Technical Assessment of Onshore and Offshore Wind Generation Potential in New England

May 1, 2007

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LIMITATION ON LIABILITY

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INTRODUCTION

In January 2007, ISO New England Inc. (ISO-NE) asked Levitan & Associates, Inc. (LAI) to assess the potential for onshore and offshore wind generation in New England. LAI's assessment of wind generation potential throughout the region is part of ISO-NE's 2007 Scenario Analysis Project examining technology options to meet New England's future resource requirements.[1] For resource planning requirements, nameplate or installed capacity (ICAP) as well as unforced capacity (UCAP) are relevant for intermittent resources. An intermittent resource is a resource whose output amount and availability are not subject to the control of the plant operator usually due to the intermittent nature of the fuel *e.g.* wind, solar, run-of-river hydro. Since wind generation is an intermittent resource, LAI has centered its quantitative effort on the determination of UCAP, roughly the amount of dependable capacity based on expected wind patterns by location during the summer.

The objectives of the analysis conducted herein are twofold: <u>first</u>, to quantify the maximum theoretical wind generation potential expressed in terms of megawatts (MW) of UCAP for both onshore and offshore sites; and, <u>second</u>, to analyze historic wind data in New England in order to quantify the patterns and variability in wind speeds for the locations where data is available. New England stakeholders are encouraged to interpret the quantification of wind generation potential reported in this study as a theoretical limit insofar as necessary environmental and other screening criteria that would eliminate many sites have <u>not</u> been applied. The generation capacity numbers therefore comprise the maximum theoretical wind generation potential rather than the amount of onshore or offshore installed capacity that can be successfully permitted and commercially developed. Further refinements are necessary in order to delineate the amount of wind generation potential by location throughout New England. Additional factors that need to be considered include: recreational and aesthetic considerations associated with wind locations, proximity to transmission infrastructure, proximity to populated areas, local opposition, exclusion of park lands, conservation areas and onshore water bodies, terrain constraints – turbines cannot be built in steeply sloped locations, and environmental impacts, including bird migration patterns.

ISO-NE's scenario process examines a number of future mixes of fuels and technologies for new generation capacity, including wind generation. A broad field of technology and fuel options is being tested through the 2007 Scenario Analysis Project. One of the seven scenarios, Scenario #6, considers satisfying a large portion of New England's future resource needs by installing 5,400 MW of renewable generation, including onshore and offshore wind, biomass, landfill gas, distributed generation, combined heat and power, fuel cells and photovoltaics.

Wind is the result of atmospheric pressure differentials due to the uneven heating of the earth's surface. Winds vary by location, by hour, by season and by year. Hence, wind power is inherently uncertain for purposes of long term capacity planning. While offshore winds flow over a comparatively flat ocean surface, onshore winds encounter structures and elevation changes, and are therefore more turbulent. In general, offshore winds are stronger and more

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[1] http://www.iso-ne.com/committees/comm_wkgrps/othr/sas/index.html

constant than onshore winds. From the standpoint of resource planning, energy produced from wind is proportional to the cube of the wind speed; in other words, a very small increase in wind speed can significantly increase electricity production, and *vice versa*. The greater the wind speed, the greater the electrical output, until a maximum wind speed is reached, at which point the turbine shuts off in order to ensure mechanical safety and the avoidance of damage to the wind turbine.

Ideally, several years of accumulated wind speed data should be used to build an accurate profile of energy production for a postulated wind generator. Variations in wind speed patterns require that at least one year of data is collected in order to compute potential wind energy. In characterizing potential wind generation by location, LAI has used the industry standard classification system for annual average wind speeds, which ranges from Class 1 (less than 5.6 meters per second, or "m/s") to Class 7 (greater than 8.8 m/s). Higher Class ratings yield greater wind capacity factors, which in turn, indicate increased energy production and lower all-in unitized energy costs. Technology advances have resulted in wind turbines that can operate at lower speeds, enabling the development of Class 3 sites with wind speeds between 6.4 and 7.0 m/s. For offshore locations, Class 4 sites with wind speeds of 7.0 to 7.5 m/s are preferred due to the higher cost of construction and the higher annual operating and maintenance (O&M) costs relative to onshore locations.

In performing this study, LAI has relied primarily on AWS Truewind's database of wind speeds in New England to identify onshore and offshore locations meeting respectively Class 3 and Class 4 criteria which are minimum thresholds for development. Data from other leading studies performed in New England, elsewhere in the U.S., and Europe have also been reviewed. Lastly, LAI developed "representative" hourly production profiles for onshore and offshore wind projects based on actual 2005 data.

EXECUTIVE SUMMARY

This analysis represents a high-level review of the maximum potential for wind generation in New England. Uncertainty about wind patterns and difficulty in forecasting requires careful study in order to integrate wind technology into New England's existing generation and transmission infrastructure. To compute the maximum theoretical wind generation potential for onshore locations, LAI screened each location for both adequate wind speed and low population density. The proxy for the maximum allowable population density value has been set equal to that of Hull, Massachusetts, the site of two wind turbines using state-of-the-art wind turbine technology. To compute the maximum potential for offshore locations, LAI considered wind speed and water depth. Existing wind technology does not favor installation in water deeper than 60 meters. Potential technology progress allowing for installation in deeper water depths was not contemplated.

The first goal of this study is the derivation of maximum theoretical wind generation potential in New England. LAI made assumptions concerning the installed technology both onshore and offshore. Using existing technology characteristics, we assumed that onshore wind turbines would be standard onshore General Electric (GE) 1.5-MW turbines spaced about four rotor diameters, or 282 meters, apart. We also assumed that offshore turbines would be standard offshore GE 3.6-MW turbines spaced about six to nine rotor diameters apart on a 0.6 kilometer by 1.0 kilometer grid. Normally, an accurate assessment of power production requires one or more years of hourly wind measurements or simulations at the chosen site in order to account for the effects of spatial and geographic diversity. LAI based its analysis on the AWS Truewind database which provides average yearly wind speeds for each of the more than 5 million, 200 meter by 200 meter grid squares in New England. LAI then filtered the database in order to identify grid squares meeting the wind speed and population density (for onshore) or water depth (for offshore) factors required to support wind generation development. Using proprietary wind turbine power curves provided by GE, LAI estimated energy production based on the average annual wind speed at each selected grid square.

New England's maximum theoretical wind generation potential based on the AWS Truewind model amounts to approximately 94,000 MW, over three times the existing total ICAP in New England. The representation of maximum theoretical wind generation potential expressed in terms of UCAP is henceforth referred to as Maximum Theoretical UCAP (MT-UCAP). The locational distribution of MT-UCAP by onshore and offshore zone is summarized in Table 1.

Table 1 – Maximum Theoretical Wind Generation Potential in New England

Zone	MT-UCAP (MW)
Maine	39,379
Vermont	7,997
New Hampshire	5,598
SEMA	4,552
WCMA	1,432
Rhode Island	488
NEMA	226
Connecticut	175
Offshore Shallow	25,679
Offshore Deep	8,295
Total	93,821

Of this amount, 60,000 MW, or about 64%, of the total MT-UCAP is onshore. About 34,000 MW of the MT-UCAP is located offshore along New England's coastline, the majority of which is near Maine and Massachusetts.

Measured UCAP wind potential for summer and winter was calculated in accord with the months and hours of the day used for rating resource capacity under ISO-NE's Forward Capacity Market (FCM). The relevant summer period is June through September, 1:01 pm to 6:00 p.m. The relevant winter period is October through May, 5:01 p.m. to 7:00 p.m. Capacity factors have been expressed as an effective FCM capacity rating for various sites in New England that meet the threshold wind Class requirement and have at least one year of hourly data. The effective FCM capacity rating for onshore sites was 19% for summer and 41% for winter. For offshore sites, the effective FCM capacity rating was 26% for summer and 46% for winter. Measured FCM UCAP is the ICAP times the effective FCM capacity rating for the relevant period. The onshore FCM UCAP based on wind speed measurements is 42,000 MW in the summer and 90,000 MW in the winter. The offshore FCM UCAP based on wind speed measurements is 25,500 MW in the summer and 45,000 MW in the winter.

Insofar as LAI performed a high-level screening analysis with adjustments only for population density, water depth, and threshold economics, the actual amount of developable wind generation will certainly be much lower than the 94,000 MW stated on an MT-UCAP basis, or 67,500 MW stated on a measured FCM UCAP basis during the summer. New England stakeholders are reminded not to equate the derivation of maximum wind generation potential in New England with commercially developable potential. Further refinements are necessary in order to delineate the amount of wind generation potential by location both onshore and offshore throughout New England, including its coastline. Other meaningful screening criteria include:

- Recreational and aesthetic areas along beachfront property, customary shipping channels, both onshore and offshore areas near airports, or road, railroad, pipeline, and other rights-of-way,
- Proximity to transmission infrastructure, as well as system upgrades,

- Availability of ancillary services from conventional generation plants, *i.e*. load following,
- Terrain constraints, such as the slope of the land, soil conditions or flooding potential,
- Proximity to populated areas and local opposition, and
- Exclusion of environmentally sensitive areas such as onshore water bodies,[2] wetlands, park lands, conservation areas, unique habitats, bird migration routes, and archeological or cultural resources.

The second goal of this study is the examination of historic wind data in New England. LAI has compared simulated wind speed with measured wind speed. The comparisons are indicative of the variation in wind from year to year. AWS Truewind's data are based on an average of weather from the past 15 years. The results of the comparisons also illuminate problem areas associated with hourly wind patterns observed in New England. Since generation is proportional to the cube of wind speed, a possible error in wind speed of 6% to 8% corresponds to a 20% to 30% uncertainty margin in wind turbine output at a 95% confidence limit. Notably, the hourly profiles used in this report from AWS Truewind are the same for each day of the year, thus leading to additional uncertainty regarding the determination of hourly power production.

LAI analyzed the measured data from the Renewable Energy Research Laboratory at the University of Massachusetts, Amherst (UMRERL), which was limited to a few years for various sites. In sum, there are only ten onshore sites in New England with adequate public historical data. Most of these sites are in Massachusetts. Only three of these sites have a Wind Class of 3 or greater. Offshore sites at the UMRERL website as well as buoy data at the National Oceanic and Atmospheric Administration (NOAA) website were also analyzed. Historic data show that potential wind farms in New England would surely generate much more electricity in the winter than in the summer. There are, however, locations with summer wind speeds that are adequate to sustain substantial energy production even during heat storms, albeit at an output level measurably below winter season generation profiles.

For the three onshore sites and four offshore sites with adequate wind speed and data, LAI converted hourly wind speed data to electrical power output based on the GE power curves. From the hourly calculated power production, LAI estimated hourly, monthly and seasonal (summer and winter) capacity factors for the onshore and offshore locations and the standard deviation in the hourly and monthly capacity factors.

In sum, LAI finds the following:

- The maximum theoretical onshore wind generation potential in New England is extremely large, over ten times greater than the 5,400 MW ICAP threshold defined by ISO-NE in Scenarios #6 for all new renewable technology to help meet New England's

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[2] The Energy Policy Act of 2005 (EPACT 05) requires the Department of the Interior to study the renewable potential on Federal lands. Moreover, EPACT 05 suggests that renewable energy development is an appropriate use for public lands and that, within 10 years from passage, Federal lands should support at least 10,000 MW of renewable energy generation.

future capacity and energy requirements. However, meaningful onshore screening criteria have not yet been applied to these wind sites. The application of such screening criteria would significantly reduce the theoretical onshore wind generation potential. The magnitude of the decrease in onshore MT-UCAP when appropriate screening criteria are applied is unknown. Nearly 66% of the total onshore MT-UCAP potential is located in Maine. Over 20% of the remainder onshore potential is located in New Hampshire and Vermont. Most of the wind generation potential in Massachusetts is located in southeast Massachusetts, about 8% of the total onshore potential across the region. Remaining wind generation potential in Massachusetts, Rhode Island and Connecticut is comparatively small. During the summer, the measured UCAP onshore across all of New England amounts to 42,000 MW based on the 19% effective FCM capacity rating. Given that most of the onshore wind sites being developed are in Maine, Vermont and New Hampshire where there are many sites with onshore wind speeds higher than the two Massachusetts sites used for calculating onshore capacity factors, LAI's estimate of the effective FCM capacity ratings understates both the effective FCM capacity ratings and the measured FCM UCAP for onshore New England.

- The maximum theoretical offshore wind generation potential in New England is also very large, over six times greater than the 5,400 MW ICAP threshold defined by ISO-NE in Scenarios #6. Again, meaningful offshore screening criteria have not yet been applied to these wind sites. The application of offshore screening criteria would also significantly reduce the theoretical offshore wind generation potential. The total offshore MT-UCAP of 34,000 MW is divided into shallow offshore (less than 30 meters) and deep offshore (between 30 to 60 meters). Over 75% of total offshore wind generation potential is located in shallow offshore waters, about 26,000 MW. Insofar as the majority of the shallow offshore wind generation potential is located on or very close to New England's shoreline, the actual amount of developable wind generation potential may be materially lower when environmental, safety, recreational, and aesthetic screening criteria are applied. Irrespective of water depth, the total measured UCAP equivalent offshore potential during the summer is 25,500 MW based on the 26% effective FCM capacity rating.

- The summer and winter FCM UCAP estimates based on wind speed measurements at a handful of sites bracket the MT-UCAP calculated with the AWS Truewind model in which average wind speeds by site are used. Therefore, the AWS Truewind model is useful for purposes of developing a rough estimate of wind generation potential for sites where hourly measurements of wind speed are not available. Based on the AWS Truewind model, the theoretical average capacity factor is 27% for onshore New England and 35% for offshore New England. However, the model does not capture the variability inherent in the summer and winter hourly wind speeds.

- There are limited public data for many sites and only a complete year of data for a few sites, mostly in Massachusetts. In light of the promising amount of wind generation potential in Maine, Vermont and New Hampshire, much more data and better quality data are needed in order to refine the estimate of wind generation potential in northern New England.

- Relative to onshore locations, available data show that offshore wind installations will produce more electricity during the relevant afternoon hours in the summer or during the narrow, two-hour window of relevance in the late afternoon and early evening the rest of the year. However, a combination of onshore and offshore sites scattered throughout New England will tend to minimize hourly variability in wind generation.

- For both onshore and offshore sites, it is very windy during the winter, but not nearly as windy during the summer. Wind speeds during the fall and spring are somewhere in between the velocities observed during winter and summer. The effective FCM capacity rating for onshore sites was 19% for summer and 41% for winter. For offshore sites, the effective FCM capacity rating was 26% for summer and 46% for winter.

NEW ENGLAND WIND GENERATION POTENTIAL: ONSHORE AND OFFSHORE

The primary goal of this analysis is to assess the maximum wind generation potential in New England without applying an array of screening criteria of relevance in the present context. Other than wind speed, the only criteria used to identify potential wind generation sites are population density for the onshore locations and water depth for the offshore locations. Potential wind generation areas / sites were identified using wind speed and topographic maps. Wind maps indicate predicted wind speed and prevailing directions at a specific height based on computational weather models that also account for the influence of local terrain and land cover. These maps allow project developers to identify promising sites with greater confidence, especially smaller areas that are only now revealed through high-resolution mapping.

Figure 1 on the following page depicts wind speeds in New England at 50 m.[3]

LAI used wind power classifications to help identify potential areas / sites as defined by the U.S. Department of Energy (DOE), shown in Table 2.[4]

Table 2 – Wind Classifications

Power Class	Wind Power (W/m^2)	Speed (m/s)
1	< 200	< 5.6
2	200 - 300	5.6 – 6.4
3	300 - 400	6.4 – 7.0
4	400 - 500	7.0 – 7.5
5	500 - 600	7.5 – 8.0
6	600 - 800	8.0 – 8.8
7	> 800	> 8.8

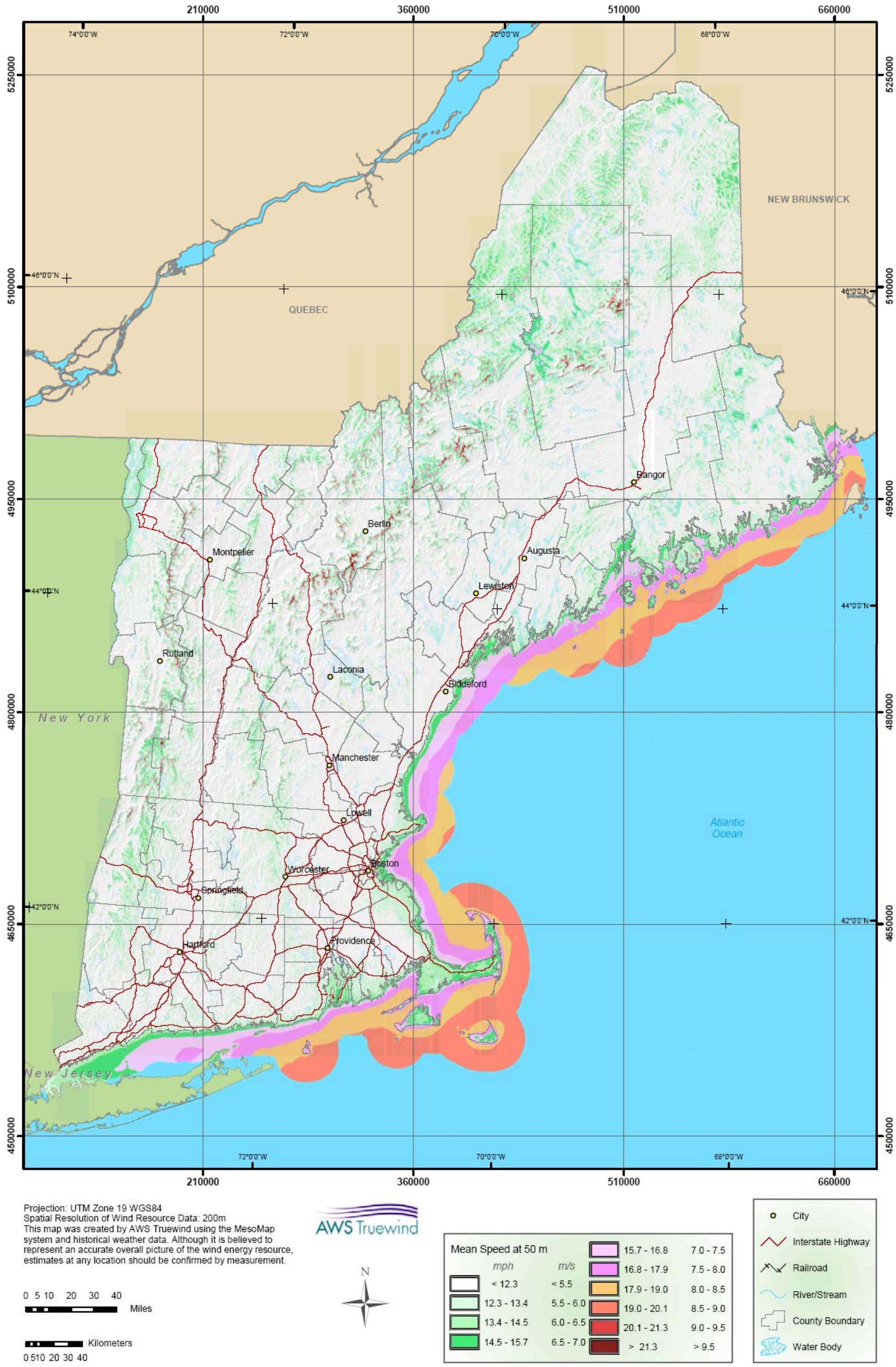
Locations with an average wind speed of Class 3 or greater can be developed for wind generation using current technology. Thus, we assumed that areas with an average wind speed of Class 3 or greater could be commercialized onshore, while areas with a wind speed of Class 4 or greater could be developed offshore. In compiling wind speed data, LAI relied on wind maps, topographic maps and other relevant data available in New England.[5]

[3] Wind turbine hub heights range from 52.6 m to 100 m for the various GE 1.5 MW turbines.

[4] www1.eere.energy.gov/windandhydro/wind_potential.html

[5] Existing installations, projects under construction or planned, projects in the ISO-NE System Impact Study (SIS) queue, and previous project activities that may have been discontinued.

Figure 1 – Wind Speed Map of New England at 50 m[6]



[6] From http://www.awstruewind.com.

Proposed Projects

According to DOE's Energy Efficiency and Renewable Energy website, there are only a handful of commercial scale wind projects in operation or under construction in New England[7]

Table 3 – New England Wind Projects: Operational & Under Construction[8]

Facility	Nameplate Capacity (MW)	Location
In Operation		
Hull Wind 1	0.66	MA
Hull Wind 2	1.8	MA
MA Maritime Academy	0.66	MA
Portsmouth Abbey	0.66	RI
Searsburg Wind Project	6.6	VT
Under Construction		
Berkshire Wind	15	MA
Evergreen Wind	42	ME
Jericho Mountain Wind	1.4	NH
Total	69	

Wind data from these projects are either not publicly available in a usable format or do not span a complete year. Power production data for existing projects are similarly not publicly available in a usable format or the project has been in operation for less than a year.

A number of projects have been proposed for New England, as listed in Table 4.[9]

[7] www.eere.energy.gov/windandhydro/windpoweringamerica/ne_projects.asp

[8] As of January 2007.

[9] Ibid.

Table 4 – Proposed New England Wind Projects

Facility	Nameplate Capacity (MW)	State
Sterling Wind Energy	50	CT
Cape Wind	468	MA
CEI Mass Wind	3.0 – 3.3	MA
Hoosac Wind Project	30	MA
Minuteman Wind	12.5	MA
South Coast Windfarm	300	MA
Aroostook County Wind	500	ME
Kibby Mountain	130	ME
Maine Mountain Power	90	ME
CEI NH Wind	25-30	NH
Deerfield Wind	30 – 45	VT
Equinox Wind	9	VT
Lowell Mountain	19.5 – 39.0	VT
Sheffield Wind	45 – 55	VT
Total	1,712 - 1,762	

Many of these projects have made interconnection requests of ISO-NE. Over 1,300 MW of wind generation are presently in the ISO-NE queue. Having requested interconnection in June, 2001, Cape Wind is the second largest of the projects and the oldest in the interconnection queue. It is also further along in its development and its regulatory process with a projected commercial operation date of November 2010.[10] The Cape Wind Draft Environmental Impact Statement (DEIS) has a comprehensive alternatives analysis. A series of criteria for screening site selection of both onshore and offshore wind plant locations was developed. Such criteria encompassed wind power classification, adequate electric transmission capacity, commercially available land or watersheet area, engineering and design limitations and legal / regulatory constraints. A Scientific Monitoring Station erected on Horseshoe Shoal has been providing comprehensive data for the area where the park will be sited, including wind, wave, tide height, current and water temperature information. The tower is 196 feet tall and is measuring wind at three different levels. Collected data provide information for the environmental research and design of the offshore wind park on Horseshoe Shoal. The data are not publicly available.

Related Studies

There have been a number of previous studies both of wind generation potential in New England as a whole and for individual New England states. Some of the studies are several years old; wind maps have substantially improved in resolution from a 1 km grid to a 200 m grid. Brief summaries of the relevant studies are provided below in chronological order.

[10] On March 30, 2007, Cape Wind obtained final state environmental approval. Federal governmental review will continue in 2007.

Connecticut Clean Energy Fund's Report: Wind Energy in the Northeastern U.S. (1999)[11]

This report also provides estimates of wind energy potential in MW for each state in New England.

Table 5 – MW of Wind Energy Potential Class 3 and Above[12]

State	MW
CT	571
ME	6,390
MA	2,880
NH	502
RI	109
VT	537
Total	10,989

These estimates exclude the following classifications of land:

- 100% of environmentally protected lands such as parks and wetlands
- 100% of urban areas,
- 50% of forest lands,
- 30% of agricultural lands, and
- 10% of range lands.

DOE's Office of Energy Efficiency and Renewable Energy Study – Wind and Biomass Integration Scenarios in Vermont – Summary of First Phase Research: Wind Energy Resource Analysis (May 2003)[13]

The first phase of this analysis identifies wind resources by location in Vermont based on environmental, transmission and distribution criteria. The wind power map developed by NREL was used.[14] Similar to the other Vermont study below, turbine strings are placed in each grid square with a wind Class 3 or greater and oriented perpendicular to the prevailing wind flow. The turbines were assumed to be Vestas V66 (1.65 MW) and spaced five rotor diameters apart. Class A turbine strings are defined as being within 3 miles of existing suitable transmission lines or another turbine string. Class B turbine strings are defined as being within 0.25 miles of roads/distribution lines. All the turbine strings were screened for general land use and

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[11] Prepared by Energy & Environmental Ventures LLC.
www.ctinnovations.com/pdfs/Wind_Energy_Northeastern_US.pdf

[12] Connecticut Clean Energy Fund's Report: Wind Energy in the Northeastern U.S., 1999, Table 3, p. 12.

[13] Prepared by Princeton Energy Resources International, LLC, DOE Project # DE-FG01-00EE10762
www.perihq.com/documents/wind-biomass_integration_scenarios_in_VT.pdf

[14] The database from 1999 was limited to map resolution of 1 km^2. D. Elliott, M. Schwartz and R. Nierenberg, "Wind Resource Mapping of the State of Vermont," NICH Report No. CP-500-27507.

environmental compatibility.[15] The table below summarizes total wind generation potential and potential net energy production in Vermont.

Table 6 –Technical Potential of Wind Power Generation in Vermont[16]

Wind Class	Miles of Turbine String Before Exclusions	Miles of Turbine String After Exclusions	Capacity Before Exclusions (MW)	Capacity After Exclusions (MW)	Net Energy Production Before Exclusions (TWh/yr)	Net Energy Production After Exclusions (TWh/yr)
Class A Turbine Strings						
3	122	97	976	773	2.2	1.7
4	122	102	976	816	2.5	2.1
5	149	114	1,192	914	3.3	2.6
6	307	222	2,456	1,773	7.7	5.6
7	469	225	3,752	1,798	15	7.2
Total	1,169	759	9,352	6,074	30.7	19.1
Class B Turbine Strings						
3	286	224	2,284	1,791	5.1	4.3
4	174	144	1,390	1,150	3.5	2.9
5	159	131	1,269	1,050	3.5	2.9
6	259	167	2,074	1,337	6.5	4.2
7	141	103	1,130	826	4.5	3.3
Total	1,019	769	8,147	6,153	23.2	17.3

On an installed capacity basis, Vermont has the possibility of installing about 6,000 MW of either Class A or Class B turbine strings. It is important to note that the total potential capacity estimates for the Class A and B strings are not additive because the same resource may satisfy both selection criteria, and hence appear in both totals.

Vermont Department of Public Service Study: Estimating the Hypothetical Wind Power Potential on Public Lands in Vermont (December 2003)[17]

This study estimated the hypothetical wind power on public lands in Vermont using Truewind Solutions maps with a spatial resolution of 200 m square grid cells. Since the terrain is mountainous, rows of wind turbines or turbine strings were manually created and form the basis

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[15] Turbine strings were eliminated if they were within 0.5 miles of the Appalachian and Long Trails, intersected public land where wind development is prohibited, were within Green Mountain National Forest restrictive Management Areas, or were within 0.5 miles of a rare, threatened or endangered species.

[16] Wind and Biomass Integration Scenarios in Vermont – Summary of First Phase Research: Wind Energy Resource Analysis, May 2003, Table 1, p. 7; energy production is based on the Vestas V47 (50 m hub height) power curve. 1 million MWh = 1 TWh.

[17] Prepared by Vermont Environmental Research Associates, Inc
www.vermontwindpolicy.org/windpwr.pdf

of the analysis. It was possible to assign 832 km (517 miles) of turbine strings which correspond to 6,000 MW of ridgeline wind capacity assuming a typical side-to-side distance between turbines of 2.5 to 3.0 rotor diameters or 176 to 212 m, which was rounded to 200 m. Only turbine strings that were less than 7 km from existing transmission lines with electrical capacities in the 34.5 to 230 kilovolt (kV) range were used. Energy production is calculated for each string segment assuming the GE 1.5 MW turbine power curve. The study found that 3% of Vermont's total land area has a wind Class 4 or greater.

National Renewable Energy Laboratory: (a) Future for Offshore Wind Energy in the U.S. (2004)[18] *(b) Overview: Potential of Offshore Wind Energy in the Northeast (2005)*[19]

Offshore winds flow more consistently, at higher speeds and are less turbulent compared to onshore sites. These studies estimate offshore wind resources for New England as shown in Table 7.

Table 7 – Offshore Wind Energy Resource Estimates in MW[20]

	5-20 Nautical Miles	20-50 Nautical Miles
Shallow water <30 m	9,900	2,700
Deep water >30 m	41,600	166,300
% Exclusion[21]	67	33

The shallow water (<30 m) technology uses the monopile foundation while the deep water (>30 m) technology uses a gravity or a tripod / truss foundation. Commercial deepwater technology is 10-15 years away but the capacity factors are up to 0.5. More than one-half of the identified offshore wind generation potential in the U.S. is located off the New England and Mid-Atlantic coasts where water depths deepen gradually with distance from shore compared to the West Coast where water depths quickly deepen from the shoreline.

[18] W. Musial and S. Butterfield, NREL/CP-500-36313, presented at Energy Ocean 2004, Palm Beach, Florida, June 28-29, 2004.

www.nrel.gov/docs/fy04osti/36313.pdf

[19] Walt Musial, presented at the Offshore Wind Energy Collaborative Workshop, Washington, D.C., February 10-11, 2005.

www.mtpc.org/renewableenergy/owec.htm

[20] W. Musial and S. Butterfield, NREL/CP-500-36313, presented at Energy Ocean 2004, Palm Beach, Florida, June 28-29, 2004, Table 2, p. 3; 1 nautical mile (NM) is equal to 1.15 U.S. miles.

[21] 67% of the potential area within 5-20 nautical miles from shore is excluded to account for shipping lanes, avian, marine mammal, fish and view shed concerns. Within 20-50 nautical miles from shore, the exclusion is reduced to 33% because there are fewer environmental concerns and no view shed issues.

Maine Public Utilities Commission: Report on the Viability of Wind Power Development in Maine (Jan. 27, 2005)[22]

The Maine Public Utilities Commission (MPUC) concluded that the potential for wind power development that is economic, environmentally sound and publicly acceptable in Maine is approximately 1,000 MW. The conclusions are based on a National Renewable Energy Laboratory analysis that calculated a theoretical potential in Maine of approximately 8,000 MW at Class 3 or higher. About 1,000 MW of this potential is located within 5 miles of a transmission line. This study is of interest because it lists MW of wind generation potential Class 3 and above, for each New England state, as shown in Table 8.

Table 8 – New England Wind Generation Potential (MW ICAP) Class 3 and Above[23]

	Miles from Transmission				
	0-5	**5-10**	**10-20**	**>20**	**Total**
Connecticut	0	0	43	0	43
Maine	981	1,898	2,892	2,433	8,205
Massachusetts	1,614	525	772	427	3,338
New Hampshire	1,774	1,499	919	548	4,740
Rhode Island	4	85	25	0	113
Vermont	1,817	2,085	1,637	28	5,567
Total	6,190	6,092	6,288	3,436	22,006

Massachusetts Technology Collaborative's presentation: The Search for Resources for New England's Electricity Future (2006)[24]

This presentation refers to DOE's estimate of wind resource for New England as a function of water depth. Table 9 summarizes the MW of ICAP with the following exclusions to account for avian, marine mammal, view shed, restricted habitats, shipping routes and other habitats: 100% exclusion 0 to 5 nautical miles (NM), 67% exclusion 5 to 20 NM, and 33% exclusion 20 to 50 NM.

[22] Maine Public Utilities Commission: Report on the Viability of Wind Power Development in Maine, Jan. 27, 2005. www.maine.gov/mpuc/renewable/info_mat/wind_study_cover.pdf

[23] Maine Public Utilities Commission: Report on the Viability of Wind Power Development in Maine, Jan. 27, 2005, Appendix E; it appears that the estimate for wind generation potential does not include offshore sites.

[24] G. Watson, presented at the Electricity Restructuring Roundtable, February 10, 2006. www.raabassociates.org/main/roundtable.asp?sel=71

Table 9 – New England Offshore Wind Energy Resource

Water Depth	MW ICAP
Shallow water <30 m	10,000
Transitional 30-60 m	44,000
Deep 60-90 m	131,000
Very deep >90	0
Total	185,000

LAI Analysis

The purpose of this task was to determine the maximum theoretical wind generation potential in New England. The result is an estimate of New England's wind resource potential expressed in MW of MT-UCAP. Necessary screening criteria have not yet been applied to these wind sites; hence, stated MT-UCAP far exceeds the developable quantity based on the array of screening criteria previously referenced. Of critical importance, the MT-UCAP estimate presented in this section does not reflect an assessment of the amount of generation that can be practically developed. Significant refinement is needed in order to quantify a more realistic amount of wind generation potential by location.

The primary data source is the proprietary database licensed from AWS Truewind. The licensor provides information on average wind speeds at various heights for locations throughout New England. The region is divided into more than 5 million square grids of 200 meters on each side. For each grid square, the database provided an estimate of average wind speed as well as information about terrain and other factor inputs. Figure 2 and Figure 3 show the locations which have adequate wind speed to site wind generation, independent of other screening factors.

The AWS methodology for calculating wind speeds is based on the MesoMap[25] simulation code, which calculates wind flows without the need for direct measurements. The model has been tested to an accuracy of between 5% and 7% in mean annual wind speed at hub height (50 m). Values are the result of a simulation of evolving atmospheric conditions over 365 or 366 days, based on a 15-year historical period. Although the measured accuracy of the AWS Truewind database is good, wind speed values incorporated into wind maps are, in general, prone to uncertainty resulting from modeling complexities such as inadequate characterization of atmospheric stability and terrain variations which affect the definition of boundary layers. In a recent study commissioned by the California Energy Commission, the validation process determined that the mean wind speed calculations were accurate to within a standard error of 0.4-0.6 m/s or 6-8% at a height of 50 m above ground.[26] Since generation is proportional to the cube of the wind speed, this standard error in wind speed corresponds to a 20-30% uncertainty margin in wind turbine output at the 95% confidence limit. Furthermore, the AWS Truewind hourly profiles available to LAI are the same for each day of the year for each 2,000m x 2,000m area

[25] http://www.awstruewind.com/inner/services/windmapping/mesomap/mesomap.htm

[26] "California Wind Energy Resource Modeling and Measurement," prepared for the California Energy Commission by AWS Truewind, LLC, June 2006.

Figure 2 – Onshore Locations with Class 3 or Higher Winds at 50 m

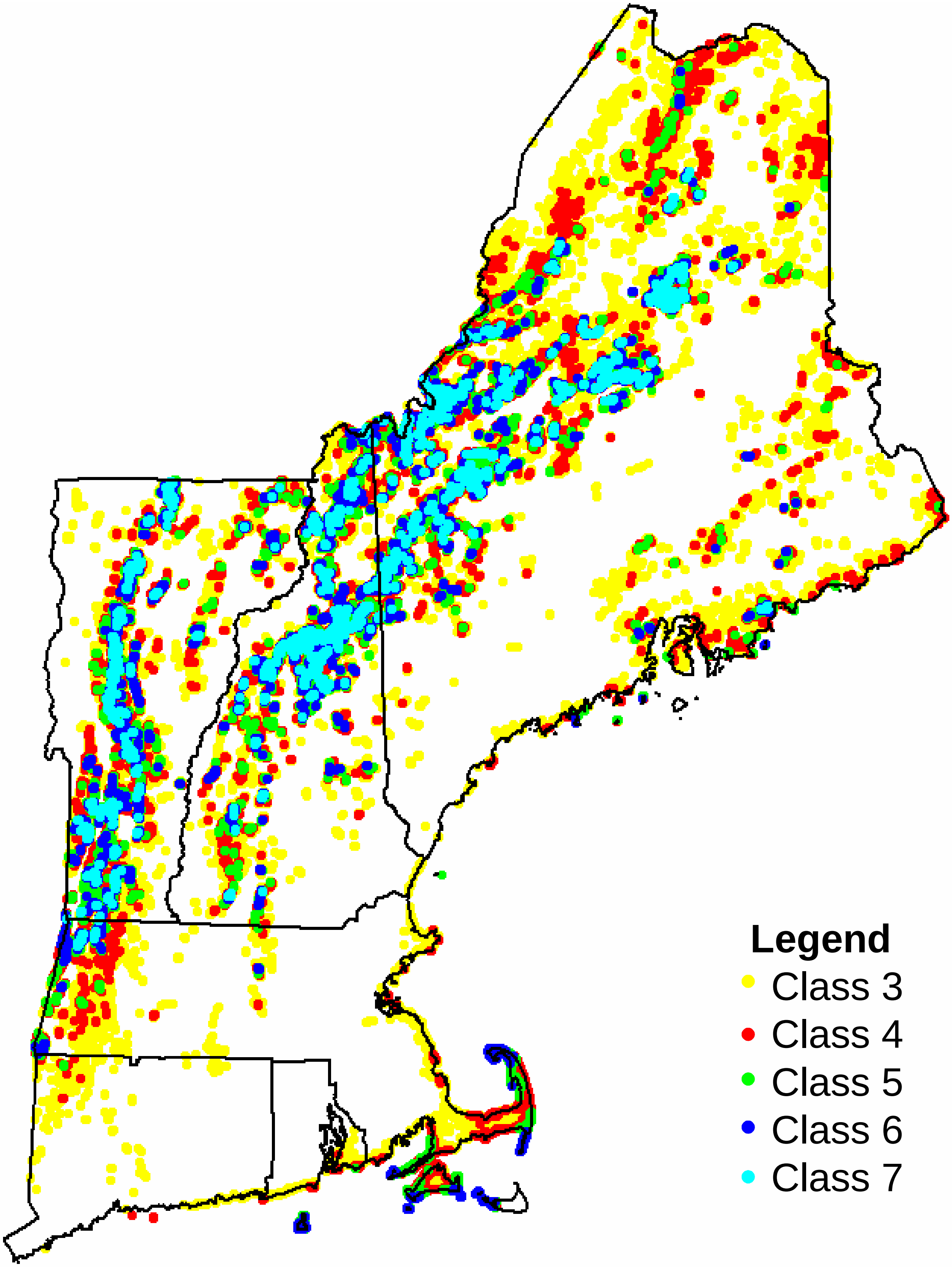
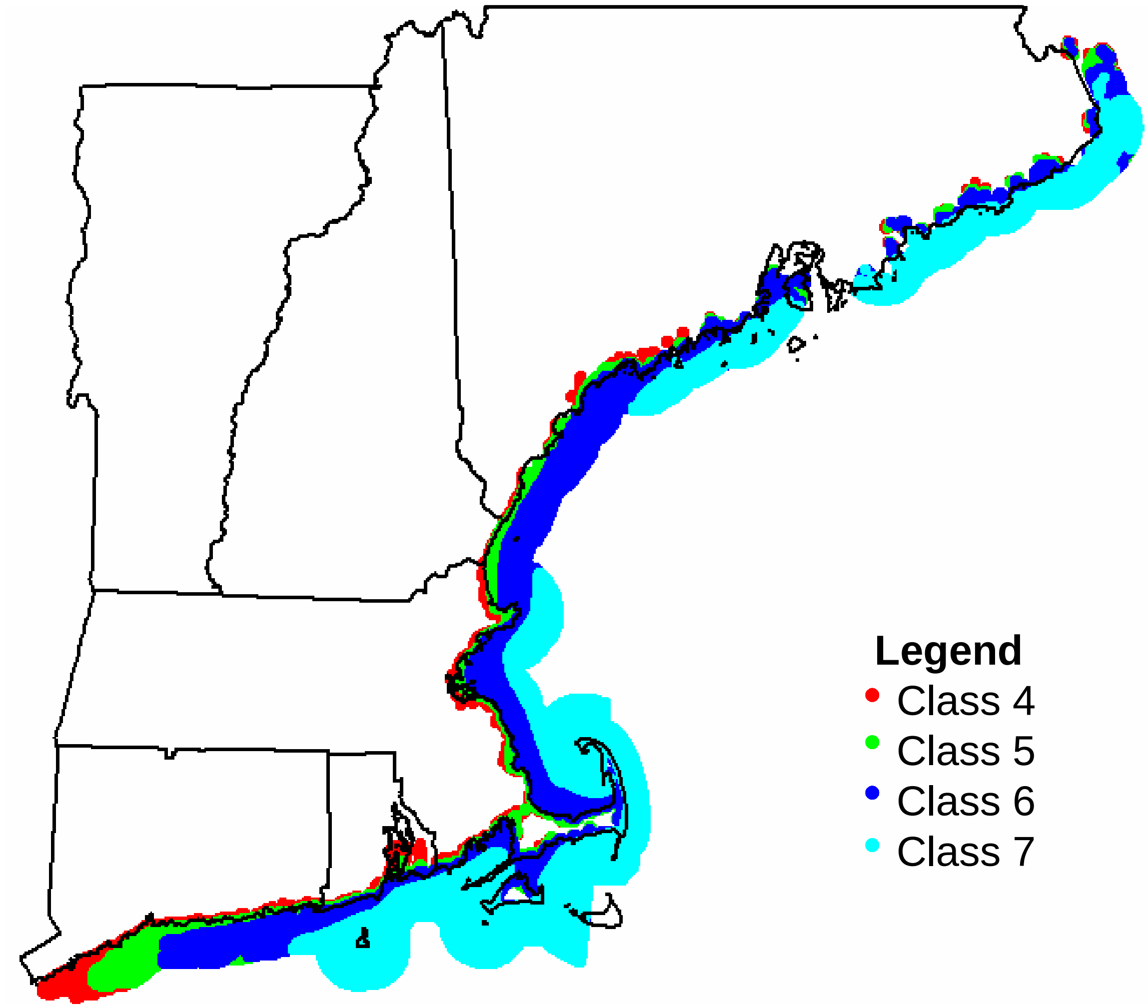


Figure 3 – Offshore Locations with Class 4 or Higher Winds at 100 m[27]



(corresponding to 100 grids).[28] This means that every day is assumed to have the same wind profile. The hourly wind speed values are expressed as a percentage of the annual average wind speed. Analysis of historical data later in this report indicates that hourly wind speeds and power production have different patterns in the summer and winter. This limitation of the model will lead to additional uncertainty if hourly power production volatility is the goal.

