



## Data Service Provider Cost Estimation Tool

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The Data Service Provider Cost Estimation Tool (CET) and Comparables Database (CDB) package provides to NASA's Earth Science Enterprise (ESE) the ability to estimate the full range of year-by-year lifecycle cost estimates for the implementation and operation of data service providers required by ESE to support its science and applications programs. The CET can make estimates dealing with staffing costs, supplies, facility costs, network services, hardware and maintenance, commercial off-the-shelf (COTS) software licenses, software de-

velopment and sustaining engineering, and the changes in costs that result from changes in workload.

Data Service Providers may be stand-alone or embedded in flight projects, field campaigns, research or applications projects, or other activities. The CET and CDB package employs a cost-estimation-by-analogy approach. It is based on a new, general data service provider reference model that provides a framework for construction of a database by describing existing data service providers that are analogs (or compara-

bles) to planned, new ESE data service providers. The CET implements the staff effort and cost estimation algorithms that access the CDB and generates the lifecycle cost estimate for a new data services provider. This data creates a common basis for an ESE proposal evaluator for considering projected data service provider costs.

*This program was written by Kathy Fontaine of Goddard Space Flight Center and Greg Hunolt, Arthur L. Booth, and Mel Banks of SGT, Inc. Further information is contained in a TSP (see page 1). GSC-14905-1*

## Hybrid Power Management-Based Vehicle Architecture

**This ultracapacitor design is energy- and cost-efficient with measurably less environmental impact.**

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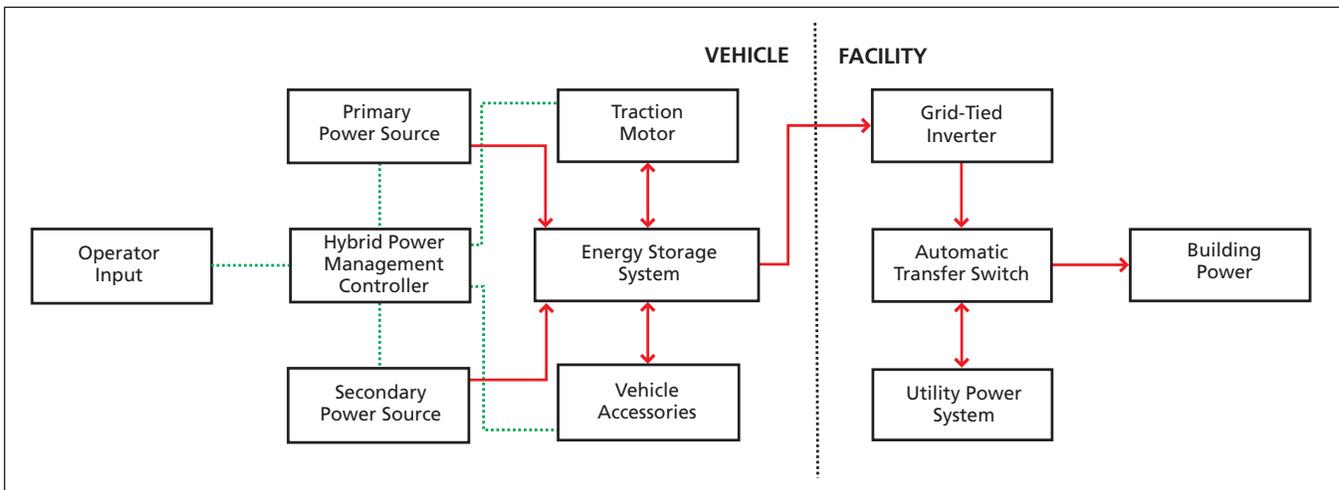
Hybrid Power Management (HPM) is the integration of diverse, state-of-the-art power devices in an optimal configuration for space and terrestrial applications (see figure). The appropriate application and control of the various power devices significantly improves overall system performance and efficiency. The basic vehicle architecture consists of a primary power source, and possibly other power sources, that pro-

vides all power to a common energy storage system that is used to power the drive motors and vehicle accessory systems. This architecture also provides power as an emergency power system.

Each component is independent, permitting it to be optimized for its intended purpose. The key element of HPM is the energy storage system. All generated power is sent to the energy storage system, and all loads derive their

power from that system. This can significantly reduce the power requirement of the primary power source, while increasing the vehicle reliability.

Ultracapacitors are ideal for an HPM-based energy storage system due to their exceptionally long cycle life, high reliability, high efficiency, high power density, and excellent low-temperature performance. Multiple power sources and multiple loads are easily



General HPM Vehicle Architecture.

incorporated into an HPM-based vehicle. A gas turbine is a good primary power source because of its high efficiency, high power density, long life, high reliability, and ability to operate on a wide range of fuels. An HPM controller maintains optimal control over each vehicle component. This flexible operating system can be applied to all vehicles to considerably improve vehicle efficiency, reliability, safety, security, and performance.

The HPM-based vehicle architecture has many advantages over conventional vehicle architectures. Ultracapacitors

have a much longer cycle life than batteries, which greatly improves system reliability, reduces life-of-system costs, and reduces environmental impact as ultracapacitors will probably never need to be replaced and disposed of. The environmentally safe ultracapacitor components reduce disposal concerns, and their recyclable nature reduces the environmental impact. High ultracapacitor power density provides high power during surges, and the ability to absorb high power during recharging. Ultracapacitors are extremely efficient in capturing recharging energy, are rugged, reliable,

maintenance-free, have excellent low-temperature characteristic, provide consistent performance over time, and promote safety as they can be left indefinitely in a safe, discharged state whereas batteries cannot.

*This work was done by Dennis J. Eichenberg of Glenn Research Center. Further information is contained in a TSP (see page 1).*

*Inquiries concerning rights for the commercial use of this invention should be addressed to NASA Glenn Research Center, Innovative Partnerships Office, Attn: Steven Fedor, Mail Stop 4-8, 21000 Brookpark Road, Cleveland, Ohio 44135. Refer to LEW-18704-1.*