National Aeronautics and
Space Administration

Intelligent Power Systems

Leverage NASA's expertise, testing capability, and state-of-the-art facilities in intelligent power

TECHNOLOGY OPPORTUNITY

With over 50 years of experience in designing, developing, and testing advanced power systems, NASA's Glenn Research Center (GRC) has engineered revolutionary intelligent power management technologies that have benefitted the Nation's space program and enhanced the competitiveness of U.S. industries. Whether in the area of power generation, power management and distribution, or energy storage, NASA knows how to optimize intelligent power through a combination of hardware and software solutions. GRC invites companies to explore partnerships that can help improve power system performance and enhance the design and development of next-generation electric and hybrid electric vehicles.

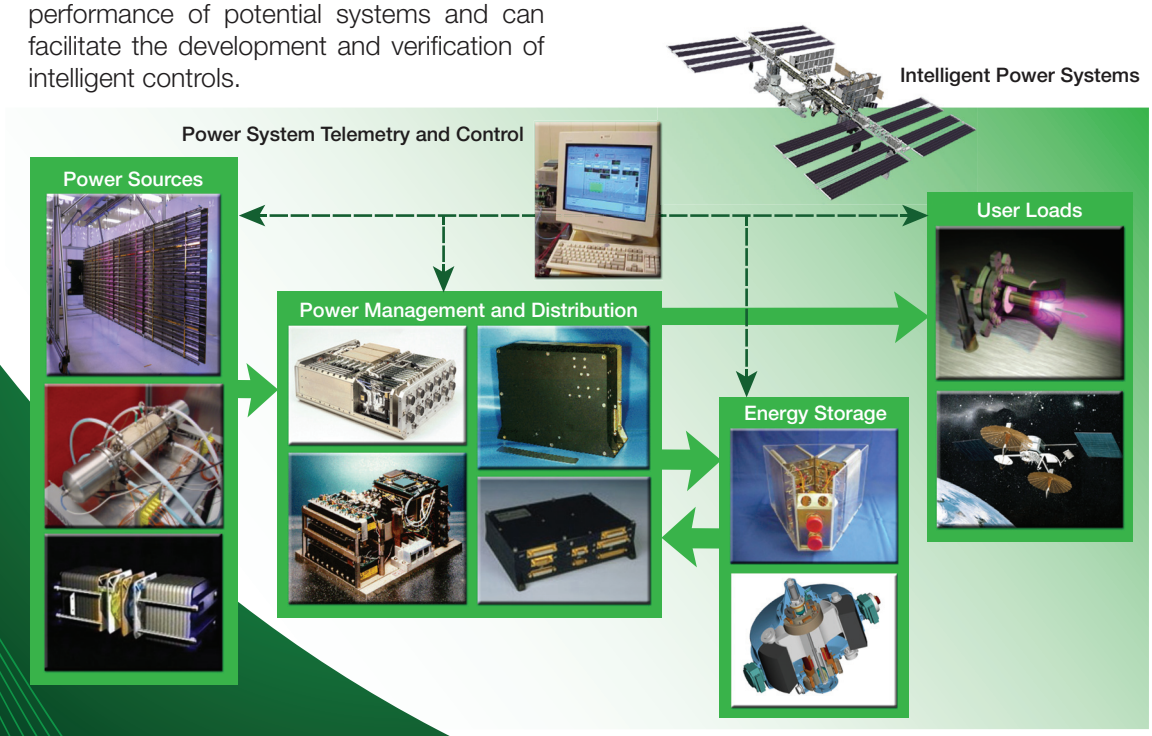
BENEFITS

- GRC expertise in intelligent power systems can be leveraged to control and manage hybrid power sources that have significant energy storage needs.
- GRC power system test facilities can accommodate integrated power system testing of novel platforms, including batteries, fuel cells, and flywheels as well as standard engines.
- GRC modeling and simulation of power systems can rapidly assess the long-term performance of potential systems and can facilitate the development and verification of intelligent controls.

