



Commercialization of Energy Harvesting Wireless Technology

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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

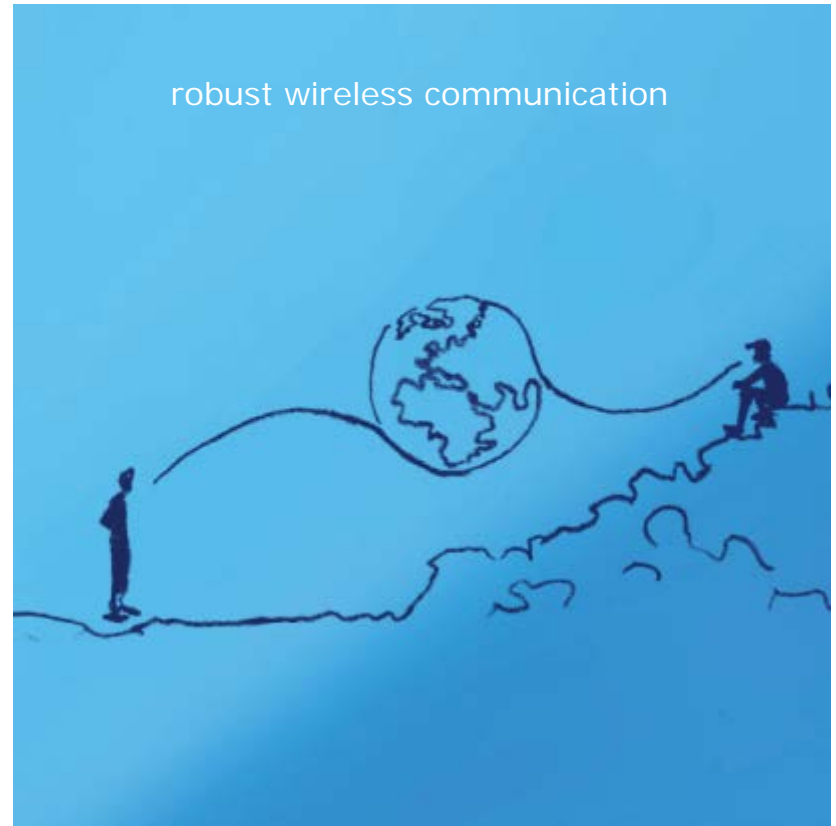
Combining EH-Power with Wireless

EnOcean combines

energy harvesting components



robust wireless communication



Energy Harvesting Sources



■ Motion

- Linear
- Rotational

■ Light

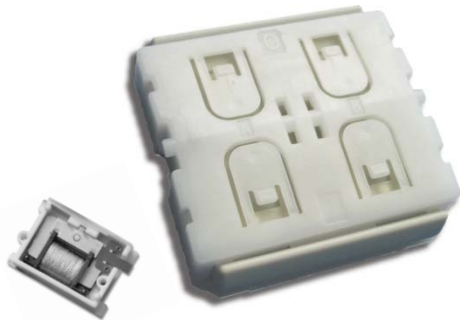
- Indoor

■ Thermo-electric

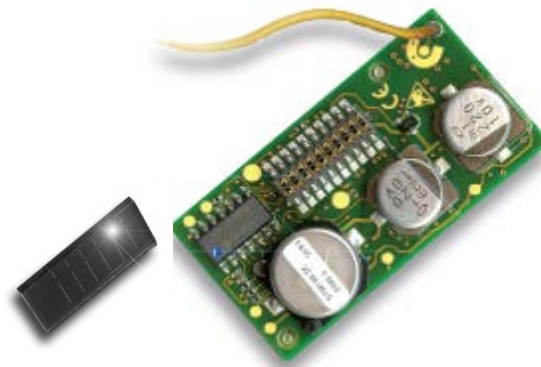
- Water pipes, air ducts

EH-Powered Wireless Devices

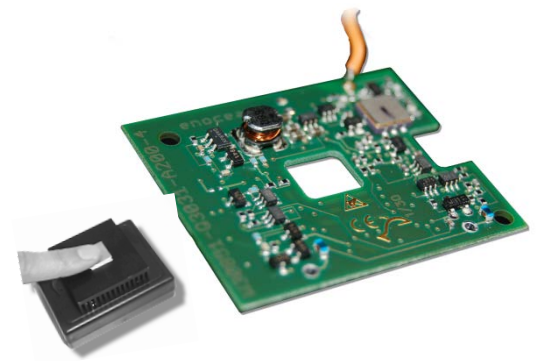
Combines Ultra-Low Power Electronics with Wireless



