Milesight

Smart Water Management on Nevis Island with LoRaWAN and AI

Enable refined water resource management

📍 Location: St. Kitts and Nevis

| Other Relevant Parties	Location	Numbers of Devices Deployed	Applications
AMNETPRO SAS	St. Kitts and Nevis	UG67*6, UC300*27, EM500-UDL*9, EM500-PP*13, UPS01*6	Smart water utility

Background

Nevis Island, part of the Federation of Saint Kitts and Nevis in the Caribbean Sea, is renowned for its volcanic terrain, tropical rainforests, and complex topography. The Nevis Water Department is responsible for managing and distributing the island's drinking water resources. It faces challenges such as traditional wired monitoring systems being prone to lightning damage, low efficiency of manual inspections, and difficulty in timely detection of pipeline leaks. Due to the island's unique geographical environment, high-altitude water tanks and dispersed water supply stations make traditional maintenance costly. The water department urgently needs an interference-resistant, low-power wireless IoT solution to achieve remote real-time monitoring, reduce operational costs, and improve water supply efficiency.

Against this backdrop, Milesight's intelligent water management solution based on LoRaWAN® technology was introduced. Through wireless sensors, cloud platforms, and predictive analytics, it helps customers build a highly reliable and easily scalable smart water management system.
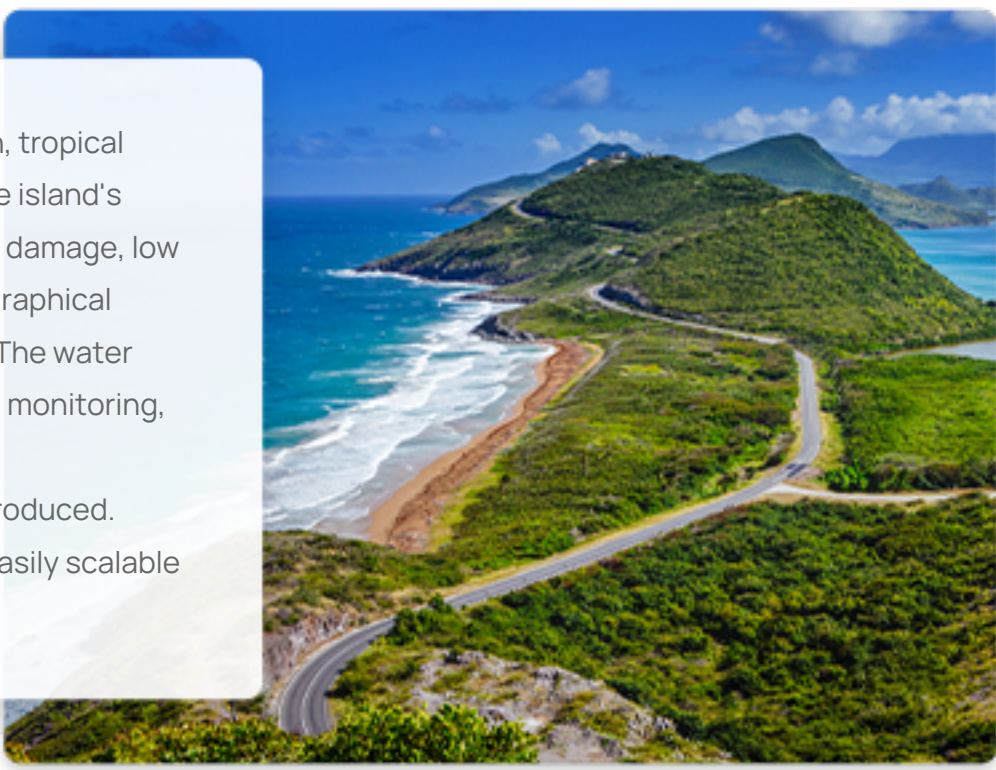
Challenges & Needs Analysis

Natural Environmental Factors
- Frequent lightning strikes damage traditional wired sensors, increasing maintenance costs.
- Volcanic terrain and high humidity environments accelerate equipment corrosion.

Infrastructure Issues
- Dispersed high-altitude water tanks make manual inspections inefficient.
- Outdated monitoring systems struggle to detect pipeline leaks in a timely manner, resulting in water wastage.
- Pump station pressure adjustment relies on manual operation, leading to increased energy consumption.

System Deficiencies
- The current system relies on passive maintenance, causing delayed fault responses.
- Lack of data integration capabilities restricts the precision and sustainable development of water management.

