Warfighter Alternative Energy Study (WAES)

Alexis Moy; Julianne Douglas

U.S. Army AFC DEVCOM C5ISR

alexis.m.moy.civ@army.mil /732-766-3752

Abstract

As we move forward into contested near-peer conflicts, the risks to our power and energy supply chains increases. The tyranny of distance in INDOPACOM increases costs, reaction time, and decreases readiness. Little to no investments/studies have focused on solving these problems for inland or land-based operations in this Area of Responsibility (AOR), which this study seeks to rectify. Due to increasing power demand for Warfighters, it is critical to investigate the future power and energy needs to determine and remedy gaps. This increasing power demand is due to both the deployment of new and novel devices that support Joint All Domain Situational Awareness (JADSA), and future operating concepts in the INDOPACOM theater. The added time with limited to no resupply, increases the need for power and energy for the land-based Warfighter on the move. Additionally, there is no guide for alternative energy or available resources in the AOR, which makes planning and sustainment more difficult. Combining these challenges creates a significant gap that must be addressed to support the deployment of mobile and distributed operations with decreased logistical footprint in contested environments.

This study seeks to determine the most useful ways to leverage our joint investments by modeling the future fight and technology projections to determine the best path forward and influence policy, TTPs and CONOPS to increase readiness for future conflict. The operational impact of alternative energy in INDOPACOM is in JADSA, lethality, survivability, logistics, and mobility of the future force that it enables. Addressing the recommended technology investments and policy changes could mean the difference between lives and wars lost versus won. The right changes and actions need to be identified now and actioned to ensure tactical advantage and survivability to meet wartime production capability needs.

The focus of this study is to 1) determine and leverage resources available within the AOR's regions of interest to create an alternative energy logistics-planning guide; and 2) identify the power and energy gaps and potential solutions by identifying critical alternative energy technologies for investment. These will lead to recommended changes in Concepts of Operations (CONOPs), Tactics, Techniques, and Procedures (TTPs), and policy changes to achieve tactical advantage among joint dismounted forces in INDOPACOM.

This study is aimed at using results from recent and upcoming joint service test events to determine gaps and extrapolate power demands for next generation alternative energy technologies. The energy demands will be for a company or below of dismounted Warfighters and focus on the feasibility of implementing alternative energy in the INDOPACOM region. This study also focuses on looking at what potential types of alternative energy sources can be used to close the gaps that are identified for the future fight. The end state of this project will be a report and briefing on the findings of the study. The report will recommend technologies and policies (CONOPS and TTPs) for the resources, gaps, scenarios, and case studies identified and analyzed during the study. It will also estimate the opportunities for investments in the near-, mid-, and far-term for alternative energy to provide power at the tactical edge.

Keywords

Alternative Energy; INDOPACOM, Power; Energy; Energy Conversion; Tactical Advantage; Energy Availability; Energy Resupply; Area Of Responsibility; Change of Policy

Introduction

As we move forward into contested near-peer conflicts, the risks to our power and energy supply chains increases. The tyranny of distance in INDOPACOM increases costs, reaction time, and decreases readiness. Little to no investments/studies

have focused on solving these problems for inland or land-based operations in this Area of Responsibility (AOR), which this study seeks to rectify. Due to increasing power demand for Warfighters, it is critical to investigate the future power and energy needs to determine and remedy the gaps. This increasing power demand is due to both the deployment of new and novel devices that support Joint All Domain Situational Awareness (JADSA), and future operating concepts such as multi-day semi-autonomous / limited resupply operations in the INDOPACOM theater. The added time with limited to no resupply, increases the need for power and energy for the land-based Warfighter on the move. Additionally, due to lack of available resources in the AOR, planning and sustainment is more difficult. Combining these challenges creates a gap that must be addressed to support the deployment of mobile and distributed operations with decreased logistical footprint in contested environments.