To evaluate offshore locations, LAI obtained data regarding water depths from NOAA and added it to our own proprietary databases containing geographic and demographic data for New England cities and towns. LAI's criteria for selection of locations that possess usable wind resources were broad. For onshore locations, each 200m x 200 m grid square with both wind

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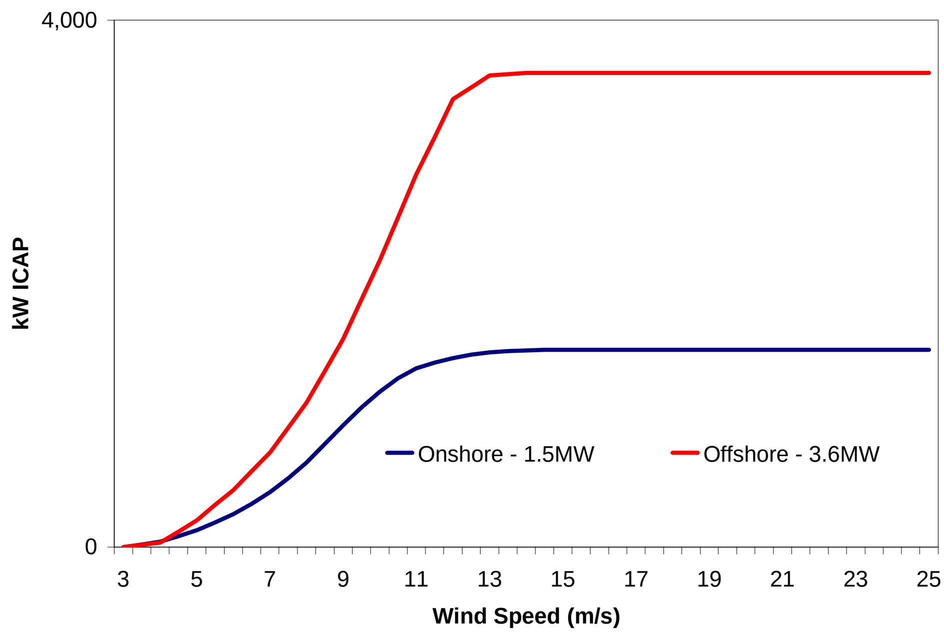
[27] Note that there are no wind speeds for the shallow areas shown on this map directly east of Cape Cod and the Islands. The AWS Truewind database does not include data for those areas; therefore, they are not included in the offshore maximum wind generation potential estimate.

[28] The hourly wind profiles are for a larger area, 2,000m x 2,000m, than the annual wind profiles which are for each 200m x 200m grid.

speed at a height of 50 m equal to Class 3 or greater and a population density less than or equal to the average population for the Town of Hull, MA (3,787 people per square mile), was selected. For offshore locations, wind speed at a height of 100 m and a water depth less than 60 m were necessary criteria for selection. Utilizing these selected grids, LAI was then able to estimate the maximum theoretical wind resource potential both onshore and off the coast of New England. In order to translate wind resources to electric generation potential, LAI chose the GE 1.5 MW turbine as our reference onshore unit and the GE 3.6 MW turbine as our reference offshore turbine.[29] These turbines are state-of-the-art technology in the U.S. and are used for wind farm projects across the country. A power curve provided by GE was applied to the results of our wind evaluation, yielding an estimate of theoretical wind-powered UCAP. The power curves provided by GE are presented below in Figure 4.

Figure 4 – Power Generation Curves for GE Onshore and Offshore Turbines



As the curves indicate, wind turbines have a cut-in wind speed, the speed at which the turbines begin to produce power, of between 3.5 and 4.0 m/s, and a cut-out speed of between 20 and 25 m/s. The cut-out speed (25 m/s for these turbines) is necessary to safeguard against mechanical damage.

In order to use a power curve to translate the available wind resource to electric generation potential, several assumptions had to be made regarding turbine operating characteristics. LAI assumed ideal operating conditions: no performance degradation over time, proper turbine alignment at all times, no detrimental wake effect from adjacent turbines, and, finally, no production constraints attributable to icing. Surely, adjustments for actual performance

[29] Technical detail about the reference turbines can be found at : http://www.gepower.com/businesses/ge_wind_energy/en/index.htm

conditions would significantly reduce the estimate of maximum theoretical wind generation capability in New England.

Onshore Results

For the onshore analysis, each onshore grid square that met the criterion of having wind speed at 50 m classified as Class 3 or higher,[30] and whose population density was less than or equal to that of Hull, Massachusetts, was included in the supply mix of potentially developable wind resources. Hull was selected as the benchmark for population density since two large wind-generation facilities have been commercially developed there – Hull Wind I, a 0.66-MW turbine, and Hull Wind II, a 1.8 MW turbine.[31,32] Figure 5 shows the cities and towns in New England with a population density less than that of Hull, which is 3,787 people per square mile, based on 2000 census data.

For each of these acceptable grid squares, the average wind speed was applied to the onshore GE turbine power curve to yield an MT-UCAP value. This value was then multiplied by a factor of 0.50. This adjustment was necessary due to engineering constraints that require turbines of this type be located at least 280 m apart. Rather than attempt to optimize the configuration of acceptable grid squares, we applied the 0.5 ratio.[33] Finally, the MT-UCAP at specific sites was aggregated by ISO sub-area.

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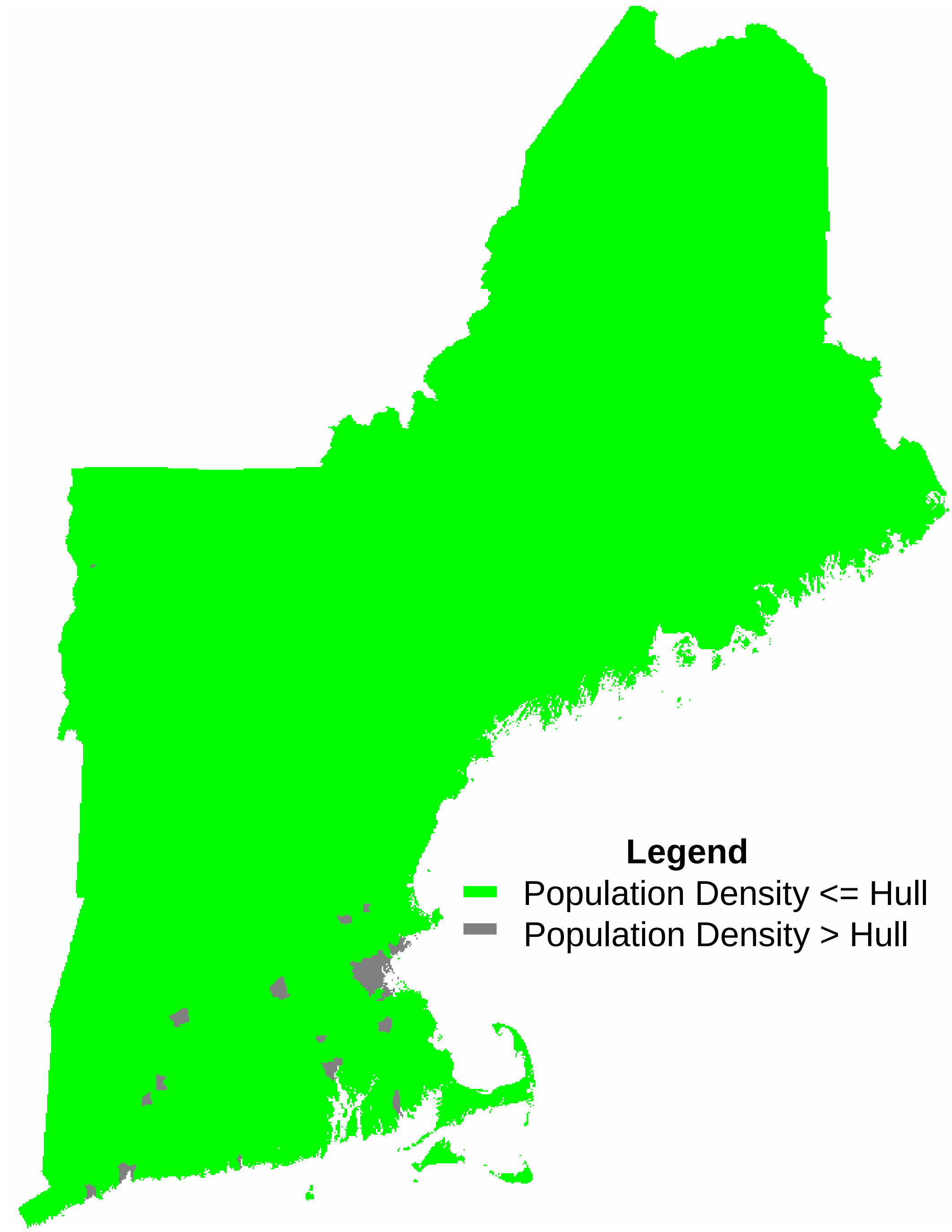
[30] Wind power classes are defined by DOE. Class 3 wind speeds are between 6.4 and 7.0 m/s.

[31] In total, there is currently 10.38 MW (ICAP) of wind generation operating commercially in New England, with 58.4 MW (ICAP) currently under construction. See Table 3 and Table 4 for details.

[32] Source: American Wind Energy Association

[33] $(200\text{ m}/280\text{ m})^2 = (0.71)^2 = 0.50$.

Figure 5 – Population Density Screen



LAI has concluded that New England has a maximum onshore ICAP potential of 219 gigawatts (GW)[34] and an MT-UCAP of approximately 60 GW. LAI has also calculated capacity factors

[34] 1 GW = 1,000 MW.

later on in this report, based on historical hourly wind speeds to determine generation capability on a measured UCAP basis.[35] Consistent with the FCM intermittent resource rating rules, LAI has used capacity factors to calculate effective FCM capacity ratings for both the summer (June-September, 13:01-18:00) and winter (October-May, 17:01-19:00) capability periods.[36] Measured FCM UCAP is the ICAP times the effective FCM capacity rating for the relevant period. A locational breakdown of onshore wind resources on an ICAP and UCAP basis is provided in Table 10.

Table 10 – Onshore Maximum Wind Resources by Zone[37]

Zone	Maximum Theoretical (MW)		Measured FCM UCAP (MW)	
	ICAP	UCAP	Summer (19% Effective FCM Capacity Rating)	Winter (41% Effective FCM Capacity Rating)
Maine	141,990	39,379	26,978	58,216
Vermont	29,080	7,997	5,525	11,923
New Hampshire	19,500	5,598	3,705	7,995
SEMA	18,585	4,552	3,531	7,620
WCMA	5,991	1,432	1,138	2,456
Rhode Island	1,995	488	379	818
NEMA	1,105	226	210	453
Connecticut	876	175	166	359
Total	219,122	59,847	41,633	89,840

The MT-UCAP estimate of 59,847 MW is largely unscreened, and therefore does not represent a permittable and developable amount of onshore wind generation potential. Using the UMRERL measurement data for various wind sites in New England, we have derived summer and winter effective FCM capacity ratings of 19% and 41%, respectively.[38] Hence, the measured FCM UCAP equivalent onshore is 41,633 MW in the summer and 89,840 MW in the winter.

Given that most of the onshore wind sites being developed are in Maine, Vermont and New Hampshire where there are many sites with onshore wind speeds higher than the two Massachusetts sites used for calculating onshore capacity factors, LAI's estimate of the effective FCM capacity ratings understates both the effective FCM capacity ratings and the measured FCM UCAP for onshore New England.

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[35] Measured UCAP is the product of ICAP times the measured capacity factor.

[36] FERC filing by ISO-NE, "Filing Containing Revisions to Market Rules Implementing FCM Settlement Agreement," Docket No. ER07-546-000, February 15, 2007, FCM Tariff Sheets Section III.13 Original Sheet No. 7309Z.

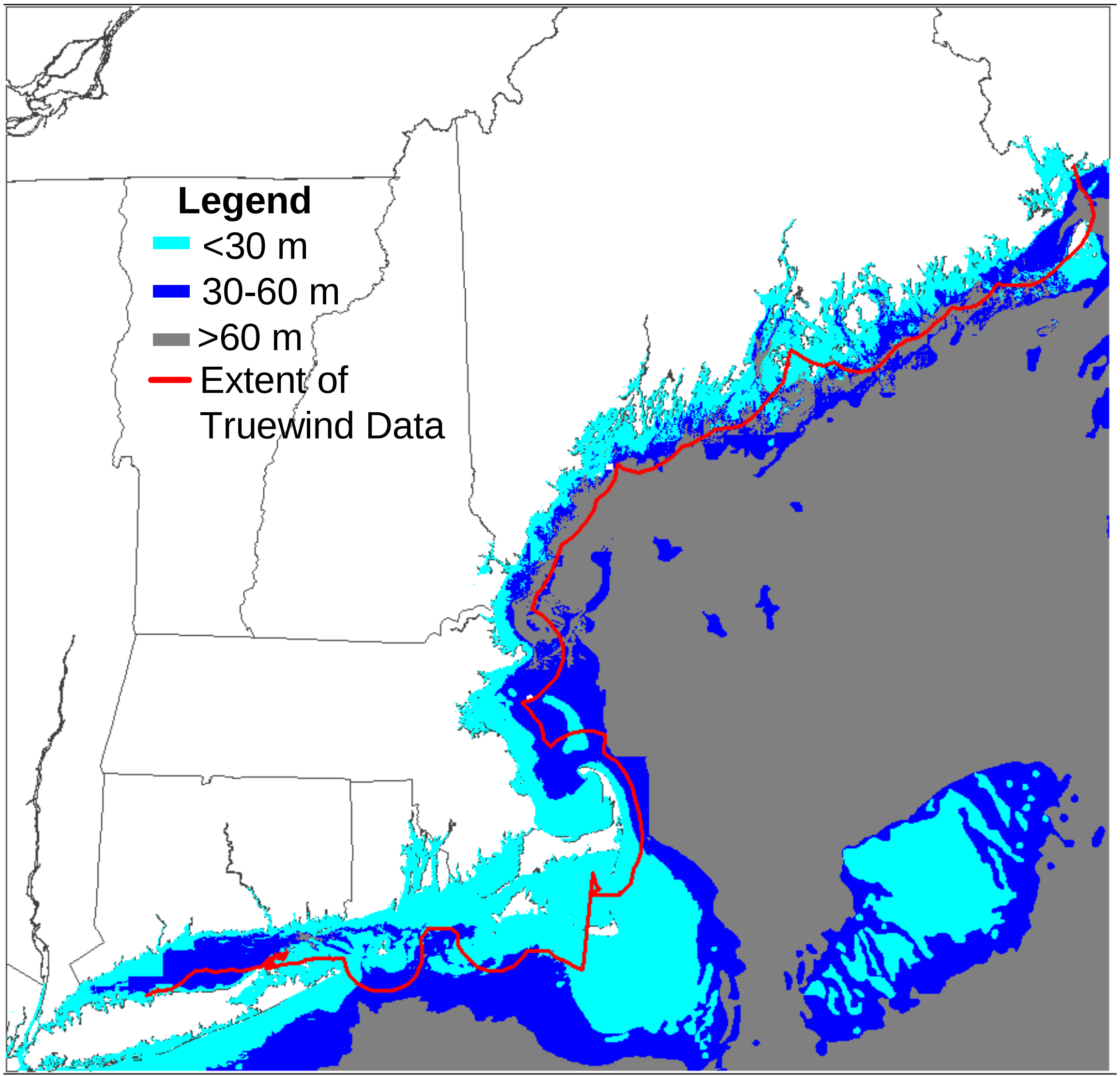
[37] The onshore sites used for the UCAP capacity factors are Mt. Tom and Paxton. The Thompson Island data have the characteristics of an offshore site so would not be an appropriate example of onshore capacity data. Moreover, Thompson Island wind speeds are mostly Class 2 not Class 3.

[38] Ibid.

Offshore Results

As with the onshore data, utilization of the AWS Truewind database provided wind speed data in 200 m-square grids. For the offshore analysis, we applied two screening criteria to wind development applicability: average wind speed at 100 m representing a Class 4 category,[39] and water depth of 60 m or less. We did not differentiate between the New England states for the offshore data since state waters extend only 3 miles offshore.

Figure 6 – Water Depth Screen



[39] Power Class 4 wind speeds are between 7.0 and 7.5 m/s

Again, we applied a power curve to the offshore wind speeds meeting the established criteria. The power curve was based on a GE 3.6-MW offshore turbine, as shown above in Figure 4. To account for spacing on a 600 m by 1,000 m grid, we multiplied by a factor of 0.07.[40]

We differentiated the offshore totals between "Shallow" areas, whose depth was 30 m or less, and "Deep" areas, whose depth was between 30 m and 60 m. Current technology does not favor the development of offshore wind turbines in water more than 60 m deep.

Using data from UMRERL and pursuant to the ISO-NE capability periods, we calculated summer and winter effective FCM capacity ratings of 26% and 46% respectively for the offshore turbines from the capacity factors. As expected, the effective FCM capacity ratings for offshore turbines were higher than for onshore turbines.

The results of our analysis of offshore resources are detailed in Table 11.

Table 11 – Offshore Maximum Wind Resources by Water Depth[41]

	Maximum Theoretical (MW)		**Measured FCM UCAP (MW)**	
Water Depth	**ICAP**	**UCAP**	**Summer (26% Effective FCM Capacity Rating)**	**Winter (46% Effective FCM Capacity Rating)**
Shallow	73,612	25,679	19,139	33,862
Deep	24,372	8,295	6,337	11,211
Total	97,985	33,974	25,476	45,073

The referenced Shallow areas hold far greater potential resources than the Deep areas because a larger offshore area has shallower water, as can be seen in Figure 6. Of the grid squares that were less than 60 m in depth and in which the requisite average wind speed was observed, approximately 310,000 grid squares were of a depth of less than 30 m while approximately 103,000 grid squares were of a depth of between 30 m and 60 m.

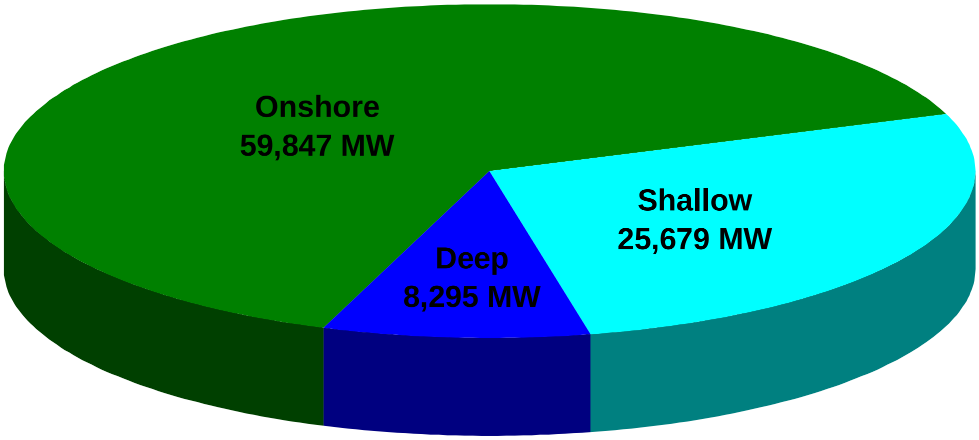
Total Estimated Wind Generation Potential

LAI has calculated the maximum theoretical wind resource in New England to be just under 94,000 MW on an MT-UCAP basis, with about two-thirds onshore, as shown in Figure 7.

[40] This spacing is proposed for the Cape Wind project so that it will both satisfy the GE spacing criterion for 3.6 MW turbines and not limit traditional uses of the watersheet area.

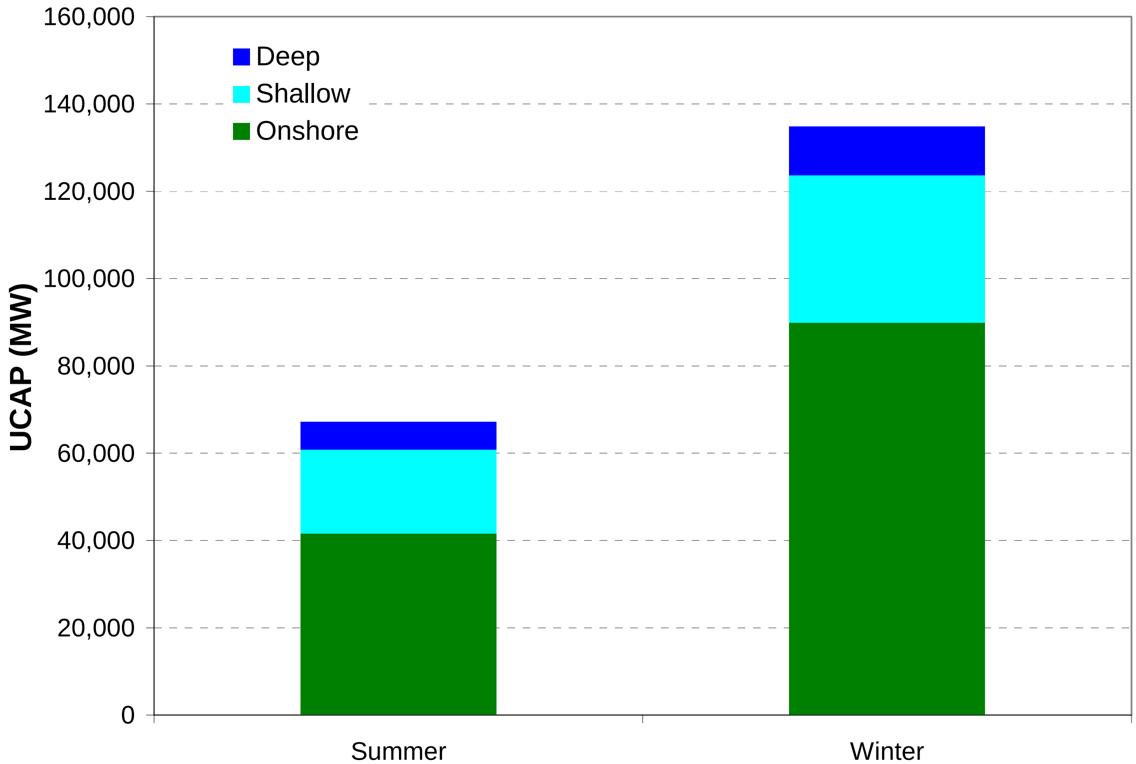
[41] The offshore sites used for the UCAP capacity factors are Bishop and Clerks, Buzzard's Bay and the Isle of Shoals. The Portland, ME data was measured at 5 m and was not included because of the large errors associated with scaling the wind speeds to the 100 m turbine height assumed for offshore wind turbines.

Figure 7 – Maximum Theoretical UCAP Wind Generation Potential in New England



Due to wind's inherent variability, wind turbines have low capacity factors, even offshore. Based on the AWS Truewind model, the theoretical average annual capacity factor is 27% for onshore and 35% for offshore. On a measured FCM UCAP basis during the summer, the capacity for wind generation across New England, including all offshore facilities, is 67,109 MW, as shown in Figure 8. In the winter, the measured FCM based UCAP is 134,913 MW.

Figure 8 – Maximum Measured New England FCM UCAP Wind Resources



Of the summer total, 62% is land-based while 29% is offshore in shallow waters and 9% is offshore in deep water. Approximately 75% of the offshore summer FCM UCAP potential is located in shallow water.

These numbers are not comparable to the results reported in other studies since LAI has not yet had the opportunity to apply other relevant screening criteria. For example, the CT Clean Energy Fund study referenced in Table 5 excludes resources based on environmental considerations and location. Given these restrictions, that report estimates the total resource potential in New England to be 10,989 MW.[42] The study by the MPUC, summarized in Table 8, considers proximity to transmission and other factors. The MPUC study concludes that there are 22,006 MW of potential wind energy in the region. Our total MW of ICAP or more accurately, MW nameplate, for the region are much higher, as shown in Table 12.

Table 12 – Estimates of New England Wind Generation Potential (MW ICAP)

	CT Clean Energy Fund	Maine PUC	LAI
Regional Total	10,989	22,006	219,122 onshore 97,984 offshore

Consistent with LAI's scope of work, the potentially developable wind generation both onshore and offshore has not been appropriately screened in this research phase. Hence, the MT-UCAP potential reported in Figure 7 represents the maximum theoretical wind generation potential irrespective of aesthetic and environmental constraints, geographic and demographic constraints, and the economic viability of wind generation assets, among other things. New England stakeholders are reminded not to equate the derivation of maximum wind generation potential in New England with useful results synonymous with commercially developable potential. Further refinements are necessary in order to delineate the amount of wind generation potential by location both onshore and offshore throughout New England, including its coastline.

Additional factors that need to be considered include:

- Recreational and aesthetic considerations associated with wind locations,
- Proximity to transmission infrastructure,
- Proximity to populated areas,
- Local opposition,
- Exclusion of park lands, conservation areas and onshore water bodies,[43]
- Terrain constraints – generally, turbines cannot be built in steeply sloped locations, and
- Environmental impacts, including bird migration patterns.

[42] The CT Clean Energy Fund study does not make it clear whether offshore resources are included in its calculations.

[43] The Energy Policy Act of 2005 (EPACT 05) requires the Department of the Interior to study the renewable potential on Federal lands. Moreover, EPACT 05 suggests that renewable energy development is an appropriate use for public lands and that, within 10 years from passage, Federal lands should support at least 10,000 MW of renewable energy generation.

ANALYSIS OF HISTORICAL WIND DATA IN NEW ENGLAND

In addition to analyzing the AWS Truewind database, LAI reviewed the publicly available experimental data that have been collected for sites in New England, and the associated studies. Two data sets – measured and simulated –show some variation when compared against each other. The more detailed historical data have also been used to gain additional insight into New England's wind generation potential, including calculating onshore and offshore capacity factors and summer and winter effective FCM capacity ratings.

Data Structure and Analysis

LAI reviewed existing site-specific measurements of wind resources in New England from all the available sources. Three states – Maine, Massachusetts and Vermont – have anemometer loan programs:

- Maine Anemometer Loan Program: Richard Michaud, U.S. DOE[44]
- Massachusetts Anemometer Loan Program[45]
- Vermont Anemometer Loan Program: run by John Kidder at Vermont Technical College[46]

Other sources of data include:

- Massachusetts Division of Energy Resources (MA-DOER),[47]
- NOAA National Data Buoy Center,[48] and the
- Rhode Island Renewable Energy Fund Wind Power Feasibility Analysis.[49]

The UMRERL database includes wind data from 28 sites in Massachusetts,[50] three sites in Maine[51] and one site in Rhode Island. There were no sites in Connecticut, New Hampshire or Vermont. Of these 34 sites, only 10 had data for a complete year and, of those with a year's

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[44] www.eere.energy.gov/windandhydro/windpoweringamerica/filter_detail.asp?itemid=598

[45] www.eere.energy.gov/windandhydro/windpoweringamerica/filter_detail.asp?itemid=401

[46] web.vtc.edu/users/jnk06190/VTALP

[47] Their data is posted at the UMRERL website but has not been filtered and was recorded in an inconsistent manner from site to site. The staff at UMRERL urged caution in using the data.

[48] www.ndbc.noaa.gov

[49] http://rewhc.org/wind/windtechfeas.shtml

[50] www.ceere.org/rerl/rerl_resourcedata.html

Barnstable, Bourne, Brewster, Eastham, Falmouth, Harwich, Nantucket Island, Nantucket Sound (Bishop and Clerks), Orleans, Truro, Deer Island, Dartmouth, Hull, Ipswich, Kingston, Little Brewster Island, Lynn, Mattapoisett, Quincy, Thompson Island, Rockport, Scituate, Mt. Tom, Templeton, Paxton, Blandford, Chester, Savoy.

[51] Camden Hills, Presque Isle, Vinalhaven.

worth of data, only 3 had Class 3 (6.4 m/s or greater) wind speeds or greater. Wind data for at least one complete year is necessary to assess the wind generation potential of a specific site. Much of the UMRERL data are only for a few months and therefore could not be included in the analysis. Only sites with recent wind data reports as prepared by UMRERL for the Massachusetts Technology Collaborative and DOE were included in our database.[52] Researchers from UMRERL recommended not using data from the 1970s, 1980s and 1990s since the data acquisition methodology varied considerably from site to site and year to year, and proper documentation of methodology was lacking.

LAI compared yearly, seasonal and hourly measured averages of wind speed to those from AWS Truewind. In most cases, measured wind speeds had to be scaled to the closest available value from AWS Truewind.[53] The analysis of historical data allowed LAI to quantify the patterns and variability in wind speeds and power generation for the locations where data are available.

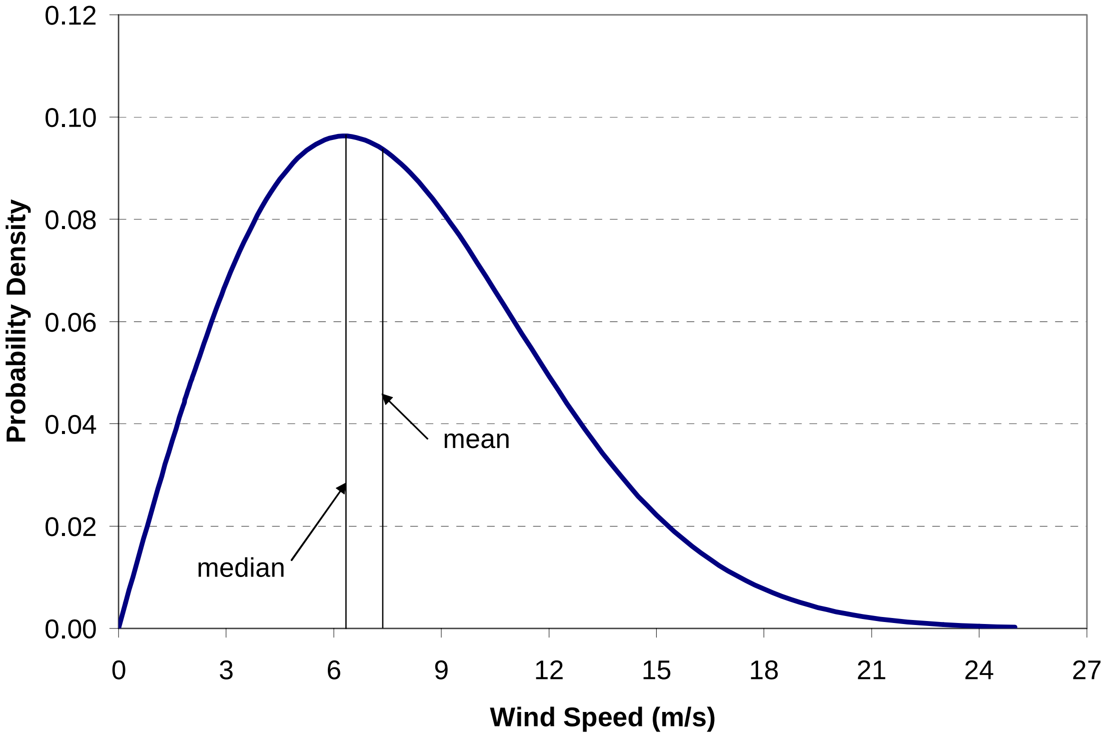
Probabilistic Distribution of Wind Speeds

Measured wind speed obeys an asymmetrical probability density distribution and is usually described using a Weibull distribution (Figure 9). Because the distribution is left-skewed, the mean wind speed (7.9 m/s), is greater than the most common, or median, wind speed (6.3 m/s). Although average wind speed is a useful indicator of wind generation potential, because the wind distribution is skewed, measured data is more valuable in estimating power generation than are average modeled wind speeds.

[52] Recent data includes data recorded since 2000.

[53] Yearly wind speed averages for each location were available at 30m, 50m, 70m and 100m.

Figure 9 – Weibull Distribution of Wind Speeds



Height Scaling

Typical onshore wind turbines have hub heights ranging from 50 to 100 m, while offshore wind turbines have site dependent hub heights ranging from 70 to 120 m. However, the available anemometer data were taken at various heights, ranging from 5 to 100 m, which are often lower than the anticipated hub heights of either onshore or offshore wind turbines. Because wind speeds are generally higher at higher elevations, the recorded wind speeds need to be scaled to the proper height in order to reasonably estimate representative power generation projections. There are various methods utilized for height scaling; the two most commonly used methods are the "power law" and the "log law" which provide somewhat different estimates. The power law predicts 5-15% higher wind speeds at a 75 m hub height than the log law starting with a 5 to 30 m measurement height.[54]

For onshore applications, the power law is commonly applied to scale wind speed with height above ground. The wind speed at the scaled height is estimated to be:[55]

$$U = U_r \times \left(\frac{z}{z_r} \right)^{1/7},$$

[54] J.F. Manwell, J.G. McGowan and A.L. Rogers, "Wind Energy Explained," Wiley, West Sussex, United Kingdom, 2002.

[55] The 1/7 power law corresponds to a shear exponent of 0.14.

where U_r = measured wind speed,
z = target height, and
z_r = measurement height.

For offshore height scaling, the UMRERL group recommends the more conservative log law method where the wind speed at the scaled height is estimated to be:

$$U = U_r \times \frac{\ln\left(\frac{z}{z_0}\right)}{\ln\left(\frac{z_r}{z_0}\right)},$$

where U_r = measured wind speed,
z = target height,
z_0 = surface roughness length, and
z_r = measurement height.

The surface roughness length z_0 is an adjustable parameter which is taken to equal 0.2 mm for calm, open seas in the MIT study.

Power Production

The conversion of wind energy to electrical power is described by a turbine power curve which shows turbine electrical output as a function of steady wind speed. LAI used the GE 1.5 MW turbine as our reference onshore unit and the GE 3.6 MW turbine as our reference offshore turbine with the power curves shown in Figure 4. It is important to note the flatness of output for wind speeds at or above the rated value as well as the cut-in wind speed below which there is zero output. This power curve assumes steady-state operation and neglects the dynamics of the mechanical and electrical system. LAI used the GE power curves to calculate hourly electrical generation for the locations with a year of hourly wind measurements that met the onshore and offshore wind Class criteria.

Capacity Factors/Effective FCM Capacity Rating

The capacity factor for a wind turbine is the annual energy output divided by the theoretical maximum output, if the wind turbine were running at its rated (maximum) power during all hours of the year. For example, if a 1.5 MW turbine produces 4.0 million kWh in a year, its capacity factor is 30.4%.[56] Capacity factors usually range from 20% to 70%, depending on location. Offshore capacity factors are usually higher than onshore capacity factors as can be seen from the data described below. In this report, effective capacity rating is used to mean the calculated output during intermittent reliability hours divided by the theoretical maximum output

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[56] Calculated as $\frac{4{,}000{,}000}{365.25 \times 24 \times 1{,}500} = \frac{4{,}000{,}000}{13{,}149{,}000} = 0.304$.

for the purposes of establishing UCAP values for the ISO New England FCM qualified capacity protocol. Under ISO-NE's FCM, the relevant intermittent reliability hours for the summer period, June through September, are 1:01 pm to 6:00 p.m. and for the winter period, October through May, the hours are 5:01 p.m. to 7:00 p.m.

Other Relevant Studies

Economic and Environmental Performance of Potential Northeast Offshore Wind Energy Resources

In January, 2006, The MIT Laboratory for Energy and the Environment issued an analysis entitled "Economic and Environmental Performance of Potential Northeast Offshore Wind Energy Resources" (MIT Study).[57] The study evaluated 17 off-shore sites surrounding the Northeast U.S. seaboard, from Maine to Delaware. The MIT Study was based on data from all the offshore data stations in the study region with at least one complete year of data. Sixteen of the sites were National Data Buoy Center (NDBC) stations, for which an average of 17 years of data were available. Eleven stations had at least 20 years of data. The quality of the data was quantified by creating a "quality score" based on the number of years of data, the number of complete years, and average completeness for all years. The analysis of the buoy data required data gap filling since most of the years do not have complete data sets. Small data gaps of several hours were filled in by simple interpolation. Larger data gaps of several days had to be filled with representative data from similar temporal and geographic locations using the Measure-Correlate-Predict (MCP) method[58]. However, if an appropriate reference site for the target site could not be identified, the MCP method could not be applied. For better accuracy, the year could be divided into seasons in order to be able to compare periods with similar weather.

Figure 10 displays the location of the various sites assessed in the MIT Study. Offshore sites (C-Man Stations and Moored Buoys) were segregated into three categories: near shore, far offshore, and very far offshore.[59]

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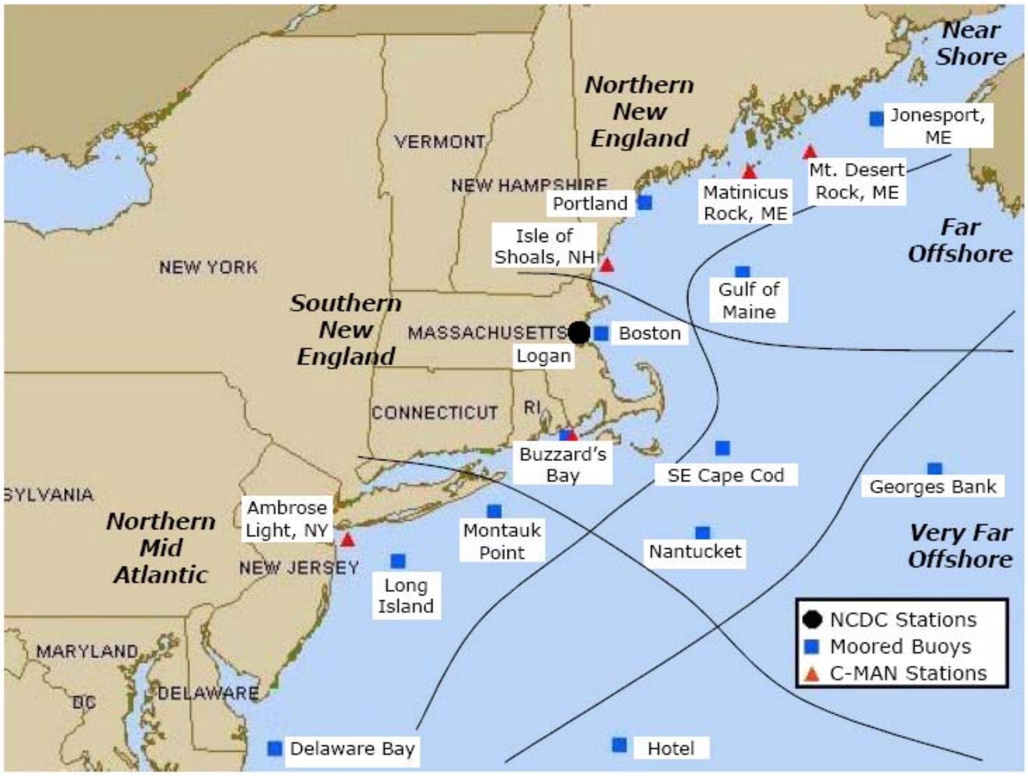
[57] M. Berlinski and S. Connors, "Economic and Environmental Performance of Potential Northeast Offshore Wind Energy Resources," MIT Laboratory for Energy and the Environment, January 2006.

www.masstech.org/renewableenergy/public_policy/DG/resources/2005-12_MIT-Wind-Resource-Rpt.pdf

[58] The MCP method predicts wind speed and direction at a target site using data from a nearby reference site.

[59] The Coastal-Marine Automated Network (C-MAN) was established by the NDBC for the National Weather Service (NWS) in the early 1980's. The development of C-MAN was in response to a need to maintain meteorological observations in U. S. coastal areas.

