



Overview

Tank Automotive Research,
Development & Engineering Center
Mr. Chuck Coutteau, Associate Director
Ground Vehicle Power & Mobility



Report Documentation Page

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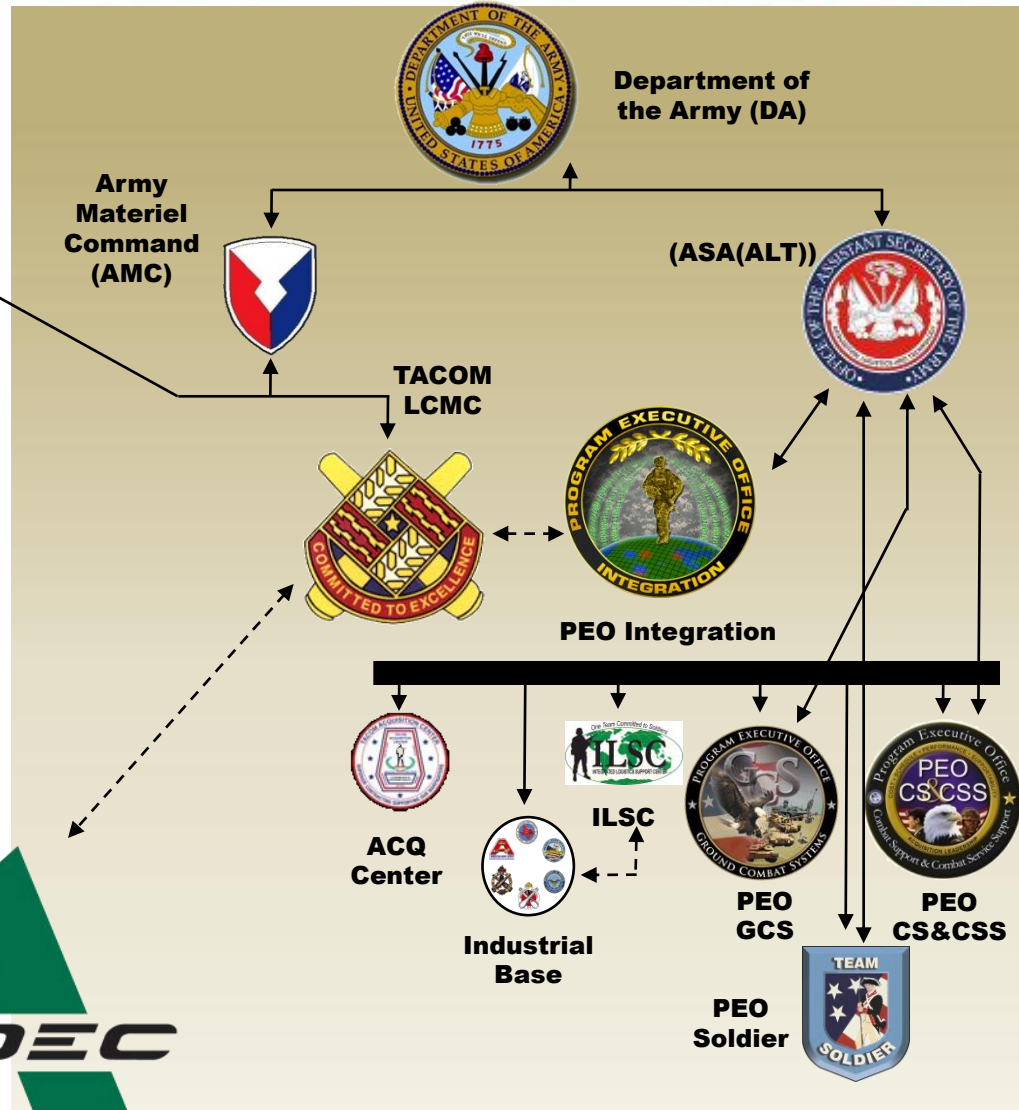
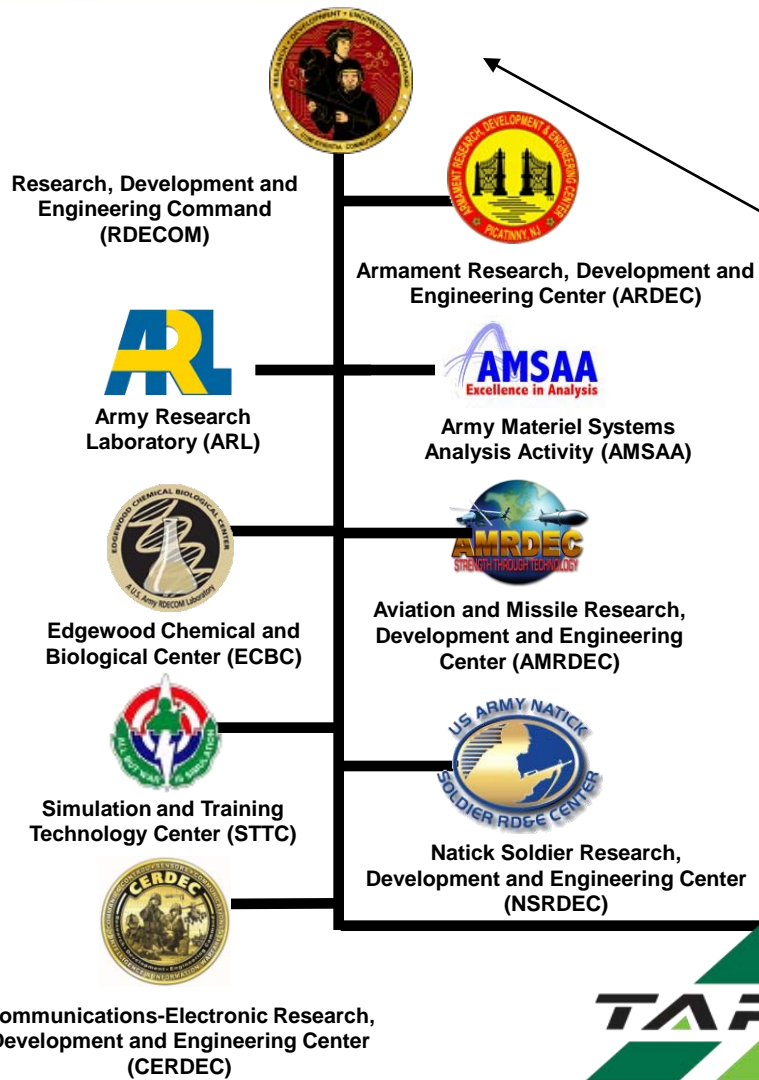
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- Provides full life-cycle engineering support and is provider-of-first-choice for all DOD ground combat and combat support vehicle systems.
- Develops and integrates the right technology solutions to improve Current Force effectiveness and provide superior capabilities for the Future Force.

