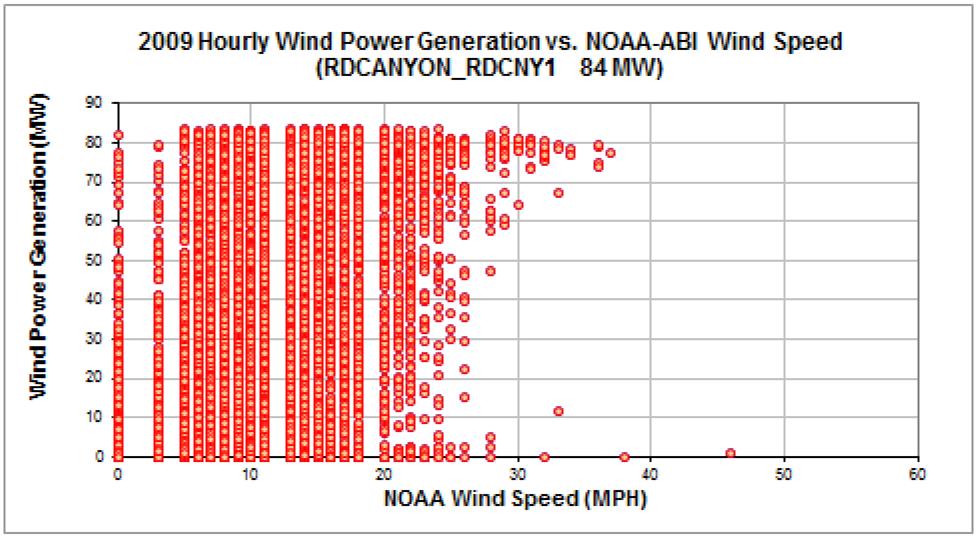


Figure 11-197: RDCANYON_RDCNY1– Hourly Wind Power vs. NOAA Wind Speed (2009)

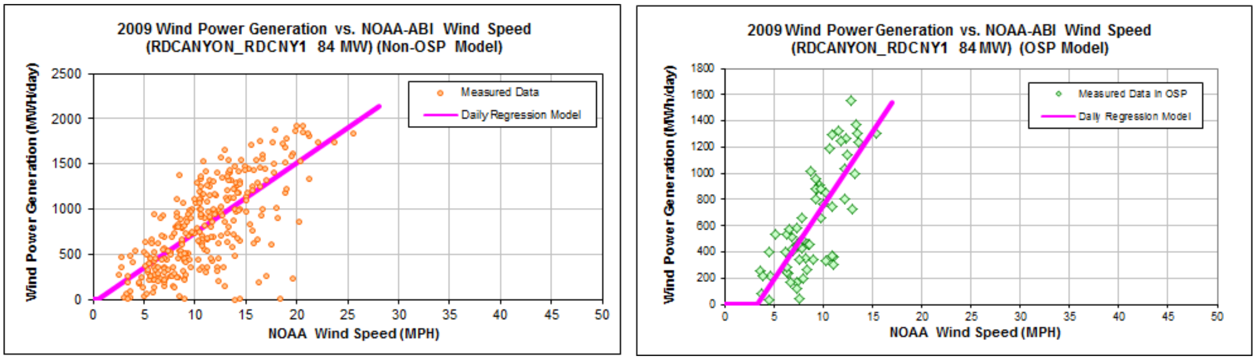


Figure 11-198: RDCANYON_RDCNY1 – Daily Wind Power vs. NOAA Wind Speed (Using OSP and Non-OSP Model)

Table 11-189: RDCANYON_RDCNY1– Model Coefficients

Using Non-OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-41.5713
Left Slope (MWh/mph-day)	77.2814
RMSE (MWh/day)	339.1958
R2	0.5045
CV-RMSE	41.8%

Using OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-368.4986
Left Slope (MWh/mph-day)	112.3522
RMSE (MWh/day)	251.3225
R2	0.6088
CV-RMSE	39.7%

Table 11-190: RDCANYON_RDCNY1– Comparison of Predicted Power vs. Measured Power

Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-09	31	10.70	27,905	24,348	12.74%	45%	39%
Feb-09	27	13.31	27,195	26,651	2.00%	50%	49%
Mar-09	31	13.29	34,701	30,554	11.95%	56%	49%
Apr-09	30	14.82	30,065	33,106	-10.12%	50%	55%
May-09	31	10.10	20,399	22,913	-12.33%	33%	37%
Jun-09	30	11.31	24,629	24,984	-1.44%	41%	41%
Jul-09	31	8.90	19,051	19,546	-2.60%	30%	31%
Aug-09	31	9.59	24,761	21,961	11.31%	40%	35%
Sep-09	30	8.61	16,079	18,000	-11.95%	27%	30%
Oct-09	30	10.43	19,023	22,931	-20.55%	31%	38%
Nov-09	30	8.39	21,424	18,200	15.05%	35%	30%
Dec-09	30	8.81	17,365	19,181	-10.46%	29%	32%
Total	362	10.66	282,597	282,376	0.08%	39%	39%
Total in OSP (07/15-09/15)	63	8.91	39,875	39,873	0.00%	31%	31%

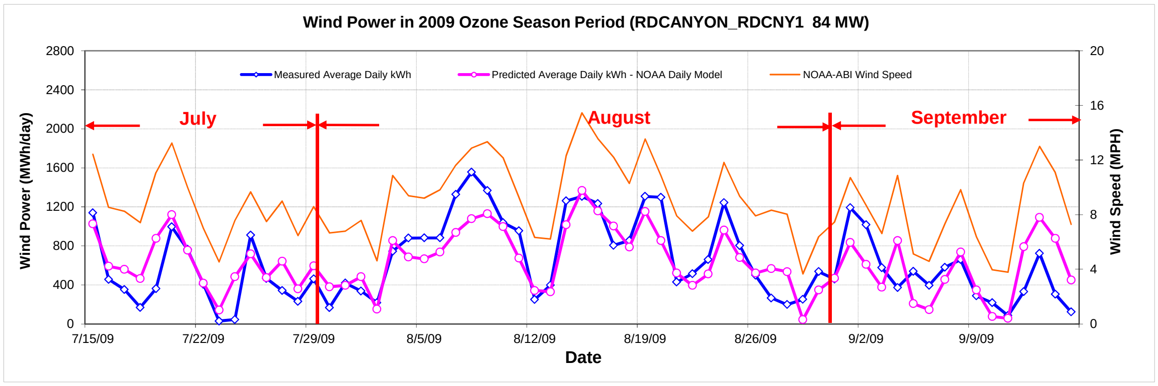


Figure 11-199: RDCANYON_RDCNY1– Predicted Wind Power in OSP Using NOAA Wind Speed (2009)

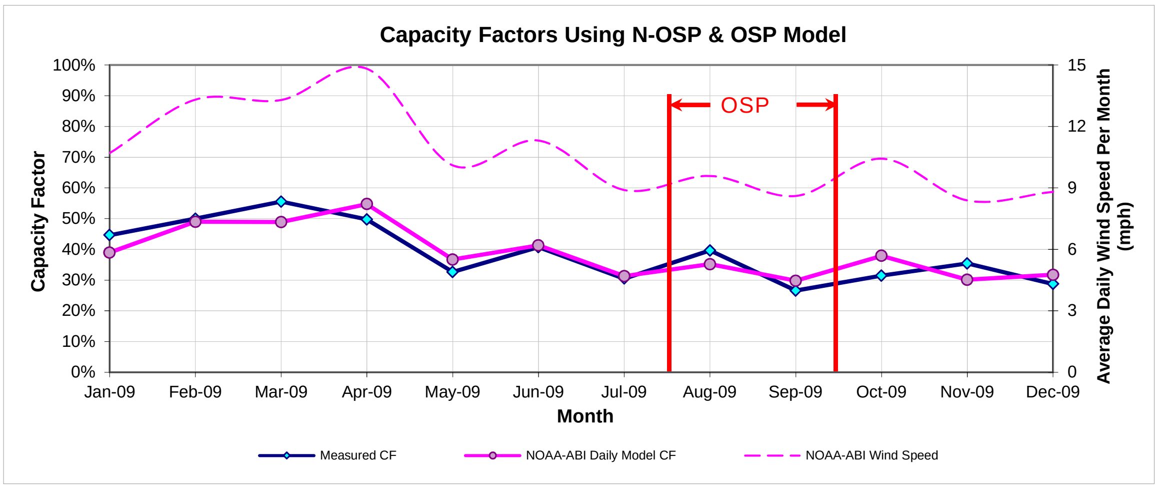


Figure 11-200: RDCANYON_RDCNY1– Predicted Capacity Factors Using Daily Models (2009)

Table 11-191: RDCANYON_RDCNY1– Predicted Power Production in 1999

Annual

1999 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
304,205	284,939

OSD

1999 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
722	633

11.41 Big Spring Wind Power

Table 11-192: Site Information for Big Spring Wind Power

GENSITECODE_ERCOT	Renewable Energy	City	County	Date in Service	Capacity (MW)	Company	Facility	Wind Turbine Information	Region	PCA	Interconnection	Weather Station
SGMTN	WIND	Big Spring	HOWARD	Feb-99	41	York Research	Big Spring Wind Power	Vestas V-47 (42) Vestas (4)	ERCOT	TXU	TXU	MAF

SUBGENCODE_ERCOT	GENSITECODE_ERCOT	Capacity (MW)
SGMTN_SIGNALMT	SGMTN	41

11.41.1 Big Spring Wind Power – SGMTN_SIGNALMT

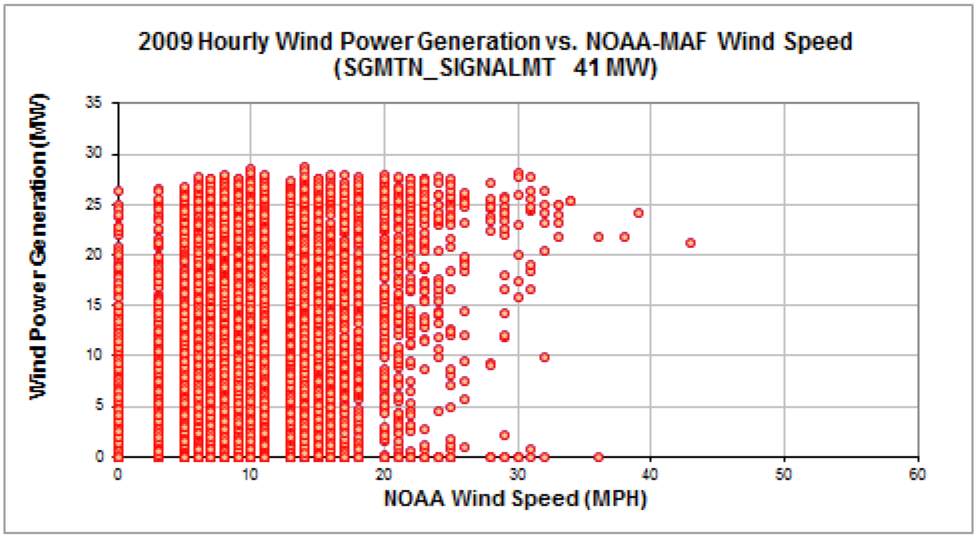


Figure 11-201: SGMTN_SIGNALMT – Hourly Wind Power vs. NOAA Wind Speed (2009)

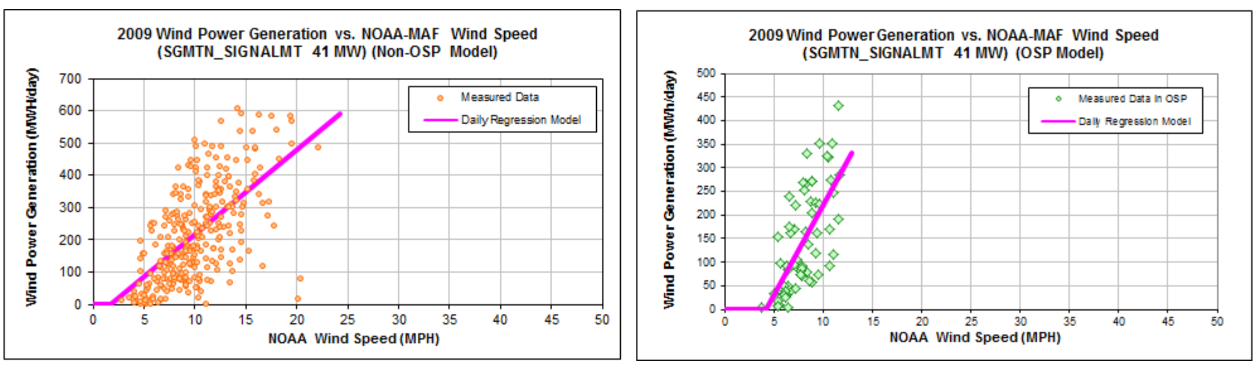


Figure 11-202: SGMTN_SIGNALMT – Daily Wind Power vs. NOAA Wind Speed (Using OSP and Non-OSP Model)

Table 11-193: SGMTN_SIGNALMT – Model Coefficients

Using Non-OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-45.9249
Left Slope (MWh/mph-day)	26.2721
RMSE (MWh/day)	115.5936
R2	0.3884
CV-RMSE	53.1%

Using OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-158.9326
Left Slope (MWh/mph-day)	37.9379
RMSE (MWh/day)	80.1681
R2	0.4471
CV-RMSE	55.3%

Table 11-194: SGMTN_SIGNALMT – Comparison of Predicted Power vs. Measured Power

Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-09	31	9.45	7,389	6,271	15.13%	24%	21%
Feb-09	28	11.28	8,976	7,008	21.92%	33%	25%
Mar-09	30	11.09	6,832	7,365	-7.80%	23%	25%
Apr-09	29	13.32	7,846	8,819	-12.39%	27%	31%
May-09	31	10.53	5,008	7,154	-42.84%	16%	23%
Jun-09	30	10.16	5,865	6,631	-13.06%	20%	22%
Jul-09	31	8.18	4,309	4,898	-13.66%	14%	16%
Aug-09	31	8.31	5,797	4,846	16.41%	19%	16%
Sep-09	30	8.06	4,102	4,602	-12.19%	14%	16%
Oct-09	31	10.08	6,325	6,789	-7.33%	21%	22%
Nov-09	29	7.66	6,153	4,502	26.84%	22%	16%
Dec-09	30	8.34	5,500	5,195	5.55%	19%	18%
Total	361	9.69	74,105	74,080	0.03%	21%	21%
Total in OSP (07/15-09/15)	63	8.01	9,140	9,153	-0.14%	15%	15%

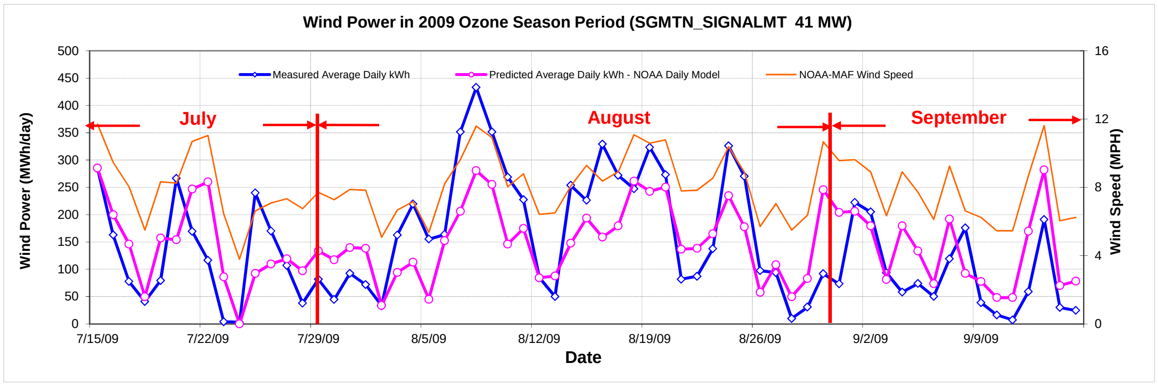


Figure 11-203: SGMTN_SIGNALMT – Predicted Wind Power in OSP Using NOAA Wind Speed (2009)

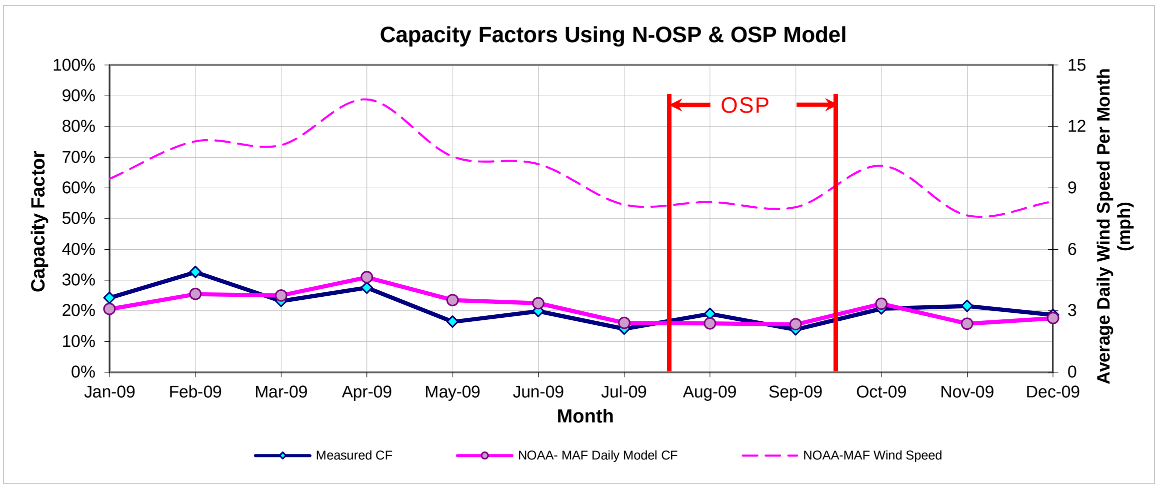


Figure 11-204: SGMTN_SIGNALMT – Predicted Capacity Factors Using Daily Models (2009)

Table 11-195: SGMTN_SIGNALMT – Predicted Power Production in 1999

Annual

1999 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
87,634	74,926

OSD

1999 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
200	145

11.42 South Trent Wind Farm

Table 11-196: Site Information for South Trent Wind Farm

GENSITECODE_ERCOT	Renewable Energy	City	County	Date in Service	Capacity (MW)	Company	Facility	Wind Turbine Information	Region	PCA	Interconnection	Weather Station
STWF_T1	WIND		Taylor	Oct-08	101.2	Babcock & Brown	South Trent Wind Farm	Siemens (44)	ERCOT	AEP-West	ONCOR	ABI

SUBGENCODE_ERCOT	GENSITECODE_ERCOT	Capacity (MW)
STWF_T1	STWF_T1	101.2

11.42.1 South Trend Wind Farm – STWF_T1

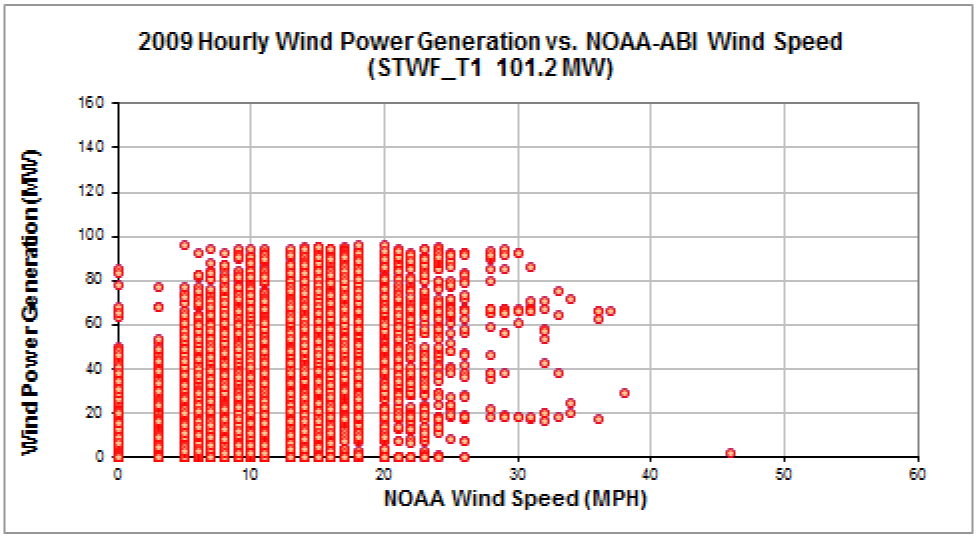
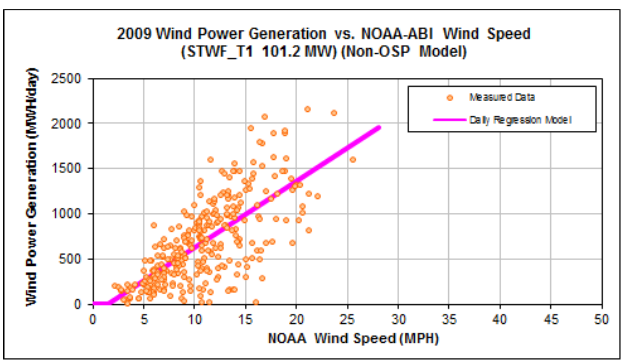


Figure 11-205: STWF_T1 – Hourly Wind Power vs. NOAA Wind Speed (2009)



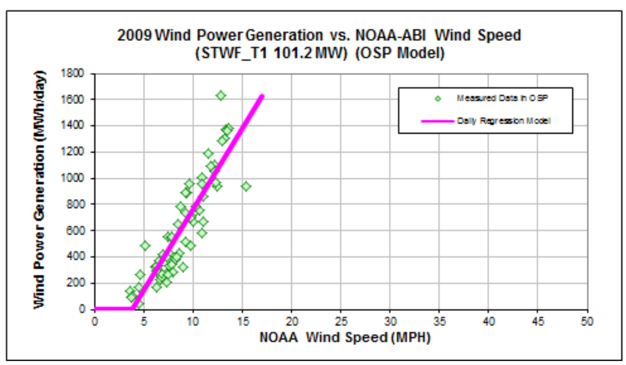


Figure 11-206: STWF_T1 – Daily Wind Power vs. NOAA Wind Speed (Using OSP and Non-OSP Model)

Table 11-197: STWF_T1 – Model Coefficients

Using Non-OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-110.1011
Left Slope (MWh/mph-day)	73.5915
RMSE (MWh/day)	328.8238
R2	0.4975
CV-RMSE	47.1%

Using OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-484.8396
Left Slope (MWh/mph-day)	124.3420
RMSE (MWh/day)	173.9472
R2	0.7991
CV-RMSE	27.9%

Table 11-198: STWF_T1 – Comparison of Predicted Power vs. Measured Power

Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-09	30	10.58	17,726	20,046	-13.09%	24%	28%
Feb-09	28	12.91	30,354	23,524	22.50%	45%	35%
Mar-09	30	13.45	29,679	26,400	11.05%	41%	36%
Apr-09	30	14.82	25,285	29,410	-16.31%	35%	40%
May-09	31	10.10	17,350	19,633	-13.16%	23%	26%
Jun-09	30	11.31	24,257	21,675	10.64%	33%	30%
Jul-09	31	8.90	18,326	17,861	2.54%	24%	24%
Aug-09	31	9.59	22,648	21,946	3.10%	30%	29%
Sep-09	30	8.61	15,006	16,164	-7.72%	21%	22%
Oct-09	29	10.16	12,707	18,482	-45.44%	18%	26%
Nov-09	30	8.39	16,593	15,215	8.30%	23%	21%
Dec-09	30	8.81	16,498	16,150	2.11%	23%	22%
Total	360	10.61	246,428	246,508	-0.03%	28%	28%
Total in OSP (07/15-09/15)	63	8.91	39,278	39,320	-0.11%	26%	26%

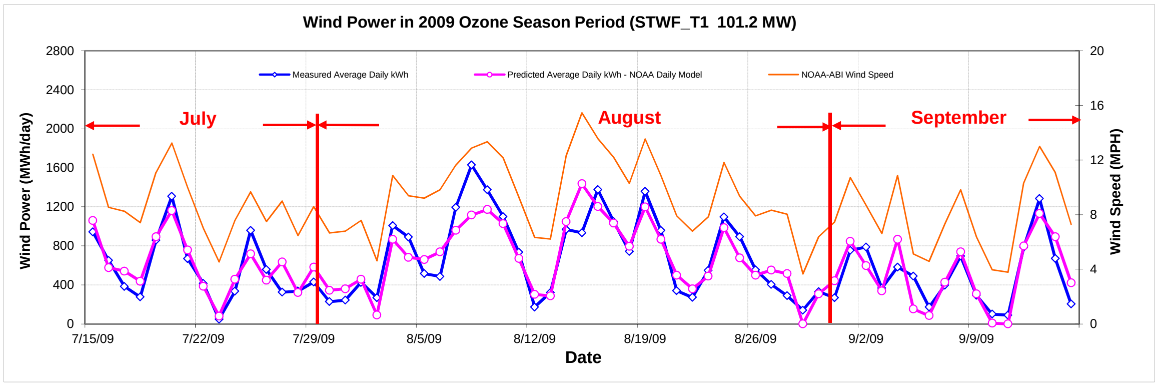


Figure 11-207: STWF_T1 – Predicted Wind Power in OSP Using NOAA Wind Speed (2009)

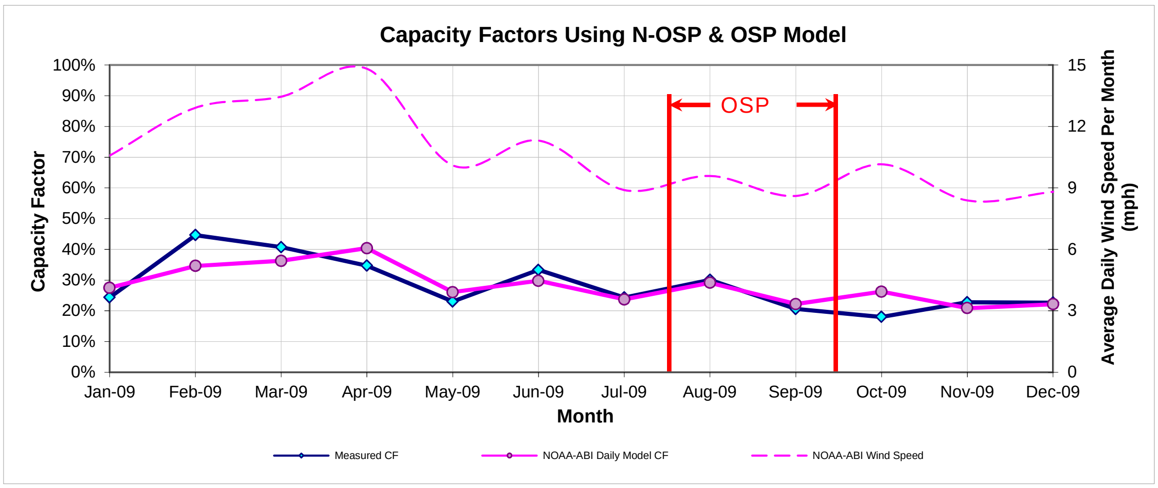


Figure 11-208: STWF_T1 – Predicted Capacity Factors Using Daily Models (2009)