Figure 10 – Map of Sites Assessed by MIT Study



The study found that Class 5 and 6 locations could generate on average 25-30% more electricity than a Class 3 site, and 15-30% more than a Class 4 site. In addition to long-term averages, the MIT offshore study finds that temporal (both on a seasonal and daily basis) and spatial variability is necessary in order to estimate the economic and environmental performance of wind resources. The MIT study finds that changes in wind speed of +/- 10% year to year are common. The study also finds that offshore sites, which allow for capacity factors in the 40% - 50%, are far more promising potential wind resources than onshore sites.

Among the off-shore sites, the MIT study only found modest differences in wind speeds, projected capacity factor, or other metrics of site quality. Increasing distance from land did not necessarily increase wind speeds or projected average capacity factors. For example, one of the farthest sites, Georges Bank, has only average wind quality relative to other off-shore sites in the study.

The study also showed that there are many high-quality locations off the coast of New England, New York, New Jersey and Delaware. Of the 17 sites assessed, only four could be categorized below Class 5, and two of those sites (Logan and Portland) are really on-shore sites. With respect to off-shore New England sites, numerous high-quality sites exist off the coasts of Rhode Island, Massachusetts, and Maine.[60] Table 13 displays the results of the MIT Study.

Table 13 – Various Metrics of Off-Shore Wind Sites from MIT Study

NOAA Data Site	Average Windspeed @ 75 m (m/s)	Wind Power Class	Average Annual Generation (GWh/MW)	Average Capacity Factor (%)	Annual Revenue ($000/MW)	Unit Revenue (¢/kWh)	Avoided Emissions (metric tonnes/yr)		
							SO_2	NO_x	CO_2
Logan	6.46	2	2.2	25.5	113	5.54	4.52	1.59	1,613
Portland	7.16	3	3.1	34.9	161	5.40	7.18	2.56	2,535
Isle of Shoals	7.58	4	3.3	38.2	189	5.43	8.29	2.91	2,932
Boston	7.60	4	3.3	37.9	177	5.52	7.57	2.71	2,665
Jonesport	7.88	5	3.5	40.3	190	5.37	N/A	N/A	N/A
Georges Bank	8.03	5	3.6	41.1	206	5.48	8.46	3.01	2,993
Delaware Bay	8.15	5	3.7	42.7	211	5.41	8.93	3.17	3,166
Long Island	8.26	5	3.8	43.7	212	5.42	8.99	3.19	3,170
Nantucket	8.34	6	3.8	43.7	202	5.50	8.82	3.13	3,113
Gulf of Maine	8.36	6	3.9	44.3	226	5.41	9.13	3.24	3,206
Ambrose Light	8.38	6	3.9	44.9	202	5.34	8.90	3.14	3,167
SE Cape Cod	8.39	6	3.8	43.6	208	5.48	N/A	N/A	N/A
Buzzards Bay	8.40	6	4.0	45.1	212	5.40	9.26	3.29	3,281
Matinicus Rock	8.47	6	3.9	45.0	221	5.39	9.17	3.24	3,226
Montauk Point	8.61	6	4.1	46.4	219	5.47	N/A	N/A	N/A
Mt. Desert Rock	8.63	6	4.1	46.3	234	5.41	9.65	3.41	3,402
Hotel	8.98	6	4.3	49.5	237	5.39	9.48	3.37	3,353

2006 Minnesota Wind Integration Study

In November 2006, the Minnesota Public Utility Commission issued a study[61] to:

- Evaluate impacts on reliability and costs associated with increasing wind capacity to 15%, 20%, and 25% of Minnesota retail electric energy sales by 2020;
- Identify and develop options to manage the impacts of the wind resources;
- Build upon prior wind integration studies and related technical work;
- Coordinate with recent and current regional power system study work; and
- Produce meaningful, broadly supported results through a technically rigorous, inclusive study process.

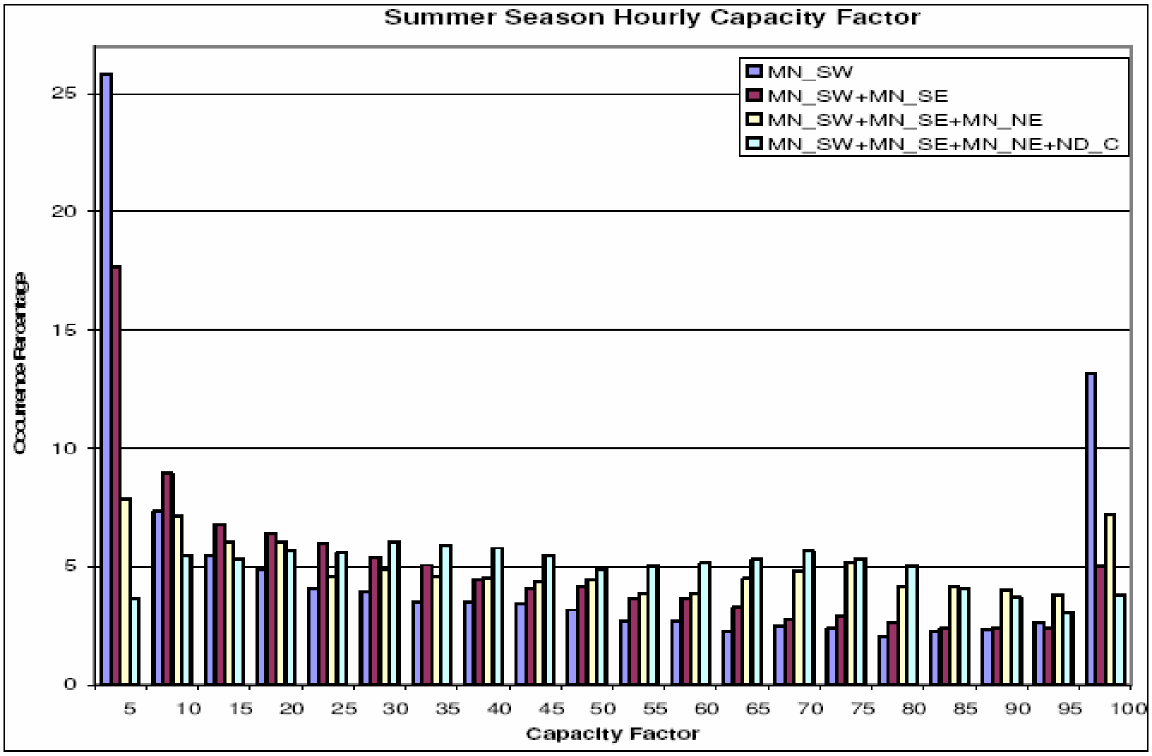
The Minnesota Wind Integration Study undertook a capacity factor analysis for annual and seasonal time periods in order to assess and compare the wind power production and its seasonal

[60] No sites in Connecticut waters were tested although it is naturally protected by Long Island and thus does not likely constitute a high-quality wind resource. One site in New Hampshire waters, Isle of Shoals, was tested and categorized as Class 4 winds.

[61] Final Report – 2006 Minnesota Wind Integration Study: Volume II – Characterizing the Minnesota Wind Resource, prepared for the Minnesota Public Utilities Commission by WindLogics, Inc., November 30, 2006. www.puc.state.mn.us/docs/index.htm#electric

and spatial variability at the four regional representative sites. Specifically, they reviewed the annual and seasonal frequency histograms of occurrence as a percentage of hourly capacity factors for several plants dispersed within a state. They found a dramatic effect of geographic dispersion in the summer months which is the season of weakest wind resource: the frequency of the 0-5% capacity factor drops from nearly 26% with just one site to under for 4% for all four sites (Figure 11).[62]

Figure 11 – Capacity Factors of Single & Combined MN Facilities



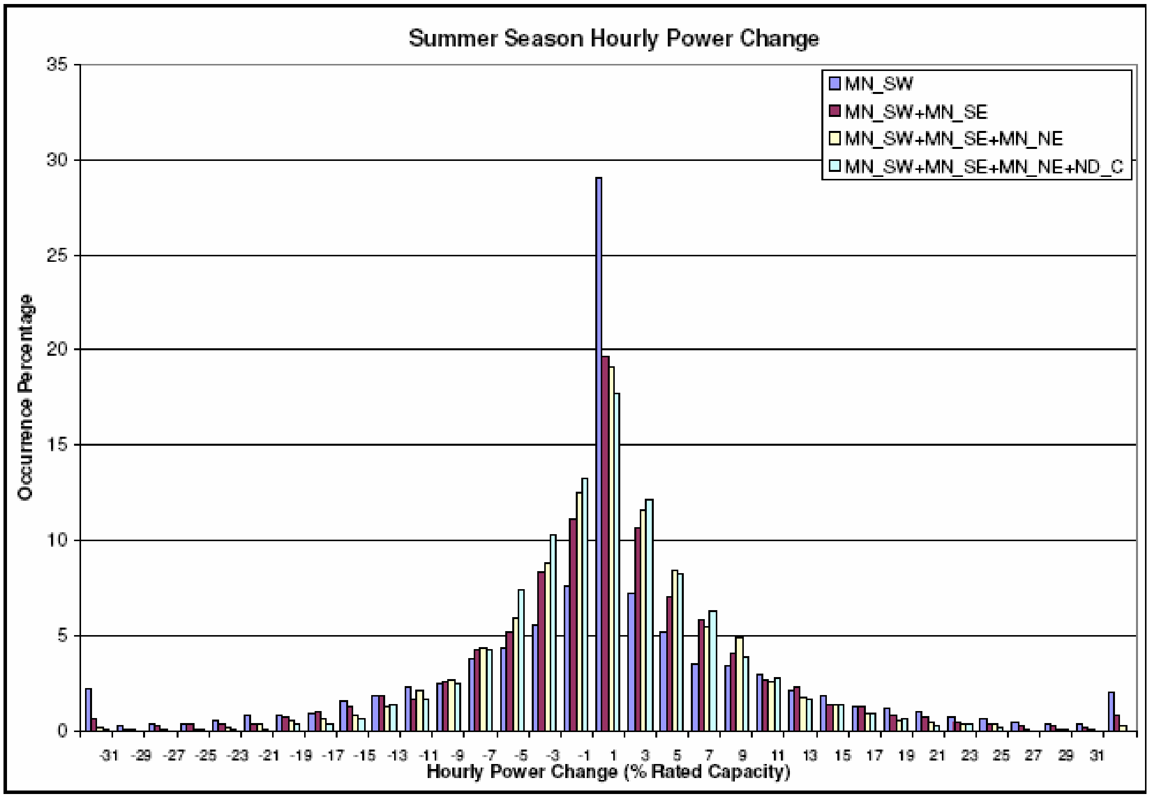
The advantage of geographic dispersion was observed in all seasonal capacity factor distributions.

The Minnesota study also reviewed hourly power changes and found that important seasonal differences exist. Summer, and to a lesser extent spring, have a high probability of experiencing very large hourly power changes exceeding 31% of rated capacity. As shown in Figure 12, the frequency of these large power changes drops from 2.5% with one plant location to 0.1% with four plant locations.[63]

[62] Final Report – 2006 Minnesota Wind Integration Study: Volume II – Characterizing the Minnesota Wind Resource, prepared for the Minnesota Public Utilities Commission by WindLogics, Inc., November 30, 2006, Figure 23.

[63] Ibid., Figure 26.

Figure 12 – Hourly Power Change of Single & Combined MN Facilities



Although adding another geographic region with a lower capacity factor will reduce the collective capacity factor of the state, its value in managing the hourly and daily energy production volatility from dispersed wind resources should not be underestimated.

2004 NREL Wind Power Plant Behavior Study

Although good quality wind data from an anemometer is necessary to estimate wind power output by a wind plant, it is not sufficient. NREL has been studying long-term, high-resolution wind power data from seven large wind plants in various regions of the U.S.[64] They found that the output of a multi-turbine facility cannot be scaled from anemometer data at one location because all the turbines in a large plant do not experience identical wind speeds at the same instant. Rather, the output from a large plant will fluctuate less than the output from a single turbine or a small group of turbines because different turbines will be exposed to different wind speeds. In effect, the spatial and temporal variations from a large plant make the combined output less variable and enhance the power plant output from what would have been predicted based on wind data.

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[64] Y.-H. Wan, "Wind Power Plant Behaviors: Analyses of Long-Term Wind Power Data," September 2004, NREL/TP-500-36551.

www.nrel.gov/docs/fy04osti/36551.pdf

The NREL study looked at data from seven plants ranging in size from a 35-MW plant comprised of one hundred and twelve (112) 330-kV turbines to a 230-MW plant comprised of turbines of various sizes and turbine types. Specifically, in analyzing the statistics of wind power, they found that wind power will not change much from one time step to another especially when the time steps are short. Wind speed does not change suddenly over a wide area to affect every wind turbine in a large wind power plant at the same time. Average 1 second changes of wind power are less than 0.1% of plant capacity. Average 1 minute changes of wind power are 0.3-1.0% of plant capacity. Compared to the natural fluctuations of system load, these short-term fluctuations are too small to have any significant impact on power system operations until the penetration of wind capacity reaches a critical percent of the system. Average 10 minute changes of wind power vary around 2% of the overall wind power plant capacity. Finally, average hourly changes of wind power range from 4.5% to 6.4% of overall wind plant capacity. The data also show that operations of wind power plants in different regions and with different turbine types are very similar.

It is useful to look at the hourly data for a specific wind power plant. Of the seven plants studied, the data from the Storm Lake plant in Iowa was chosen. The Storm Lake plant has 151 Zond Z50 (0.75 MW) turbines with a total installed wind power capacity of 113.25 MW. The standard deviations from hourly changes in wind power for the Storm Lake plant are significant as seen in Table 14.[65]

Table 14 – Hourly Wind Power Step Changes (Storm Lake)

Storm Lake	Average (MW)	Average (% capacity)	Standard Deviation (MW)	Maximum (+) (MW)	Minimum (-) (MW)
July 2001	5.0	4.4	6.1	60.1	(35.4)
August	5.5	4.9	6.9	45.4	(52.8)
September	4.9	4.3	6.3	47.0	(36.7)
October	6.6	5.8	7.4	54.0	(49.8)
November	7.3	6.4	8.0	53.7	(79.7)
December	5.9	4.3	5.6	24.9	(32.0)
January 2002	7.1	6.3	7.6	40.0	(38.3)
February	7.5	6.6	8.8	80.0	(79.0)
March	7.2	6.4	9.4	72.2	(88.6)
April	7.4	6.5	7.9	47.0	(50.6)
May	7.4	6.5	8.8	54.8	(50.1)
June	6.7	5.9	7.7	44.8	(49.9)
12-month	6.6	5.8	7.8	80.0	(88.6)

The table above shows that maximum magnitudes of hourly wind power changes can be significant. The study found that the largest hourly power level change of a plant was approximately 70% of plant capacity during a 12-month period.

[65] Ibid, Appendix D.

2005 NYSERDA Wind Integration Study

The NYSERDA wind integration study evaluated the effects of wind generation on many aspects of the New York State Bulk Power System.[66] The base scenario consisted of 3,300 MW of wind generation corresponding to 10% of New York's peak load. Wind generation was distributed at 33 locations across the state, with one location being offshore, south of Long Island – referred to by NYISO as "Zone K." The Zone K offshore location was divided into 5 separate wind farms, so a total of 37 individual wind farms were modeled in this study. The report analyzes the effective capacity of wind generation using data from the AWS Truewind model on MW of wind generation for 2001, 2002 and 2003.[67] Although the AWS Truewind model uses historical weather data from the Madison wind project for 2001, 2002 and 2003, the data are not equivalent to hourly measurements of wind at each of the proposed 37 wind locations. The monthly and hourly wind capacity factors are a combination of modeled and measured quantities. These capacity factors are therefore subject to greater uncertainty. Since most New York wind sites are onshore sites, it is not surprising that the hourly wind capacities are at a minimum in the late morning and early afternoon -- wind output picks up later in the day. The report notes that the offshore site is more valuable as a source of generation because of the different daily wind pattern that peaks earlier in the day than the onshore sites which have 30% capacity factors. The report concludes that onshore effective capacities are only approximately 10% while offshore effective capacities are approximately 40%.

Measured vs. Predicted Wind Speed Data

In the following sections, we analyze the measured versus predicted hourly and seasonal wind speeds, and percentage difference, at several sites throughout New England. We focused this analysis on 2005, since it was the year with the most data available. Furthermore, our intent was to compare sites for the same time period since wind speeds can vary +/- 10% from year to year. Data analysis for other years can be found in the Exhibits.

For the most part, we focus on seven sites in the region, primarily based on the availability of data, including:

- Bishops and Clerks, several miles south of Cape Cod, MA;
- Thompson Island, off Boston Harbor, MA;
- Paxton, MA (several miles west of Worcester);
- Mt. Tom, MA (north-west of Springfield);

[66] GE Energy Consulting, "The Effects of Integrating Wind Power on Transmission System Planning, Reliability, and Operations – Report on Phase 2: System Performance Evaluation," prepared for NYSERDA, March 4, 2005. www.nyserda.org/publications/wind_integration_report.pdf

[67] Ibid., Section 7.

- Portland, ME (NOAA offshore buoy);[68]
- Buzzards Bay, off of the coast of Massachusetts near Cape Cod (NOAA offshore buoy); and,
- Isle of Shoals, off the coast of New Hampshire (NOAA offshore buoy).

All the NOAA offshore buoys were treated as offshore sites. Bishop and Clerks was also handled as an offshore sites because it consists of a few rocks and no land mass. Thompson Island does not fall neatly into either an onshore or offshore category, since the island has varied terrain and its wind speed patterns are a blend of onshore and offshore characteristics. LAI arbitrarily analyzed Thompson Island as an onshore site. It is important to note that some of these sites are between a Class 2 and a Class 3 category depending on the year and are therefore not necessarily optimal sites to install wind farms. Thompson Island in particular is mostly a Class 2 site. However, given the lack of measured data for New England, LAI included these sites in the detailed analysis.

Yearly Comparison

An average wind speed, shown in Table 15, was calculated for each full year (not always starting on January 1) and each height that measured data was available. Not all these sites have wind speeds strong enough to justify the installation of a wind farm. In particular, the average annual AWS Truewind wind speed for Mt. Tom is 7.04 m/s which would make it a Class 3-4 site. However, the average measured wind speed at the same height is less than 6.0 m/s for 2005 making it a Class 2 site. Thompson Island is a Class 2 site based on both the AWS Truewind data and the measured wind speeds for 2005.

Yearly average wind speed was scaled to the height of the AWS Truewind value for the wind speed that was closest to the anemometer height. The AWS Truewind model and the measured data were compared by calculating the percent difference. The percent difference is defined as:

$$100 \times \frac{\text{AWS Truewind} - \text{Measured}}{\text{Measured}}.$$

Exhibit 1 shows the percent difference for the locations and years that had a full year of data. The percent difference is mostly positive, indicating the Truewind values are generally optimistic: the actual wind speed for the year 2005 is not as high as the AWS Truewind predicted values.

[68] The anemometer at this buoy only had a height of 5 m so there is limited value to absolute wind speeds from the scaling of the 5m values to 100 m.

Table 15 – Annual Average Wind Speeds by Location

Location	Start Date	Anemometer Height (m)	Measured Wind Speed (m/s)	Wind Speed Scaled to AWS Height (m/s)	AWS Wind Speed (m/s)	AWS Height (m)	% Difference
Bishop and Clerks	Mar-02	15	7.93	8.76	7.25	30	-17.2
	Mar-03	15	7.44	8.21	7.25	30	-11.7
	Mar-04	15	7.40	8.17	7.25	30	-11.3
Thompson Island	Jan-03	25	5.65	5.79	5.90	30	1.83
	Jan-05	25	5.62	5.77	5.90	30	2.22
Nantucket Island	Sep-05	99	9.52	9.54	8.73	100	-8.47
	Sep-05	68	8.65	8.68	7.97	70	-8.20
	Sep-05	58	8.22	8.04	7.31	50	-9.11
Barnstable	Apr-05	39	5.28	5.08	6.08	30	19.6
	Apr-05	30	4.87	4.87	6.08	30	25.0
Bourne	Aug-04	50	5.50	5.50	6.03	50	9.74
	Aug-04	39	4.97	4.79	5.31	30	10.5
	Aug-04	20	3.60	3.81	5.31	30	41.6
Falmouth	Jun-04	39	5.52	5.31	5.87	30	10.5
	Jun-04	30	4.99	4.99	5.87	30	17.7
Orleans	Jun-04	50	5.60	5.60	6.19	50	10.6
	Jun-04	40	5.06	5.23	6.19	50	18.4
	Jun-04	20	3.72	3.95	5.38	30	36.4
Kingston	Aug-05	49	5.69	5.71	6.04	50	5.76
	Aug-05	38	5.27	5.10	5.48	30	7.54
	Aug-05	20	4.36	4.62	5.48	30	18.6
Mt. Tom	Jan-05	37	5.88	5.70	7.04	30	23.5
	Jan-05	24	5.07	5.23	7.04	30	34.6
Paxton	Sep-03	78	8.03	7.91	7.41	70	-6.31
	Jan-04	78	7.88	7.75	7.41	70	-4.44
	Jan-05	78	7.57	7.45	7.41	70	-0.59
Presque Isle	Dec-04	39	4.43	4.26	5.32	30	24.7
	Dec-04	30	4.11	4.11	5.32	30	29.4

Seasonal Comparison

An average wind speed was calculated for each season and each height that measured data are available. LAI used the traditional definitions of seasons that matched AWS Truewind's seasonal data.[69] In the case where there is more than one year available for a certain season, the values were not averaged, but kept separate. The AWS Truewind values for seasonal averages were only given for a height of 50 m, so the measured data were scaled to the 50 m height of the

[69] Spring included March, April and May. Summer included June, July and August. Fall included September, October and November. Winter included December, January and February.

AWS Truewind values. The AWS Truewind model and the measured data were compared by calculating the difference between these two values, along with the percent error. The legend indicates the location, year, and anemometer height that corresponds to each data entry. As with the yearly data, the Truewind model predicts wind speeds that are higher than measured values. No other trends are visible when comparing seasons -- it appears as though the model is as accurate for one season as it is for another. The results of this analysis can be found in Exhibit 2.

Hourly and Seasonal Comparison for Specific Sites

The average wind speed for every hour of the day was calculated for each full year and at each height where measured data were available. The measured hourly data were scaled to the nearest height for which AWS Truewind data were available. In the case where there was more than one year's worth of data available, the hourly averages were averaged separately for each year. These data were then compared to the AWS Truewind hourly average values for the correct height, and a percent difference was calculated.

In Figure 13, LAI provides average measured wind speed by hour of day at the Bishop and Clerks off-shore site against that predicted by AWS Truewind. The Bishop and Clerks site, formerly the site of a lighthouse, is located several miles south of Yarmouth, Massachusetts, a town on Cape Cod. The current wind measurement facility is referred to as a C-Man Station taking wind measurements at 30 meters.

The measured data were compared to the AWS Truewind data at 30 meters in Figure 13. [70] Actual measured wind speed stayed relatively consistent at or above 7.0 m/s, while AWS Truewind projected a general decline in the afternoon to less than 6.5 m/s. It is noteworthy that wind speeds can vary significantly from year to year: 2005 was less windy by about 0.5 m/s or about 7% compared to 2003 and 2004.

In Figure 14, LAI compares measured data against AWS Truewind-predicted values for daily averages by season. As indicated in the graph, the AWS Truewind data underestimated wind generation potential during the spring and fall seasons as average measured wind speeds were 12% and 17% higher, respectively. Although winter wind speeds are greatest, the variance among seasons is narrow. The greatest seasonal spread in measured wind speeds, winter vs. summer, was less than 2 m/s, representing approximately a 19.5% falloff in wind speed, well less than the AWS Truewind predicted 26.4% drop in wind speed.

[70] Anemometer data was measured at 15 m and scaled to 30 m, the closest AWS Truewind height..

Figure 13 – Hourly Measured vs. Predicted Wind Speed: Bishops and Clerks (30 m)

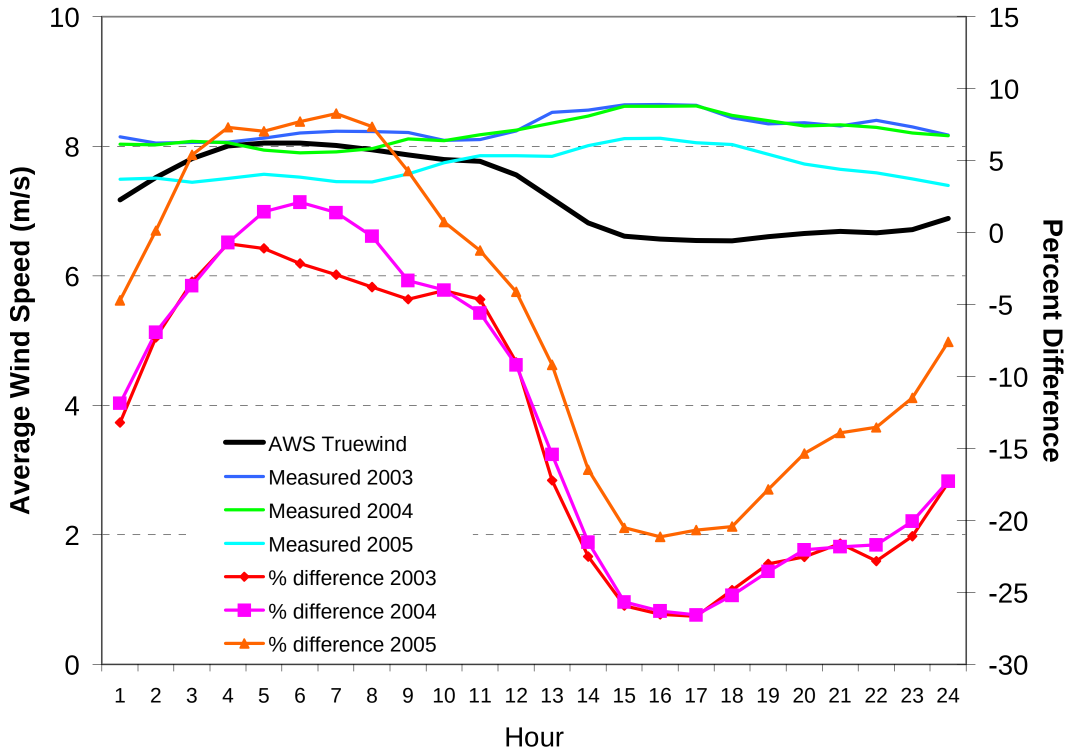


Figure 14 – Seasonal Measured vs. Predicted Wind Speed: Bishop and Clerks (50 m)

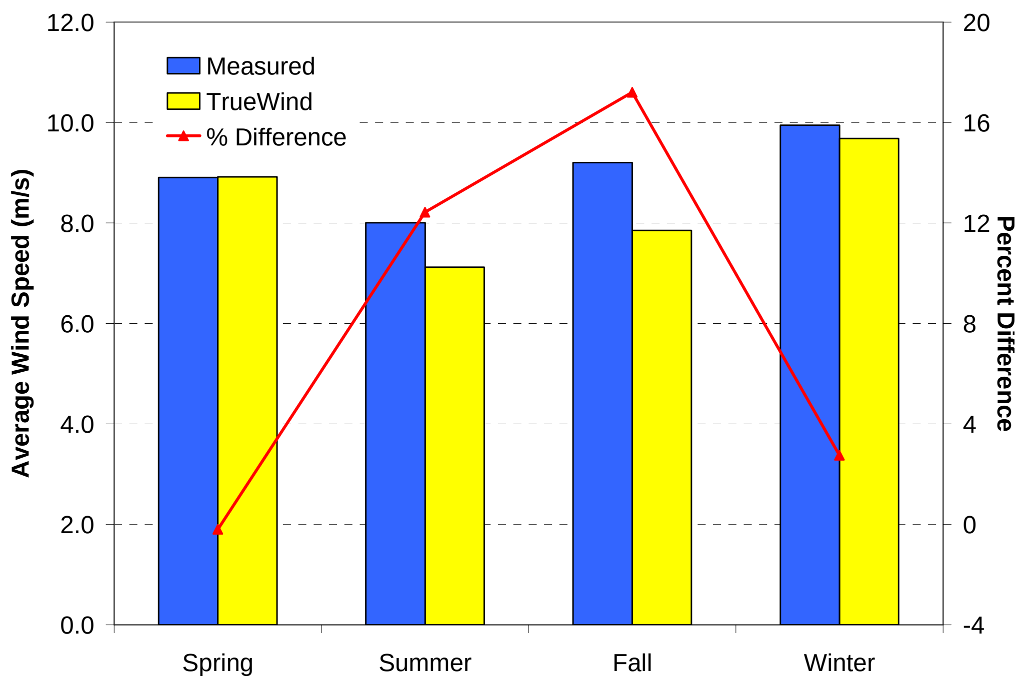
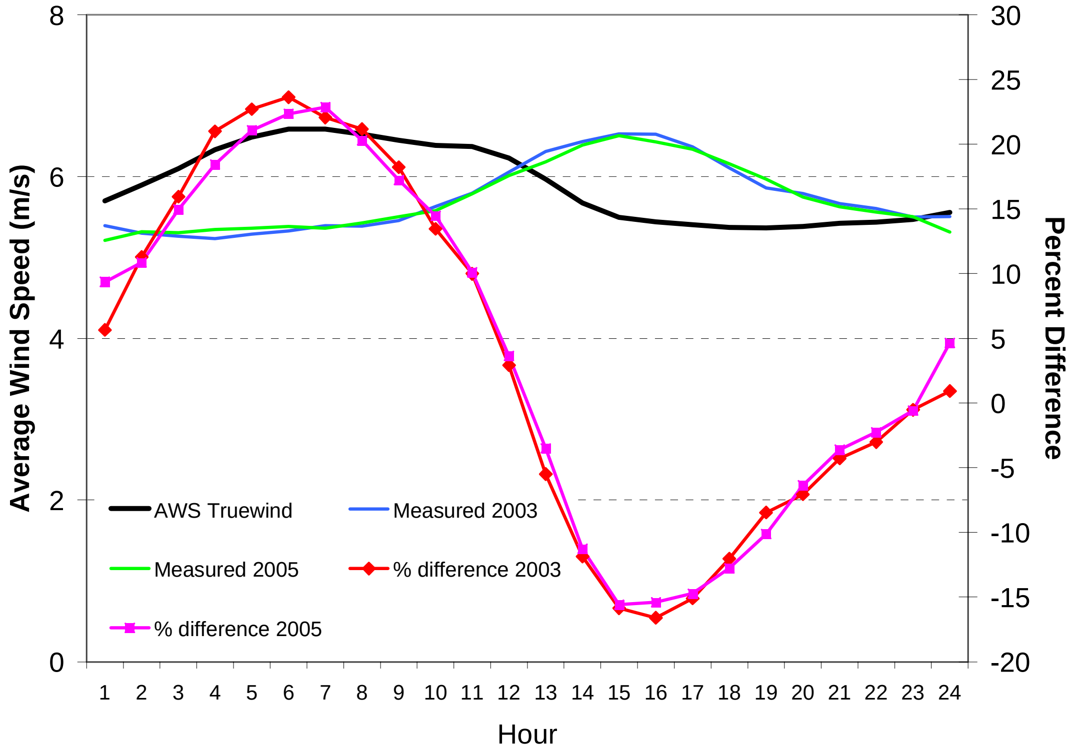


Figure 15 shows measured vs. predicted hourly wind speed at Thompson Island. Thompson Island is located in Boston Harbor, and the most western of the 34 islands of the Boston Harbor Islands National Recreation Area. The Thompson Island site is a C-Man station with an anemometer height of 25 meters. LAI scaled the actual wind speed data to 30 meters for consistent comparison. Wind speed data is shown for 2003 and 2005.[71]

Figure 15 – Hourly Measured vs. Predicted Wind Speed: Thompson Island[72]



Actual measured speeds were approximately 1 m/s lower than predicted by the AWS Truewind database in the morning hours and 1 m/s higher than predicted in the afternoon hours. Percentage differences between measured and predicted values reached +/- 20% in almost mirror image fashion. Accordingly, daily averages were almost equal for the predicted and measured values (5.7 m/s vs. 5.9 m/s). With a wind speed of 5.7 m/s, Thompson Island is considered a Class 2 wind resource for 2005. Although average hourly wind speeds at Bishop and Clerks were lower for 2005 compared to 2003 and 2004, average hourly wind speeds at Thompson Island were very similar in 2003 and 2005. Seasonal differences between measured and predicted values were relatively small, similar to the average daily data described above. During the winter, the largest percentage difference reached only slightly over a 3% differential from that predicted in the AWS Truewind database (Figure 16).

Figure 17 shows measured vs. predicted wind speeds at Paxton, MA. [73] Paxton is a town in

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[71] The monitoring tower did not operate from June 30, 2004 through November 10, 2004.

[72] Anemometer data was measured at 40 m and scaled to 50 m, the closest AWS Truewind height.

[73] Anemometer data was measured at 78 m and scaled to 70 m, the closest AWS Truewind height.

Figure 16 – Seasonal Measured vs. Predicted Wind Speed: Thompson Island (50 m)

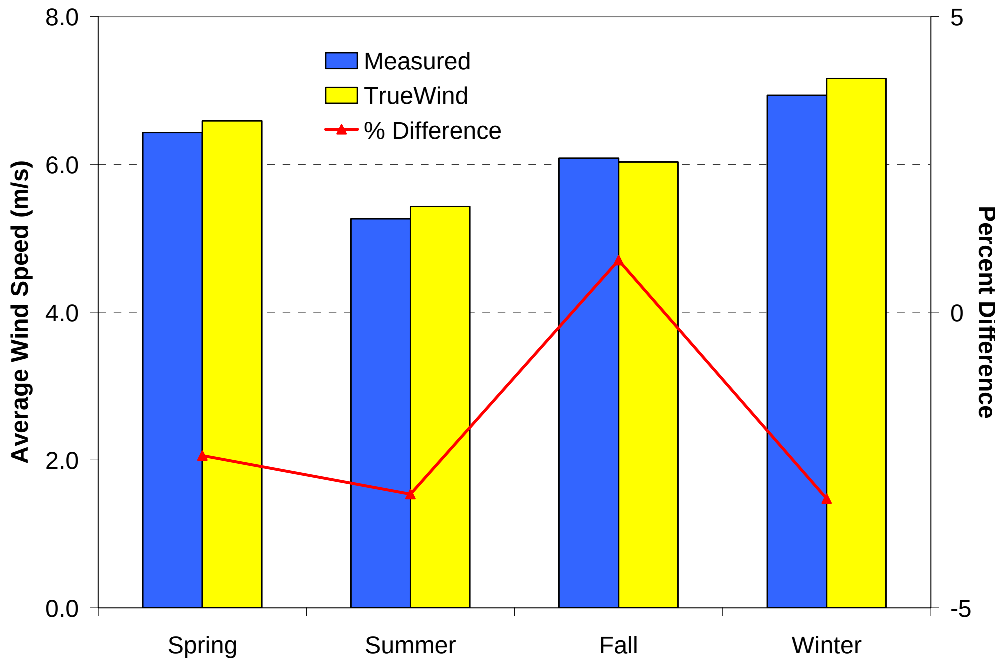
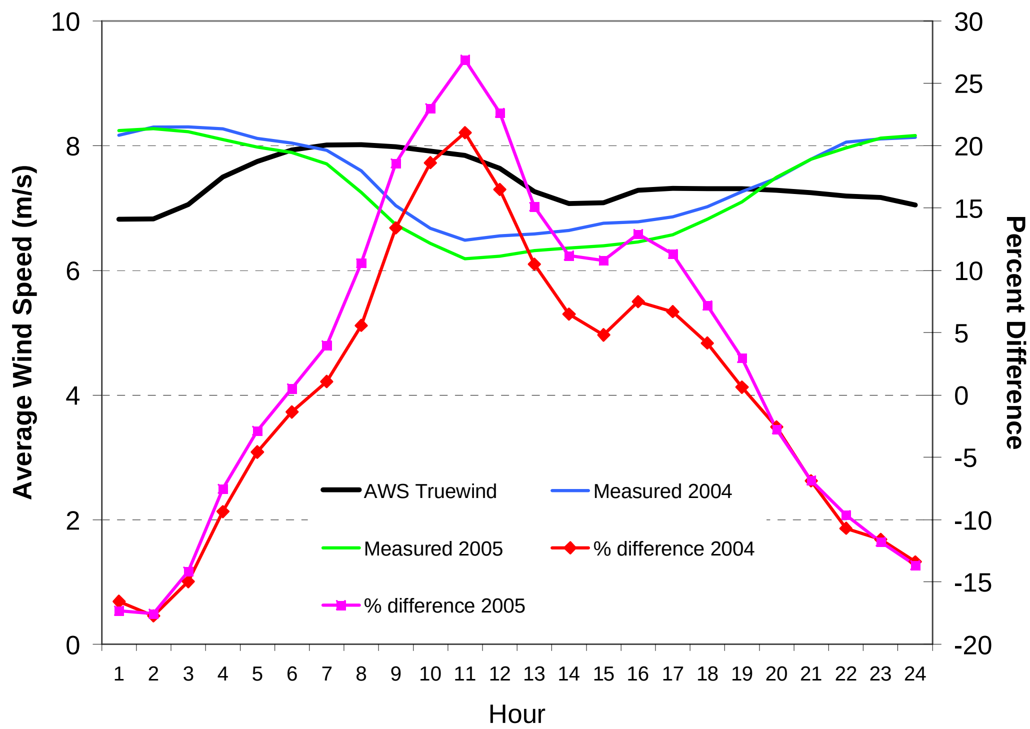


Figure 17 – Hourly Measured vs. Predicted Wind Speed: Paxton, MA (70 m)

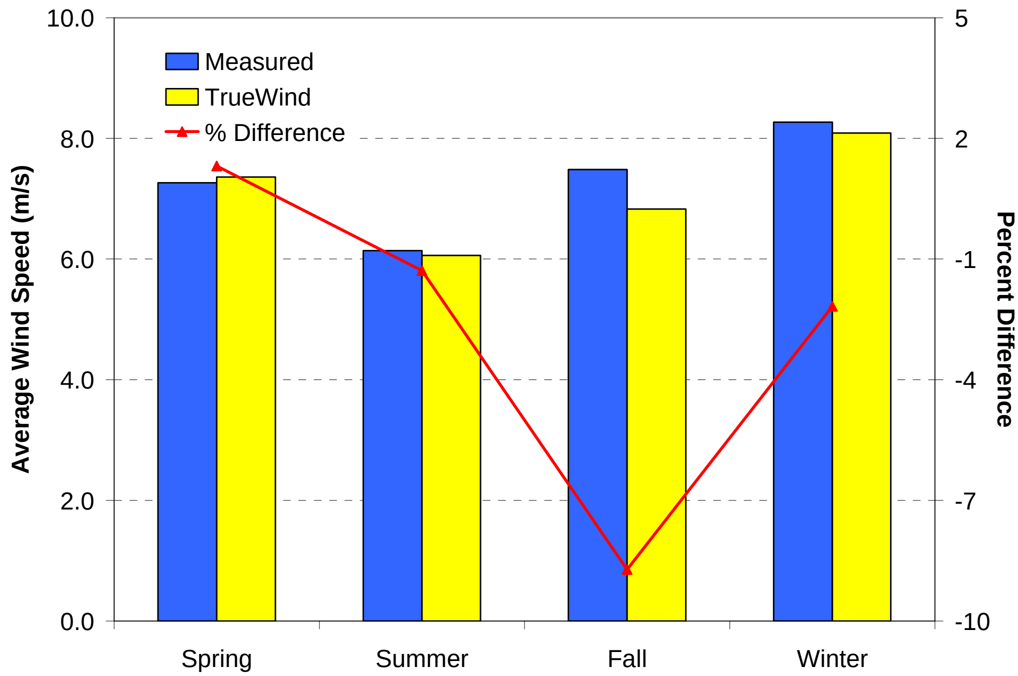


Massachusetts, eight miles west of Worcester. The wind measurement site is a 78 meter tower on Mount Asnebumskit, southeast of the town at an elevation of 420 m. LAI scaled the actual wind measurements to 70 meters for consistency. Data were measured over the 2004-2005 timeframe.

There is a modest difference between measured and predicted values, fluctuating between ±20%, with AWS Truewind predictions over-estimating during the middle of the day and underestimating during the nighttime / early morning hours. Average hourly wind speeds were lower for 2003 than 2004 in the middle of the day.

On a seasonal basis, differences between measured and predicted wind speeds at Paxton were largest during the fall, with percentage variances over 9%. The remaining seasons were much more accurately predicted; no other actual seasonal data showed higher than a 3% seasonal variation from the predicted values of average daily wind speed.

