Learning from the Experts Webinar Series

The Science of Visibility

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June 23, 2021

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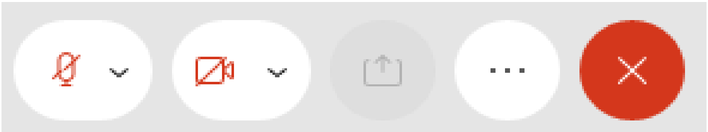
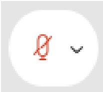


You'll see  **when your microphone is muted**

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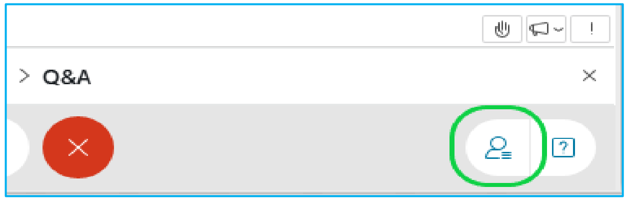

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Learning from the Experts

This webinar series is hosted by NYSERDA's offshore wind team and features experts in offshore wind technologies, development practices, and related research.

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The Science of Visibility

Gordon Perkins and Kiva VanDerGeest

Wednesday, June 23, 2021 1:00 pm

EDR

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Speakers

EDR's staff includes landscape architects, civil engineers, regulatory compliance specialists, ecologists, community planners, cultural resource professionals, and graphic communication and mapping specialists that uniquely come together as a multi-disciplinary team to address client needs while demonstrating stewardship to the aesthetic, cultural and the natural environment.

Gordon Perkins, GISP
Visualization Practice Leader

I have a background in Landscape Architecture and 21 years of experience in Visual Resource Assessment focusing on the potential visibility and visual effects associated with renewable energy projects.

Kiva VanDerGeest, AICP
Visualization Project Manager

I have a background in Landscape Architecture, Fine Arts, and Community Planning. I bring planning aspects into the visual assessment science to better understand how renewable energy projects may affect community initiatives and goals.

Agenda

1. Develop Visibility Thresholds
2. Establish a Visual Study Area
3. Determine Project Visibility
4. Identify Sensitive Viewing Areas
5. Develop Visual Simulations
6. Determine Factors that Influence Visibility

What factors contribute to the visibility threshold?