Table 11-199: STWF_T1 – Predicted Power Production in 1999

Annual

1999 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
270,563	249,851

OSD

1999 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
722	623

11.43 Stanton Wind Energy

Table 11-200: Site Information for Stanton Wind Energy

GENSITECODE_ERCOT	Renewable Energy	City	County	Date in Service	Capacity (MW)	Company	Facility	Wind Turbine Information	Region	PCA	Interconnection	Weather Station
SWEC_G1	WIND		Martin	Jan-08	123.6	Invenergy	Stanton Wind Energy	GE Energy	ERCOT		ONCOR	MAF

SUBGENCODE_ERCOT	GENSITECODE_ERCOT	Capacity (MW)
SWEC_G1	SWEC_G1	123.6

11.43.1 Station Wind Energy – SWEC_G1

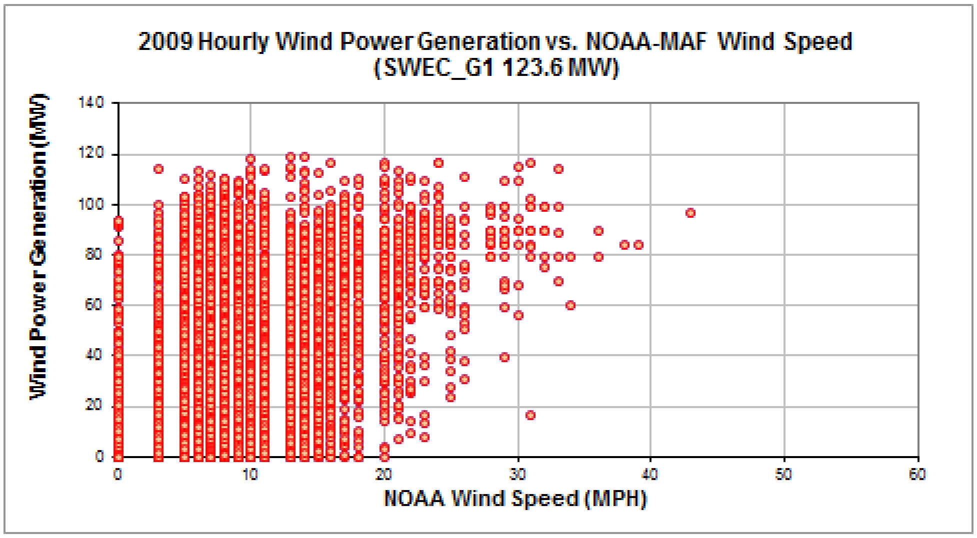


Figure 11-209: SWEC_G1 – Hourly Wind Power vs. NOAA Wind Speed (2009)

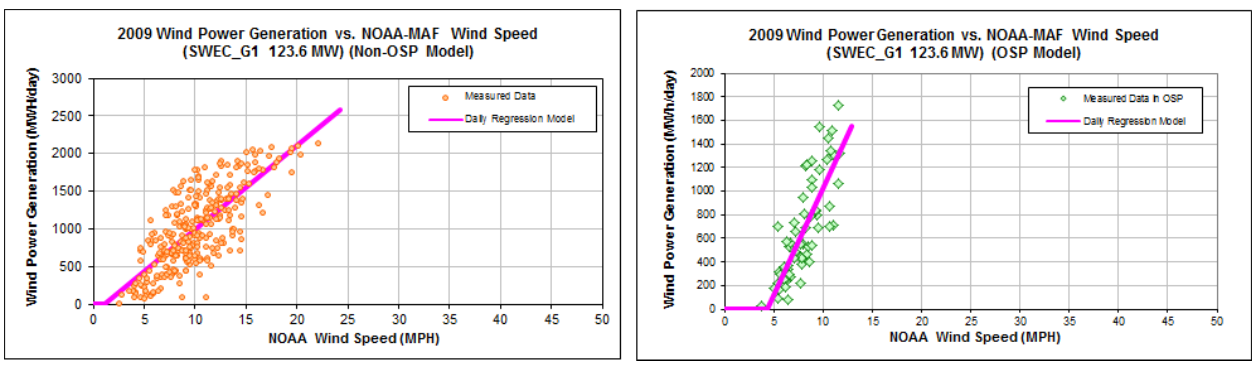


Figure 11-210: SWEC_G1 – Daily Wind Power vs. NOAA Wind Speed (Using OSP and Non-OSP Model)

Table 11-201: SWEC_G1 – Model Coefficients

Using Non-OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-122.1838
Left Slope (MWh/mph-day)	111.7748
RMSE (MWh/day)	331.6955
R2	0.5845
CV-RMSE	33.2%

Using OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-779.5840
Left Slope (MWh/mph-day)	180.9190
RMSE (MWh/day)	249.6742
R2	0.6547
CV-RMSE	37.3%

Table 11-202: SWEC_G1 – Comparison of Predicted Power vs. Measured Power

Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-09	31	9.45	31,538	28,951	8.20%	34%	31%
Feb-09	28	11.28	37,243	31,867	14.43%	45%	38%
Mar-09	31	11.01	36,880	34,379	6.78%	40%	37%
Apr-09	29	13.32	39,979	39,642	0.84%	46%	46%
May-09	31	10.53	25,424	32,705	-28.64%	28%	36%
Jun-09	28	10.29	23,581	28,779	-22.05%	28%	35%
Jul-09	31	8.18	20,524	22,747	-10.83%	22%	25%
Aug-09	31	8.31	25,008	22,439	10.27%	27%	24%
Sep-09	30	8.06	18,519	21,337	-15.22%	21%	24%
Oct-09	31	10.08	28,294	31,152	-10.10%	31%	34%
Nov-09	30	7.49	26,342	21,442	18.60%	30%	24%
Dec-09	30	8.34	26,314	24,298	7.66%	30%	27%
Total	361	9.67	339,646	339,739	-0.03%	32%	32%
Total in OSP (07/15-09/15)	63	8.01	42,223	42,305	-0.19%	23%	23%

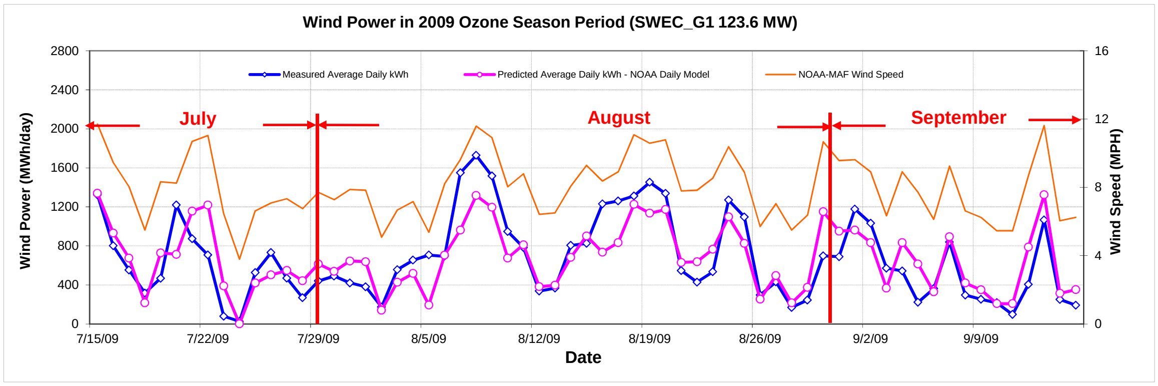


Figure 11-211: SWEC_G1 – Predicted Wind Power in OSP Using NOAA Wind Speed (2009)

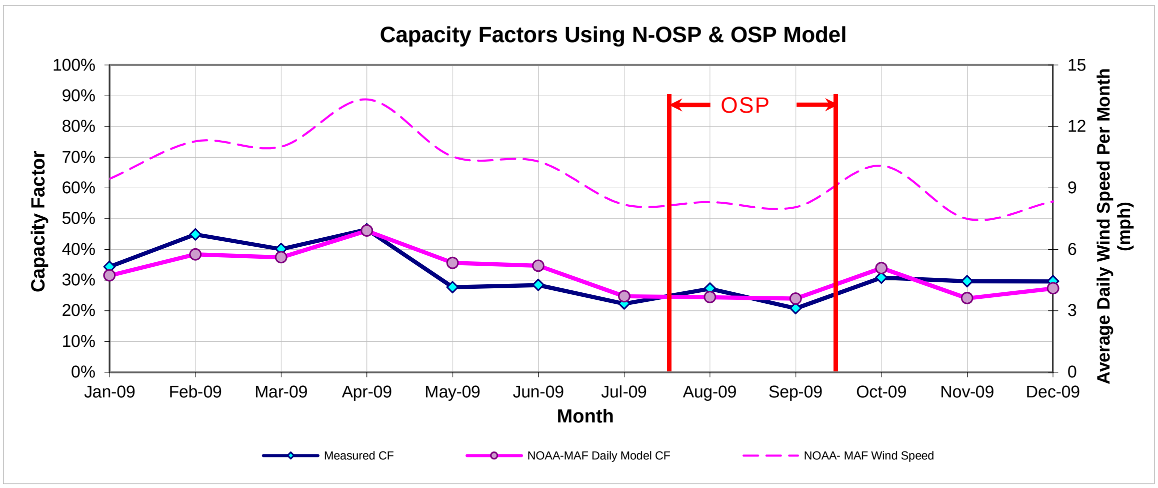


Figure 11-212: SWEC_G1 – Predicted Capacity Factors Using Daily Models (2009)

Table 11-203: SWEC_G1 – Predicted Power Production in 1999

Annual

1999 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
400,077	343,410

OSD

1999 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
934	670

11.44 Southwest Mesa Wind Project

Table 11-204: Site Information for Southwest Mesa Wind Project

GENSITECODE_ERCOT	Renewable Energy	City	County	Date in Service	Capacity (MW)	Company	Facility	Wind Turbine Information	Region	PCA	Interconnection	Weather Station
SW_MESA	WIND	McCamey	UPTON	Jun-99	74.6	FPL Energy	Southwest Mesa Wind Project	NEG Micon (107)	ERCOT	AEP-West	WTU	MAF

SUBGENCODE_ERCOT	GENSITECODE_ERCOT	Capacity (MW)
SW_MESA_SW_MESA	SW_MESA	74.6

11.44.1 Southwest Mesa Wind Project – SW_MESA_SW_MESA

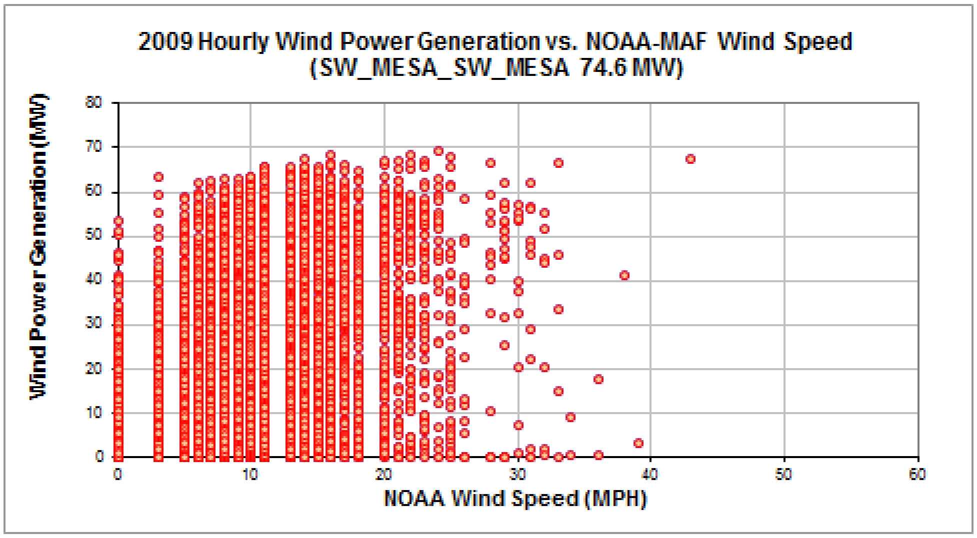


Figure 11-213:SW_MESA_SW_MESA – Hourly Wind Power vs. NOAA Wind Speed (2009)

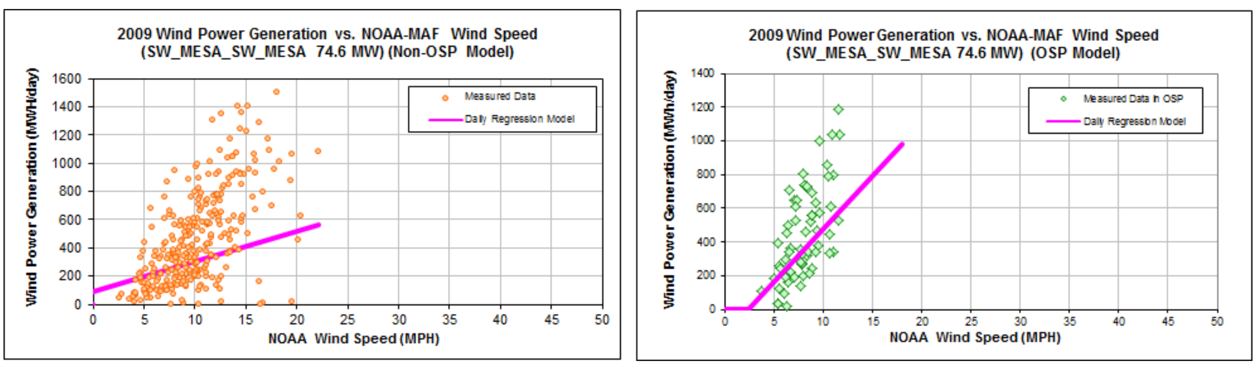


Figure 11-214: SW_MESA_SW_MESA – Daily Wind Power vs. NOAA Wind Speed (Using OSP and Non-OSP Model)

Table 11-205: SW_MESA_SW_MESA – Model Coefficients

Using Non-OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	90.7037
Left Slope (MWh/mph-day)	21.5694
RMSE (MWh/day)	159.1949
R2	0.1368
CV-RMSE	56.1%

Using OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-148.8632
Left Slope (MWh/mph-day)	62.5888
RMSE (MWh/day)	148.3699
R2	0.3602
CV-RMSE	44.5%

Table 11-206: SW_MESA_SW_MESA – Comparison of Predicted Power vs. Measured Power

Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-09	31	9.45	11,290	9,129	19.14%	20%	16%
Feb-09	28	11.28	15,256	9,349	38.72%	30%	19%
Mar-09	31	11.01	15,441	10,177	34.09%	28%	18%
Apr-09	29	13.32	17,996	10,964	39.08%	35%	21%
May-09	31	10.53	14,208	9,854	30.64%	26%	18%
Jun-09	30	10.16	13,974	9,296	33.48%	26%	17%
Jul-09	31	8.18	13,962	9,705	30.49%	25%	17%
Aug-09	31	8.31	15,970	11,509	27.94%	29%	21%
Sep-09	30	8.06	10,180	8,989	11.69%	19%	17%
Oct-09	31	10.08	16,045	9,554	40.45%	29%	17%
Nov-09	30	7.49	11,039	7,566	31.46%	21%	14%
Dec-09	30	8.34	10,930	8,117	25.74%	20%	15%
Total	363	9.67	166,290	114,211	31.32%	26%	18%
Total in OSP (07/15-09/15)	63	8.01	27,814	22,215	20.13%	25%	20%

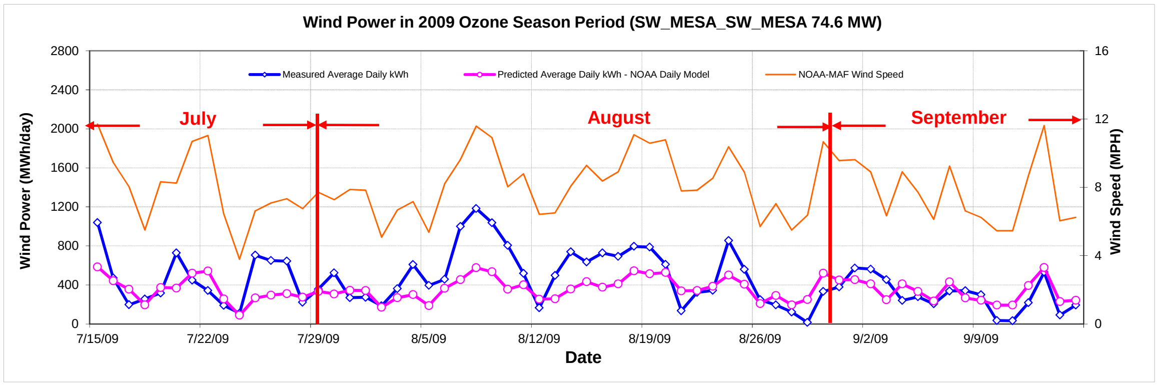


Figure 11-215: SW_MESA_SW_MESA – Predicted Wind Power in OSP Using NOAA Wind Speed (2009)

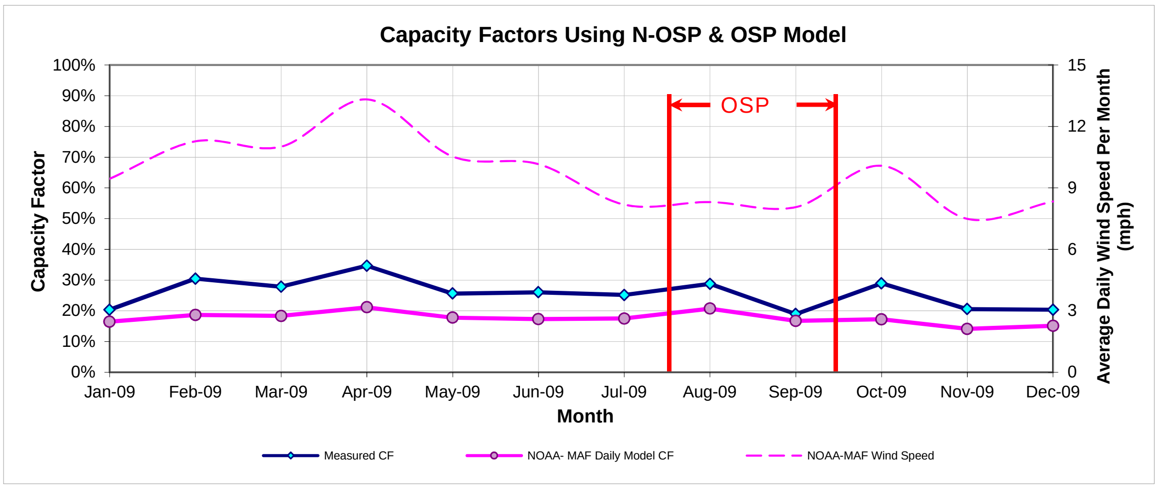


Figure 11-216: SW_MESA_SW_MESA – Predicted Capacity Factors Using Daily Models (2009)

Table 11-207: SW_MESA_SW_MESA – Predicted Power Production in 1999

Annual

1999 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
128,331	167,206

OSD

1999 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
444	441

11.45 Sweetwater Wind 1

Table 11-208: Site Information for Sweetwater Wind 1

GENSITECODE_ERCOT	Renewable Energy	City	County	Date in Service	Capacity (MW)	Company	Facility	Wind Turbine Information	Region	PCA	Interconnection	Weather Station
SWEETWND	WIND	Sweetwater	NOLAN	Dec-03	37.5	DKR Development	Sweetwater Wind 1	GE Wind 1500 (25)	ERCOT	LCRA	LCRA	ABI

SUBGENCODE_ERCOT	GENSITECODE_ERCOT	Capacity (MW)
SWEETWND_WND1	SWEETWND	37.5

11.45.1 Sweetwater Wind 1 – SWEETWND_WND1

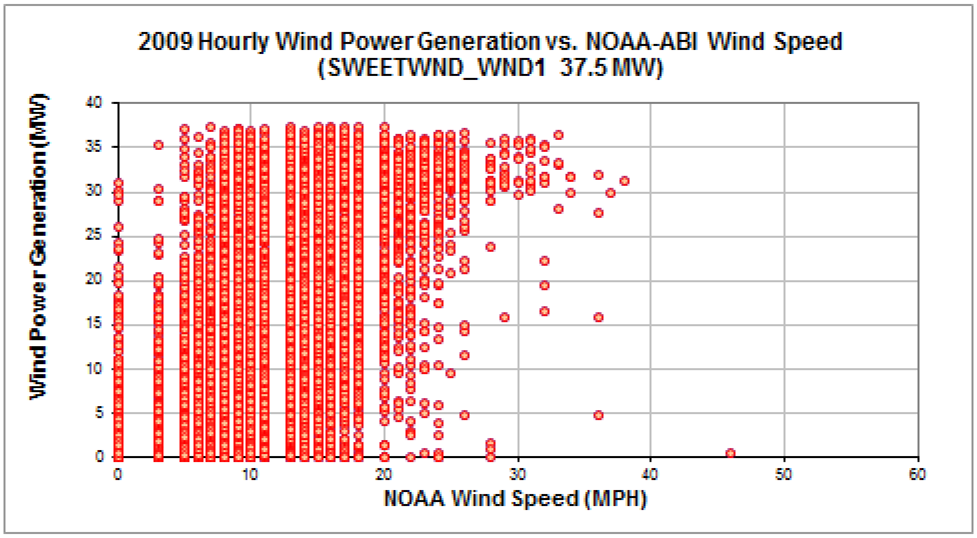


Figure 11-217: SWEETWND_WND1– Hourly Wind Power vs. NOAA Wind Speed (2009)

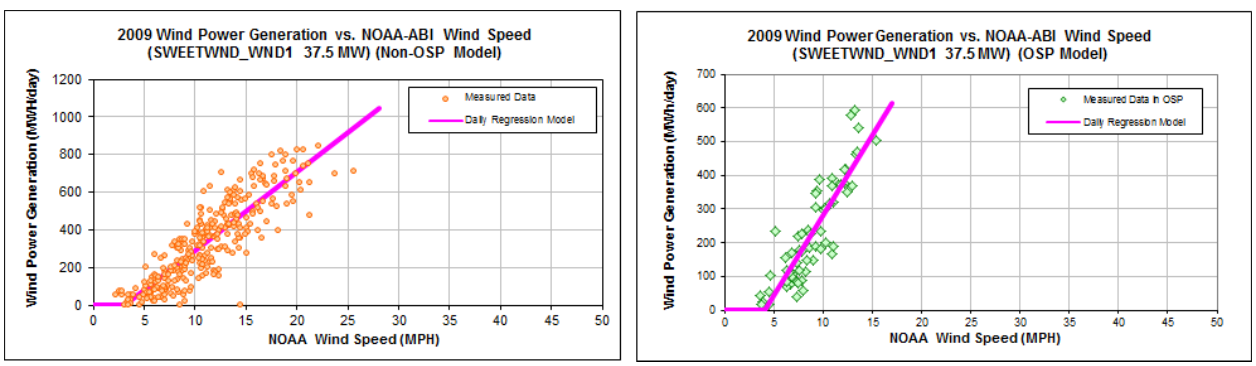


Figure 11-218: SWEETWND_WND1– Daily Wind Power vs. NOAA Wind Speed (Using OSP and Non-OSP Model)

Table 11-209: SWEETWND_WND1– Model Coefficients

Using Non-OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-129.7277
Left Slope (MWh/mph-day)	41.8363
RMSE (MWh/day)	106.5347
R2	0.7540
CV-RMSE	32.1%

Using OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-197.1474
Left Slope (MWh/mph-day)	47.7783
RMSE (MWh/day)	71.7909
R2	0.7752
CV-RMSE	31.4%

Table 11-210: SWEETWND_WND1– Comparison of Predicted Power vs. Measured Power

Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-09	31	10.70	10,710	9,857	7.96%	38%	35%
Feb-09	28	12.91	12,463	11,533	7.47%	49%	46%
Mar-09	31	13.29	12,746	13,217	-3.69%	46%	47%
Apr-09	30	14.82	13,450	14,705	-9.33%	50%	54%
May-09	31	10.10	7,850	9,080	-15.67%	28%	33%
Jun-09	30	11.31	8,894	10,308	-15.91%	33%	38%
Jul-09	31	8.90	7,024	7,231	-2.96%	25%	26%
Aug-09	31	9.59	8,523	8,107	4.88%	31%	29%
Sep-09	30	8.61	6,421	6,635	-3.33%	24%	25%
Oct-09	31	10.66	9,784	9,812	-0.29%	35%	35%
Nov-09	30	8.39	9,027	6,677	26.03%	33%	25%
Dec-09	30	8.81	7,412	7,167	3.30%	27%	27%
Total	364	10.66	114,304	114,330	-0.02%	35%	35%
Total in OSP (07/15-09/15)	63	8.91	14,409	14,455	-0.32%	25%	25%

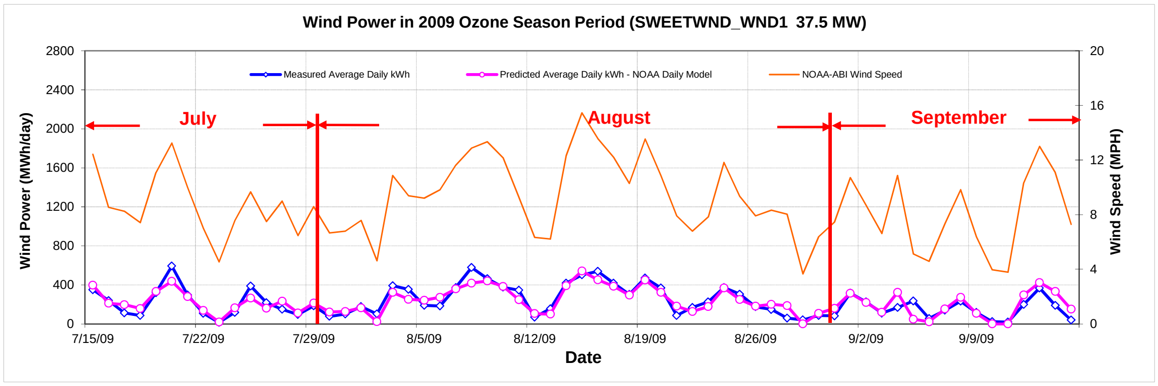


Figure 11-219: SWEETWND_WND1– Predicted Wind Power in OSP Using NOAA Wind Speed (2009)

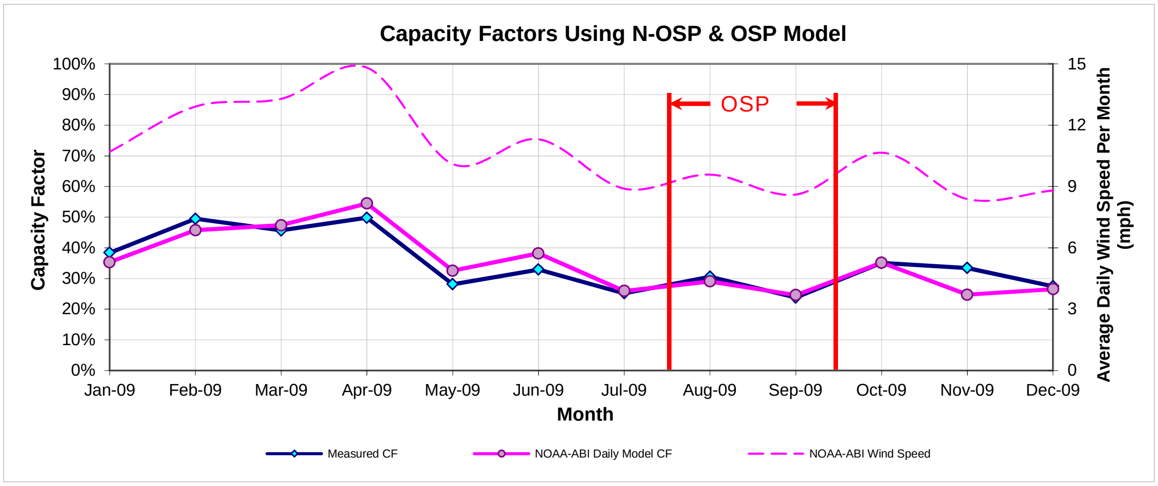


Figure 11-220: SWEETWND_WND1– Predicted Capacity Factors Using Daily Models (2009)

