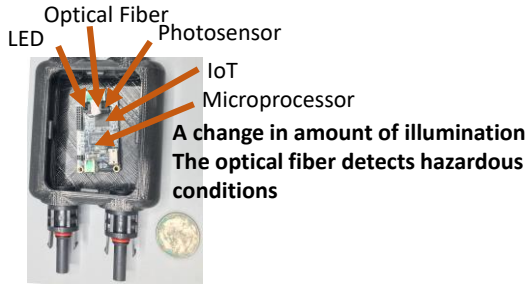
Solar Guardian® Intelligent Optical Sensors

Management Sciences, Inc. is a woman owned small business, incorporated in 1976. Since 2002, MSI has developed electronic devices that use artificial intelligence to monitor and manage the safety of components in electrical systems. Development of MSI's innovative technologies has been supported by the Department of Defense (DoD) and Department of Energy (DoE).

Solar Guardian Intelligent Optical Sensors

Our technology for the current competition is an inexpensive microsystem for 24/7 monitoring of safety of PV system components including, but not limited to, solar modules, wiring, inverters, combiners, energy storage units, control panels, and distribution systems.



Key Features and Benefits

- **24/7 monitoring of the health of PV system components**
- **Durable to operate in any environment**
- **Extremely inexpensive**
- **Easy to incorporate into PV system components**
- **IoT communication via WiFi, Ethernet or Phy**
- **Compliant with safety standards**
- **Covered by 7 US and 3 China patents**

Support by Sandia National Laboratories

In 2011, MSI was contracted by Sandia National Laboratories (SNL) to innovate an affordable technology to locate defective solder joints and parallel arcing to frames of solar modules to prevent electrocution and prevent PV module electrical fires by detecting overheating of solar module conductors. In 2013, a team of Sandia scientists, led by Jay Johnson, evaluated MSI's solution (US Patent # 9,464,946) in a Sandia solar testing laboratory. Sandia Technical Report SAND2018-0876 documents this support. In 2015, Sandia provided testing of MSI's PV wiring connector to prevent arc faults in balance of system wiring (US Patent # 9,413,155). In 2019, Sandia provided testing in their PV array of MSI's Rapid Shutdown System. This year (2020), MSI is invited to team with SNL to develop a technology to monitor and prevent overheat and other hazards in large scale PV energy storage units.

Support by Underwriter Laboratory (UL)

The new UL PV Innovations Program was established to develop test procedures for innovations like the Solar Guardian® PV system safe monitors. Solar Guardian has engaged with the UL PV Innovations program to learn what is required to attain UL Certification for PV system components.

Support by Solar Industry

Amphenol is collaborating with MSI in making solar connectors that have an embedded sensor circuit and microprocessor. Emera Technologies, a subsidiary of Emera Inc., was created to explore and develop emerging energy-related technologies. It constructed a 50-home microgrid testbed with built-in safe-guards in 2018 in Albuquerque, NM on Kirtland Air Force Base adjacent to SNL, providing us ease of local access to a testbed. The testbed has large-scale energy storage units and wiring to prove the Solar Guardian's Intelligent Optical Sensor's ability to detect safety problems and communicate alerts.

Need for Continued DoE Support

Rapidly moving the Solar Guardian® Intelligent Optical Sensors to market readiness will benefit from continued collaboration with Emera Technologies, Amphenol Solar Industries, Sandia National Laboratory (SNL), and Underwriters Laboratory (UL). Amphenol has the experience and ability to assist with reducing cost and readying the product for market. Emera Technologies and SNL have the necessary equipment and expertise to perform independent testing and validation. In addition, during the Go! phase, Emera and SNL have the microgrid resources to perform live testing on full scale solar arrays to validate that the Solar Guardian product is ready for release to the market. In the Ready! phase, Solar Guardian will work with the UL PV Innovations Program to develop a test procedure to ensure our product and manufacturing processes meet the requirements for UL Certification. UL has the ability to perform certification to meet requirements for safety, reliability, and durability.