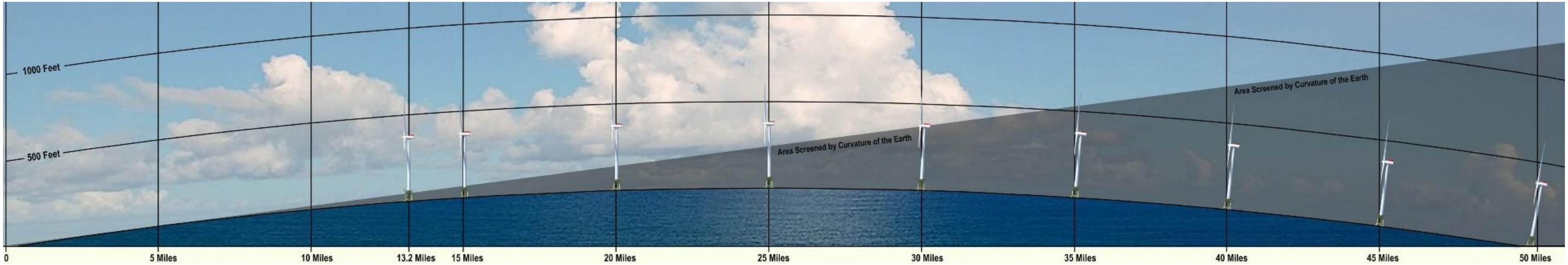
Constant

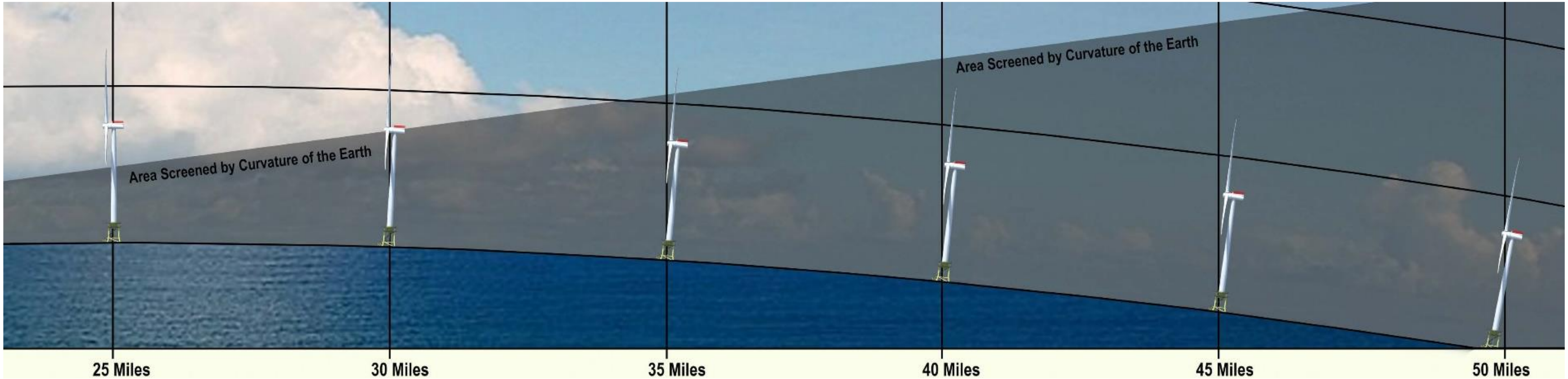
- Curvature of the Earth
- Human Visual Acuity
- Size of the Viewed Object
- Viewer Elevation
- Distance of the Viewed Object

Variables

- Refraction
- Atmospheric Perspective
- Weather and atmospheric conditions
- Degree of available screening