Table 11-211: SWEETWND_WND1– Predicted Power Production in 1999

Annual

1999 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
124,493	114,618

OSD

1999 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
267	229

11.46 Sweetwater Wind 2

Table 11-212: Site Information for Sweetwater Wind 2

GENSITECODE_ERCOT	Renewable Energy	City	County	Date in Service	Capacity (MW)	Company	Facility	Wind Turbine Information	Region	PCA	Interconnection	Weather Station
SWEETWN2	WIND	Sweetwater	NOLAN	Feb-05	100.3	DKRW Development	Sweetwater Wind 2	GE Wind 1500 (61)	ERCOT	TXU	TXU	ABI

SUBGENCODE_ERCOT	GENSITECODE_ERCOT	Capacity (MW)
SWEETWN2_WND2	SWEETWN2_WND2	100.3

11.46.1 Sweetwater Wind 2 – SWEETWN2_WND2

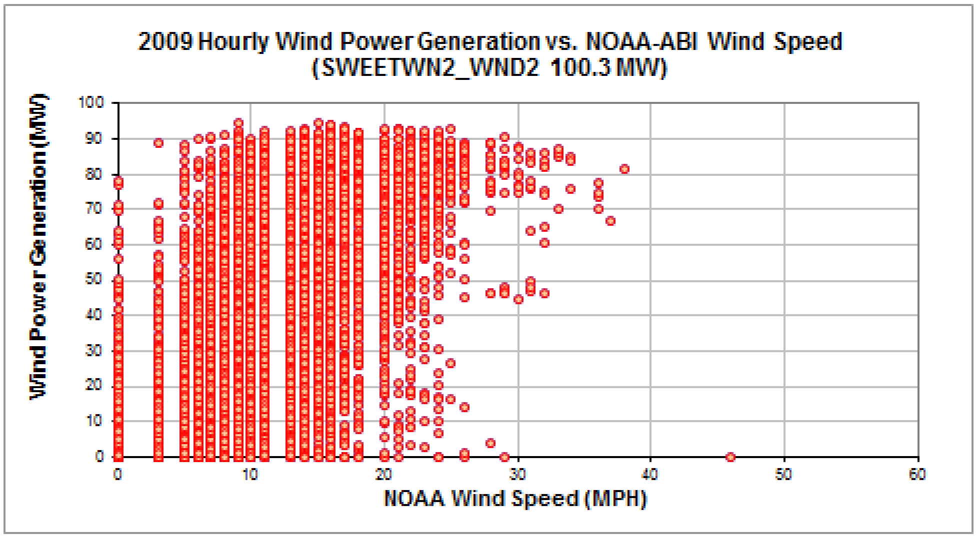


Figure 11-221: SWEETWN2_WND2– Hourly Wind Power vs. NOAA Wind Speed (2009)

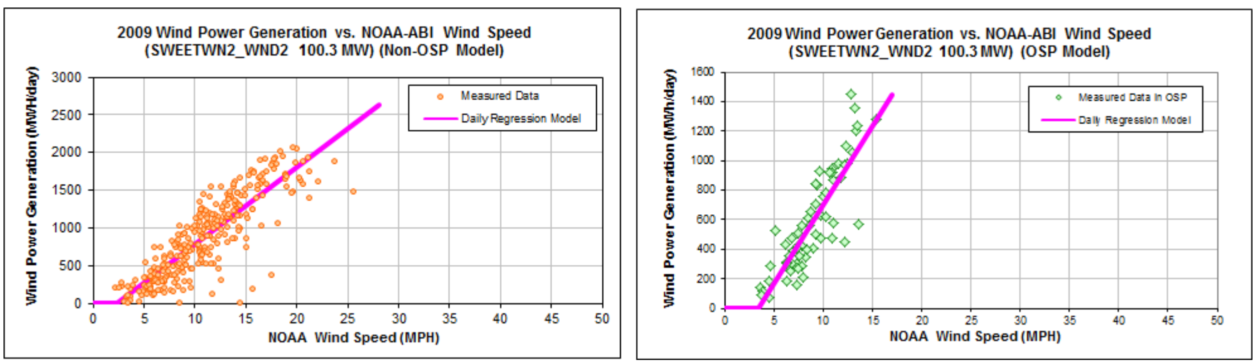


Figure 11-222: SWEETWN2_WND2– Daily Wind Power vs. NOAA Wind Speed (Using OSP and Non-OSP Model)

Table 11-213: SWEETWN2_WND2– Model Coefficients

Using Non-OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-238.6835
Left Slope (MWh/mph-day)	101.8973
RMSE (MWh/day)	276.2579
R2	0.7301
CV-RMSE	31.2%

Using OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-359.4556
Left Slope (MWh/mph-day)	106.0258
RMSE (MWh/day)	176.5916
R2	0.7373
CV-RMSE	30.2%

Table 11-214: SWEETWN2_WND2– Comparison of Predicted Power vs. Measured Power

Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-09	31	10.70	27,562	26,404	4.20%	37%	35%
Feb-09	28	12.91	32,113	30,176	6.03%	48%	45%
Mar-09	31	13.29	34,521	34,587	-0.19%	46%	46%
Apr-09	30	14.82	36,054	38,135	-5.77%	50%	53%
May-09	31	10.10	23,167	24,512	-5.81%	31%	33%
Jun-09	30	11.31	27,559	27,425	0.48%	38%	38%
Jul-09	31	8.90	18,709	19,250	-2.89%	25%	26%
Aug-09	31	9.59	20,540	20,362	0.87%	28%	27%
Sep-09	30	8.61	15,317	17,834	-16.44%	21%	25%
Oct-09	31	10.66	23,893	26,259	-9.90%	32%	35%
Nov-09	30	8.39	23,617	18,481	21.75%	33%	26%
Dec-09	30	8.81	20,368	19,775	2.91%	28%	27%
Total	364	10.66	303,421	303,199	0.07%	35%	35%
Total in OSP (07/15-09/15)	63	8.91	36,892	36,890	0.00%	24%	24%

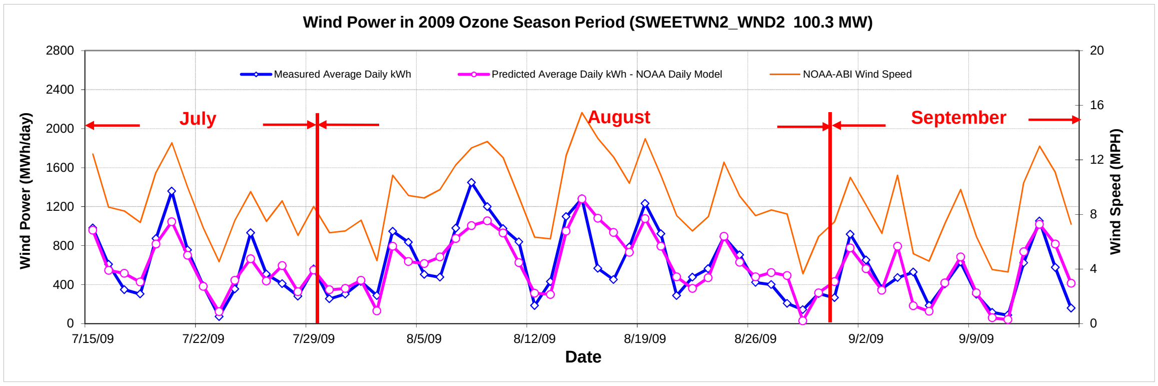


Figure 11-223: SWEETWN2_WND2– Predicted Wind Power in OSP Using NOAA Wind Speed (2009)

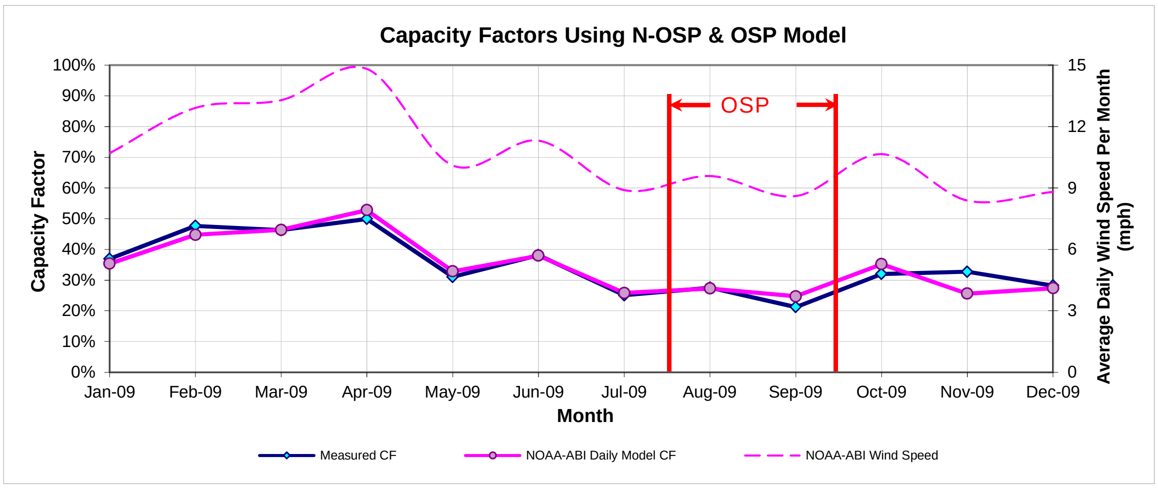


Figure 11-224: SWEETWN2_WND2– Predicted Capacity Factors Using Daily Models (2009)

Table 11-215: SWEETWN2_WND2– Predicted Power Production in 1999

Annual

1999 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
327,777	304,254

OSD

1999 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
670	586

11.47 Sweet Wind 24

Table 11-216: Site Information for Sweet Wind 24 – SWEETWN2_WND24

GENSITECODE_ERCOT	Renewable Energy	City	County	Date in Service	Capacity (MW)	Company	Facility	Wind Turbine Information	Region	PCA	Interconnection	Weather Station
SWEETWN2_WND24	WIND	Abilene	NOLAN	Feb-05	16	DKRW Development	SWEET WIND 24		ERCOT		LCRA	ABI

SUBGENCODE_ERCOT	GENSITECODE_ERCOT	Capacity (MW)
SWEETWN2_WND24	SWEETWN2_WND24	16

11.47.1 Sweetwater Wind 2 – SWEETWN2_WND24

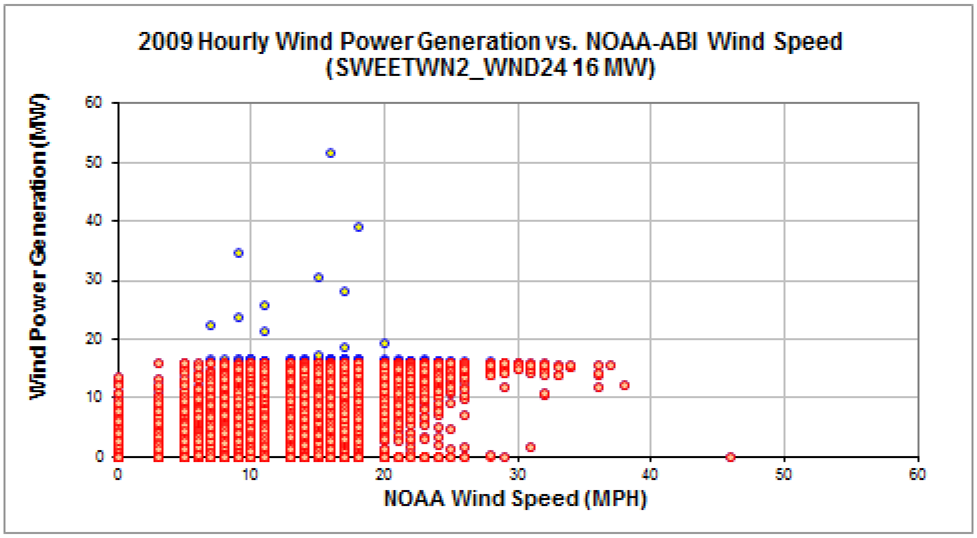


Figure 11-225: SWEETWN2_WND24– Hourly Wind Power vs. NOAA Wind Speed (2009)

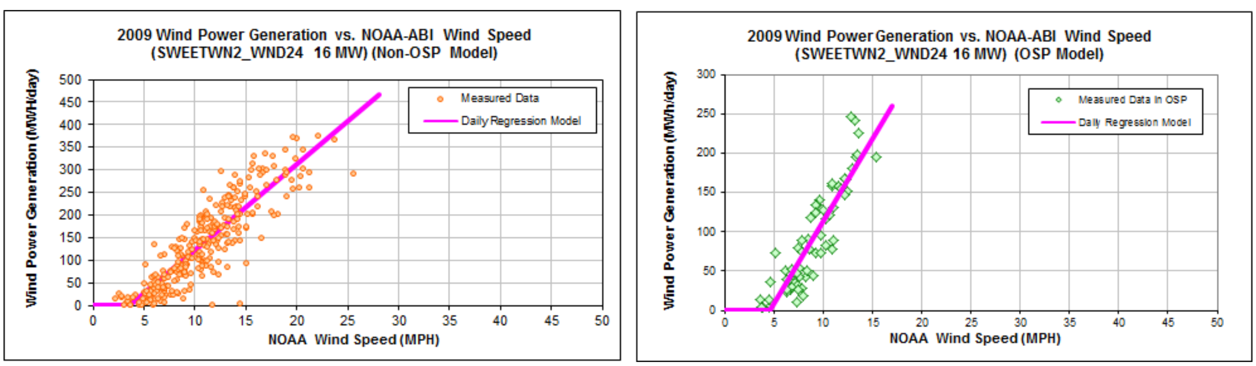


Figure 11-226: SWEETWN2_WND24– Daily Wind Power vs. NOAA Wind Speed (Using OSP and Non-OSP Model)

Table 11-217: SWEETWN2_WND24– Model Coefficients

Using Non-OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-68.1945
Left Slope (MWh/mph-day)	19.0411
RMSE (MWh/day)	45.0042
R2	0.7724
CV-RMSE	32.5%

Using OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-97.1956
Left Slope (MWh/mph-day)	21.0383
RMSE (MWh/day)	28.7682
R2	0.8064
CV-RMSE	31.8%

Table 11-218: SWEETWN2_WND24– Comparison of Predicted Power vs. Measured Power

Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-09	31	10.70	4,531	4,203	7.26%	38%	35%
Feb-09	27	12.73	5,280	4,730	10.42%	51%	46%
Mar-09	28	13.25	5,282	5,153	2.44%	49%	48%
Apr-09	28	14.53	5,301	5,836	-10.10%	49%	54%
May-09	31	10.10	3,248	3,854	-18.66%	27%	32%
Jun-09	29	11.16	3,926	4,185	-6.61%	35%	38%
Jul-09	31	8.90	2,768	2,935	-6.05%	23%	25%
Aug-09	31	9.59	3,365	3,258	3.18%	28%	27%
Sep-09	30	8.61	2,708	2,707	0.02%	24%	24%
Oct-09	28	9.85	3,001	3,359	-11.92%	28%	31%
Nov-09	30	8.39	3,634	2,795	23.09%	32%	24%
Dec-09	29	9.00	2,863	2,994	-4.58%	26%	27%
Total	353	10.51	45,907	46,009	-0.22%	34%	34%
Total in OSP (07/15-09/15)	63	8.91	5,691	5,744	-0.94%	24%	24%

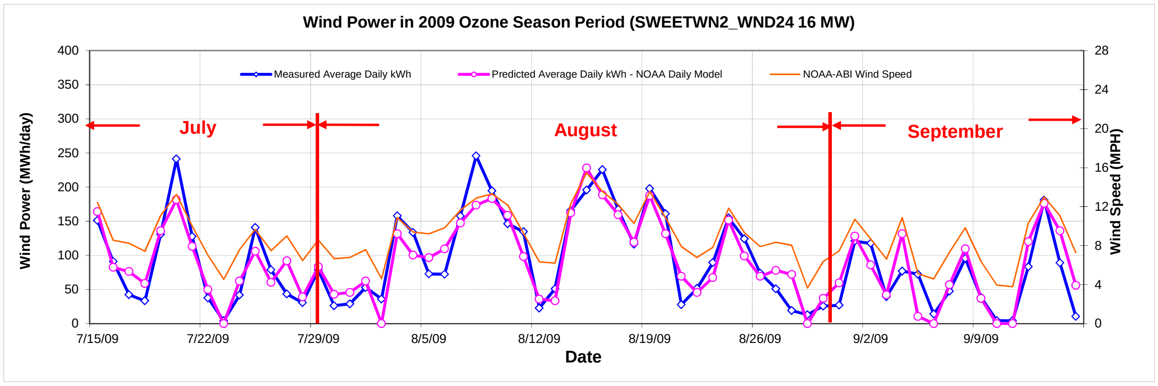


Figure 11-227: SWEETWN2_WND24– Predicted Wind Power in OSP Using NOAA Wind Speed (2009)

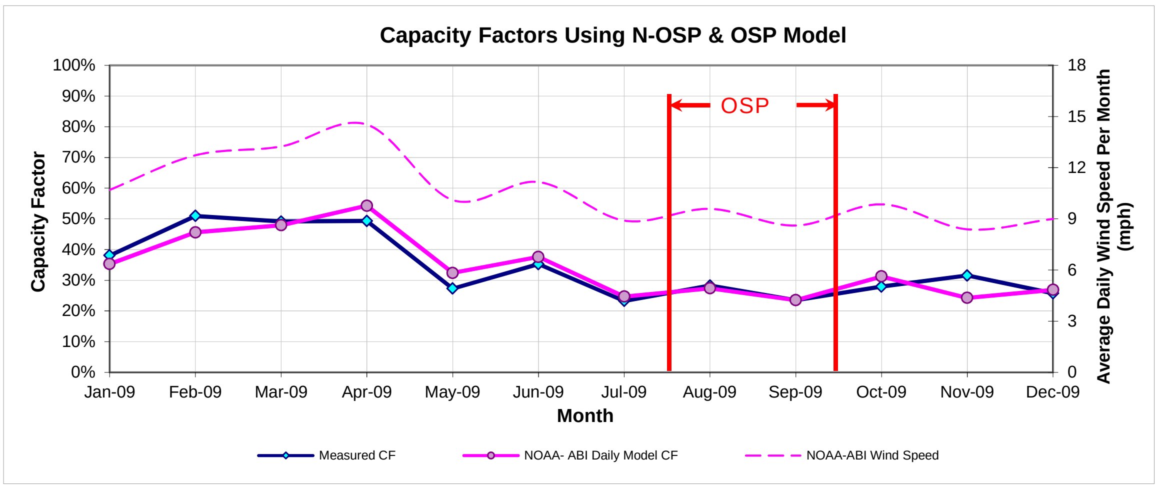


Figure 11-228: SWEETWN2_WND24– Predicted Capacity Factors Using Daily Models (2009)

Table 11-219: SWEETWN2_WND24– Predicted Power Production in 1999

Annual

1999 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
53,003	47,468

OSD

1999 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
107	90

11.48 Sweetwater Wind 3

Table 11-220: Site Information for Sweetwater Wind 3

GENSITECODE_ERCOT	Renewable Energy	City	County	Date in Service	Capacity (MW)	Company	Facility	Wind Turbine Information	Region	PCA	Interconnection	Weather Station
SWEETWN3	WIND	Sweetwater	NOLAN	Dec-05	135	DKRW Development	Sweetwater Wind 3	GE Energy 1.5 MW (90)	ERCOT	TXU	TXU	ABI

SUBGENCODE_ERCOT	GENSITECODE_ERCOT	Capacity (MW)
SWEETWN3_WND3	SWEETWN3	135

11.48.1 Sweetwater Wind 3 – SWEETWN3_WND3

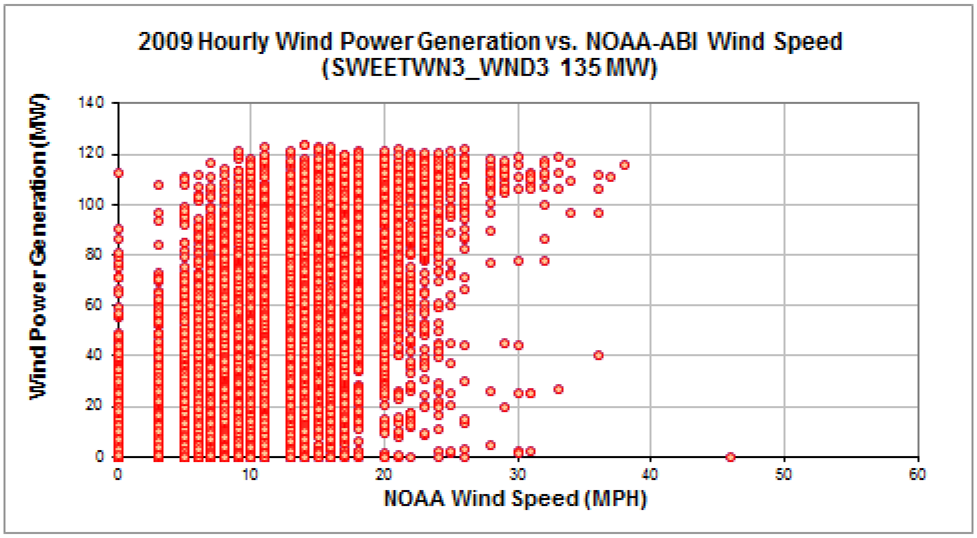


Figure 11-229: SWEETWN3_WND3 – Hourly Wind Power vs. NOAA Wind Speed (2009)

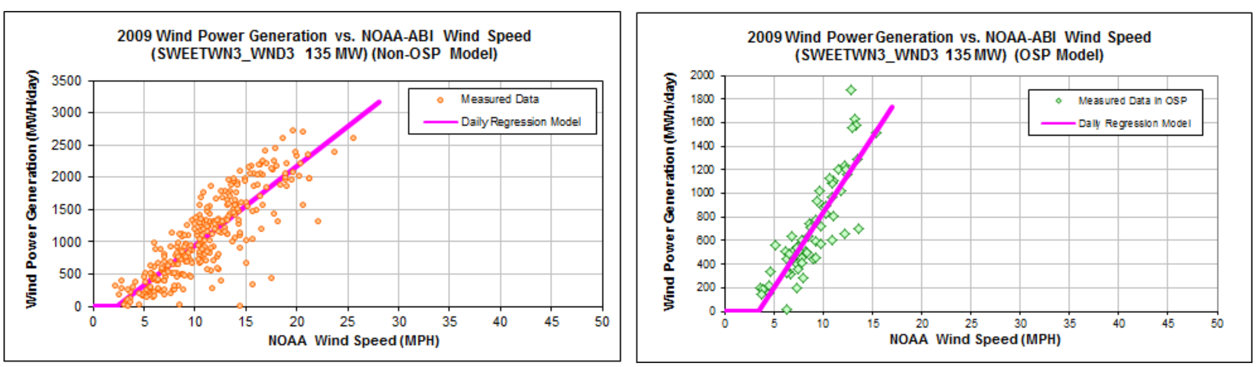


Figure 11-230: SWEETWN3_WND3 – Daily Wind Power vs. NOAA Wind Speed (Using OSP and Non-OSP Model)

Table 11-221: SWEETWN3_WND3 – Model Coefficients

Using Non-OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-281.4839
Left Slope (MWh/mph-day)	122.8570
RMSE (MWh/day)	341.2370
R2	0.7204
CV-RMSE	31.8%

Using OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-439.4850
Left Slope (MWh/mph-day)	128.0264
RMSE (MWh/day)	210.8535
R2	0.7416
CV-RMSE	30.1%

Table 11-222: SWEETWN3_WND3– Comparison of Predicted Power vs. Measured Power

Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-09	31	10.70	33,889	32,030	5.49%	34%	32%
Feb-09	28	12.91	37,726	36,553	3.11%	42%	40%
Mar-09	31	13.29	45,058	41,896	7.02%	45%	42%
Apr-09	30	14.82	45,426	46,168	-1.63%	47%	47%
May-09	31	10.10	28,314	29,749	-5.07%	28%	30%
Jun-09	30	11.31	32,920	33,256	-1.02%	34%	34%
Jul-09	31	8.90	22,551	23,221	-2.98%	22%	23%
Aug-09	31	9.59	23,806	24,418	-2.57%	24%	24%
Sep-09	30	8.61	18,851	21,529	-14.20%	19%	22%
Oct-09	31	10.66	27,917	31,856	-14.11%	28%	32%
Nov-09	30	8.39	26,123	22,471	13.98%	27%	23%
Dec-09	30	8.81	24,771	24,032	2.99%	25%	25%
Total	364	10.66	367,352	367,178	0.05%	31%	31%
Total in OSP (07/15-09/15)	63	8.91	44,204	44,202	0.00%	22%	22%

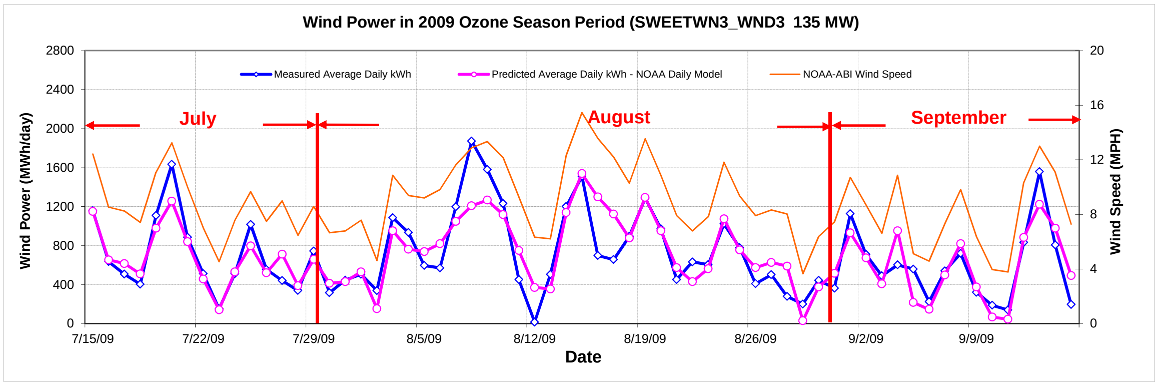


Figure 11-231: SWEETWN3_WND3– Predicted Wind Power in OSP Using NOAA Wind Speed (2009)

