Appendix II-M4

Aircraft Detection Lighting System (ADLS) Efficacy Analysis

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Atlantic Shores Offshore Wind

Environmental Design & Research

Offshore Atlantic and Ocean Counties, New Jersey

Aircraft Detection Lighting System (ADLS) Efficacy Analysis

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Summary

Capitol Airspace conducted an Aircraft Detection Lighting System (ADLS) efficacy analysis for Atlantic Shores Offshore Wind, LLC (Atlantic Shores) project located off the coast of Atlantic and Ocean Counties, New Jersey. At the time of this analysis, 200 individual wind turbine locations had been identified (black points, ***Figure 1***) within the southern portion of Lease Area OCS-A-0499 (shaded gray, ***Figure 1***), referred to as the wind turbine area (WTA, blue area, ***Figure 1***). The WTA includes Project 1 (dashed blue outline, ***Figure 1***), Project 2 (dashed orange outline, ***Figure 1***), and an Overlap Area (dashed purple outline, ***Figure 1***). This analysis utilized historic air traffic data obtained from the Federal Aviation Administration (FAA) in order to determine the total duration that an ADLS-controlled obstruction lighting system would have been activated for the WTA. The results of this analysis will be used to predict an ADLS's effectiveness in reducing the total amount of time that an obstruction lighting system would be activated.

An ADLS utilizes surveillance radar to track aircraft operating in proximity to the WTA. The ADLS will activate the obstruction lighting system when aircraft enter the light activation volume[1] and will deactivate the system when all aircraft depart the light activation volume. As a result, the ADLS provides nighttime conspicuity on an as-needed basis thereby reducing the amount of time that obstruction lights will be illuminated. Depending on the volume of nighttime flights transiting a project's light activation volume, an ADLS could result in a significant reduction in the amount of time obstruction lights are illuminated. This reduces the impact of nighttime obstruction lighting on nearby communities, migratory birds, and extends the life expectancy of the obstruction lights.[2]

Historical air traffic data for flights passing through the WTA light activation volume indicated that ADLS-controlled obstruction lights would have been activated for a total of 8 hours 35 minutes and 9 seconds over a one-year period for 880- or 890-foot-tall wind turbines. Light activation duration increases slightly for 1,048-foot-tall wind turbines to 8 hours 40 minutes and 11 seconds over a one-year period. Considering the local sunrise and sunset times, an ADLS-controlled obstruction lighting system could result in over a 99% reduction in system activated duration as compared to a traditional always-on obstruction lighting system.

[1] Light Activation Volume – A three-dimensional volume of airspace, or coverage area, around the obstructions with a minimum 3 nautical mile perimeter around the edge of the WTA, and a minimum of 1,000 feet above the highest part of the obstructions in the WTA.

[2] FAA Marking and Lighting Advisory Circular AC 70/7460-1M, Chapter 10. Aircraft Detection Lighting Systems, Purpose, 11/16/2020

