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Designing an Alternative Energy System for a Forward Operating Base

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The views expressed herein are those of the author and do not reflect the position of the United States Military Academy, the Department of the Army, or the Department of Defense.

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Abstract: Boeing challenged our team to power a Forward Operating Base (FOB) by creating, testing, and fabricating an alternative energy generator that will have a Technology Readiness Level (TRL) of at least 6 by 2040. First, we conducted research & stakeholder analysis, functional & requirements analysis, and value modeling. Key findings showed that the final solution needs to reduce the necessary amount of resupply convoys and be relatively simple and intuitive to operate. Second, the team then generated a list of alternatives which focused on energy generation and storage. Extensive research produced three viable storage alternatives and five supply alternatives which the team evaluated using a variety of Systems and Mechanical Engineering simulations. The solution that best addressed the problem, while meeting all the provided constraints, utilizes biodiesel generators and photovoltaic panels as energy supply sources, lithium air technology for energy storage, and a microgrid network to manage energy distribution.

Keywords: Systems Design Process, Multi-objective Decision Analysis, Biodiesel Generators, and Lithium Air