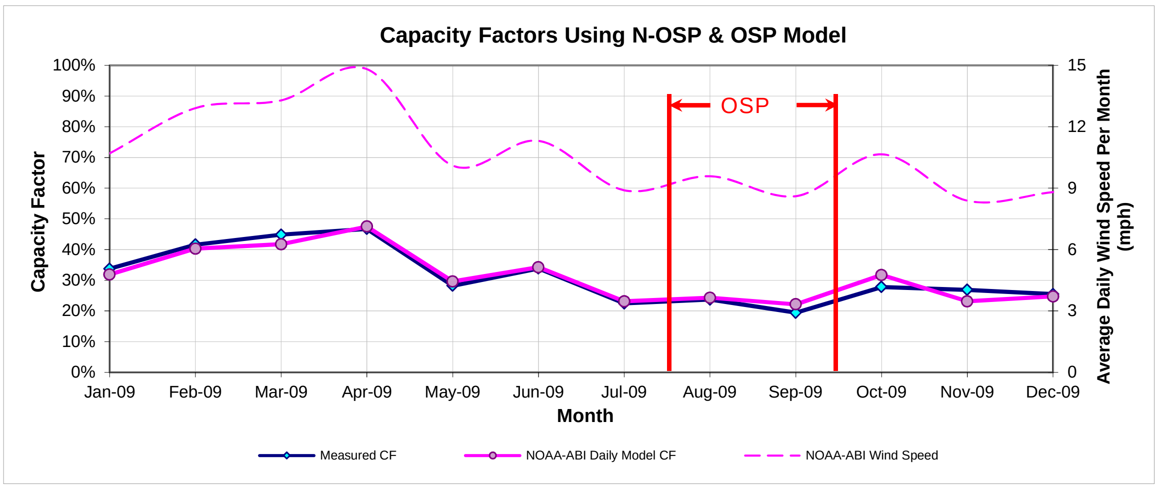


Figure 11-232: SWEETWN3_WND3– Predicted Capacity Factors Using Daily Models (2009)

Table 11-223: SWEETWN3_WND3– Predicted Power Production in 1999

Annual

1999 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
396,834	368,362

OSD

1999 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
804	702

11.49 Sweetwater Wind 4

Table 11-224: Site Information for Sweetwater Wind 4 – SWEETWN4_WND4A

GENSITECODE_ERCOT	Renewable Energy	City	County	Date in Service	Capacity (MW)	Company	Facility	Wind Turbine Information	Region	PCA	Interconnection	Weather Station
SWEETWN4	WIND	Abilene	NOLAN	May-07	240.8	DKRW/ Babcock Brown	SWEET WIND 4	Mitsubishi	ERCOT		LCRA	ABI

SUBGENCODE_ERCOT	GENSITECODE_ERCOT	Capacity (MW)
SWEETWN4_WND4A	SWEETWN4_WND4A	135
SWEETWN4_WND4B	SWEETWN4_WND4B	105.8

11.49.1 Sweetwater Wind 4 – SWEETWN4_WND4A

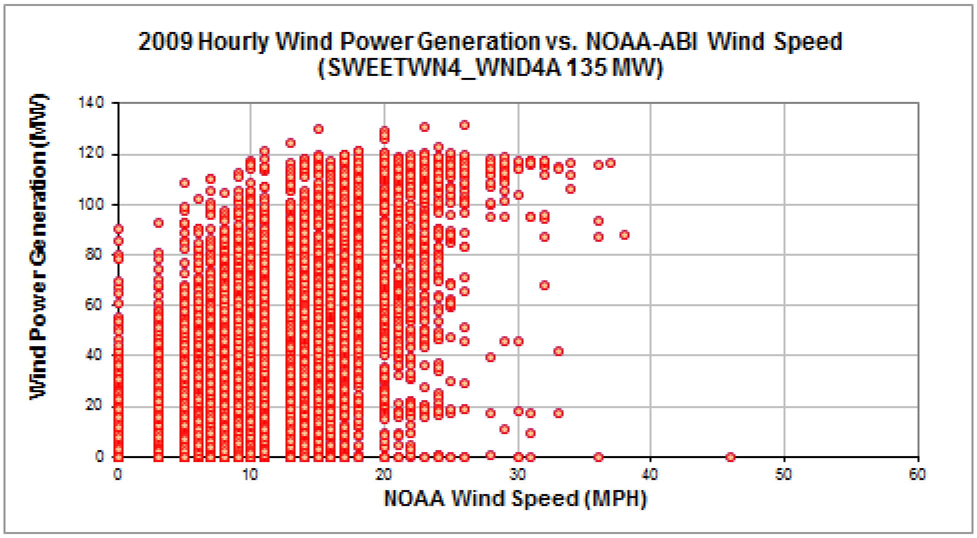


Figure 11-233: SWEETWN4_WND4A– Hourly Wind Power vs. NOAA Wind Speed (2009)

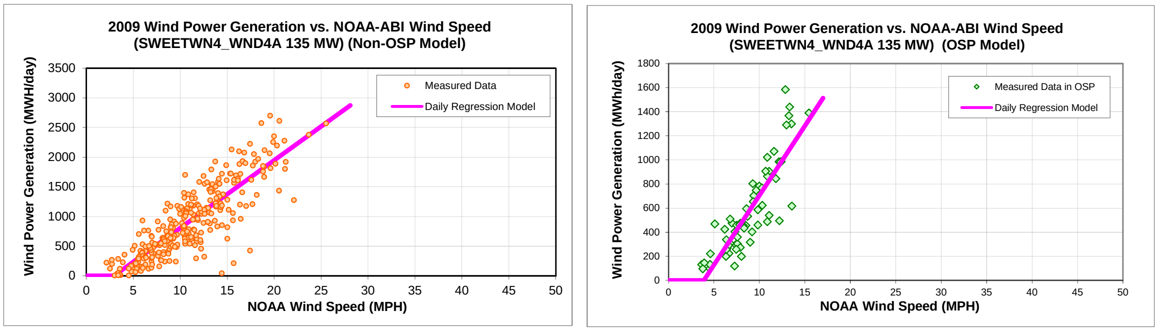


Figure 11-234: SWEETWN4_WND4A– Daily Wind Power vs. NOAA Wind Speed (Using OSP and Non-OSP Model)

Table 11-225: SWEETWN4_WND4A– Model Coefficients

Using Non-OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-338.1495
Left Slope (MWh/mph-day)	114.2806
RMSE (MWh/day)	311.4614
R2	0.7284
CV-RMSE	33.8%

Using OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-447.6865
Left Slope (MWh/mph-day)	115.2568
RMSE (MWh/day)	187.4116
R2	0.7465
CV-RMSE	32.3%

Table 11-226: SWEETWN4_WND4A– Comparison of Predicted Power vs. Measured Power

Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-09	31	10.70	29,398	27,428	6.70%	29%	27%
Feb-09	28	12.91	33,828	31,941	5.58%	37%	35%
Mar-09	30	13.45	38,375	35,982	6.24%	39%	37%
Apr-09	30	14.82	40,665	40,656	0.02%	42%	42%
May-09	31	10.10	23,975	25,306	-5.55%	24%	25%
Jun-09	30	11.31	26,398	28,645	-8.51%	27%	29%
Jul-09	31	8.90	17,462	19,316	-10.62%	17%	19%
Aug-09	31	9.59	20,630	20,394	1.14%	21%	20%
Sep-09	30	8.61	14,219	17,851	-25.55%	15%	18%
Oct-09	31	10.66	25,936	27,290	-5.22%	26%	27%
Nov-09	30	8.39	22,302	18,686	16.21%	23%	19%
Dec-09	30	8.81	20,321	20,065	1.26%	21%	21%
Total	363	10.67	313,509	313,559	-0.02%	27%	27%
Total in OSP (07/15-09/15)	63	8.91	36,517	36,552	-0.10%	18%	18%

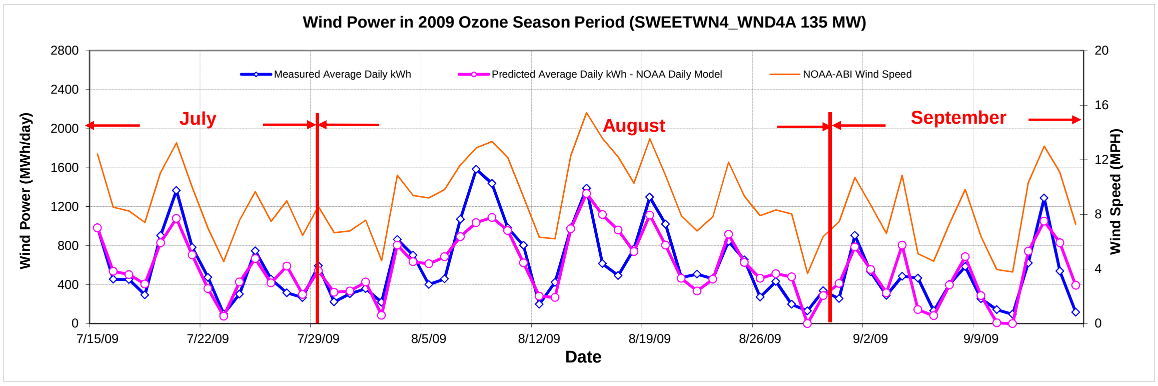


Figure 11-235: SWEETWN4_WND4A – Predicted Wind Power in OSP Using NOAA Wind Speed (2009)

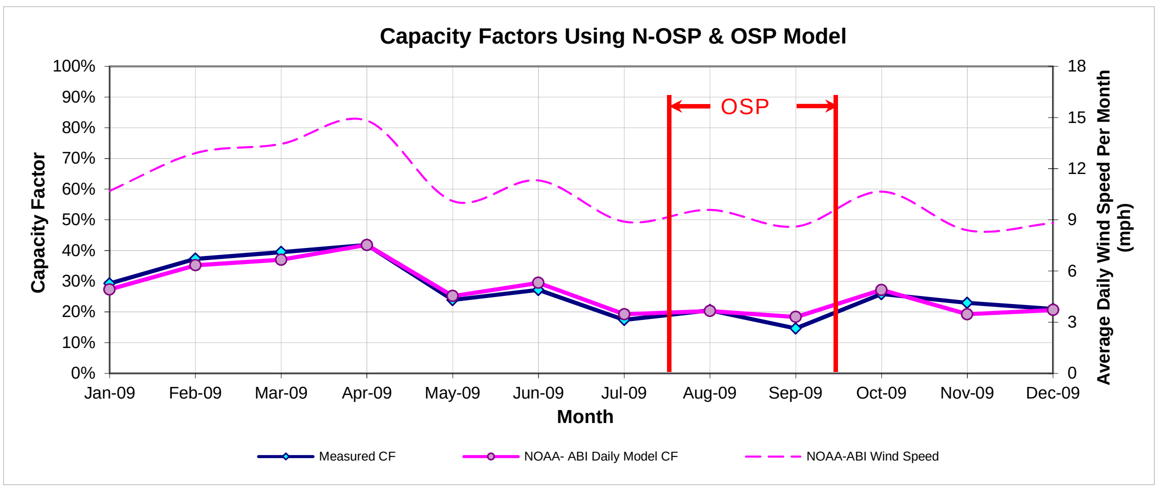


Figure 11-236: SWEETWN4_WND4A – Predicted Capacity Factors Using Daily Models (2009)

Table 11-227: SWEETWN4_WND4A – Predicted Power Production in 1999

Annual

1999 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
341,340	315,236

OSD

1999 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
671	580

11.49.2 Sweetwater Wind 4 – SWEETWN4_WND4B

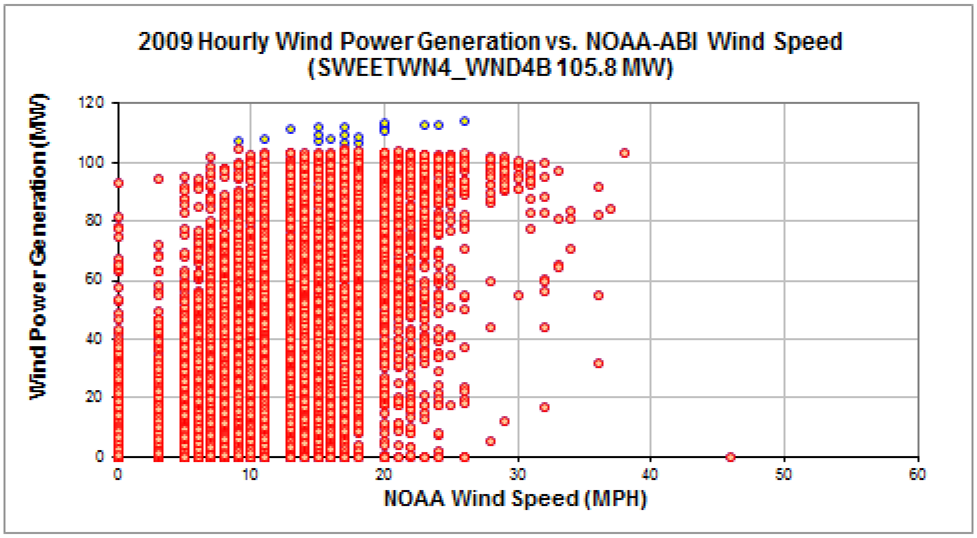


Figure 11-237: SWEETWN4_WND4B – Hourly Wind Power vs. NOAA Wind Speed (2009)

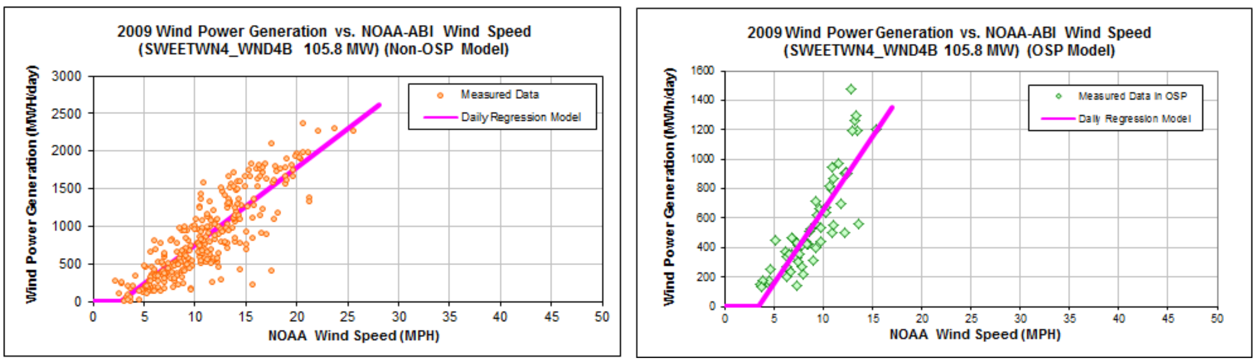


Figure 11-238: SWEETWN4_WND4B – Daily Wind Power vs. NOAA Wind Speed (Using OSP and Non-OSP Model)

Table 11-228: SWEETWN4_WND4B – Model Coefficients

Using Non-OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-282.4528
Left Slope (MWh/mph-day)	102.9875
RMSE (MWh/day)	275.8340
R2	0.7343
CV-RMSE	32.5%

Using OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-341.0764
Left Slope (MWh/mph-day)	99.7798
RMSE (MWh/day)	164.2443
R2	0.7418
CV-RMSE	30.0%

Table 11-229: SWEETWN4_WND4B – Comparison of Predicted Power vs. Measured Power

Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-09	30	10.58	28,084	24,203	13.82%	37%	32%
Feb-09	28	12.91	32,027	29,386	8.25%	45%	41%
Mar-09	30	13.45	33,959	33,095	2.55%	45%	43%
Apr-09	30	14.82	35,161	37,306	-6.10%	46%	49%
May-09	31	10.10	22,265	23,496	-5.53%	28%	30%
Jun-09	30	11.31	25,016	26,482	-5.86%	33%	35%
Jul-09	31	8.90	16,611	18,188	-9.49%	21%	23%
Aug-09	31	9.59	19,021	19,075	-0.28%	24%	24%
Sep-09	30	8.61	13,982	16,857	-20.57%	18%	22%
Oct-09	30	10.39	21,886	23,623	-7.94%	29%	31%
Nov-09	30	8.39	21,066	17,463	17.10%	28%	23%
Dec-09	30	8.81	18,938	18,750	0.99%	25%	25%
Total	361	10.63	288,017	287,925	0.03%	31%	31%
Total in OSP (07/15-09/15)	63	8.91	34,543	34,541	0.00%	22%	22%

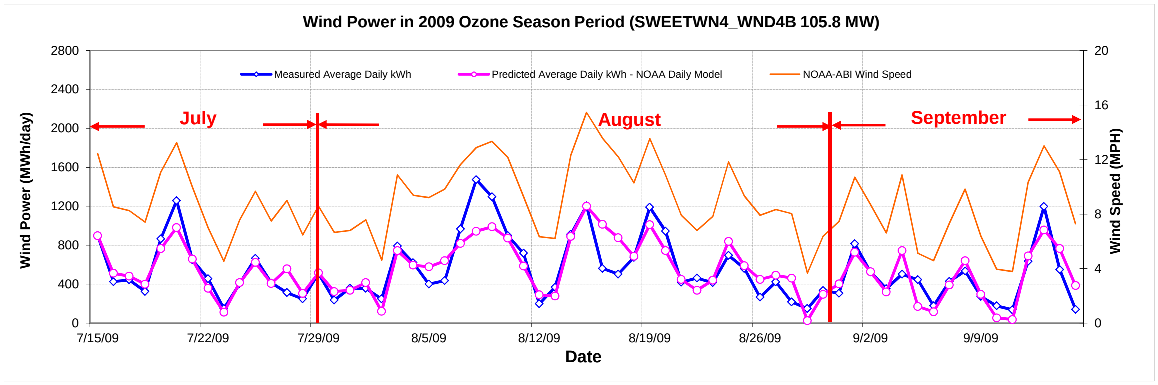


Figure 11-239: SWEETWN4_WND4B – Predicted Wind Power in OSP Using NOAA Wind Speed (2009)

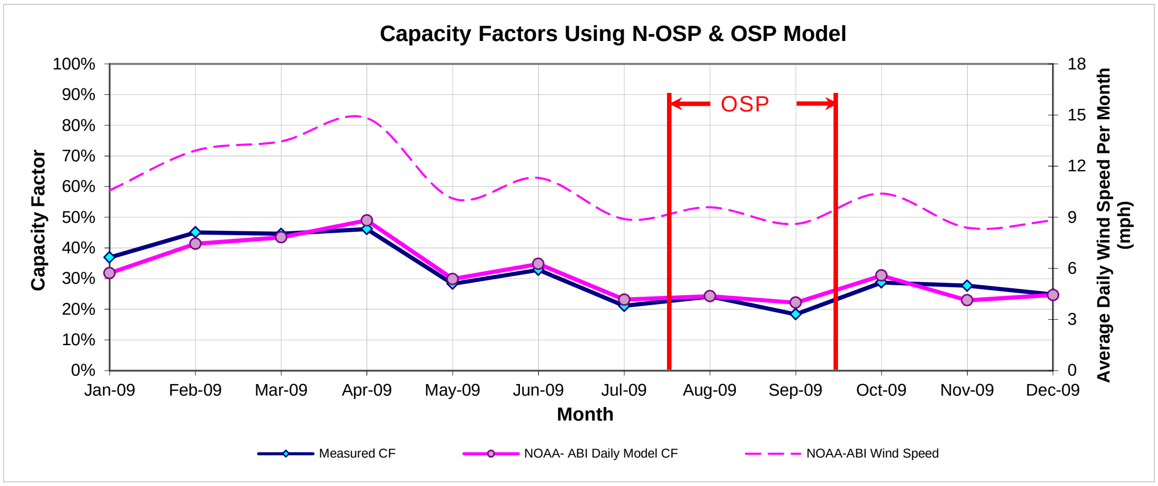


Figure 11-240: SWEETWN4_WND4B – Predicted Capacity Factors Using Daily Models (2009)

Table 11-230: SWEETWN4_WND4B – Predicted Power Production in 1999

Annual

1999 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
315,745	291,208

OSD

1999 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
628	548

11.50 Sweetwater Wind 5

Table 11-231: Site Information for Sweetwater Wind 5

GENSITECODE_ERCOT	Renewable Energy	City	County	Date in Service	Capacity (MW)	Company	Facility	Wind Turbine Information	Region	PCA	Interconnection	Weather Station
SWEETWND4_WND 5	WIND	Sweetwater	Nolan	Dec-07	80.5	DKRW/BabockBrown	Sweetwater Wind 5	Siemens	ERCOT		LCRA	ABI

SUBGENCODE_ERCOT	GENSITECODE_ERCOT	Capacity (MW)
SWEETWND4_WND 5	SWEETWND4_WND 5	80.5

11.50.1 Sweetwater Wind 5 – SWEETWN4_WND5

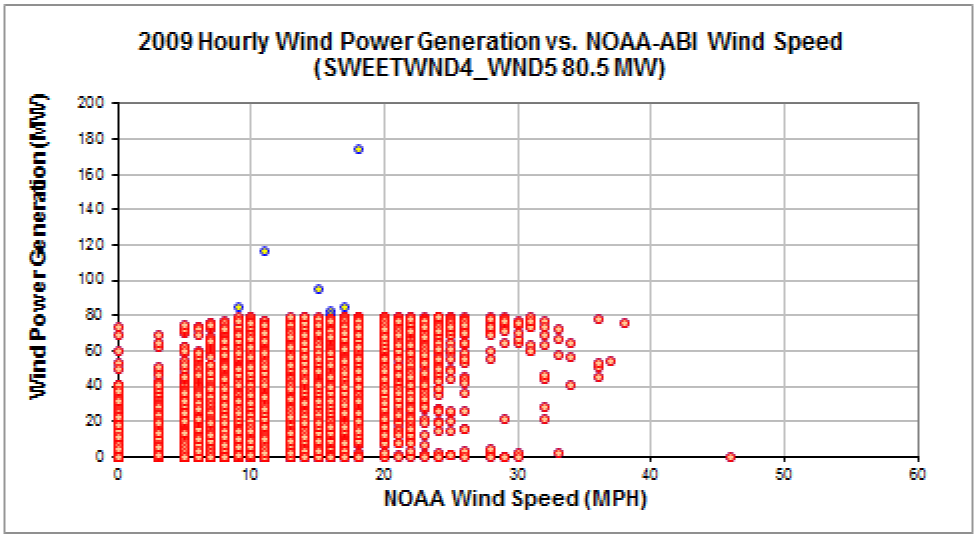
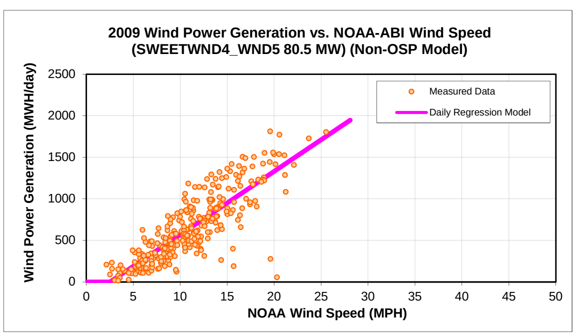


Figure 11-241: SWEETWN4_WND5– Hourly Wind Power vs. NOAA Wind Speed (2009)



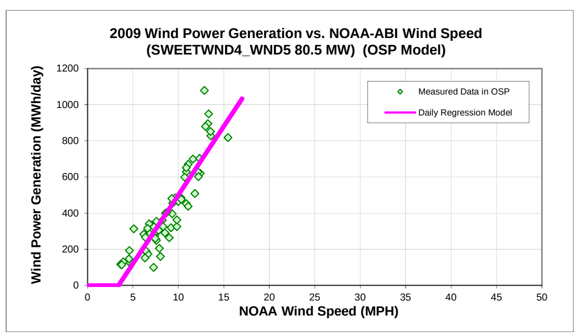


Figure 11-242: SWEETWN4_WND5– Daily Wind Power vs. NOAA Wind Speed (Using OSP and Non-OSP Model)

Table 11-232: SWEETWN4_WND5– Model Coefficients

Using Non-OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-193.9816
Left Slope (MWh/mph-day)	76.1860
RMSE (MWh/day)	224.3806
R2	0.6970
CV-RMSE	34.7%

Using OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-260.5978
Left Slope (MWh/mph-day)	76.0460
RMSE (MWh/day)	102.3617
R2	0.8112
CV-RMSE	24.5%

Table 11-233: SWEETWN4_WND5 – Comparison of Predicted Power vs. Measured Power

Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-09	30	10.58	21,084	18,353	12.95%	36%	32%
Feb-09	28	12.91	25,598	22,143	13.50%	47%	41%
Mar-09	30	13.45	24,787	24,931	-0.58%	43%	43%
Apr-09	30	14.82	30,558	28,047	8.22%	53%	48%
May-09	31	10.10	16,459	17,845	-8.43%	27%	30%
Jun-09	30	11.31	16,909	20,040	-18.51%	29%	35%
Jul-09	31	8.90	12,669	13,847	-9.30%	21%	23%
Aug-09	31	9.59	14,557	14,518	0.27%	24%	24%
Sep-09	30	8.61	11,244	12,838	-14.18%	19%	22%
Oct-09	31	10.66	15,742	19,152	-21.67%	26%	32%
Nov-09	30	8.39	15,387	13,352	13.23%	27%	23%
Dec-09	30	8.81	14,451	14,320	0.91%	25%	25%
Total	362	10.66	219,445	219,385	0.03%	31%	31%
Total in OSP (07/15-09/15)	63	8.91	26,285	26,284	0.00%	22%	22%

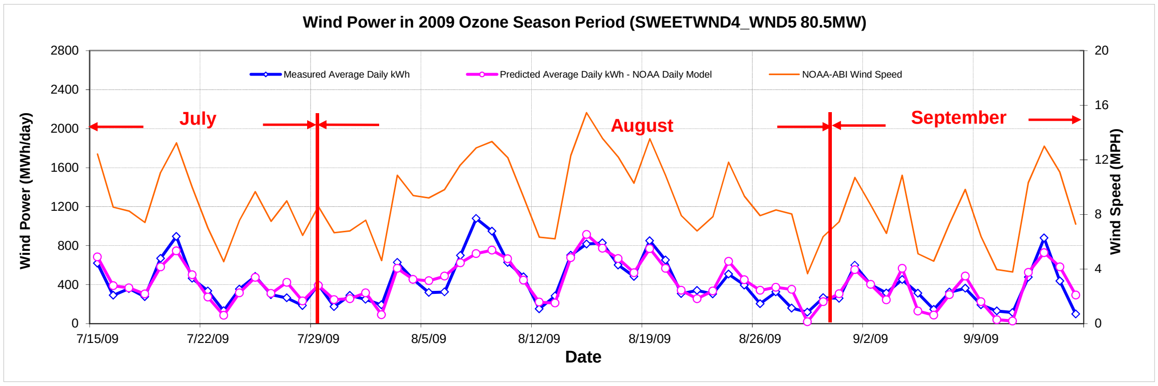


Figure 11-243: SWEETWN4_WND5 – Predicted Wind Power in OSP Using NOAA Wind Speed (2009)

