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USE CASES

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TAKE A DIVE INTO THE PRESSING ENERGY AND POWER CHALLENGES THAT SOLDIERS ARE FACING — AND THAT WE'LL BREAK DOWN TOGETHER AT VERTEX | ENERGY.

BATTERY TECHNOLOGIES FOR MILITARY USE

Exploring ready-to-scale battery technology with a focus on density, standardization, form, fit, and function

While industry is primarily focused on large, single battery packs that are designed for specific platforms, Army modernization requires modular batteries that can support a wide variety of electrified platforms. The US Army is exploring ready-to-scale battery technologies with a focus on density, standardization, form, fit, and function.

During this breakout, we will dive into game-changing power and energy solutions that are significantly lighter and smaller than current state of the art lithium-ion batteries. We will also share our projected uses for these batteries as well as explain our preference for rugged technologies that can operate in extreme environments — ranging from the Arctic to desert conditions.

ELECTRIC POWER IN REMOTE LOCATIONS

Projected evolution of mobile-generated power to recharge militarized ground vehicle capabilities at the point of need

Despite the progress that's been made in creating and refining EV platforms, the infrastructure necessary to power them is lagging behind. That delay results in an industrial-scale problem that hampers the Army's adoption of EVs across its fleet. The Army needs a flexible, scalable EV infrastructure that can operate anywhere it does.

This breakout will focus on transportable power sources that are capable of charging militarized electric platform capabilities at the point of need, including in remote locations. This could include transportable generated power as well as stored energy, battery-powered solutions, or power import from and export to other electric vehicles as well as non-EV systems.

DAY ONE

Platform Electrification

OVERCOMING RANGE ANXIETY

Ready-to-scale, modular range extender technologies to convert JP-8 fuel to electricity and meet near-term needs

As commercial industry moves to all-electric platforms, the US Army may be driven toward adopting these platforms and power systems for tactical vehicles in order to maintain acceptable costs and supportability. Yet the range achievable by all-electric vehicles — in terms of both distance and duration — does not support all of our Army missions (mix of primary, secondary, and cross-country drives greater energy use).

The Army will need to augment any all-electric platforms with a range extender to convert JP8 to electricity. This breakout will focus on range extension technologies in the 30-50 kW output category, including key aspects like power density, efficiency, modularity, lower noise, and cost.

MEETING POWER DEMANDS FOR ARMY AVIATION

Electrification of aviation components to increase on-board power and improve a range of related energy capabilities

Modernization of the US Army's aviation fleet is challenged by increased power demands for higher speed, greater range, and payload. The electrification of current and future platforms can provide more on-board power while improving power management, mission & flight performance, vehicle control, and engine-out safety. It could also potentially reduce our sustainment costs.

This small group session will focus on alternate power generation, high energy dense and flight-safe energy storage, high power dense electric machines, intelligent power management, efficient conversion electronics, and thermal management to meet Army power demands for aviation — including size, weight, and heat generation.

ADVANCED ENERGY STORAGE

Advanced materials, architectures, and energy storage chemistries to enable longer missions and added capabilities

Currently, the length of Soldier missions depends — in part — on the amount of self-sufficient energy sources they can carry. The desire for longer missions and added capabilities requires better energy storage, so that Soldiers don't lose power when they need it most and so missions aren't held hostage to the limits of technology.

This breakout session will focus on advanced materials, architectures, and chemistries that can meet this need. Topics for discussion will include: advanced materials, high-density rechargeable batteries, increased safety, transportation, alternative energy carriers, faster changes, and other solutions that can help the Army transform compact expeditionary power for Soldiers.

ON-THE-MOVE AUXILIARY POWER

Lightweight medium power systems that can offer increased mobility in Multi-Domain Operations (MDO)

Mobility requires lighter power sources that can meet higher demands. Lightweight power systems — ranging from sub 5kW to 10kW and above — will be required to enable the future fight. Whether as a vehicle bolt-on power source for on-board loads or through other approaches, the ability to harvest on-the-move power is a critical enabler for MDO.

During this session, we will explore multi-fuel and alternative power sources, sub 5kW power generation, and Soldier harvesting to meet this evolving need. Ultimately, our goal is to better understand the art of the possible in giving Soldiers and small units auxiliary power when and where they need it while supporting the Army's power demands through 2035 and beyond.

