Response to review

The reviewer's comments are given below in black font and our responses are in green font. A full tracked changes version of the manuscript is at the end of this document.

Paper Review Quantitative Comparison of Power Production and Power Quality Onshore and Offshore: A Case Study from the Eastern U.S.
Author: Rebecca Foody
General
This paper presents an observational analysis of potential onshore and offshore wind power production using data from two buoy-based LiDAR systems (sponsored by the New York State Energy Research and Development Authority, or NYSERDA) located in the New York Bight, and from several sites in the New York State Mesonet profiler network. The authors also complement the short-term LiDAR observation data sets with extrapolated winds from the longer-term ERA5 reanalysis product. Key points of the analysis include that 1) the offshore waters in the New York Bight, as characterized by the NYSERDA buoys, provide a significantly greater wind resource, 2) the offshore wind resource is more persistent (less intermittent) as compared with land-based (and even coastal) observations, 3) there is a summer peak in the frequency of low level jets (LLJs) and higher rotor plane shear, 4) not surprisingly, given the mid-latitude east coast location, geographic diversity (here defined has > 350 km) would reduce the potential for large-scale "wind power droughts", and 5) offshore wind is a more favorable location for load matching given reduced diurnal range of hub height winds and the large coastal populations in the region. Overall, the paper provides a very useful and cogent comparative analysis of the onshore and offshore (potential) wind resource in New York and the adjacent coastal waters. With minor edits, I recommend the draft manuscript for publication.

Specific comments
Page 2, line 45: note that aesthetics—visual blight, commercial fisheries, social equity, and NIMBY (e.g., transmission cable land fall) are significant social barrier issues for offshore wind siting.
Response: For visual blight and noise concerns are generally lower than on land. Nevertheless, we have slightly modified this statement to include co-use etc. Sentence modified to read:

> Second, there are generally fewer social barriers than exist on land (e.g., competition for land, noise concerns, visual blight, etc.) (Diógenes et al., 2020), although there are considerations regarding co-use (e.g. for commercial fishing and marine navigation) (Stone et al., 2017;Kirkegaard et al., 2023).

Page 3, line 84: in addition to the Aird et al. (2022) paper, McCabe and Freedman (2023; see https://journals.ametsoc.org/view/journals/wefo/38/4/WAF-D-22-0119.1.xml) also recently published on the frequency and physical characteristics of the sea breeze and associated LLJ in the New York Bight and coastal NY (also using the NYSERDA and NYSM LiDARs).
Response: Thanks for pointing it out. We have added the reference!

Page 5, 174-176: this sentence is confusing— the ERA5 hourly data "…represent approximately 15- to 20-minute average values…."
Response: rewritten to:

> Herein we analyze once-hourly estimates of the u- and v- wind components at a height of 100 m. We use ERA5 output for the period of record with highest quality data assimilated into the reanalysis system: 1979-2022. This time period also includes the observational period of the LiDARs.

Page 7, line 226: essentially $\gamma \equiv r$?
Response: yes (we have added a parenthetical note to this effect)

Page 8, line 241: see McCabe and Freedman (2023)
We have included this text:

> Alternative metrics to detect LLJs have been proposed, including use of normalized wind increments by the height interval (i.e. a shear definition) (Hallgren et al., 2023;McCabe and Freedman, 2023).

Page 8, lines 246 - 259: should be more discussion of the limitations of using ERA5 data
Response: We are using ERA5 to examine low-frequency climatological variability but have added a cautionary note earlier (in section 2.3) we have added:

> However, past research has also indicated substantial spatio-temporal variability in the fidelity of ERA5 wind speed products of relevance to wind energy contexts (Pryor et al., 2020b;Kalverla et al., 2020;Meyer and Gottschall, 2022;Knoop et al., 2020). Here we are using ERA5 output to (i) examine climatological variability and thus contextualize the short observational records, (ii) provide context for the spatial decay of association manifest in the remote sensing observations and (iii) quantify the bias in annual mean wind speeds due to seasonal bias in LiDAR data availability.

(perhaps in section 2.3?)—especially given the use of extrapolating using the calculated shear exponent between 10 m and 100 m. The co-authors of this paper have used ERA5 data sets in previous analyses, and other papers have discussed the issue of ERA5 underestimating near-surface wind speeds and smoothing out potential LLJ profiles (e.g., Kalverla et al. 2020).
Response- yes see above we have added a cautionary note saying ERA5 exhibit variability in terms of fidelity.

Page 8, line 265: the cost recovery factor, CRF is mentioned once and does not appear in Table 1 but is part of the calculation in equation (8). It is defined in Barthelmie et al. (2023).
Response- sorry for the typo that made it seem that this parameter was not specified (it is in the Table).

Page 12, Figure 3: top left graphic is tough to read.
Response-We have revised to figure to make it clearer.

Page 14, Figure 5: tough to clearly see Hudson North and Hudson South on right side figure.
Response-We have also revised this figure to make it clearer.

Page 17, lines 410 - 420: should reference McCabe and Freedman (2023) on climatology of the LLJ. Compare and contrast their methods for identifying LLJs.
Response-We have included this text where we discuss how we define a LLJ:

> However, alternative metrics to detect LLJs have been proposed, including use of normalized wind increments by the height interval (i.e. a shear definition) (Hallgren et al., 2023;McCabe and Freedman, 2023).

Hallgren et al. (2023) does a great job of this comparison, so we will not duplicate that material here.

Page 18, Figure 9: should make this figure larger so can be read more easily.
Response-Done!