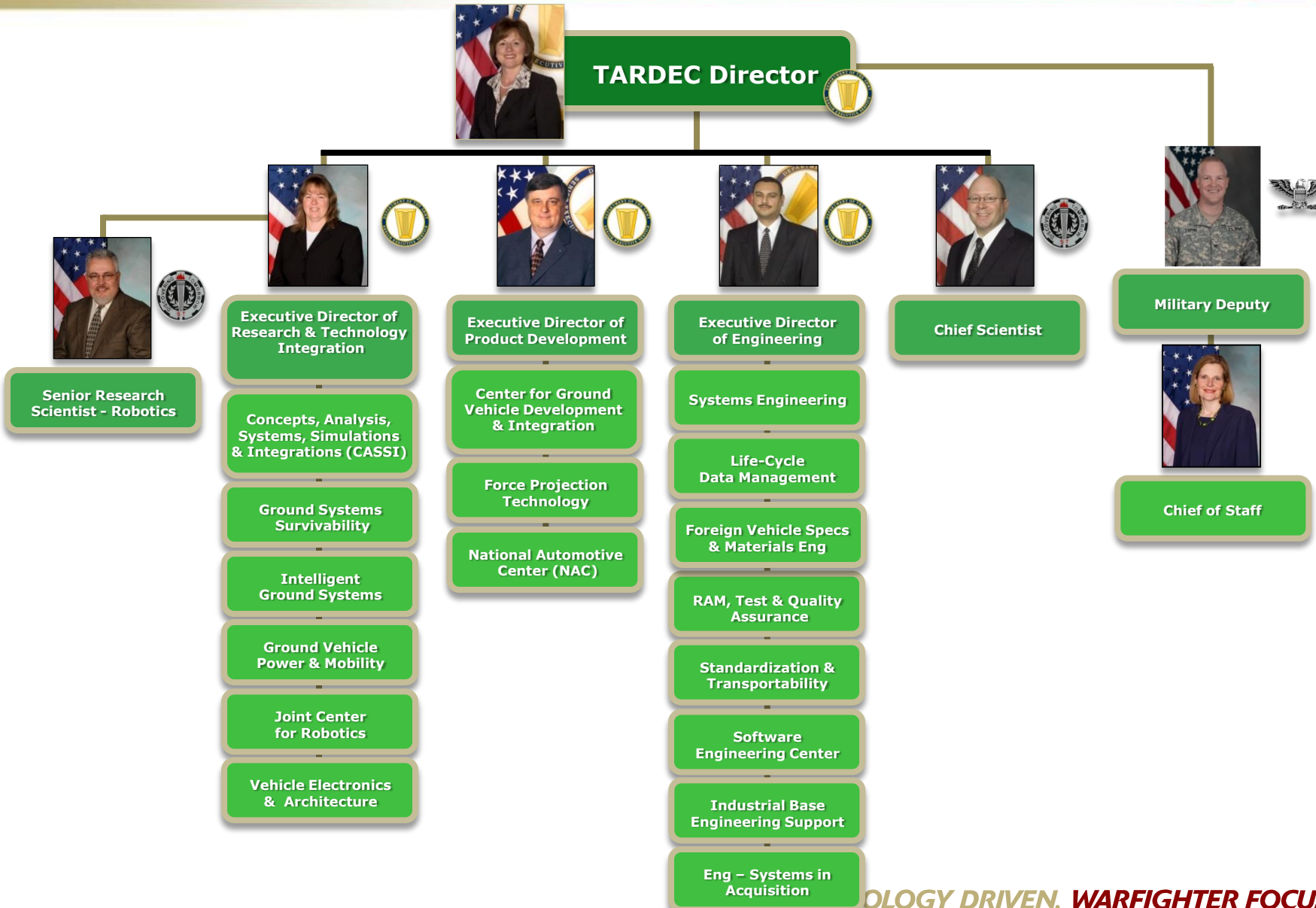
*Ground Systems Integrator
for the Department of Defense*