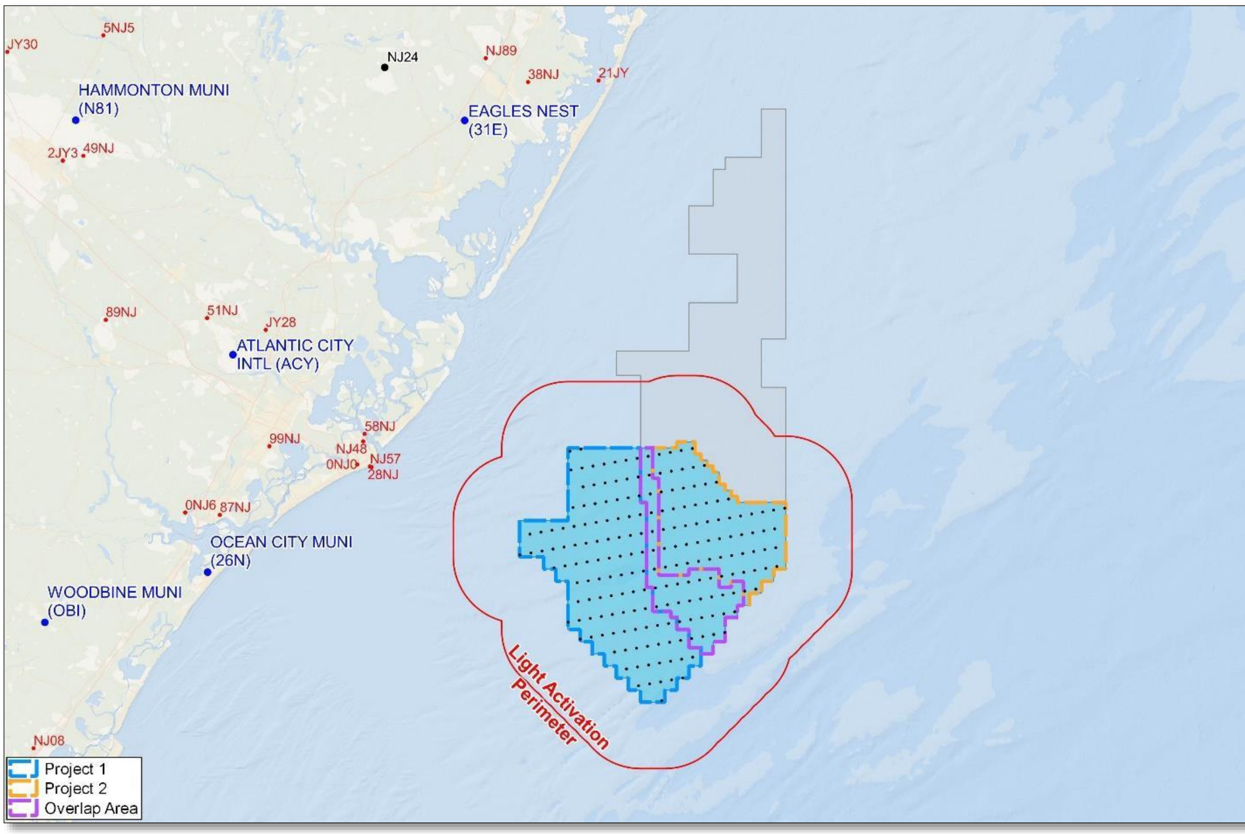

Figure 1: Public-use (blue), private-use (red), and military (black) airports in proximity to the Atlantic Shores offshore wind project with a lateral depiction of the WTA Light Activation Volume (red outline)

Methodology

Capitol Airspace analyzed FAA National Offload Program (NOP) radar returns in proximity to the WTA for the period that occurred between January 1, 2019 and December 31, 2019. FAA NOP data only includes secondary radar returns which are created if the identified aircraft is equipped with a transponder. Aircraft operations without an active transponder were not captured as part of this dataset. Within 75 nautical miles of the WTA, the NOP data contained 936,495,259 different radar returns from 15 different air traffic control (ATC) facilities.[3] These radar returns were associated with 8,058,387 unique flight tracks.

The following process was followed to determine the frequency of nighttime aviation operations in proximity to the WTA:

1. Define Three-Dimensional Light Activation Volume – In accordance with FAA Advisory Circular 70/7460-1M, obstruction lights controlled by an ADLS must be activated and illuminated prior to an aircraft reaching three nautical miles from, and 1,000 feet above, any obstruction. However, the actual light activation volume will vary depending on the ADLS. At the time of this analysis, a specific ADLS had not been selected for the WTA. In order to account for varying radar systems as well as aircraft speeds and descent rates, Capitol Airspace assessed a 3.55 nautical mile buffer (solid red outline, ***Figure 1***) around the wind project at altitudes up to 3,500 feet above the highest wind turbine (4,400 and 4,600 feet above mean sea level [AMSL] based on 880/890- and 1,048-foot-tall wind turbines, respectively).
2. Calculate Sunrise and Sunset – Sunrise and sunset times were calculated for each day of the year based on the United States Naval Observatory definition of sunrise and sunset.[4] Sunrise time was calculated at the westernmost edge of the light activation volume. Sunset time was calculated at the easternmost edge of the light activation volume.
3. Select Nighttime Radar Returns – Since traditional obstruction lights can rely on ambient light sensors to identify darkness, nighttime was considered to occur between 30 minutes prior to sunset until 30 minutes after sunrise. This represents the time during which a traditional obstruction lighting system would likely be activated. All radar returns within the light activation volume that occurred during this period were evaluated. In accordance with guidance provided by the FAA, if an ADLS loses track of an aircraft, a 30-minute timer should be initiated to keep the obstruction lights activated while the aircraft can clear the wind project area. Since the application of ADLS requires site specific radar surveillance systems that will be focused on the project area, Capitol Airspace does not anticipate a likelihood of dropped tracks.
4. Remove Time Overlap – To remove the duration of overlap occurring when more than one flight transits the light activation volume at the same time, each nighttime flight was compared to every other nighttime flight. Where overlapping flights were found, the overlapping flight's duration within the light activation volume was removed from the total obstruction lighting system activation time.

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[3] Source facilities included Allentown (ABE) TRACON, Atlantic City (ACY) TRACON, Albany (ALB) TRACON, Wilkes-Barre (AVP) TRACON, Harrisburg (MDT) TRACON, New York (N90) TRACON, Norfolk (ORF) TRACON, Potomac (PCT) TRACON, Philadelphia (PHL) TRACON, Reading (RDG) TRACON, Yankee (Y90) TRACON, Boston (ZBW) ARTCC, Washington (ZDC) ARTCC, New York (ZNY) ARTCC, and Cleveland (ZOB) ARTCC.

[4] Sunrise and sunset conventionally refer to the times when the upper edge of the disk of the Sun is on the horizon, considered unobstructed relative to the location of interest. Atmospheric conditions are assumed to be average, and the location is in a level region on the Earth's surface. (U.S. Naval Observatory Astronomical Applications Department: Rise, Set, and Twilight Definitions, 8/16/2004).

Results

FAA NOP data indicates that as many as 3,481 flights had at least one radar return within the WTA light activation volume (red outline, ***Figure 2***). However, many of these flights occurred during daytime. Using local sunrise and sunset times, Capitol Airspace determined that as many as 526 flights (purple tracks, ***Figure 3***) had at least one radar return within the light activation volume during the nighttime period when a traditional obstruction lighting system would be activated. Each of the 526 flights was further evaluated to determine the amount of time it remained within the light activation volume. Over a one-year period, these flights would have resulted in a total obstruction light system activated duration of 8 hours 35 minutes and 9 seconds for 880- or 890-foot-tall wind turbines. Total obstruction light system activated duration increases slightly to 8 hours 40 minutes and 11 seconds for 1,048-foot-tall wind turbines.

Considering that the ADLS light activation perimeter associated with the Atlantic Shores Projects' WTA observes approximately 4,751 hours of nighttime each year, an ADLS-controlled obstruction lighting system could result in over a 99% reduction in system activated duration as compared to a traditional always-on obstruction lighting system (***Table 1***).