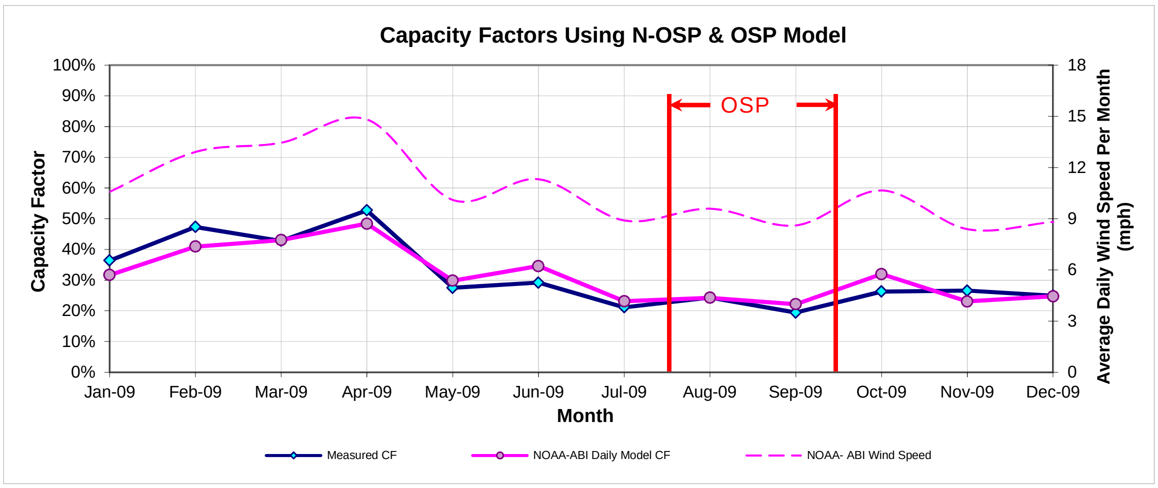


Figure 11-244: SWEETWN4_WND5 – Predicted Capacity Factors Using Daily Models (2009)

Table 11-234: SWEETWN4_WND5 – Predicted Power Production in 1999

Annual

1999 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
238,924	221,263

OSD

1999 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
478	417

11.51 Gulf Wind 1

Table 11-235: Site Information for Gulf Wind 1

	Renewable Energy	City	County	Date in Service	Capacity (MW)	Company	Facility	Wind Turbine Information	Region	PCA	Interconnection	Weather Station
TGW_T1	WIND		Kenedy	Nov-08	283.2	Babcock & Brown	Gulf Wind 1	Mitsubishi (59)	ERCOT	AEP-West	AEP-TNC	CRP

SUBGENCODE_ERCOT	GENSITECODE_ERCOT	Capacity (MW)
TGW_T1	TGW_T1	141.6
TGW_T2	TGW_T2	141.6

11.51.1 Gulf Wind 1 – TGW_T1

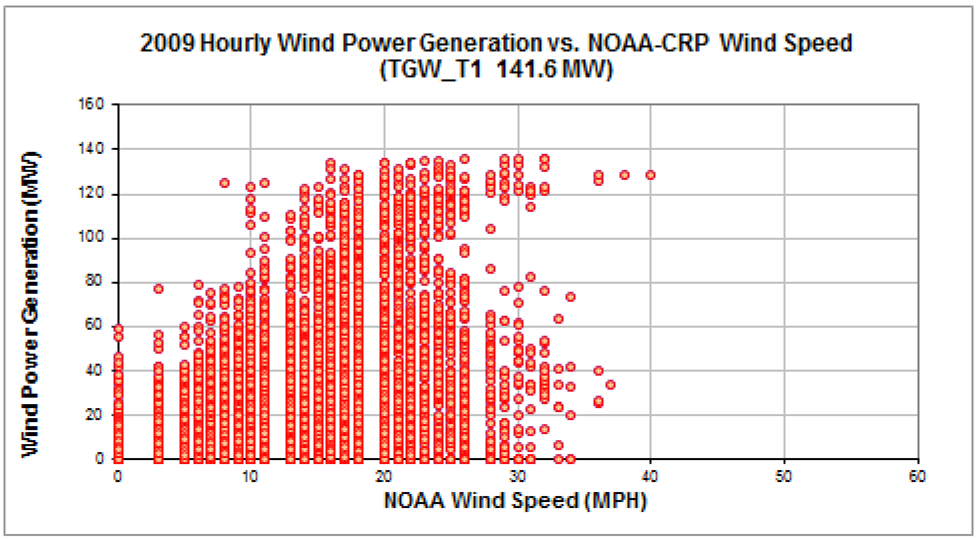


Figure 11-245: TGW_T1- Hourly Wind Power vs. NOAA Wind Speed (2009)

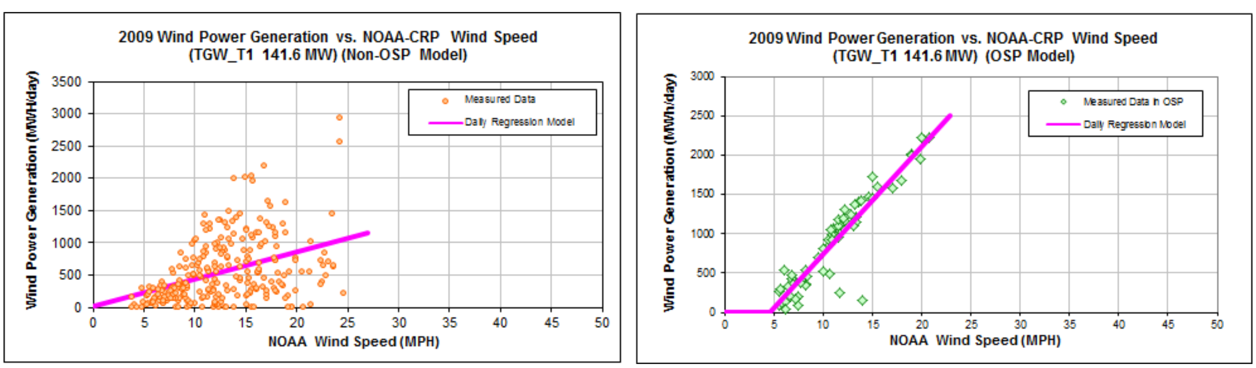


Figure 11-246: TGW_T1- Daily Wind Power vs. NOAA Wind Speed (Using OSP and Non OSP Model)

Table 11-236: TGW_T1 – Model Coefficients

Using Non-OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	16.0187
Left Slope (MWh/mph-day)	42.4518
RMSE (MWh/day)	453.8626
R2	0.1674
CV-RMSE	82.2%

Using OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-628.0718
Left Slope (MWh/mph-day)	136.6462
RMSE (MWh/day)	229.1989
R2	0.8628
CV-RMSE	25.0%

Table 11-237: TGW_T1 – Comparison of Predicted Power vs. Measured Power

Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-09	10	12.85	11	5,615	-52064.32%	0%	17%
Feb-09	21	14.70	2,064	13,445	-551.42%	3%	19%
Mar-09	31	14.28	11,210	19,296	-72.13%	11%	18%
Apr-09	27	15.89	11,413	18,644	-63.35%	12%	20%
May-09	29	13.29	8,779	16,823	-91.63%	9%	17%
Jun-09	29	13.01	21,345	16,485	22.77%	22%	17%
Jul-09	31	14.27	38,620	33,144	14.18%	37%	31%
Aug-09	29	11.08	25,174	25,695	-2.07%	26%	26%
Sep-09	30	8.13	13,008	11,038	15.15%	13%	11%
Oct-09	31	12.67	31,209	17,175	44.97%	30%	16%
Nov-09	30	9.10	18,133	12,075	33.41%	18%	12%
Dec-09	30	10.76	22,648	14,184	37.37%	22%	14%
Total	328	12.39	203,615	203,619	0.00%	18%	18%
Total in OSP (07/15-09/15)	61	11.30	55,920	55,911	0.02%	27%	27%

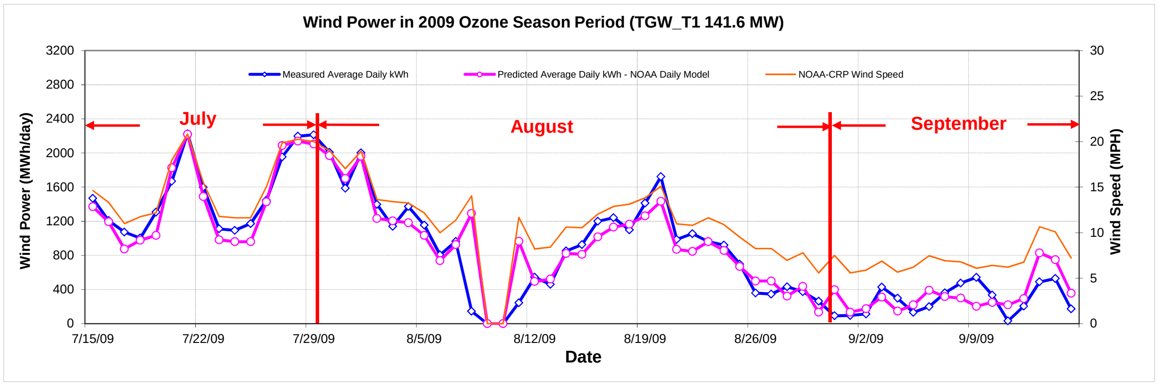


Figure 11-247: TGW_T1 - Predicted Wind Power in OSP Using NOAA Wind Speed (2009)

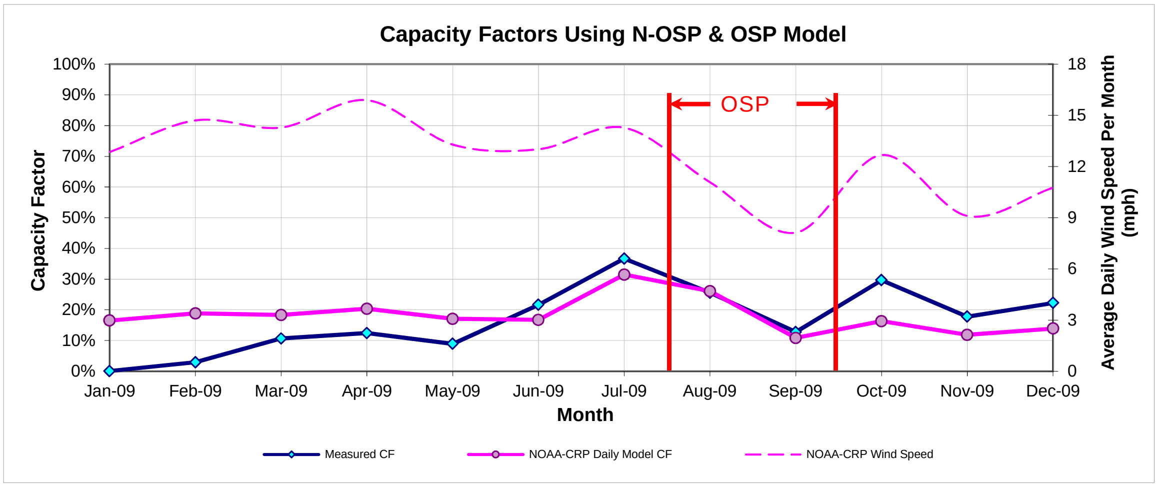


Figure 11-248: TGW_T1 – Predicted Capacity Factors Using Daily Models (2009)

Table 11-238: TGW_T1 – Predicted Power Production in 1999

Annual

1999 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
183,968	226,583

OSD

1999 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
517	917

11.51.2 Gulf Wind 1 – TGW_T2

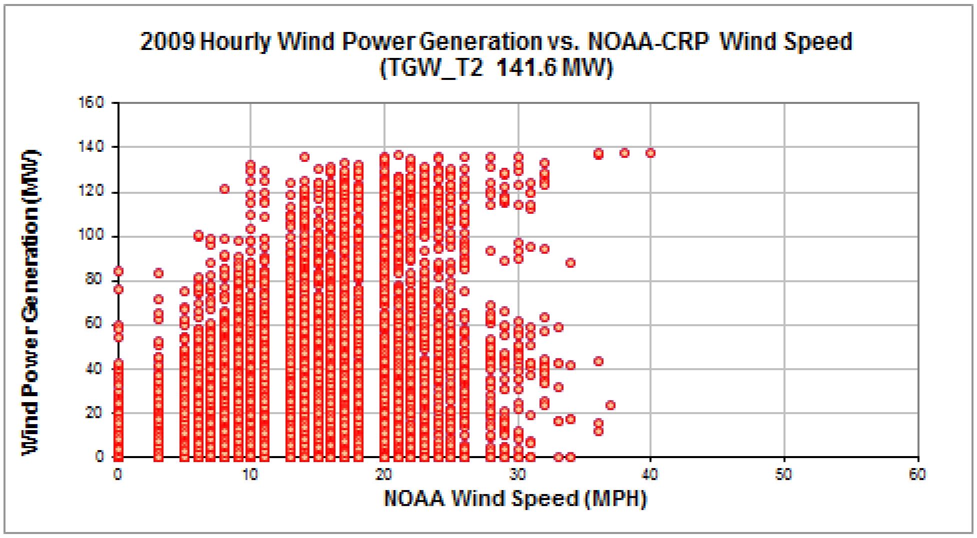


Figure 11-249: TGW_T2 - Hourly Wind Power vs. NOAA Wind Speed (2009)

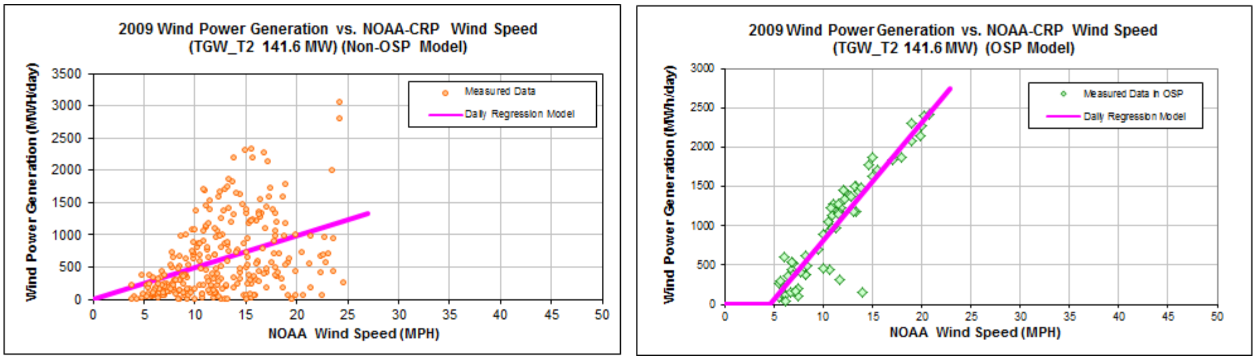


Figure 11-250: TGW_T2 – Daily Wind Power vs. NOAA Wind Speed (Using OSP and Non-OSP Model)

Table 11-239: TGW_T2 – Model Coefficients

Using Non-OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	0.2098
Left Slope (MWh/mph-day)	49.1463
RMSE (MWh/day)	531.5453
R2	0.1606
CV-RMSE	85.9%

Using OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-694.4300
Left Slope (MWh/mph-day)	150.4417
RMSE (MWh/day)	264.5993
R2	0.8512
CV-RMSE	26.3%

Table 11-240: TGW_T2 – Comparison of Predicted Power vs. Measured Power

Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-09	23	12.11	1,369	13,696	-900.63%	2%	18%
Feb-09	20	14.85	4,989	14,599	-192.59%	7%	21%
Mar-09	31	14.28	13,025	21,770	-67.14%	12%	21%
Apr-09	27	15.89	11,470	21,089	-83.87%	13%	23%
May-09	29	13.29	7,518	18,944	-151.98%	8%	19%
Jun-09	29	13.01	24,430	18,553	24.06%	25%	19%
Jul-09	31	14.27	44,883	36,628	18.39%	43%	35%
Aug-09	29	11.08	27,566	28,203	-2.31%	28%	29%
Sep-09	30	8.13	14,027	12,181	13.16%	14%	12%
Oct-09	31	12.67	38,116	19,315	49.33%	36%	18%
Nov-09	30	9.10	21,118	13,429	36.41%	21%	13%
Dec-09	30	10.76	25,751	15,871	38.37%	25%	16%
Total	340	12.36	234,263	234,278	-0.01%	20%	20%
Total in OSP (07/15-09/15)	61	11.30	61,386	61,376	0.02%	30%	30%

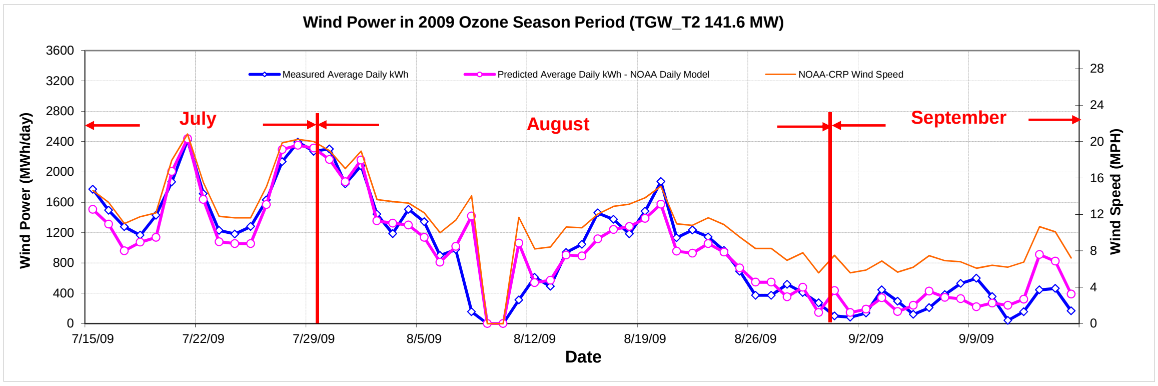


Figure 11-251: TGW_T2 – Predicted Wind Power in OSP Using NOAA Wind Speed (2009)

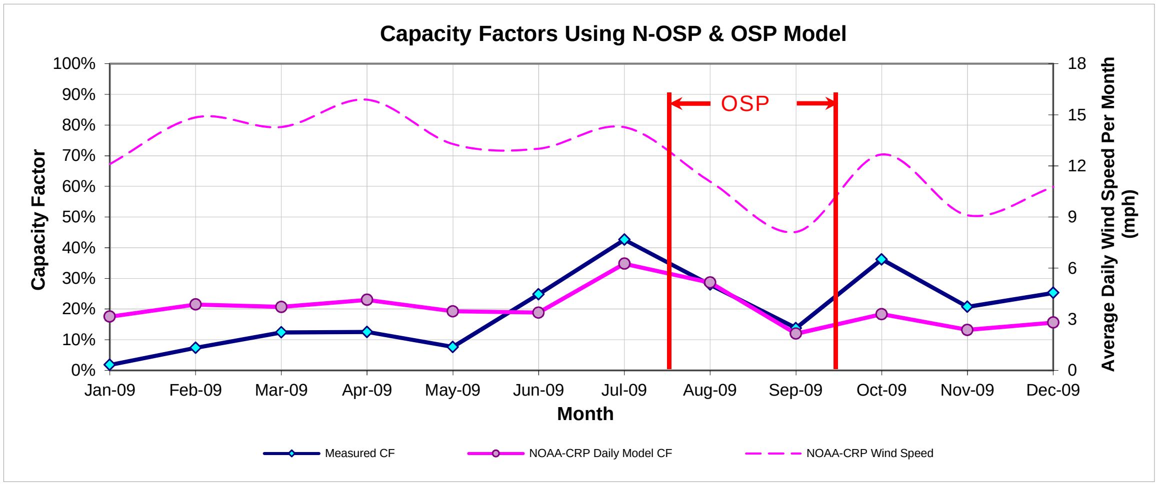


Figure 11-252: TGW_T2 – Predicted Capacity Factors Using Daily Models (2009)

Table 11-241: TGW_T2 – Predicted Power Production in 1999

Annual

1999 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
205,417	251,488

OSD

1999 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
566	1,006

11.52 Roscoe Wind Farm 1

Table 11-242: Site Information for Roscoe Wind Farm 1

GENSITECODE_ERCOT	Renewable Energy	City	County	Date in Service	Capacity (MW)	Company	Facility	Wind Turbine Information	Region	PCA	Interconnection	Weather Station
TKWSW1_ROSCOE	WIND		Scurry	Jan-08	220	Airtricity	Roscoe Wind Farm 1	Mitsubishi	ERCOT		ONCOR	LBB

SUBGENCODE_ERCOT	GENSITECODE_ERCOT	Capacity (MW)
TKWSW1_ROSCOE	TKWSW1_ROSCOE	220

11.52.1 Roscoe Wind Farm 1 – TKWSW1_ROSCOE

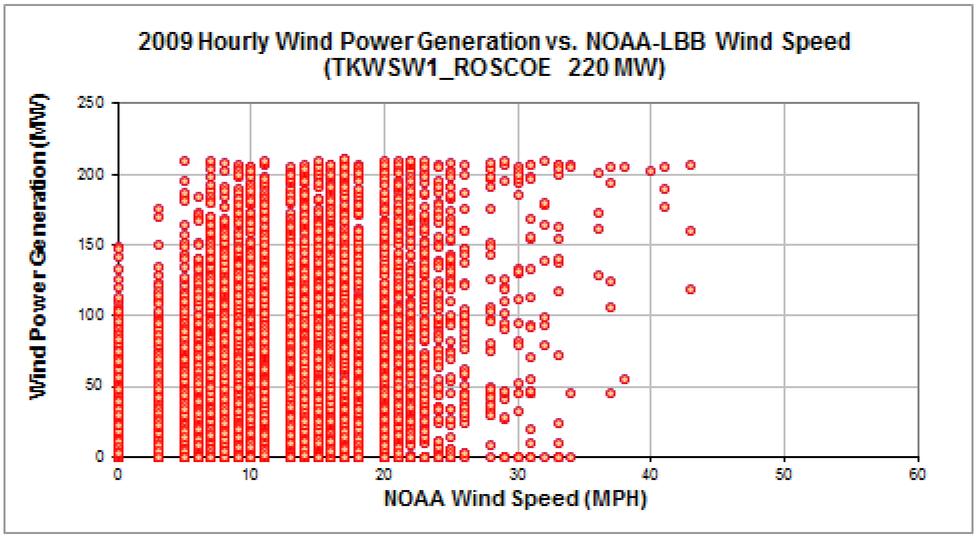
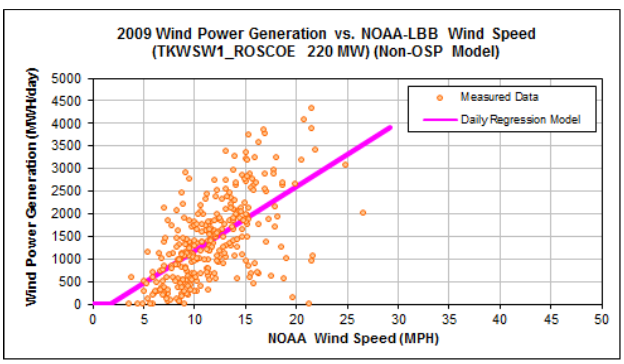


Figure 11-253: TKWSW1_ROSCOE – Hourly Wind Power vs. NOAA Wind Speed (2009)



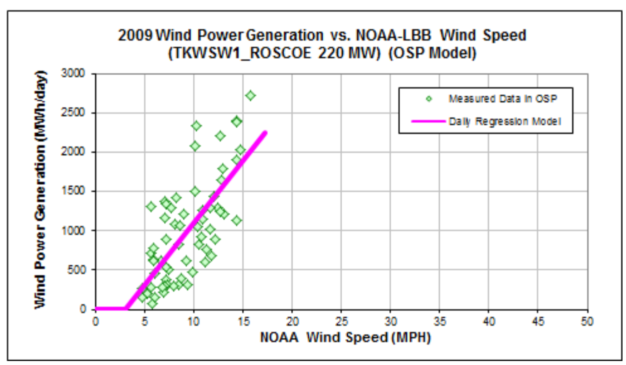


Figure 11-254: TKWSW1_ROSCOE – Daily Wind Power vs. NOAA Wind Speed (Using OSP and Non-OSP Model)

Table 11-243: TKWSW1_ROSCOE – Model Coefficients

Using Non-OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-239.5267
Left Slope (MWh/mph-day)	142.5333
RMSE (MWh/day)	731.9001
R2	0.3644
CV-RMSE	51.2%

Using OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-485.7757
Left Slope (MWh/mph-day)	158.3314
RMSE (MWh/day)	458.3120
R2	0.5078
CV-RMSE	46.1%

Table 11-244: TKWSW1_ROSCOE – Comparison of Predicted Power vs. Measured Power

Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-09	31	11.22	55,204	42,135	23.67%	34%	26%
Feb-09	27	12.60	51,293	42,006	18.11%	36%	29%
Mar-09	30	13.89	43,783	52,227	-19.29%	28%	33%
Apr-09	30	15.46	54,767	58,920	-7.58%	35%	37%
May-09	31	11.64	42,213	44,004	-4.24%	26%	27%
Jun-09	30	11.23	40,045	40,854	-2.02%	25%	26%
Jul-09	31	9.72	29,904	33,654	-12.54%	18%	21%
Aug-09	31	10.36	35,288	35,798	-1.45%	22%	22%
Sep-09	30	9.16	25,056	30,235	-20.67%	16%	19%
Oct-09	31	11.46	40,224	43,227	-7.47%	25%	26%
Nov-09	30	9.70	35,493	34,291	3.39%	22%	22%
Dec-09	30	9.28	36,786	32,509	11.63%	23%	21%
Total	362	11.29	490,056	489,859	0.04%	26%	26%
Total in OSP (07/15-09/15)	63	9.35	62,622	62,614	0.01%	19%	19%

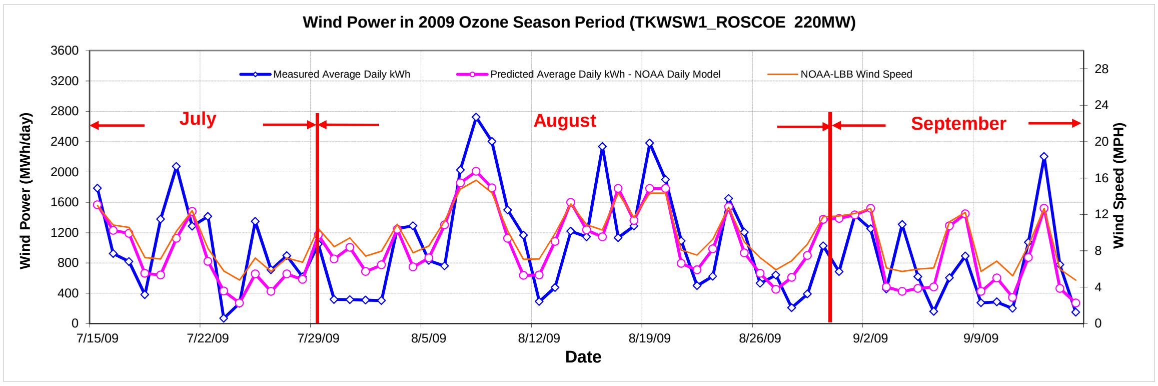


Figure 11-255: TKWSW1_ROSCOE – Predicted Wind Power in OSP Using NOAA Wind Speed (2009)

