



Enhancing the ME-Grid Tool for Quantifying Grid Values and Services of Marine Renewable Energy Integrated with Energy Storage Systems



Student: Naveen Kumar Kodanda Pani (nkodanda@uncc.edu), PI: Linqun Bai (linquanbai@uncc.edu)

Introduction:

Marine renewable energy (MRE) is an emerging sector in the energy industry and has a huge potential and can substitute approximately 57% of U.S. power generation (compared to 2019). Marine energy is often viewed as a supplement to current renewable sources, providing reliable and predictable generation to help reduce surges in energy demand [1]. ME-Grid is a software tool developed by the UNC Charlotte team led by PI Bai, sponsored by NCROEP and UNC-CSI to quantify marine renewable energy and its benefits on power grids by performing economic, deterministic and resilience analyses. This tool has successfully incorporated the modeling of MRE devices into the power grid model and can simulate and analyze the value of MRE to the economics and resilience of the power grid. The previous version was limited to Ocean wave and ocean current energy. Considering the requirements for marine energy devices, a hybrid marine energy with energy storage systems (ESS) modelling is necessary.

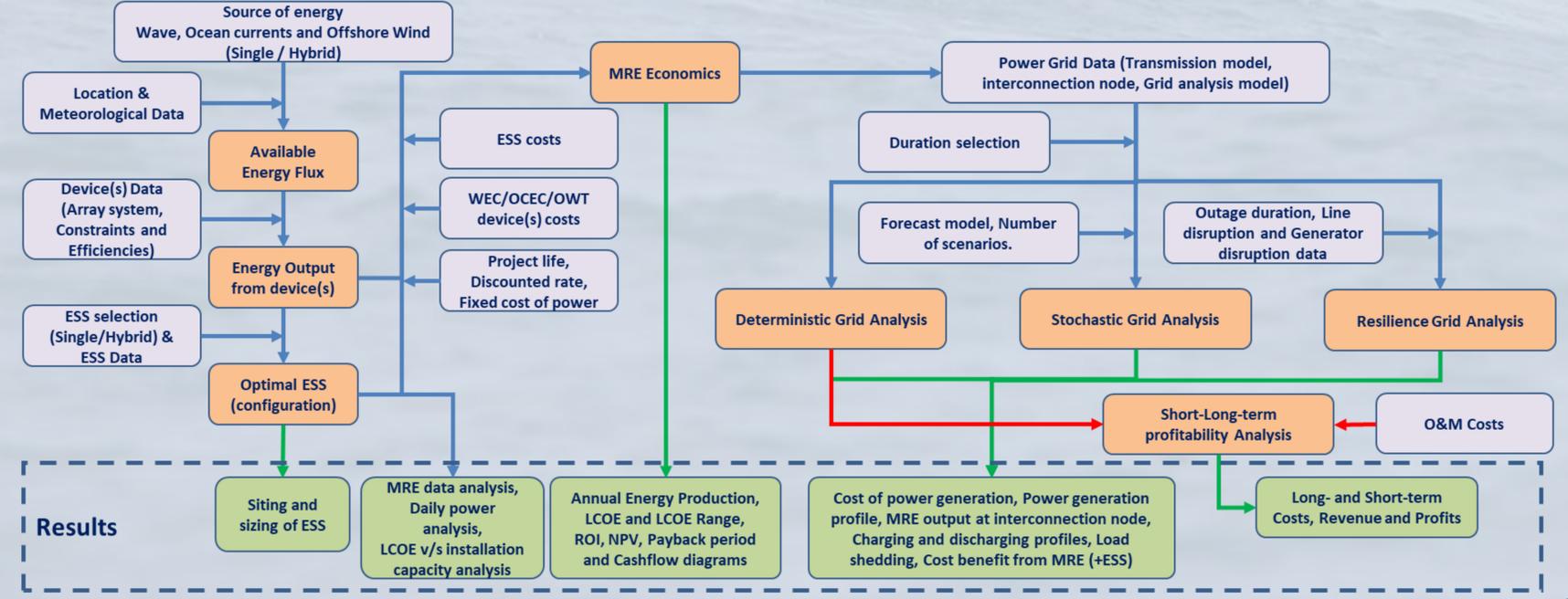
Objective:

Enhance the modeling capability of the ME-Grid tool by developing energy storage system and offshore wind related models, that can analyze, quantify, and maximize the revenue, grid value and services of marine renewable energy (MRE) integrated with energy storage systems.

Approach:

- Collect technical and costs of different ESS and develop mathematical models to optimally select ESS configuration.
- Develop offshore wind models.
- Modify the tool to incorporate hybrid energy source and ESS.
- Perform technical and economic analysis.

Framework:



Me-Grid Software Graphical User Interface:



Conclusion:

The current version of the ME-Grid tool is a MATLAB based application that can quantify the MRE projects for wave, ocean currents and offshore wind energies (single and hybrid models). The tool is capable of optimally selecting ESS (single or hybrid) and perform power grid analysis to understand the benefits of MRE. The tool and related documents will be available for download at <https://me-grid.com/>

Ongoing and future works:

- The project has been on target with the mentioned milestones.
- As of May 2022, we are currently working on long term profitability analysis and outreach to K-12 schools and community colleges.
- As part of future work, we would like to analyze the effect of MRE on microgrids, desalination and green hydrogen production.

1. Kilcher, L., Fogarty, M., & Lawson, M. (2021). Marine Energy in the United States: An Overview of Opportunities.