Responsible for Research, Development and Engineering Support to **2,800** Army systems and many of the Army's and DOD's Top Joint Warfighter Development Programs

TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.



Reach back to over 8,500 Scientists and Engineers





Force Projection

- Fuel & Water Distribution
- Force Sustainment
- Construction Equipment
- Bridging
- Assured Mobility Systems



Combat Vehicles

- Heavy Brigade Combat Team
- Strykers
- MRAPs
- Ground Combat Vehicles (Future)
- Abrams Main Battle Tank
- Bradley Fighting Vehicle



Tactical Vehicles

- HMMWVs
- Trailers
- Heavy, Medium & Light Tactical Vehicles
- Joint Tactical Vehicle (Future)

Robotics

- TALON
- PackBot
- MARCbot
- Gladiator
- Demonstrators
- Technology Components



TARDEC Engineers Provide Cradle-To-Grave Engineering Support

System & Simulation Integration Laboratories

Concept Development	Modeling & Simulation Environment	System Evaluation	MRAP Systems Integration Lab

Survivability Laboratories

Ballistic Testing	

Physical Simulation Laboratories

Reconfigurable N-Post Simulator	Multi-Axial Simulator	Vehicle Inertial Properties Evaluation Rig

Prototype Integration

Center for Ground Vehicle Development & Integration	Large Robotics Integration Cell

Fuels & Lubricants Laboratories

Coolant Lab	Grease & Hydraulic Fluid Lab	Fuel & Lube Lab	Analytical Lab

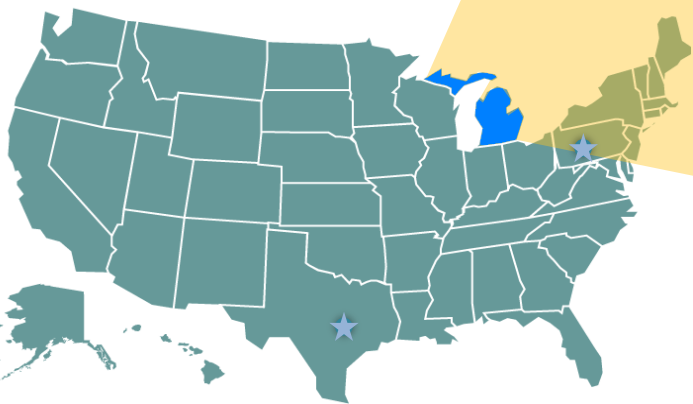
Power & Energy Laboratories

Ground Systems Power & Energy Lab	Propulsion Laboratories

TARDEC's Warren, MI operations has a resource value of over \$950M and occupies 12 facilities on the Detroit Garrison totaling over 840,000 square feet of laboratory space