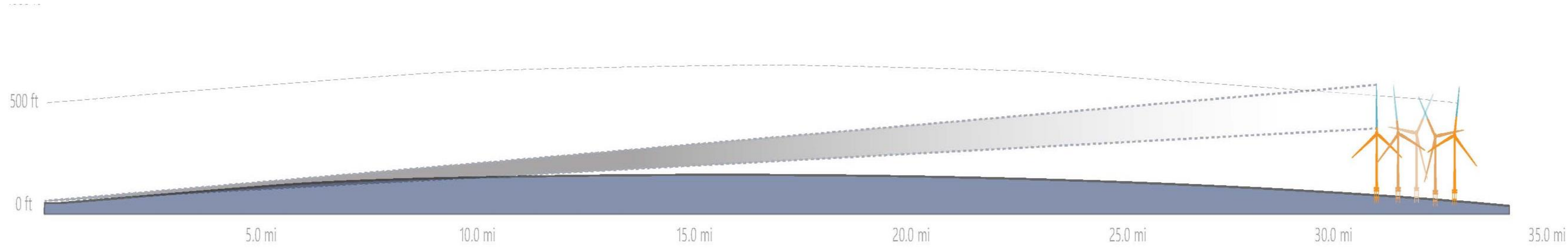
Develop Visibility Thresholds

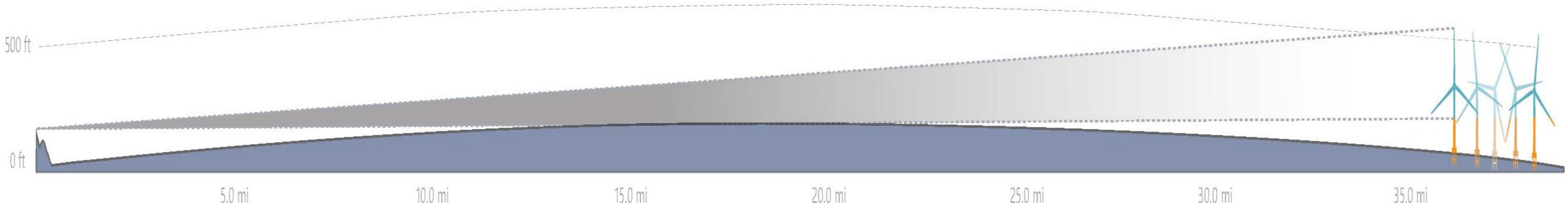




Develop Visibility Thresholds

- At sea level curvature of the earth becomes a significant factor at or beyond a distance of approximately 20 miles.
- Viewer elevation significantly extends the theoretical visibility distance.





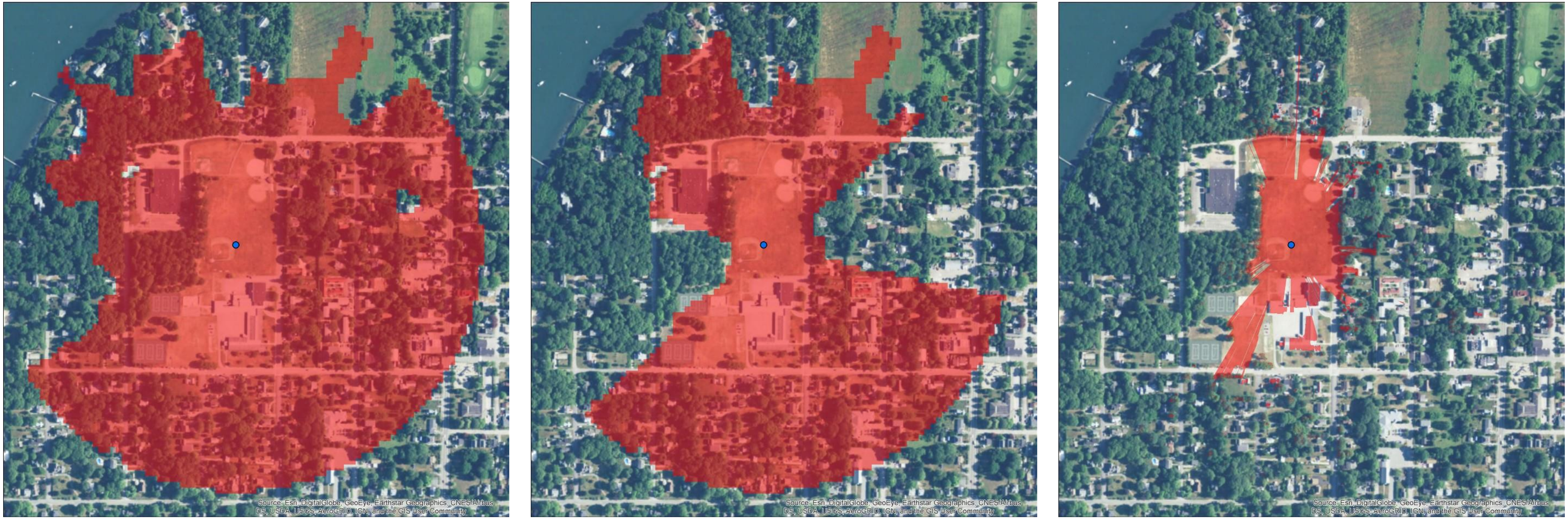
Develop Visibility Thresholds

Offshore Wind Visibility

- Offshore turbines are large. Current technology is exceeding 875 feet above the water surface with future technology predicted to exceed 1,000 feet.
- The ocean and coastal landscape typically allow for panoramic, long-distance views.
- Historic properties with a coastal setting are often considered sensitive to changes in the seascape.
- Planned wind energy areas range from 10-40 miles offshore.
- This all leads to very large study areas, and numerous sensitive receptors.

Establish a Visual Study Area

- Viewshed technology and data inputs for offshore wind projects.
- The benefits of lidar.

