Response to Referee 2 Comments

Nico Galarza and Brent Houchens on behalf of the authors, July 29, 2026

Dear Reviewer,

We appreciate the constructive feedback on our manuscript. Responses are included below and throughout the paper as described and we believe these have greatly improved our manuscript. Additionally, we incorporated all recommended text and terminology corrections (consistent abbreviations, rewording, etc.).

Best regards,

Brent and Nico, on behalf of the authors

RC2 Comments

This manuscript provides a fresh and unique view on an interesting application for AWES, focusing on energy resilience. The authors clearly walk the reader through the use-case with a well-chosen case-study in rural Puerto Rico that could be easily repeated for any other location in the world with the same input parameters. The analysis and results of the different optimizations are clear and sound. Therefore, I recommend the manuscript for publication.

A few points could be taken into consideration to elaborate on specific parts of the manuscript:

- Is the storm/hurricane frequency expected to increase in the coming years due to global warming? Which will make a stronger case for AWES compared to towered wind turbines. If this is the case, a linear distribution is chosen for the occurrence of the tropical events in section 3.2.3. Would an exponential distribution be a better fit giving the increasing frequency of tropical storms? This would only have a minor short-term impact but could be something to consider for the long-term value of containerized, stormproof energy systems.

  While it is likely that added moisture in the atmosphere will increase the severity of hurricane damage, we felt there was already sufficient compelling evidence to support the need to stormproof energy systems based on recent observations. Thus historical storm records were used to establish threat frequencies and durations for the MDT simulations. Future studies should investigate the impact of changing storm frequencies and alternative probability distributions; however, we deemed this sufficiently far outside of our expertise to consider with a sound analysis.

- Although it is true that communities with modest power needs are a good fit for AWES, does it make sense from a deployment and serviceable standpoint? Often early market adaptation requires extra operational support which can prove difficult if these communities are in remote areas, increasing operating costs. At the beginning of section 3.1.1, further maturity of the system is considered. It feels like this contradicts the point of early market adaptation mentioned earlier in the manuscript. Additional clarification would help understanding the logic used.

We agree that early-stage AWES deployments will likely require additional operational support compared to mature energy technologies. Remote communities may lack the trained personnel needed to support initial deployments. This offers both a challenge and an opportunity for workforce development, as has occurred to some extent in Bangor Erris, Ireland. In the long term, the combination of a trained workforce and increased automation would hopefully offset the challenges. We have clarified that this is a compromise of remote deployments, adding the following to conclude Section 2:

"When the wind resource, the frequent and strong storm hazards, significant grid outages, and high cost of electricity are considered along with the modest power requirements of the community, Culebra appears well suited for an AWE pilot project. This must be contrasted with the challenges of deploying an early-stage technology in a remote community, which may lack trained personnel to support the deployment. Though this too offers a potential long-term opportunity for workforce development, it may be a significant short-term challenge, requiring extended, specialized staffing."

- It isn't clear why the hourly wind speed is averaged over the 7 years of data in section 3.1.1. By averaging the wind speed, year specific outliers on either side operational wind window are dampened, resulting in a misrepresentation of a real life scenario. Therefore, letting the simulation run for the full 7 years, calculating the AEP for each year, and then averaging that number, will give a more realistic value. The sentence in 199-200, doesn't clarify enough the reasoning behind averaging the wind speed data before calculating the AEP. It is expected that calculating the AEP and the capacity factor this way will have a minor impact on the manuscript's key results, but it is still something to consider.

  We agree this was not the best way to analyze the AEP. Since we had hourly wind data from the NREL WTK Climate data, the methodology was revised to calculate the AEP based on the hourly average wind speed. This was carried out for two different years – the year with the best wind resource, and the year with the worst wind resource, taken from analyzing each of the 7 years of data available. In addition to catching the tails of the wind distribution more accurately, this also allowed us to calculate a best-case and worst-case AEP. Systems were then designed to these extremes to compare the requirements on the number of AWESs, the size of the BESS, and the size of the PV array (for hybrid configurations). This provided much more granular and insightful results.

- Could the AWES costs for the hybrid configurations added? A similar breakdown as in section 4.1 is expected in 4.2 given that in 4.3 a cost comparison is made.

  We have strengthened the Section Technoeconomic Considerations to clarify our cost inputs and have included detailed cost results for all the scenarios investigated.

RC2 Suggested corrections to improve the readability

5 – AWES is used for airborne wind energy systemS, however, in this line, a single system is referred to. Look for consistent use of this abbreviation throughout the manuscript (like line 12: "AWES systems").

We agree and have revised accordingly. Additionally, AWESs is now used for the plural, as suggested by EC1.

13 – Sentence is very long and therefore difficult to follow. Consider starting a new sentence from "while a hybrid…."

Agreed. We have rewritten the abstract to better reflect the meaningful results and improved this sentence.

52 – Use the Euro symbol (€) to stay consistent with the rest of the manuscript.

This has been corrected.

55 – AWES are not only kite based. Other methods of energy generation make use of composite aircrafts for example. To the reader, it isn't clear yet why a kite is mentioned in this line. Same is true for line 154. Only in section 3.1, a kite-based system is introduced.

This is a very good point and these have been corrected to generalize to all types of AWESs until after the specific kite-based system of the study is introduced.

57 – The final argument is, in my opinion, the strongest case for deployment of AWES in these regions. It follows logically from the introduction before, and I would therefore expect it to be the first driver mentioned in this section. Consider mentioning this driver first.

We agree and have shifted storm resiliency to the first driver.

166 – AWES is plural, is -> are. Alternatively, airborne wind energy system could be abbreviated as AWES with the plural AWESs (same for line 173)

Agreed and we have opted for AWES as singular and AWESs as plural, consistent with the recommendation of EC1.

179 – Is the cutout wind speed for the system used in section 3.1 considering gusts? If so, 20 m/s sounds reasonable if it assumed that the gusts could push the winds up to 25 m/s. Mentioning that it is on the conservative side in lines 179-180 is in this case not necessary.

We have clarified that, while the wind data we are using does not include gusts, setting the cut-out at 20 m/s helps account for the need to stop operations for gusts to 25 m/s (the manufacturer's stated limit).