APPLICATIONS

NASA's expertise, testing capability, and state-of-the-art facilities can help companies develop holistic, integrated, and intelligent power management systems. Some applications include

- Electric vehicles (EVs)
- Smart grids
- Plug-in hybrid electric vehicles (PHEVs)
- Hybrid energy storage systems
- Start/stop applications in vehicles

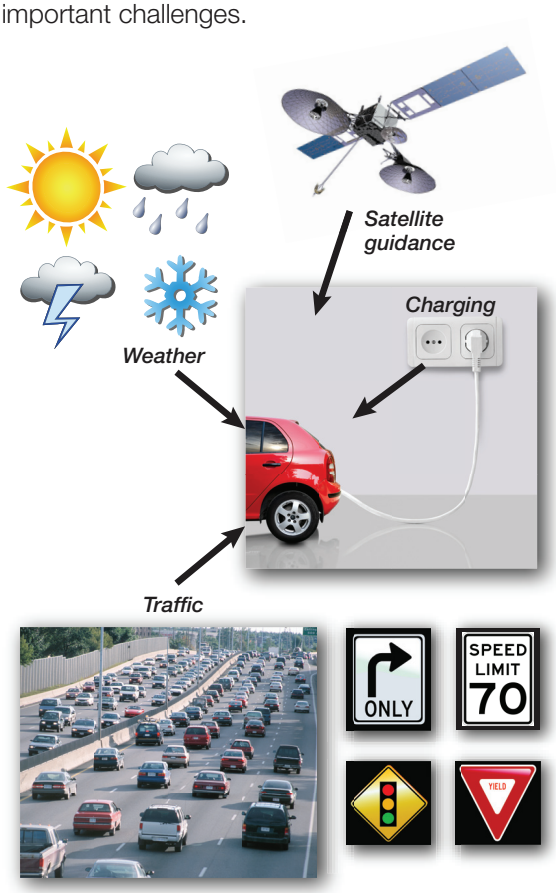


Electric Cars
AUTOMOTIVE INDUSTRY WORKSHOP

TECHNOLOGY DETAILS

To maximize the performance and efficiency of electric vehicles, the vehicle's intelligent power management systems must be integrated with other related automotive systems. Power demands must be continuously monitored and optimized with respect to (1) road and weather conditions, (2) route planning, topography/geography, and charging station locations, and (3) instantaneous traffic updates and route detours. All of this requires an intelligent power management system capable of calculating diverse bits of information in order to optimize vehicle power usage and range. Similarly, battery charging and health monitoring systems require intelligent power systems to control current, battery temperature, voltage, charging, rates to compute remaining charge, etc.

On a broader scale, intelligent power management systems must be interfaced with a smart grid infrastructure capable of managing grid capacity during charging. As the population of electric vehicles continues to grow, so does demand on the existing electric infrastructure, and this could lead to localized transformer overloads, peak demand clusters, and area brownouts. Vehicle charging in suburban environments will be a major infrastructure challenge. NASA's expertise and testing facilities can help companies solve these important challenges.



Intelligent energy management of personal electric vehicles with environment and charging infrastructure awareness.

GRC EXPERTISE IN INTELLIGENT POWER SYSTEMS

Power Controls
- Direct controller development for a wide spectrum of power generators and energy storage mechanisms
- Load management and failure diagnostics for power networks and batteries

Modeling and Simulation
- Power performance models for design assessments, and dynamic models for controller algorithm development and verification

Power Electronics
- Design and development of power converters and switchgear for multikilowatt systems

Systems Integration
- Integration and verification of power systems with multiple sources and storage

Software Development
- Design and development of software to CMMI Level 2

Advanced Sensors
- Development of high-temperature sensors for pressure and temperature

GRC EXPERIMENTAL FACILITIES IN INTELLIGENT POWER MANAGEMENT

Electric Power System Test Facility
- Provides a variety of loads and sources capable of 500 KW of power
- Accommodates sources such as fuel cells and alternators in addition to fuel cells and batteries

Power Electronics Lab
- Capability to buildup and test 10-KW-plus power electronic processing units

Fuel Cell Test Facility
- Capability to test 25-KW-plus fuel cells

Sensor Fabrication Facility
- Fabrication capability for high-temperature pressure and temperature sensors

FOR MORE INFORMATION

For more information about this and other technology licensing opportunities, please contact

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