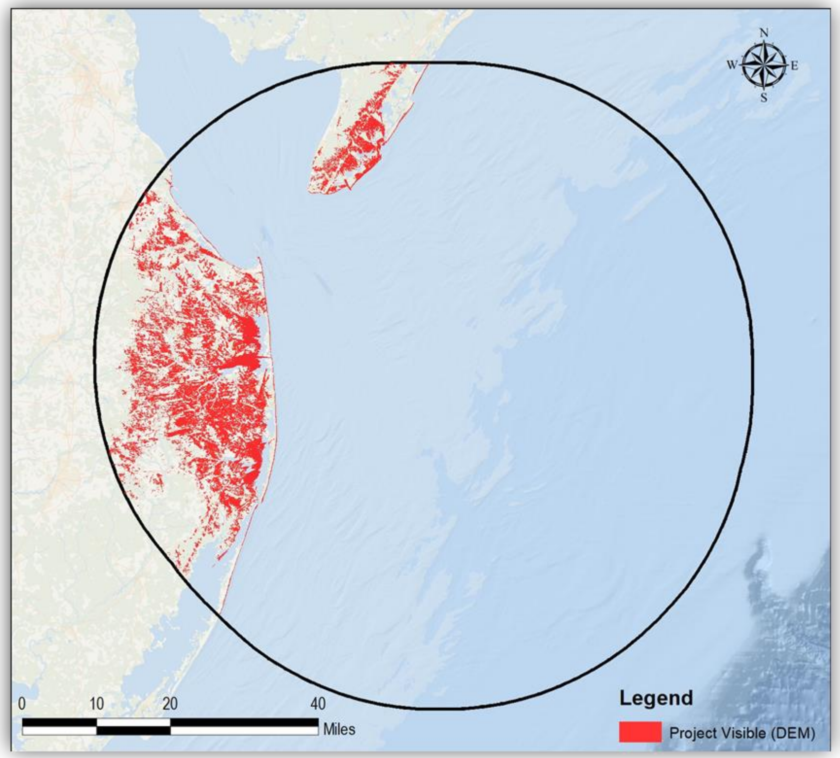


Topography Only

Topography and National Land Cover Dataset (NLCD) Vegetation

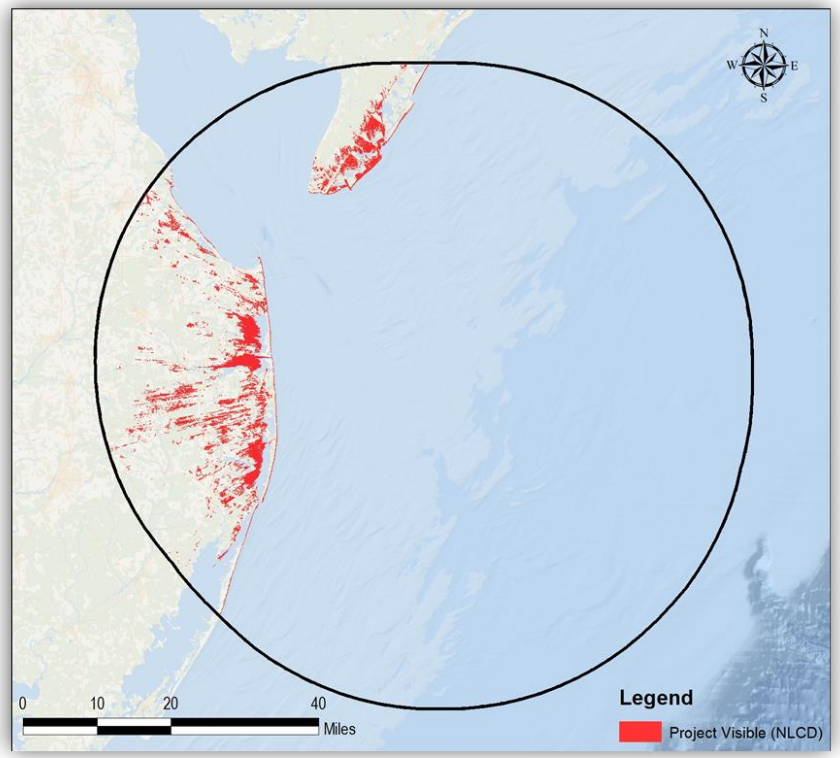
Topography, Vegetation, and Structures (lidar)