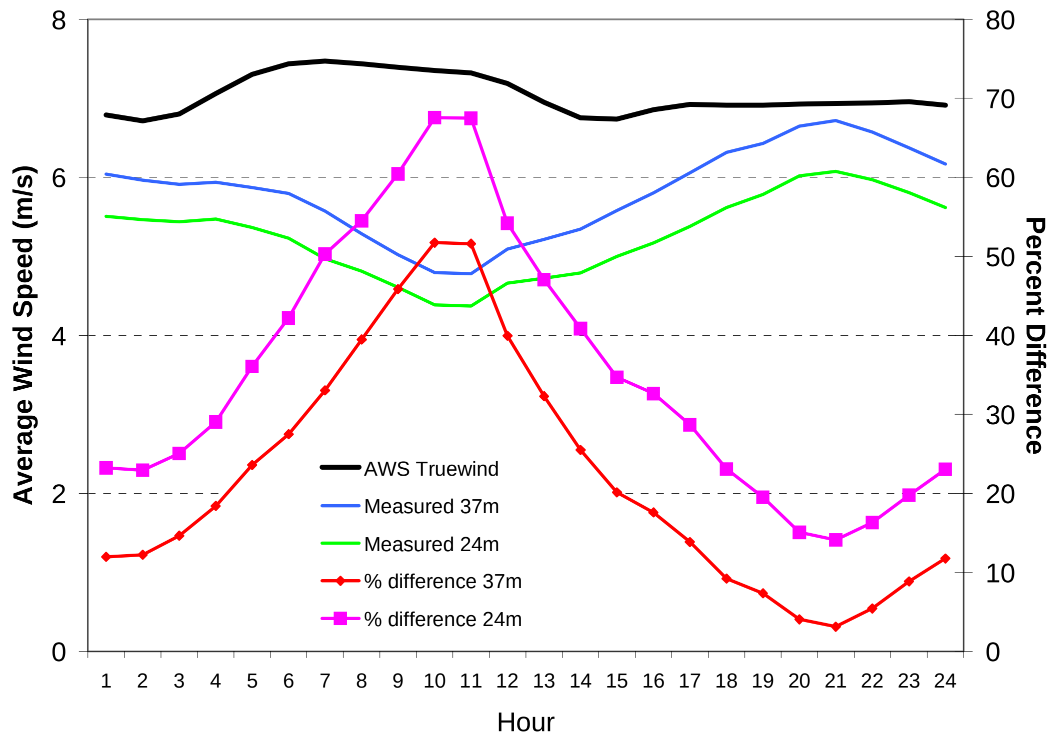
Figure 18 – Seasonal Measured vs. Predicted: Paxton, MA (50 m)



Other than Paxton, MA, there was only one other inland site assessed with data available and adequate wind speeds: Mt Tom. Located nearby in west-central Massachusetts, Mt. Tom is currently the site of an existing 250 kW wind facility, which has been operated by UMRERL since 1994. Measured data over the 2004-2005 time frame indicate that wind speeds are consistently well below predicted levels (Figure 19).[74] Average hourly measured wind speeds ranged from 4.7 m/s to 6.3 m/s, as much as 35% below wind speeds predicted by the AWS Truewind data.

[74] Anemometer data was measured at 24 and 37 m and scaled to 30 m, the closest AWS Truewind height.

Figure 19 – Hourly Measured vs. Predicted Wind Speed: Mt. Tom (30 m)



Seasonal differences between measured and predicted wind speeds at Mt. Tom peaked in the spring, but were consistently high during all seasons. As seen in Figure 20, measured vs. predicted seasonal differences were between 9 and 11% for all seasons. It is noteworthy that anemometer height can significantly affect wind speed measurements: the 24 m and 37 m anemometers record measurable differences in wind speed when scaled to 30 m.

LAI compared seasonal measured wind speeds to the AWS Truewind seasonal values which were only available at a height of 50 m. The measured values from anemometers at various heights were scaled to 50 m and the percent difference between the measured and AWS Truewind values are plotted in Figure 21 for winter and Figure 22 for summer as a function of anemometer height. [75] The percent difference decreases in general as the height approaches 50 m, indicating that scaling effects are most likely a significant source of error.

[75] All Truewind values are for 50m, measured values were scaled to 50 m for comparison.

Figure 20 – Seasonal Measured vs. Predicted Wind Speed: Mt. Tom (50 m)

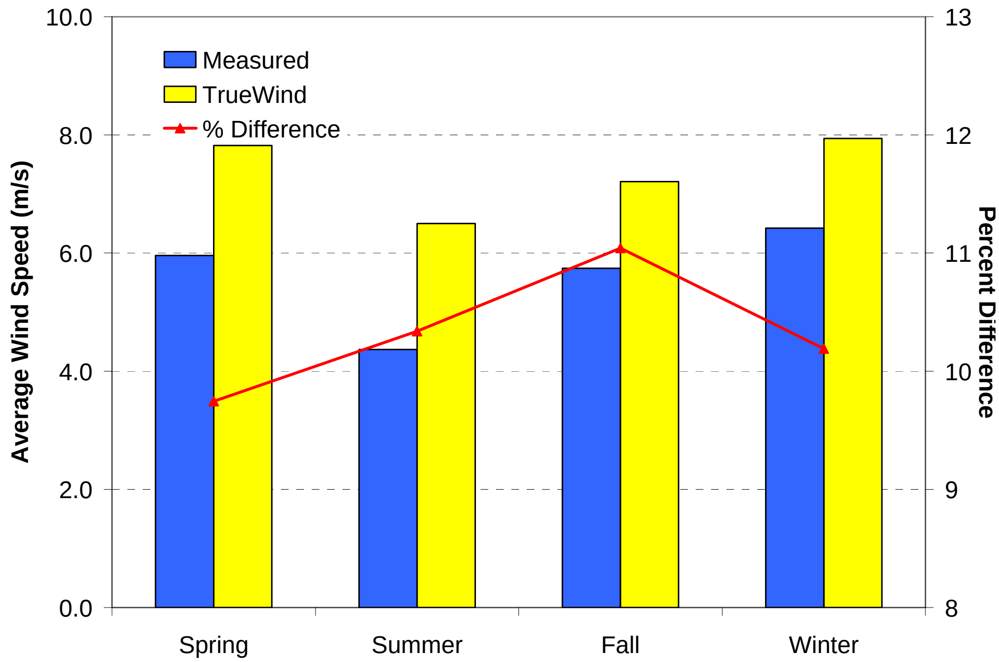


Figure 21 – Percent Difference at 50 m as a Function of Measured Height (Winter)

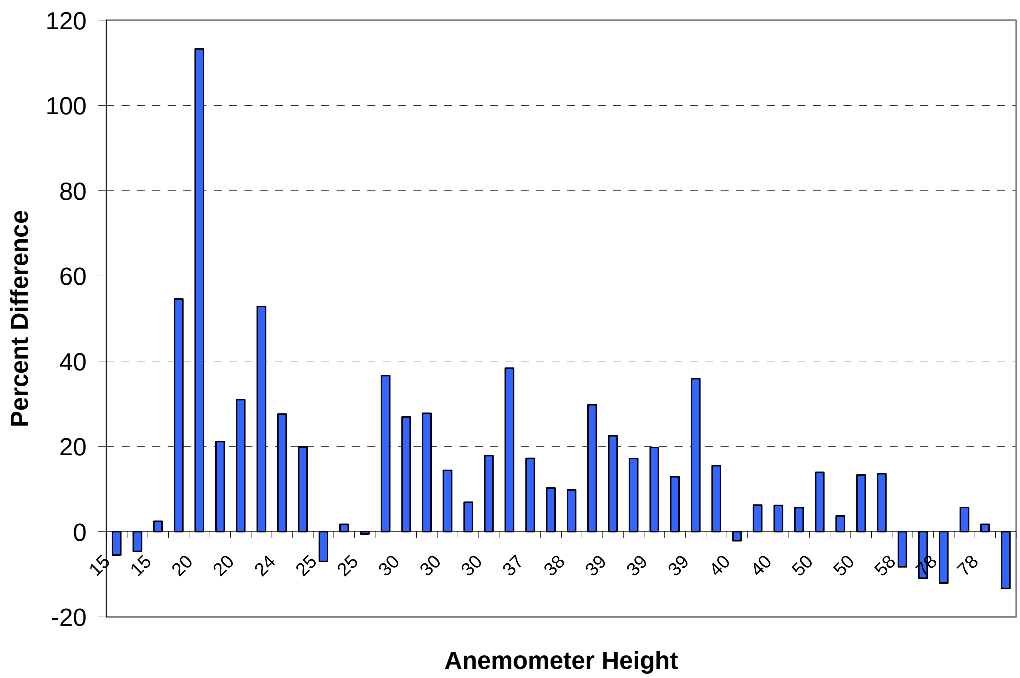
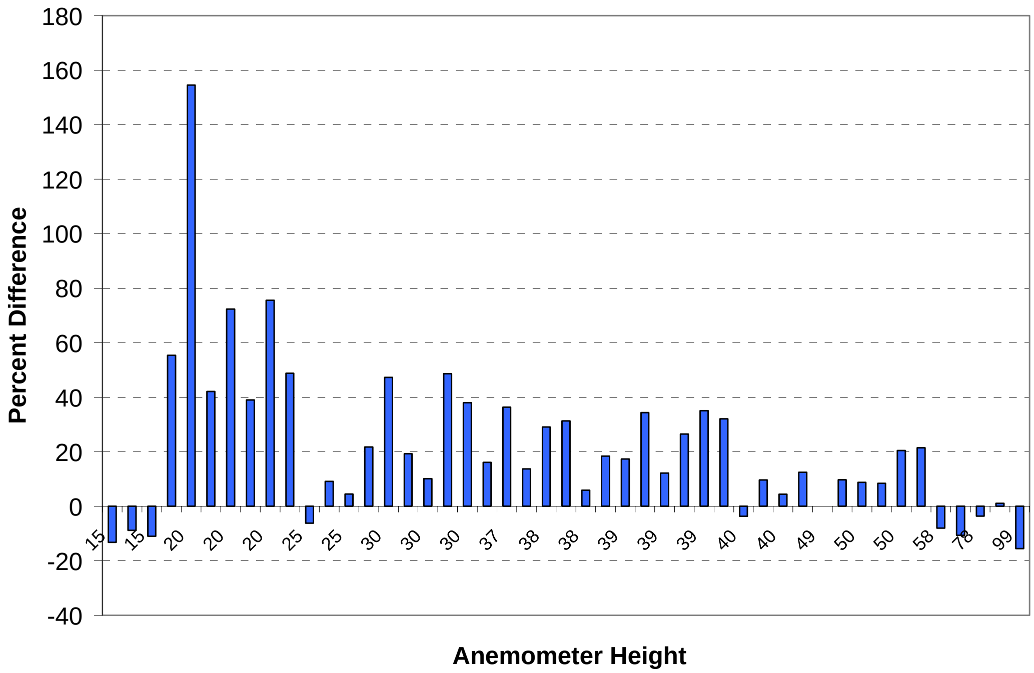


Figure 22 – Percent Difference at 50 m as a Function of Measured Height (Summer)



LAI reviewed the combination of sites and the aggregated ability of the range of sites across the region to maintain steady hour-to-hour output. As shown in Exhibit 3 and Exhibit 4, we calculated hourly capacity factors and the standard deviation of the hourly capacity factors for each month of the year for all the sites for which LAI had data for 2005. LAI focused on the year for which there was the maximum data, 2005, so that yearly weather effects could be ignored. This allowed the direct comparison of onshore and offshore capacity factors for winter and summer. Figure 23 and Figure 24 show capacity factors for each site as well as a combined capacity factor for winter and summer, 2005, respectively. The combination of offshore and onshore sites produces a capacity factor of about 50% for winter, more or less evenly throughout the day. For summer, the onshore sites bring down the combined capacity factor in the morning to a low of 16% while during the night it reaches 28%. It is noteworthy that the Thompson Island site and the Mt. Tom site are decreasing the combined capacity factor since they should not be classified as Class 3 sites for 2005. During the 13:01-18:00 afternoon summer window, the average effective FCM capacity rating ranges from 14 to 30% (Exhibit 3) while the combined capacity factor ranges from 18 to 24% range.

Given that most of the onshore wind sites being developed are in Maine, Vermont and New Hampshire where there are many sites with onshore wind speeds higher than the two Massachusetts sites used for calculating onshore capacity factors, LAI's estimate of the effective FCM capacity ratings understates the effective FCM capacity ratings for onshore New England.

Figure 23 – Capacity Factor of Single & Combined NE Sites (Winter 2005)

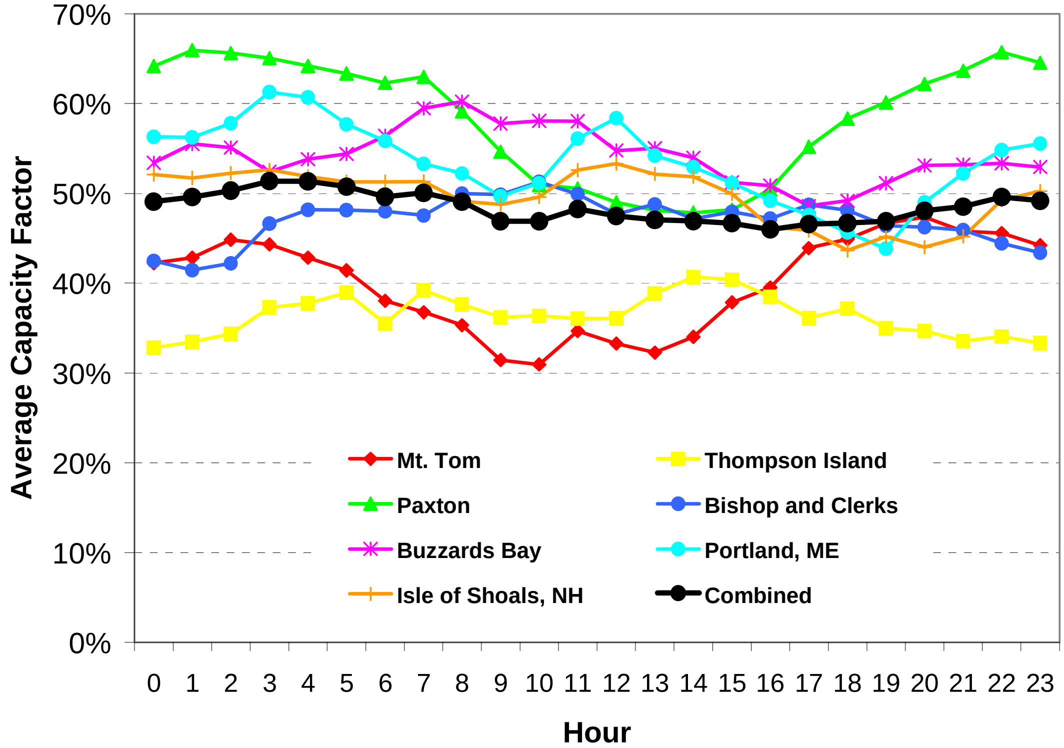


Figure 24 – Capacity Factor of Single & Combined NE Sites (Summer 2005)

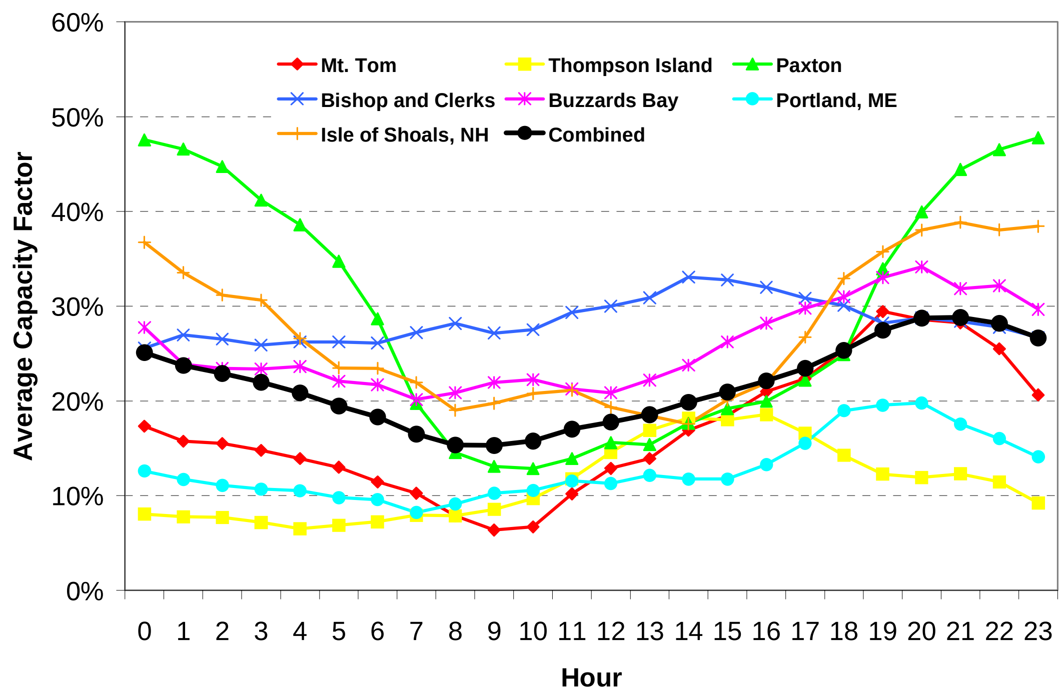
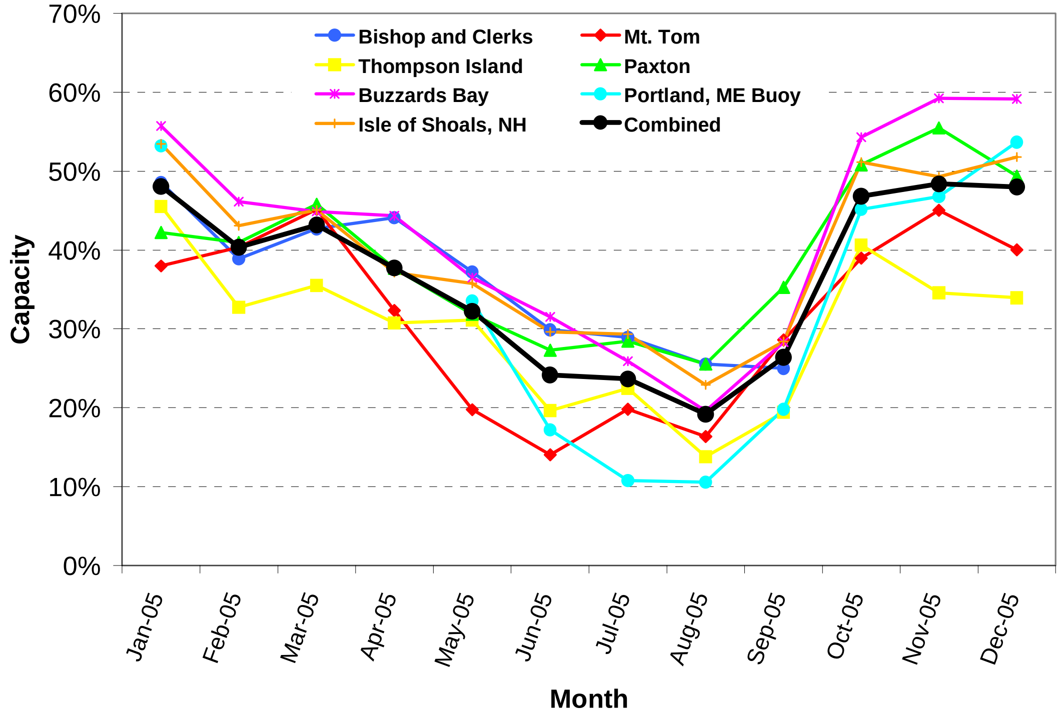


Figure 25 depicts monthly capacity factors for each of the sites as well as the combination of all sites. Clearly, capacity is at a minimum for all sites in the heat of summer, June through August, and at a maximum in the late fall and early winter, November through January.

Figure 25 – Average Monthly Capacity Factor of Single and Combined NE Sites (2005)



The standard deviations of the hourly and monthly capacity factors for each site are larger in the winter months when the average wind speed is higher. As reported in Exhibit 5, LAI also combined the hourly and monthly capacity factors for all the sites and calculated the standard deviation for the hourly and monthly capacity factors. As expected, the standard deviation of the combined capacity factors is lower than the standard deviation of the individual sites and support the conclusion that multiple wind sites will lead to a more reliable energy supply than any one wind site especially if the multiple wind sites are a combination of onshore and offshore wind plants scattered throughout the region. Finally, in Exhibit 6, LAI summarizes the analysis of the seven sites for years other than 2005 for which data are available and lists the effective capacities for the ten days of each year with maximum loads in New England. Although the capacity factors vary from year to year at the various sites, there is less variability when combining the sites (Mt. Tom, Paxton, Buzzard's Bay, Isle of Shoals, Bishop and Clerks).

CONCLUSIONS

Wind Generation Potential

LAI has calculated the MT-UCAP wind resource potential in New England to be about 94,000 MW, three times the existing installed capacity within the region. About two-thirds of this total is located onshore. A summary of the theoretical and measured FCM UCAP results is shown in Table 16.

Table 16 – Summary of Calculated Maximum Wind Generation Potential

Zone	Theoretical UCAP (MW)	Measured FCM UCAP (MW)	
		Summer	Winter
Maine	39,379	26,978	58,216
Vermont	7,997	5,525	11,923
New Hampshire	5,598	3,705	7,995
SEMA	4,552	3,531	7,620
WCMA	1,432	1,138	2,456
Rhode Island	488	379	818
NEMA	226	210	453
Connecticut	175	166	359
Shallow Offshore	25,679	19,139	33,862
Deep Offshore	8,295	6,337	11,211
Total	93,821	67,109	134,913

Most of this potential is not developable. LAI used a population screening criterion for onshore sites and a water depth screening criterion for offshore sites in addition to wind speed. Other meaningful screening criteria may include, but are not limited to, the following:

- Environmentally sensitive areas such as water bodies, wetlands, unique habitats, and archeological or cultural resources;
- Relevant engineering and geotechnical considerations, such as the slope of the terrain, soil conditions, or flooding potential;
- Potentially conflicting uses, such as recreation and aesthetic areas along beachfront property, customary shipping channels, both onshore and offshore areas near airports, or road, railroad, pipeline, and other rights-of-way; and
- Electric transmission constraints and considerations associated with existing network capability as well as interconnection and upgrade requirements to neutralize adverse system impacts, including safeguards against intermittency effects.[76]

[76] Recognition of intermittency effects may also be performed.

Measured UCAP wind potentials for summer and winter were calculated using the summer and winter hours of relevance for capacity payments under the FCM. We relied on data from five sites in New England that meet the threshold wind Class requirement and have at least one-year of hourly data. The effective FCM capacity rating for onshore sites was 19% for summer and 41% for winter. For offshore sites, the effective FCM capacity rating was 26% for summer and 46% for winter.

Nearly 66% of the total onshore MT-UCAP potential is located in Maine. Over 20% of the remainder onshore potential is located in New Hampshire and Vermont. Most of the wind generation potential in Massachusetts is located in southeast Massachusetts, about 8% of the total onshore potential across the region. Remaining wind generation potential in Massachusetts, Rhode Island and Connecticut is comparatively small. During the summer, the measured FCM UCAP onshore across all of New England amounts to 42,000 MW.

Given that most of the onshore wind sites being developed are in Maine, Vermont and New Hampshire where there are many sites with onshore wind speeds higher than the two Massachusetts sites used for calculating onshore capacity factors, LAI's estimate of the effective FCM capacity ratings understates both the effective FCM capacity ratings and the measured FCM UCAP for onshore New England.

The total offshore MT-UCAP of 34,000 MW is divided into shallow offshore (< 30 m) and deep offshore (30-60 m). Over 75% of total offshore wind generation potential, about 26,000 MW, is located in shallow offshore waters. Insofar as the majority of the shallow offshore wind generation potential is located on or very close to New England's shoreline, the actual amount of developable wind generation potential will be materially lower when environmental, safety, recreational, and aesthetic screening criteria are applied. Irrespective of water depth, the total measured FCM UCAP equivalent offshore potential during the summer is 25,500 MW.

The summer and winter FCM UCAP estimates based on wind speed measurements at a handful of sites bracket the MT-UCAP calculated with the AWS Truewind model which uses average wind speeds for each site. Therefore, the AWS Truewind model is useful for providing a rough estimate of wind generation potential for sites where hourly measurements are not available. Based on the AWS Truewind model, the theoretical average capacity factor is 27% for onshore New England and 35% for offshore. However, the model does not capture the variability inherent in the summer and winter hourly wind speeds and cannot provide the summer and winter effective capacity ratings required by FCM.

Historical Data

Studies of wind data analysis from various locations in the U.S. result in the following:

- Although good quality wind data from an anemometer are necessary to estimate wind power output by a wind plant, it is not sufficient. NREL found that the output of a multi turbine wind plant cannot be scaled from anemometer data at one location because all the turbines in a large plant do not experience the same wind speeds concurrently. Rather, the output from a large plant will fluctuate less than the output from a single turbine or a small group of turbines because different turbines will be exposed to different wind speeds. In effect, the spatial and temporal variations from a large plant make the combined output less variable.

- In addition to long-term averages, the MIT offshore study finds that temporal (both on a seasonal and daily basis) and spatial variability are necessary in order to estimate the economic and environmental performance of wind resources. The study finds that changes in wind speed of ± 10% year to year are common. They also find that offshore sites are more promising potential wind resources than onshore sites.

- The Minnesota study found that geographic spread of installed wind capacity provides substantial "smoothing" of wind generation variations. Smoothing occurs on short time scales (less than an hour) as well as longer time scales (multiple hours). The number of hours at either very low or very high production are reduced which allows aggregate wind generation over the geographic area to behave as a more stable supply.

Analysis of the historical wind data in New England results in the following observations:

- There are limited public data for many sites and only a complete year's worth of data for a few sites. Most available data are for Massachusetts. In light of the promising amount of wind generation potential in Maine, Vermont and New Hampshire, much more data and better quality data are needed in order to refine the estimate of wind generation potential in northern New England.

- A comparison of the measured data with the AWS Truewind prediction shows significant differences. Since the AWS Truewind model is based on weather from a 15 year historical period, it is unclear how much of the variation is due to yearly differences in weather and how much is due to analytic approximations within the model. The hourly differences between the measured and predicted wind speeds are consistent for both onshore and offshore locations. For offshore sites, the hourly differences suggest that the model overpredicts wind speed in the morning and underpredicts it in the afternoon. For onshore sites, the hourly differences suggest that the model overpredicts wind speed throughout the day, especially the middle of the day. Seasonally, the greatest differences between the measured and predicted wind speeds occur in the fall.

- The capacity factors for offshore wind generation are higher and have less variability throughout the year that those for onshore wind generation. Although there are considerably more onshore sites that have sufficient wind speed for wind turbine installation, the offshore sites are more effective in producing electricity all year than the onshore sites.

- In general, winter is much more windy than summer. Wind speeds in the fall and spring are somewhere in between. Winter wind generation is flat throughout the day. Summer wind generation is at a minimum in the morning hours, between 8 am and noon and at a maximum in the evening hours between 8 pm and midnight.

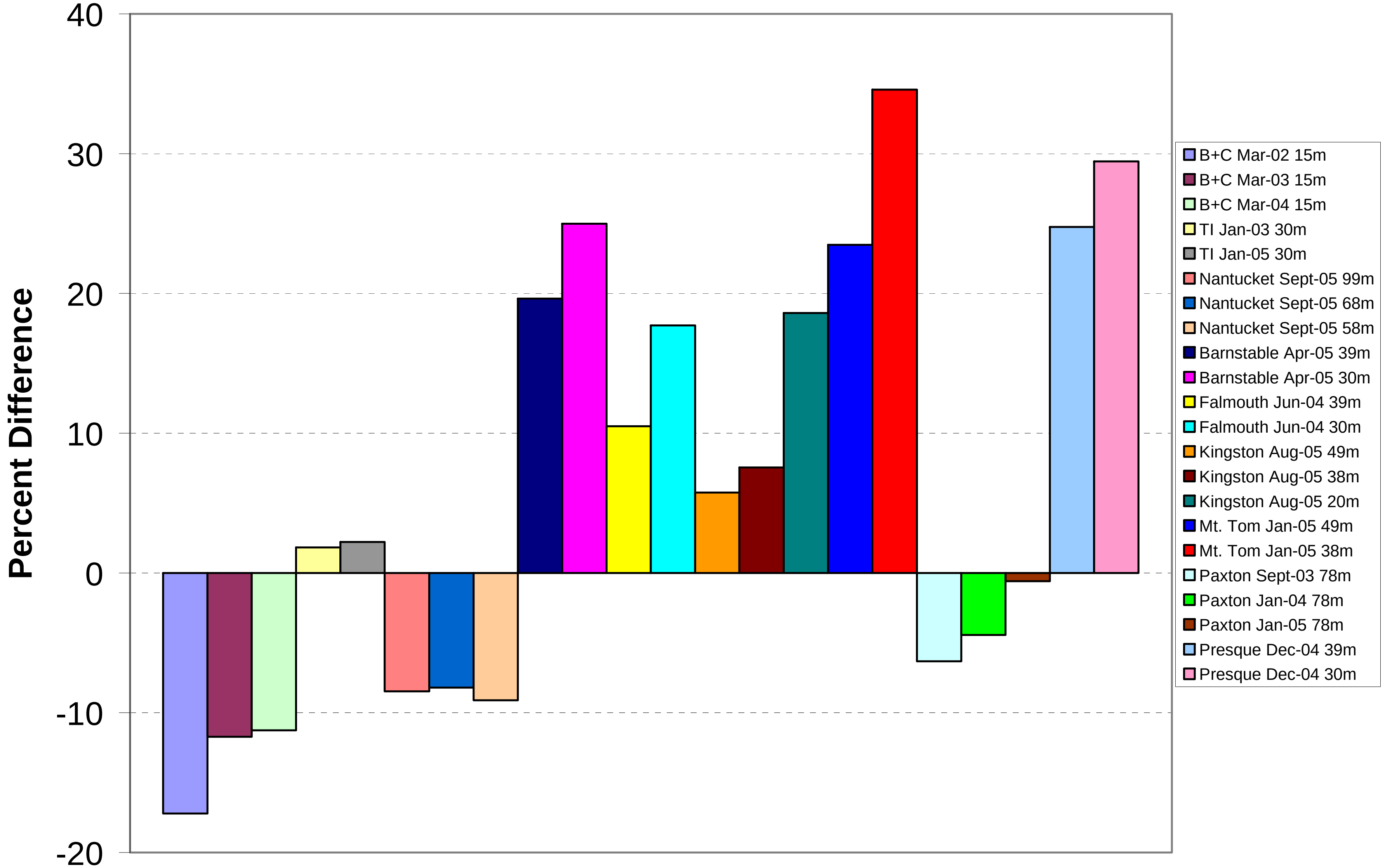
- For a given year, hourly wind generation varies sufficiently from site to site. The standard deviation of the combined capacity factors for all the sites is lower than the standard deviation of the individual sites. Therefore, multiple wind sites will lead to a more reliable energy supply than any one wind site especially if the multiple wind sites are a combination of onshore and offshore wind plants scattered throughout the region.

EXHIBITS

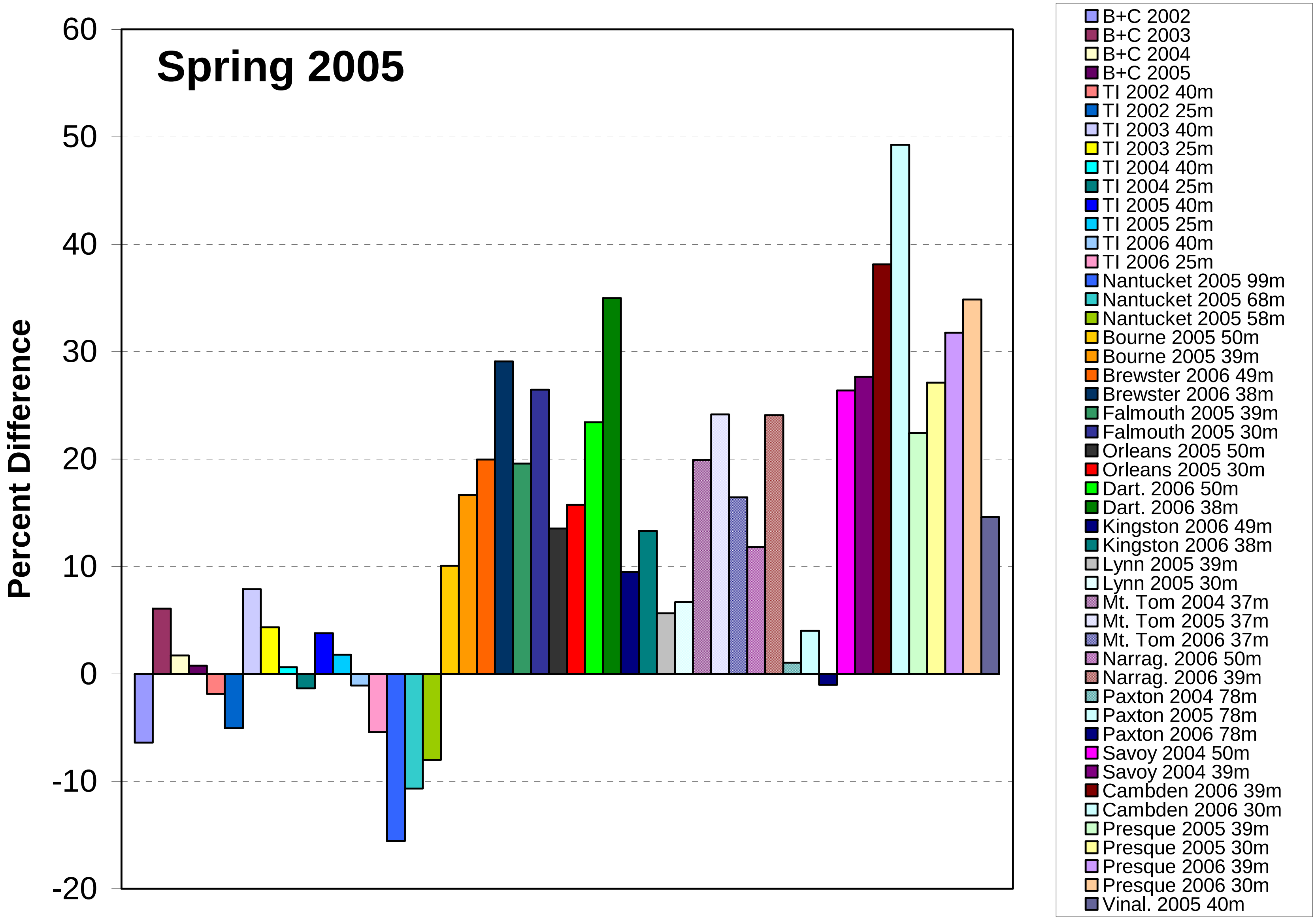
EXHIBIT 1

DRAFT

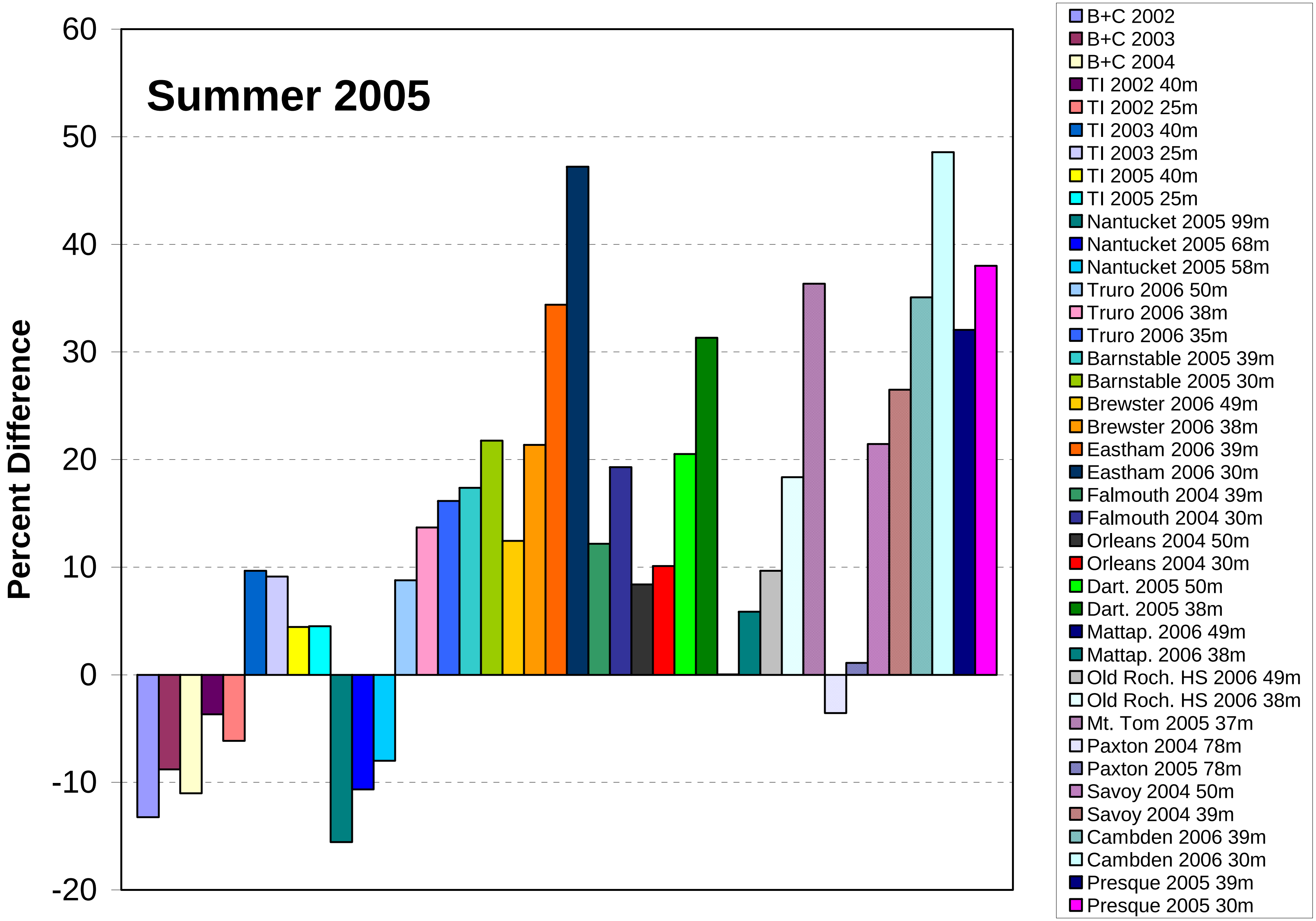
Annual Comparison of AWS Truewind and Measured Data



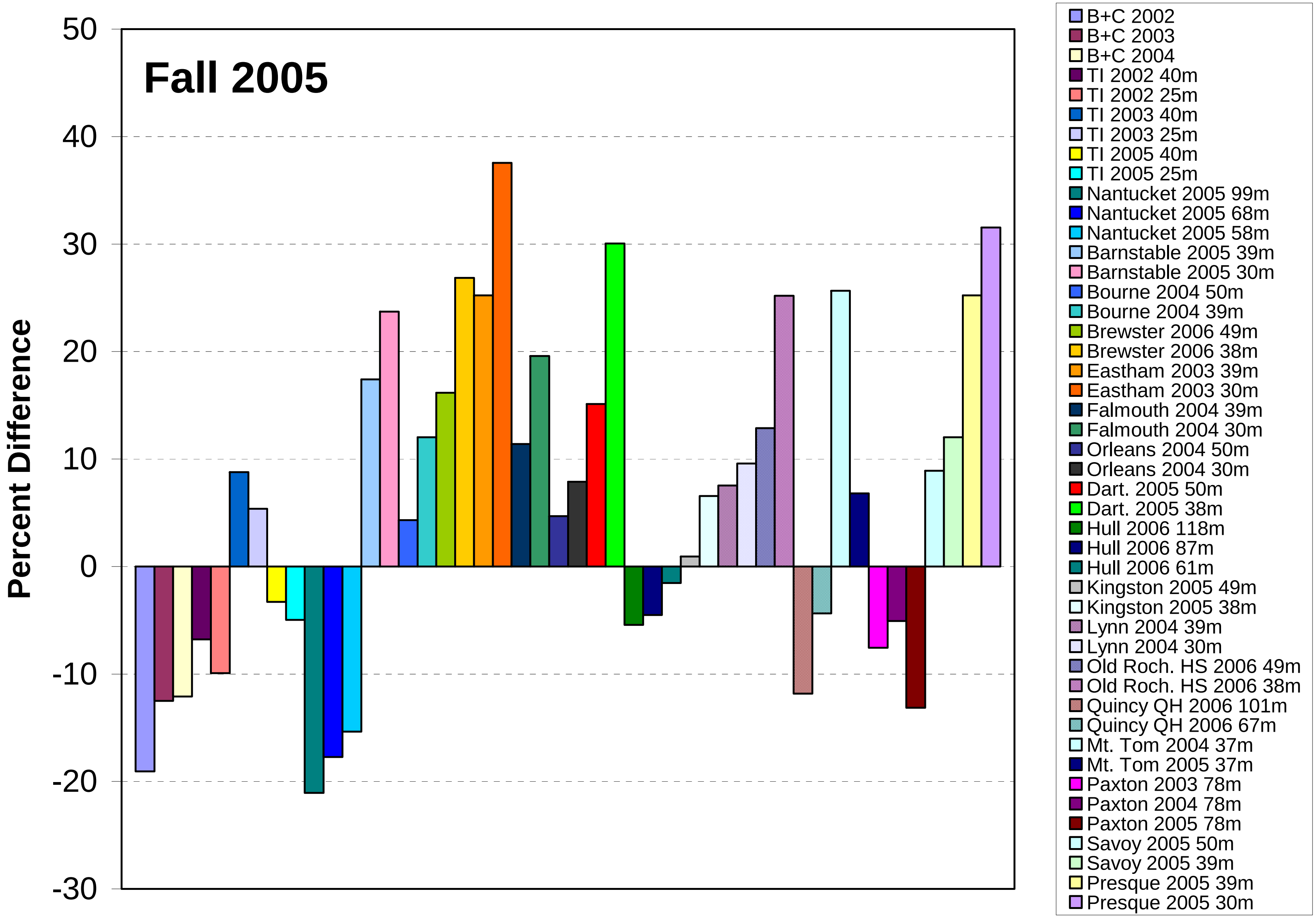
Note: The legend indicates the location and the first month of year for which the averages are calculated.


