A Computer Model for Efficient Offshore Wind Farm Siting in the North Atlantic

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This project is a computer program designed to model the siting of offshore wind farms in the North Atlantic Ocean, providing the user with the knowledge to optimally locate them for maximum energy output and hydrogen production. Human-originated greenhouse gas emissions, specifically carbon dioxide (CO2), are the leading cause of climate change. CO2 emissions have surged from 1 billion tons per year in the early 1920's to nearly 40 billion tons in 2024. Because of this, the need for renewable energy production has never been more urgent. Offshore wind-to-hydrogen conversion offers a clean, renewable energy source to offset carbon emissions. Since Denmark's first installation in 1991, offshore wind farms have proven effective, leading to successful deployments across Europe. Despite its vast wind resources, the North Atlantic remains far behind in offshore wind development. The interactive model was developed in Python using the PyCharm IDE and the PyGame package. Wind density data and a North Atlantic map were sourced from the Global Wind Atlas. Additional research included shipping routes, Canadian and U.S. ports, hydrogen transportation logistics, European success in the industry, and the technicalities of hydrogen production and conversion. This model successfully demonstrates a proof of concept that can be scaled to encompass various quantifiable parameters, such as cost of installation, maintenance expenses, and its application across regions of different sizes.

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