Establish a Visual Study Area



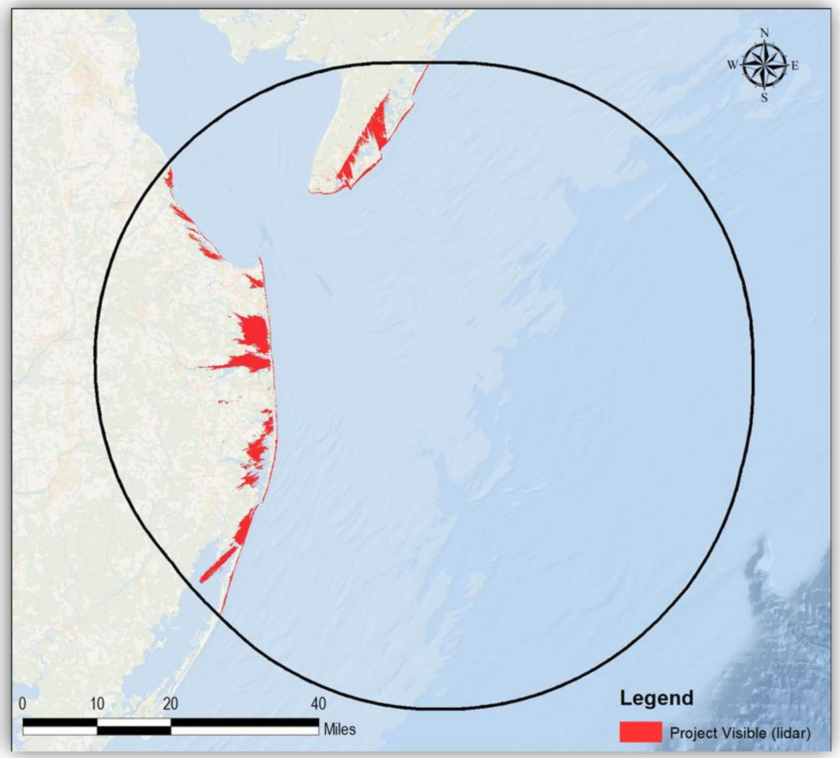
Legacy Viewshed

- Screening by topography suggest 28% of the landward study area will see the project.
- 317 square miles will require additional analysis
- Over 1,000 potentially historic resources with potential visibility.



NLCD Viewshed

- Screening by topography and NLCD forest suggest 11% of the landward study area will see the project.
- 128 square miles will require additional analysis
- 434 potentially historic resources with potential visibility.