Geographic Benefits

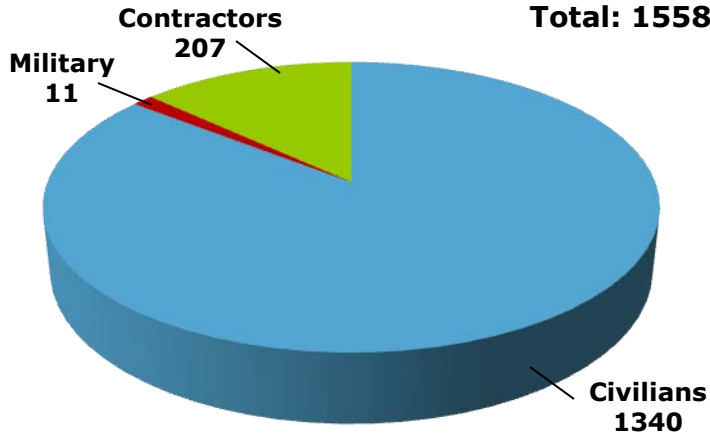
- Direct Linkage to World-Class Automotive Research and Development Centers
- Strategic Engagement with 2nd and 3rd Tier Automotive Supplier Network
- Connected to World-Class Universities



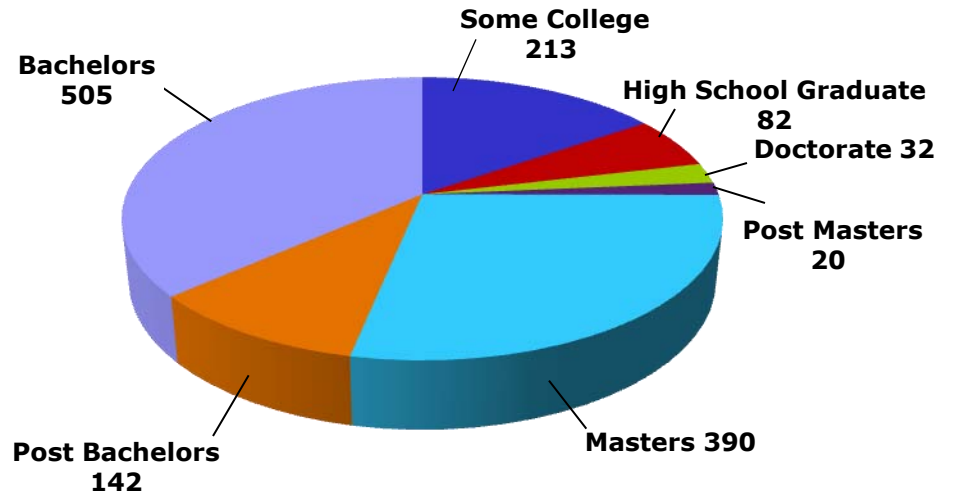
Additional Facilities in Texas, & Pennsylvania

Total Workforce

Total: 1558



Education



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Ground Vehicle Power & Mobility Integration

- Prime Power (Powertrain)
- Non Primary Power
- Power & Thermal Management
- Energy Storage
- Track & Suspension
- Alternative Energy



Ground Systems Survivability Integration

- Integrated Vehicle Protection Systems
- Active Defense
- Signature Management
- Laser Vision Protection
- Ballistic Protection
- Crew Survivability



Tactical Movement of Force Projection Technologies

- Water Generation, Purification, Storage, Distribution & Quality Surveillance (QS)
- Petroleum Storage, Distribution & QS
- Material Handling Equipment
- Mechanical Countermine Equipment
- Tactical Bridging

