



Inverter Validation/Testing

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**FY 2004 Task No. 4: Evaluation of Prototypes
for Contracts Support**

(extended from FY 2004)

**Advanced Power Electronics and Electrical Machines
Quarterly Review**

**National Transportation Research Center
January 2005**



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Project Summary

- **Background**

- AIPM task started in FY 2000 with three industrial teams developing inverters for automotive applications and ORNL providing technical and validation test support
- ORNL role — develop test procedures, determine and acquire needed test equipment, develop data acquisition system, schedule test cells, and test inverters to confirm units adherence to the established specification
- Relationships were established with industry during AIPM task with:
 - Semikron
 - SPCO
 - Rockwell Automation
 - Satcon
 - Inverters developed by Rockwell Scientific, Cree/Semikron, Michigan State University, and Ballard will be evaluated

Objectives

- **Test/evaluate the performance of the units developed under sub-contract for DOE**
- **Evaluate performance capability of units across the voltage range of the inverters**
 - Power capability
 - Current capability
 - Efficiency

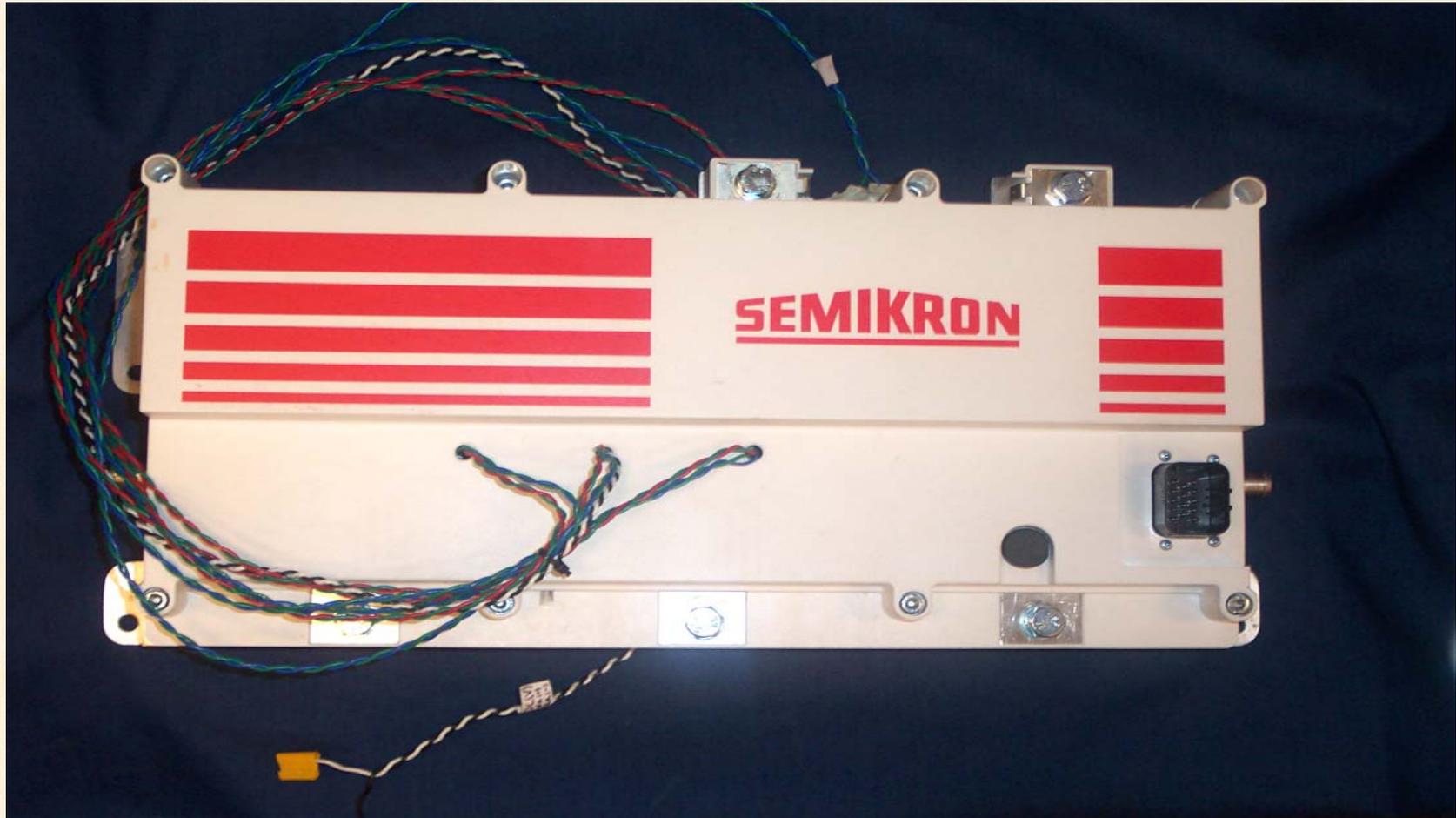
FY 2004 Progress/Results

- **Report documenting testing the AIPM unit from SPCO issued first quarter of FY 2004 – *Electrical Evaluation of Pre-Production SPCO High-Voltage AIPM Inverter*, ORNL/TM-2003/268**
- **Plans were to test Semikron unit during the fourth quarter of FY 2004, but testing was not performed due to a delay in receiving the unit**

FY 2005 Plan

- **Complete Semikron inverter testing – second quarter of FY 2005**
 - Tests to be performed
 - Inductive load test
 - Dynamometer test
 - Analyze and document test result
- **Rockwell Scientific all SiC inverter will be evaluated – third quarter FY 2005**
- **Cree/Semikron hybrid Si-SiC inverter will be evaluated – third quarter FY 2005**
- **Z source converter from MSU will be evaluated – fourth quarter FY 2005**

Semikron AIPM Unit



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Quarterly APEEM Update – January 2005


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FY 2005 Progress to Date

- **October through December**
 - Initial testing of Semikron inverter was performed October 2004
 - Testing was documented in *Testing of Semikron Validation AIPM Unit at ORNL*, ORNL/TM-2004/246 – October 2004
- **Delays in Semikron Testing**
 - Testing was not completed due to an over-current problem with the unit.
 - **Phase 1 – open diode**
 - **Phase 3 – shorted power switch**
 - The unit was returned to Semikron for repair in October, and the repaired unit was received by ORNL in late December

Future Plans and Expectations

- **Ballard dc/dc converter for fuel cell and hybrid electric vehicle applications will be evaluated in FY 2006**