# Advancing Environmental Impact Assessment Methods Throughout the Offshore Wind Development Lifecycle

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Offshore wind (OSW) development requires thorough environmental impact assessment and effective mitigation strategies to protect sensitive marine species while supporting clean energy goals. The OSW development lifecycle encompasses several distinct phases (e.g. baseline characterization, impact prediction, construction mitigation, and post-construction monitoring); each requiring specialized approaches to assess the potential effects on marine ecosystems. By examining critical stages of OSW development, we have refined approaches that better balance ecological protection of marine mammals with renewable energy development needs.

In this presentation, we show effective baseline characterization now integrates multiple survey modalities to provide a more complete picture of marine species presence than traditional single-method approaches. Our work in the Celtic Sea demonstrated that multi-year datasets are essential for capturing natural variability in cetacean distributions, preventing flawed impact predictions based on limited sampling periods. We demonstrated how OSW risk assessments can support early-stage mitigation and planning such as optimizing time-area closures, piling schedules and assessing the risk reduction value of different noise abatement methodologies.

We compare and contrast the current methods of OSW risk assessment used in Europe and North America, and highlight recent innovations and the critical methodological components, such as seasonal marine mammal density estimates. In addition, different foundation types also require tailored assessment methods. Floating OSW installations produce distinct acoustic signatures compared to fixed foundations. Our comparative analyses show substantial differences in underwater noise exposure patterns; floating systems generally produce less intense construction noise but introduce different operational considerations that must be properly evaluated (e.g. secondary entanglement and cable ‘pops’).

Overall, we aim to address the unique environmental challenges presented by both fixed

and floating offshore wind development in Canadian waters, with a focus on protecting acoustically sensitive marine mammal species.