



GVPM Advanced Propulsion Overview

Gus Khalil

11 Aug 2011

Report Documentation Page			Form Approved OMB No. 0704-0188		
Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.					
1. REPORT DATE 10 AUG 2011		2. REPORT TYPE Briefing Charts		3. DATES COVERED 10-08-2011 to 10-08-2011	
4. TITLE AND SUBTITLE GVPM ADVANCED PROPULSION OVERVIEW			5a. CONTRACT NUMBER		
			5b. GRANT NUMBER		
			5c. PROGRAM ELEMENT NUMBER		
6. AUTHOR(S) Gus Khalil; Wesley Zanardelli			5d. PROJECT NUMBER		
			5e. TASK NUMBER		
			5f. WORK UNIT NUMBER		
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) U.S. Army TARDEC ,6501 E.11 Mile Rd,Warren,MI,48397-5000			8. PERFORMING ORGANIZATION REPORT NUMBER #22028		
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) U.S. Army TARDEC, 6501 E.11 Mile Rd, Warren, MI, 48397-5000			10. SPONSOR/MONITOR'S ACRONYM(S) TARDEC		
			11. SPONSOR/MONITOR'S REPORT NUMBER(S) #22028		
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution unlimited					
13. SUPPLEMENTARY NOTES Presented at GROUND VEHICLE SYSTEMS ENGINEERING AND TECHNOLOGY SYMPOSIUM (GVSETS), SET FOR AUG 2011					
14. ABSTRACT N/A					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT Same as Report (SAR)	18. NUMBER OF PAGES 4	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			

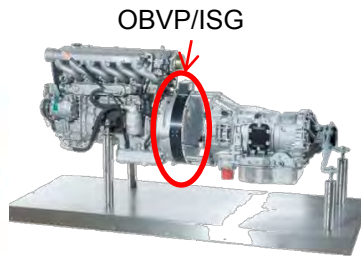
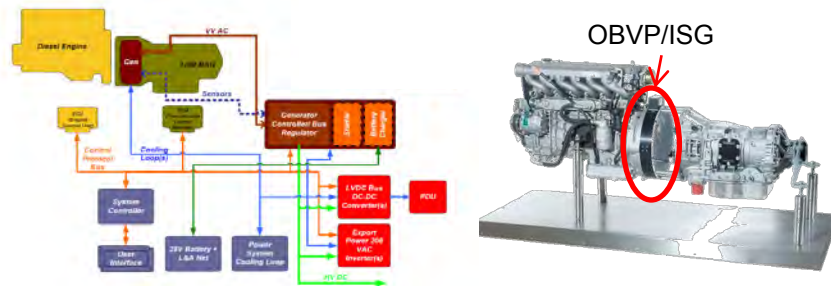
Advanced Propulsion

GVSETS
GROUND VEHICLE SYSTEMS ENGINEERING AND TECHNOLOGY SYMPOSIUM

Challenges we have:

- Safety and acceptance of high voltage architecture
- Cost of component development
- Availability of production vehicles with advanced propulsion systems
- Integration burden and current power electronics technology robustness

Solutions we are investigating:



- High voltage inline generators for onboard vehicle power (OBVP) on existing combat vehicles
- High temperature power electronics to lower the integration burden of advanced propulsion components
- Testing, Modeling and Simulation of propulsion and power electronics components



- Utilize prototype vehicles to demonstrate utility of full hybrid and OBVP technologies
- Partner with military users to evaluate capabilities offered by advanced propulsion enabled vehicles
- Reliability testing of vehicles to build confidence in the maturity of military hybrid electric

Where we need your help:

- Address high voltage safety in component and system designs
- Reduce cost through increased commercialization
- Collaboration for testing advanced propulsion systems in vehicle platforms.
- Further maturation of high temperature power electronics components