Lidar Viewshed

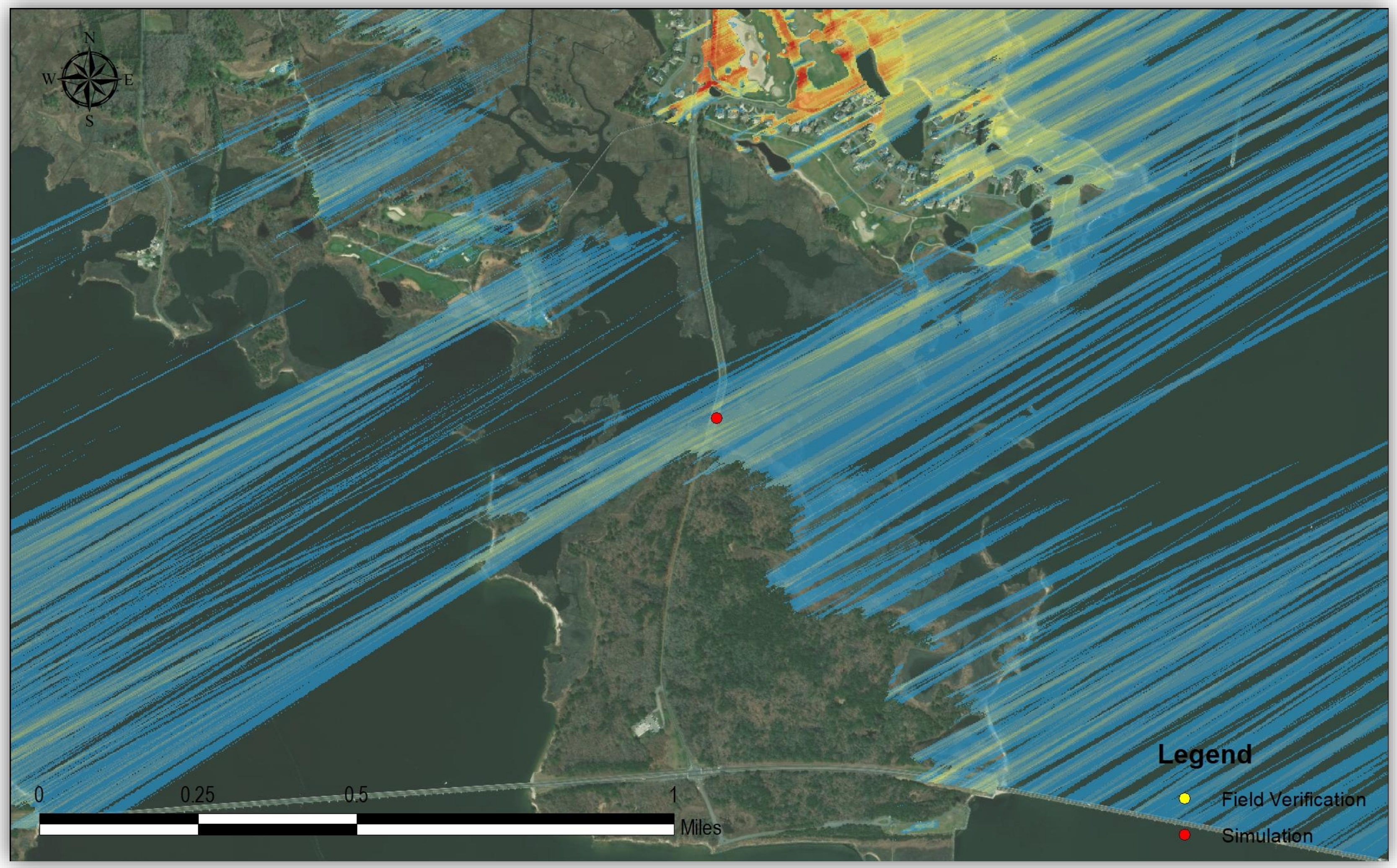
- Screening by lidar derived topography, buildings, and vegetation suggest 7% of the landward study area will see the project.
- 82 square miles will require additional analysis
- Over 236 potentially historic resources with potential visibility.

Establish a Visual Study Area

- Classification errors can cause substantial errors in the viewshed results.
- Processor and memory requirements are substantial.
- Processing time requirements.
- Transmission lines, bridges, narrow hedgerows are often interpreted as screening elements. In reality, they do not contribute substantial screening.

Establish a Visual Study Area

Verification of Accuracy



- By comparing viewshed analysis results to field review and visual simulations, the accuracy of the model can be precisely verified.

Establish a Visual Study Area

Verification of Accuracy

- Viewshed analysis determined that four turbines could be visible from this exact location on an inland bridge.
- As the simulation demonstrates, four turbine blades barely break the ocean horizon between buildings and sparse vegetation.

What is a Key Observation Point (KOP)?