Spring 2005
Percent Difference
60
50
40
30
20
10
0
-10
-20
B+C 2002
B+C 2003
B+C 2004
B+C 2005
TI 2002 40m
TI 2002 25m
TI 2003 40m
TI 2003 25m
TI 2004 40m
TI 2004 25m
TI 2005 40m
TI 2005 25m
TI 2006 40m
TI 2006 25m
Nantucket 2005 99m
Nantucket 2005 68m
Nantucket 2005 58m
Bourne 2005 50m
Bourne 2005 39m
Brewster 2006 49m
Brewster 2006 38m
Falmouth 2005 39m
Falmouth 2005 30m
Orleans 2005 50m
Orleans 2005 30m
Dart. 2006 50m
Dart. 2006 38m
Kingston 2006 49m
Kingston 2006 38m
Lynn 2005 39m
Lynn 2005 30m
Mt. Tom 2004 37m
Mt. Tom 2005 37m
Mt. Tom 2006 37m
Narrag. 2006 50m
Narrag. 2006 39m
Paxton 2004 78m
Paxton 2005 78m
Paxton 2006 78m
Savoy 2004 50m
Savoy 2004 39m
Cambden 2006 39m
Cambden 2006 30m
Presque 2005 39m
Presque 2005 30m
Presque 2006 39m
Presque 2006 30m
Vinal. 2005 40m

Seasonal Comparison of AWS Truewind and Measured Data



Seasonal Comparison of AWS Truewind and Measured Data



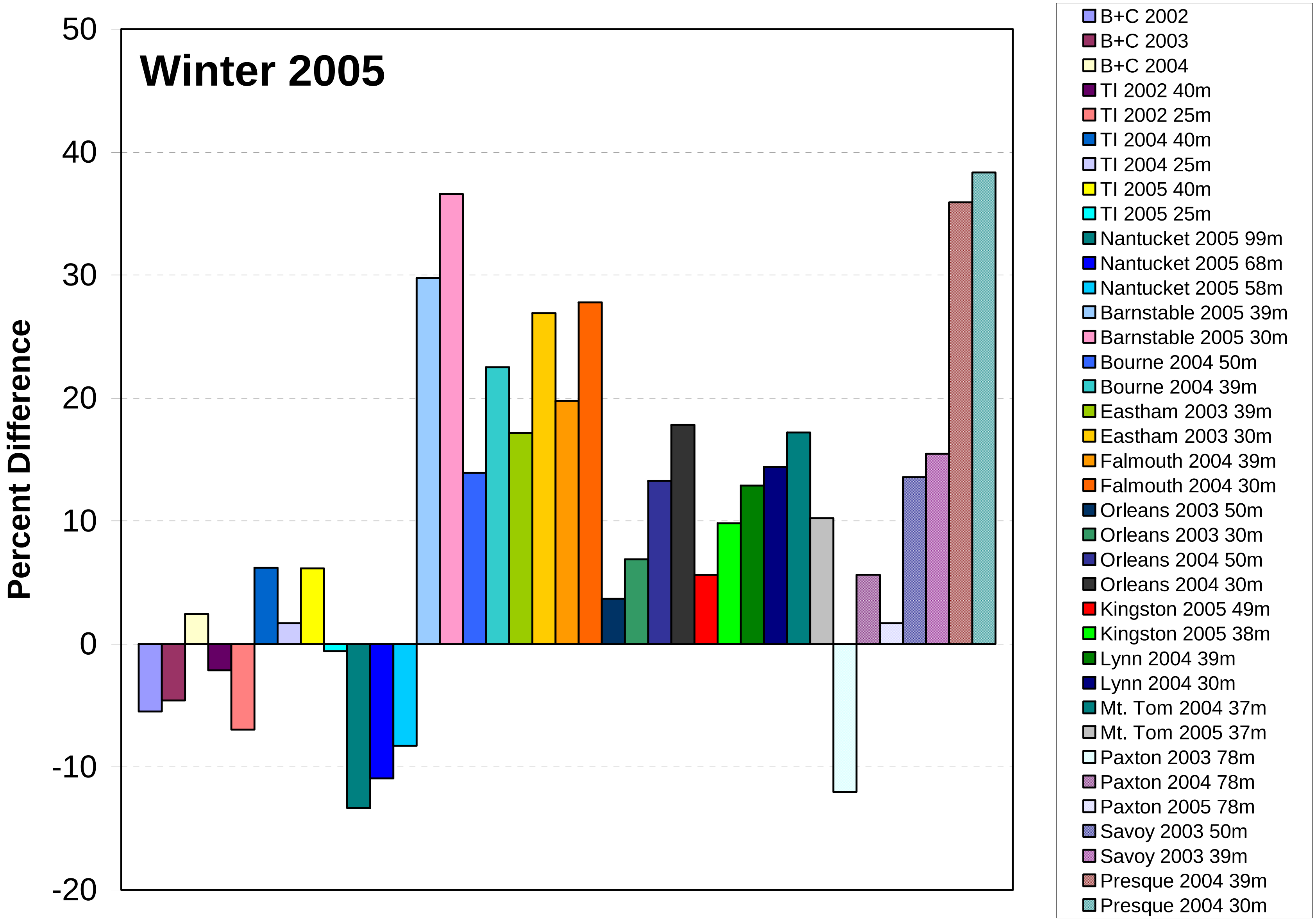

Winter 2005
Percent Difference
50
40
30
20
10
0
-10
-20
B+C 2002
B+C 2003
B+C 2004
TI 2002 40m
TI 2002 25m
TI 2004 40m
TI 2004 25m
TI 2005 40m
TI 2005 25m
Nantucket 2005 99m
Nantucket 2005 68m
Nantucket 2005 58m
Barnstable 2005 39m
Barnstable 2005 30m
Bourne 2004 50m
Bourne 2004 39m
Eastham 2003 39m
Eastham 2003 30m
Falmouth 2004 39m
Falmouth 2004 30m
Orleans 2003 50m
Orleans 2003 30m
Orleans 2004 50m
Orleans 2004 30m
Kingston 2005 49m
Kingston 2005 38m
Lynn 2004 39m
Lynn 2004 30m
Mt. Tom 2004 37m
Mt. Tom 2005 37m
Paxton 2003 78m
Paxton 2004 78m
Paxton 2005 78m
Savoy 2003 50m
Savoy 2003 39m
Presque 2004 39m
Presque 2004 30m

EXHIBIT 3

Hourly and Monthly Capacity Factors by Data Collection Site

Onshore: Mt. Tom

2005	Jan	Feb	Mar	Apr	May	Jun	Jly	Aug	Sep	Oct	Nov	Dec	Average
1	0.467	0.355	0.511	0.320	0.191	0.141	0.219	0.157	0.333	0.417	0.369	0.441	0.327
2	0.480	0.390	0.524	0.316	0.155	0.093	0.216	0.156	0.336	0.407	0.373	0.414	0.322
3	0.494	0.429	0.532	0.290	0.171	0.092	0.220	0.148	0.332	0.364	0.353	0.425	0.321
4	0.482	0.423	0.513	0.272	0.206	0.068	0.232	0.137	0.315	0.388	0.401	0.431	0.322
5	0.446	0.429	0.450	0.315	0.224	0.063	0.231	0.108	0.312	0.400	0.432	0.428	0.320
6	0.447	0.425	0.439	0.352	0.217	0.065	0.198	0.109	0.273	0.373	0.483	0.396	0.315
7	0.393	0.390	0.412	0.322	0.202	0.033	0.160	0.134	0.308	0.386	0.476	0.360	0.298
8	0.418	0.387	0.361	0.324	0.165	0.028	0.141	0.130	0.263	0.351	0.437	0.313	0.276
9	0.404	0.367	0.294	0.282	0.166	0.032	0.105	0.096	0.217	0.325	0.456	0.287	0.252
10	0.314	0.311	0.333	0.226	0.169	0.022	0.096	0.072	0.199	0.312	0.421	0.289	0.230
11	0.290	0.328	0.359	0.232	0.149	0.036	0.081	0.085	0.169	0.284	0.460	0.288	0.230
12	0.345	0.343	0.420	0.289	0.182	0.079	0.118	0.113	0.181	0.323	0.447	0.311	0.263
13	0.330	0.302	0.426	0.282	0.194	0.104	0.127	0.152	0.211	0.337	0.435	0.353	0.271
14	0.303	0.274	0.452	0.297	0.190	0.1424	0.1314	0.1422	0.2471	0.334	0.444	0.377	0.278
15	0.324	0.289	0.468	0.359	0.195	0.1455	0.1741	0.1810	0.2254	0.371	0.512	0.393	0.303
16	0.372	0.360	0.473	0.396	0.195	0.1766	0.1867	0.1843	0.2353	0.368	0.524	0.381	0.321
17	0.401	0.343	0.497	0.401	0.173	0.2115	0.2118	0.2004	0.2672	0.406	0.556	0.401	0.339
18	0.438	0.367	0.494	0.368	0.226	0.2239	0.2523	0.1927	0.3115	0.418	0.565	0.448	0.359
19	0.417	0.386	0.495	0.327	0.218	0.267	0.248	0.239	0.353	0.455	0.534	0.492	0.369
20	0.432	0.430	0.491	0.359	0.253	0.337	0.287	0.249	0.357	0.451	0.511	0.489	0.387
21	0.386	0.465	0.496	0.389	0.262	0.286	0.306	0.253	0.406	0.492	0.442	0.519	0.392
22	0.383	0.460	0.539	0.380	0.185	0.269	0.302	0.258	0.373	0.484	0.406	0.506	0.379
23	0.453	0.481	0.469	0.345	0.232	0.215	0.291	0.244	0.326	0.474	0.378	0.427	0.361
24	0.478	0.428	0.463	0.319	0.234	0.170	0.240	0.193	0.312	0.444	0.395	0.446	0.344
	0.404	0.382	0.455	0.323	0.198	0.138	0.199	0.164	0.286	0.390	0.450	0.401	0.316
											Average	0.2022	

Hourly and Monthly Capacity Factors by Data Collection Site

Onshore: Paxton

2005	Jan	Feb	Mar	Apr	May	Jun	Jly	Aug	Sep	Oct	Nov	Dec	Average
1	0.544	0.460	0.559	0.411	0.376	0.499	0.419	0.421	0.499	0.602	0.592	0.578	0.497
2	0.543	0.477	0.558	0.453	0.390	0.503	0.410	0.404	0.481	0.593	0.581	0.605	0.500
3	0.501	0.493	0.553	0.468	0.411	0.471	0.414	0.378	0.469	0.567	0.576	0.635	0.495
4	0.486	0.471	0.568	0.460	0.436	0.431	0.364	0.357	0.459	0.563	0.541	0.609	0.479
5	0.471	0.459	0.571	0.479	0.444	0.370	0.339	0.363	0.432	0.554	0.543	0.563	0.466
6	0.460	0.450	0.581	0.473	0.424	0.293	0.324	0.338	0.419	0.540	0.589	0.549	0.453
7	0.467	0.435	0.581	0.451	0.341	0.198	0.301	0.287	0.417	0.542	0.624	0.580	0.435
8	0.476	0.449	0.464	0.382	0.268	0.112	0.235	0.191	0.331	0.542	0.610	0.595	0.388
9	0.460	0.379	0.358	0.335	0.249	0.077	0.173	0.149	0.290	0.510	0.536	0.565	0.340
10	0.404	0.351	0.326	0.318	0.261	0.069	0.160	0.125	0.247	0.450	0.527	0.449	0.307
11	0.358	0.310	0.331	0.273	0.290	0.072	0.160	0.114	0.212	0.400	0.494	0.348	0.280
12	0.339	0.312	0.353	0.295	0.269	0.086	0.176	0.117	0.213	0.405	0.510	0.314	0.282
13	0.320	0.282	0.352	0.324	0.266	0.139	0.169	0.118	0.204	0.399	0.532	0.348	0.288
14	0.330	0.266	0.372	0.322	0.253	0.1282	0.1611	0.1219	0.2016	0.390	0.547	0.341	0.286
15	0.319	0.270	0.402	0.337	0.262	0.1482	0.1953	0.1389	0.2230	0.386	0.513	0.349	0.295
16	0.302	0.294	0.401	0.361	0.255	0.1700	0.2155	0.1397	0.2191	0.383	0.496	0.352	0.299
17	0.314	0.314	0.418	0.379	0.279	0.1909	0.1945	0.1636	0.2272	0.421	0.481	0.347	0.311
18	0.373	0.384	0.393	0.369	0.263	0.2450	0.1999	0.1668	0.2569	0.467	0.529	0.399	0.337
19	0.382	0.418	0.430	0.327	0.271	0.232	0.241	0.205	0.316	0.522	0.570	0.458	0.364
20	0.389	0.458	0.452	0.368	0.294	0.320	0.328	0.291	0.365	0.561	0.577	0.534	0.412
21	0.428	0.489	0.486	0.377	0.306	0.390	0.382	0.339	0.457	0.577	0.584	0.587	0.450
22	0.461	0.519	0.487	0.342	0.326	0.431	0.427	0.375	0.492	0.595	0.580	0.609	0.470
23	0.503	0.564	0.471	0.359	0.358	0.479	0.438	0.394	0.522	0.607	0.590	0.576	0.488
24	0.507	0.529	0.522	0.375	0.345	0.495	0.403	0.442	0.512	0.615	0.589	0.566	0.492
	0.422	0.410	0.458	0.377	0.318	0.273	0.285	0.256	0.353	0.508	0.555	0.494	0.392
											Average	0.1854	

EXHIBIT 3

Hourly and Monthly Capacity Factors by Data Collection Site

Onshore: Thompson Island

2005	Jan	Feb	Mar	Apr	May	Jun	Jly	Aug	Sep	Oct	Nov	Dec	Average
1	0.437	0.283	0.280	0.179	0.206	0.168	0.194	0.065	0.186	0.402	0.230	0.306	0.245
2	0.426	0.282	0.260	0.262	0.236	0.167	0.175	0.073	0.170	0.415	0.206	0.309	0.248
3	0.400	0.328	0.287	0.306	0.248	0.158	0.170	0.085	0.146	0.404	0.207	0.285	0.252
4	0.448	0.338	0.298	0.294	0.252	0.141	0.163	0.077	0.131	0.409	0.253	0.337	0.262
5	0.491	0.335	0.298	0.300	0.258	0.121	0.167	0.061	0.142	0.411	0.277	0.366	0.269
6	0.505	0.346	0.302	0.281	0.276	0.130	0.175	0.062	0.134	0.414	0.253	0.365	0.270
7	0.489	0.282	0.321	0.296	0.310	0.145	0.187	0.058	0.156	0.375	0.282	0.351	0.271
8	0.518	0.336	0.355	0.328	0.303	0.141	0.180	0.088	0.161	0.388	0.315	0.325	0.287
9	0.483	0.310	0.384	0.327	0.328	0.137	0.169	0.088	0.224	0.392	0.334	0.343	0.293
10	0.470	0.281	0.377	0.287	0.336	0.148	0.181	0.101	0.230	0.406	0.382	0.344	0.295
11	0.463	0.308	0.364	0.319	0.322	0.141	0.217	0.129	0.211	0.402	0.420	0.366	0.305
12	0.435	0.308	0.356	0.343	0.354	0.148	0.257	0.176	0.217	0.399	0.490	0.386	0.322
13	0.436	0.325	0.387	0.356	0.356	0.180	0.283	0.248	0.216	0.417	0.491	0.406	0.342
14	0.470	0.357	0.425	0.379	0.399	0.2387	0.3105	0.2682	0.2524	0.423	0.504	0.369	0.366
15	0.488	0.390	0.471	0.380	0.375	0.2850	0.3076	0.2786	0.2811	0.417	0.490	0.346	0.376
16	0.437	0.418	0.432	0.430	0.395	0.2905	0.2968	0.2443	0.2629	0.377	0.437	0.354	0.364
17	0.432	0.389	0.448	0.405	0.355	0.3049	0.3267	0.2360	0.2724	0.384	0.422	0.342	0.360
18	0.415	0.349	0.446	0.375	0.369	0.2785	0.3091	0.2073	0.2276	0.377	0.368	0.355	0.340
19	0.452	0.321	0.387	0.328	0.369	0.244	0.271	0.170	0.181	0.431	0.368	0.346	0.322
20	0.432	0.333	0.361	0.287	0.308	0.219	0.234	0.141	0.169	0.441	0.346	0.330	0.300
21	0.446	0.311	0.352	0.255	0.296	0.240	0.204	0.130	0.200	0.431	0.328	0.317	0.293
22	0.458	0.308	0.326	0.236	0.320	0.265	0.218	0.124	0.170	0.423	0.318	0.287	0.288
23	0.448	0.320	0.309	0.240	0.267	0.232	0.224	0.112	0.164	0.405	0.310	0.318	0.279
24	0.453	0.295	0.285	0.195	0.233	0.198	0.175	0.099	0.169	0.408	0.270	0.294	0.256
	0.456	0.327	0.355	0.308	0.311	0.197	0.225	0.138	0.195	0.406	0.346	0.339	0.300
											Average	0.2740	

Hourly and Monthly Capacity Factors by Data Collection Site

Offshore: Portland, ME

2005	Jan	Feb	Mar	Apr	May	Jun	Jly	Aug	Sep	Oct	Nov	Dec	Average
1	0.540				0.282	0.184	0.104	0.092	0.206	0.453	0.545	0.583	0.306
2	0.571				0.341	0.183	0.091	0.078	0.233	0.487	0.539	0.555	0.313
3	0.569				0.355	0.181	0.067	0.087	0.233	0.503	0.518	0.586	0.316
4	0.610				0.348	0.167	0.070	0.086	0.228	0.472	0.502	0.616	0.311
5	0.612				0.378	0.152	0.086	0.080	0.257	0.431	0.479	0.603	0.308
6	0.616				0.375	0.128	0.104	0.062	0.245	0.457	0.475	0.541	0.298
7	0.566				0.384	0.125	0.089	0.075	0.180	0.444	0.444	0.552	0.286
8	0.499				0.397	0.099	0.085	0.062	0.161	0.456	0.348	0.562	0.271
9	0.463				0.403	0.125	0.098	0.051	0.155	0.470	0.360	0.574	0.279
10	0.460				0.395	0.128	0.116	0.063	0.136	0.459	0.355	0.529	0.273
11	0.489				0.351	0.139	0.090	0.089	0.163	0.455	0.346	0.532	0.271
12	0.541				0.344	0.152	0.098	0.098	0.173	0.463	0.326	0.579	0.279
13	0.577				0.342	0.139	0.107	0.093	0.172	0.462	0.353	0.590	0.282
14	0.567				0.329	0.1437	0.1263	0.0927	0.1962	0.483	0.387	0.519	0.285
15	0.544				0.295	0.1483	0.1213	0.0844	0.1524	0.445	0.444	0.516	0.276
16	0.511				0.331	0.1532	0.1131	0.0879	0.1495	0.437	0.409	0.513	0.274
17	0.511				0.322	0.1681	0.1152	0.1159	0.1530	0.437	0.445	0.475	0.279
18	0.480				0.310	0.2196	0.1226	0.1262	0.1896	0.436	0.478	0.472	0.294
19	0.468				0.288	0.265	0.146	0.161	0.232	0.439	0.531	0.446	0.314
20	0.436				0.274	0.271	0.142	0.176	0.266	0.458	0.558	0.440	0.323
21	0.485				0.320	0.260	0.147	0.189	0.284	0.447	0.598	0.494	0.342
22	0.542				0.352	0.211	0.144	0.173	0.241	0.423	0.574	0.506	0.328
23	0.561				0.306	0.197	0.112	0.173	0.178	0.408	0.603	0.537	0.314
24	0.549				0.239	0.190	0.091	0.143	0.171	0.415	0.578	0.561	0.298
	0.532				0.336	0.172	0.108	0.106	0.198	0.452	0.466	0.537	0.297
											Average	0.1390	

Offshore: Buzzard's Bay

2005	Jan	Feb	Mar	Apr	May	Jun	Jly	Aug	Sep	Oct	Nov	Dec	Average
1	0.540	0.442	0.523	0.403	0.427	0.361	0.297	0.178	0.344	0.544	0.681	0.601	0.445
2	0.576	0.433	0.467	0.396	0.389	0.309	0.252	0.156	0.361	0.570	0.668	0.622	0.433
3	0.573	0.428	0.441	0.381	0.336	0.298	0.263	0.144	0.353	0.562	0.636	0.638	0.421
4	0.507	0.406	0.436	0.363	0.354	0.314	0.246	0.145	0.315	0.543	0.614	0.643	0.407
5	0.505	0.443	0.456	0.352	0.337	0.336	0.220	0.157	0.266	0.525	0.581	0.654	0.403
6	0.506	0.463	0.477	0.387	0.298	0.295	0.203	0.166	0.259	0.555	0.611	0.648	0.406
7	0.549	0.478	0.457	0.403	0.280	0.296	0.215	0.143	0.228	0.527	0.604	0.647	0.402
8	0.597	0.487	0.418	0.400	0.275	0.267	0.201	0.139	0.227	0.543	0.594	0.676	0.402
9	0.628	0.501	0.423	0.420	0.283	0.268	0.209	0.151	0.249	0.515	0.572	0.665	0.407
10	0.602	0.497	0.430	0.402	0.285	0.284	0.216	0.160	0.270	0.544	0.605	0.630	0.410
11	0.591	0.498	0.426	0.404	0.272	0.274	0.233	0.162	0.273	0.553	0.603	0.636	0.410
12	0.590	0.518	0.391	0.410	0.262	0.210	0.247	0.180	0.307	0.587	0.583	0.625	0.409
13	0.584	0.484	0.414	0.428	0.274	0.214	0.234	0.179	0.315	0.542	0.568	0.575	0.401
14	0.607	0.482	0.376	0.432	0.297	0.2618	0.2359	0.1698	0.2807	0.541	0.571	0.553	0.401
15	0.612	0.495	0.366	0.434	0.316	0.3008	0.2307	0.1832	0.2509	0.536	0.556	0.498	0.398
16	0.583	0.443	0.362	0.466	0.335	0.3257	0.2678	0.1958	0.2432	0.517	0.549	0.491	0.398
17	0.552	0.434	0.377	0.479	0.367	0.3478	0.2993	0.2014	0.2417	0.487	0.547	0.496	0.403
18	0.500	0.393	0.440	0.514	0.411	0.3645	0.2955	0.2359	0.2536	0.513	0.562	0.518	0.417
19	0.483	0.431	0.479	0.526	0.476	0.381	0.306	0.245	0.291	0.520	0.539	0.529	0.434
20	0.530	0.440	0.497	0.549	0.522	0.381	0.324	0.287	0.277	0.511	0.534	0.548	0.450
21	0.550	0.456	0.499	0.566	0.526	0.389	0.328	0.307	0.266	0.524	0.561	0.567	0.462
22	0.551	0.465	0.519	0.567	0.504	0.366	0.304	0.287	0.306	0.565	0.606	0.570	0.467
23	0.535	0.477	0.557	0.504	0.511	0.372	0.302	0.292	0.325	0.612	0.628	0.578	0.474
24	0.528	0.475	0.540	0.457	0.438	0.352	0.296	0.244	0.286	0.595	0.644	0.590	0.454
	0.557	0.461	0.449	0.443	0.366	0.315	0.259	0.196	0.283	0.543	0.592	0.591	0.421
											Average	0.2593	

Hourly and Monthly Capacity Factors by Data Collection Site

Offshore: Isle of Shoals

2005	Jan	Feb	Mar	Apr	May	Jun	Jly	Aug	Sep	Oct	Nov	Dec	Average
1	0.628	0.407	0.535	0.374	0.378	0.404	0.397	0.303	0.365	0.553	0.549	0.518	0.451
2	0.592	0.403	0.506	0.401	0.320	0.369	0.346	0.291	0.313	0.555	0.562	0.543	0.433
3	0.585	0.384	0.497	0.369	0.352	0.325	0.319	0.291	0.289	0.520	0.524	0.585	0.420
4	0.576	0.382	0.460	0.310	0.319	0.328	0.352	0.240	0.300	0.546	0.528	0.608	0.412
5	0.522	0.438	0.490	0.289	0.304	0.279	0.326	0.193	0.272	0.553	0.479	0.589	0.394
6	0.491	0.457	0.473	0.298	0.288	0.266	0.277	0.162	0.230	0.549	0.429	0.585	0.375
7	0.501	0.440	0.465	0.320	0.286	0.264	0.298	0.142	0.250	0.542	0.405	0.589	0.375
8	0.488	0.488	0.494	0.350	0.313	0.240	0.288	0.131	0.226	0.523	0.413	0.561	0.376
9	0.472	0.488	0.459	0.386	0.327	0.200	0.246	0.125	0.198	0.515	0.408	0.514	0.361
10	0.489	0.490	0.435	0.406	0.352	0.210	0.240	0.143	0.218	0.501	0.356	0.485	0.360
11	0.518	0.494	0.431	0.377	0.377	0.217	0.240	0.167	0.224	0.497	0.356	0.476	0.364
12	0.551	0.510	0.436	0.366	0.367	0.236	0.241	0.157	0.232	0.484	0.375	0.516	0.373
13	0.562	0.514	0.449	0.404	0.345	0.220	0.203	0.158	0.264	0.483	0.407	0.522	0.378
14	0.545	0.456	0.420	0.355	0.323	0.1924	0.1856	0.1752	0.2610	0.493	0.447	0.557	0.367
15	0.560	0.413	0.346	0.315	0.323	0.1657	0.2048	0.1561	0.2606	0.466	0.504	0.573	0.357
16	0.538	0.420	0.332	0.292	0.308	0.1933	0.2473	0.1627	0.2402	0.456	0.532	0.532	0.355
17	0.508	0.383	0.328	0.324	0.327	0.2449	0.2296	0.1845	0.2487	0.459	0.518	0.488	0.354
18	0.513	0.412	0.366	0.372	0.408	0.2830	0.2921	0.2276	0.3110	0.475	0.551	0.446	0.388
19	0.515	0.366	0.396	0.394	0.437	0.356	0.343	0.289	0.317	0.490	0.570	0.420	0.408
20	0.516	0.379	0.423	0.440	0.440	0.409	0.328	0.338	0.362	0.491	0.623	0.453	0.433
21	0.502	0.375	0.465	0.458	0.449	0.444	0.346	0.352	0.369	0.512	0.620	0.435	0.444
22	0.520	0.414	0.520	0.456	0.445	0.419	0.355	0.393	0.343	0.532	0.575	0.418	0.449
23	0.546	0.420	0.560	0.441	0.420	0.401	0.357	0.384	0.362	0.541	0.584	0.505	0.460
24	0.584	0.402	0.513	0.417	0.379	0.441	0.375	0.338	0.363	0.541	0.516	0.512	0.448
	0.534	0.431	0.450	0.371	0.358	0.296	0.293	0.229	0.284	0.511	0.493	0.518	0.397
											Average	0.2233	

EXHIBIT 3

Hourly and Monthly Capacity Factors by Data Collection Site

Offshore: Bishop and Clerks

2005	Jan	Feb	Mar	Apr	May	Jun	Jly	Aug	Sep	Oct	Nov	Dec	Average
1	0.466	0.314	0.438	0.408	0.341	0.286	0.262	0.217	0.276				0.334
2	0.436	0.310	0.433	0.434	0.306	0.336	0.274	0.216	0.291				0.337
3	0.449	0.331	0.385	0.451	0.295	0.305	0.275	0.207	0.282				0.331
4	0.500	0.381	0.384	0.441	0.292	0.275	0.265	0.234	0.263				0.337
5	0.523	0.421	0.411	0.437	0.285	0.257	0.275	0.243	0.251				0.345
6	0.515	0.420	0.408	0.430	0.276	0.243	0.284	0.245	0.213				0.337
7	0.491	0.454	0.408	0.403	0.281	0.256	0.266	0.247	0.241				0.339
8	0.503	0.442	0.423	0.413	0.317	0.291	0.269	0.254	0.285				0.355
9	0.527	0.424	0.410	0.466	0.336	0.329	0.257	0.253	0.273				0.364
10	0.535	0.432	0.421	0.509	0.350	0.327	0.259	0.245	0.237				0.368
11	0.563	0.422	0.411	0.499	0.374	0.295	0.293	0.252	0.235				0.372
12	0.531	0.424	0.394	0.481	0.396	0.279	0.314	0.265	0.221				0.367
13	0.471	0.399	0.450	0.461	0.419	0.268	0.312	0.287	0.230				0.366
14	0.465	0.432	0.487	0.498	0.475	0.2776	0.3136	0.2965	0.2314				0.386
15	0.444	0.403	0.510	0.479	0.490	0.3113	0.3407	0.3160	0.2448				0.393
16	0.468	0.423	0.485	0.485	0.494	0.3191	0.3408	0.3220	0.2410				0.398
17	0.445	0.436	0.479	0.474	0.476	0.3488	0.3163	0.2667	0.2452				0.387
18	0.495	0.401	0.470	0.454	0.470	0.3400	0.2994	0.2649	0.3013				0.388
19	0.490	0.375	0.447	0.392	0.427	0.329	0.294	0.265	0.277				0.366
20	0.471	0.367	0.427	0.375	0.403	0.318	0.287	0.233	0.237				0.346
21	0.479	0.340	0.421	0.380	0.386	0.319	0.293	0.241	0.240				0.344
22	0.488	0.345	0.375	0.386	0.381	0.316	0.278	0.262	0.226				0.340
23	0.464	0.322	0.365	0.411	0.338	0.290	0.297	0.253	0.232				0.330
24	0.438	0.323	0.393	0.421	0.325	0.259	0.276	0.250	0.226				0.324
	0.486	0.389	0.426	0.441	0.372	0.299	0.289	0.256	0.250				0.356
											Average	0.2969	

EXHIBIT 4 **DRAFT**

Standard Deviations of Hourly and Monthly Capacity Factors by Site

Onshore: Mt. Tom

2005	Jan	Feb	Mar	Apr	May	Jun	Jly	Aug	Sep	Oct	Nov	Dec
1	0.395	0.369	0.366	0.282	0.216	0.172	0.265	0.177	0.287	0.375	0.361	0.333
2	0.422	0.360	0.403	0.301	0.174	0.107	0.280	0.174	0.325	0.349	0.353	0.323
3	0.402	0.354	0.384	0.282	0.234	0.105	0.267	0.161	0.312	0.343	0.343	0.346
4	0.388	0.357	0.364	0.263	0.250	0.102	0.275	0.175	0.321	0.365	0.367	0.354
5	0.382	0.358	0.328	0.307	0.289	0.117	0.292	0.155	0.327	0.366	0.379	0.353
6	0.371	0.333	0.306	0.332	0.283	0.099	0.274	0.166	0.284	0.333	0.386	0.330
7	0.352	0.346	0.326	0.330	0.281	0.056	0.231	0.199	0.329	0.363	0.378	0.302
8	0.358	0.340	0.355	0.339	0.251	0.069	0.227	0.206	0.313	0.347	0.366	0.331
9	0.354	0.336	0.348	0.318	0.263	0.073	0.211	0.193	0.292	0.349	0.398	0.310
10	0.321	0.349	0.366	0.282	0.273	0.059	0.195	0.187	0.281	0.330	0.407	0.328
11	0.342	0.364	0.364	0.301	0.245	0.105	0.146	0.192	0.255	0.341	0.429	0.353
12	0.373	0.362	0.398	0.342	0.290	0.192	0.198	0.216	0.257	0.355	0.438	0.391
13	0.373	0.354	0.381	0.353	0.284	0.198	0.184	0.258	0.276	0.339	0.418	0.391
14	0.345	0.339	0.398	0.336	0.240	0.250	0.183	0.235	0.316	0.356	0.394	0.382
15	0.350	0.356	0.384	0.342	0.276	0.236	0.233	0.261	0.299	0.374	0.399	0.385
16	0.364	0.388	0.374	0.349	0.279	0.272	0.226	0.246	0.311	0.354	0.397	0.396
17	0.361	0.365	0.385	0.360	0.243	0.274	0.248	0.263	0.330	0.344	0.379	0.385
18	0.352	0.344	0.387	0.322	0.254	0.223	0.286	0.241	0.333	0.312	0.325	0.369
19	0.348	0.357	0.379	0.320	0.238	0.225	0.263	0.244	0.337	0.336	0.315	0.374
20	0.368	0.349	0.376	0.328	0.245	0.241	0.277	0.246	0.299	0.345	0.342	0.363
21	0.370	0.400	0.374	0.337	0.231	0.244	0.282	0.263	0.319	0.341	0.343	0.335
22	0.356	0.421	0.370	0.334	0.163	0.245	0.300	0.252	0.313	0.328	0.361	0.339
23	0.394	0.395	0.368	0.291	0.213	0.225	0.310	0.249	0.271	0.349	0.349	0.308
24	0.407	0.386	0.340	0.292	0.247	0.185	0.277	0.206	0.295	0.368	0.348	0.321
	0.369	0.362	0.368	0.318	0.249	0.170	0.247	0.215	0.303	0.348	0.374	0.350

Onshore: Paxton

2005	Jan	Feb	Mar	Apr	May	Jun	Jly	Aug	Sep	Oct	Nov	Dec
1	0.386	0.327	0.325	0.326	0.314	0.340	0.295	0.305	0.289	0.338	0.309	0.343
2	0.379	0.346	0.322	0.328	0.316	0.326	0.291	0.322	0.304	0.346	0.297	0.334
3	0.387	0.344	0.329	0.326	0.336	0.316	0.305	0.300	0.309	0.355	0.311	0.325
4	0.378	0.329	0.339	0.309	0.340	0.308	0.298	0.281	0.301	0.364	0.303	0.332
5	0.341	0.326	0.330	0.304	0.367	0.285	0.281	0.278	0.303	0.378	0.308	0.342
6	0.339	0.317	0.344	0.268	0.360	0.236	0.317	0.267	0.310	0.364	0.316	0.372
7	0.348	0.316	0.343	0.283	0.350	0.190	0.303	0.228	0.296	0.364	0.337	0.362
8	0.343	0.318	0.325	0.282	0.341	0.117	0.275	0.187	0.289	0.367	0.349	0.355
9	0.363	0.314	0.325	0.281	0.343	0.094	0.229	0.190	0.334	0.384	0.353	0.347
10	0.366	0.312	0.345	0.284	0.352	0.093	0.215	0.191	0.317	0.379	0.350	0.346
11	0.362	0.322	0.332	0.271	0.374	0.102	0.205	0.199	0.290	0.361	0.359	0.337
12	0.361	0.330	0.320	0.298	0.354	0.133	0.203	0.205	0.295	0.371	0.339	0.335
13	0.354	0.310	0.319	0.308	0.335	0.199	0.195	0.183	0.261	0.372	0.336	0.344
14	0.374	0.299	0.328	0.306	0.321	0.170	0.166	0.179	0.256	0.362	0.335	0.349
15	0.374	0.289	0.355	0.287	0.314	0.204	0.222	0.186	0.266	0.364	0.346	0.365
16	0.345	0.306	0.364	0.293	0.316	0.215	0.251	0.182	0.270	0.355	0.348	0.365
17	0.342	0.290	0.354	0.303	0.307	0.214	0.224	0.211	0.256	0.362	0.338	0.336
18	0.369	0.288	0.330	0.284	0.315	0.237	0.241	0.202	0.269	0.348	0.346	0.326
19	0.364	0.298	0.337	0.267	0.290	0.228	0.239	0.209	0.311	0.335	0.316	0.315
20	0.363	0.307	0.316	0.257	0.297	0.253	0.267	0.264	0.323	0.327	0.286	0.320
21	0.399	0.323	0.305	0.263	0.312	0.258	0.280	0.282	0.344	0.335	0.305	0.339
22	0.400	0.339	0.294	0.291	0.300	0.294	0.285	0.290	0.332	0.320	0.319	0.346
23	0.401	0.333	0.306	0.306	0.322	0.328	0.306	0.289	0.334	0.326	0.310	0.341
24	0.405	0.334	0.331	0.333	0.314	0.333	0.307	0.303	0.289	0.331	0.317	0.340
	0.369	0.317	0.330	0.294	0.329	0.228	0.258	0.239	0.298	0.354	0.326	0.342

EXHIBIT 4

Standard Deviations of Hourly and Monthly Capacity Factors by Site

Onshore: Thompson Island

2005	Jan	Feb	Mar	Apr	May	Jun	Jly	Aug	Sep	Oct	Nov	Dec
1	0.384	0.270	0.263	0.242	0.314	0.170	0.237	0.076	0.244	0.393	0.304	0.301
2	0.398	0.295	0.260	0.277	0.325	0.184	0.216	0.083	0.202	0.373	0.280	0.287
3	0.395	0.325	0.290	0.295	0.368	0.199	0.222	0.098	0.205	0.360	0.291	0.269
4	0.389	0.341	0.295	0.299	0.372	0.183	0.219	0.097	0.182	0.367	0.323	0.314
5	0.375	0.326	0.287	0.314	0.377	0.184	0.219	0.097	0.197	0.374	0.328	0.325
6	0.381	0.333	0.303	0.311	0.381	0.179	0.234	0.094	0.217	0.370	0.290	0.336
7	0.366	0.288	0.309	0.313	0.381	0.184	0.263	0.085	0.217	0.352	0.307	0.345
8	0.370	0.289	0.313	0.330	0.362	0.199	0.257	0.132	0.207	0.371	0.328	0.330
9	0.367	0.297	0.327	0.333	0.372	0.209	0.254	0.148	0.272	0.368	0.329	0.340
10	0.389	0.274	0.320	0.312	0.380	0.224	0.250	0.155	0.318	0.359	0.338	0.355
11	0.408	0.318	0.327	0.297	0.365	0.203	0.237	0.187	0.282	0.355	0.346	0.359
12	0.379	0.319	0.311	0.309	0.364	0.169	0.251	0.221	0.275	0.346	0.349	0.359
13	0.381	0.332	0.349	0.313	0.356	0.187	0.252	0.227	0.252	0.345	0.350	0.366
14	0.392	0.369	0.346	0.336	0.356	0.242	0.269	0.243	0.268	0.333	0.358	0.358
15	0.407	0.357	0.341	0.323	0.341	0.272	0.233	0.251	0.264	0.350	0.366	0.365
16	0.388	0.354	0.335	0.342	0.343	0.290	0.244	0.224	0.258	0.333	0.347	0.372
17	0.392	0.349	0.328	0.339	0.346	0.273	0.246	0.228	0.261	0.357	0.367	0.370
18	0.370	0.349	0.323	0.315	0.355	0.247	0.240	0.236	0.247	0.349	0.354	0.343
19	0.379	0.323	0.286	0.317	0.363	0.205	0.238	0.238	0.205	0.358	0.342	0.333
20	0.382	0.331	0.289	0.297	0.358	0.193	0.227	0.206	0.187	0.345	0.359	0.324
21	0.380	0.329	0.322	0.282	0.364	0.217	0.211	0.192	0.234	0.347	0.344	0.316
22	0.392	0.314	0.303	0.259	0.364	0.257	0.237	0.178	0.219	0.362	0.356	0.270
23	0.387	0.306	0.306	0.272	0.342	0.227	0.258	0.145	0.228	0.361	0.326	0.308
24	0.382	0.253	0.292	0.253	0.333	0.196	0.226	0.148	0.231	0.371	0.302	0.292
	0.385	0.318	0.309	0.303	0.358	0.212	0.239	0.166	0.236	0.358	0.333	0.331