Projects Current & Future

GVSETS
GROUND VEHICLE SYSTEMS ENGINEERING AND TECHNOLOGY SYMPOSIUM

Vehicle Control Systems Roadmap

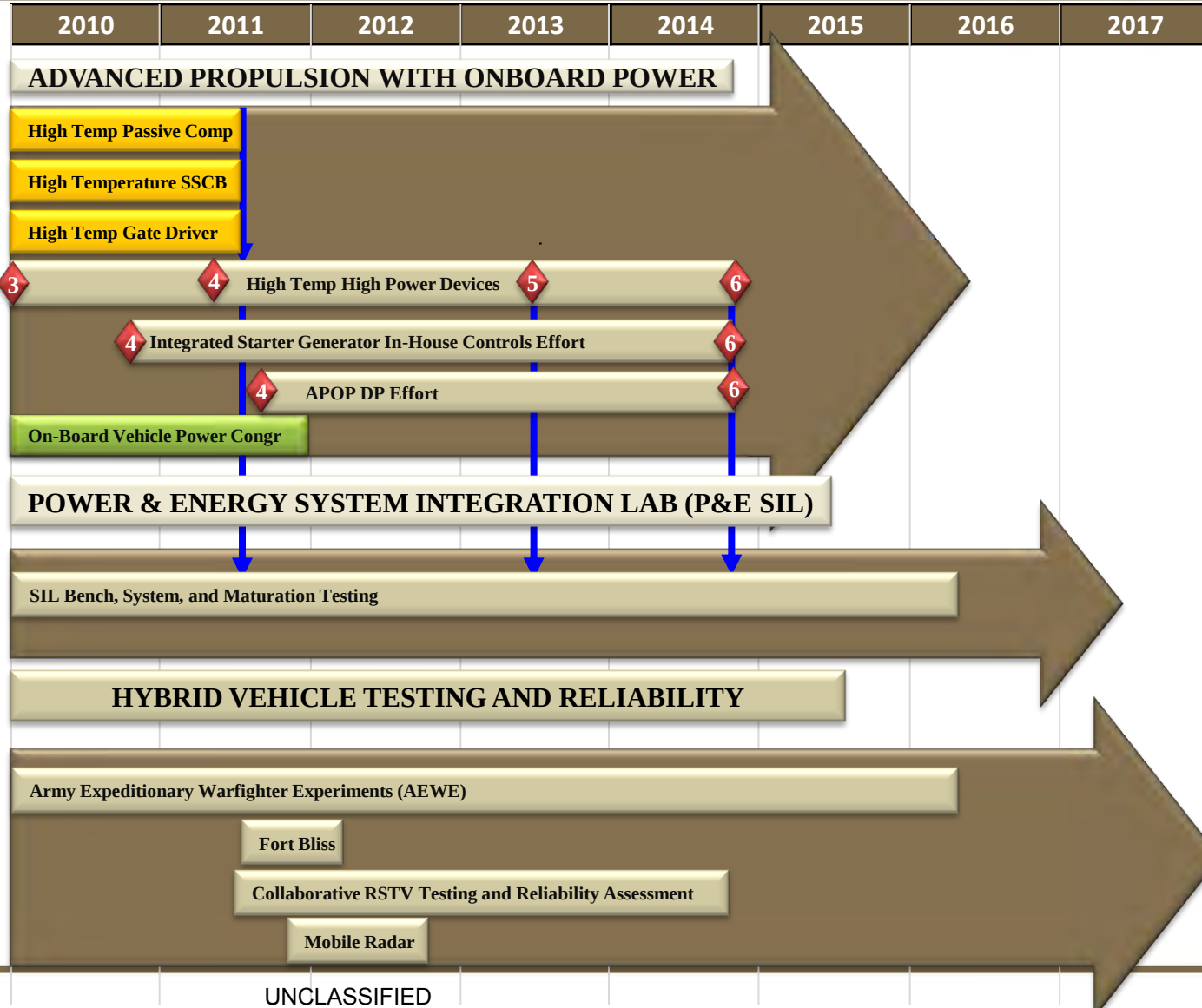
- SBIRs to develop high temperature passive components for power electronics
- SBIRs to develop high temperature solid state circuit breakers and gate drivers
- High temperature power electronics to support advanced propulsion systems
- High torque density and high power density electric motors for OBVP/ISG application operating at high temperatures ($\geq 100^{\circ}\text{C}$)
- On-Board power generation to support increased military power demands and improve military mission effectiveness

Test and evaluation to mature components

1. Bench testing
2. System integration in full hybrid electric propulsion system
3. Vibration and high ambient temperature/in-vehicle

Vehicle Level Testing

1. Warfighter experiment to demonstrate and gain user feedback of advanced technologies
2. Military user assessment of a hybrid electric drive tactical vehicle
3. Demonstrate the Sentinel radar system without the need for a towed generator
4. Assess the reliability of the hybrid electric drivetrain on the RSTV in collaborative effort with GDLS



UNCLASSIFIED

Laboratory Capability Current & Future

GVSETS
GROUND VEHICLE SYSTEMS ENGINEERING AND TECHNOLOGY SYMPOSIUM

Current Capability



Hybrid Electric Reconfigurable Movable Integration Testbed (HERMIT)



Cell 10 Motor Dynamometer

AV900 Power Supply

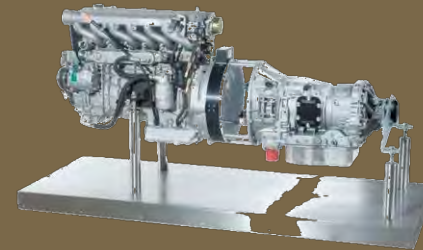
- The HERMIT allows integrated testing of HE components in a vehicle platform
- Cell 10 - electric machine and power electronics bench testing

GSPEL

Ground Systems Power
and Energy Laboratories

**Advanced Propulsion
Roadmap**

Future Capability



ISG test stand



Cell 10 Motor Dynamometer



GSPEL Motor Dynamometer

- ISG Test stand for controls development
- Added capability to test and evaluate multiple electric machines and power electronic components