

Hybrid Energy Storage Module

DESCRIPTION: The capability to store electrical energy with high energy density, variable charge & discharge rates, and in modular-reconfigurable packages is a critical challenge for future military and civilian systems such as microgrids and vehicles. Currently, no such components are available that incorporate such a broad spectrum of energy and power requirements. Hybrid Energy Storage Modules (HESMs) are proposed to fill this gap. However, such hybrid systems with these energy and power capabilities pose a unique set of technical challenges, particularly when considering the wide range of potential military and civilian applications. To surmount these shared and parallel challenges, a joint ARPA-E and ASD(R&E) program is being initiated with two major thrusts: 1) the development of a system-level module encompassing hybrid energy storage components capable of diverse transient operations, and 2) the development of advanced energy storage components (e.g. secondary batteries, capacitors, and flywheels).

DEFENSE & COMMERCIAL CIVILIAN NEED: Hybrid Energy Storage Modules will provide future Defense systems with long endurance, rapid charge/discharge platform electrical grids while maintaining a restrictive size & weight form factor, along with assured life and safety under a wide range of application and installation environments. Integrated into these advanced military systems, HESMs will be key components for extending fuel duration up to 30% in forward bases and military platforms while providing robustness and easy maintenance.

As the national electric grid becomes more diverse, with high penetration of renewable resource electric generation, there is an increasing need to match the power and energy requirements of consumers (industrial and residential) to the intermittent and non-dispatchable generation while maintaining customer power reliability and assurance. HESM technologies enable a wide range of functions including frequency/voltage support power, intermittent ramp firming, microgrid islanding and ride-through and peak shifting of energy. Additional commercial applications range from robust islanded power systems, extended-duration commercial and private vehicles, stabilized local and national grids, and home or industrialized ride-through power systems.

Workshop Objective:

- Identification and classification of DoD/ARPA-E energy storage needs
- Identification of critical metrics for Hybrid ESM system development
- Identify key subcomponent technology along with technology gaps to meet Hybrid ESM metrics

Day 1 – HESM Technology Workshop

Time	Title	Presenter
0815	Registration and Continental Breakfast / Coffee	
0900	Introduction	Don Hoffman (DoD) & Mark Johnson (ARPA-E)
0915	ARPA-E Remarks	Dr Arun Majumdar (Director of ARPA-E)
0930	OSD Remarks	Ms. Sharon Burke, ASD (OEPP)
0945	Hybrid Energy Storage Overview	Mark Johnson (ARPA-E)
1015	Break	
1030	HESM Applications	John Heinzl (HESM IPT)
1100	Energy Dense Storage	Mike Perry (UTRC)
1130	Power Dense Storage	Matt Lazarewicz (Beacon Power)
1200	Lunch	
1245	Power Electronics	Pat Hayes (ABB)
1315	Control Systems	Darrell Massie (IPERC)
1345	Commercial Certification	Greg Monty (UL)
1415	Break	
1430	Open Discussion <ul style="list-style-type: none"> • Application Requirements & Opportunities 	Facilitators: Jack Price - ASD(R&E) Jillyn Alban - ASD(R&E)
1700	Report – Out on Breakout Discussion	
1730	Wrap Up & Final Words	Don Hoffman (DoD) & Mark Johnson (ARPA-E)

Day 2 - HESM Technology Workshop

Time	Title	Presenter
0900	Introduction	Don Hoffman (DoD) & Mark Johnson (ARPA-E)
0915	Open Discussion <ul style="list-style-type: none">• Technology Needs & Gaps	Facilitators Dave Danielson (ARPA-E) Rajeev Ram (ARPA-E)
1130	Lunch	
1215	Breakout Group Report	
1315	Wrap Up & Final Words	Don Hoffman (DoD) & Mark Johnson (ARPA-E)
1330	End of Workshop	
1330	One on One with HESM Program Managers	