Offshore: Portland, ME

2005	Jan	Feb	Mar	Apr	May	Jun	Jly	Aug	Sep	Oct	Nov	Dec
1	0.419				0.357	0.233	0.128	0.110	0.302	0.406	0.348	0.355
2	0.397				0.381	0.246	0.106	0.098	0.317	0.423	0.356	0.359
3	0.410				0.399	0.224	0.084	0.136	0.340	0.411	0.326	0.342
4	0.410				0.426	0.233	0.101	0.138	0.303	0.412	0.342	0.363
5	0.395				0.448	0.242	0.140	0.131	0.323	0.384	0.349	0.366
6	0.369				0.449	0.203	0.178	0.104	0.319	0.395	0.366	0.392
7	0.371				0.441	0.209	0.191	0.125	0.235	0.389	0.378	0.400
8	0.405				0.435	0.198	0.199	0.105	0.244	0.397	0.342	0.399
9	0.378				0.418	0.230	0.195	0.075	0.240	0.418	0.360	0.400
10	0.359				0.418	0.233	0.203	0.088	0.204	0.402	0.357	0.400
11	0.371				0.407	0.256	0.129	0.146	0.252	0.407	0.339	0.373
12	0.360				0.391	0.269	0.149	0.139	0.266	0.393	0.321	0.366
13	0.345				0.406	0.248	0.161	0.128	0.237	0.388	0.329	0.390
14	0.351				0.386	0.256	0.175	0.143	0.273	0.404	0.320	0.417
15	0.372				0.367	0.252	0.160	0.151	0.252	0.387	0.338	0.413
16	0.396				0.382	0.250	0.162	0.146	0.246	0.386	0.338	0.421
17	0.419				0.369	0.243	0.153	0.190	0.236	0.414	0.362	0.419
18	0.412				0.332	0.272	0.184	0.191	0.248	0.409	0.361	0.433
19	0.416				0.317	0.294	0.204	0.209	0.264	0.402	0.354	0.441
20	0.410				0.312	0.310	0.185	0.218	0.292	0.402	0.347	0.430
21	0.422				0.303	0.313	0.189	0.224	0.289	0.402	0.362	0.430
22	0.412				0.355	0.290	0.190	0.208	0.241	0.377	0.354	0.415
23	0.407				0.371	0.263	0.158	0.197	0.239	0.375	0.356	0.418
24	0.417				0.349	0.252	0.124	0.202	0.260	0.381	0.344	0.381
	0.393				0.384	0.251	0.160	0.150	0.268	0.398	0.348	0.397

Offshore: Buzzard's Bay

2005	Jan	Feb	Mar	Apr	May	Jun	Jly	Aug	Sep	Oct	Nov	Dec
1	0.395	0.352	0.380	0.371	0.389	0.272	0.295	0.164	0.321	0.400	0.347	0.365
2	0.399	0.339	0.361	0.378	0.404	0.241	0.218	0.134	0.330	0.419	0.370	0.373
3	0.400	0.357	0.379	0.366	0.400	0.246	0.249	0.124	0.351	0.421	0.388	0.377
4	0.394	0.348	0.387	0.363	0.389	0.277	0.251	0.136	0.352	0.407	0.379	0.386
5	0.387	0.353	0.395	0.372	0.382	0.289	0.260	0.166	0.333	0.402	0.391	0.395
6	0.380	0.347	0.405	0.387	0.364	0.283	0.237	0.168	0.317	0.412	0.368	0.397
7	0.369	0.370	0.384	0.387	0.362	0.298	0.247	0.152	0.293	0.407	0.359	0.378
8	0.363	0.365	0.372	0.370	0.373	0.284	0.235	0.123	0.293	0.411	0.363	0.378
9	0.354	0.372	0.380	0.363	0.371	0.273	0.244	0.139	0.295	0.402	0.353	0.388
10	0.360	0.366	0.380	0.348	0.366	0.291	0.255	0.153	0.296	0.396	0.355	0.381
11	0.357	0.352	0.377	0.350	0.368	0.276	0.298	0.180	0.305	0.394	0.352	0.371
12	0.361	0.354	0.362	0.331	0.380	0.238	0.298	0.216	0.329	0.407	0.352	0.392
13	0.381	0.339	0.377	0.339	0.382	0.225	0.295	0.227	0.323	0.412	0.359	0.397
14	0.368	0.347	0.367	0.362	0.391	0.283	0.303	0.238	0.292	0.412	0.367	0.378
15	0.379	0.372	0.358	0.366	0.402	0.317	0.303	0.261	0.299	0.413	0.361	0.368
16	0.386	0.355	0.366	0.372	0.402	0.296	0.318	0.255	0.314	0.416	0.365	0.361
17	0.382	0.346	0.356	0.374	0.390	0.312	0.327	0.268	0.298	0.404	0.369	0.370
18	0.365	0.328	0.356	0.373	0.377	0.318	0.308	0.303	0.294	0.399	0.374	0.394
19	0.355	0.344	0.351	0.371	0.353	0.323	0.313	0.289	0.318	0.394	0.372	0.386
20	0.344	0.344	0.365	0.360	0.362	0.332	0.311	0.292	0.290	0.391	0.345	0.389
21	0.345	0.355	0.393	0.347	0.381	0.328	0.309	0.289	0.281	0.405	0.360	0.388
22	0.350	0.370	0.379	0.362	0.398	0.313	0.271	0.255	0.302	0.405	0.376	0.382
23	0.369	0.370	0.376	0.364	0.390	0.311	0.284	0.259	0.295	0.392	0.378	0.397
24	0.392	0.381	0.391	0.376	0.384	0.291	0.281	0.242	0.276	0.385	0.368	0.385
	0.372	0.355	0.375	0.365	0.382	0.288	0.280	0.210	0.308	0.404	0.366	0.382

EXHIBIT 4

Standard Deviations of Hourly and Monthly Capacity Factors by Site

Offshore: Isle of Shoals

2005	Jan	Feb	Mar	Apr	May	Jun	Jly	Aug	Sep	Oct	Nov	Dec
1	0.390	0.354	0.374	0.379	0.385	0.340	0.316	0.290	0.360	0.378	0.352	0.342
2	0.395	0.369	0.367	0.385	0.360	0.343	0.293	0.295	0.338	0.392	0.343	0.348
3	0.376	0.369	0.373	0.333	0.364	0.316	0.298	0.280	0.314	0.393	0.338	0.369
4	0.405	0.388	0.362	0.330	0.347	0.332	0.323	0.254	0.326	0.376	0.340	0.405
5	0.395	0.397	0.342	0.345	0.369	0.288	0.322	0.213	0.274	0.365	0.359	0.393
6	0.400	0.393	0.321	0.347	0.374	0.293	0.310	0.195	0.206	0.360	0.350	0.397
7	0.386	0.384	0.318	0.350	0.370	0.290	0.312	0.166	0.238	0.372	0.331	0.376
8	0.400	0.382	0.332	0.370	0.383	0.261	0.296	0.180	0.255	0.371	0.349	0.362
9	0.401	0.387	0.341	0.377	0.385	0.252	0.263	0.183	0.251	0.396	0.335	0.362
10	0.399	0.390	0.356	0.382	0.377	0.260	0.265	0.182	0.289	0.408	0.325	0.362
11	0.390	0.402	0.351	0.379	0.404	0.285	0.295	0.188	0.302	0.404	0.339	0.358
12	0.385	0.402	0.339	0.356	0.398	0.312	0.281	0.191	0.288	0.410	0.331	0.360
13	0.406	0.410	0.337	0.376	0.401	0.286	0.227	0.211	0.295	0.401	0.333	0.363
14	0.399	0.382	0.342	0.353	0.398	0.257	0.227	0.241	0.297	0.394	0.351	0.375
15	0.381	0.375	0.324	0.346	0.396	0.244	0.239	0.243	0.311	0.402	0.371	0.373
16	0.382	0.380	0.328	0.327	0.389	0.276	0.247	0.243	0.312	0.403	0.376	0.381
17	0.381	0.355	0.354	0.344	0.377	0.302	0.235	0.244	0.304	0.414	0.379	0.392
18	0.393	0.371	0.374	0.361	0.394	0.294	0.288	0.266	0.320	0.413	0.392	0.392
19	0.411	0.372	0.400	0.333	0.388	0.324	0.310	0.323	0.315	0.393	0.389	0.363
20	0.431	0.370	0.395	0.346	0.372	0.358	0.319	0.338	0.305	0.374	0.366	0.370
21	0.424	0.380	0.399	0.333	0.367	0.367	0.320	0.305	0.303	0.369	0.367	0.381
22	0.416	0.405	0.388	0.335	0.373	0.358	0.321	0.326	0.285	0.357	0.368	0.380
23	0.415	0.397	0.402	0.357	0.375	0.337	0.311	0.317	0.308	0.353	0.343	0.377
24	0.409	0.370	0.395	0.385	0.381	0.353	0.307	0.300	0.334	0.360	0.345	0.364
	0.399	0.383	0.359	0.355	0.380	0.305	0.289	0.249	0.297	0.386	0.353	0.373

Offshore: Bishop and Clerk's

2005	Jan	Feb	Mar	Apr	May	Jun	Jly	Aug	Sep	Oct	Nov	Dec
1	0.371	0.327	0.371	0.381	0.371	0.286	0.282	0.196	0.340			
2	0.362	0.332	0.380	0.387	0.360	0.336	0.295	0.185	0.335			
3	0.344	0.341	0.347	0.390	0.366	0.336	0.312	0.160	0.307			
4	0.353	0.354	0.364	0.383	0.367	0.270	0.302	0.176	0.283			
5	0.348	0.384	0.374	0.371	0.358	0.260	0.288	0.180	0.272			
6	0.360	0.363	0.373	0.385	0.375	0.279	0.302	0.215	0.259			
7	0.377	0.367	0.350	0.377	0.374	0.298	0.305	0.228	0.287			
8	0.380	0.357	0.363	0.393	0.390	0.326	0.315	0.258	0.278			
9	0.394	0.345	0.365	0.398	0.385	0.347	0.300	0.252	0.266			
10	0.395	0.364	0.368	0.378	0.379	0.343	0.290	0.241	0.282			
11	0.377	0.343	0.368	0.351	0.390	0.311	0.303	0.241	0.260			
12	0.378	0.355	0.379	0.344	0.393	0.254	0.305	0.253	0.248			
13	0.369	0.342	0.379	0.364	0.399	0.248	0.329	0.263	0.253			
14	0.365	0.373	0.374	0.356	0.408	0.259	0.331	0.264	0.245			
15	0.335	0.344	0.391	0.351	0.403	0.270	0.332	0.281	0.261			
16	0.347	0.343	0.388	0.358	0.409	0.287	0.327	0.279	0.250			
17	0.330	0.333	0.417	0.346	0.399	0.299	0.316	0.242	0.213			
18	0.347	0.374	0.419	0.358	0.404	0.273	0.313	0.257	0.246			
19	0.378	0.358	0.395	0.317	0.391	0.270	0.335	0.272	0.253			
20	0.394	0.349	0.374	0.334	0.395	0.269	0.318	0.227	0.229			
21	0.404	0.353	0.381	0.355	0.399	0.293	0.300	0.235	0.268			
22	0.392	0.347	0.381	0.357	0.389	0.313	0.278	0.234	0.271			
23	0.397	0.310	0.380	0.376	0.391	0.282	0.292	0.222	0.277			
24	0.381	0.311	0.377	0.382	0.375	0.292	0.278	0.241	0.314			
	0.370	0.349	0.378	0.366	0.386	0.292	0.306	0.233	0.271			

EXHIBIT 5

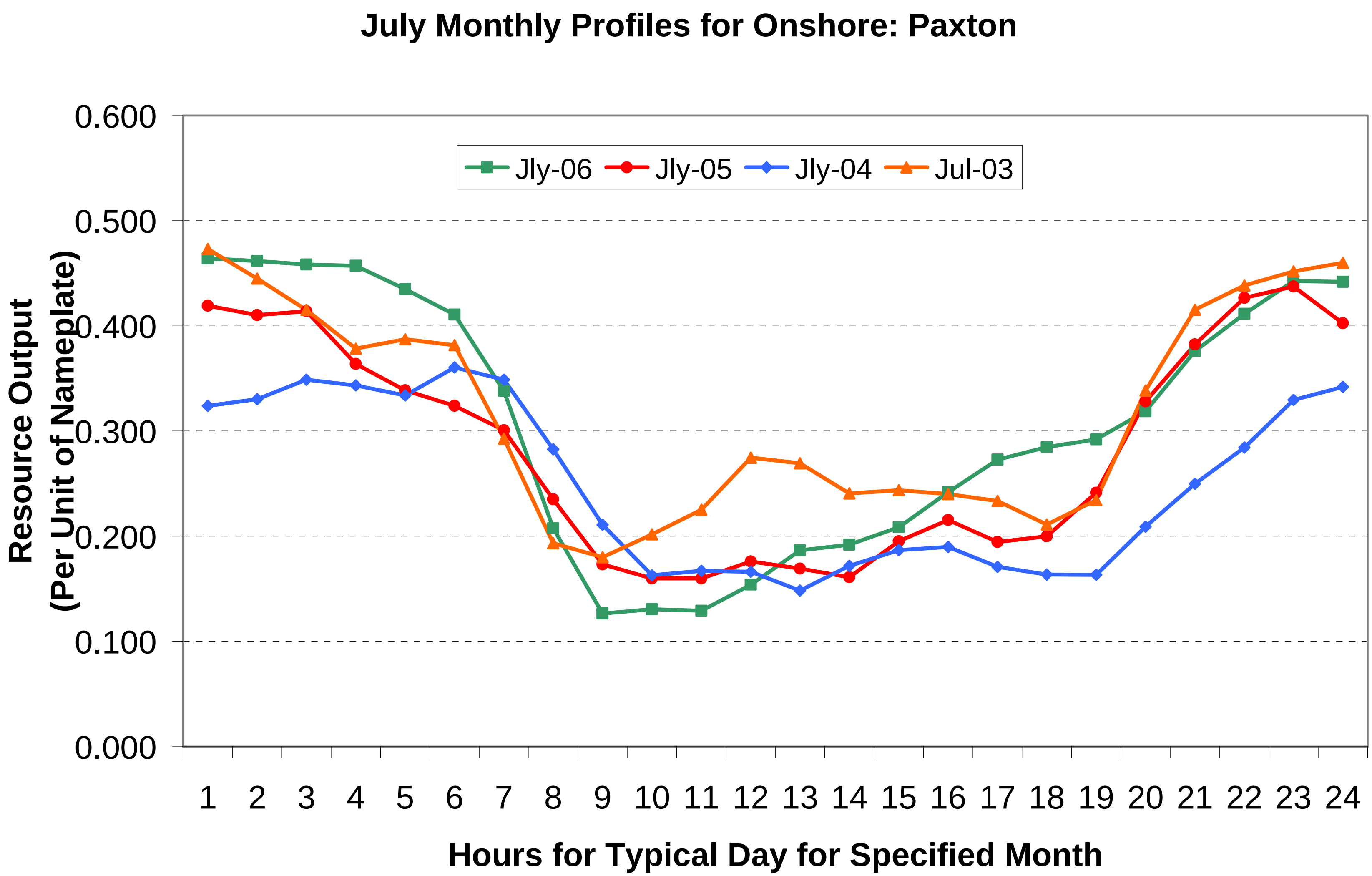
Combined Capacity Factors and Standard Deviations for New England

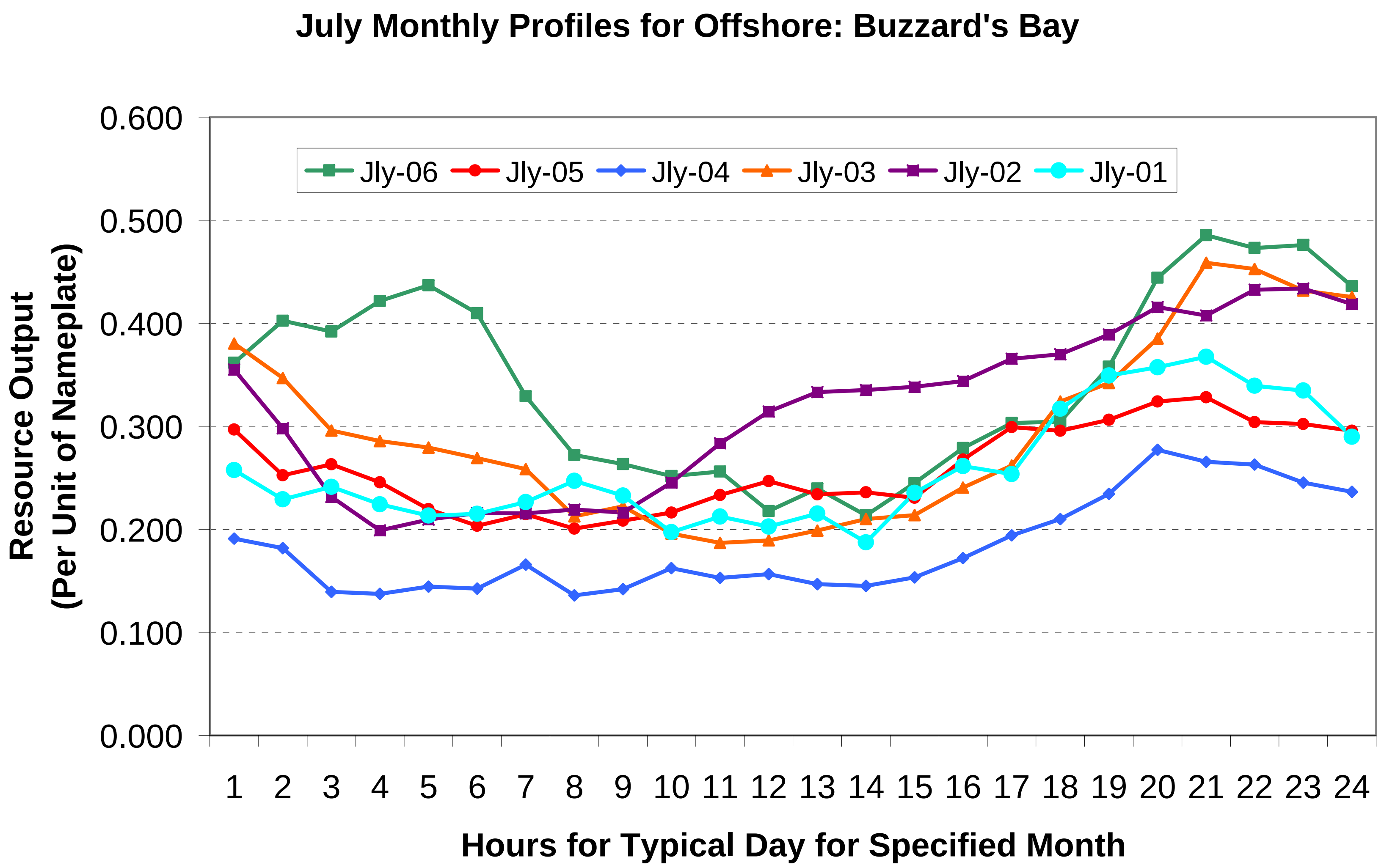
Combined Capacity Factors

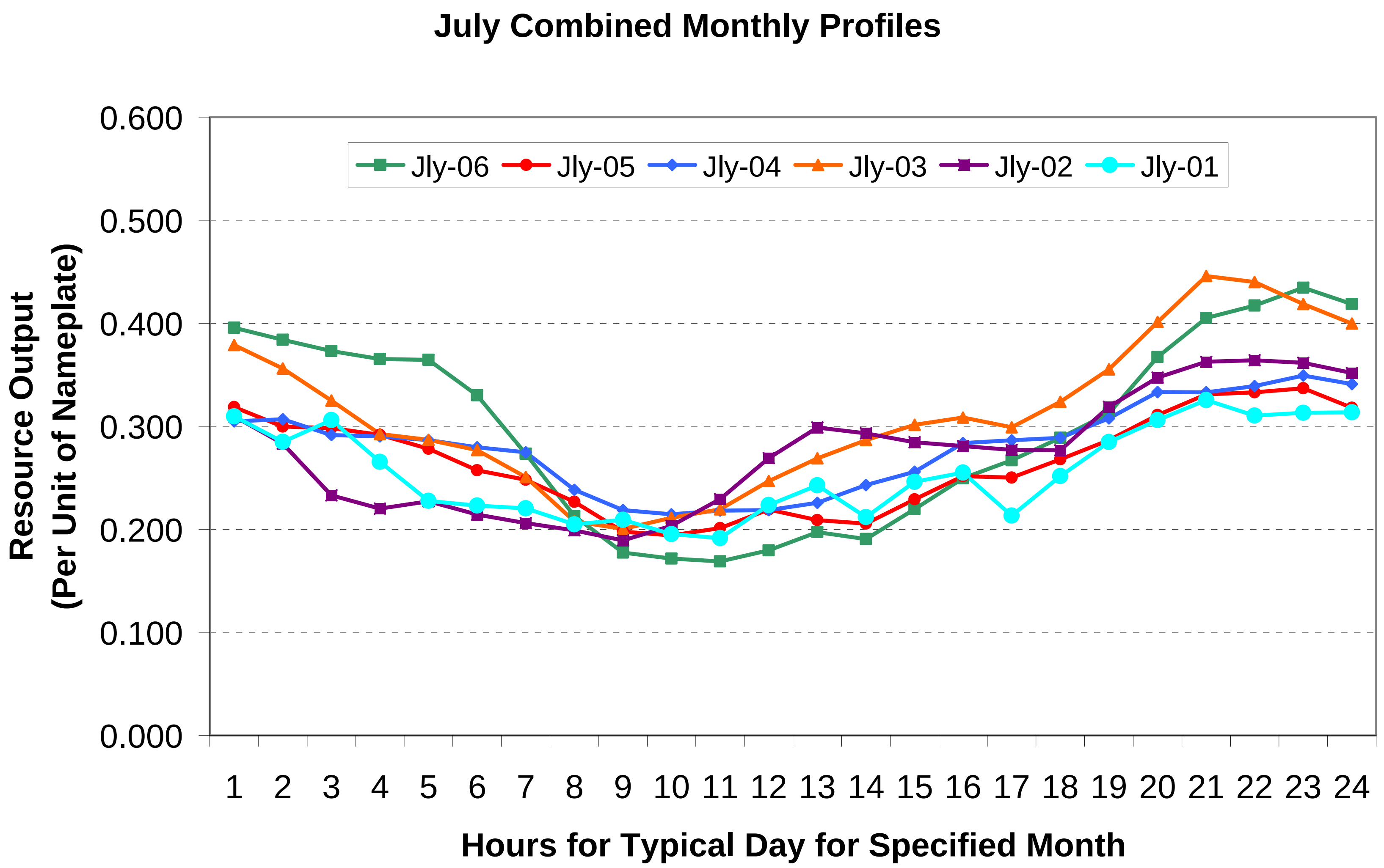
2005	Jan	Feb	Mar	Apr	May	Jun	Jly	Aug	Sep	Oct	Nov	Dec
1	0.500	0.375	0.471	0.342	0.313	0.280	0.262	0.197	0.312	0.485	0.477	0.489
2	0.499	0.382	0.456	0.368	0.300	0.270	0.243	0.193	0.308	0.496	0.472	0.493
3	0.491	0.387	0.447	0.371	0.289	0.250	0.241	0.186	0.297	0.478	0.455	0.511
4	0.495	0.387	0.442	0.351	0.304	0.237	0.235	0.176	0.285	0.467	0.456	0.527
5	0.494	0.411	0.443	0.355	0.304	0.218	0.228	0.164	0.271	0.457	0.443	0.523
6	0.488	0.417	0.441	0.361	0.294	0.194	0.216	0.157	0.251	0.470	0.454	0.504
7	0.477	0.410	0.431	0.356	0.284	0.180	0.210	0.149	0.249	0.460	0.455	0.501
8	0.483	0.428	0.414	0.357	0.276	0.162	0.194	0.135	0.227	0.458	0.439	0.495
9	0.474	0.408	0.377	0.363	0.283	0.159	0.173	0.126	0.221	0.445	0.427	0.481
10	0.452	0.394	0.381	0.352	0.292	0.163	0.173	0.123	0.214	0.433	0.425	0.442
11	0.453	0.393	0.382	0.345	0.295	0.161	0.181	0.136	0.207	0.421	0.431	0.428
12	0.454	0.403	0.389	0.357	0.303	0.163	0.200	0.150	0.214	0.432	0.441	0.443
13	0.446	0.380	0.408	0.369	0.306	0.173	0.201	0.170	0.224	0.429	0.461	0.451
14	0.449	0.375	0.416	0.373	0.316	0.190	0.206	0.174	0.233	0.435	0.475	0.445
15	0.450	0.379	0.422	0.378	0.327	0.207	0.221	0.184	0.229	0.430	0.484	0.438
16	0.439	0.395	0.395	0.398	0.340	0.224	0.234	0.186	0.228	0.412	0.473	0.427
17	0.432	0.391	0.423	0.403	0.332	0.250	0.237	0.189	0.235	0.420	0.475	0.414
18	0.436	0.387	0.431	0.400	0.354	0.268	0.245	0.195	0.257	0.438	0.489	0.431
19	0.438	0.384	0.435	0.376	0.362	0.284	0.256	0.215	0.278	0.466	0.501	0.431
20	0.436	0.394	0.434	0.390	0.359	0.311	0.270	0.234	0.291	0.476	0.507	0.453
21	0.446	0.402	0.442	0.395	0.362	0.322	0.281	0.249	0.317	0.488	0.507	0.471
22	0.462	0.409	0.450	0.386	0.352	0.316	0.278	0.258	0.307	0.496	0.495	0.469
23	0.475	0.418	0.453	0.378	0.343	0.302	0.279	0.255	0.301	0.496	0.501	0.478
24	0.479	0.404	0.447	0.358	0.317	0.291	0.256	0.235	0.290	0.492	0.483	0.480
	0.464	0.396	0.426	0.370	0.317	0.232	0.230	0.185	0.260	0.458	0.468	0.468

Standard Deviation of Combined Capacity Factors

2005	Jan	Feb	Mar	Apr	May	Jun	Jly	Aug	Sep	Oct	Nov	Dec
1	0.298	0.238	0.273	0.213	0.262	0.159	0.163	0.102	0.239	0.314	0.239	0.259
2	0.308	0.244	0.271	0.230	0.256	0.157	0.152	0.106	0.242	0.330	0.245	0.244
3	0.308	0.253	0.282	0.232	0.265	0.153	0.167	0.105	0.237	0.330	0.256	0.245
4	0.316	0.266	0.291	0.232	0.278	0.154	0.177	0.106	0.231	0.328	0.259	0.254
5	0.311	0.258	0.279	0.242	0.289	0.151	0.179	0.094	0.230	0.318	0.266	0.260
6	0.312	0.251	0.285	0.242	0.291	0.147	0.177	0.095	0.213	0.323	0.267	0.266
7	0.292	0.248	0.285	0.245	0.292	0.154	0.181	0.098	0.206	0.320	0.269	0.258
8	0.286	0.250	0.289	0.259	0.308	0.138	0.177	0.112	0.206	0.331	0.272	0.251
9	0.290	0.252	0.283	0.261	0.314	0.137	0.177	0.126	0.215	0.340	0.276	0.251
10	0.289	0.258	0.296	0.256	0.308	0.135	0.169	0.131	0.226	0.331	0.271	0.258
11	0.289	0.264	0.284	0.252	0.312	0.140	0.163	0.141	0.223	0.326	0.276	0.272
12	0.286	0.272	0.287	0.250	0.312	0.133	0.170	0.154	0.228	0.327	0.261	0.285
13	0.291	0.261	0.284	0.242	0.309	0.134	0.173	0.165	0.219	0.319	0.244	0.294
14	0.287	0.255	0.284	0.237	0.296	0.150	0.174	0.169	0.219	0.319	0.251	0.302
15	0.281	0.256	0.283	0.229	0.291	0.157	0.174	0.178	0.217	0.328	0.267	0.310
16	0.270	0.261	0.273	0.233	0.293	0.171	0.174	0.172	0.242	0.323	0.271	0.326
17	0.266	0.258	0.286	0.235	0.285	0.183	0.169	0.179	0.230	0.327	0.283	0.326
18	0.260	0.260	0.281	0.230	0.277	0.166	0.178	0.182	0.220	0.306	0.279	0.310
19	0.264	0.259	0.277	0.215	0.270	0.159	0.166	0.185	0.230	0.290	0.265	0.296
20	0.268	0.264	0.268	0.204	0.256	0.162	0.152	0.173	0.223	0.276	0.258	0.293
21	0.271	0.266	0.277	0.192	0.252	0.168	0.154	0.182	0.227	0.279	0.260	0.289
22	0.269	0.276	0.277	0.190	0.250	0.169	0.143	0.169	0.212	0.274	0.256	0.270
23	0.287	0.258	0.275	0.197	0.255	0.167	0.163	0.149	0.212	0.285	0.231	0.270
24	0.298	0.248	0.267	0.206	0.270	0.156	0.167	0.149	0.216	0.293	0.230	0.261
	0.288	0.257	0.281	0.231	0.284	0.164	0.171	0.151	0.226	0.315	0.261	0.279


July Monthly Profiles for Onshore: Paxton
Jly-06
Jly-05
Jly-04
Jul-03
Resource Output
(Per Unit of Nameplate)
0.600
0.500
0.400
0.300
0.200
0.100
0.000
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Hours for Typical Day for Specified Month


July Monthly Profiles for Offshore: Buzzard's Bay
Jly-06
Jly-05
Jly-04
Jly-03
Jly-02
Jly-01
0.600
0.500
0.400
0.300
0.200
0.100
0.000
Resource Output
(Per Unit of Nameplate)
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Hours for Typical Day for Specified Month


July Combined Monthly Profiles
Jly-06
Jly-05
Jly-04
Jly-03
Jly-02
Jly-01
0.600
0.500
0.400
0.300
0.200
0.100
0.000
Resource Output
(Per Unit of Nameplate)
1
2
3
4
5
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18
19
20
21
22
23
24
Hours for Typical Day for Specified Month

Effective capacities are based on two onshore sites (Mt. Tom and Paxton) and three offshore sites (Bishop and Clerks, Buzzard's Bay and Isle of Shoals) unless otherwise noted

Date	Load	Effective Capacity[1]	Date	Load	Effective Capacity[2]	Date	Load	Effective Capacity
8/9/2001	25072	0.485	8/14/2002	25422	0.178	8/22/2003	24685	0.555
8/8/2001	24532	0.091	8/13/2002	24943	0.047	6/27/2003	24494	0.300
8/7/2001	24505	0.471	7/3/2002	24890	0.377	6/26/2003	24352	0.039
8/10/2001	24244	0.956	8/15/2002	24683	0.323	7/8/2003	23981	0.180
7/25/2001	24075	0.719	7/23/2002	24660	0.705	8/21/2003	23704	0.165
7/24/2001	23610	0.887	8/16/2002	24611	0.254	8/14/2003	23429	0.123
8/6/2001	23237	0.240	7/30/2002	24364	0.466	8/11/2003	23099	0.277
6/27/2001	22431	0.386	7/2/2002	24008	0.431	8/20/2003	23020	0.168
6/20/2001	22271	0.528	8/1/2002	23844	0.049	8/13/2003	22976	0.239
8/2/2001	22263	0.194	8/12/2002	23819	0.068	8/12/2003	22858	0.103

Date	Load	Effective Capacity[3]	Date	Load	Effective Capacity	Date	Load	Effective Capacity[4]
8/30/2004	24116	0.204	7/27/2005	26885	0.685	8/2/2006	28130	0.335
8/3/2004	23690	0.169	7/19/2005	26736	0.204	8/1/2006	27469	0.236
8/20/2004	23209	0.367	8/5/2005	25983	0.525	7/18/2006	27332	0.312
7/22/2004	23147	0.081	7/26/2005	25555	0.309	8/3/2006	27122	0.496
8/2/2004	23097	0.016	8/11/2005	25282	0.203	7/17/2006	26727	0.126
6/9/2004	22940	0.466	6/13/2005	25231	0.158	7/28/2006	25348	0.621
1/15/2004	22818	0.807	7/20/2005	24983	0.106	7/27/2006	25327	0.526
12/20/2004	22631	0.975	7/22/2005	24912	0.114	7/26/2006	24329	0.181
7/21/2004	22547	0.015	8/10/2005	24738	0.166	6/19/2006	24046	0.423
1/14/2004	22477	0.384	8/3/2005	24716	0.103	7/14/2006	23942	0.115

1 Only data for the offshore sites, Buzzard's Bay and Isle of Shoals, were used for 2001
2 Only data for the offshore sites, Buzzard's Bay and Isle of Shoals, and Mt. Tom were used for 2002
3 The Mt. Tom data was incomplete for the summer of 2004
4 There was no data for Bishop and Clerks and data for only one day for Buzzard's Bay for 2006

Hourly and Monthly Capacity Factors for Onshore: Mt. Tom

2002	Jan	Feb	Mar	Apr	May	Jun	Jly	Aug	Sep	Oct	Nov	Dec	Average
1	0.489	0.449	0.359	0.389	0.335	0.258	0.274	0.234	0.186			0.248	0.322
2	0.491	0.423	0.369	0.408	0.313	0.245	0.245	0.196	0.155			0.331	0.317
3	0.411	0.375	0.358	0.366	0.285	0.227	0.207	0.185	0.192			0.217	0.282
4	0.420	0.333	0.393	0.419	0.288	0.203	0.239	0.201	0.227			0.357	0.308
5	0.459	0.346	0.375	0.388	0.240	0.164	0.230	0.208	0.227			0.390	0.303
6	0.439	0.399	0.339	0.347	0.248	0.123	0.178	0.204	0.227			0.191	0.269
7	0.417	0.425	0.369	0.293	0.244	0.120	0.163	0.177	0.178			0.174	0.256
8	0.465	0.441	0.368	0.254	0.257	0.115	0.170	0.130	0.137			0.205	0.254
9	0.409	0.389	0.316	0.202	0.267	0.136	0.151	0.092	0.194			0.344	0.250
10	0.397	0.372	0.297	0.231	0.252	0.138	0.167	0.060	0.132			0.327	0.237
11	0.420	0.373	0.331	0.274	0.281	0.146	0.193	0.065	0.114			0.271	0.247
12	0.449	0.389	0.327	0.301	0.344	0.165	0.256	0.087	0.131			0.153	0.260
13	0.442	0.390	0.317	0.338	0.409	0.210	0.297	0.097	0.170			0.348	0.302
14	0.452	0.436	0.333	0.361	0.400	0.234	0.336	0.134	0.226			0.345	0.326
15	0.477	0.410	0.393	0.413	0.407	0.252	0.342	0.139	0.238			0.387	0.346
16	0.432	0.386	0.412	0.359	0.437	0.252	0.306	0.133	0.240			0.368	0.332
17	0.381	0.345	0.363	0.347	0.429	0.268	0.281	0.164	0.234			0.342	0.315
18	0.406	0.457	0.393	0.313	0.375	0.291	0.229	0.137	0.268			0.337	0.321
19	0.409	0.440	0.442	0.372	0.404	0.310	0.308	0.189	0.318			0.331	0.352
20	0.417	0.412	0.446	0.375	0.432	0.312	0.339	0.248	0.287			0.316	0.358
21	0.431	0.439	0.444	0.429	0.454	0.276	0.336	0.312	0.273			0.386	0.378
22	0.467	0.465	0.372	0.425	0.453	0.277	0.334	0.276	0.248			0.389	0.370
23	0.448	0.491	0.371	0.395	0.418	0.238	0.301	0.255	0.231			0.367	0.352
24	0.464	0.485	0.357	0.387	0.375	0.233	0.291	0.258	0.209			0.215	0.327
	0.437	0.411	0.368	0.349	0.348	0.216	0.257	0.174	0.210			0.306	0.308
											Average	0.2352	

Hourly and Monthly Capacity Factors for Onshore: Mt. Tom

2003	Jan	Feb	Mar	Apr	May	Jun	Jly	Aug	Sep	Oct	Nov	Dec	Average
1	0.363	0.358	0.435	0.358	0.208	0.214	0.239	0.208	0.257	0.350	0.031	0.430	0.287
2	0.405	0.366	0.401	0.335	0.198	0.203	0.214	0.154	0.265	0.353	0.059	0.394	0.279
3	0.400	0.355	0.363	0.327	0.204	0.207	0.193	0.134	0.249	0.329	0.023	0.355	0.262
4	0.381	0.375	0.329	0.302	0.198	0.197	0.144	0.167	0.251	0.363	0.020	0.363	0.257
5	0.373	0.364	0.324	0.259	0.212	0.208	0.139	0.186	0.259	0.345	0.012	0.329	0.251
6	0.372	0.402	0.329	0.212	0.195	0.206	0.142	0.215	0.291	0.361	0.016	0.302	0.254
7	0.398	0.456	0.302	0.170	0.172	0.191	0.155	0.170	0.338	0.324	0.015	0.289	0.248
8	0.406	0.481	0.271	0.182	0.120	0.116	0.126	0.127	0.237	0.324	0.005	0.279	0.223
9	0.387	0.460	0.297	0.169	0.108	0.097	0.119	0.095	0.203	0.329	0.012	0.301	0.215
10	0.347	0.407	0.262	0.152	0.079	0.081	0.161	0.098	0.134	0.278	0.026	0.317	0.195
11	0.367	0.391	0.289	0.210	0.125	0.116	0.162	0.098	0.135	0.302	0.016	0.304	0.210
12	0.363	0.342	0.300	0.204	0.146	0.121	0.217	0.146	0.115	0.301	0.004	0.265	0.210
13	0.374	0.336	0.322	0.248	0.168	0.140	0.210	0.177	0.108	0.338	0.004	0.258	0.223
14	0.383	0.364	0.325	0.271	0.180	0.163	0.251	0.215	0.086	0.400	0.012	0.292	0.245
15	0.361	0.346	0.349	0.301	0.174	0.163	0.247	0.213	0.108	0.422	0.007	0.313	0.250
16	0.362	0.381	0.401	0.358	0.180	0.172	0.228	0.211	0.128	0.410	0.011	0.325	0.264
17	0.375	0.389	0.426	0.371	0.189	0.231	0.217	0.231	0.180	0.430	0.024	0.369	0.286
18	0.346	0.396	0.447	0.389	0.214	0.260	0.245	0.265	0.197	0.430	0.036	0.418	0.304
19	0.367	0.442	0.419	0.407	0.235	0.271	0.253	0.287	0.252	0.434	0.042	0.434	0.320
20	0.350	0.429	0.410	0.468	0.269	0.335	0.289	0.284	0.282	0.423	0.058	0.431	0.336
21	0.358	0.447	0.442	0.450	0.248	0.393	0.319	0.322	0.275	0.406	0.035	0.456	0.346
22	0.390	0.452	0.457	0.400	0.264	0.408	0.314	0.324	0.198	0.375	0.033	0.453	0.339
23	0.403	0.428	0.445	0.355	0.214	0.321	0.300	0.290	0.189	0.388	0.046	0.436	0.318
24	0.408	0.403	0.440	0.340	0.172	0.258	0.259	0.277	0.213	0.370	0.033	0.422	0.300
	0.377	0.399	0.366	0.302	0.186	0.211	0.214	0.204	0.206	0.366	0.024	0.356	0.268
											Average	0.2005	

