



FEDERAZIONE NAZIONALE IMPRESE
ELETTROTECNICHE ED ELETTRONICHE

La giornata dell'agrivoltaico: l'impatto del DLGS Testo Unico FER e del DL Ambiente

28 novembre 2024

Hotel Splendid Royal

Via di Porta Pinciana 14, Roma

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Solarig





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Il sistema di monitoraggio con sensori batteryless

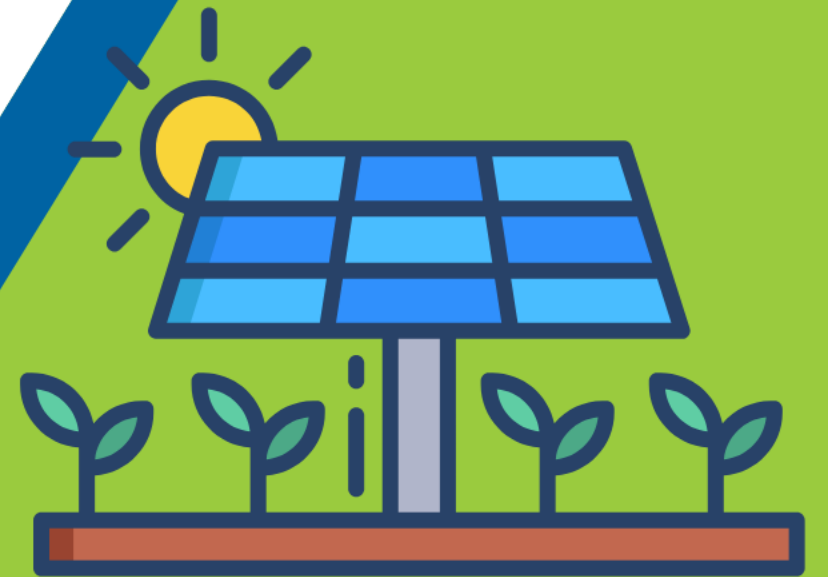
Roberto La Rosa

Ultra-low Power Applications Team Manager
STMicroelectronics

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How to reduce or null maintenance costs in agriculture

Problem

Wireless sensor node maintenance

Requirements

- No wired connections
- Maintenance-free
- Low-Cost
- Compact form factor
- Environmentally Friendly

Solution

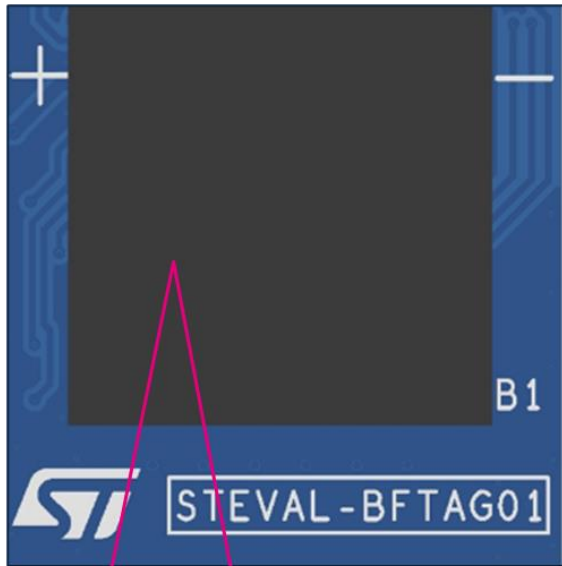
- Ultra-low-power devices
- Energy-harvesting

Key features

- Energy Autonomous and Battery-Free
- Bluetooth Low Energy connectivity
- LoRa connectivity
- LEO connectivity
- Easy to configure
- Set-and-Forget device
- Sustainability