Alternative energy for the land-based Warfighter presents opportunities to shift the paradigm and for competition and success on this field of battle. Alternative energy is typically defined as "energy generated in ways that do not deplete natural resources or harm the environment, especially by avoiding the use of fossil fuels and nuclear power." For the purposes of this study, alternative energy encompasses solar, wind, water, kinetic and other energy harvesting, urban energy scavenging, fuel cells, alternative power or fuel generation from readily available fuels, among other technologies. These technologies allow our land-based Warfighters to live off the land between resupplies or using only the supplies they bring with them. The benefits to the joint force are significant and include decreased logistics and maintenance costs, increased readiness, continuity of operations and communications in contested environments, minimal footprint, maintained responsiveness to JADSA, and reduced environmental cleanup after the military leaves a location. This translates to lives saved during land or sea resupply operations.

Approach

This study first assesses the gaps and identify the reference architecture that is used for the study while leveraging prior studies and programs from OECIF, INDOPACOM, SOCOM, and the Joint Services. This includes joint service and commercial technologies and takes information from recent and upcoming joint service tests to use in the gap assessment. Next, the study develops possible scenarios in a future battlefield and select the scenarios that were run for the study. The part also projects the power and energy demand based on incorporating lessons learned from prior OECIF efforts and INDOPACOM-focused programs into the current problem space. The gaps and technology advancement projects will be input into an unclassified version of the scenario using a common software package to determine if and how the technologies can meet the joint forces power and energy demands. Finally, the assessment of the state-of-the-art alternative energy technologies will be done to see what technologies can feasibly close the gaps that were identified and what changes to the TPs/CONOPS/policy is needed to achieve tactical advantage.

The study utilized a common software package model that was developed in a previous OECIF project and has since been improved to input the case studies into and run the different scenarios for this effort to guide our future investment strategy and policy development. Data from joint test events will be used as inputs to the model to gain additional Warfighter feedback on technologies in this scenario. Simultaneously, this study determines, consolidates, and leverages resources available in select regions within INDOPACOM into an alternative energy sustainment guide for logistics planners by leveraging existing databases.

In this instance, the common software package model can rapidly simulate any number of scenarios for an infantry brigade combat team (IBCT) and run the scenarios using a variety of equipment such as different soldier energy sources, power consumers, battery charging behavior and available energy, renewable energy sources, logistics package (LOGPAC) resupply scenarios, and many other variables. Expert analysis and lessons learned, as well as software optimization of the solution sets, can help guide product and CONOPs development without taking years to field and test materiel, only to learn it no longer applies to the current threat scenario.

Results

The output of the common software package model includes the timeline of the input scenario showing energy use during each individual mission activity, periods of battery recharging, and utilization of renewable energy. Analysts will iterate different equipment sets and CONOPs to identify optimal energy usage equipment and behaviors. The written report will discuss why the optimum solution(s) were chosen, and how acquisition and CONOPs can be

tailored to achieve the desired outcomes. Outcomes could also affect recharging TTPs based on mission and available technology. Identified solutions will provide analytics-backed guidance to shape technology development and acquisition strategies. This study will utilize a combination of Warfighter feedback from test events, requirements community knowledge, technology subject matter expert analysis, and common software package model products to influence high-level policy and shape the future fight.

Outcomes

This study is aimed at using results from recent and upcoming joint service test events to determine gaps and extrapolate power demands for next generation alternative energy technologies. The energy demands will be for a Company or below of land-based Warfighters and focus on the feasibility of implementing alternative energy in the IDOPACOM region. This study also focuses on looking at what potential types of alternative energy sources can be used to close the gaps that are identified for the future fight. The end state of this project will be a report and briefing on the findings of the study. The report will recommend technologies and policies (CONOPS and TTPs) for the resources, gaps, scenarios, and case studies identified and analyzed during the study. It will also estimate the opportunities for investments in the near, mid and far term for alternative energy to provide power at the tactical edge.

References

1. Douglas J., “FY 2022 OECIF Proposal: Warfighter Alternative Energy Study (WAES)”