Commercialization of Energy Harvesting Wireless Technology

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Troy Davis
Agenda

- Overview of the Energy Harvesting Solutions
- Examples of Energy Harvester modules
- Energy Harvesting Powered Devices
- Companies utilizing EH-Powering for Products
- Commercialized EH-Powered products
- Commercial Deployments and Savings Realized
- Q and A
Combining EH-Power with Wireless

EnOcean combines

energy harvesting components

+ robust wireless communication
Energy Harvesting Sources

- **Motion**
  - Linear
  - Rotational

- **Light**
  - Indoor

- **Thermo-electric**
  - Water pipes, air ducts
EH-Powered Wireless Devices

Combines Ultra-Low Power Electronics with Wireless

Mechanical  Solar  Thermal
Energy Harvesting Wireless Switch Modules

- **PTM 200** – For energy harvesting wireless switches

- **ECO 200 and PTM 330** – For unique switch applications
Energy Harvesting Wireless Sensor Modules

- **STM 300** – Bi-directional energy harvesting wireless sensors or innovative actuators

- **STM 310 series** – used for a variety of energy harvesting wireless sensors, such as window contacts, temperature or humidity sensors
Comparison of Wireless Technologies

- **NO BATTERIES**
  - Home & Building Automation
  - Industrial

- **FEW MONTH TO FEW YEARS BATTERY LIFE**
  - IEEE 802.15.4
    - e.g. ZigBee, Wireless HART, Dust Networks

- **RECHARGEABLE BATTERIES (FEW DAYS)**
  - Bluetooth
  - Metering infrastructure
  - Industrial
  - Headsets
  - PC Peripherals
  - PDA/Phone
  - PC Networking
  - Home Networking
  - Video Distribution
  - WiFi

- **WIRELESS VIDEO CONNECTION**
  - Wireless USB
  - Video/audio links

- **ENERGY REQUIREMENTS**
  - FACTOR 1
  - FACTOR 10s
  - FACTOR 100s
  - FACTOR 1.000s
  - FACTOR 10.000s
Who’s using Energy Harvesting?

- Leviton
- Delta Controls
- Schneider Electric
- Siemens
- Somfy
- Texas Instruments
- Philips
- Ledalite
130+ Customers in the EnOcean Alliance

... and created more than 1100 interoperable products!
Reference EH-Powered Deployments

Warehouse  Olympic Village  Hotels  Historic

Worldwide we control roughly 250,000 buildings with millions of energy harvesting powered devices.
Smart Floors, Dumb Walls

- Movable floor panels
- Movable walls, no wiring
- Sensors / switches ‘peel and stick’

USGBC LEED PLATINUM

15 Day Renovation
Office Buildings

Workers Compensation Fund
- Salt Lake City, UT
- New Construction, Lighting

- Building Automation
  - Occupancy Detection & Response
  - Daylighting
- Installation completed in one weekend, resulting in zero down-time for tenants
- USGBC LEED GOLD

Leviton
Example: Office Buildings

Promutuel Insurance
- Lighting & HVAC
- 800 EnOcean-enabled Devices
- LEED Certified
Office Buildings

Glumac “Office of the Future”
- Irvine, CA
- New Construction, Lighting/HVAC
- 8,500 sq. ft.

- EnOcean wireless extension to wired BACnet
- Occupancy based-lighting and climate control
  - Task-ambient luminaires & controls helped Glumac beat California Title 24 lighting allowances by 75%

- USGBC LEED PLATINUM
- (file picture)
### The Citadel of Quebec
- Retrofit, HVAC
- Quebec, Canada

#### Project Facts
Preserved Aesthetics with wireless thermostats, conserving energy with zone climate control and heating valve monitors.

#### Features
- **Wireless Controls:** Each controller is fully wireless and operates battery-free. These controls are nomadic and can adapt to future configurations allowing switch’s to be placed in any desired location without drilling or any addition construction.
- **Seamless Connectivity:** Simple plug-into BACnet system.

#### Payback Data
- **Energy Savings** - Utilizing multiple zone temperature controls, savings were estimated to be between 20-30%.
- **Preserved Aesthetics:** Without having to install any new wires and by utilizing a remote and wireless wall mount switch system, no drilling or building reconstruction was needed.
Emirates Green Building Council
- Dubai, UAE
- Retrofit, Lighting & HVAC

- Seamless Integration
  - Wireless controls integrated with existing BACnet & IP systems
  - Lighting & HVAC programmed via the CAN2GO web interface

- Controllers
  - Bidirectional control of EnOcean end devices
Tallest Building in Italy
Altra Sede Regione Lombardia, Mailand (2010)

Owner: Local Government Lombardia
OEM-Partner: Siemens

Situation
- 39 Floors
- 530 ft.
- 72,000 sqm Floorspace

Solution
- Flexible BMS
  - 400 EnOcean-KNX-Gateways for Full-Radio Coverage
  - 1580 EnOcean-Rocker for Lighting Control (DALI)
  - 2500 EnOcean Room-Units Temp./Setpoint

Benefit
- Flexible Roomstructure
- Quick and easy installation
- Saving of time Initial installation and Retrofit
Hainan Airline Hotel
- China
- Retrofit, Lighting
- 2 buildings, multiple floors

- 30% Energy Savings
  - Using a row of motion sensors through the hallway, lights turn on when someone walks through
  - Light brightness increases gradually as the people approach and gradually turn off behind them once they are further down the hallway.
Office Buildings

1000 Continental Avenue
- King of Prussia, PA
- New Construction, Lighting
- 5-Stories, 200,000 sq. ft.

- Automated Climate Control
  - Temperature sensors communicate with VAV unit controllers allowing seamless climate control
- Personalized HVAC Control
  - Tenants are able to customize their space needs using wireless controls
- USGBC LEED SILVER

Distech Controls
IKEA Warehouse
- Brossard, Quebec
- Retrofit, HVAC
- 4 buildings, 600,000 sq. ft

- Seamless Connectivity
  - Simple plug-in to robust BACnet backbone
  - Reliable RF communications despite harsh environment (metal)
Final Thoughts

- Energy sources are varied and widely available.
- The market supports the no-battery option
- Installations on very large scale exist globally
- Large corporations have adopted energy harvesting
- Hundreds of options available
- Technology is growing quickly
- Q and A
Thank you for your attention.
Any Questions?

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Troy Davis
Troy.davis@enocean.com