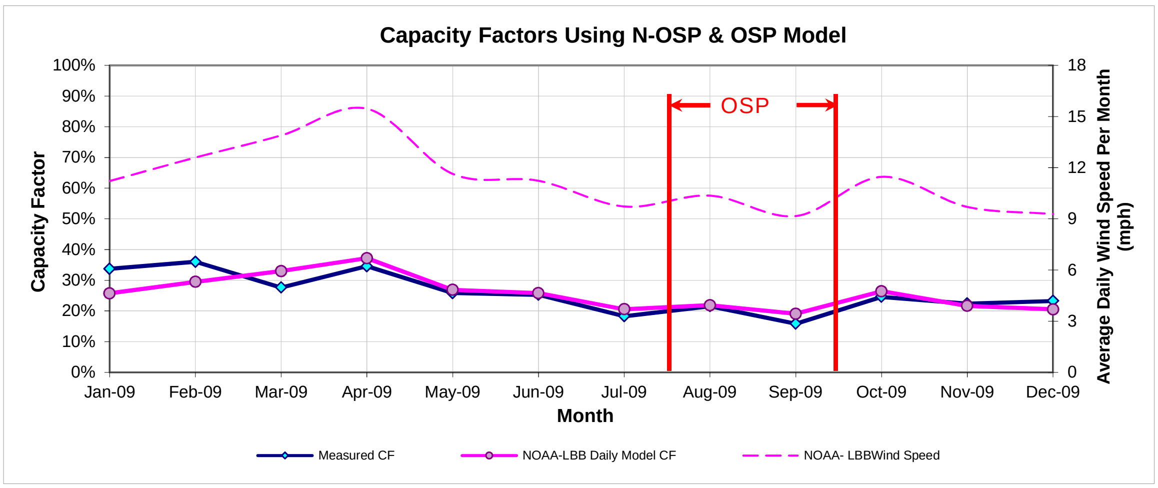


Figure 11-256: TKWSW1_ROSCOE – Predicted Capacity Factors Using Daily Models (2009)

Table 11-245: TKWSW1_ROSCOE – Predicted Power Production in 1999

Annual

1999 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
532,780	494,118

OSD

1999 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
1,073	994

11.53 Champion Wind Farm

Table 11-246: Site Information for Champion Wind Farm

GENSITECODE_ERCOT	Renewable Energy	City	County	Date in Service	Capacity (MW)	Company	Facility	Wind Turbine Information	Region	PCA	Interconnection	Weather Station
TKWSW_CHAMPION	WIND		Scurry	Jan-08	126.5	Airtricity	Champion Wind Farm	Siemens	ERCOT		ONCOR	LBB

SUBGENCODE_ERCOT	GENSITECODE_ERCOT	Capacity (MW)
TKWSW_CHAMPION	TKWSW_CHAMPION	126.5

11.53.1 Champion Wind Farm – TKWSW_CHAMPION

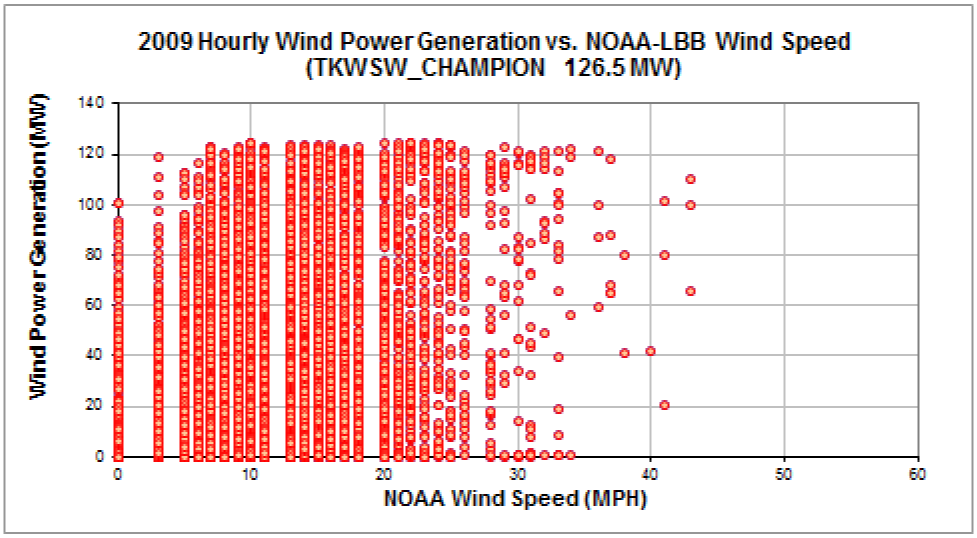
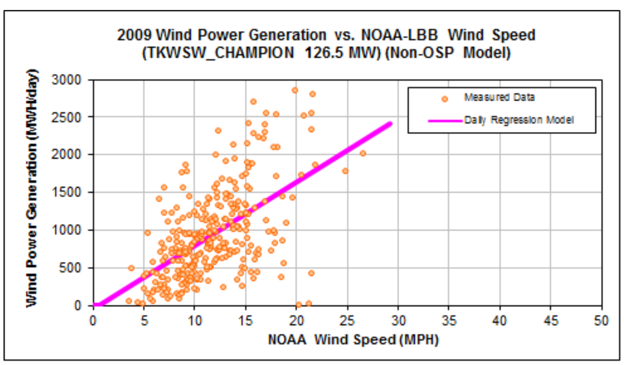


Figure 11-257: TKWSW_CHAMPION – Hourly Wind Power vs. NOAA Wind Speed (2009)



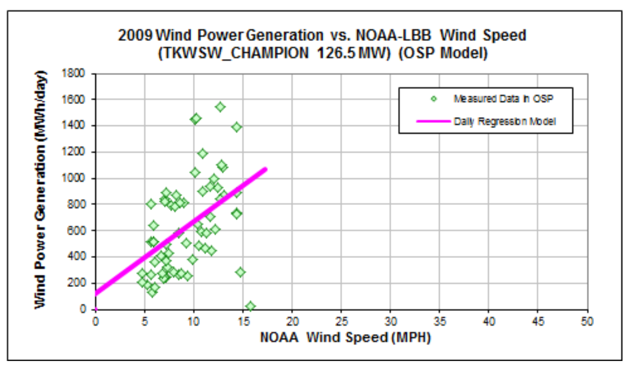


Figure 11-258: TKWSW_CHAMPION – Daily Wind Power vs. NOAA Wind Speed (Using OSP and Non-OSP Model)

Table 11-247: TKWSW_CHAMPION – Model Coefficients

Using Non-OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-51.1373
Left Slope (MWh/mph-day)	84.5351
RMSE (MWh/day)	491.9889
R2	0.3132
CV-RMSE	52.1%

Using OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	120.6633
Left Slope (MWh/mph-day)	54.6169
RMSE (MWh/day)	320.7678
R2	0.2004
CV-RMSE	50.8%

Table 11-248: TKWSW_CHAMPION – Comparison of Predicted Power vs. Measured Power

Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-09	30	11.28	28,150	27,070	3.84%	31%	30%
Feb-09	28	12.79	36,412	28,839	20.80%	43%	34%
Mar-09	30	14.27	31,727	34,654	-9.23%	35%	38%
Apr-09	30	15.46	32,002	37,673	-17.72%	35%	41%
May-09	31	11.64	24,592	28,917	-17.59%	26%	31%
Jun-09	30	11.23	29,568	26,958	8.83%	32%	30%
Jul-09	31	9.72	19,692	22,469	-14.10%	21%	24%
Aug-09	31	10.36	20,661	21,284	-3.01%	22%	23%
Sep-09	30	9.16	17,473	20,629	-18.06%	19%	23%
Oct-09	31	11.46	30,867	28,456	7.81%	33%	30%
Nov-09	30	9.70	26,005	23,066	11.30%	29%	25%
Dec-09	30	9.28	25,033	22,008	12.08%	27%	24%
Total	362	11.35	322,182	322,022	0.05%	29%	29%
Total in OSP (07/15-09/15)	63	9.35	39,760	39,757	0.01%	21%	21%

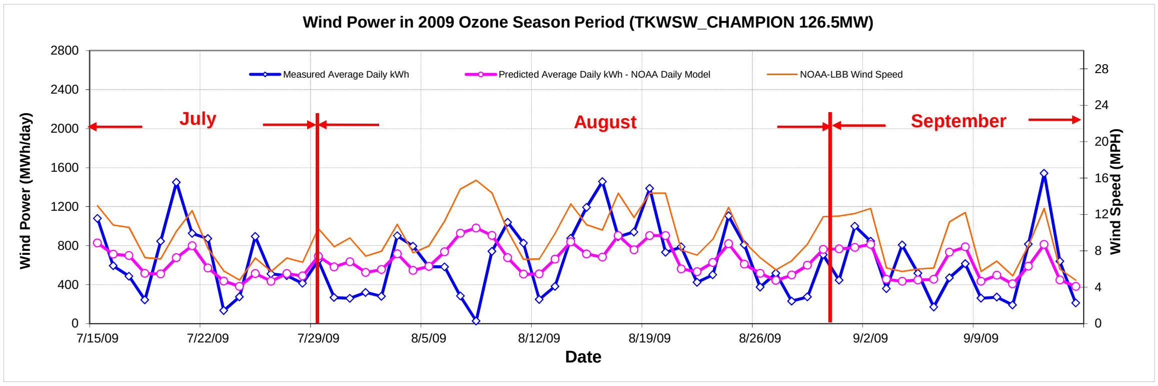


Figure 11-259: TKWSW_CHAMPION – Predicted Wind Power in OSP Using NOAA Wind Speed (2009)

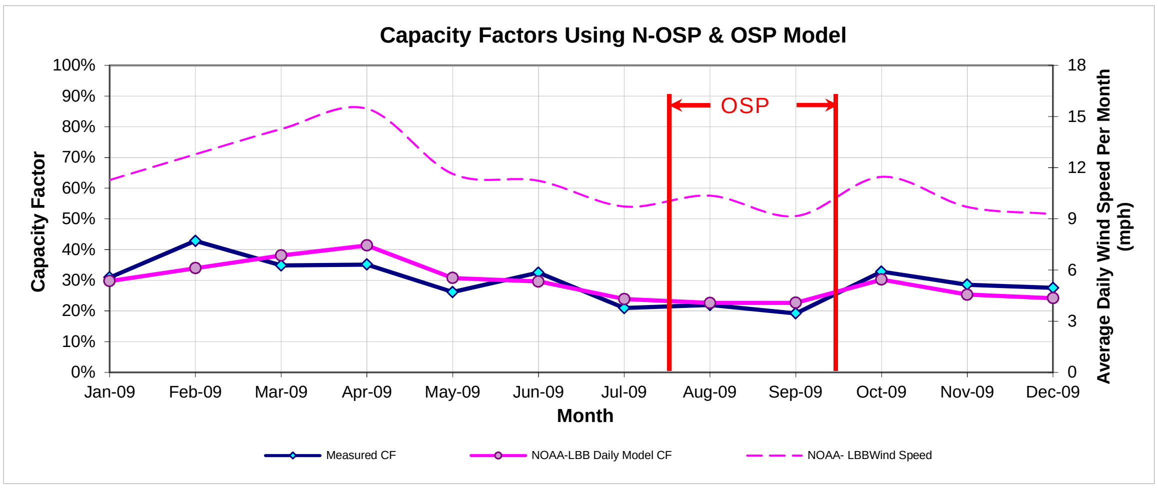


Figure 11-260: TKWSW_CHAMPION – Predicted Capacity Factors Using Daily Models (2009)

Table 11-249: TKWSW_CHAMPION – Predicted Power Production in 1999

Annual

1999 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
344,823	324,852

OSD

1999 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
659	631

11.54 Trent Mesa

Table 11-250: Site Information for Trent Mesa

GENSITECODE_ERCOT	Renewable Energy	City	County	Date in Service	Capacity (MW)	Company	Facility	Wind Turbine Information	Region	PCA	Interconnection	Weather Station
TRENT	WIND	Trent Mesa	NOLAN	Nov-01	150	AEP	Trent Mesa	Enron 1500 (100)	ERCOT	TXU	TXU	ABI

SUBGENCODE_ERCOT	GENSITECODE_ERCOT	Capacity (MW)
TRENT_TRENT	TRENT	150

11.54.1 Trent Mesa – TRENT_TRENT

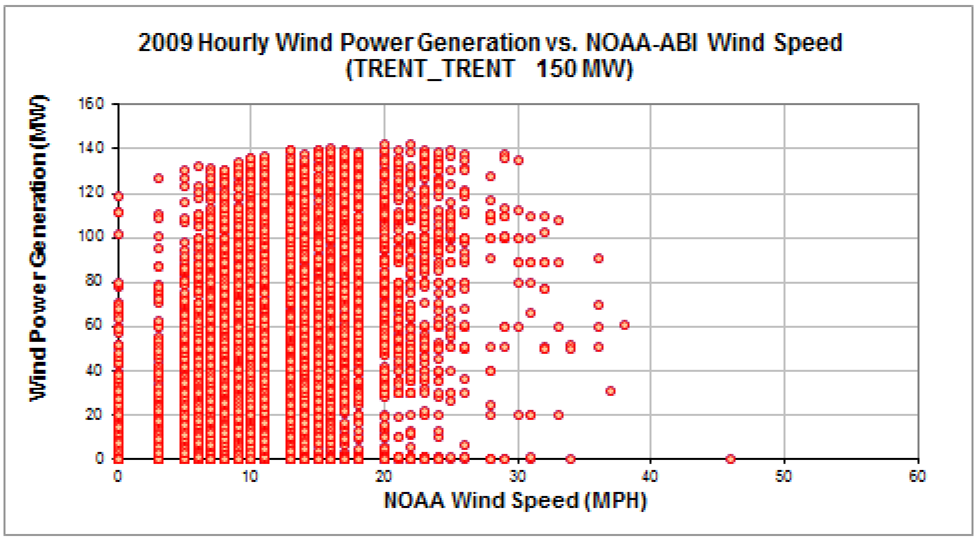


Figure 11-261: TRENT_TRENT – Hourly Wind Power vs. NOAA Wind Speed (2009)

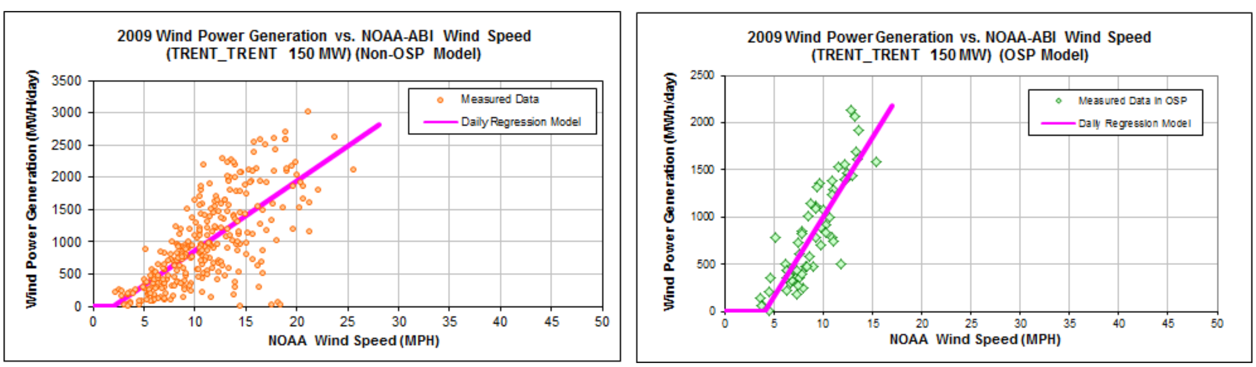


Figure 11-262: TRENT_TRENT – Daily Wind Power vs. NOAA Wind Speed (Using OSP and Non-OSP Model)

Table 11-251: TRENT_TRENT – Model Coefficients

Using Non-OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-207.6410
Left Slope (MWh/mph-day)	107.8330
RMSE (MWh/day)	481.2199
R2	0.5001
CV-RMSE	49.0%

Using OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-676.2172
Left Slope (MWh/mph-day)	167.8400
RMSE (MWh/day)	269.6719
R2	0.7510
CV-RMSE	32.9%

Table 11-252: TRENT_TRENT – Comparison of Predicted Power vs. Measured Power

Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-09	31	10.70	39,746	29,335	26.19%	36%	26%
Feb-09	28	12.91	35,153	33,173	5.63%	35%	33%
Mar-09	30	13.45	43,369	37,295	14.01%	40%	35%
Apr-09	30	14.82	37,170	41,705	-12.20%	34%	39%
May-09	31	10.10	22,741	27,333	-20.19%	20%	24%
Jun-09	30	11.31	34,433	30,371	11.79%	32%	28%
Jul-09	31	8.90	25,219	24,026	4.73%	23%	22%
Aug-09	31	9.59	29,543	28,970	1.94%	26%	26%
Sep-09	30	8.61	17,775	21,818	-22.74%	16%	20%
Oct-09	31	10.66	16,826	29,182	-73.44%	15%	26%
Nov-09	30	8.39	22,130	20,906	5.53%	20%	19%
Dec-09	30	8.81	22,275	22,275	0.00%	21%	21%
Total	363	10.67	346,379	346,390	0.00%	27%	27%
Total in OSP (07/15-09/15)	63	8.91	51,647	51,759	-0.22%	23%	23%

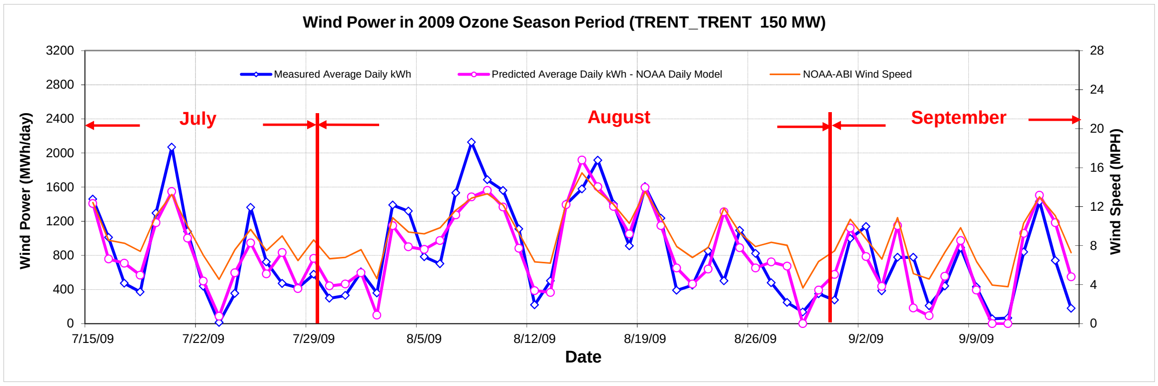


Figure 11-263: TRENT_TRENT – Predicted Wind Power in OSP Using NOAA Wind Speed (2009)

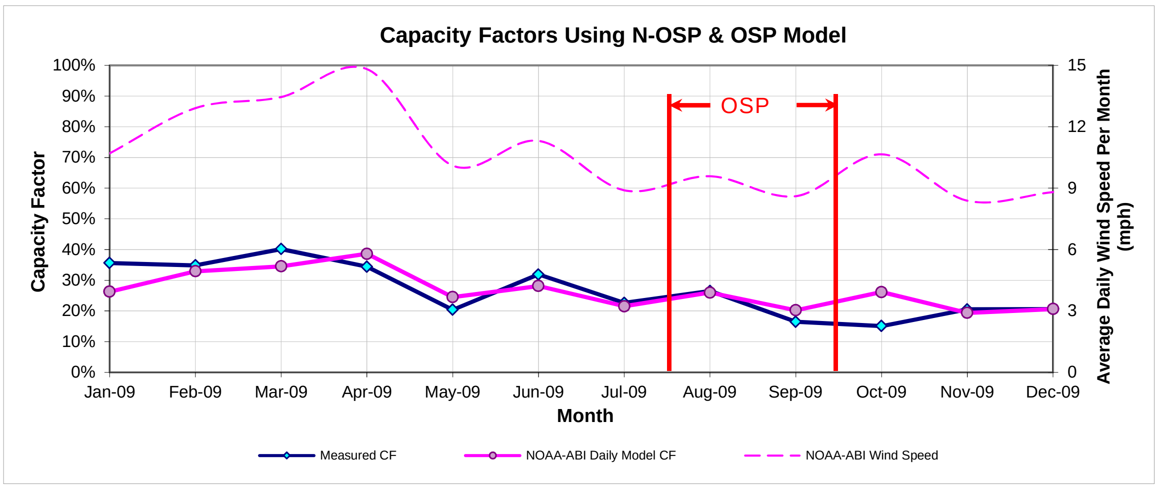


Figure 11-264: TRENT_TRENT – Predicted Capacity Factors Using Daily Models (2009)

Table 11-253: TRENT_TRENT – Predicted Power Production in 1999

Annual

1999 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
375,841	348,288

OSD

1999 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
953	820

11.55 Turkey Track Energy Center

Table 11-254: Site Information for Turkey Track Energy Center

GENSITECODE_ERCOT	Renewable Energy	City	County	Date in Service	Capacity (MW)	Company	Facility	Wind Turbine Information	Region	PCA	Interconnection	Weather Station
TTWEC_G1	WIND		Nolan	Nov-08	170	Invenergy	Turkey Track Energy Center	GE Energy (113)	ERCOT	AEP-West	AEP	ABI

SUBGENCODE_ERCOT	GENSITECODE_ERCOT	Capacity (MW)
TTWEC_G1	TTWEC_G1	170

11.55.1 Turkey Track energy Center – TTWEC_G1

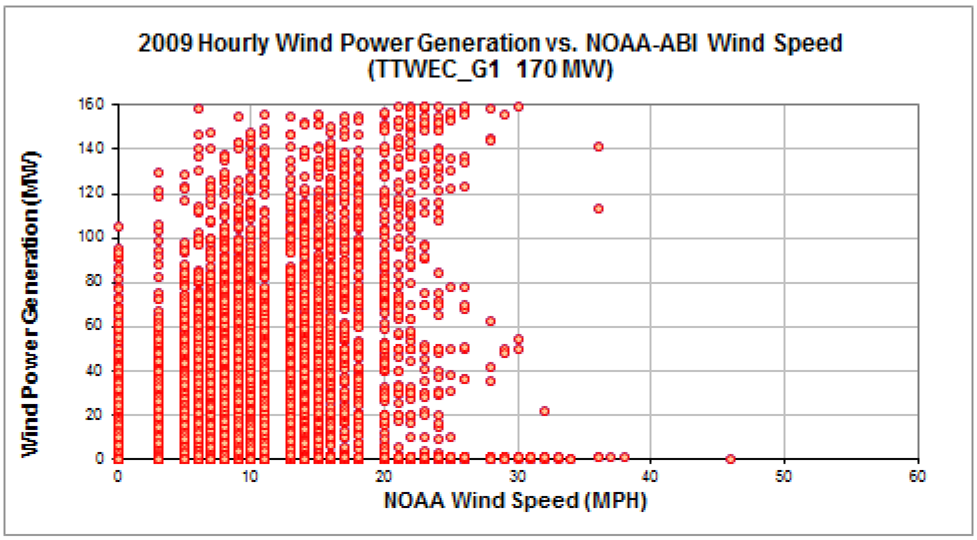


Figure 11-265: TTWEC_G1 – Hourly Wind Power vs. NOAA Wind Speed (2009)

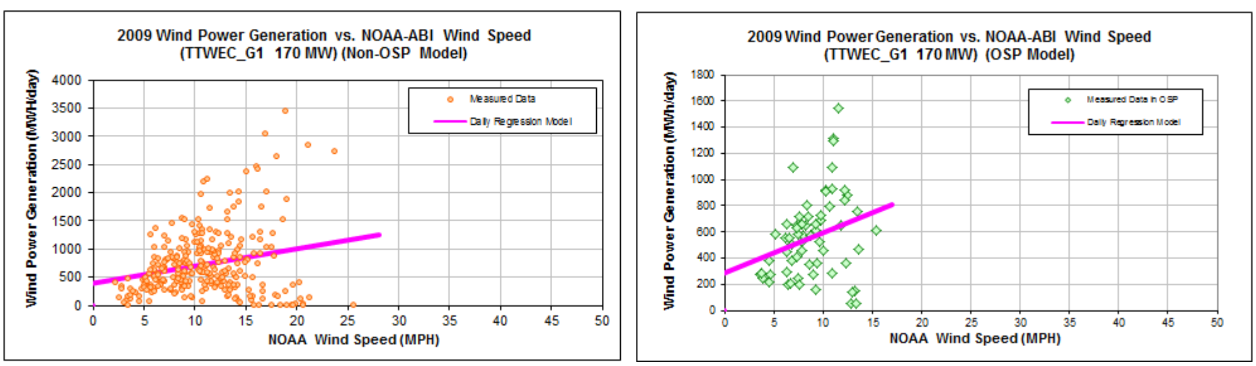


Figure 11-266: TTWEC_G1 – Daily Wind Power vs. NOAA Wind Speed (Using OSP and Non-OSP Model)

Table 11-255: TTWEC_G1 – Model Coefficients

Using Non-OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	398.3277
Left Slope (MWh/mph-day)	30.6311
RMSE (MWh/day)	553.3935
R2	0.0552
CV-RMSE	75.7%

Using OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	287.4037
Left Slope (MWh/mph-day)	30.7216
RMSE (MWh/day)	304.4038
R2	0.0735
CV-RMSE	54.2%

Table 11-256: TTWEC_G1 – Comparison of Predicted Power vs. Measured Power

Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-09	30	10.58	25,607	21,669	15.38%	21%	18%
Feb-09	25	12.02	15,264	19,166	-25.56%	15%	19%
Mar-09	30	13.45	20,389	24,313	-19.25%	17%	20%
Apr-09	27	14.47	23,382	22,719	2.83%	21%	21%
May-09	29	10.18	24,981	20,597	17.55%	21%	17%
Jun-09	28	11.26	18,098	20,810	-14.99%	16%	18%
Jul-09	30	8.73	16,638	18,101	-8.79%	14%	15%
Aug-09	31	9.59	17,422	18,038	-3.54%	14%	14%
Sep-09	30	8.61	18,939	18,207	3.87%	15%	15%
Oct-09	31	10.66	20,295	22,466	-10.70%	16%	18%
Nov-09	30	8.39	19,003	19,658	-3.45%	16%	16%
Dec-09	30	8.81	25,222	20,047	20.52%	21%	16%
Total	351	10.50	245,240	245,789	-0.22%	17%	17%
Total in OSP (07/15-09/15)	63	8.91	35,358	35,357	0.00%	14%	14%

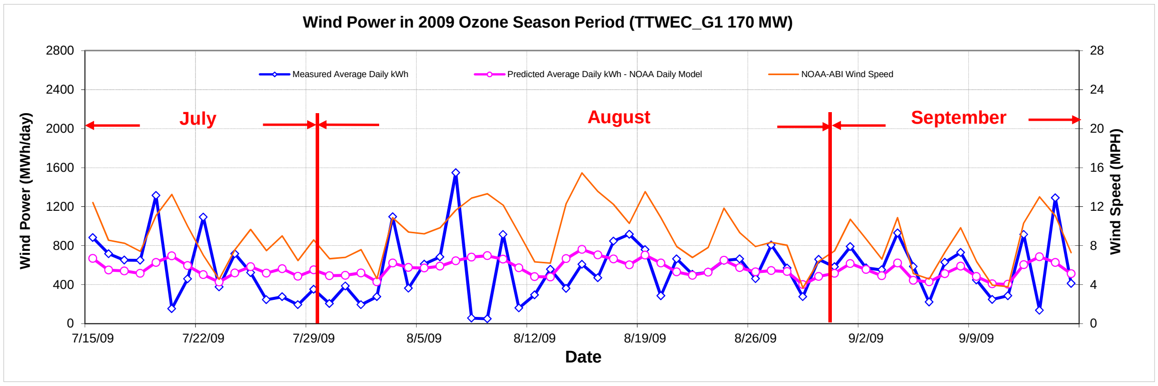


Figure 11-267: TTWEC_G1 – Predicted Wind Power in OSP Using NOAA Wind Speed (2009)