- Identified by federal, state, local, or tribal officials/agencies as important visual resources, either in prior studies or through direct consultation.
- KOPs provide clear, unobstructed views toward the Project site (as determined through field verification).
- They illustrate the most open views available from historic sites, designated scenic areas, and other VSRs within the ZVI (“worst case” visibility).
- They are representative of a larger group of candidate KOPs of the same resource type or in the same geographic area.
- They illustrate typical views from landscape settings where views of the WTGs are most likely to be available.
- They illustrate typical views of the proposed Project that will be available to representative viewer/user groups within the project viewshed.
- They illustrate typical views from a variety of geographic locations and under different lighting conditions to illustrate the range of visual change that could occur with the Project in place.

Develop Visual Simulations

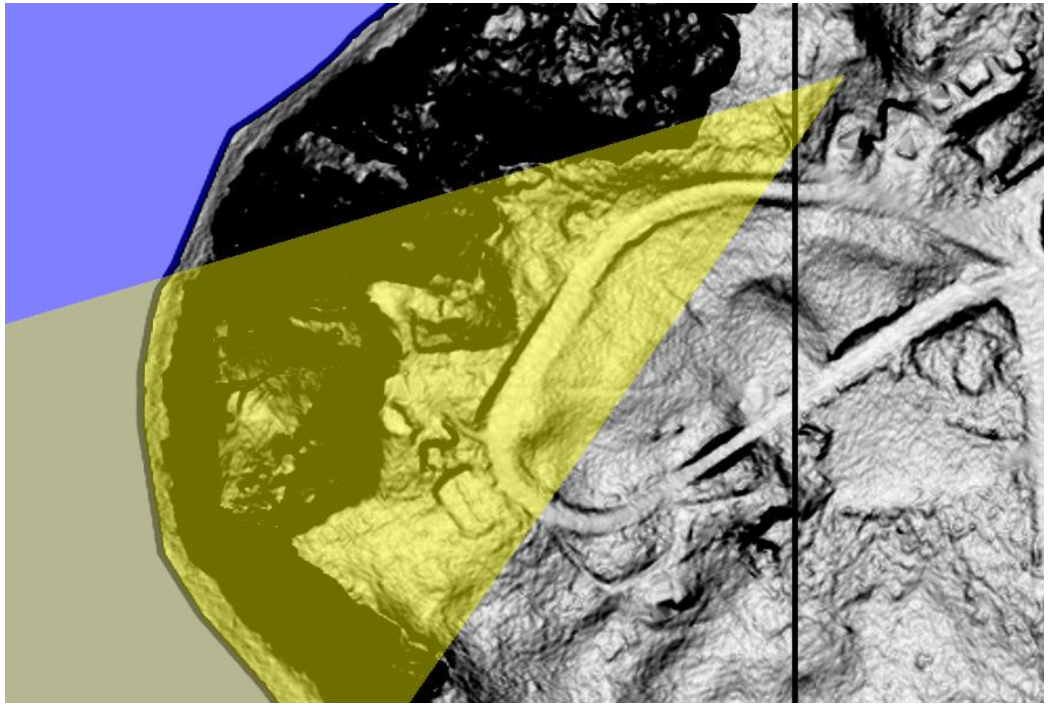
- Simulations can be accurately represented in a variety of media formats.
  - 50-millimeter single frame simulations
  - 124 by 55-degree panorama simulations
  - 50-millimeter video simulations
  - 360-degree immersive video simulations
- We will not recreate the human experience of the landscape in the near term.
  - Influences on experience include smell, vision memory, focus, sound, and so many other external influences that will be received differently by every individual.
- Fifty-millimeters.
  - The reason 50-millimeter is used for visual simulations is very simple. It is the best and most natural re-creation of a scene. It is a ‘normal’ lens which means it is not too wide or too zoomed and therefore spatial and scale relationships between foreground and middle ground elements remain constant.
    - Single frame simulations can be made available to a wide audience and a variety of readable formats.

Develop Visual Simulations

- Simulations must be spatially accurate. Meaning they must represent the proposed project at the correct scale and in the correct geographic location.

Develop Visual Simulations

- Survey is a critical component of the visual simulations. Particularly when there are no visible reference points in the photograph. Reference points set 50 feet from the camera with a survey error of 2 feet, will result in an error of up to 2,500 feet at 10 miles offshore. As such, the accuracy of the simulation could be compromised if the survey is not accurate.



