Toward Resilient Hybrid Energy Futures: MESO Assessment of Offshore Wind, Storage, and Grid Readiness in Nova Scotia

Authors:
Peter Ogban, Angler Solutions Inc.
Grace Khatrine, Angler Solutions Inc.
Fatemeh Kafrashi, Angler Solutions Inc.
Chad Lafitte, Angler Solutions Inc.
Chad Fowlow, Angler Solutions Inc.

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The rapid evolution of hybrid energy systems, driven by global decarbonization goals, underscores the urgent need for advanced modeling tools that integrate technological, economic, and environmental dimensions. In response, Angler Solutions Inc. has developed a proprietary Model for Energy Systems Optimization (MESO), a versatile, AI/ML-enhanced platform for simulating and optimizing complex energy systems.

This study highlights MESO's application in assessing hybrid configurations of offshore wind (OSW) and potential energy storage for three newly prioritized Nova Scotia OSW lease areas: French Bank, Middle Bank, and Sydney Bight, which were formally identified in the Joint Strategic Direction Letter from the Governments of Canada and Nova Scotia in September 2025. These configurations can be designed to support high-intensity, continuous loads and to enhance grid-level resilience by supplying power directly to local and regional grids, or by exporting it to other parts of Canada and the USA. MESO models the temporal dynamics between intermittent generation and storage technologies, optimizing system sizing, dispatch strategies, LCOE, and emissions performance.

The proposed methodology includes three key stages. First, a site-specific assessment of OSW potential using high-resolution modeled meteorological data and techno-economic parameters, integrated with spatial layers. Second, environmental constraints are evaluated, focusing on emissions reduction and cost savings. Third, in cases where energy storage is needed, appropriate technologies such as BESS will be assessed based on techno-economic criteria including Capex, round-trip efficiency, and charge/discharge duration. To frame the study's objective, the current state of grid and transmission readiness, for local integration and export opportunities, will be examined, providing broader context for decision-making.

MESO combines spatial modeling with techno-economic analysis to de-risk early-stage

hybrid energy projects. This study will demonstrate how optimized wind–storage systems can reduce emissions, enhance grid resilience, and strengthen regional energy security. Key findings will highlight actionable pathways toward resilient, low-carbon energy futures in Atlantic Canada.