DAY TWO

Soldier & Small Unit Power

ADVANCED MOBILE POWER GENERATION

Technologies that let Soldiers harvest or generate power that can support operations on-the-move or at-the-halt

During extended operations in remote locations, units often lack the ability to provide and sustain power for the duration of the mission or to recharge equipment while in the field. Whether dismounted or in light, mobile vehicles, power generation capabilities constrain the current mission optempo as well as Soldier mobility.

This breakout will focus on technologies that enable Soldiers to harvest or generate power to support operations on-the-move or at-the-halt, including: small generators (man-portable 3kW-5kW); small and medium fuel cells (50W+); energy harvesting and scavenging; renewable power (low-signature solar, hydro, wind, and others); and lightweight, fast-charging systems.

EXTREME THERMAL DOMINANCE

Novel thermal management tech and design methods to support advances in miniaturization and directed energy

Technological advances in miniaturization and the emergence of directed energy systems for various applications demand improvements in thermal management technologies to improve efficiencies while reducing the size, weight, and power requirements for transient and continuous loads.

This session will focus on thermal management technologies and design methodologies to include both active and passive cooling strategies. Possible topics for discussion include: material solutions that provide enhanced thermal storage and transfer; co-engineered or designed solutions, active control for high and low temperature regimes, and efficient transient thermal management technologies.

INTELLIGENT POWER MANAGEMENT (I&I)

Resilient software and hardware solutions to intelligently manage power across a variety of US Army platforms and assets

On the MDO battlefield, the Army must understand energy flows and dependence in real time and be able to manage power resources across fixed infrastructure and mobile assets (e.g., ground vehicles, aviation fleet, UAVs, small robotics, sensors, Soldier electronics, etc). We must be able to plan for disruptions, enable resilience, detect and predict the energy status of all assets, and manage power distribution or production.

During this deep-dive discussion, we will focus on planning, software, and hardware solutions to address these needs — including grid-tie voltage, integrated demand-side power management, power-aware devices, and AI/ML for energy management and optimization.

PLUG-AND-PLAY POWER (I&I)

Innovative, dynamic power architectures and interoperable power components to enable maximum flexibility

Multi-Domain Operations will require innovative, dynamic power architectures to enable maximum flexibility while minimizing sustainment demand in theater. Seamless AC/DC integration covers a broad range of approaches, voltages, frequencies, and power technologies that will enable a future dynamic power capability to enable the fight.

This breakout will focus on interoperable power components at a power physics interconnection point and cover the DoD's emerging power interoperability standard – Tactical Microgrid Standard (TMS). Discussion will include prognostics and diagnostics; plug-and-play conversion concepts; and fast-forming, wired, and wireless meshed power network topologies.

DAY THREE
Infrastructure & Integration / Operational Touchpoints

SECURE, FLEXIBLE POWER TRANSFER (OT)

Secure, flexible power management and distribution techniques and technologies for a diverse suite of systems

Power management and distribution technologies have not been fully realized or implemented as a viable method to use available energy efficiently. As the Army fields a diverse suite of systems with longer-range capabilities, we will need secure, flexible power transfer to a variety of assets — both near and far — with power requirements ranging from sub-watt to megawatts.

This breakout will focus on power management and distribution techniques and technologies to enable the transfer of power to various assets. These include distributed energy systems, scalable smart grids, data-constrained algorithms, efficient and secure power transfer, novel energy carriers, and vehicle-to-vehicle/grid power.

CLOSING THE POWER GAPS (OT)

Power electronics for a universal power architecture and advanced algorithms to bridge the power gap in US Army systems

The central components for a dynamic, universal battlefield power architecture are lightweight, cost effective, highly efficient power electronics. Being able to bridge the power gap between renewables, batteries, vehicles, and traditional fielded power systems will require advanced algorithms and myriad DC voltage range inputs.

This session will cover demands on tactical power electronics and areas to meet this need, including: lightweight isolated, non-isolated D/D conversion for voltage manipulation, lightweight inversion using silicon carbide and beyond, and secondary control to overcome issues with AC paralleling between inverters and spinning generation while maintaining MIL-STD 1332 compliance.