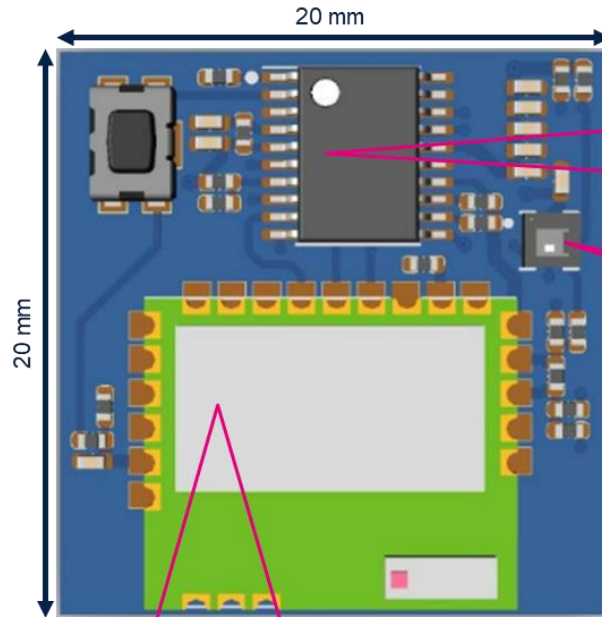
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Battery-free wireless sensor platform: STDES-BFTAG01



Amorphous silicon solar cell
AM 1606-C by Panasonic

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STM32L011F4
Ultra-low-power ARM
Cortex-M0+ MCU with
16 Kbytes of flash
memory, 32-MHz CPU

HTS221
Ultra-compact sensor for
relative humidity and
temperature

BlueNRG-M2SP
Very-low-power application
processor module for
Bluetooth low energy v5.2

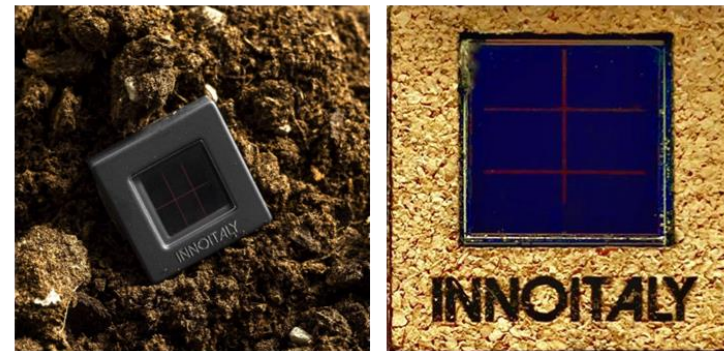
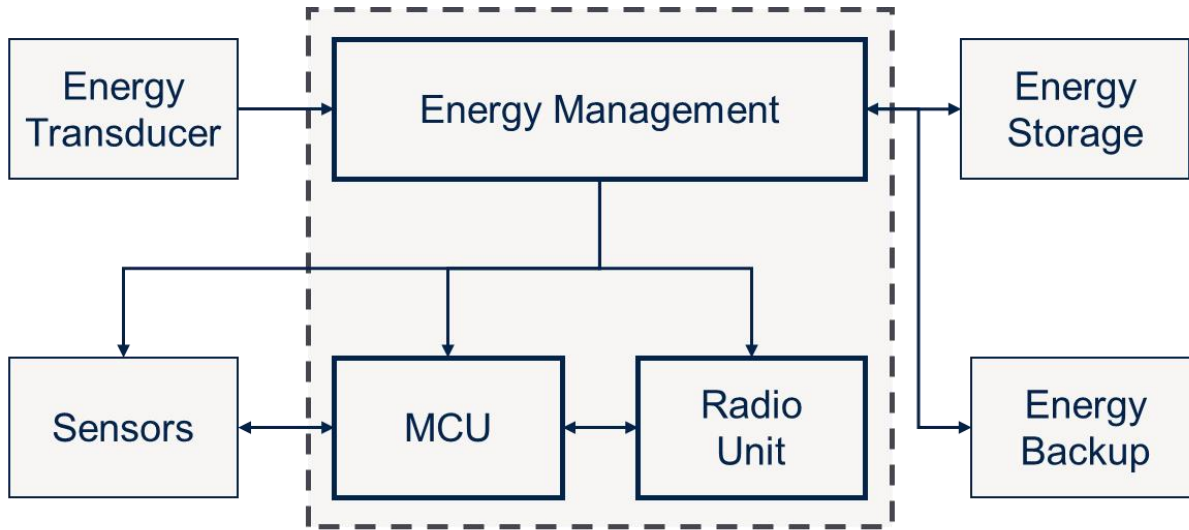




