

Retrofitting and Optimizing Building Efficiency with IoT Solutions for a Greener, More Sustainable Future

Power Consumption Management in Residential Buildings

Location: Vancouver, Canada

Milesight Partner

British Columbia Institute of Technology (BCIT)
Building Science Centre of Excellence

Location

Vancouver
Canada

Devices Deployed

CT101 / CT103
WS523 / AM307
UG65 / UG67

Applications

Energy Efficiency Management
Smart Building
Indoor Air Quality

Background

From the Roadmap to Net-zero Ready Homes in Musqueam First Nation Vancouver published by British Columbia Institute of Technology and BC Housing, the importance of energy efficiency is revealed.

"In Canada, an estimated 13% of greenhouse gas emissions comes from the building sector. Direct greenhouse gas emissions from buildings are mainly associated with energy consumption. Therefore, improving building energy performance can help achieve Canada's energy goals as outlined in the Paris Agreement."

The objective of this study is to establish a series of comprehensive deep energy retrofit roadmaps towards net-zero energy/emissions for existing residential houses on Musqueam First Nation Reserve by 2050. There are three key goals:

- Develop baseline energy models for 10 selected houses on Musqueam First Nation Reserve. Investigate various energy conservation measures for these houses and identify the most effective ones.
- Propose energy retrofit roadmaps based on the identified conservation measures that will allow Musqueam houses to achieve net-zero energy and greenhouse gas emissions by 2050.

*Source:

<https://www.cmhc-schl.gc.ca/nhs/nhs-project-profiles/2023-nhs-projects/roadmap-net-zero-ready-homes-musqueam-first-nation>



Challenges



Infrastructure Compatibility

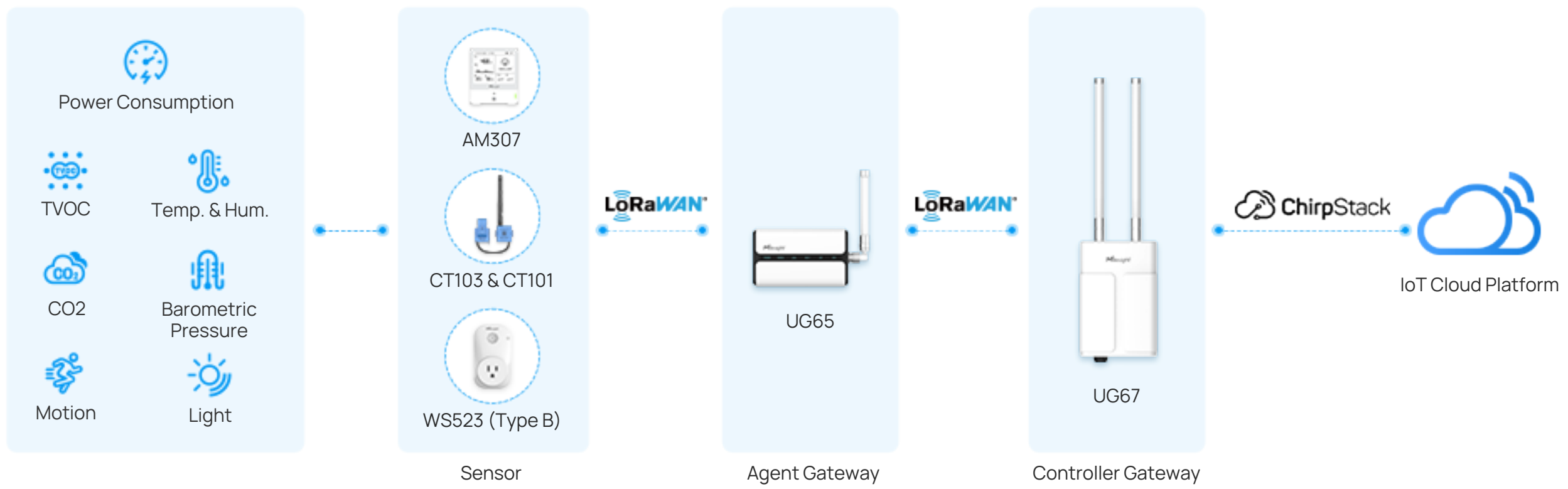
Many existing structures have outdated wiring, plumbing, and structural systems that may not support the installation of modern technology. Overcoming this challenge often requires creative engineering solutions and careful planning to minimize disruption to the building's fabric.