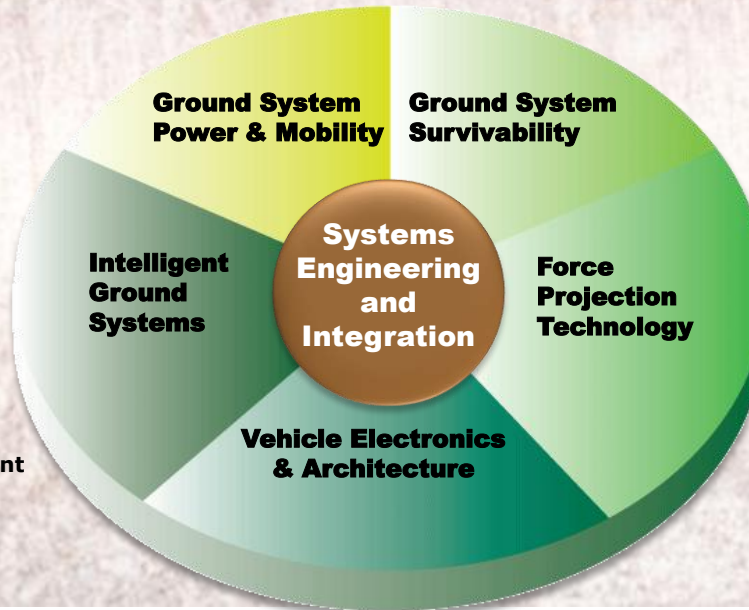
Specification Development of Force Projection Technologies

- Petroleum, Oils & Lubricants Technology
- Alternative Fuels



Intelligent Ground Systems

- Autonomous Robotics Systems
- Safe Operations Technologies
- Indirect Vision Technologies
- Unmanned Systems Technology Development
- 360° Situational Awareness Technologies
- Soldier Machine Interfaces
- Connected Vehicles



Vehicle Electronics & Architecture Integration

- Electronics Integration
- Data Architecture
- Condition-Based Maintenance (CBM+)
- Power Architecture/Management

Advanced Concepting



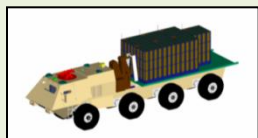
Future Force



JLTV

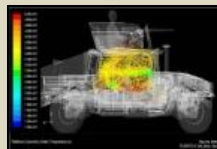


MRAP

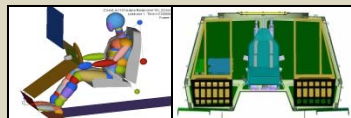


FTTS

Analytics



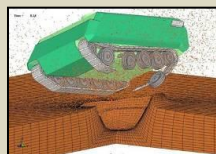
Thermal / CFD



Crew Safety



Structures/Durability



Blast



Dynamics

Hardware & Man-In-The-Loop Simulation



Characterization



Durability



Turret Testing



Human Dimension



Virtual Environments

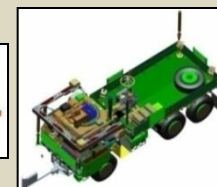
Prototype & Demonstrators



FTTS



FED



TWVS

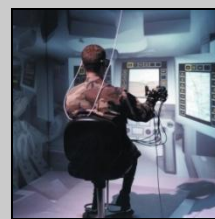


APD

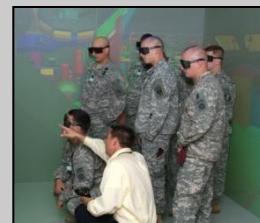
HPC & Data Management



High Performance Computing (HPC)



Computer Aided Virtual Environment (CAVE)

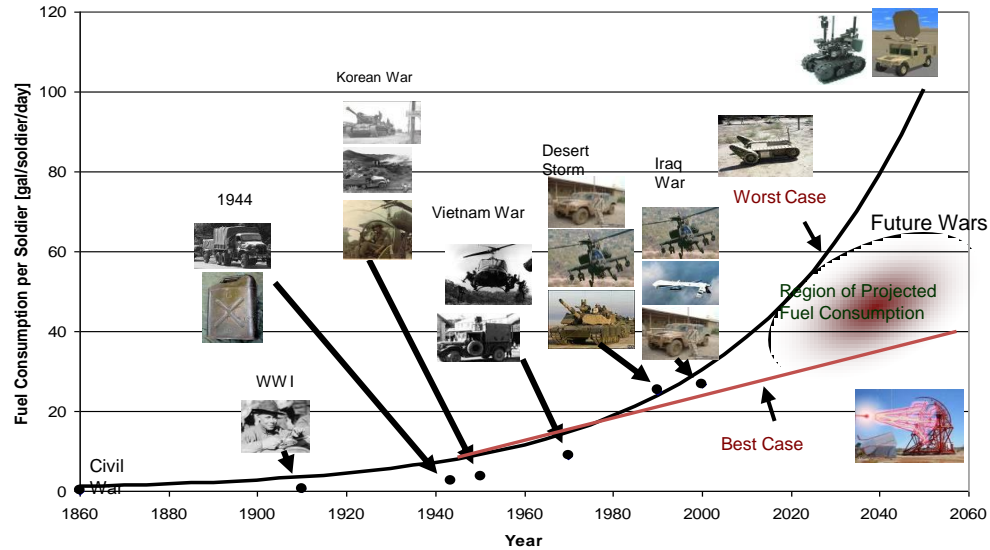


Advanced Collaborative Environment (ACE)