Hourly and Monthly Capacity Factors for Onshore: Mt. Tom

2004	Jan	Feb	Mar	Apr	May	Jun	Jly	Aug	Sep	Oct	Nov	Dec	Average
1	0.456	0.401	0.381	0.380	0.263	0.319	0.000	0.237	0.264	0.293	0.401	0.523	0.327
2	0.486	0.413	0.394	0.431	0.264	0.265	0.000	0.201	0.205	0.277	0.406	0.483	0.319
3	0.496	0.486	0.392	0.406	0.239	0.265	0.000	0.138	0.202	0.294	0.391	0.487	0.316
4	0.496	0.500	0.370	0.419	0.211	0.246	0.000	0.142	0.187	0.306	0.453	0.410	0.312
5	0.438	0.452	0.367	0.417	0.212	0.230	0.000	0.176	0.179	0.311	0.426	0.384	0.299
6	0.403	0.424	0.344	0.403	0.201	0.238	0.000	0.145	0.190	0.322	0.409	0.400	0.290
7	0.446	0.410	0.307	0.360	0.153	0.188	0.000	0.134	0.177	0.297	0.437	0.382	0.274
8	0.463	0.389	0.283	0.328	0.149	0.137	0.000	0.141	0.147	0.276	0.424	0.368	0.259
9	0.533	0.398	0.291	0.288	0.157	0.105	0.000	0.107	0.133	0.222	0.390	0.409	0.253
10	0.471	0.373	0.300	0.261	0.173	0.150	0.000	0.057	0.161	0.169	0.388	0.386	0.241
11	0.427	0.404	0.313	0.290	0.192	0.187	0.000	0.068	0.154	0.172	0.326	0.387	0.243
12	0.446	0.412	0.310	0.309	0.229	0.208	0.007	0.105	0.148	0.163	0.310	0.375	0.252
13	0.471	0.387	0.322	0.306	0.226	0.226	0.350	0.111	0.142	0.151	0.333	0.401	0.285
14	0.481	0.392	0.316	0.375	0.237	0.266	0.331	0.126	0.151	0.201	0.334	0.437	0.304
15	0.468	0.407	0.367	0.419	0.262	0.292	0.241	0.171	0.169	0.220	0.370	0.437	0.319
16	0.508	0.423	0.414	0.445	0.313	0.294	0.000	0.205	0.208	0.247	0.348	0.423	0.319
17	0.556	0.448	0.461	0.486	0.339	0.287	0.000	0.176	0.203	0.267	0.401	0.457	0.340
18	0.561	0.483	0.472	0.505	0.379	0.299	0.000	0.186	0.244	0.317	0.360	0.495	0.358
19	0.573	0.457	0.496	0.549	0.372	0.317	0.000	0.275	0.293	0.349	0.409	0.502	0.383
20	0.578	0.405	0.460	0.471	0.402	0.339	0.000	0.291	0.304	0.358	0.387	0.488	0.374
21	0.555	0.431	0.430	0.423	0.367	0.328	0.000	0.307	0.353	0.307	0.393	0.436	0.361
22	0.501	0.434	0.397	0.418	0.382	0.328	0.000	0.345	0.334	0.302	0.423	0.507	0.364
23	0.501	0.417	0.422	0.408	0.340	0.333	0.000	0.267	0.266	0.293	0.391	0.533	0.348
24	0.479	0.397	0.355	0.384	0.297	0.341	0.000	0.241	0.277	0.302	0.383	0.545	0.334
	0.491	0.423	0.374	0.395	0.265	0.258	0.039	0.181	0.212	0.267	0.387	0.444	0.311
											Average	0.1925	

Hourly and Monthly Capacity Factors for Onshore: Mt. Tom

2006	Jan	Feb	Mar	Apr	May	Jun	Jly	Aug	Sep	Oct	Nov	Dec	Average
1	0.613	0.516	0.480	0.413	0.311	0.250	0.232	0.281	0.259	0.340	0.313	0.656	0.389
2	0.590	0.476	0.455	0.393	0.241	0.234	0.226	0.294	0.306	0.348	0.303	0.656	0.377
3	0.477	0.448	0.460	0.350	0.278	0.223	0.226	0.303	0.308	0.360	0.328	0.526	0.357
4	0.509	0.419	0.411	0.330	0.278	0.213	0.204	0.268	0.324	0.374	0.250	0.481	0.338
5	0.508	0.451	0.323	0.379	0.301	0.200	0.197	0.289	0.308	0.312	0.230	0.448	0.329
6	0.470	0.409	0.355	0.339	0.286	0.211	0.164	0.237	0.292	0.291	0.185	0.476	0.310
7	0.514	0.409	0.353	0.298	0.220	0.209	0.141	0.173	0.271	0.315	0.268	0.494	0.305
8	0.481	0.476	0.341	0.288	0.185	0.196	0.107	0.143	0.230	0.294	0.269	0.476	0.291
9	0.479	0.492	0.305	0.226	0.176	0.208	0.072	0.135	0.219	0.262	0.218	0.509	0.275
10	0.475	0.485	0.359	0.169	0.216	0.200	0.062	0.163	0.216	0.254	0.178	0.497	0.273
11	0.404	0.511	0.406	0.217	0.201	0.226	0.072	0.185	0.219	0.295	0.171	0.444	0.279
12	0.447	0.516	0.448	0.253	0.221	0.239	0.125	0.199	0.257	0.297	0.199	0.480	0.307
13	0.461	0.550	0.475	0.313	0.216	0.222	0.169	0.216	0.280	0.334	0.202	0.505	0.329
14	0.456	0.610	0.488	0.359	0.264	0.233	0.213	0.221	0.302	0.342	0.219	0.573	0.357
15	0.449	0.630	0.475	0.425	0.286	0.234	0.257	0.179	0.308	0.390	0.262	0.711	0.384
16	0.469	0.559	0.508	0.448	0.293	0.250	0.307	0.184	0.295	0.418	0.285	0.750	0.397
17	0.521	0.537	0.542	0.415	0.357	0.266	0.270	0.174	0.272	0.439	0.320	0.738	0.404
18	0.576	0.561	0.526	0.433	0.353	0.243	0.278	0.147	0.280	0.476	0.312	0.712	0.408
19	0.600	0.553	0.525	0.428	0.381	0.298	0.282	0.201	0.309	0.459	0.346	0.661	0.420
20	0.706	0.602	0.514	0.449	0.391	0.279	0.320	0.263	0.314	0.473	0.349	0.722	0.448
21	0.687	0.609	0.510	0.443	0.394	0.286	0.329	0.314	0.310	0.459	0.345	0.686	0.448
22	0.631	0.657	0.487	0.434	0.367	0.310	0.320	0.335	0.309	0.437	0.313	0.678	0.440
23	0.609	0.628	0.464	0.385	0.320	0.247	0.318	0.331	0.278	0.445	0.344	0.610	0.415
24	0.592	0.593	0.461	0.396	0.296	0.248	0.266	0.317	0.256	0.404	0.348	0.598	0.398
	0.530	0.529	0.445	0.358	0.285	0.239	0.215	0.231	0.280	0.367	0.273	0.587	0.362
											Average	0.2457	

Hourly and Monthly Capacity Factors for Onshore: Paxton

2003	Jan	Feb	Mar	Apr	May	Jun	Jly	Aug	Sep	Oct	Nov	Dec	Average
1						0.703	0.473	0.409	0.406	0.536	0.598	0.657	0.540
2						0.674	0.445	0.378	0.391	0.526	0.581	0.655	0.521
3						0.662	0.415	0.370	0.378	0.529	0.585	0.665	0.515
4						0.718	0.379	0.359	0.403	0.520	0.513	0.670	0.509
5						0.654	0.387	0.339	0.413	0.517	0.534	0.684	0.504
6						0.574	0.382	0.346	0.403	0.510	0.521	0.660	0.485
7						0.412	0.293	0.348	0.368	0.531	0.511	0.631	0.442
8						0.203	0.194	0.242	0.311	0.468	0.521	0.629	0.367
9						0.079	0.180	0.185	0.212	0.356	0.489	0.615	0.302
10						0.052	0.202	0.164	0.172	0.338	0.466	0.573	0.281
11						0.054	0.225	0.145	0.174	0.394	0.409	0.529	0.276
12						0.065	0.275	0.153	0.157	0.394	0.382	0.526	0.279
13						0.083	0.269	0.184	0.163	0.394	0.399	0.520	0.288
14						0.0831	0.2407	0.2211	0.1608	0.395	0.407	0.494	0.286
15						0.1207	0.2439	0.2372	0.1580	0.399	0.393	0.456	0.287
16						0.1487	0.2400	0.2186	0.1718	0.377	0.381	0.449	0.284
17						0.1157	0.2335	0.2085	0.1599	0.323	0.388	0.536	0.281
18						0.1137	0.2112	0.2159	0.1948	0.403	0.453	0.610	0.314
19						0.285	0.235	0.286	0.247	0.501	0.482	0.651	0.384
20						0.348	0.339	0.379	0.304	0.548	0.563	0.680	0.452
21						0.490	0.416	0.392	0.380	0.553	0.561	0.699	0.499
22						0.559	0.438	0.400	0.360	0.543	0.583	0.692	0.511
23						0.613	0.452	0.412	0.351	0.549	0.584	0.694	0.522
24						0.587	0.460	0.425	0.364	0.549	0.595	0.659	0.520
						0.350	0.318	0.292	0.283	0.465	0.496	0.610	0.402
											Average	0.1849	

Hourly and Monthly Capacity Factors for Onshore: Paxton

2004	Jan	Feb	Mar	Apr	May	Jun	Jly	Aug	Sep	Oct	Nov	Dec	Average
1	0.517	0.590	0.506	0.524	0.487	0.518	0.324	0.419	0.460	0.465	0.560	0.604	0.498
2	0.562	0.628	0.523	0.538	0.489	0.533	0.330	0.444	0.453	0.468	0.570	0.608	0.512
3	0.590	0.631	0.535	0.528	0.477	0.526	0.349	0.427	0.468	0.454	0.582	0.594	0.513
4	0.585	0.630	0.523	0.571	0.482	0.514	0.344	0.421	0.480	0.500	0.579	0.582	0.518
5	0.541	0.631	0.555	0.568	0.476	0.475	0.334	0.386	0.431	0.488	0.547	0.576	0.501
6	0.544	0.615	0.509	0.586	0.474	0.429	0.361	0.395	0.399	0.493	0.511	0.586	0.492
7	0.528	0.625	0.488	0.526	0.442	0.391	0.349	0.381	0.354	0.492	0.500	0.584	0.472
8	0.535	0.604	0.438	0.468	0.376	0.314	0.283	0.304	0.274	0.464	0.482	0.600	0.429
9	0.526	0.519	0.374	0.431	0.319	0.247	0.211	0.216	0.197	0.367	0.447	0.570	0.369
10	0.497	0.454	0.357	0.411	0.251	0.252	0.163	0.154	0.178	0.315	0.417	0.534	0.332
11	0.460	0.430	0.367	0.384	0.252	0.237	0.167	0.130	0.177	0.266	0.402	0.521	0.316
12	0.485	0.447	0.396	0.380	0.288	0.216	0.166	0.141	0.180	0.267	0.386	0.496	0.321
13	0.492	0.419	0.384	0.371	0.298	0.229	0.148	0.166	0.189	0.283	0.393	0.472	0.320
14	0.530	0.397	0.370	0.372	0.291	0.239	0.172	0.201	0.181	0.271	0.388	0.457	0.322
15	0.512	0.427	0.377	0.383	0.309	0.261	0.187	0.213	0.199	0.285	0.384	0.466	0.334
16	0.492	0.430	0.385	0.386	0.303	0.277	0.190	0.215	0.199	0.301	0.354	0.479	0.334
17	0.485	0.431	0.378	0.393	0.331	0.304	0.171	0.210	0.210	0.304	0.372	0.488	0.340
18	0.510	0.427	0.377	0.415	0.314	0.307	0.164	0.216	0.232	0.360	0.444	0.505	0.356
19	0.539	0.477	0.381	0.432	0.289	0.274	0.163	0.208	0.310	0.457	0.511	0.550	0.383
20	0.536	0.507	0.389	0.430	0.260	0.274	0.209	0.257	0.381	0.509	0.512	0.553	0.401
21	0.564	0.577	0.466	0.432	0.293	0.336	0.250	0.344	0.459	0.503	0.536	0.532	0.441
22	0.560	0.572	0.509	0.428	0.398	0.448	0.284	0.377	0.454	0.525	0.548	0.574	0.473
23	0.536	0.583	0.537	0.439	0.416	0.474	0.330	0.392	0.463	0.499	0.541	0.615	0.485
24	0.546	0.583	0.523	0.500	0.446	0.493	0.342	0.406	0.489	0.490	0.515	0.598	0.494
	0.528	0.526	0.444	0.454	0.365	0.357	0.250	0.293	0.326	0.409	0.478	0.548	0.415
											Average	0.2172	

Hourly and Monthly Capacity Factors for Onshore: Paxton

2006	Jan	Feb	Mar	Apr	May	Jun	Jly	Aug	Sep	Oct	Nov	Dec	Average
1	0.647	0.486	0.454	0.563	0.482	0.436	0.464	0.426	0.467	0.526	0.526	0.642	0.510
2	0.658	0.464	0.494	0.498	0.486	0.401	0.462	0.463	0.465	0.521	0.481	0.651	0.504
3	0.605	0.479	0.492	0.499	0.481	0.403	0.458	0.482	0.441	0.506	0.476	0.656	0.498
4	0.581	0.506	0.542	0.498	0.500	0.391	0.457	0.477	0.442	0.531	0.461	0.674	0.505
5	0.552	0.468	0.511	0.473	0.529	0.402	0.435	0.489	0.443	0.548	0.497	0.631	0.498
6	0.556	0.442	0.525	0.429	0.475	0.400	0.411	0.473	0.428	0.534	0.444	0.612	0.477
7	0.555	0.450	0.490	0.415	0.435	0.342	0.338	0.409	0.393	0.529	0.460	0.554	0.448
8	0.516	0.441	0.431	0.344	0.374	0.267	0.208	0.254	0.298	0.494	0.445	0.552	0.385
9	0.492	0.429	0.419	0.286	0.321	0.266	0.127	0.209	0.238	0.391	0.412	0.502	0.341
10	0.429	0.435	0.401	0.289	0.305	0.269	0.131	0.201	0.230	0.327	0.338	0.493	0.321
11	0.408	0.464	0.406	0.290	0.296	0.262	0.129	0.175	0.240	0.323	0.290	0.446	0.311
12	0.391	0.493	0.380	0.277	0.309	0.259	0.154	0.188	0.252	0.352	0.258	0.431	0.312
13	0.350	0.524	0.432	0.333	0.325	0.258	0.187	0.179	0.244	0.344	0.250	0.424	0.321
14	0.318	0.541	0.469	0.385	0.345	0.2696	0.1921	0.1808	0.2539	0.338	0.249	0.448	0.332
15	0.343	0.548	0.455	0.402	0.338	0.2866	0.2087	0.1703	0.2433	0.335	0.248	0.484	0.338
16	0.347	0.518	0.432	0.423	0.350	0.2888	0.2421	0.1759	0.2446	0.366	0.290	0.482	0.347
17	0.353	0.530	0.421	0.436	0.387	0.2890	0.2728	0.1687	0.2166	0.354	0.327	0.477	0.353
18	0.399	0.527	0.431	0.432	0.431	0.2807	0.2848	0.1486	0.2671	0.368	0.374	0.550	0.375
19	0.447	0.497	0.411	0.399	0.404	0.288	0.292	0.204	0.346	0.425	0.426	0.606	0.395
20	0.476	0.544	0.481	0.396	0.442	0.323	0.319	0.268	0.374	0.456	0.425	0.616	0.427
21	0.485	0.572	0.540	0.434	0.467	0.383	0.376	0.340	0.403	0.486	0.446	0.611	0.462
22	0.544	0.635	0.536	0.465	0.472	0.438	0.411	0.370	0.421	0.516	0.466	0.610	0.490
23	0.589	0.585	0.532	0.502	0.447	0.427	0.443	0.387	0.410	0.550	0.488	0.610	0.498
24	0.599	0.569	0.509	0.543	0.461	0.395	0.442	0.399	0.436	0.518	0.507	0.615	0.499
	0.485	0.506	0.466	0.417	0.411	0.334	0.310	0.302	0.342	0.443	0.399	0.557	0.414
											Average	0.2343	

Hourly and Monthly Capacity Factors for Onshore: Thompson Island

2002	Jan	Feb	Mar	Apr	May	Jun	Jly	Aug	Sep	Oct	Nov	Dec	Average
1	0.338	0.408	0.319	0.326	0.288	0.188	0.202	0.150	0.218	0.315	0.362	0.362	0.289
2	0.350	0.407	0.315	0.324	0.260	0.185	0.180	0.155	0.255	0.280	0.416	0.380	0.292
3	0.362	0.360	0.312	0.308	0.257	0.194	0.161	0.154	0.224	0.295	0.408	0.395	0.286
4	0.348	0.326	0.292	0.298	0.223	0.195	0.195	0.150	0.216	0.309	0.370	0.427	0.279
5	0.315	0.318	0.283	0.317	0.214	0.226	0.213	0.165	0.212	0.324	0.416	0.425	0.286
6	0.295	0.297	0.286	0.358	0.234	0.229	0.230	0.189	0.235	0.313	0.435	0.439	0.295
7	0.278	0.278	0.324	0.368	0.274	0.257	0.272	0.207	0.204	0.316	0.405	0.446	0.302
8	0.285	0.275	0.362	0.359	0.331	0.252	0.278	0.200	0.238	0.346	0.428	0.432	0.316
9	0.311	0.316	0.398	0.341	0.362	0.255	0.290	0.180	0.254	0.416	0.457	0.469	0.337
10	0.366	0.407	0.379	0.333	0.406	0.279	0.292	0.167	0.256	0.411	0.506	0.519	0.360
11	0.396	0.400	0.360	0.363	0.428	0.333	0.320	0.182	0.283	0.382	0.469	0.532	0.371
12	0.430	0.401	0.360	0.403	0.451	0.352	0.314	0.194	0.305	0.354	0.501	0.545	0.384
13	0.441	0.455	0.394	0.436	0.517	0.402	0.321	0.239	0.316	0.341	0.539	0.562	0.414
14	0.429	0.471	0.455	0.453	0.525	0.4314	0.3681	0.2832	0.3217	0.328	0.543	0.532	0.428
15	0.429	0.451	0.450	0.459	0.501	0.4337	0.3618	0.2813	0.3127	0.349	0.552	0.510	0.424
16	0.423	0.440	0.465	0.514	0.514	0.4143	0.3824	0.3000	0.3374	0.373	0.492	0.483	0.428
17	0.366	0.398	0.453	0.546	0.506	0.4246	0.3502	0.2993	0.3263	0.383	0.472	0.421	0.412
18	0.311	0.369	0.451	0.491	0.510	0.4237	0.3604	0.2887	0.2765	0.364	0.508	0.423	0.398
19	0.320	0.372	0.415	0.482	0.442	0.356	0.321	0.233	0.233	0.369	0.484	0.419	0.370
20	0.281	0.401	0.348	0.414	0.353	0.307	0.223	0.182	0.225	0.349	0.425	0.394	0.325
21	0.280	0.456	0.322	0.392	0.319	0.288	0.185	0.163	0.243	0.346	0.365	0.344	0.309
22	0.378	0.428	0.298	0.373	0.329	0.265	0.215	0.175	0.264	0.344	0.364	0.377	0.318
23	0.368	0.377	0.270	0.345	0.368	0.218	0.233	0.189	0.243	0.306	0.374	0.405	0.308
24	0.342	0.367	0.317	0.373	0.312	0.204	0.224	0.175	0.247	0.283	0.369	0.387	0.300
	0.352	0.382	0.360	0.391	0.372	0.296	0.270	0.204	0.260	0.342	0.444	0.443	0.343
											Average	0.3489	

Hourly and Monthly Capacity Factors for Onshore: Thompson Island

2003	Jan	Feb	Mar	Apr	May	Jun	Jly	Aug	Sep	Oct	Nov	Dec	Average
1	0.472	0.446	0.286	0.338	0.240	0.141	0.168	0.082	0.105	0.242	0.302	0.467	0.274
2	0.462	0.438	0.282	0.330	0.222	0.143	0.137	0.084	0.099	0.244	0.275	0.418	0.261
3	0.464	0.431	0.291	0.314	0.206	0.151	0.144	0.073	0.099	0.264	0.260	0.442	0.262
4	0.481	0.401	0.287	0.340	0.197	0.127	0.112	0.080	0.091	0.263	0.290	0.475	0.262
5	0.480	0.434	0.296	0.375	0.201	0.103	0.100	0.095	0.096	0.257	0.265	0.460	0.263
6	0.418	0.375	0.321	0.355	0.208	0.104	0.112	0.120	0.128	0.301	0.261	0.450	0.263
7	0.436	0.350	0.330	0.370	0.210	0.159	0.124	0.142	0.130	0.282	0.313	0.440	0.274
8	0.431	0.366	0.310	0.342	0.206	0.186	0.154	0.147	0.141	0.272	0.319	0.456	0.277
9	0.464	0.382	0.332	0.349	0.183	0.182	0.164	0.133	0.155	0.278	0.339	0.479	0.287
10	0.534	0.393	0.341	0.377	0.185	0.180	0.186	0.132	0.164	0.292	0.368	0.502	0.304
11	0.520	0.389	0.355	0.398	0.223	0.174	0.234	0.150	0.165	0.337	0.373	0.474	0.316
12	0.527	0.408	0.395	0.416	0.247	0.207	0.297	0.174	0.159	0.389	0.360	0.486	0.339
13	0.537	0.417	0.403	0.459	0.275	0.223	0.389	0.238	0.183	0.425	0.352	0.508	0.367
14	0.540	0.436	0.400	0.449	0.303	0.230	0.376	0.246	0.212	0.466	0.348	0.494	0.375
15	0.520	0.424	0.433	0.466	0.301	0.193	0.384	0.291	0.204	0.469	0.351	0.530	0.380
16	0.540	0.462	0.442	0.448	0.276	0.214	0.390	0.250	0.218	0.416	0.340	0.543	0.378
17	0.507	0.474	0.412	0.447	0.250	0.221	0.383	0.243	0.176	0.400	0.342	0.498	0.363
18	0.485	0.445	0.380	0.422	0.251	0.215	0.317	0.215	0.115	0.310	0.323	0.503	0.332
19	0.432	0.455	0.416	0.395	0.232	0.180	0.264	0.150	0.110	0.244	0.315	0.507	0.308
20	0.452	0.453	0.396	0.401	0.240	0.146	0.212	0.108	0.082	0.263	0.310	0.535	0.300
21	0.447	0.467	0.350	0.369	0.199	0.178	0.192	0.091	0.098	0.256	0.294	0.527	0.289
22	0.471	0.454	0.322	0.335	0.215	0.205	0.177	0.100	0.095	0.240	0.298	0.565	0.290
23	0.463	0.416	0.306	0.329	0.226	0.182	0.169	0.093	0.092	0.228	0.292	0.527	0.277
24	0.481	0.428	0.312	0.312	0.235	0.174	0.157	0.093	0.104	0.240	0.306	0.538	0.282
	0.482	0.423	0.350	0.381	0.230	0.176	0.222	0.147	0.134	0.307	0.316	0.493	0.305
											Average	0.2546	

Hourly and Monthly Capacity Factors for Offshore: Portland, ME

2001	Jan	Feb	Mar	Apr	May	Jun	Jly	Aug	Sep	Oct	Nov	Dec	Average
1	0.359	0.508	0.352	0.221	0.151	0.107	0.114	0.097	0.224	0.305	0.333	0.393	0.264
2	0.391	0.499	0.367	0.194	0.106	0.085	0.109	0.098	0.233	0.321	0.343	0.409	0.263
3	0.374	0.464	0.344	0.173	0.095	0.075	0.113	0.108	0.259	0.276	0.327	0.434	0.254
4	0.345	0.425	0.366	0.182	0.090	0.091	0.095	0.083	0.244	0.263	0.332	0.426	0.245
5	0.351	0.450	0.392	0.126	0.092	0.101	0.080	0.075	0.220	0.273	0.330	0.407	0.241
6	0.344	0.416	0.420	0.144	0.092	0.090	0.092	0.079	0.203	0.270	0.345	0.380	0.240
7	0.325	0.399	0.430	0.171	0.092	0.070	0.078	0.090	0.228	0.276	0.335	0.371	0.239
8	0.303	0.356	0.461	0.178	0.103	0.069	0.065	0.079	0.215	0.259	0.292	0.384	0.230
9	0.279	0.337	0.446	0.188	0.113	0.073	0.035	0.078	0.242	0.274	0.301	0.406	0.231
10	0.263	0.298	0.453	0.228	0.121	0.086	0.052	0.069	0.231	0.275	0.312	0.419	0.234
11	0.277	0.257	0.444	0.203	0.149	0.060	0.046	0.065	0.246	0.265	0.327	0.418	0.230
12	0.272	0.290	0.486	0.208	0.118	0.045	0.070	0.058	0.225	0.272	0.326	0.398	0.231
13	0.267	0.285	0.514	0.222	0.120	0.098	0.062	0.056	0.248	0.283	0.314	0.424	0.241
14	0.240	0.324	0.521	0.205	0.132	0.1025	0.0517	0.0601	0.2063	0.304	0.345	0.390	0.240
15	0.248	0.329	0.479	0.190	0.140	0.0621	0.0572	0.0726	0.1800	0.278	0.333	0.383	0.229
16	0.279	0.336	0.467	0.176	0.127	0.0681	0.0541	0.0812	0.1666	0.281	0.318	0.345	0.225
17	0.262	0.376	0.444	0.162	0.147	0.1008	0.0623	0.1016	0.2142	0.268	0.305	0.333	0.231
18	0.227	0.429	0.441	0.173	0.166	0.1289	0.1128	0.1004	0.1999	0.279	0.288	0.376	0.243
19	0.197	0.444	0.443	0.208	0.161	0.141	0.150	0.118	0.231	0.321	0.279	0.403	0.258
20	0.208	0.428	0.394	0.216	0.180	0.139	0.126	0.142	0.256	0.384	0.326	0.374	0.264
21	0.274	0.483	0.385	0.246	0.190	0.114	0.135	0.155	0.227	0.413	0.367	0.365	0.279
22	0.276	0.460	0.385	0.253	0.201	0.141	0.142	0.193	0.216	0.368	0.424	0.359	0.285
23	0.293	0.479	0.381	0.239	0.171	0.102	0.125	0.138	0.201	0.308	0.357	0.366	0.263
24	0.332	0.455	0.427	0.218	0.174	0.083	0.107	0.133	0.190	0.276	0.354	0.354	0.258
	0.291	0.397	0.427	0.197	0.135	0.093	0.089	0.097	0.221	0.296	0.330	0.388	0.247
											Average	0.1092	

Hourly and Monthly Capacity Factors for Offshore: Portland, ME

2002	Jan	Feb	Mar	Apr	May	Jun	Jly	Aug	Sep	Oct	Nov	Dec	Average
1	0.522	0.476	0.429	0.404	0.284	0.216	0.111	0.062	0.170	0.372	0.488	0.511	0.337
2	0.521	0.491	0.421	0.362	0.270	0.193	0.107	0.048	0.187	0.398	0.503	0.486	0.332
3	0.521	0.525	0.411	0.379	0.248	0.169	0.081	0.058	0.174	0.385	0.476	0.451	0.323
4	0.536	0.555	0.408	0.362	0.261	0.158	0.074	0.079	0.164	0.384	0.493	0.463	0.328
5	0.564	0.557	0.488	0.370	0.244	0.138	0.085	0.074	0.152	0.383	0.480	0.476	0.334
6	0.558	0.519	0.460	0.355	0.232	0.144	0.101	0.088	0.160	0.400	0.486	0.500	0.334
7	0.524	0.493	0.421	0.328	0.238	0.155	0.078	0.099	0.148	0.370	0.468	0.517	0.320
8	0.538	0.500	0.419	0.302	0.240	0.155	0.078	0.107	0.193	0.400	0.449	0.533	0.326
9	0.549	0.444	0.378	0.320	0.219	0.170	0.087	0.130	0.178	0.387	0.472	0.524	0.322
10	0.516	0.387	0.416	0.317	0.222	0.185	0.085	0.125	0.216	0.381	0.444	0.521	0.318
11	0.539	0.414	0.439	0.318	0.234	0.213	0.084	0.126	0.205	0.388	0.475	0.539	0.331
12	0.504	0.411	0.449	0.310	0.252	0.182	0.092	0.130	0.201	0.417	0.462	0.538	0.329
13	0.491	0.387	0.441	0.320	0.272	0.180	0.105	0.125	0.197	0.417	0.470	0.593	0.333
14	0.475	0.368	0.420	0.352	0.240	0.1890	0.1133	0.1211	0.2022	0.416	0.514	0.580	0.333
15	0.469	0.359	0.392	0.311	0.248	0.1969	0.1224	0.0929	0.2153	0.380	0.539	0.551	0.323
16	0.402	0.338	0.390	0.252	0.252	0.1779	0.1152	0.0987	0.2037	0.372	0.573	0.560	0.311
17	0.391	0.335	0.373	0.232	0.293	0.2247	0.1366	0.1052	0.2138	0.327	0.513	0.534	0.307
18	0.375	0.402	0.376	0.259	0.375	0.2314	0.1206	0.1265	0.2409	0.341	0.494	0.510	0.321
19	0.433	0.456	0.370	0.334	0.380	0.237	0.153	0.179	0.223	0.320	0.490	0.501	0.340
20	0.464	0.442	0.382	0.339	0.410	0.273	0.206	0.145	0.210	0.317	0.520	0.507	0.351
21	0.456	0.454	0.358	0.378	0.456	0.264	0.152	0.128	0.239	0.342	0.514	0.494	0.353
22	0.423	0.457	0.396	0.367	0.462	0.244	0.154	0.130	0.242	0.350	0.575	0.503	0.359
23	0.435	0.502	0.403	0.413	0.412	0.198	0.148	0.119	0.234	0.339	0.506	0.507	0.351
24	0.468	0.481	0.405	0.404	0.339	0.196	0.174	0.080	0.214	0.415	0.549	0.526	0.354
	0.486	0.448	0.410	0.337	0.295	0.195	0.115	0.107	0.199	0.375	0.498	0.518	0.332
											Average	0.1624	

Hourly and Monthly Capacity Factors for Offshore: Portland, ME

2003	Jan	Feb	Mar	Apr	May	Jun	Jly	Aug	Sep	Oct	Nov	Dec	Average
1	0.559	0.496	0.416	0.313	0.124	0.132	0.148	0.086	0.095	0.338	0.366	0.613	0.307
2	0.567	0.512	0.443	0.335	0.153	0.128	0.109	0.080	0.102	0.370	0.375	0.619	0.316
3	0.576	0.537	0.424	0.283	0.128	0.124	0.107	0.087	0.115	0.407	0.388	0.608	0.315
4	0.574	0.580	0.431	0.241	0.131	0.140	0.082	0.097	0.164	0.395	0.379	0.574	0.316
5	0.568	0.617	0.416	0.206	0.132	0.105	0.131	0.082	0.143	0.392	0.360	0.570	0.310
6	0.575	0.583	0.414	0.200	0.133	0.124	0.078	0.062	0.123	0.387	0.345	0.536	0.297
7	0.562	0.552	0.408	0.243	0.169	0.143	0.057	0.063	0.080	0.399	0.347	0.523	0.295
8	0.554	0.542	0.415	0.236	0.247	0.142	0.127	0.061	0.113	0.463	0.382	0.524	0.317
9	0.548	0.541	0.434	0.218	0.133	0.103	0.061	0.049	0.085	0.392	0.390	0.492	0.287
10	0.545	0.554	0.425	0.226	0.138	0.106	0.074	0.039	0.120	0.382	0.400	0.485	0.291
11	0.528	0.522	0.416	0.263	0.140	0.098	0.077	0.050	0.143	0.344	0.411	0.475	0.289
12	0.528	0.541	0.404	0.287	0.154	0.101	0.082	0.055	0.169	0.341	0.411	0.509	0.299
13	0.519	0.524	0.394	0.281	0.187	0.122	0.092	0.064	0.168	0.329	0.409	0.481	0.298
14	0.516	0.533	0.345	0.264	0.147	0.1510	0.0788	0.0718	0.1369	0.320	0.414	0.455	0.286
15	0.465	0.527	0.313	0.193	0.127	0.1107	0.1040	0.0783	0.1192	0.327	0.350	0.504	0.268
16	0.442	0.459	0.284	0.195	0.144	0.1268	0.1071	0.0778	0.1020	0.281	0.318	0.499	0.253
17	0.430	0.395	0.290	0.204	0.238	0.1757	0.1521	0.1206	0.1042	0.274	0.313	0.479	0.265
18	0.438	0.383	0.332	0.198	0.193	0.1377	0.1600	0.0945	0.1247	0.284	0.332	0.461	0.262
19	0.437	0.449	0.317	0.271	0.184	0.159	0.180	0.135	0.161	0.373	0.325	0.462	0.288
20	0.446	0.454	0.362	0.274	0.223	0.277	0.212	0.323	0.213	0.404	0.304	0.518	0.334
21	0.457	0.450	0.379	0.276	0.160	0.160	0.207	0.126	0.171	0.373	0.310	0.518	0.299
22	0.475	0.449	0.383	0.286	0.149	0.131	0.156	0.141	0.142	0.372	0.334	0.530	0.296
23	0.526	0.422	0.391	0.288	0.141	0.169	0.168	0.136	0.114	0.391	0.388	0.531	0.305
24	0.551	0.443	0.430	0.301	0.153	0.137	0.137	0.144	0.126	0.368	0.385	0.563	0.312
	0.516	0.503	0.386	0.254	0.159	0.138	0.120	0.097	0.131	0.363	0.364	0.522	0.296
											Average	0.1167	

Hourly and Monthly Capacity Factors for Offshore: Portland, ME

2004	Jan	Feb	Mar	Apr	May	Jun	Jly	Aug	Sep	Oct	Nov	Dec	Average
1	0.595	0.579	0.365	0.238	0.239	0.151	0.090	0.186	0.202	0.374	0.574	0.543	0.345
2	0.620	0.569	0.350	0.267	0.235	0.180	0.085	0.170	0.187	0.375	0.576	0.528	0.345
3	0.570	0.580	0.395	0.282	0.221	0.159	0.084	0.159	0.168	0.408	0.577	0.487	0.341
4	0.565	0.594	0.405	0.276	0.177	0.133	0.091	0.162	0.186	0.419	0.581	0.464	0.338
5	0.545	0.549	0.415	0.279	0.151	0.151	0.097	0.151	0.214	0.455	0.522	0.479	0.334
6	0.516	0.510	0.403	0.317	0.179	0.149	0.132	0.138	0.213	0.453	0.522	0.496	0.336
7	0.492	0.494	0.388	0.335	0.202	0.150	0.108	0.130	0.221	0.410	0.474	0.479	0.324
8	0.481	0.477	0.347	0.315	0.199	0.137	0.110	0.131	0.247	0.442	0.461	0.466	0.318
9	0.483	0.463	0.307	0.336	0.226	0.146	0.104	0.128	0.248	0.447	0.405	0.484	0.315
10	0.521	0.465	0.293	0.371	0.219	0.146	0.090	0.114	0.247	0.456	0.431	0.488	0.320
11	0.530	0.450	0.288	0.407	0.235	0.143	0.092	0.104	0.254	0.450	0.439	0.518	0.326
12	0.480	0.474	0.306	0.427	0.237	0.120	0.082	0.079	0.243	0.450	0.416	0.532	0.320
13	0.440	0.488	0.322	0.376	0.217	0.126	0.100	0.081	0.234	0.465	0.420	0.538	0.317
14	0.491	0.432	0.318	0.340	0.206	0.132	0.082	0.087	0.220	0.448	0.410	0.546	0.309
15	0.519	0.413	0.270	0.317	0.248	0.131	0.083	0.068	0.191	0.433	0.389	0.538	0.300
16	0.505	0.409	0.252	0.306	0.213	0.152	0.094	0.090	0.175	0.383	0.349	0.548	0.290
17	0.454	0.410	0.244	0.312	0.244	0.161	0.120	0.110	0.176	0.357	0.320	0.524	0.286
18	0.431	0.363	0.258	0.306	0.281	0.175	0.117	0.147	0.205	0.332	0.317	0.520	0.288
19	0.443	0.354	0.256	0.336	0.303	0.202	0.130	0.170	0.204	0.316	0.337	0.501	0.296
20	0.524	0.385	0.267	0.378	0.355	0.185	0.142	0.204	0.281	0.312	0.367	0.531	0.328
21	0.572	0.361	0.276	0.392	0.358	0.184	0.141	0.205	0.310	0.321	0.392	0.529	0.337
22	0.588	0.370	0.303	0.349	0.324	0.182	0.163	0.205	0.274	0.316	0.428	0.558	0.338
23	0.574	0.431	0.323	0.297	0.296	0.173	0.154	0.168	0.248	0.324	0.472	0.597	0.338
24	0.609	0.504	0.369	0.279	0.279	0.161	0.126	0.156	0.230	0.404	0.469	0.585	0.348
	0.523	0.463	0.322	0.327	0.243	0.155	0.109	0.139	0.224	0.398	0.444	0.520	0.322
											Average	0.1359	

Hourly and Monthly Capacity Factors for Offshore: Portland, ME

2006	Jan	Feb	Mar	Apr	May	Jun	Jly	Aug	Sep	Oct	Nov	Dec	Average
1	0.402	0.516	0.454	0.300	0.366	0.195	0.156	0.161	0.177	0.388	0.322	0.448	0.324
2	0.416	0.449	0.466	0.293	0.328	0.201	0.159	0.145	0.180	0.358	0.327	0.462	0.315
3	0.444	0.556	0.495	0.309	0.330	0.177	0.142	0.154	0.153	0.378	0.356	0.490	0.332
4	0.405	0.586	0.465	0.281	0.322	0.190	0.107	0.157	0.152	0.401	0.355	0.484	0.325
5	0.387	0.576	0.407	0.261	0.321	0.169	0.114	0.175	0.153	0.395	0.361	0.486	0.317
6	0.495	0.602	0.341	0.261	0.301	0.135	0.102	0.148	0.169	0.369	0.374	0.469	0.314
7	0.431	0.596	0.351	0.230	0.307	0.114	0.101	0.119	0.206	0.403	0.407	0.467	0.311
8	0.487	0.597	0.339	0.270	0.287	0.106	0.079	0.099	0.225	0.426	0.365	0.459	0.312
9	0.482	0.523	0.308	0.313	0.300	0.136	0.097	0.118	0.212	0.387	0.322	0.478	0.306
10	0.510	0.509	0.316	0.296	0.334	0.159	0.096	0.126	0.228	0.399	0.327	0.468	0.314
11	0.534	0.519	0.345	0.302	0.298	0.161	0.082	0.150	0.223	0.360	0.366	0.502	0.320
12	0.549	0.548	0.330	0.291	0.339	0.156	0.076	0.146	0.234	0.354	0.344	0.522	0.324
13	0.547	0.547	0.335	0.270	0.332	0.138	0.087	0.160	0.220	0.337	0.347	0.515	0.319
14	0.558	0.551	0.304	0.237	0.336	0.136	0.088	0.122	0.197	0.297	0.346	0.511	0.307
15	0.447	0.543	0.289	0.242	0.349	0.171	0.095	0.128	0.191	0.273	0.325	0.547	0.300
16	0.412	0.496	0.222	0.207	0.381	0.191	0.109	0.128	0.170	0.288	0.293	0.515	0.284
17	0.391	0.470	0.197	0.218	0.382	0.186	0.137	0.144	0.137	0.309	0.281	0.445	0.275
18	0.395	0.474	0.226	0.279	0.397	0.201	0.168	0.168	0.169	0.315	0.257	0.456	0.292
19	0.400	0.536	0.257	0.302	0.396	0.201	0.197	0.172	0.196	0.307	0.258	0.445	0.305
20	0.403	0.539	0.290	0.378	0.387	0.207	0.214	0.162	0.215	0.350	0.248	0.472	0.322
21	0.423	0.586	0.348	0.388	0.363	0.211	0.197	0.180	0.197	0.379	0.254	0.421	0.329
22	0.402	0.604	0.393	0.309	0.370	0.191	0.187	0.183	0.188	0.392	0.320	0.431	0.331
23	0.413	0.591	0.437	0.284	0.383	0.217	0.138	0.174	0.192	0.376	0.322	0.388	0.326
24	0.410	0.534	0.450	0.298	0.377	0.207	0.151	0.149	0.194	0.365	0.345	0.433	0.326
	0.448	0.544	0.348	0.284	0.345	0.173	0.128	0.149	0.191	0.359	0.326	0.471	0.314
											Average	0.1518	