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Maintenance-Free Wireless Sensor Node

Dual Energy Harvesting: Solar and PMFC
Eco-Friendly Cork Packaging
BLE Connectivity



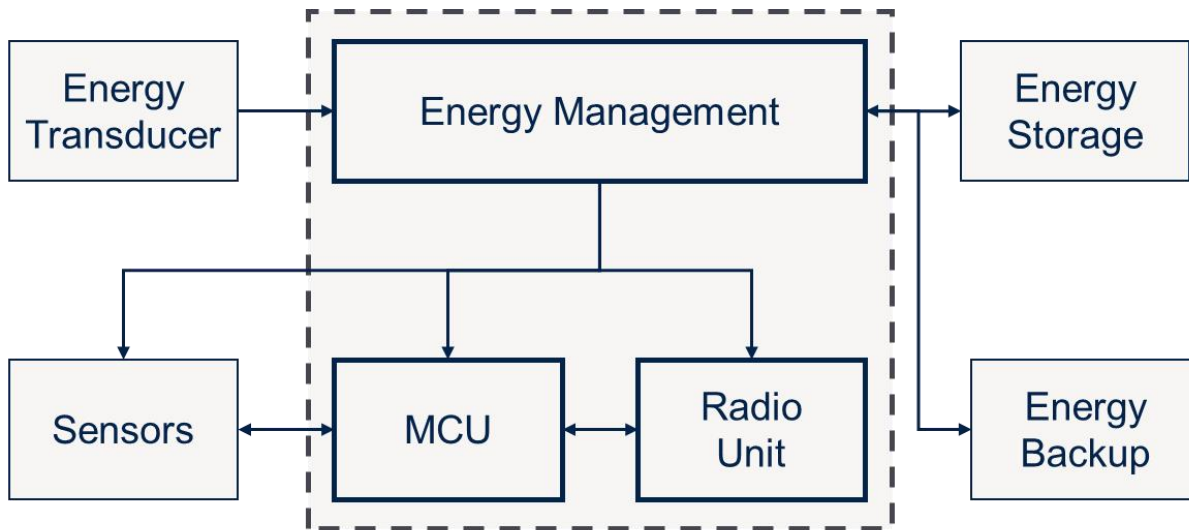
STM32WB | BLE Connectivity

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Maintenance-Free Wireless Sensor Node

Dual Energy Harvesting: Solar and PMFC
Eco-Friendly Cork Packaging
BLE Connectivity