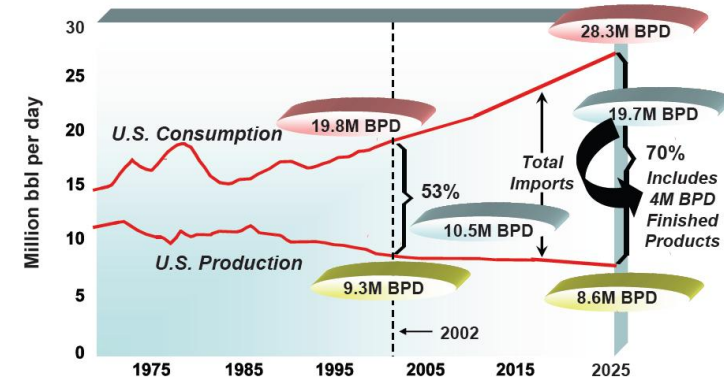
Providing rapid assessment and integration services throughout the Life Cycle of both Technology and System/Platform Development Programs.

The Challenges

- Battlefield consumption of energy increasing
 - New C4ISR technologies
 - IED Defeat Systems
 - New weapons
- Energy security problematic
 - Increasing dependence on foreign oil
 - Alternative sources sought – wind, solar, bio-mass, waste to energy
- Operational issues
 - Battery usage & limitations – energy & power density
 - Demand for auxiliary power on-board vehicles
 - Emphasis on silent (“quiet”) watch
 - Unmanned vehicles (air/ground)
 - Unattended sensors
 - Inefficient management/ distribution of power
 - Demand for soldier-wearable power
- Increased emphasis on system power metrics (KPPs, low consumption components)



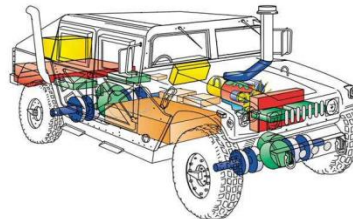
The US: Our Increasing Reliance on Fossil Energy Imports

