Human Factors

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Review and Comparative Analysis of Visual Impact Assessment

Prepared for:

Falmouth, MA

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Prepared for:

Falmouth, MA

Prepared by:

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February 1, 2022

Warning—This document is draft material and work-in-progress—Warning
Significant changes may occur as a result of final quality checking

Scope and Limitations

The town of Falmouth, MA, requested that Exponent perform a high-level review and comparative analysis of the Visual Impact Assessment (VIA) prepared by Mayflower Wind Energy LLC ("Mayflower") for the Mayflower Wind Project, a set of onshore transmission connector facilities that will be used to interconnect up to 1,200 megawatts (MW) of clean renewable energy to the New England bulk power grid in Falmouth, MA. Exponent compared the Mayflower VIA with other similar filing information and published authoritative resources pertaining to VIA methodology and processes. This high-level analysis was intended to (1) summarize any noteworthy differences between the Mayflower report and other similar previous filing information, to the extent that such differences exist, and (2) provide actionable feedback for consideration, to the extent that such actions appear fundamental to established VIA procedures.

The role of Exponent in this project is advisory in nature, and the opinions, analyses, conclusions, results, suggestions, and the like, hereafter referred to as "work products," must be assessed by the town of Falmouth with respect to its services. Falmouth assumes full and complete responsibility for all uses and applications of work products, or failure to use work products, as well as for the application of any data captured through use of the work products. Exponent involvement is based on scientific literature, industry standards, and the training, education, and experience of the Exponent consulting staff. Work products do not represent safety certification of any sort.

The findings presented herein are made to a reasonable degree of engineering and scientific certainty. Exponent reserves the right to supplement this report and to expand or modify opinions based on review of additional material if it becomes available.

Comparative Analysis of VIAs

VIA Scope and Key Process

A VIA aims to quantify potential adverse and advantageous consequences of a proposed project's components that are visible onshore.[1] The process of assessing the visual impact of project components almost ubiquitously involves determining key observation points (KOPs), or probable sites where components may be viewed and experienced by humans.[2] Such KOPs are often photographically simulated under a variety of conditions, such as estimated ranges of visual impact, the number, and profiles (e.g., activities performed during viewing, viewing experiences of residents, commuters, tourists, etc.) of potential viewers, magnitude of visual impacts, and viewer sensitivity to visual impacts.[3] The Natural Environment Policy Act of 1969 (NEPA) requires Federal agencies to assess the environmental effects of proposed actions prior to allowing permitting.[4] The act does not specifically require a VIA, but the requirements of the act can be satisfied by using a methodology established by a Federal agency.[5] Table 1 shows the general process of a VIA under the NEPA and whether the two subject reports – the Mayflower report and a similar, useful, but offshore-focused report for the Vineyard Wind Project – include any consideration of that process.

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[1] AECOM, 2021, p. 1-1
[2] Sullivan et al., 2018
[3] Sullivan et al., 2018
[4] Sullivan et al., 2018, p. 202
[5] Sullivan et al., 2018, p. 202

Table 1. Key Process for VIAs

	Mayflower Wind (2021)[6]	Vineyard Wind (2020)[7]
Create Project Description	+	+
Determine Elements Causing Visual Impact	+	+
Determine Geographic Scope	+	+
Conduct Viewshed Analysis	+	+
Identify Visual Impact Receptors	+	+
Identify KOPs within Viewshed	+	+
Identify Affected Activities, Viewer Characteristics, View Duration	+	+
Identify Landscape Character in Potentially Affected Area	+	+
Identify Required Mitigation	+	+
Create Photo Simulations	+/-[8]	+
Assess Nature and Magnitude of Visual and Landscape Character Impacts	+	+
Construction and Decommissioning Impacts	+	+
Determine Impact to Traditional Cultural Properties	+	+

Geographic Scope

The Vineyard Wind Project's VIA specifies that the proposed location for the development area is 14 miles from shore. In contrast, the Mayflower Wind Project's VIA indicates that the impact area includes potential onshore development and extends from the southern coast of Falmouth to 1.5 miles south of the northern boundary.[9]

Photographic and Video Simulations

Both VIAs make use of photographic simulations, but Mayflower Wind documentation does not include the photo simulations used for its VIA. The simulations that were created purportedly modeled various times of day (i.e., morning to sunset), but not night.[10] The GLVIA recommends assessing for obtrusive lighting by carrying out nighttime "darkness" surveys and incorporating