Hourly and Monthly Capacity Factors for Offshore: Buzzard's Bay

2001	Jan	Feb	Mar	Apr	May	Jun	Jly	Aug	Sep	Oct	Nov	Dec	Average
1	0.448	0.537	0.446	0.232	0.350	0.263	0.258	0.291	0.247	0.563	0.541	0.533	0.392
2	0.493	0.542	0.436	0.231	0.333	0.242	0.229	0.249	0.231	0.507	0.536	0.557	0.382
3	0.509	0.575	0.477	0.236	0.340	0.230	0.241	0.265	0.257	0.486	0.531	0.564	0.393
4	0.505	0.590	0.489	0.241	0.347	0.222	0.224	0.253	0.269	0.445	0.565	0.553	0.392
5	0.461	0.628	0.474	0.208	0.368	0.193	0.213	0.226	0.254	0.432	0.585	0.541	0.382
6	0.461	0.654	0.488	0.254	0.382	0.194	0.215	0.194	0.296	0.448	0.560	0.545	0.391
7	0.467	0.592	0.521	0.237	0.385	0.225	0.227	0.199	0.333	0.412	0.520	0.551	0.389
8	0.397	0.555	0.543	0.256	0.339	0.223	0.247	0.213	0.328	0.399	0.500	0.522	0.377
9	0.418	0.502	0.533	0.267	0.331	0.197	0.233	0.185	0.378	0.411	0.448	0.505	0.367
10	0.414	0.468	0.540	0.288	0.299	0.175	0.197	0.155	0.336	0.376	0.433	0.513	0.350
11	0.415	0.439	0.532	0.314	0.343	0.173	0.212	0.132	0.324	0.398	0.459	0.465	0.351
12	0.378	0.446	0.552	0.300	0.308	0.176	0.203	0.143	0.335	0.442	0.481	0.447	0.351
13	0.370	0.449	0.534	0.313	0.320	0.172	0.215	0.151	0.363	0.429	0.473	0.427	0.351
14	0.361	0.504	0.531	0.353	0.336	0.1852	0.1874	0.1804	0.3127	0.471	0.496	0.451	0.364
15	0.385	0.506	0.477	0.334	0.335	0.1939	0.2356	0.1771	0.2888	0.475	0.479	0.438	0.360
16	0.351	0.520	0.482	0.338	0.356	0.2120	0.2615	0.1833	0.2725	0.474	0.464	0.409	0.360
17	0.316	0.507	0.477	0.317	0.354	0.2165	0.2537	0.2002	0.2762	0.451	0.448	0.456	0.356
18	0.315	0.501	0.457	0.329	0.356	0.2262	0.3170	0.2263	0.2793	0.453	0.453	0.469	0.365
19	0.344	0.512	0.482	0.378	0.376	0.262	0.349	0.253	0.268	0.452	0.447	0.443	0.381
20	0.339	0.532	0.494	0.362	0.386	0.299	0.357	0.281	0.268	0.482	0.470	0.433	0.392
21	0.334	0.545	0.502	0.402	0.386	0.314	0.367	0.287	0.269	0.531	0.458	0.448	0.404
22	0.367	0.563	0.527	0.398	0.399	0.319	0.339	0.301	0.282	0.537	0.501	0.459	0.416
23	0.402	0.535	0.482	0.336	0.394	0.344	0.335	0.320	0.288	0.548	0.533	0.499	0.418
24	0.421	0.499	0.449	0.301	0.375	0.310	0.290	0.326	0.264	0.550	0.541	0.524	0.404
	0.403	0.529	0.497	0.301	0.354	0.232	0.259	0.225	0.293	0.466	0.497	0.490	0.379
											Average	0.2343	

EXHIBIT 6

LAI Analysis for Years Other Than 2005

Hourly and Monthly Capacity Factors for Offshore: Buzzard's Bay

2002	Jan	Feb	Mar	Apr	May	Jun	Jly	Aug	Sep	Oct	Nov	Dec	Average
1	0.636	0.626	0.600	0.503	0.446	0.476	0.355	0.327	0.374	0.529	0.658	0.636	0.514
2	0.643	0.629	0.572	0.486	0.387	0.430	0.298	0.289	0.394	0.550	0.632	0.595	0.492
3	0.635	0.622	0.512	0.468	0.399	0.396	0.232	0.243	0.406	0.581	0.625	0.606	0.477
4	0.644	0.606	0.541	0.493	0.398	0.367	0.199	0.224	0.435	0.575	0.620	0.611	0.476
5	0.650	0.570	0.538	0.438	0.382	0.339	0.209	0.203	0.409	0.585	0.633	0.632	0.466
6	0.671	0.570	0.503	0.406	0.366	0.312	0.216	0.207	0.378	0.577	0.618	0.630	0.454
7	0.632	0.512	0.515	0.433	0.368	0.308	0.216	0.207	0.376	0.595	0.604	0.634	0.450
8	0.624	0.532	0.529	0.466	0.302	0.319	0.219	0.190	0.377	0.609	0.627	0.642	0.453
9	0.592	0.566	0.535	0.483	0.325	0.320	0.216	0.209	0.382	0.605	0.673	0.647	0.463
10	0.564	0.521	0.547	0.431	0.377	0.316	0.245	0.200	0.361	0.603	0.678	0.619	0.455
11	0.542	0.447	0.520	0.417	0.404	0.352	0.283	0.275	0.336	0.594	0.688	0.622	0.457
12	0.526	0.460	0.494	0.402	0.395	0.302	0.314	0.300	0.345	0.611	0.697	0.658	0.459
13	0.511	0.428	0.504	0.391	0.412	0.303	0.333	0.285	0.347	0.635	0.689	0.631	0.456
14	0.515	0.446	0.447	0.344	0.432	0.2778	0.3351	0.2442	0.3640	0.620	0.678	0.613	0.443
15	0.469	0.471	0.421	0.330	0.438	0.2781	0.3383	0.2449	0.3188	0.559	0.690	0.600	0.430
16	0.480	0.455	0.422	0.322	0.478	0.2740	0.3439	0.2490	0.2994	0.477	0.657	0.615	0.423
17	0.471	0.454	0.457	0.349	0.486	0.3058	0.3655	0.2682	0.3013	0.451	0.646	0.587	0.429
18	0.476	0.440	0.483	0.400	0.537	0.3468	0.3699	0.3310	0.2970	0.428	0.664	0.576	0.446
19	0.520	0.441	0.565	0.463	0.560	0.378	0.389	0.337	0.323	0.413	0.663	0.576	0.469
20	0.459	0.501	0.582	0.486	0.595	0.449	0.416	0.362	0.339	0.412	0.657	0.588	0.487
21	0.479	0.500	0.590	0.500	0.580	0.454	0.407	0.369	0.348	0.405	0.681	0.617	0.494
22	0.540	0.537	0.631	0.504	0.577	0.502	0.433	0.380	0.353	0.438	0.672	0.611	0.515
23	0.557	0.591	0.570	0.545	0.550	0.540	0.434	0.357	0.342	0.443	0.686	0.626	0.520
24	0.586	0.621	0.567	0.489	0.499	0.524	0.419	0.306	0.350	0.469	0.684	0.641	0.513
	0.559	0.523	0.527	0.440	0.446	0.370	0.316	0.275	0.357	0.532	0.659	0.617	0.468
											Average	0.3076	

EXHIBIT 6 **DRAFT**

LAI Analysis for Years Other Than 2005

Hourly and Monthly Capacity Factors for Offshore: Buzzard's Bay

2003	Jan	Feb	Mar	Apr	May	Jun	Jly	Aug	Sep	Oct	Nov	Dec	Average
1	0.596	0.598	0.408	0.516	0.305	0.268	0.380	0.297	0.263	0.551	0.491	0.675	0.446
2	0.631	0.559	0.416	0.525	0.296	0.276	0.347	0.275	0.226	0.544	0.471	0.666	0.436
3	0.644	0.553	0.395	0.521	0.319	0.259	0.296	0.298	0.216	0.528	0.473	0.695	0.433
4	0.646	0.546	0.414	0.500	0.330	0.224	0.286	0.318	0.228	0.486	0.471	0.689	0.428
5	0.635	0.568	0.432	0.476	0.324	0.224	0.279	0.295	0.200	0.491	0.482	0.681	0.424
6	0.657	0.568	0.402	0.444	0.310	0.229	0.269	0.267	0.194	0.512	0.449	0.698	0.417
7	0.674	0.601	0.413	0.454	0.293	0.217	0.258	0.265	0.218	0.525	0.448	0.699	0.422
8	0.685	0.609	0.389	0.490	0.270	0.206	0.213	0.254	0.224	0.526	0.461	0.680	0.417
9	0.670	0.591	0.395	0.495	0.336	0.232	0.222	0.226	0.283	0.488	0.452	0.687	0.423
10	0.663	0.589	0.380	0.534	0.340	0.233	0.196	0.212	0.309	0.480	0.459	0.671	0.422
11	0.653	0.552	0.356	0.552	0.378	0.241	0.187	0.211	0.321	0.473	0.453	0.683	0.422
12	0.647	0.548	0.386	0.534	0.387	0.219	0.189	0.242	0.316	0.470	0.454	0.680	0.423
13	0.674	0.602	0.409	0.553	0.390	0.177	0.199	0.243	0.326	0.485	0.467	0.692	0.435
14	0.653	0.589	0.444	0.500	0.371	0.1881	0.2099	0.2096	0.3129	0.478	0.487	0.697	0.428
15	0.630	0.520	0.458	0.535	0.366	0.2175	0.2138	0.2028	0.3049	0.466	0.508	0.677	0.425
16	0.581	0.496	0.433	0.550	0.353	0.2094	0.2405	0.2059	0.2912	0.466	0.488	0.636	0.413
17	0.557	0.491	0.454	0.554	0.378	0.2261	0.2620	0.2261	0.2821	0.451	0.462	0.666	0.417
18	0.536	0.532	0.478	0.554	0.423	0.2399	0.3240	0.2560	0.3131	0.475	0.455	0.650	0.436
19	0.568	0.566	0.485	0.606	0.442	0.291	0.342	0.282	0.336	0.541	0.484	0.667	0.468
20	0.556	0.587	0.479	0.579	0.420	0.316	0.385	0.336	0.352	0.551	0.516	0.673	0.479
21	0.600	0.577	0.450	0.570	0.404	0.298	0.459	0.342	0.351	0.572	0.491	0.660	0.481
22	0.607	0.581	0.434	0.557	0.385	0.296	0.453	0.342	0.353	0.587	0.494	0.638	0.477
23	0.616	0.591	0.405	0.546	0.348	0.326	0.432	0.318	0.332	0.599	0.502	0.671	0.474
24	0.597	0.612	0.439	0.516	0.333	0.323	0.425	0.302	0.307	0.580	0.501	0.684	0.468
	0.624	0.568	0.423	0.528	0.354	0.247	0.294	0.268	0.286	0.514	0.476	0.676	0.438
											Average	0.2468	

Hourly and Monthly Capacity Factors for Offshore: Buzzard's Bay

2004	Jan	Feb	Mar	Apr	May	Jun	Jly	Aug	Sep	Oct	Nov	Dec	Average
1	0.598	0.409	0.458	0.352	0.269	0.286	0.191	0.193	0.290	0.399	0.499	0.549	0.375
2	0.580	0.391	0.488	0.320	0.250	0.241	0.182	0.175	0.285	0.422	0.495	0.520	0.362
3	0.560	0.455	0.466	0.333	0.214	0.221	0.139	0.181	0.282	0.418	0.460	0.495	0.352
4	0.588	0.448	0.415	0.300	0.239	0.245	0.137	0.189	0.267	0.393	0.479	0.498	0.350
5	0.609	0.445	0.386	0.315	0.234	0.236	0.144	0.167	0.257	0.378	0.497	0.519	0.349
6	0.625	0.435	0.385	0.342	0.204	0.212	0.142	0.179	0.249	0.358	0.505	0.516	0.346
7	0.618	0.430	0.416	0.356	0.191	0.202	0.166	0.187	0.257	0.364	0.487	0.525	0.350
8	0.643	0.430	0.406	0.355	0.194	0.204	0.136	0.182	0.250	0.380	0.491	0.542	0.351
9	0.670	0.418	0.363	0.350	0.212	0.164	0.142	0.178	0.230	0.344	0.479	0.512	0.339
10	0.680	0.392	0.362	0.412	0.180	0.147	0.162	0.187	0.227	0.361	0.484	0.475	0.339
11	0.670	0.379	0.341	0.422	0.145	0.149	0.153	0.241	0.207	0.373	0.466	0.484	0.336
12	0.655	0.356	0.373	0.399	0.164	0.168	0.157	0.256	0.206	0.386	0.456	0.478	0.338
13	0.640	0.345	0.397	0.384	0.177	0.184	0.147	0.207	0.209	0.413	0.455	0.495	0.338
14	0.657	0.327	0.367	0.387	0.190	0.188	0.145	0.216	0.220	0.423	0.426	0.512	0.338
15	0.647	0.323	0.414	0.410	0.188	0.170	0.153	0.230	0.217	0.403	0.420	0.499	0.340
16	0.586	0.306	0.434	0.383	0.191	0.194	0.172	0.209	0.216	0.389	0.405	0.477	0.330
17	0.568	0.295	0.448	0.379	0.208	0.205	0.194	0.232	0.214	0.399	0.394	0.449	0.332
18	0.491	0.302	0.459	0.361	0.223	0.228	0.210	0.274	0.214	0.406	0.378	0.451	0.333
19	0.500	0.355	0.460	0.423	0.256	0.285	0.234	0.271	0.223	0.416	0.370	0.446	0.353
20	0.527	0.385	0.476	0.479	0.298	0.334	0.277	0.268	0.241	0.423	0.396	0.453	0.380
21	0.533	0.377	0.517	0.455	0.328	0.339	0.265	0.238	0.243	0.423	0.394	0.529	0.387
22	0.559	0.401	0.533	0.434	0.316	0.339	0.263	0.233	0.244	0.405	0.441	0.517	0.390
23	0.581	0.414	0.560	0.385	0.274	0.334	0.245	0.209	0.240	0.397	0.440	0.531	0.384
24	0.613	0.422	0.514	0.357	0.272	0.312	0.236	0.199	0.289	0.394	0.473	0.551	0.386
	0.600	0.385	0.435	0.379	0.226	0.233	0.183	0.213	0.241	0.394	0.450	0.501	0.353
											Average	0.2050	

Hourly and Monthly Capacity Factors for Offshore: Buzzard's Bay

2006	Jan	Feb	Mar	Apr	May	Jun	Jly	Aug	Sep	Oct	Nov	Dec	Average
1	0.545	0.634	0.496	0.375	0.486	0.428	0.362	0.343	0.342	0.627	0.400	0.589	0.469
2	0.546	0.620	0.499	0.349	0.448	0.423	0.402	0.208	0.359	0.583	0.386	0.603	0.452
3	0.548	0.655	0.526	0.326	0.444	0.427	0.392	0.205	0.309	0.606	0.439	0.596	0.456
4	0.542	0.691	0.535	0.315	0.428	0.418	0.422	0.292	0.271	0.570	0.420	0.566	0.456
5	0.543	0.699	0.521	0.285	0.429	0.408	0.437	0.267	0.288	0.577	0.452	0.627	0.461
6	0.548	0.669	0.493	0.325	0.420	0.423	0.410	0.289	0.216	0.564	0.423	0.627	0.450
7	0.561	0.641	0.513	0.386	0.432	0.407	0.329	0.250	0.236	0.569	0.428	0.602	0.446
8	0.593	0.594	0.532	0.420	0.428	0.370	0.272	0.243	0.275	0.516	0.371	0.597	0.434
9	0.598	0.584	0.543	0.428	0.409	0.329	0.263	0.224	0.288	0.456	0.373	0.560	0.421
10	0.601	0.563	0.530	0.409	0.417	0.363	0.252	0.243	0.297	0.503	0.363	0.622	0.430
11	0.562	0.554	0.501	0.409	0.410	0.346	0.256	0.264	0.225	0.496	0.376	0.568	0.414
12	0.579	0.526	0.500	0.389	0.399	0.311	0.218	0.236	0.293	0.513	0.355	0.535	0.405
13	0.609	0.491	0.480	0.400	0.390	0.330	0.240	0.270	0.312	0.509	0.380	0.513	0.410
14	0.567	0.523	0.465	0.434	0.368	0.345	0.213	0.266	0.346	0.516	0.406	0.467	0.410
15	0.557	0.542	0.424	0.468	0.383	0.336	0.245	0.261	0.328	0.486	0.433	0.466	0.411
16	0.551	0.532	0.391	0.471	0.391	0.355	0.279	0.244	0.313	0.499	0.411	0.483	0.410
17	0.514	0.557	0.357	0.493	0.433	0.399	0.303	0.227	0.278	0.542	0.386	0.505	0.416
18	0.492	0.589	0.379	0.528	0.454	0.403	0.305	0.213	0.340	0.572	0.389	0.483	0.429
19	0.508	0.614	0.409	0.530	0.482	0.384	0.358	0.207	0.392	0.596	0.398	0.458	0.445
20	0.489	0.663	0.427	0.551	0.483	0.417	0.444	0.174	0.384	0.595	0.376	0.506	0.459
21	0.527	0.691	0.462	0.584	0.518	0.416	0.486	0.218	0.443	0.640	0.373	0.545	0.492
22	0.534	0.682	0.488	0.583	0.555	0.435	0.473	0.206	0.451	0.631	0.352	0.572	0.497
23	0.567	0.657	0.493	0.518	0.528	0.386	0.476	0.262	0.449	0.611	0.401	0.564	0.493
24	0.579	0.617	0.504	0.458	0.508	0.393	0.436	0.251	0.386	0.594	0.396	0.572	0.474
	0.553	0.608	0.478	0.435	0.443	0.385	0.345	0.244	0.326	0.557	0.395	0.551	0.443
											Average	0.3000	

Hourly and Monthly Capacity Factors for Offshore: Isle of Shoals

2001	Jan	Feb	Mar	Apr	May	Jun	Jly	Aug	Sep	Oct	Nov	Dec	Average
1	0.418	0.538	0.471	0.373	0.351	0.451	0.362	0.270	0.422	0.514	0.427	0.419	0.418
2	0.431	0.523	0.468	0.354	0.372	0.338	0.341	0.267	0.394	0.500	0.429	0.457	0.406
3	0.399	0.524	0.480	0.339	0.354	0.333	0.371	0.264	0.397	0.445	0.415	0.467	0.399
4	0.391	0.531	0.477	0.300	0.282	0.318	0.307	0.216	0.340	0.427	0.395	0.500	0.374
5	0.414	0.470	0.431	0.280	0.260	0.300	0.242	0.210	0.334	0.347	0.382	0.509	0.348
6	0.413	0.454	0.447	0.267	0.266	0.236	0.231	0.219	0.295	0.313	0.395	0.496	0.336
7	0.379	0.474	0.430	0.258	0.270	0.211	0.214	0.210	0.294	0.311	0.411	0.479	0.329
8	0.366	0.463	0.457	0.299	0.251	0.207	0.162	0.175	0.251	0.334	0.413	0.467	0.321
9	0.372	0.423	0.483	0.294	0.259	0.239	0.186	0.172	0.265	0.294	0.412	0.469	0.322
10	0.345	0.420	0.447	0.281	0.252	0.251	0.193	0.185	0.276	0.287	0.440	0.457	0.320
11	0.325	0.421	0.474	0.301	0.230	0.218	0.171	0.166	0.253	0.310	0.465	0.475	0.317
12	0.300	0.431	0.543	0.282	0.274	0.228	0.245	0.150	0.249	0.333	0.466	0.441	0.329
13	0.314	0.441	0.541	0.290	0.252	0.212	0.270	0.153	0.260	0.341	0.417	0.456	0.329
14	0.303	0.483	0.526	0.285	0.226	0.2105	0.2362	0.1411	0.2645	0.333	0.408	0.438	0.321
15	0.295	0.506	0.485	0.250	0.211	0.2010	0.2567	0.1413	0.2547	0.312	0.378	0.450	0.312
16	0.271	0.501	0.474	0.256	0.215	0.2309	0.2487	0.1633	0.2708	0.311	0.373	0.443	0.313
17	0.246	0.555	0.401	0.345	0.249	0.2497	0.1733	0.1924	0.3127	0.317	0.367	0.417	0.319
18	0.246	0.537	0.406	0.370	0.311	0.3011	0.1863	0.1893	0.3662	0.363	0.376	0.411	0.339
19	0.244	0.520	0.448	0.362	0.365	0.426	0.220	0.246	0.415	0.420	0.416	0.399	0.373
20	0.288	0.504	0.455	0.370	0.384	0.489	0.255	0.312	0.452	0.457	0.414	0.426	0.401
21	0.341	0.502	0.486	0.347	0.459	0.517	0.283	0.306	0.441	0.478	0.425	0.424	0.417
22	0.372	0.495	0.520	0.401	0.483	0.554	0.282	0.317	0.426	0.436	0.442	0.415	0.429
23	0.307	0.480	0.511	0.419	0.468	0.501	0.292	0.288	0.475	0.454	0.446	0.393	0.419
24	0.367	0.483	0.471	0.394	0.417	0.511	0.337	0.292	0.450	0.457	0.437	0.384	0.417
	0.339	0.487	0.472	0.322	0.311	0.322	0.253	0.219	0.340	0.379	0.415	0.446	0.359
											Average	0.2295	

Hourly and Monthly Capacity Factors for Offshore: Isle of Shoals

2002	Jan	Feb	Mar	Apr	May	Jun	Jly	Aug	Sep	Oct	Nov	Dec	Average
1	0.497	0.515	0.460	0.491	0.480	0.497	0.300	0.321	0.317	0.390	0.520	0.579	0.447
2	0.521	0.549	0.488	0.511	0.491	0.475	0.307	0.309	0.305	0.358	0.494	0.548	0.446
3	0.539	0.546	0.492	0.489	0.502	0.431	0.260	0.284	0.266	0.348	0.500	0.530	0.432
4	0.593	0.551	0.470	0.468	0.464	0.438	0.223	0.252	0.235	0.328	0.505	0.539	0.422
5	0.576	0.559	0.454	0.457	0.415	0.367	0.242	0.220	0.218	0.359	0.495	0.577	0.412
6	0.554	0.542	0.441	0.415	0.406	0.348	0.250	0.211	0.199	0.354	0.483	0.588	0.399
7	0.545	0.525	0.427	0.416	0.377	0.292	0.240	0.201	0.246	0.388	0.506	0.633	0.400
8	0.546	0.506	0.410	0.404	0.352	0.314	0.207	0.196	0.243	0.390	0.496	0.609	0.390
9	0.576	0.521	0.420	0.371	0.394	0.251	0.200	0.191	0.215	0.363	0.488	0.602	0.383
10	0.537	0.450	0.457	0.431	0.356	0.263	0.198	0.207	0.190	0.389	0.547	0.607	0.386
11	0.538	0.428	0.459	0.462	0.360	0.250	0.212	0.206	0.244	0.403	0.532	0.638	0.394
12	0.521	0.409	0.441	0.435	0.368	0.229	0.237	0.171	0.238	0.444	0.547	0.682	0.394
13	0.551	0.429	0.436	0.429	0.399	0.216	0.266	0.183	0.232	0.462	0.515	0.693	0.401
14	0.536	0.409	0.463	0.427	0.426	0.2362	0.2080	0.1780	0.2176	0.468	0.518	0.695	0.399
15	0.481	0.400	0.474	0.413	0.416	0.2456	0.1733	0.1709	0.1942	0.446	0.512	0.695	0.385
16	0.441	0.400	0.439	0.374	0.403	0.2918	0.1931	0.1422	0.2081	0.394	0.512	0.654	0.371
17	0.455	0.424	0.463	0.322	0.455	0.2928	0.1855	0.1797	0.2612	0.366	0.500	0.619	0.377
18	0.456	0.479	0.446	0.363	0.487	0.4006	0.2315	0.2180	0.3335	0.376	0.541	0.600	0.411
19	0.500	0.481	0.403	0.405	0.530	0.488	0.259	0.278	0.328	0.373	0.551	0.550	0.429
20	0.469	0.493	0.438	0.422	0.617	0.526	0.287	0.321	0.352	0.354	0.546	0.546	0.448
21	0.430	0.479	0.477	0.480	0.607	0.533	0.344	0.351	0.391	0.378	0.540	0.535	0.462
22	0.420	0.487	0.504	0.557	0.559	0.541	0.326	0.414	0.392	0.387	0.550	0.530	0.472
23	0.450	0.504	0.533	0.584	0.588	0.547	0.350	0.384	0.368	0.354	0.572	0.528	0.480
24	0.479	0.472	0.497	0.535	0.534	0.511	0.345	0.308	0.342	0.374	0.560	0.569	0.461
	0.509	0.482	0.458	0.444	0.458	0.374	0.252	0.246	0.272	0.385	0.522	0.598	0.417
											Average	0.2281	

Hourly and Monthly Capacity Factors for Offshore: Isle of Shoals

2003	Jan	Feb	Mar	Apr	May	Jun	Jly	Aug	Sep	Oct	Nov	Dec	Average
1	0.594	0.546	0.436	0.372	0.273	0.251	0.365	0.281	0.168	0.377	0.384	0.656	0.392
2	0.579	0.609	0.429	0.381	0.267	0.224	0.325	0.237	0.173	0.360	0.409	0.630	0.385
3	0.579	0.596	0.442	0.367	0.278	0.221	0.307	0.200	0.162	0.347	0.419	0.587	0.376
4	0.575	0.607	0.430	0.330	0.260	0.215	0.271	0.189	0.147	0.359	0.422	0.609	0.368
5	0.585	0.599	0.415	0.345	0.244	0.220	0.268	0.193	0.151	0.371	0.393	0.618	0.367
6	0.595	0.571	0.436	0.340	0.252	0.218	0.248	0.205	0.140	0.370	0.386	0.582	0.362
7	0.615	0.545	0.445	0.321	0.244	0.192	0.204	0.156	0.147	0.373	0.348	0.587	0.348
8	0.603	0.518	0.458	0.327	0.252	0.189	0.162	0.131	0.155	0.343	0.337	0.595	0.339
9	0.603	0.509	0.402	0.355	0.273	0.189	0.141	0.123	0.173	0.360	0.362	0.571	0.338
10	0.617	0.546	0.388	0.382	0.228	0.176	0.147	0.142	0.185	0.370	0.372	0.581	0.344
11	0.612	0.556	0.360	0.374	0.237	0.180	0.155	0.124	0.213	0.379	0.402	0.588	0.348
12	0.624	0.538	0.310	0.378	0.232	0.167	0.136	0.124	0.200	0.378	0.403	0.576	0.339
13	0.616	0.561	0.326	0.352	0.209	0.150	0.141	0.173	0.201	0.392	0.425	0.559	0.342
14	0.580	0.580	0.316	0.366	0.186	0.1877	0.1600	0.1780	0.2075	0.360	0.401	0.543	0.339
15	0.595	0.551	0.304	0.348	0.177	0.2039	0.1898	0.2133	0.1837	0.337	0.351	0.543	0.333
16	0.546	0.507	0.284	0.346	0.159	0.1953	0.1940	0.2188	0.1870	0.308	0.359	0.514	0.318
17	0.536	0.515	0.273	0.362	0.167	0.2237	0.1895	0.2403	0.1842	0.319	0.393	0.521	0.327
18	0.508	0.491	0.352	0.376	0.214	0.2371	0.2859	0.2549	0.1710	0.349	0.383	0.530	0.346
19	0.490	0.412	0.368	0.407	0.267	0.246	0.344	0.256	0.159	0.423	0.386	0.555	0.360
20	0.519	0.408	0.365	0.416	0.258	0.316	0.399	0.310	0.156	0.448	0.344	0.563	0.375
21	0.552	0.436	0.412	0.408	0.299	0.344	0.464	0.340	0.143	0.425	0.365	0.556	0.395
22	0.553	0.461	0.467	0.416	0.285	0.332	0.467	0.360	0.138	0.459	0.368	0.580	0.407
23	0.594	0.463	0.464	0.399	0.283	0.304	0.410	0.333	0.142	0.428	0.372	0.616	0.401
24	0.616	0.497	0.434	0.361	0.275	0.259	0.380	0.313	0.144	0.400	0.381	0.626	0.390
	0.579	0.526	0.388	0.368	0.242	0.227	0.265	0.221	0.168	0.376	0.382	0.579	0.360
											Average	0.2053	

Hourly and Monthly Capacity Factors for Offshore: Isle of Shoals

2004	Jan	Feb	Mar	Apr	May	Jun	Jly	Aug	Sep	Oct	Nov	Dec	Average
1	0.666	0.586	0.537	0.456	0.381	0.347	0.323	0.350	0.341	0.443	0.564	0.586	0.465
2	0.707	0.603	0.496	0.416	0.333	0.361	0.305	0.347	0.314	0.465	0.578	0.573	0.458
3	0.730	0.592	0.488	0.375	0.332	0.383	0.280	0.327	0.285	0.466	0.554	0.546	0.447
4	0.758	0.573	0.497	0.380	0.293	0.416	0.246	0.274	0.285	0.460	0.523	0.520	0.435
5	0.721	0.548	0.450	0.371	0.299	0.402	0.249	0.229	0.259	0.448	0.517	0.515	0.417
6	0.681	0.509	0.467	0.359	0.313	0.329	0.216	0.233	0.231	0.423	0.487	0.531	0.398
7	0.626	0.508	0.484	0.395	0.343	0.285	0.205	0.241	0.214	0.404	0.454	0.550	0.392
8	0.635	0.497	0.427	0.398	0.323	0.231	0.180	0.220	0.272	0.384	0.460	0.561	0.383
9	0.627	0.493	0.383	0.436	0.339	0.244	0.162	0.218	0.265	0.426	0.435	0.573	0.383
10	0.609	0.459	0.409	0.443	0.340	0.266	0.159	0.197	0.265	0.418	0.426	0.552	0.379
11	0.580	0.444	0.423	0.468	0.348	0.260	0.152	0.186	0.274	0.417	0.444	0.560	0.380
12	0.590	0.419	0.385	0.470	0.369	0.252	0.134	0.186	0.254	0.469	0.459	0.570	0.380
13	0.603	0.384	0.375	0.465	0.356	0.234	0.136	0.175	0.231	0.490	0.442	0.574	0.372
14	0.578	0.393	0.369	0.434	0.359	0.185	0.159	0.171	0.185	0.487	0.416	0.563	0.358
15	0.610	0.406	0.401	0.401	0.374	0.168	0.154	0.182	0.194	0.452	0.404	0.534	0.357
16	0.619	0.361	0.414	0.393	0.354	0.170	0.203	0.189	0.191	0.411	0.375	0.523	0.350
17	0.624	0.333	0.385	0.404	0.407	0.192	0.224	0.233	0.204	0.391	0.370	0.512	0.357
18	0.609	0.306	0.408	0.438	0.445	0.266	0.270	0.294	0.237	0.379	0.375	0.492	0.377
19	0.611	0.321	0.432	0.472	0.452	0.315	0.308	0.385	0.289	0.383	0.386	0.512	0.405
20	0.623	0.399	0.470	0.515	0.451	0.347	0.352	0.399	0.328	0.433	0.422	0.517	0.438
21	0.655	0.425	0.515	0.495	0.431	0.366	0.355	0.408	0.332	0.440	0.445	0.536	0.450
22	0.676	0.438	0.522	0.483	0.444	0.379	0.345	0.401	0.369	0.453	0.478	0.575	0.464
23	0.665	0.470	0.534	0.493	0.478	0.357	0.376	0.387	0.385	0.438	0.502	0.568	0.471
24	0.671	0.529	0.533	0.488	0.422	0.337	0.360	0.367	0.354	0.438	0.504	0.585	0.466
	0.645	0.458	0.450	0.435	0.374	0.295	0.244	0.275	0.273	0.434	0.459	0.547	0.408
											Average	0.2036	

Hourly and Monthly Capacity Factors for Offshore: Isle of Shoals

2006	Jan	Feb	Mar	Apr	May	Jun	Jly	Aug	Sep	Oct	Nov	Dec	Average
1	0.445	0.571	0.546	0.458	0.572	0.474	0.524	0.312	0.275	0.498	0.406	0.487	0.464
2	0.480	0.567	0.531	0.369	0.559	0.451	0.446	0.339	0.271	0.518	0.367	0.547	0.454
3	0.484	0.632	0.561	0.348	0.489	0.396	0.417	0.315	0.251	0.530	0.392	0.577	0.449
4	0.471	0.687	0.544	0.369	0.409	0.401	0.378	0.298	0.235	0.542	0.446	0.598	0.448
5	0.521	0.678	0.498	0.355	0.409	0.375	0.389	0.259	0.219	0.534	0.445	0.572	0.438
6	0.550	0.671	0.439	0.335	0.380	0.339	0.336	0.193	0.244	0.500	0.428	0.572	0.415
7	0.556	0.641	0.423	0.351	0.399	0.300	0.284	0.214	0.243	0.488	0.425	0.536	0.405
8	0.553	0.623	0.425	0.324	0.401	0.291	0.265	0.191	0.292	0.500	0.426	0.517	0.401
9	0.564	0.617	0.424	0.362	0.438	0.329	0.248	0.191	0.304	0.487	0.397	0.511	0.406
10	0.532	0.621	0.407	0.379	0.442	0.346	0.242	0.171	0.276	0.499	0.393	0.557	0.405
11	0.548	0.589	0.382	0.380	0.442	0.353	0.219	0.183	0.268	0.449	0.354	0.554	0.393
12	0.589	0.588	0.396	0.386	0.451	0.354	0.222	0.177	0.279	0.469	0.357	0.542	0.401
13	0.546	0.583	0.423	0.409	0.438	0.332	0.193	0.165	0.262	0.431	0.351	0.534	0.389
14	0.516	0.530	0.487	0.372	0.436	0.274	0.144	0.152	0.267	0.399	0.325	0.559	0.372
15	0.494	0.512	0.472	0.328	0.409	0.274	0.168	0.177	0.244	0.354	0.333	0.548	0.359
16	0.484	0.519	0.407	0.350	0.409	0.271	0.170	0.173	0.262	0.319	0.321	0.528	0.351
17	0.492	0.496	0.407	0.383	0.449	0.312	0.222	0.200	0.271	0.360	0.302	0.473	0.364
18	0.471	0.529	0.402	0.437	0.506	0.346	0.287	0.182	0.307	0.397	0.282	0.444	0.383
19	0.449	0.546	0.426	0.458	0.545	0.412	0.319	0.200	0.342	0.426	0.303	0.445	0.406
20	0.494	0.595	0.509	0.472	0.511	0.446	0.387	0.228	0.359	0.472	0.363	0.449	0.440
21	0.486	0.612	0.566	0.495	0.563	0.427	0.430	0.237	0.311	0.516	0.381	0.453	0.456
22	0.452	0.623	0.597	0.493	0.586	0.516	0.464	0.241	0.310	0.523	0.372	0.448	0.469
23	0.428	0.627	0.596	0.493	0.573	0.570	0.501	0.245	0.327	0.510	0.416	0.430	0.476
24	0.452	0.576	0.534	0.456	0.604	0.508	0.530	0.252	0.316	0.516	0.432	0.440	0.468
	0.502	0.593	0.475	0.398	0.476	0.379	0.324	0.221	0.281	0.468	0.376	0.513	0.417
											Average	0.2352	

Hourly and Monthly Capacity Factors for Offshore: Bishop and Clerks

2003	Jan	Feb	Mar	Apr	May	Jun	Jly	Aug	Sep	Oct	Nov	Dec	Average
1	0.700	0.626	0.506	0.535	0.370	0.357	0.437	0.627	0.418	0.661	0.516	0.746	0.542
2	0.698	0.627	0.508	0.537	0.344	0.366	0.450	0.608	0.429	0.662	0.526	0.751	0.542
3	0.707	0.643	0.493	0.556	0.368	0.310	0.414	0.609	0.447	0.641	0.507	0.747	0.537
4	0.722	0.674	0.453	0.586	0.395	0.296	0.384	0.577	0.466	0.639	0.501	0.727	0.535
5	0.711	0.659	0.447	0.593	0.428	0.363	0.361	0.572	0.551	0.588	0.501	0.711	0.540
6	0.700	0.621	0.460	0.630	0.454	0.358	0.344	0.583	0.566	0.625	0.511	0.712	0.547
7	0.690	0.652	0.490	0.612	0.448	0.364	0.343	0.562	0.533	0.603	0.553	0.740	0.549
8	0.715	0.658	0.519	0.606	0.434	0.370	0.346	0.574	0.488	0.580	0.577	0.718	0.549
9	0.695	0.673	0.542	0.620	0.487	0.309	0.339	0.564	0.451	0.560	0.607	0.683	0.544
10	0.657	0.660	0.557	0.591	0.468	0.303	0.350	0.535	0.435	0.553	0.584	0.668	0.530
11	0.650	0.657	0.542	0.606	0.473	0.343	0.368	0.523	0.421	0.520	0.570	0.700	0.531
12	0.633	0.671	0.575	0.607	0.442	0.366	0.416	0.511	0.453	0.542	0.574	0.696	0.540
13	0.643	0.719	0.619	0.658	0.469	0.404	0.527	0.494	0.505	0.595	0.585	0.701	0.576
14	0.646	0.686	0.604	0.667	0.460	0.4221	0.5721	0.4934	0.5337	0.627	0.601	0.744	0.588
15	0.658	0.667	0.581	0.636	0.471	0.4260	0.6121	0.5329	0.5458	0.643	0.598	0.734	0.592
16	0.654	0.706	0.554	0.638	0.425	0.4413	0.6397	0.5940	0.5511	0.621	0.615	0.691	0.594
17	0.670	0.707	0.561	0.621	0.435	0.4099	0.5933	0.6134	0.5383	0.654	0.595	0.669	0.589
18	0.692	0.711	0.565	0.612	0.403	0.3980	0.5526	0.6340	0.4970	0.653	0.566	0.675	0.580
19	0.652	0.680	0.529	0.612	0.362	0.396	0.603	0.588	0.479	0.641	0.559	0.707	0.567
20	0.699	0.644	0.534	0.557	0.364	0.350	0.594	0.591	0.464	0.631	0.562	0.733	0.560
21	0.718	0.637	0.562	0.592	0.397	0.351	0.572	0.569	0.449	0.609	0.520	0.726	0.558
22	0.700	0.611	0.601	0.591	0.376	0.383	0.528	0.567	0.449	0.622	0.534	0.708	0.556
23	0.659	0.608	0.550	0.579	0.346	0.388	0.500	0.599	0.450	0.627	0.529	0.739	0.548
24	0.648	0.592	0.542	0.527	0.347	0.342	0.474	0.622	0.448	0.635	0.530	0.764	0.539
	0.680	0.658	0.537	0.599	0.415	0.367	0.472	0.573	0.482	0.614	0.555	0.716	0.531
											Average	0.5300	

Hourly and Monthly Capacity Factors for Offshore: Bishop and Clerks

2004	Jan	Feb	Mar	Apr	May	Jun	Jly	Aug	Sep	Oct	Nov	Dec	Average
1	0.701	0.593	0.556	0.467	0.431	0.535	0.382	0.537	0.568	0.544	0.564	0.669	0.546
2	0.693	0.563	0.622	0.488	0.447	0.513	0.410	0.504	0.573	0.525	0.569	0.670	0.548
3	0.719	0.581	0.612	0.539	0.489	0.479	0.398	0.504	0.572	0.525	0.544	0.651	0.551
4	0.741	0.546	0.616	0.558	0.457	0.447	0.434	0.531	0.575	0.513	0.532	0.653	0.550
5	0.727	0.511	0.622	0.535	0.429	0.442	0.420	0.532	0.560	0.515	0.520	0.659	0.539
6	0.707	0.524	0.607	0.586	0.418	0.444	0.400	0.525	0.540	0.558	0.517	0.667	0.541
7	0.716	0.520	0.569	0.583	0.428	0.457	0.379	0.511	0.503	0.597	0.510	0.643	0.535
8	0.740	0.531	0.572	0.595	0.432	0.446	0.355	0.498	0.487	0.590	0.509	0.637	0.533
9	0.760	0.565	0.610	0.582	0.425	0.439	0.360	0.469	0.508	0.617	0.511	0.675	0.543
10	0.741	0.559	0.619	0.595	0.446	0.400	0.374	0.477	0.513	0.618	0.513	0.632	0.541
11	0.748	0.575	0.598	0.598	0.492	0.440	0.401	0.518	0.510	0.627	0.530	0.657	0.558
12	0.744	0.600	0.591	0.642	0.497	0.460	0.418	0.556	0.496	0.669	0.515	0.651	0.570
13	0.710	0.568	0.621	0.601	0.490	0.469	0.472	0.596	0.472	0.668	0.530	0.661	0.571
14	0.711	0.551	0.670	0.590	0.458	0.4709	0.4951	0.5943	0.4524	0.657	0.536	0.671	0.571
15	0.672	0.589	0.718	0.612	0.508	0.5066	0.5294	0.6289	0.4645	0.639	0.566	0.684	0.593
16	0.677	0.585	0.729	0.618	0.576	0.5348	0.5705	0.6154	0.4667	0.598	0.570	0.675	0.601
17	0.673	0.562	0.736	0.624	0.566	0.5241	0.5559	0.6689	0.4985	0.562	0.544	0.701	0.601
18	0.654	0.517	0.716	0.604	0.523	0.5100	0.5125	0.6171	0.4792	0.525	0.527	0.732	0.576
19	0.632	0.460	0.699	0.563	0.490	0.502	0.525	0.600	0.491	0.518	0.587	0.718	0.565
20	0.680	0.467	0.707	0.546	0.506	0.523	0.495	0.594	0.504	0.505	0.611	0.696	0.569
21	0.687	0.533	0.670	0.532	0.481	0.525	0.462	0.599	0.525	0.513	0.606	0.700	0.569
22	0.683	0.532	0.658	0.551	0.479	0.501	0.464	0.559	0.543	0.559	0.593	0.694	0.568
23	0.671	0.553	0.599	0.521	0.498	0.499	0.446	0.543	0.564	0.550	0.571	0.704	0.560
24	0.695	0.575	0.583	0.501	0.500	0.503	0.425	0.541	0.547	0.535	0.575	0.696	0.556
	0.703	0.548	0.637	0.568	0.478	0.482	0.445	0.555	0.517	0.572	0.548	0.675	0.548
											Average	0.5348	