Title: Spatial Acquisition and Measurement of Power Sources (SAMPS) Program
The SAMPS program focuses on technologies used to assess the operational status of power generating and energy transmission infrastructure. The Mobile Electric Power-line Analyzer (MEPA) technology allows for the measurement of power flow and voltage without physically touching or being physically close to an overhead transmission power line. The Mobile Grid Frequency Analyzer (MGFA) technology measures the frequency of alternating current in a domestic power outlet for power grid situational awareness. The MGFA data can also be used to perform audio forensics to compare the 60 Hz noise in audio/video recordings. Forensics experts can use this data to determine: the location where the recording has been made to the power grid level, the time at which recording was made, the check time, spatial continuity of the recording, and if recording has been dubbed, spliced, edited, or manipulated. The Mobile Optical Vibration Analyzer (MOVA) technology allows for the measurement of surface vibrations using infrared optical reflectometry to detect whether fluid is flowing in a pipeline and determine whether the vibration levels observed is a low, medium or high rate of operation.

Title: Advanced Fuel Cell (AFC) Program
The AFC program is conducting research and development of technology for advanced energy storage through hydrogen generation and utilization, including catalysts, membranes, support materials, balance of plant, and smart electronics, that are increasing the potential of fuel cells being available for battlefield applications. Under the AFC program, an efficient and quality power hybrid fuel cell – battery storage system has been developed, tested, and demonstrated in an unmanned airborne vehicle test-bed. The nearly acoustically undetectable power system was capable of producing 150 Watts average power, with peak powers up to 1 kW from the integrated rechargeable hybrid battery. Additionally, an on demand chemical hydride reactor was developed that produced fuel (hydrogen) on board the airborne test-bed. Leveraging these simulated environment tests, a novel, smart 250 Watt fuel cell is currently under development that will advance fuel cell and hydrogen generation component technologies. This system is potentially ideal for supplying silent power for covert, front-line radar and communications systems, battery chargers, unmanned remote ground/airborne systems, and similar missions.

Title: Alternative Power Technology for Missile Defense (APT) Program
The goals of this SMDC program are to design, fabricate and test novel microgrid technologies; conduct research and development on new photovoltaic technologies; establish and operate an microgrid test-bed; and identify high pay-off alternative power technology applications for SMDC and warfighter needs. A novel microgrid design has been developed that includes specialized electronic hardware and software that can dramatically reduce fuel usage for mobile tactical power needs. The custom software for this system is under development along with a 10 to 50 kW test bed that will demonstrate full functionality of this microgrid system. Novel cost effective photovoltaic devices are also under development for military applications.

Title: Simulation & Design of Large Electromagnetic Systems (SDLES) Program
The SDLES program will conduct research and develop physics-based electromagnetic algorithms specially designed to exploit parallel-processor computing systems and develop similar capabilities for analysis and design of polymer Electrolyte Membrane (PEM) fuel-cell components. High order of accuracy time-domain and frequency-domain finite element codes for electromagnetic systems will be developed, along with sensitivity analysis coupled with optimization algorithms for design capabilities. 3-D time-domain and frequency domain EM solvers will be developed in the Base Period with adjoint-based sensitivity analyzer for solution optimization in Option 1, and integrated 3-D Electromagnetic Solver and Optimizer for Option 2. The end product of this effort is a large-scale radar simulation/design capability and a design tool for innovative energy sources and efficient power components. The benefits of this program include reduced time and overall cost of development of future next generation radar systems, and the ability to develop alternative power and energy systems for the battlefield.