STM32WB | BLE Connectivity

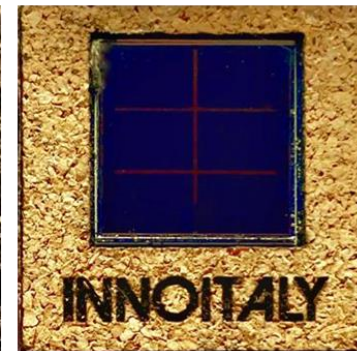
life.augmented

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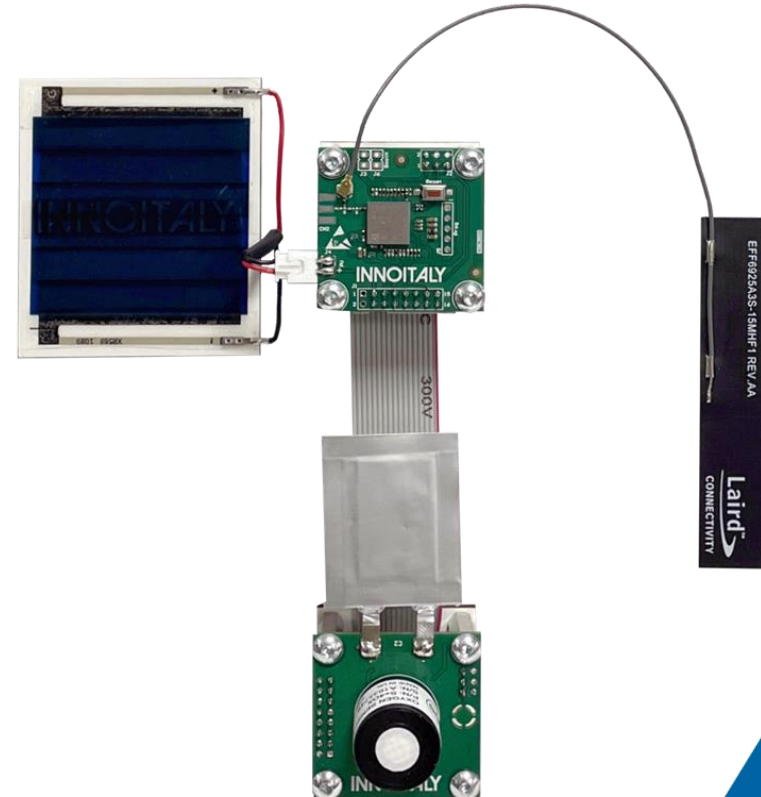
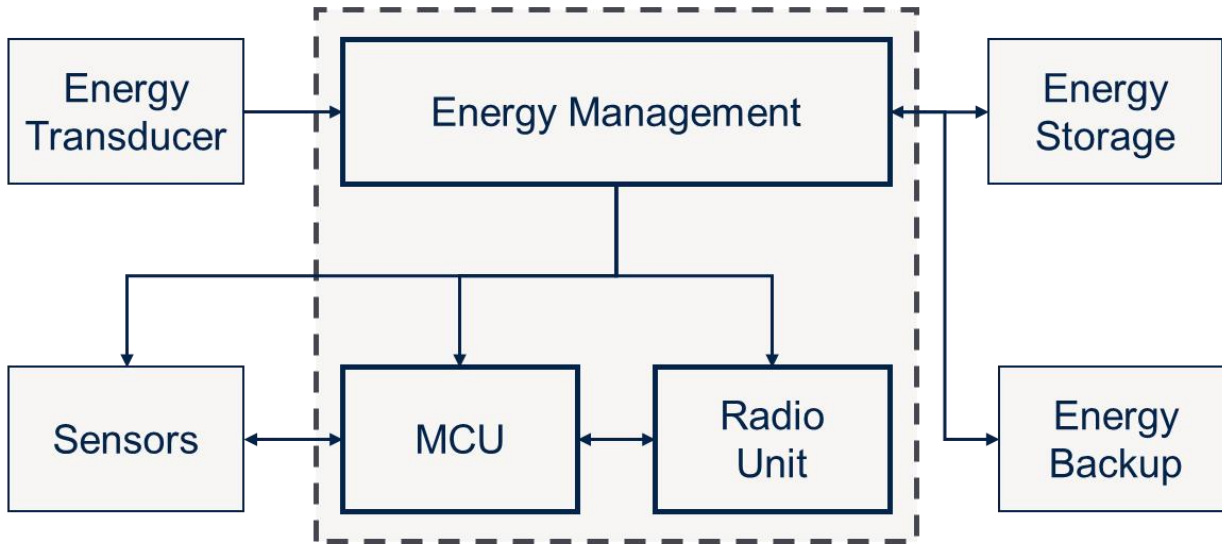
Max distance in vineyards with BLE: 160 meters

Ref: La Rosa, Roberto, et al. "A battery-free wireless Smart sensor platform with Bluetooth Low Energy connectivity for Smart agriculture".
2022 IEEE 21st Mediterranean Electrotechnical Conference (MELECON). IEEE, 2022.'



