

## MicroGen's BOLT™ MEMS Energy Harvester Combines with Infinite Power Solutions' THINERGY® MEC to Create Self-powered Wireless Sensor Node

MicroGen demonstrates missing-link to efficient and reliable vibrational Energy Harvesting solutions

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MicroGen Systems, Inc. (MicroGen; <http://www.microgensystems.com>) of Ithaca, NY, and Infinite Power Solutions, Inc. (IPS; <http://www.infinitepowersolutions.com>) of Littleton, CO, recently demonstrated a complete Wireless Sensor Network (WSN) solution powered by their combined products. At the recent Sensors Expo and Tradeshow 2011 (<http://www.sensorsexpo.com>) held in Rosemont, IL, MicroGen's MicroElectroMechanical Systems (MEMS) based Piezoelectric Vibrational Energy Harvester (PZEH) micro-power generator product called the BOLT™060 combined with the THINERGY® IPS-EVAL-EH-01 Energy Harvesting Evaluation Kit from IPS to power-up a complete wireless sensor board.

The actual demonstration was completed at MicroGen's booth on an electro-mechanical shaker to simulate a typical industrial vibration environment. The IPS-EVAL-EH-01 was easily connected to the MicroGen BOLT060 micro-power generator and vibrated at a frequency of 60 Hz and an acceleration amplitude of 0.7 g (g = 9.8 m/s<sup>2</sup>). The BOLT devices are 1.0 cm<sup>2</sup> silicon-based chips or less that produce power levels up to 200 microWatts. These are the first commercial MEMS-based PZEH to be demonstrated at low relevant frequency and acceleration levels.

The IPS-EVAL-EH-01 is a universal energy harvesting evaluation kit that accepts energy from a variety of energy harvesting transducers (both AC and DC charge sources), and efficiently stores the energy in a THINERGY® MEC101 solid-state micro-energy cell (MEC), a unique type of thin-film battery the size of a postage stamp. The THINERGY MEC101 is a near loss-less energy storage device able to accept charge currents less than 1 microAmp making it ideal for energy harvesting applications. The IPS-EVAL-EH-01 kit also included the MAX17710 energy harvesting power management integrated circuit (PMIC) from Maxim Integrated Products (<http://www.maxim-ic.com>) which provides an input voltage boost circuit if needed, manages the charge voltage of the battery and provides a programmable regulated output voltage to power the load. For this demonstration, the popular ez430-RF2500 wireless temperature sensor demo from Texas Instruments' (<http://www.ti.com>) was used as the load, which features an integrated MSP430 microcontroller and CC2500 2.4GHz radio transceivers to transmit temperature data.

MicroGen's founder, President and CTO, Robert Andosca stated, "Our BOLT micro-power generator products are the first of their kind to be sold into the emerging energy harvesting market. These products will help eliminate the need to constantly replace dead batteries in wireless sensor nodes/networks, which is very cost prohibitive in terms of labor." He added, "MicroGen products are ideally positioned to complement energy efficient solutions recently brought to market by IPS and a growing number of power management, micro-controller and low-power RF transceiver companies. MicroGen has now demonstrated that efficient and cost-effective solutions can be offered to accelerate the deployment of self-powered WSNs."

Tim Bradow, VP Marketing for IPS added, "We are delighted to work with MicroGen and to provide them with the most efficient and easy to use energy storage solution available for their low power energy harvesters. Together we provide a low cost, compact, vibration harvesting power supply solution that can operate reliably and maintenance-free for decades."

MicroGen is developing a MEMS-based PZEH family of products called BOLT™. This product line is intended to enable low power electronic devices, such as wireless sensor nodes for wireless sensor network (WSN) applications. The product-line consists of BOLT050 and BOLT100, and BOLT060 and BOLT120, which resonate at vibrational frequencies of 50 and 100 Hz, and 60 and 120 Hz, respectively, and are aimed at industrial and building applications. A custom BOLT product can be fabricated for any target frequency between 30 and 1,500 Hz. There are no other commercially available MEMS-based PZEH products on the market today.

MicroGen is a self-funded startup that also benefits from the support provided by The University of Vermont (<http://www.uvm.edu>), Cornell University's Energy Materials Center (<http://www.emc2.cornell.edu>) and New York State Foundation for Science, Technology and Innovation (<http://www.nystar.state.ny.us>), the Cleantech Center (<http://www.thecleantechcenter.com>), High Tech Rochester (<http://www.htr.org>), NY State Energy Research and Development Authority (<http://www.nyserda.org>), and the National Aeronautics and Space Administration (<http://www.nasa.gov>). This work was performed at the Cornell NanoScale Facility (<http://www.cnf.cornell.edu>), a member of the National Nanotechnology Infrastructure Network, which is supported by the National Science Foundation (Grant ECS-0335765).

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