Table 1: Typical duration of light system activation time during each month

Month	Nighttime Observed (HHH:MM:SS)	Light System Activated Duration (HH:MM:SS)		
		880-foot-tall wind turbines	890-foot-tall wind turbines	1,048-foot-tall wind turbines
January	479:05:36	01:01:58 (0.22%)	01:01:58 (0.22%)	01:01:58 (0.22%)
February	405:38:50	00:58:11 (0.24%)	00:58:11 (0.24%)	01:01:39 (0.25%)
March	410:56:24	00:58:25 (0.24%)	00:58:25 (0.24%)	00:58:25 (0.24%)
April	359:01:17	00:07:52 (0.04%)	00:07:52 (0.04%)	00:07:52 (0.04%)
May	337:05:52	00:15:53 (0.08%)	00:15:53 (0.08%)	00:15:53 (0.08%)
June	309:35:08	00:08:19 (0.04%)	00:08:19 (0.04%)	00:08:29 (0.05%)
July	328:20:32	01:04:36 (0.33%)	01:04:36 (0.33%)	01:04:51 (0.33%)
August	357:52:20	00:21:27 (0.10%)	00:21:27 (0.10%)	00:21:37 (0.10%)
September	383:14:48	00:14:12 (0.06%)	00:14:12 (0.06%)	00:14:12 (0.06%)
October	435:42:31	00:15:03 (0.06%)	00:15:03 (0.06%)	00:15:44 (0.06%)
November	455:22:51	02:40:05 (0.59%)	02:40:05 (0.59%)	02:40:08 (0.59%)
December	488:44:16	00:29:08 (0.10%)	00:29:08 (0.10%)	00:29:23 (0.10%)
Total	**4750:40:25**	**08:35:09 (0.18%)**	**08:35:09 (0.18%)**	**08:40:11 (0.18%)**

Please contact ***Dan Underwood*** or ***Candace Childress*** at (703) 256-2485 with any questions regarding the findings of this analysis.

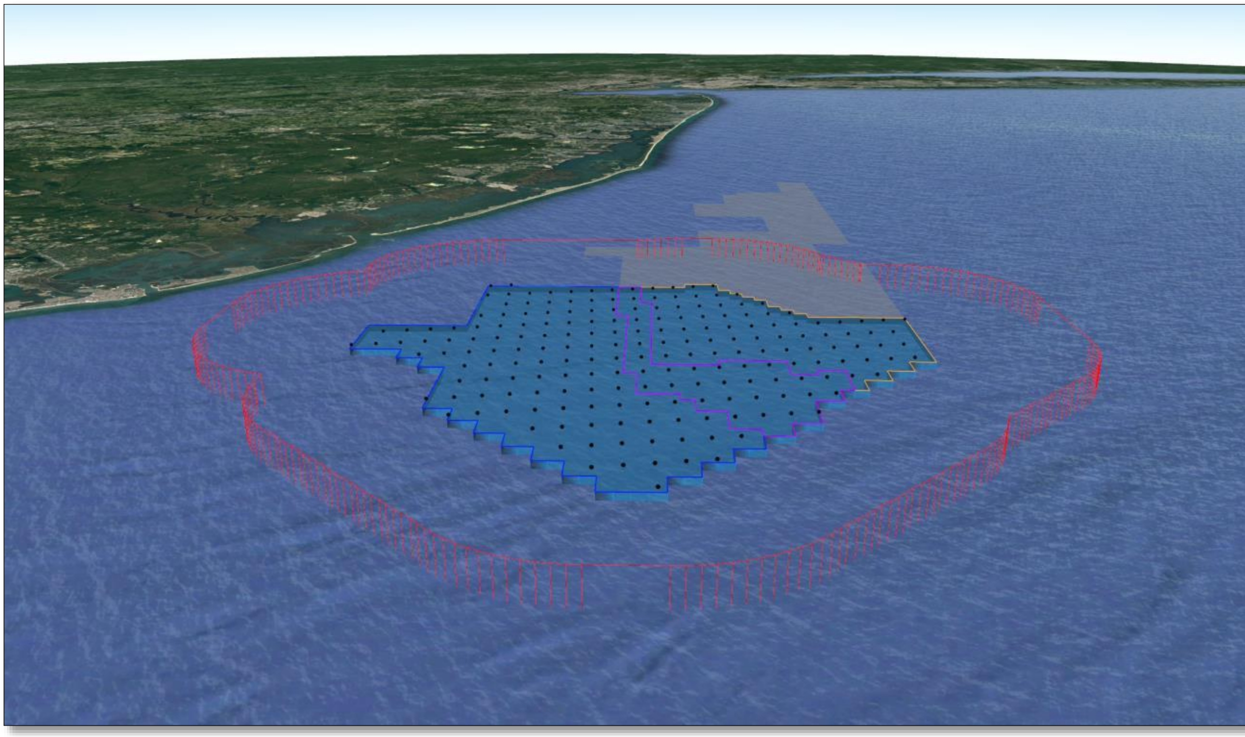

Figure 2: Atlantic Shores offshore wind project WTA (blue) and light activation volume (red outline)