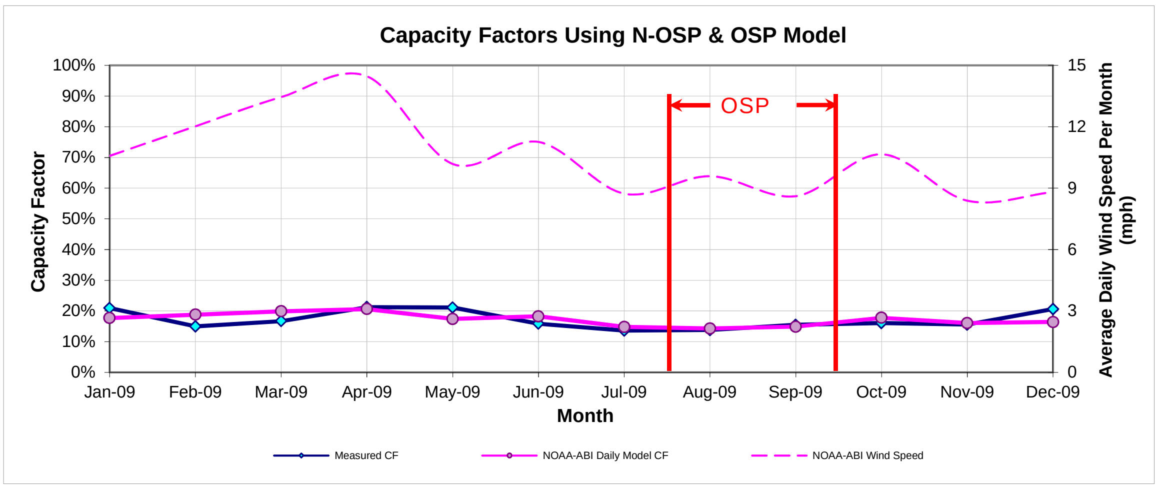


Figure 11-268: TTWEC_G1 – Predicted Capacity Factors Using Daily Models (2009)

Table 11-257: TTWEC_G1 – Predicted Power Production in 1999

Annual

1999 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
264,706	255,022

OSD

1999 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
586	561

11.56 Whirlwind

Table 11-258: Site Information for Whirlwind

GENSITECODE_ERCOT	Renewable Energy	City	County	Date in Service	Capacity (MW)	Company	Facility	Wind Turbine Information	Region	PCA	Interconnection	Weather Station
WEC_WECG1	WIND		Floyd	Dec-07	60	Renewable Energy Systems	Whirlwind	Siemens	ERCOT		AEP	LBB

SUBGENCODE_ERCOT	GENSITECODE_ERCOT	Capacity (MW)
WEC_WECG1	WEC_WECG1	60

11.56.1 Whirlwind – WEC_WECG1

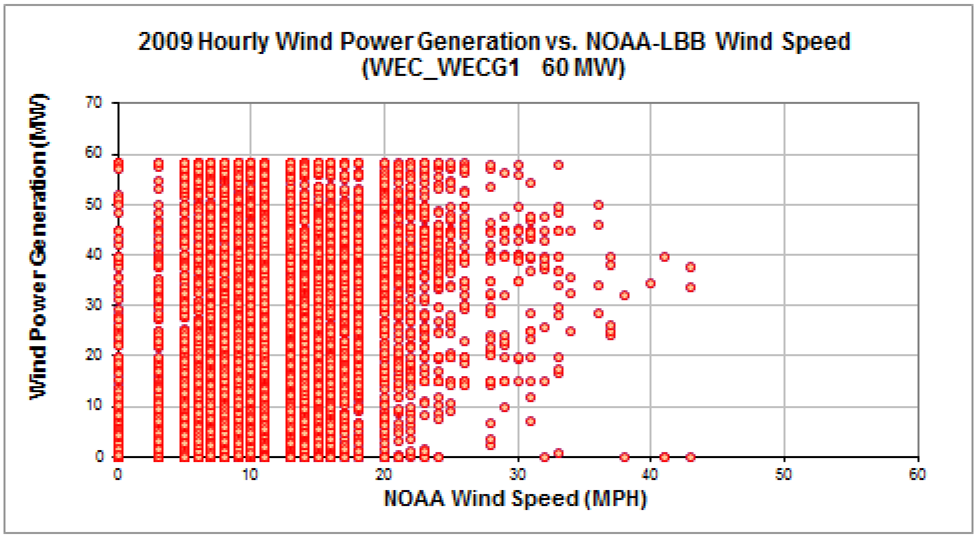


Figure 11-269: WEC_WECG1 – Hourly Wind Power vs. NOAA Wind Speed (2009)

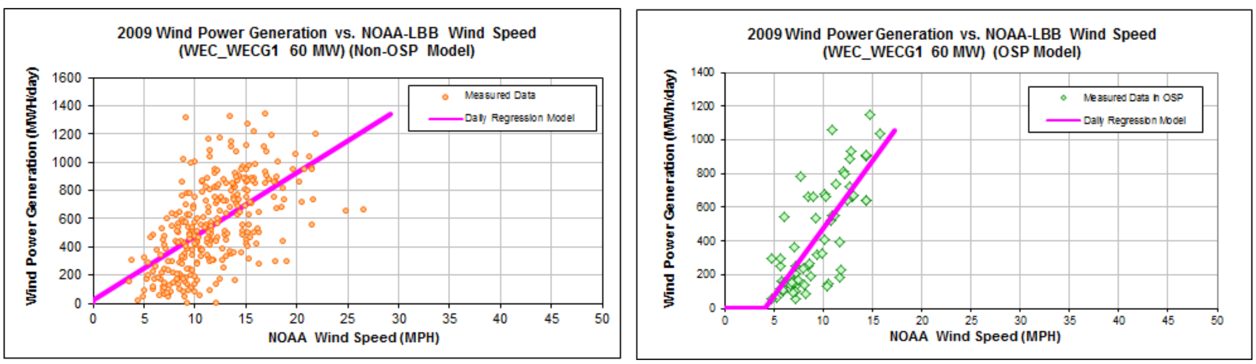


Figure 11-270: WEC_WECG1 – Daily Wind Power vs. NOAA Wind Speed (Using OSP and Non-OSP Model)

Table 11-259: WEC_WECG1 – Model Coefficients

Using Non-OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	22.8743
Left Slope (MWh/mph-day)	45.1430
RMSE (MWh/day)	249.2380
R2	0.3366
CV-RMSE	45.0%

Using OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-331.8372
Left Slope (MWh/mph-day)	80.2119
RMSE (MWh/day)	196.3456
R2	0.5906
CV-RMSE	47.0%

Table 11-260: WEC_WECG1 – Comparison of Predicted Power vs. Measured Power

Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-09	30	11.28	19,081	15,961	16.35%	44%	37%
Feb-09	28	12.79	17,203	16,805	2.31%	43%	42%
Mar-09	31	14.10	17,409	20,438	-17.40%	39%	46%
Apr-09	30	15.46	18,631	21,623	-16.06%	43%	50%
May-09	31	11.64	14,235	16,998	-19.40%	32%	38%
Jun-09	29	11.17	13,858	15,292	-10.35%	33%	37%
Jul-09	31	9.72	13,157	13,387	-1.75%	29%	30%
Aug-09	31	10.36	15,991	15,478	3.21%	36%	35%
Sep-09	30	9.16	13,923	12,059	13.39%	32%	28%
Oct-09	31	11.46	15,902	16,752	-5.34%	36%	38%
Nov-09	30	9.70	17,720	13,823	21.99%	41%	32%
Dec-09	30	9.28	14,849	13,258	10.71%	34%	31%
Total	362	11.34	191,960	191,875	0.04%	37%	37%
Total in OSP (07/15-09/15)	63	9.35	26,323	26,319	0.02%	29%	29%

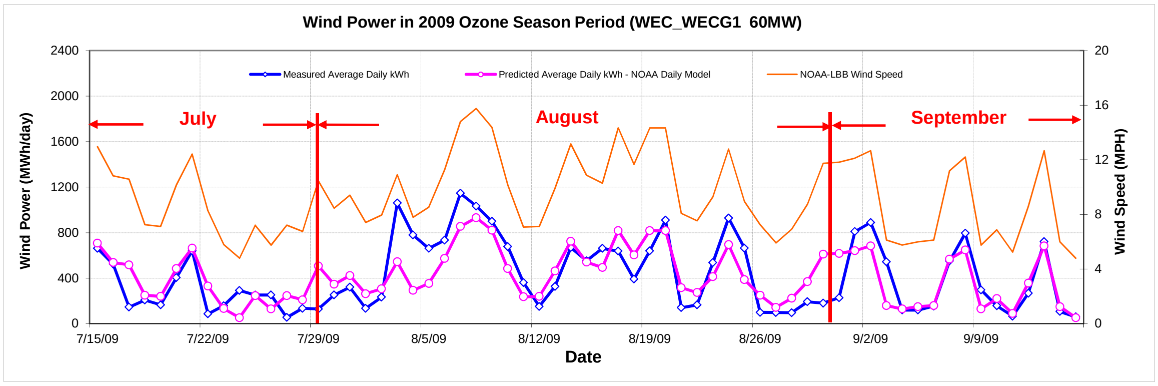


Figure 11-271: WEC_WECG1 – Predicted Wind Power in OSP Using NOAA Wind Speed (2009)

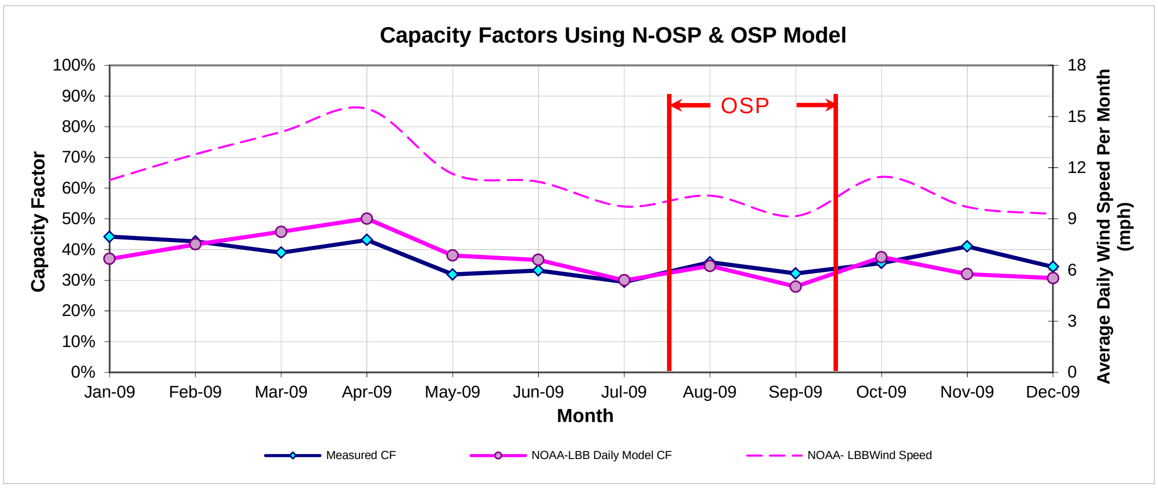


Figure 11-272: WEC_WECG1 – Predicted Capacity Factors Using Daily Models (2009)

Table 11-261: WEC_WECG1 – Predicted Power Production in 1999

Annual

1999 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
206,000	193,550

OSD

1999 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
458	418

11.57 Wolf Ridge Wind Farm

Table 11-262: Site Information for Wolf Ridge Wind Farm

GENSITECODE_ERCOT	Renewable Energy	City	County	Date in Service	Capacity (MW)	Company	Facility	Wind Turbine Information	Region	PCA	Interconnection	Weather Station
WHTTAIL_WR1	WIND		Cooke	Oct-08	112.5	FPL Energy	Wolf Ridge Windfarm	GE Energy (75)	ERCOT			DFW

SUBGENCODE_ERCOT	GENSITECODE_ERCOT	Capacity (MW)
WHTTAIL_WR1	WHTTAIL_WR1	112.5

11.57.1 Wolf Ridge Wind Farm – WHTTAIL_WR1

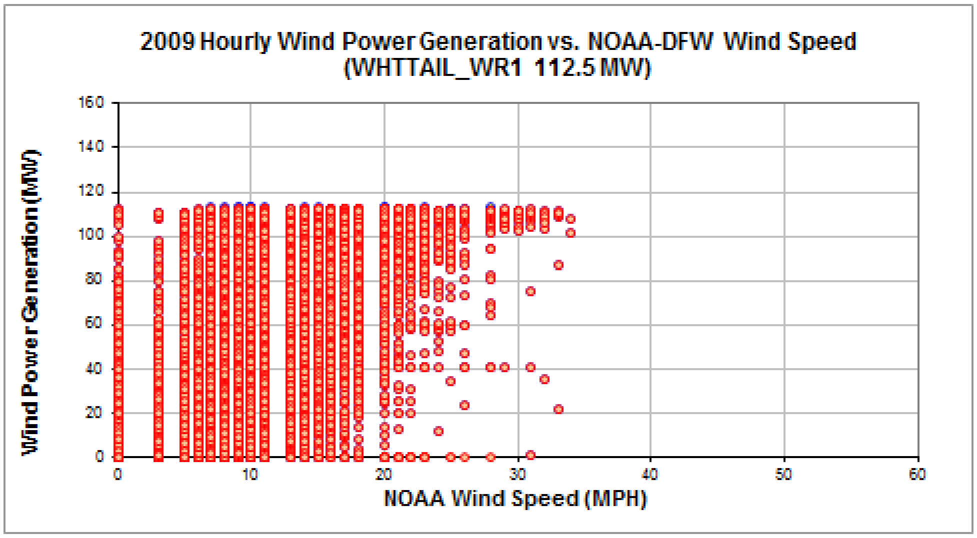


Figure 11-273: WHTTAIL_WR1 – Hourly Wind Power vs. NOAA Wind Speed (2009)

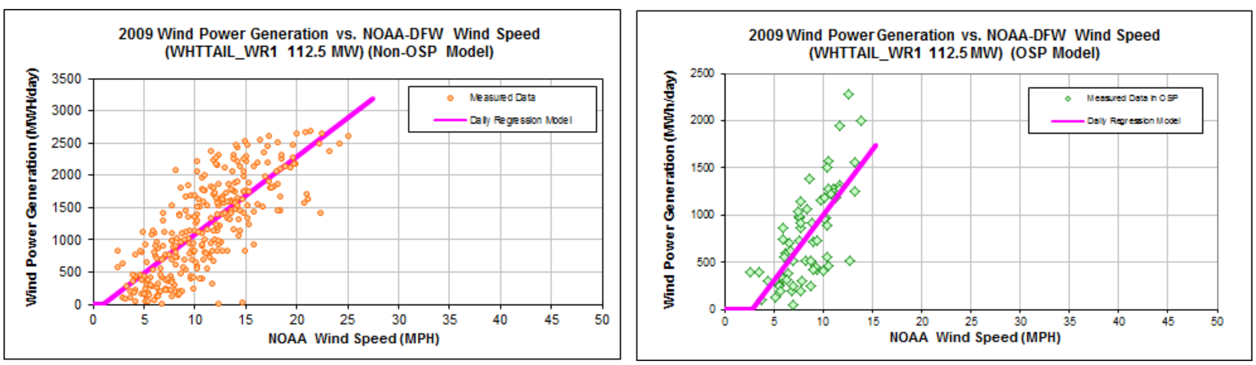


Figure 11-274: WHTTAIL_WR1 – Daily Wind Power vs. NOAA Wind Speed (Using OSP and Non-OSP Model)

Table 11-263: WHTTAIL_WR1 – Model Coefficients

Using Non-OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-121.9225
Left Slope (MWh/mph-day)	120.4783
RMSE (MWh/day)	460.3397
R2	0.5913
CV-RMSE	38.3%

Using OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-401.0854
Left Slope (MWh/mph-day)	139.5915
RMSE (MWh/day)	359.0198
R2	0.4943
CV-RMSE	45.8%

Table 11-264: WHTTAIL_WR1 – Comparison of Predicted Power vs. Measured Power

Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-09	31	11.21	37,023	38,082	-2.86%	44%	45%
Feb-09	28	13.66	45,165	42,674	5.52%	60%	56%
Mar-09	31	13.99	45,409	48,483	-6.77%	54%	58%
Apr-09	29	13.45	46,151	43,441	5.87%	59%	55%
May-09	31	9.59	24,199	32,040	-32.40%	29%	38%
Jun-09	29	11.00	34,196	34,898	-2.05%	44%	45%
Jul-09	31	8.67	25,031	26,554	-6.09%	30%	32%
Aug-09	31	9.13	29,483	27,059	8.22%	35%	32%
Sep-09	30	8.29	21,986	24,290	-10.48%	27%	30%
Oct-09	31	10.15	34,195	34,146	0.14%	41%	41%
Nov-09	30	8.24	32,844	26,136	20.42%	41%	32%
Dec-09	30	9.51	33,205	30,699	7.55%	41%	38%
Total	362	10.55	408,887	408,501	0.09%	42%	42%
Total in OSP (07/15-09/15)	63	8.49	49,391	49,407	-0.03%	29%	29%

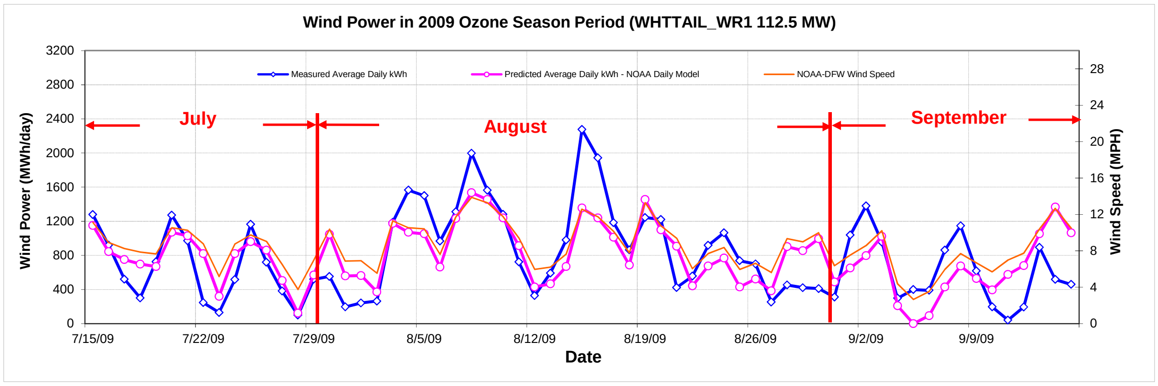


Figure 11-275: WHTTAIL_WR1 – Predicted Wind Power in OSP Using NOAA Wind Speed (2009)

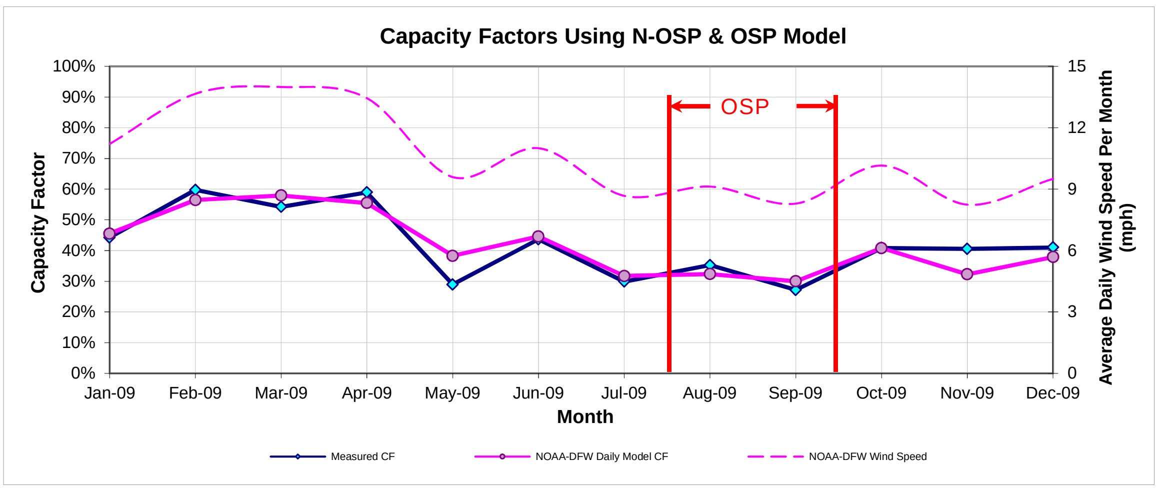


Figure 11-276: WHTTAIL_WR1 – Predicted Capacity Factors Using Daily Models (2009)

Table 11-265: WHTTAIL_WR1 – Predicted Power Production in 1999

Annual

1999 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
416,767	412,275

OSD

1999 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
877	784

11.58 Woodward Mountain Ranch

Table 11-266: Site Information for Woodward Mountain Ranch

GENSITECODE_ERCOT	Renewable Energy	City	County	Date in Service	Capacity (MW)	Company	Facility	Wind Turbine Information	Region	PCA	Interconnection	Weather Station
WOODWRD	WIND	McCamey	PECOS	Jul-01	160	FPL/Cielo/TXU	Woodward Mountain Ranch	Vestas V-47 (121)	ERCOT	AEP-West	WTU	FST

SUBGENCODE_ERCOT	GENSITECODE_ERCOT	Capacity (MW)
WOODWRD1_WOODWRD1	WOODWRD1	80
WOODWRD2_WOODWRD2	WOODWRD2	80

11.58.1 Woodward Mountain Ranch – WOODWRD1_WOODWRD1

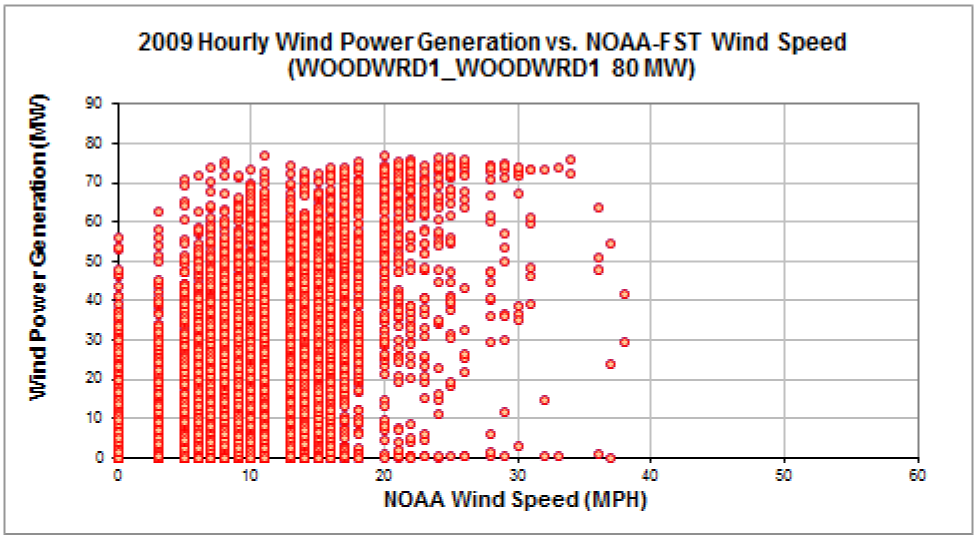


Figure 11-277: WOODWRD1_WOODWRD1 - Hourly Wind Power vs. NOAA Wind Speed (2009)

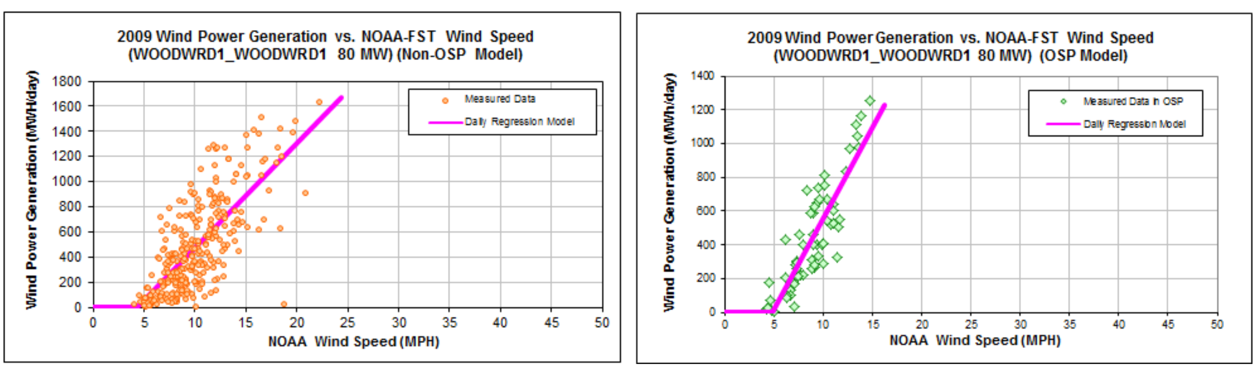


Figure 11-278: WOODWRD1_WOODWRD1 - Daily Wind Power vs. NOAA Wind Speed (Using OSP and Non OSP Model)

Table 11-267: WOODWRD1_WOODWRD1 – Model Coefficients

Using Non-OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-364.6525
Left Slope (MWh/mph-day)	83.5410
RMSE (MWh/day)	248.6818
R2	0.5361
CV-RMSE	51.6%

Using OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-512.8003
Left Slope (MWh/mph-day)	106.6506
RMSE (MWh/day)	150.4063
R2	0.7624
CV-RMSE	34.5%

Table 11-268: WOODWRD1_WOODWRD1 – Comparison of Predicted Power vs. Measured Power

Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-09	31	9.44	11,191	13,152	-17.53%	19%	22%
Feb-09	27	11.26	16,242	15,554	4.23%	31%	30%
Mar-09	29	10.31	15,871	14,402	9.26%	29%	26%
Apr-09	30	12.47	21,003	20,316	3.27%	36%	35%
May-09	31	10.12	16,058	14,895	7.24%	27%	25%
Jun-09	24	10.47	10,298	12,241	-18.87%	22%	27%
Jul-09	31	9.38	13,894	13,953	-0.43%	23%	23%
Aug-09	30	9.67	15,707	15,592	0.73%	27%	27%
Sep-09	30	8.09	9,907	9,766	1.42%	17%	17%
Oct-09	31	10.48	15,467	15,867	-2.58%	26%	27%
Nov-09	30	8.93	11,552	11,453	0.86%	20%	20%
Dec-09	30	8.56	10,280	10,525	-2.38%	18%	18%
Total	354	9.92	167,470	167,717	-0.15%	25%	25%
Total in OSP (07/15-09/15)	62	8.89	27,004	27,135	-0.49%	23%	23%