Cost Considerations

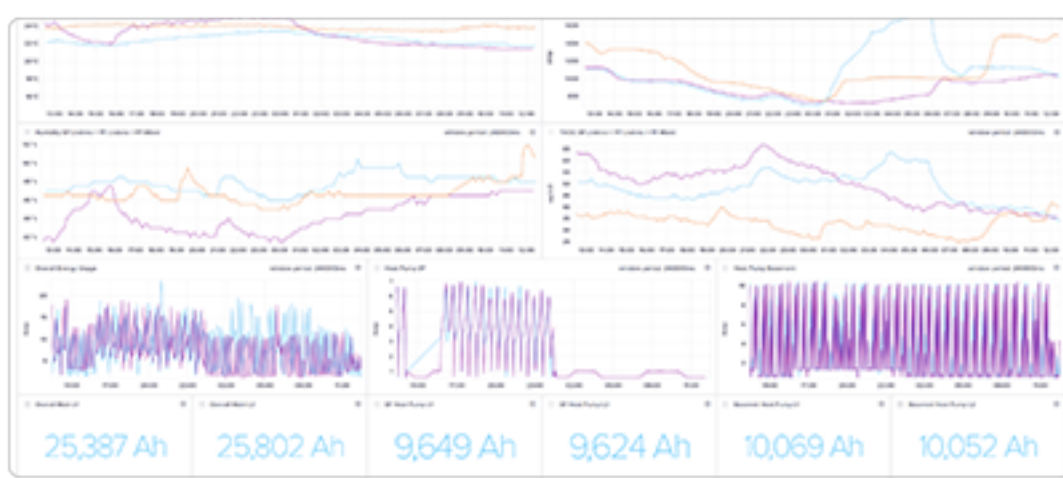
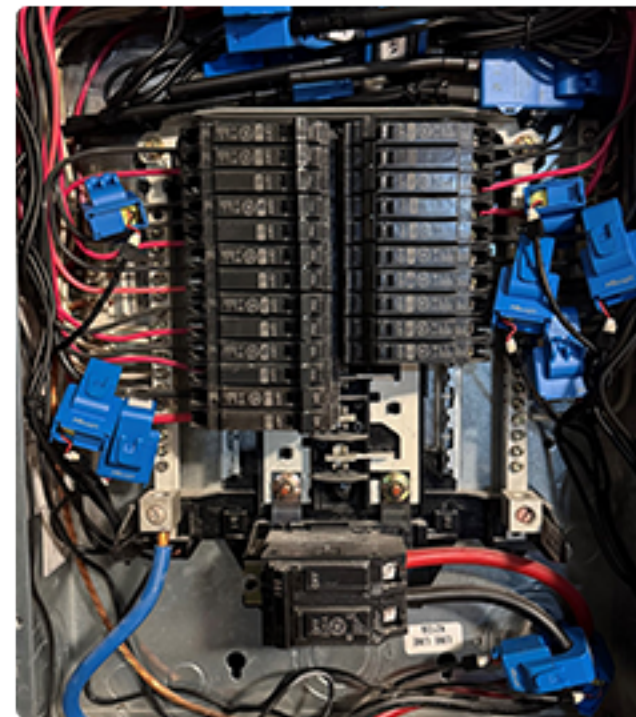
The upfront cost of implementing high-tech solutions in old buildings can be prohibitive, especially for nonprofit organizations or community-driven projects with limited budgets. Balancing the financial investment required for technology upgrades with the long-term benefits of energy savings and operational efficiencies is a key consideration.

Solutions



In this project, our partner British Columbia Institute of Technology (BCIT), has successfully deployed IoT solutions for residential houses retrofitting in Vancouver, Canada, with around 150pcs of LoRaWAN devices. Every breath matters for occupants. To live in a safer and healthier, a comprehensive indoor air quality monitoring in real-time is vital. To meet this needs, Milesight 7-in-1 IAQ Sensor was deployed. All relevant data can be captured including CO2 concentration, temperature, humidity, light, TVOC, barometric pressure and motion.

For power consumption management, they selected Milesight CT101 and CT103 Smart Current Transformer and WS523 Smart Portable Socket. As all data is collected and transmitted via Milesight UG65 Semi-industrial LoRaWAN Gateway and UG67 Outdoor LoRaWAN Gateway to cloud platform. By using Chirpstack with InfluxDB for data storage and visualization, facility managers are able to have a comprehensive view on cloud platform, being informed of real-time data as well as historical data for scientific analysis, optimizing energy efficiency effortlessly.



By deploying CT101 and CT103 in main electrical panel of buildings, it is able to derive power directly from the measured circuit, eliminating the constraints of batteries while ensuring seamless operation. Calculate accumulated ampere hour in real-time at a one-second interval. This enables precise current consumption monitoring and analysis, achieving goals such as energy conservation and reduced operational. With split core product design, it is workable to have non-invasive and quick installation, eliminating the risk of circuit damage or power interruptions. With WS523 connected to plug loads, facility managers are able to get energy consumption readings in real time without any changes in the existing buildings. Utilizing power consumption measurements and implementing flexible scheduling settings can reduce energy usage and lower electricity bills.

Results

Operational Cost Reduction

With wireless sensors and gateways deployed, it is easier to launch retrofit in these existing buildings. The strong wall penetration of LoRaWAN allows us to deploy gateways in buildings with minimum amount and guarantee the coverage.

Centralized Management & Energy Usage Optimization

This data would help us create digital twins of the existing buildings which could predict future energy use very accurately.

Data-driven Decision-making

Various combinations of energy conservation measures can be implemented in the digital model providing us with the energy savings & GHG emissions reduction values.

Why Choose Milesight

"The technology provided by Milesight was a great fit for our budget and requirements. The compact form and long range of sensors made data collection a breeze."

- BCIT



About British Columbia Institute of Technology (BCIT)

The Building Science Centre of Excellence (BSCE) is an initiative of the School of Construction and the Environment at BCIT. Extending BCIT's mandate to increase capacities in applied research, the BSCE provides advanced research and educational support to the construction industry.