Determine Factors That Influence Visibility

- Detailed studies drawing from years of airport meteorological and visibility data can be useful in determining the frequency of potential visibility of offshore wind projects.
- Studies in the past have included 10 years of minute-by-minute meteorological visibility measurements taken from several airports near the study area of offshore wind farms.
- Findings suggest that in the MA/RI WEA, and found that visibility to 20 nautical miles could occur during as little as 31 percent of daylight hours in a given year.
- This same study suggests that visibility out to a distance of 30 nautical miles may only occur during nine percent of daylight hours in a given year.

Determine Factors That Influence Visibility

- These onshore visibility measurements are meaningful data when attempting to characterize the frequency of potential visual impacts associated with offshore wind farms.
- However, it is important to note that onshore data is NOT the same as offshore data. Recent studies have suggested that the potential visibility over the water could be as much as 20% less than visibility over land in the Mid-Atlantic region.

Determine Factors That Influence Visibility

- Under certain conditions, wind turbines are exceptionally difficult to see. Even on seemingly clear days, atmospheric perspective can change minute by minute, making the turbines obscure in their surroundings.

Determine Factors That Influence Visibility

- This image illustrates turbine visibility over water after the sun had set behind the horizon. For a period of less than 2 minutes, the turbines appeared more prominently (although still very difficult to see) against a dark horizon.

Determine Factors That Influence Visibility

- Visibility can be loosely defined as “reflected light”, so when there is an actual source of light generation, visibility can be much more prominent at night. This is obviously influenced by competing light sources, ambient light present (moon phase), weather/atmospheric conditions, and distance of the project from the viewer.

Determine Factors That Influence Visibility

Determine Factors That Influence Visibility

Visibility and Visual Impact

- While the focus of this presentation is focused on visibility influences, another major component of visual studies includes visual impact assessment.
- Visual impacts are typically quantified by assembling a rating system that determines the scenic quality of the existing landscape or seascape without the project and then considers the scenic quality of the landscape or seascape with the project in place. The delta between these ratings quantifies the potential visual impacts.
- It is important to note that visibility is not the same as visual impact, but you do need one to have the other.

Summary

- Visibility thresholds and study areas should be established for each project individually.
- Lidar viewshed analysis is currently the most accurate means of determining visibility and can be used to measure magnitude, with limitations.
- Simulations should be accurate and representative.
- Simulations should be viewed according to specified viewing instructions.
- Simulations do not replace the human experience, but they are the best means of illustrating visibility and visual impact.
- Impact determinations should consider the worse-case visibility conditions, but it is also important to illustrate the most likely conditions based on meteorological data and visitation patterns.
- It is not possible to predict atmospheric perspective, but assessment of past meteorological conditions can provide a means to quantify frequency of visibility.

BOEM Guidance on Visual Assessments

- For potential daytime impacts for Projects occurring within 23 nautical miles of shore, the study area should now be defined using a digital terrain model (DTM) and will only consider the highest point on the turbine and the screening effects of topography and curvature of the earth. The study area radius shall not exceed 46 statute miles.
- A separate seascape/landscape impact assessment and visual impact assessment must be submitted for BOEM review. One evaluates the Project's effects on the character of a place and the other evaluates the Project's potential visual impact on people.
- BOEM guidance requires the visual impact assessment to evaluate the susceptibility to change and value attached to the view in order to determine a sensitivity rating.
- With the project in place, raters must review the size or scale, geographic extent, and duration of the impacts to arrive at a magnitude rating. This will ultimately result in an overall impact level defined as either major, moderate, minor, or negligible.

Questions

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Coming Next:

July 7, 1:00 p.m. ET
Offshore Wind Resiliency Planning
Neil Weisenfeld & Garrett Moran, ICF

July 28, 1:00 p.m. ET
Offshore Wind Stakeholder Engagement
Kris Ohleth, Special Initiative on Offshore Wind

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