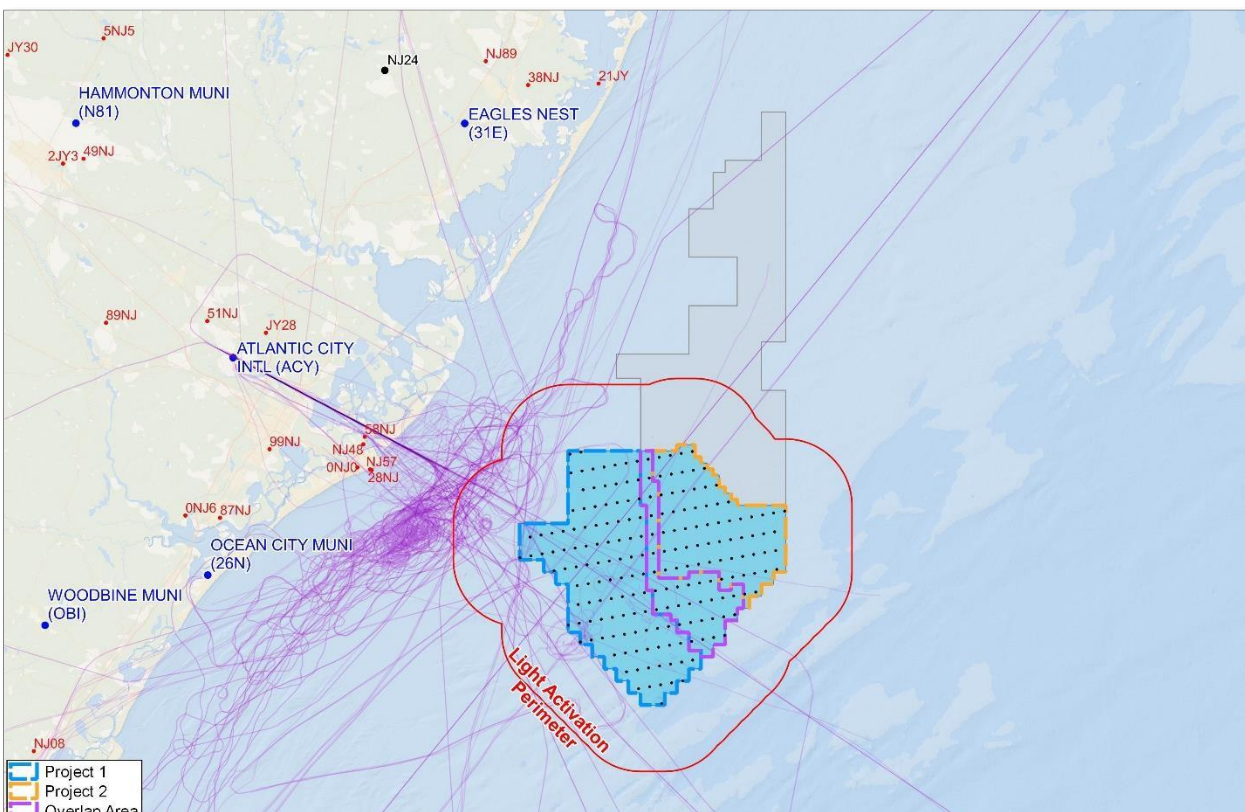

Figure 3: Flight tracks (purple) that would have activated ADLS obstruction lights (based on 1,048-foot-tall wind turbines)