Dr. Ethan Kubatko, Assistant Professor in Civil, Environmental and Geodetic Engineering at The Ohio State University recently completed a project funded by the Ohio Water Resources Center. This project titled “Generating Renewable Energy on Lake Erie with Wave Energy Converters: A Feasibility Study” has aimed to make progress towards meeting the State of Ohio’s energy goal of providing 25 percent of all electricity sold in 2025 from alternative energy sources. He investigated the feasibility of generating clean, renewable energy on Lake Erie by harnessing the Lake’s wave energy through the use of a novel kinetic energy harvesting technology called nPower ® developed by Tremont Electric, LLC, a Cleveland-based alternative energy company; see Figure 1.

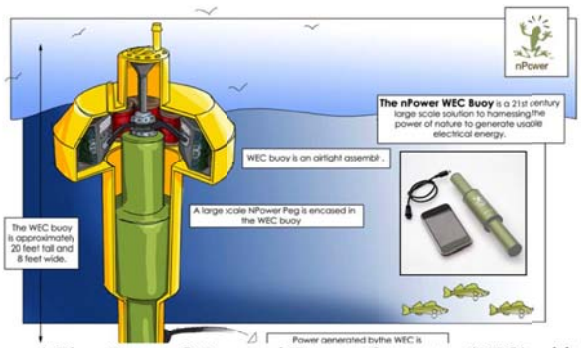

Figure 1 The nPower ® Personal Energy Generator (PEG), which can be used to recharge mobile devices by harvesting the kinetic energy generated from walking (inset), and a schematic of a proposed nPower ® Wave Energy Converter (WEC) encased in an airtight buoy.

The main technical aspect of his work has been the characterization of the so-called wave energy spectrum of Lake Erie to assess the feasibility of this idea. This was accomplished through the development and application of a high-fidelity computational wave simulator. Simulation results showed excellent agreement with historical data of wave conditions and provided graphical outputs of the wave energy density associated with Lake Erie over a range of wind conditions; see Figure 2. Given these results, the next phase of this study is to work in conjunction with Tremont Electric to quantify the conversion of this wave energy into electricity through the use of the wave energy converter devices.

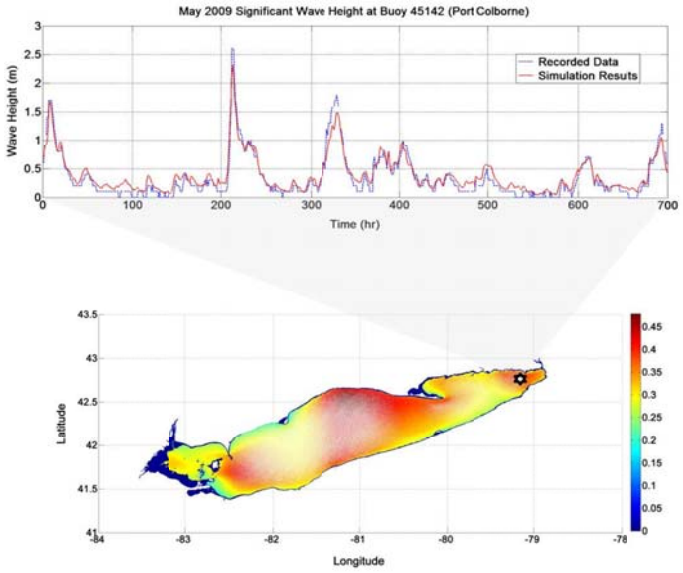

Figure 2 A comparison of wave simulation results to recorded data (top); and simulation results indicating a profile of the monthly average wave conditions (bottom). “Hot spots” of wave energy are shown in red and orange and indicate potentially beneficial spots

Researcher: Dr Kubatko's primary research interests are in the development, implementation, analysis, and application of computational models for fluid flow and transport processes. More specifically, his main research goal is the development and application of "next generation" high-performance computing tools, which utilize state-of-the-art methods and algorithms that can be used, for example, to guide improvements in coastal management practices and hazard mitigation strategies. The research is highly interdisciplinary in nature, involving aspects of not only engineering but also applied mathematics, physical oceanography and computer science.