World Academy of Science, Engineering and Technology
International Journal of Energy and Power Engineering
Vol:18, No:12, 2024

Data Driven Infrastructure Planning for Offshore Wind farms

Authors : Isha Saxena, Behzad Kazemtabrizi, Matthias C. M. Troffaes, Christopher Crabtree

Abstract : The calculations done at the beginning of the life of a wind farm are rarely reliable, which makes it important to conduct research and study the failure and repair rates of the wind turbines under various conditions. This miscalculation happens because the current models make a simplifying assumption that the failure/repair rate remains constant over time. This means that the reliability function is exponential in nature. This research aims to create a more accurate model using sensory data and a data-driven approach. The data cleaning and data processing is done by comparing the Power Curve data of the wind turbines with SCADA data. This is then converted to times to repair and times to failure timeseries data. Several different mathematical functions are fitted to the times to failure and times to repair data of the wind turbine components using Maximum Likelihood Estimation and the Posterior expectation method for Bayesian Parameter Estimation. Initial results indicate that two parameter Weibull function and exponential function produce almost identical results. Further analysis is being done using the complex system analysis considering the failures of each electrical and mechanical component of the wind turbine. The aim of this project is to perform a more accurate reliability analysis that can be helpful for the engineers to schedule maintenance and repairs to decrease the downtime of the turbine.

Keywords : reliability, bayesian parameter inference, maximum likelihood estimation, weibull function, SCADA data
Conference Title : ICCWEWE 2024 : International Conference on Computational Wind Engineering for Wind Energy
Conference Location : Auckland, New Zealand
Conference Dates : December 02-03, 2024