[6] AECOM, 2021
[7] Epsilon Associates, Inc. 2020
[8] The Mayflower Wind Project does not provide the simulation photos as part of the report for independent review while the Vineyard Wind Project does. In addition, simulations relied upon did not include night simulations.
[9] AECOM, 2021, p. 6-12
[10] AECOM, 2021, p. 6-14

potential effects of lighting into photographic simulations.[11] The GLVIA also recommends quantitative assessment and report of illumination levels.[12] Illumination levels onshore do not appear assessed or offered in the Mayflower report. Simulation of the onshore substation may inform visual impact potential, as Mayflower's substation plans included eight-foot-high fences with barbed wire, and 80-foot-high lightning protection masts.[13] Visual impact potential of onshore development was characterized as medium to medium/high based on medium visual contrast, medium to high sensitivity, and partial vegetative screening, without factoring in mitigation or onshore substation simulations.[14]

Mitigation of Visual Impacts

Both the Mayflower Wind Project VIA and the Vineyard Wind Project VIA include mitigation strategies, as suggested by the GLVIA. But Mayflower did not report mitigation measures for avoiding or reducing obtrusive lighting or light pollution, contrary to the GLVIA.[15] The Mayflower Wind Project considered visual impacts of vegetation and other screens, as well as building design within Cape Cod village context for the onshore development. The GLVIA encourages developers to provide all considered mitigation strategies in a detailed report.[16] The GLVIA recommends including offsetting measures for negative visual impacts.[17] These measures may include parks, greenspaces, or art to counter unavoidable negative effects.[18] The GLVIA also notes that contingency planning is important, should a mitigation measure fail. Therefore, it may be beneficial for the Mayflower Wind Report to state what alternatives may be planned, if any.

Visual Impact

The Vineyard Wind Project VIA concluded that only minor visual impacts were expected. This is likely because Vineyard Wind utilized an existing onshore substation and was the first approved

[11] GLVIA, 2013, p. 133
[12] GLVIA, 2013, p. 133
[13] MAYFLOWER-AECOM, 2021, p. 4
[14] AECOM, 2021, p. 6-20
[15] GLVIA, 2013, p. 60
[16] GLVIA, 2013, p. 53
[17] GLVIA, 2013, p. 62
[18] GLVIA, 2013, p. 62

project in the area.[19] By contrast, the Mayflower Wind Project estimated that the overall visual impact will be medium, with some potential for high impact.[20] Given that visual impacts associated with the Mayflower Wind Project are estimated to be greater than visual impacts associated with the Vineyard Wind Project, Mayflower Wind may consider developing additional mitigation strategies or offsetting measures to reduce the likelihood of onshore visual impacts. Lighting does not appear to be considered as part of the visibility of the onshore developments during the visual analysis phase.[21] The visual analysis phase entails analyzing the photos of KOPs and simulations in order to assess the post-development impact, which is based on how sensitive potential viewers may be to development, and the visibility level of the development.[22]

Other Potential Considerations

In general, limitations of KOP-based assessments have been identified. KOP-based assessments usually do not account for cumulative visual effects of developments, nor do they usually account for ways in which human sensitivity may change over time as land use, human behavior, and KOPs change.[23] The Mayflower Wind VIA indicated that cumulative effects will be assessed, as directed by the BOEM, for the offshore installations following COP submission.[24] However, Mayflower did not consider cumulative effects for the Falmouth onshore installations. Mayflower noted that the project adds cumulative impacts to existing visual disturbances in the onshore study area, but no further details were provided. Mayflower provided simulations and data to the BOEM in conjunction with an assessment of cumulative effects offshore; however, given that the Vineyard Wind Project VIA was approved in the same general area, and seven others are being designed or are under review,[25] additional evaluations of cumulative visual effects may be useful to consider regarding the onshore Falmouth installations. The GLVIA has devoted a chapter to assessing cumulative visual effects.[26] Thus, guidance exists for conducting such an assessment.