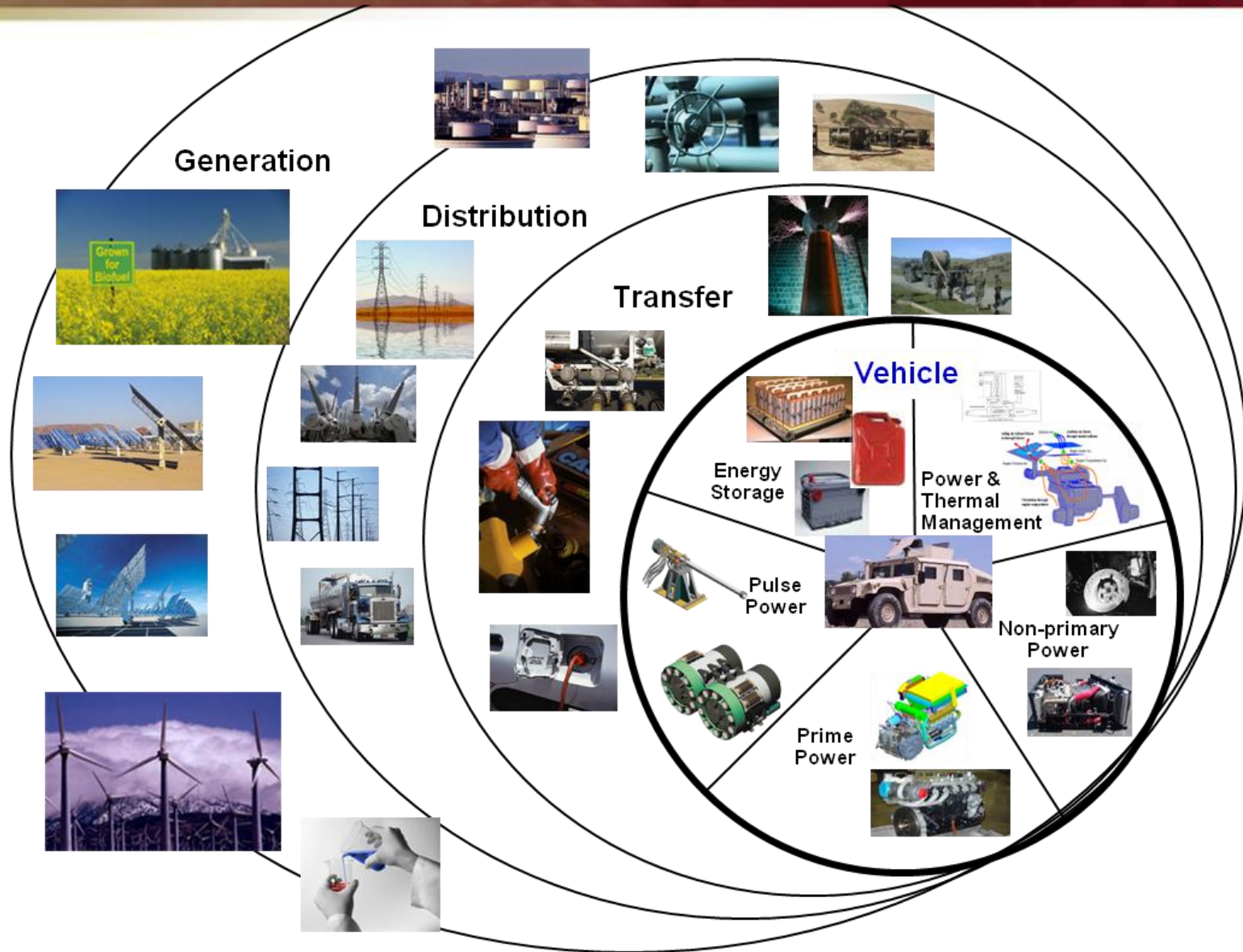


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Strategic Energy Security Goals (ESGs)

- ESG 1:** Reduced energy consumption.
- ESG 2:** Ensuring resilience in energy systems.
- ESG 3:** Increased use of renewable/alternative energy.
- ESG 4:** Assured access to sufficient energy supplies.
- ESG 5:** Reduced adverse impacts on the environment.





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Ground Vehicle Power and Energy Technology

<p>Power Generation</p>	<p>Diesel Engines Rotary Engines</p>	<p>Transmissions</p>	<p>Traction Motors JP-8 Fuel Cells</p>	<p>Integrated Starter Generator Turbine Engines</p>	<p>Alternators</p>	<p>Drivelines</p>
<p>Energy Storage</p>	<p>Li-Ion / Ultracap Hybrid Energy Storage</p>	<p>Capacitors</p>	<p>Advanced Batteries</p>	<p>Advanced Batteries</p>		<p>Fuels</p>
<p>Thermal Transport & Distribution</p>	<p>Radiators</p>	<p>Thermal Interface Materials</p>	<p>Heat Recovery</p>	<p>Phase Change Cooling</p>	<p>Advanced Electronics Cooling</p>	<p>Thermal Architectures</p>
<p>Power Control & Distribution</p>	<p>Power Controllers for Power Management</p>	<p>Power Converters/Inverters</p>	<p>Wide Band Gap Materials (SiC)</p>	<p>High Temperature SiC Modules</p>	<p>Pulse Power Switching</p>	<p>High Temperature Capacitors High Temp Inductors</p>
<p>Track & Suspension</p>	<p>Track Systems</p>	<p>Suspension Systems</p>	<p>Electronic Stability Control</p>		<p>Elastomer Research</p>	<p>Elastomer Research</p>

TECHNOLOGY DRIVEN WARFIGHTER FOCUSED

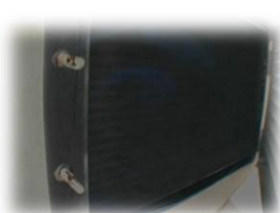
- Propulsion Laboratory
 - Engine Dynamometer Test Cells
 - Power and Inertia Simulator (PAISI) Test Cell
 - Vehicle/transmission/drive axle Evaluation Test Cell
 - Single-cylinder Engine Research Test Cell
 - Engine Generator Test Lab
- Full Vehicle Environmental Test Cell
- Hybrid Electric Reconfigurable Moveable Integration Testbed (HERMIT)
- Electro-chemical Analysis and Research Lab (EARL)
- Battery Lab
- Air Flow/Cooling Lab
- Electrical Power Architecture Systems Integration Lab (SIL)
- Ground Systems Power & Energy Labs (GSPEL)



