



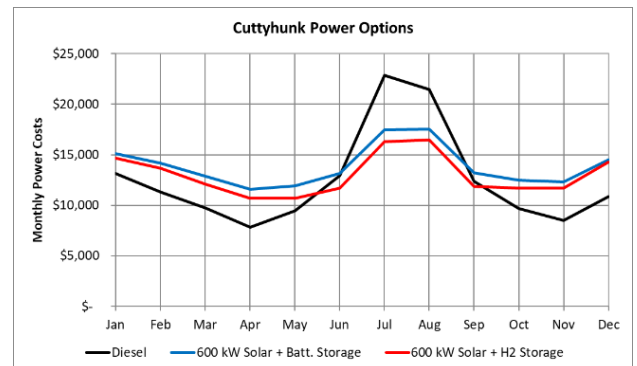
## Maximizing Renewable Energy Production in a Hybrid Diesel, Solar, Storage and Hydrogen Microgrid

### Situation

The United States Small Business Administration along with the Connecticut Center for Advanced Technology sought to advance the development and deployment of innovative hydrogen and related technologies and solutions in the Northeastern United States by identifying highest potential early market opportunities. The specific test case identified to evaluate was to minimize the use of diesel generators for power generation on Cuttyhunk Island in Massachusetts. Cuttyhunk Island used diesel generators to meet 100% of their power requirements, resulting in high power costs, local noise and particulate and carbon dioxide emissions. Earlier analyses resulted in solar – battery energy storage solutions able to reduce emissions and diesel usage by only 50%.

### Solution

Velerity was tasked with identifying the highest value market opportunities for hydrogen and related technologies and solutions, considering advanced storage solutions including hydrogen and related technologies. Velerity designed and implemented a systematic effort to identify and screen potential high value hydrogen energy storage solutions.



- Identified and characterized potential hydrogen solutions, including using hydrogen as an energy storage solution in a hybrid diesel, solar, storage microgrid application;
- Designed and built a detailed hourly energy and financial model to test, evaluate and optimize the design of alternative technologies, sizing and operating strategies minimize diesel usage; and
- Integrated actual energy demand and solar insolation to approximate actual conditions.

Velerity ran multiple iterations of the hourly model, capturing monthly net cash flows with which to compare alternative configurations including equipment choices and equipment sizing, with an objective to minimize energy costs.

### Result

Velerity identified alternative configurations of the hybrid design that resulted in reducing diesel consumption and emissions, integrating a hybrid diesel, solar and hydrogen storage solution.