Consensus Study Report
HIGHLIGHTS
June 2021

Powering the U.S. Army of the Future

What types of energy sources and technologies will power the U.S. Army in 2035? Today the U.S. Army requires twenty times more energy per soldier than it did in World War II. Moving forward, these energy demands will only grow due to new advances in communications, electronic sensing, artificial intelligence, and vehicle mobility. A robust plan for how the Army will meet its power needs efficiently is particularly important because transporting fuel to the battlefield poses significant risk to soldiers and contractors.

At the request of the Deputy Assistant Secretary of the Army for Research and Technology, the National Academies of Sciences, Engineering, and Medicine appointed a committee to examine the U.S. Army's future power requirements for sustaining a multi-domain operational conflict and to what extent emerging power generation and transmission technologies can achieve the Army's operational power requirements in 2035.

Powering the U.S. Army of the Future explores the power needs surrounding dismounted soldiers, existing vehicle platforms, and forward operating bases, as well as innovations under development that are expected to be in service by 2035. The committee specifically focused on the needs of an armored brigade combat team (ABCT) because they expend prodigious amounts of energy and the Army expects them to remain a primary, independently maneuvering unit for the foreseeable future. The main messages from the report are summarized below. The full report is available for download at **http://nap.edu/26052**.

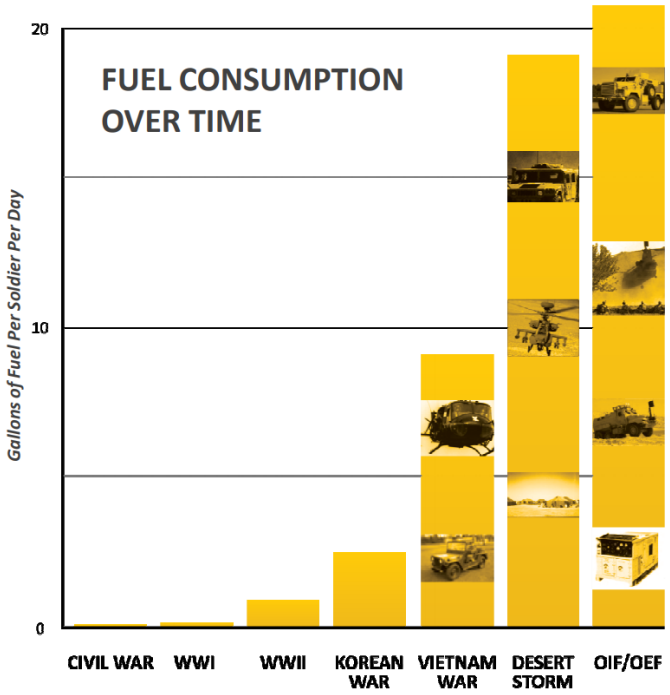
FUEL DIVERSIFICATION

The committee concludes that jet propellant 8 (JP8), diesel, and biodiesel should serve as the primary sources of power and energy brought to the battlefield for the foreseeable future. The high energy density of these fuels reduces how many supply trucks in convoys carrying fuel are needed, which lowers risks to soldiers and contractors and the supply chain as a whole. Given the growing need to address climate change, biodiesel (a renewable, carbon-neutral fuel) could serve as a preferred fuel source during peacetime.

ELECTRIFICATION OF COMBAT VEHICLES

Electrification of ground combat vehicles is highly desirable, but it should take the form of hybrid electric vehicles (with internal combustion engines), not all-battery electric vehicles. While pure battery-electric ground combat vehicles would provide advantages over traditional powertrains—such as less noise, smaller thermal signatures, and a lower carbon footprint—this technology is impractical for ground combat vehicles because of its high weight, limited range, excessive power requirement for charging and/or excessively long recharging times. Therefore, diesel

engine powerplants configured as hybrids (with battery systems) represent the powerpack of choice for ground combat and tactical vehicles. Such hybrid powerplants offer significant fuel efficiency advantages, exportable power, improved acceleration, low-acoustic operations, and limited silent mobility. Furthermore, charging times are not a concern as refueling remains the same as with today's vehicles. Several important advanced technologies in this report were identified that, if incorporated, should reduce the amount of fuel required in the field by a third for a given mission.



Daily fuel use per soldier over time. Image Credit: U.S. Army

MOBILE NUCLEAR REACTORS

The Army is reconsidering mobile fission nuclear power as a tactical solution because of chronic logistics and security challenges in operations in Southwest Asia and anticipation of future persistent conflict with anti-access/area denial (A2/AD). However, the latest mobile nuclear power plant designs are difficult to transport, take days to set up and cool down, and are not capable of providing the amount of power needed to support forward operations or quickly charge electric combat vehicles. Therefore, the committee concludes that ***it would be impractical to use a nuclear reactor for an expeditionary force***. Nevertheless, such a nuclear plant might be attractive for 24/7 power at long-term military facilities that require substantial energy for sustainment operations.

WARGAMING

Given the importance of power and energy on overall operational capabilities, ***it is strongly recommended that the scope of future warfare simulations (i.e., tactical exercises without troops) be expanded to include power and energy considerations***. These simulations should take into account local sources of energy available and the quantity and form of energy to be transported to the battlefield, including where the energy would be stored, any set-up or take-down times, the rate that energy could be released, and refueling or recharging times.

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