Propulsion Lab



Electrical Power Architecture SIL



Airflow/Cooling Lab



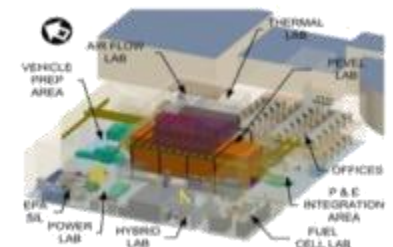
Battery Lab



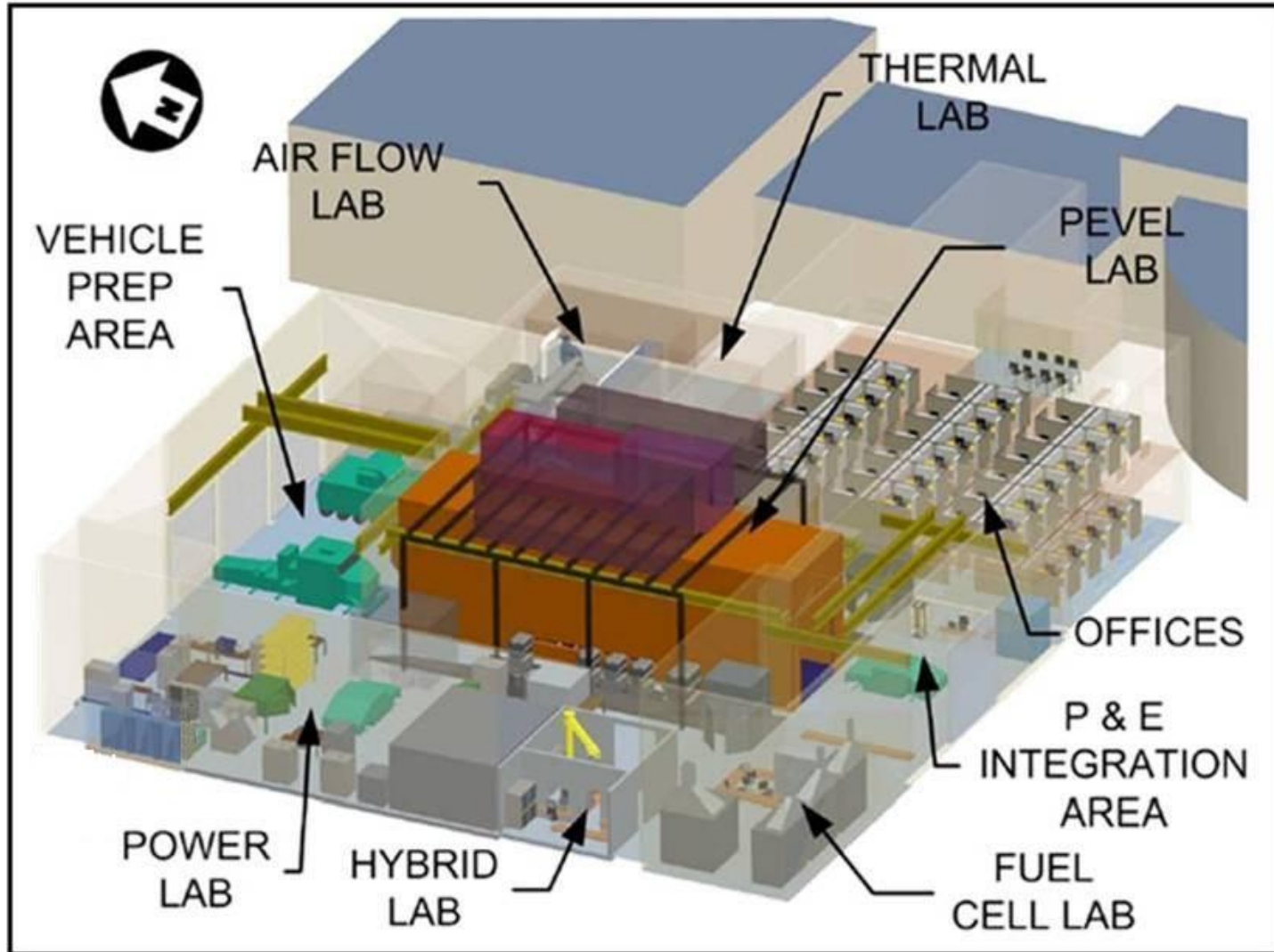
HERMIT



Environmental Test Cell



GSPEL



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It's all about...Supporting the Warfighter

