Variable Module Management System

Energy Advantage Architecture

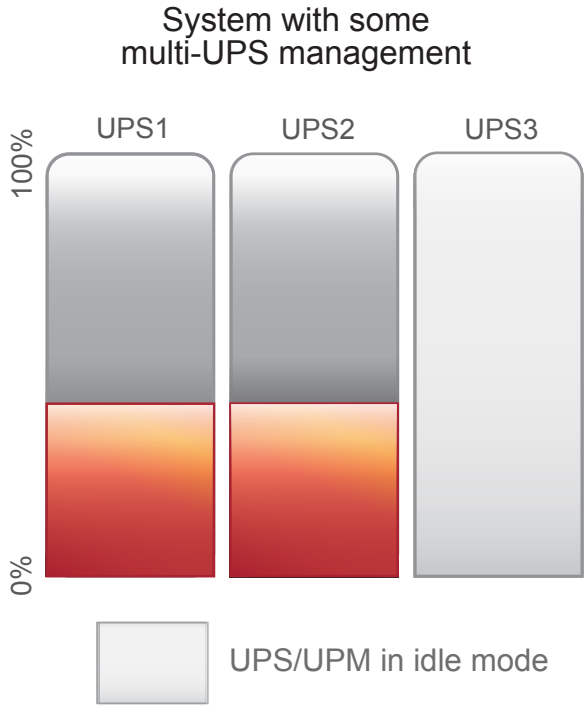
Energy Advantage Architecture (EAA) is a suite of options, technologies and designs that allow specifying engineers and facility managers to get the best possible performance and protection from their UPS.

As the growth of business and industry continues to rely on power hungry information and communication networks, higher energy efficiency helps businesses answer increasing environmental, regulatory and economic pressures.

Variable Management Module System (VMMS) is a key component of EAA. Eaton VMMS technology maximizes UPS efficiencies at low load levels while supplying the load with continuous double-conversion power. Most UPS installations are only loaded between 20-40 percent, but UPSs are not optimally efficient when used at these lighter loads.

Existing method for increasing load percentage

The existing approach to capturing efficiency from low load levels applied only to multi-UPS parallel systems. The system can increase the effective load percentage by putting entire UPSs into idle. While this helps improve efficiency slightly, it is limited to multi-UPS parallel systems, and flexibility to adapt to the load can only be done in the large steps of full UPS capacity.



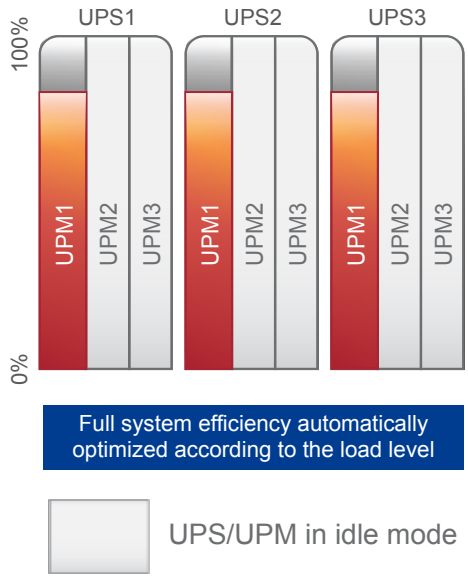
Applications

Applications where VMMS is particularly efficient:

- Redundant N+1 and 2N systems
  - Lightly loaded: <45 percent load level
- Critical data centers, especially when UPS feeds dual corded servers
- Any applications where load varies frequently

Powering Business Worldwide

System with Eaton modular 9395 UPS and VMMS



The VMMS way

VMMS optimally employs uninterruptible power modules (UPMs) to achieve higher efficiencies in double-conversion mode in order to maximize the load level on remaining active UPMs by setting UPMs that are not needed to ready state.* This is calculated according to VMMS load threshold of the UPMs – 80 percent by default – and the system configuration (redundancy requirements). As a result, VMMS maximizes energy savings.

VMMS is possible thanks to Power Xpert™ 9395 UPS modularity, and VMMS applies even in single-UPS systems.

Upon a load increase on critical bus, all ready-state UPMs are able to react quickly and revert to double-conversion mode in less than 2 ms by connecting the existing PWM signals to the IGBT gates.

Extensive configurability

Customers can decide how to configure their system establishing the number of redundant UPMs and the maximum load level per UPM.

VMMS can be used in single (multiple-UPM) and multi-UPS 9395 systems

- Single 9395 units from 550 kVA to 1100 kVA
- Distributed parallel systems (Xx550, Xx825, Xx1100)
- SBM centralized bypass system

Earlier installations can also be upgraded with VMMS capability, contact Eaton customer service technical support at 1-800-843-9433 for more information.

- VMMS maintains redundancy and achieves higher efficiency by intelligently controlling the load levels of the UPMs
- Number of redundant UPMs can be selected (N+0, N+1, N+2, N+X)
- UPMs on ready state can be used as redundant units (N+0)

**In ready-state, the UPM rectifies DC-link, generates logic level PWM signals, and filters EMI and lightning spikes.*

Two 9395 825 kVA (A and B feed design) with 440 kVA (27 percent) total load

UPS configuration	Without VMMS	VMMS on N + 1 redundancy	VMMS on N + 0 redundancy
Efficiency @ 440 kVA (27%) load	91.2%	92.8%	94.3%
UPS energy savings	Used as reference for savings calculation	56 MWh/year	108 MWh/year
Additional benefits & comments	✓ Industry-leading UPS efficiency in double conversion	✓ Additional energy savings from reduced cooling in VMMS (typically adds 30 - 40% to UPS energy savings) ✓ UPMs in VMMS ready state available for redundancy	
UPM active UPM in ready-state	A Feed 220 kVA B Feed 220 kVA	A Feed 220 kVA B Feed 220 kVA	A Feed 220 kVA B Feed 220 kVA

For more information about VMMS or to use the Eaton UPS efficiency calculator, please visit **Eaton.com/EAA**.

Eaton Corporation
Electrical Sector
1111 Superior Avenue
Cleveland, OH 44114 USA
Eaton.com

Printed in USA
VMMS01FXA
November 2012

Powering Business Worldwide