Mechanical



Solar



Thermal

Energy Harvesting Wireless Switch Modules

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



- **ECO 200 and PTM 330** – For unique switch applications

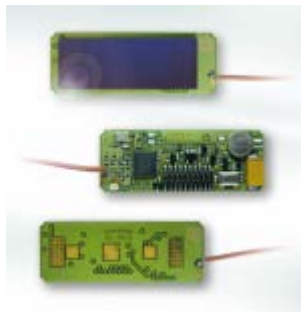


Energy Harvesting Wireless Sensor Modules

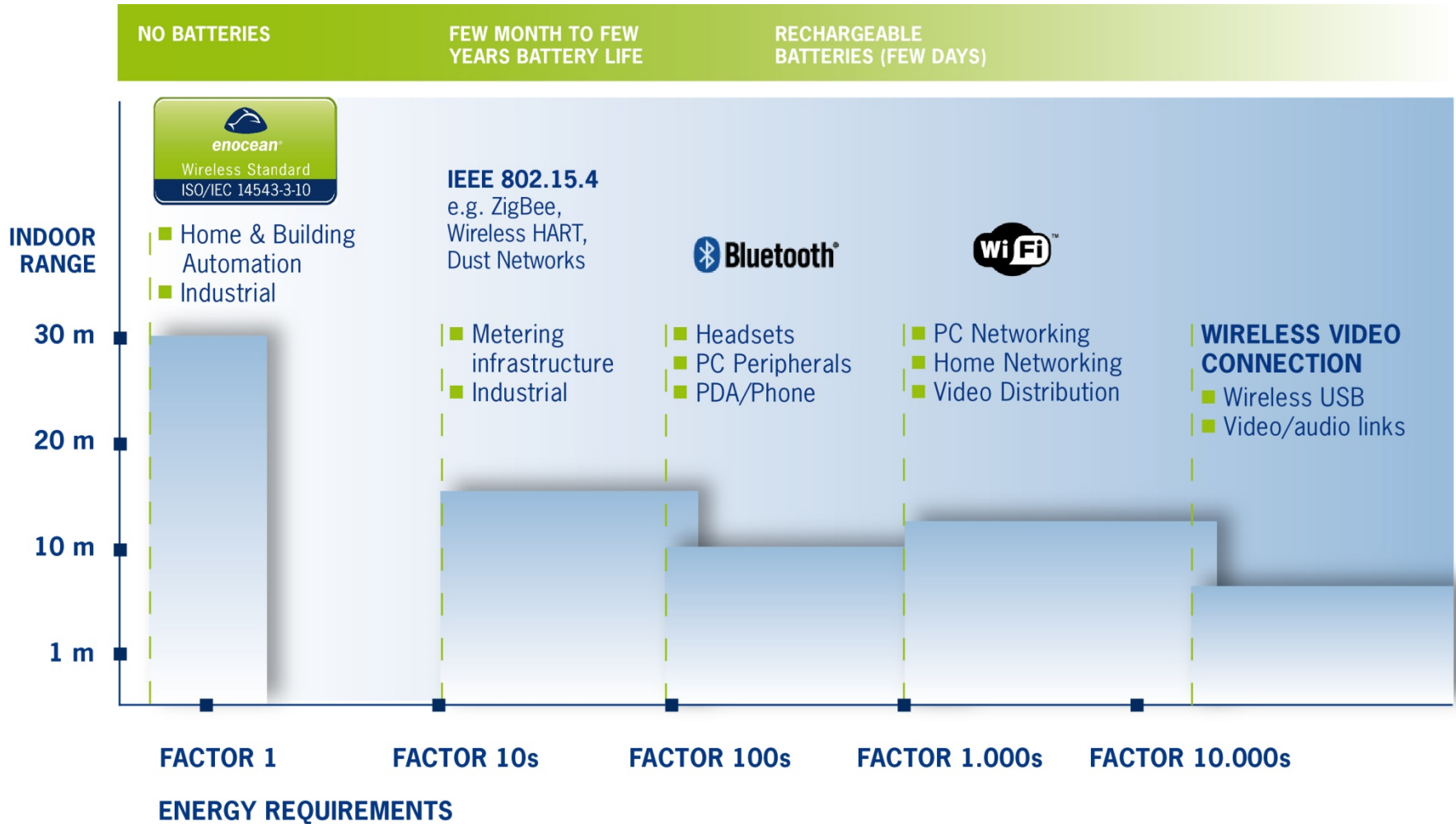
- **STM 300** – Bi-directional energy harvesting wireless sensors or innovative actuators



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



Comparison of Wireless Technologies



Who's using Energy Harvesting?



130+ Customers in the EnOcean Alliance

ENOCEAN MANUFACTURERS				AQUALISA								
				ERCO								
			ENOCEAN ALLIANCE PROMOTERS									

... 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.

Leggat McCall



ILLUMRA

- Smart Floors, Dumb Walls
 - Movable floor panels
 - Movable walls, no wiring
 - Sensors / switches 'peel and stick'
- USGBC LEED PLATINUM
- 15 Day Renovation

Office Buildings



Leviton

Workers Compensation Fund

- Salt Lake City, UT
- New Constuction, Lighting

■ Building Automation

- Occupancy Detection & Response
- Daylighting

- Installation completed in one weekend, resulting in zero down-time for tenants

- USGBC LEED GOLD

Example: Office Buildings



Promutuel Insurance

- Lighting & HVAC
- 800 EnOcean-enabled Devices
- LEED Certified

Office Buildings



Echoflex Solutions, Tambient

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)

Historic Building



--- Regular

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

Office Buildings (Overseas)



Can2Go

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 Lombardiei

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 Initialinstallation and Retrofit

Hotel / Hospitality (Overseas)



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



Distech Controls

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

Warehouse



Regulvar

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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