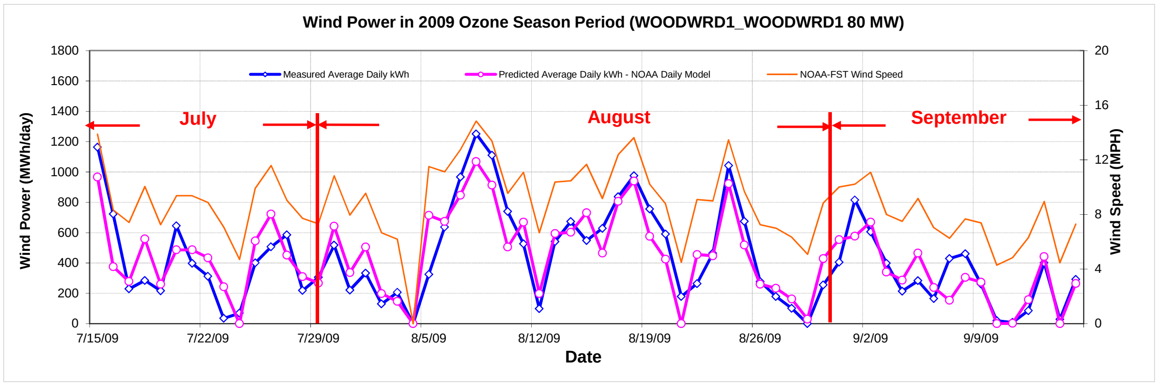


Figure 11-279: WOODWRD1_WOODWRD1 - Predicted Wind Power in OSP Using NOAA Wind Speed (2009)

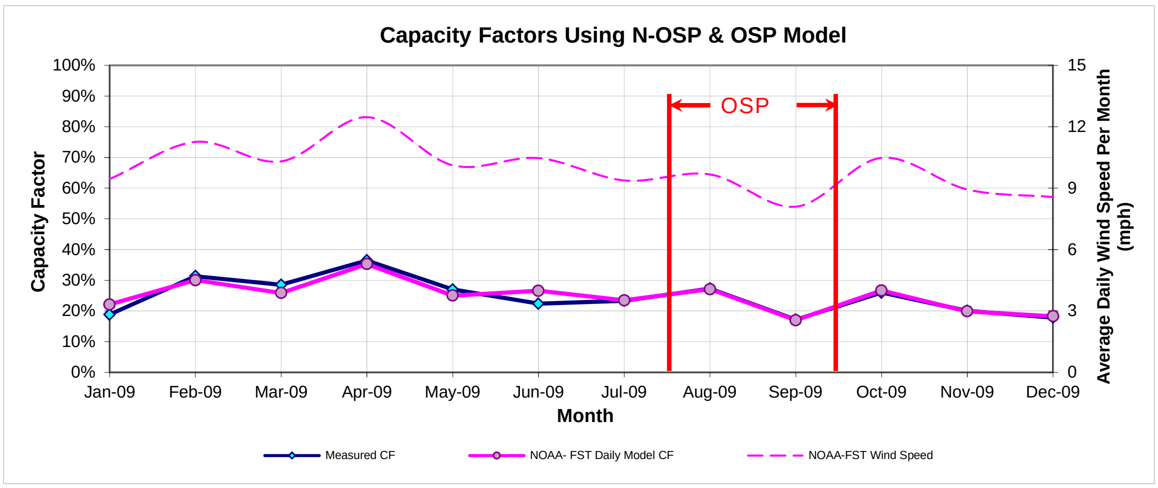


Figure 11-280: WOODWRD1_WOODWRD1 – Predicted Capacity Factors Using Daily Models (2009)

Table 11-269: WOODWRD1_WOODWRD1 – Predicted Power Production in 1999

Annual

1999 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
213,421	172,674

OSD

1999 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
550	436

11.58.2 Woodward Mountain Ranch – WOODWRD2_WOODWRD2

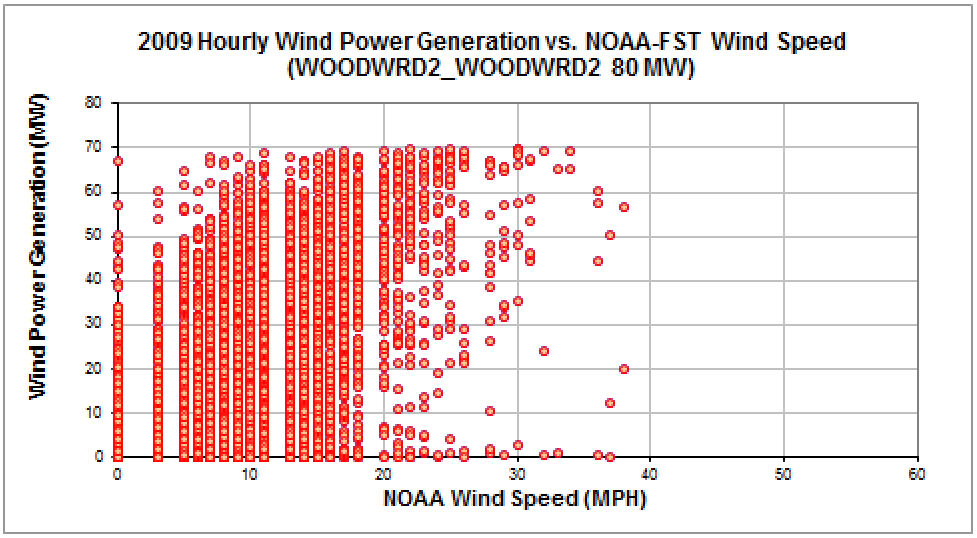


Figure 11-281: WOODWRD2_WOODWRD2- Hourly Wind Power vs. NOAA Wind Speed (2009)

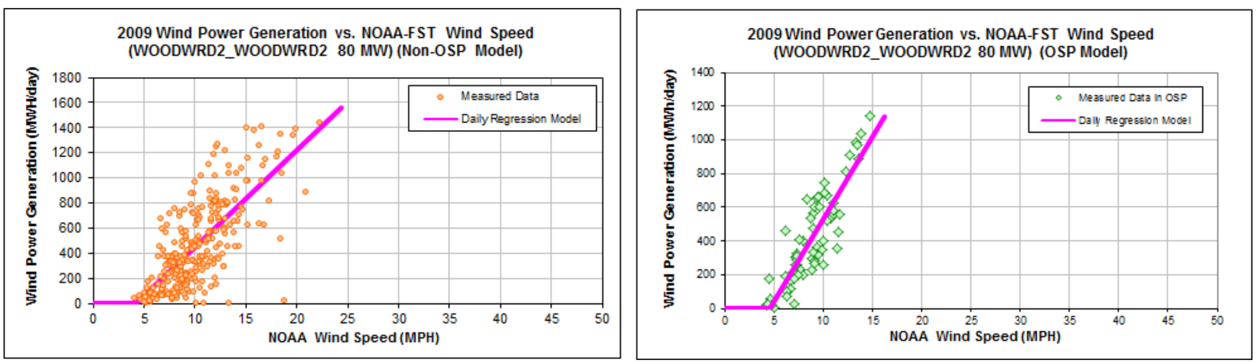


Figure 11-282: WOODWRD2_WOODWRD2 – Daily Wind Power vs. NOAA Wind Speed (Using OSP and Non-OSP Model)

Table 11-270: WOODWRD2_WOODWRD2 – Model Coefficients

Using Non-OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-327.8570
Left Slope (MWh/mph-day)	77.4741
RMSE (MWh/day)	232.9748
R2	0.5302
CV-RMSE	50.8%

Using OSP Model:

IMT Coefficients	NOAA Daily Model
Ycp (MWh/day)	-448.4213
Left Slope (MWh/mph-day)	97.3176
RMSE (MWh/day)	134.7229
R2	0.7690
CV-RMSE	32.3%

Table 11-271: WOODWRD2_WOODWRD2 – Comparison of Predicted Power vs. Measured Power

Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-09	31	9.44	11,354	12,516	-10.24%	19%	21%
Feb-09	28	11.24	15,299	15,211	0.57%	28%	28%
Mar-09	30	10.41	15,025	14,354	4.47%	26%	25%
Apr-09	30	12.47	20,013	19,150	4.31%	35%	33%
May-09	31	10.12	14,873	14,133	4.97%	25%	24%
Jun-09	24	10.47	9,982	11,600	-16.21%	22%	25%
Jul-09	31	9.38	13,159	13,297	-1.04%	22%	22%
Aug-09	30	9.67	15,044	14,794	1.67%	26%	26%
Sep-09	30	8.09	9,577	9,403	1.82%	17%	16%
Oct-09	31	10.48	14,640	15,024	-2.62%	25%	25%
Nov-09	30	8.93	11,304	10,931	3.30%	20%	19%
Dec-09	30	8.56	10,038	10,070	-0.32%	17%	17%
Total	356	9.93	160,308	160,482	-0.11%	23%	23%
Total in OSP (07/15-09/15)	62	8.89	25,850	25,902	-0.20%	22%	22%

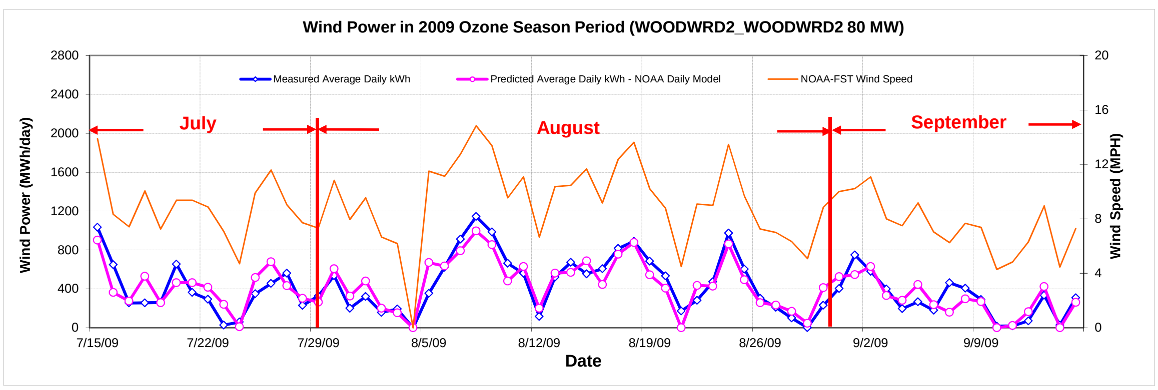


Figure 11-283: WOODWRD2_WOODWRD2 – Predicted Wind Power in OSP Using NOAA Wind Speed (2009)

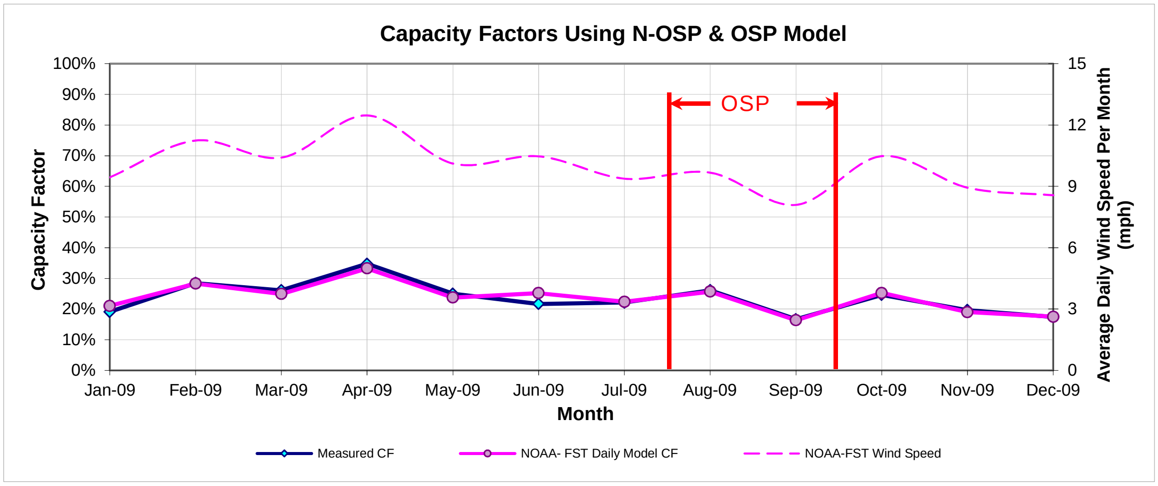


Figure 11-284: WOODWRD2_WOODWRD2 – Predicted Capacity Factors Using Daily Models (2009)

Table 11-272: WOODWRD2_WOODWRD2 – Predicted Power Production in 1999

Annual

1999 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
201,731	164,361

OSD

1999 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
521	417

12 Appendix C

In this section, the comparison between 2008 and 2009 annual and OSP power productions are performed for wind farms built since 2008. For some of the wind farms, 2008 measured data is available ,which was presented in 2010 report. For the rest, wind data for 2008 is not available from ERCOT. In this case, the estimated 2008 annual and OSP power productions are calculated by using 2009 daily models.

12.1 Buffalo Gap 3

Measured data for this wind farm named BUFF_GAP_Unit3 was provided by ERCOR. There is missing data in 2008 and the actual data period is June - December 2008. The annual predicted power production shown in Table 12-1for the comparison is an adjustment for one year period.

Table 12-1: Buffalo Gap 3(BUFF_GAP_Unit3) – Measured Power Production in 2008

Annual

2008 Measured MWh/yr	2009 Measured MWh/yr
276,843	292,765

OSD

2008 OSD Measured MWh/day	2009 OSD Measured MWh/day
542	601

12.2 Bull Creek Wind Plant

Both BULLCRK_WND1 and BULLCRK_WND2 belong to Bull Creek Wind Plant. Measured data in 2008 is not available since they were built in November 2008. The estimated 2008 annual and OSP power productions are calculated by using 2009 daily models, shown in Table 12-2 and Table 12-3.

12.2.1 Bull Creek Wind Plant(BULLCRK_WND1)

Table 12-2: Bull Creek Wind Plant(BULLCRK_WND1) – Predicted Power Production in 2008

Annual

2008 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
170,473	158,701

OSD

2008 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
233	254

12.2.2 Bull Creek Wind Plant(BULLCRK_WND2)

Table 12-3: Bull Creek Wind Plant(BULLCRK_WND2) – Predicted Power Production in 2008

Annual

2008 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
178,682	162,129

OSD

2008 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
268	288

12.3 Capricorn Ridge Wind Expansion

Both CAPRIDGE_CR3 and CAPRIDGE_CR4 belong to Bull Creek Wind Plant Measured data for this wind farm named CAPRIDG_CR3 was provided by ERCOR. There is missing data in 2008 and the actual data period is Feburary - December 2008. The annual predicted power production shown in Table 12-4 and the comparison is an adjustment for one year period.

12.3.1 Capricorn Ridge Wind Expansion(CAPRIDGE_CR3)

Table 12-4: Capricorn Ridge Wind Expansion (CAPRIDG_CR3) – Measured Power Production in 2008

Annual

2008 Measured MWh/yr	2009 Measured MWh/yr
443,685	329,051

OSD

2008 OSD Measured MWh/day	2009 OSD Measured MWh/day
783	716

12.3.2 Capricorn Ridge Wind Expansion(CAPRIDGE_CR4)

Table 12-5: Capricorn Ridge Wind Expansion (CAPRIDG_CR4) – Measured Power Production in 2008

Annual

2008 Measured MWh/yr	2009 Measured MWh/yr
303,185	232,730

OSD

2008 OSD Measured MWh/day	2009 OSD Measured MWh/day
513	499

12.4 Camp Springs Energy Expansion

Table 12-6: Camp Springs Energy Expansion (CSEC_CSECG2) – Measured Power Production in 2008

Annual

2008 Measured MWh/yr	2009 Measured MWh/yr
351,450	353,015

OSD

2008 OSD Measured MWh/day	2009 OSD Measured MWh/day
607	718

12.5 Elbow Creek Wind

Measured data in 2008 for this wind farm named ELB_ELBCREEK is not available since it was built in November 2008. The estimated 2008 annual and OSP power productions are calculated by using 2009 daily models, shown in Table 12-7.

Table 12-7: Elbow Creek Wind (ELB_ELBCREEK) –Predicted Power Production in 2008

Annual

2008 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
357,441	326,361

OSD

2008 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
731	636

12.6 Silver Star Phase 1

There is missing data in 2008 and the actual data period is May - December 2008 for this wind farm named FLTCK_SSI. The annual predicted power production shown in Table 12-8 and the comparison is an adjustment for one year period.

Table 12-8: Silver Star Phase 1 (FLTCK_SSI) – Measured Power Production in 2008

Annual

2008 Measured MWh/yr	2009 Measured MWh/yr
126,279	134,867

OSD

2008 OSD Measured MWh/day	2009 OSD Measured MWh/day
123	119

12.7 Goat Wind and Goat Wind Phase 2

There is missing data in 2008 and the actual data period is April - December 2008 for this wind farm named GOAT_GOATWIND. The annual predicted power production shown in Table 12-9 and the comparison is an adjustment for one year period.

Table 12-9: Goat Wind and Goat Wind Phase 2 (GOAT_GOATWIND) – Measured Power Production in 2008

Annual

2008 Measured MWh/yr	2009 Measured MWh/yr
212,109	258,484

OSD

2008 OSD Measured MWh/day	2009 OSD Measured MWh/day
333	660

12.8 Hackberry Wind Farm

Table 12-10: Hackberry Wind Farm (HWF_HWFG1) – Predicted Power Production in 2008

Annual

2008 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
534,585	501,046

OSD

2008 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
972	1,037

12.9 Inadale

Measured data in 2008 for this wind farm named INDL_INADALE1 is not available since it was built in November 2008. The estimated 2008 annual and OSP power productions are calculated by using 2009 daily models, shown in Table 12-11.

Table 12-11: Inadale (INDL_INADALE1) – Predicted Power Production in 2008

Annual

2008 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
299,739	289,487

OSD

2008 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
679	728

12.10 Sherbino Mesa Wind Farm

Measured data in 2008 for this wind farm named KEO_KEO_SM1 is not available since it was built in September 2008. The estimated 2008 annual and OSP power productions are calculated by using 2009 daily models, shown in Table 12-12.

Table 12-12: Sherbino Mesa Wind Farm (KEO_KEO_SM1) – Predicted Power Production in 2008

Annual

2008 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
341,642	322,568

OSD

2008 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
991	928

12.11 Lone Star – Post Oak Wind

Both LNCRK2_G871 and LNCRK2_G872 belong to Lone Star – Post Oak Wind.

12.11.1 Lone Star – Post Oak Wind(LNCRK2_G871)

Table 12-13: Lone Star – Posr Oak Wind (LNCRK2_G871) – Measured Power Production in 2008

Annual

2008 Measured MWh/yr	2009 Measured MWh/yr
210,777	286,955

OSD

2008 OSD Measured MWh/day	2009 OSD Measured MWh/day
521	598

12.11.2 Lone Star – Post Oak Wind(LNCRK2_G872)

Table 12-14: Lone Star – Posr Oak Wind (LNCRK2_G872) – Measured Power Production in 2008

Annual

2008 Measured MWh/yr	2009 Measured MWh/yr
210,921	295,482

OSD

2008 OSD Measured MWh/day	2009 OSD Measured MWh/day
504	605

12.12 McAdoo Wind Energy

Measured data in 2008 for this wind farm named MWEC_G1 is not available since it was built in May 2008. The estimated 2008 annual and OSP power productions are calculated by using 2009 daily models, shown in Table 12-15.

Table 12-15: McAdoo Wind Energy (MWEC_G1) – Predicted Power Production in 2008

Annual

2008 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
452,342	437,411

OSD

2008 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
839	877

12.13 Ocotillo Windpower1

Measured data in 2008 for this wind farm named OWF_OWF is not available since it was built in August 2008. The estimated 2008 annual and OSP power productions are calculated by using 2009 daily models, shown in Table 12-16.

Table 12-16: Ocotillo Windpower1 (OWF_OWF) – Predicted Power Production in 2008

Annual

2008 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
148,806	135,732

OSD

2008 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
320	277

12.14 Panther Creek

Both PC_NORTH_PANTHER1 and PC_NORTH_PANTHER2 belong to Panther Creek. Measured data in 2008 is not available since they were built in June 2008. The estimated 2008 annual and OSP power productions are calculated by using 2009 daily models, shown in Table 12-17 and Table 12-18.

12.14.1 Panther Creek(PC_NORTH_PANTHER1)

Table 12-17: Panther Creek (PC_NORTH_PANTHER1) – Predicted Power Production in 2008

Annual

2008 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
446,034	409,394

OSD

2008 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
953	842

12.14.2 Panther Creek(PC_NORTH_PANTHER2)

Table 12-18: Panther Creek (PC_NORTH_PANTHER2) – Predicted Power Production in 2008

Annual

2008 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
353,360	323,330

OSD

2008 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
749	663

12.15 Penascal Wind Farm

Both PENA_UNIT1 and PENA_UNIT2 belong to Penascal Wind Farm. Measured data in 2008 is not available since they were built in November 2008. The estimated 2008 annual and OSP power productions are calculated by using 2009 daily models, shown in Table 12-19 and Table 12-20.

12.15.1 Penascal Wind Farm(PENA_UNIT1)

Table 12-19: Penascal Wind Farm (PENA_UNIT1) – Predicted Power Production in 2008

Annual

2008 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
101,348	105,695

OSD

2008 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
300	325

12.15.2 Penascal Wind Farm(PENA_UNIT2)

Table 12-20: Penascal Wind Farm (PENA_UNIT2) – Predicted Power Production in 2008

Annual

2008 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
245,164	257,777

OSD

2008 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
444	555

12.16 Pyron

Measured data in 2008 for this wind farm named PYRPYRON1is not available since it was built in November 2008. The estimated 2008 annual and OSP power productions are calculated by using 2009 daily models, shown in Table 12-21.

Table 12-21: Pyron (PYRPYRON1) – Predicted Power Production in 2008

Annual

2008 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
549,104	524,942

OSD

2008 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
1,119	1,166

12.17 South Trent Wind Farm

Measured data in 2008 for this wind farm named STWF_T1 is not available since it was built in October 2008. The estimated 2008 annual and OSP power productions are calculated by using 2009 daily models, shown in Table 12-22.

Table 12-22: South Trent Wind Farm (STWF_T1) – Predicted Power Production in 2008

Annual

2008 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
263,519	249,851

OSD

2008 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
581	623

12.18 Stanton Wind Energy

Table 12-23: Stanton Wind Energy(SWEC_G1) – Measured Power Production in 2008

Annual

2008 Measured MWh/yr	2009 Measured MWh/yr
315,845	343,410

OSD

2008 OSD Measured MWh/day	2009 OSD Measured MWh/day
622	670

12.19 Gulf Wind 1

Both TGW_T1 and TGW_T2 belong to Penascal Wind Farm. Measured data in 2008 is not available since they were built in November 2008. The estimated 2008 annual and OSP power productions are calculated by using 2009 daily models, shown in Table 12-24 and Table 12-25.

12.19.1 Gulf Wind 1 (TGW_T1)

Table 12-24: Gulf Wind 1(TGW_T1) – Predicted Power Production in 2008

Annual

2008 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
195,463	226,583

OSD

2008 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
607	917

12.19.2 Gulf Wind 1 (TGW_T2)

Table 12-25: Gulf Wind 1 (TGW_T2) – Predicted Power Production in 2008

Annual

2008 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
218,376	251,488

OSD

2008 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
665	1,006

12.20 Champion Wind Farm

Table 12-26: Champion Wind Farm (TKWSW_CHAMPION) – Measured Power Production in 2008

Annual

2008 Measured MWh/yr	2009 Measured MWh/yr
302,762	324,852

OSD

2008 OSD Measured MWh/day	2009 OSD Measured MWh/day
522	631

12.21 Roscoe Wind Farm 1

There is missing data in 2008 and the actual data period is April - December 2008 for this wind farm named Roscoe Wind Farm. The annual predicted power production shown in Table 12-27 and the comparison is an adjustment for one year period.

Table 12-27: Roscoe Wind Farm 1 (TKWSW1_ROSCOE) – Measured Power Production in 2008

Annual

2008 Measured MWh/yr	2009 Measured MWh/yr
591,496	494,118

OSD

2008 OSD Measured MWh/day	2009 OSD Measured MWh/day
820	994

12.22 Turkey Track Energy Center

Measured data in 2008 is not available since it was built in November 2008. The estimated 2008 annual and OSP power productions are calculated by using 2009 daily models, shown in Table 12-28.

Table 12-28: Turkey Track Energy Center (TTWEC_G1) – Predicted Power Production in 2008

Annual

2008 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
260,238	255,022

OSD

2008 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
550	561

12.23 Wolf Ridge Windfarm

Measured data in 2008 is not available since it was built in October 2008. The estimated 2008 annual and OSP power productions are calculated by using 2009 daily models, shown in Table 12-29.

Table 12-29: Wolf Ridge Windfarm (WHTTAIL_WR1) – Predicted Power Production in 2008

Annual

2008 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
448,262	412,275

OSD

2008 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
832	784

12.24 Notrees Windpower

Measured data in 2008 is not available since it was built in January 2009. The estimated 2008 annual and OSP power productions are calculated by using 2009 daily models, shown in Table 12-30.

Table 12-30: Notrees Windpower (NWF_NWF1) – Predicted Power Production in 2008

Annual

2008 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
364,986	345,327

OSD

2008 OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
1,013	922

12.25 Panther Creek 3

Measured data in 2008 is not available since it was built in August 2009. The estimated 2008 annual and OSP power productions are calculated by using 2009 daily models, shown in Table 12-31.

Table 12-31: Panther Creek 3 (PC_SOUTH_PANTHER 3) – Predicted Power Production in 2008

Annual

2008 Estimated MWh/yr (2009 Daily Model)	2009 Measured MWh/yr
492,715	368,526

OSD

2008OSD Estimated MWh/day (2009 Daily Model)	2009 OSD Measured MWh/day
723	755

13 Appendix D

13.1 Data Files for Wind Energy Production and Weather Files for the Modeling – contact ESL for access

13.2 Papers Presented

Yazdani, B.; Culp, C.; Haberl, J.; Baltazar, J-C; Do, SL; *Analysis of Emissions Calculators for the National Center of Excellence on Displaced Emission Reductions (CEDER) Annual Report*, March, 2010.

Gilman, D.; Haberl, J.; Culp, C.; Liu, Z.; Yazdani, B.; Montgomery, C.; Claridge, D.; O'Neal, S.; Kayati, M; *Report on the Development of the Format for a Texas National Residential Registry* presented to the Texas Public Utility Commission, March 2010.

Cho, S.; Haberl, J.; *Integrating Solar Thermal and Photovoltaic Systems in Whole Building Energy Simulation*, presented at the 2010 SimBuild Conference in New York City, August 2010.

Baltazar, J-C.; Haberl, J.; Liu, Z.; Mukhopadhyay, J.; Marshall, K.; Gilman, D.; Culp, C.; Yazdani, B.; Lewis, C.; McKelvey, K.; Reid, V.; *A Methodology for Calculating Intergrated NOx Emissions Reductions from Energy Efficient and Renewable Energy (EE/RE) Programs across State Agencies in Texas*, presented at the tenth International Conference for Enhanced Building Operations, Safat, Kuwait October 2010.