INNOITALY

Maintenance-Free Wireless Sensor Node LoRa Connectivity



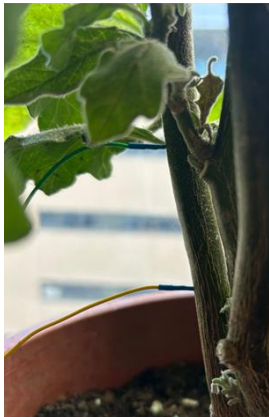
life.augmented

STM32WL | LoRa Connectivity

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Maintenance-free Stem Impedance measurement with TDDC

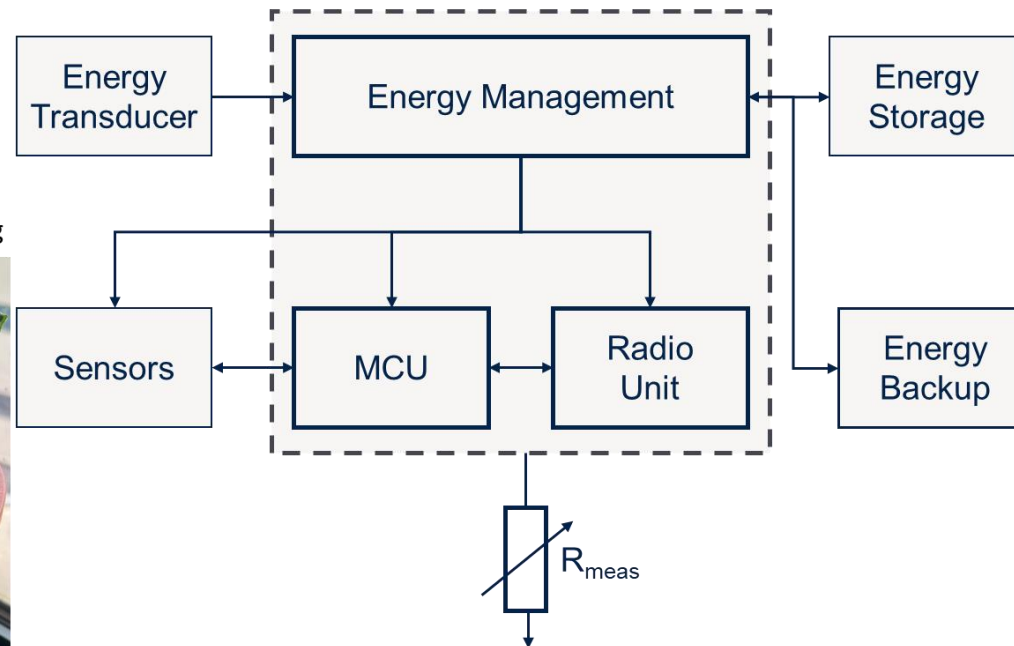


Applications:

- Plant Health Monitoring
- Irrigation Management
- Nutrient Management
- Disease Detection
- Development Studies
- Post-Harvest Quality Control
- Environmental Stress Monitoring



STM32WL | LoRa Connectivity



Ref: "Calvo, Stefano, et al. "An Energy Autonomous and Battery-Free Plant's Electrical Impedance Measurement System." 2024 IEEE International Symposium on Circuits and Systems (ISCAS). IEEE, 2024."

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Energy autonomous water control system



The world's first fully energy-autonomous water controller for garden irrigation that requires no batteries or electrical grid connections.

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Energy autonomous water control system



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Takeaways

Energy Harvesting is now off-the-shelf and enables innovation in agritech electronics

- Improved Plant Health
- Plant conditions monitoring
- Plant predictive maintenance
- Precision farming
- Beyond precision Irrigation
- Smart irrigation

- Low-cost solutions
- Commercially available devices
- Energy autonomous and battery-free WSN
- Maintenance-free WSN
- Long-range and low-power connectivity
- Compact form factor
- Easy to configure
- Set-and-forget device
- Sustainable Solutions

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