[19] Epsilon Associates, Inc. 2020, p. 11
[20] AECOM, 2021, p. 5-51
[21] AECOM, 2021, p. 3-13
[22] AECOM, 2021, p. 4-1
[23] Sullivan et al., 2018
[24] AECOM, 2021, p. v
[25] AECOM 2021, p. 5-52
[26] GLVIA, 2013

Preliminary Considerations

To more closely align the Mayflower VIA with published authoritative resources, the following preliminary considerations are offered to the town of Falmouth and to Mayflower:

(1) Consider including all photographic simulations, in addition to darkness/nighttime surveys of the substation area, quantitative assessment of lighting levels, and linking to video simulations within the VIA report. An approved VIA filing from 2020 (i.e., the Vineyard Wind Project) included photographic simulations and links to video simulations. Although Mayflower indicated that photographic simulations were created, it appears that these simulations were not included in the present VIA under review;

(2) Mayflower may consider developing and proposing additional mitigation strategies for reducing potential adverse visual impacts of obtrusive lighting. Examples of additional relevant mitigation strategies offered in the GLVIA include: (a) adding screens such as berms, fences, or vegetative barriers to decrease visual impact, (b) developing contingency plans for failed or unapproved mitigation strategies if that mitigation is not possible, and (c) including offsetting measures such as parks, greenspaces, or works of art; and

(3) Mayflower may consider assessing, and/or reporting in more detail, the cumulative visual effects for the onshore development in its VIA. It is noted here that the Mayflower VIA states that cumulative effects will be assessed only for the offshore installations as part of the subsequent COP. Cumulative effects may be important considerations for onshore installations as well.

References

AECOM (2021). Mayflower Wind: Appendix T. Visual Impact Assessment.

Epsilon Associates, Inc. (2020) Vineyard Wind Project: Visual Impact Assessment, Appendix III-H.a.

Landscape Institute & Institute of Environmental Management and Assessment (2013). *Guidelines for landscape and visual impact assessment* (3rd ed.). London: Routledge.

MAYFLOWER-AECOM (2021). Environmental Notification Form.

Sullivan, R. G., Meyer, M. E., & O'Rourke, D. J. (2018). Comparison of visual impact analysis under the National Environmental Policy Act and section 106 of the National Historic Preservation Act. In: *Gobster, Paul H.; Smardon, Richard C., eds. Visual resource stewardship conference proceedings: landscape and seascape management in a time of change.* Gen. Tech. Rep. NRS-P-183. Newtown Square, PA: US Department of Agriculture, Forest Service, Northern Research Station: 201-212. (pp. 201-212).

Sullivan, R. G. (2021) Assessment of Seascape, Landscape, and Visual Impacts of Offshore Wind Energy Developments on the Outer Continental Shelf of the United States. OCS Study BOEM

END OF REPORT

Author Biographies

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Dr. Coelho is a human factors professional with experience in several industries, including aviation, aerospace, on-shore and off-shore oil and gas, chemical, marine, mining, construction, manufacturing, and utilities. A cognitive neuroscientist whose research focuses on human motor control, he applies a uniquely interdisciplinary expertise in cognitive and physical behavior to issues such as warnings and labels, human error and reliability, decision making, safety in design, human-machine interfacing, and ergonomics.

Dr. Coelho conducts risk analyses aimed at reducing human error through incorporating human factors principles in design, policies, procedures, hardware, software, work environments, and team resource management. Dr. Coelho is a published subject matter expert on a variety of topics, including action selection, manual object manipulation, handedness, hand choice, lateralized performance asymmetries of the arms, coordination of walking, standing, and reaching behaviors, decision making, learning, visual object recognition, human fatigue risk management, and risk perception. He is practiced at evaluating compliance with regulatory requirements and assessing conformance with voluntary standards, including those published by the American National Standards Institute (ANSI), International Organization for Standardization (ISO), National Fire Protection Association (NFPA), and others. Prior to joining Exponent, Dr. Coelho started his applied professional career as a human factors design engineer supporting the International Space Station Program at NASA Johnson Space Center.

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Dr. Bailey is a human factors professional and Board Certified Behavior Analyst with expertise in applied behavior analysis, behavioral economics, and statistical decision science. Dr. Bailey assists clients with analyses of scientific and authoritative literature regarding human behavior, human performance, as well as regulatory and voluntary consensus standards that apply to products, policies, and services. He has worked on numerous projects involving review and synthesis of information for products and policies. He provides expert analysis in issues involving such as decision making, learning, sensation, and perception, and in cases that require analysis of the influence of competence and motivation on behavior in workplace and consumer settings. As a complement to behavior analysis, Dr. Bailey uses his expertise in statistical decision science, including machine learning, to solve complex multivariate problems.

Prior to joining Exponent, Dr. Bailey served as a behavior analyst in a variety of roles. He began his post-doctoral career as an assistant professor at Franciscan Missionaries of Our Lady University in Baton Rouge, Louisiana. He also served as a research consultant for DynamiCare Health in Boston, Massachusetts.