Solution
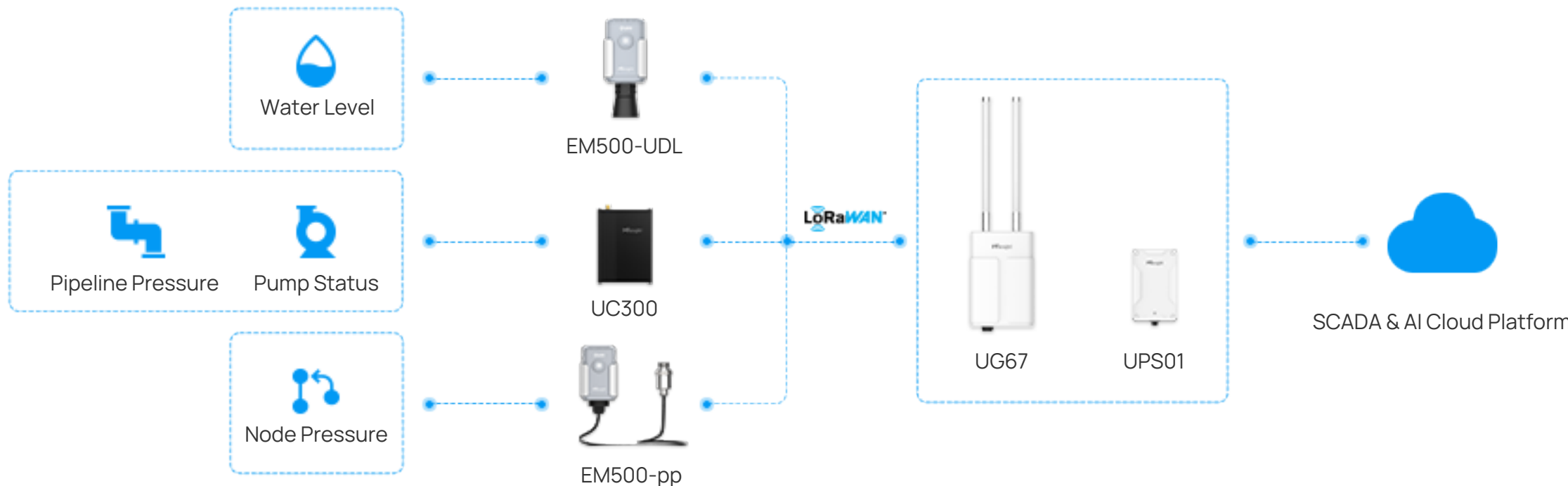
The system deploys a specialized combination of intelligent devices tailored to different water management scenarios, creating a comprehensive IoT monitoring and control framework. In the tank monitoring segment, the EM500-UDL ultrasonic level sensor is used for non-contact measurements. With a range of 0-10 meters and an IP68 protection rating, it is particularly suitable for the complex environments of high-altitude tanks on the island. The accompanying UC300 controller not only collects water flow data via the pulse input interface but also receives 4-20mA pipeline pressure signals, transmitting multidimensional data to the monitoring center via LoRaWAN.

The intelligent upgrade of the pump stations centers around the UC300 controller, which establishes Modbus RTU communication with VFDs via the RS485 interface, providing real-time acquisition of 18 motor parameters, including current, voltage, and frequency. The controller's built-in PID algorithm automatically adjusts pump speed based on pipeline pressure requirements and can immediately initiate a backup pump switch program when abnormal conditions are detected. The system integrates a FLEXEM HMI interface with a dedicated communication protocol, enabling the issuance of control commands and real-time monitoring of equipment status.

Critical node pressure monitoring in the pipeline network is performed by the EM500-PP sensor, which accurately captures pressure changes within the 0-1.6MPa range with a measurement accuracy of 0.5% FS. In addition to analog data collection, the sensor is equipped with digital input channels for valve position monitoring, and its built-in vibration analysis algorithm can detect anomalies such as water hammer. Monitoring data transmitted to the SCADA system via LoRaWAN triggers the intelligent analysis module for pattern recognition, and if necessary, links to the video surveillance system for on-site verification.

The communication network adopts a layered architecture, utilizing UG67 gateways with 8-channel LoRaWAN access, 10kV lightning protection, and redundant transmission via dual Ethernet ports supporting 4G and fiber optic lines. High-altitude sites are equipped with UG67 gateways as communication relays and UPS01 power systems for reliable operation in extreme weather. The central platform features dual-redundant SCADA servers and GPU-accelerated AI workstations, enabling 3D digital twin visualization and AR maintenance guidance. All field devices are ATEX-certified for explosion protection, ensuring long-term reliability in the island's harsh environment. This integrated approach enables intelligent, refined management and operation of the island's water facilities.
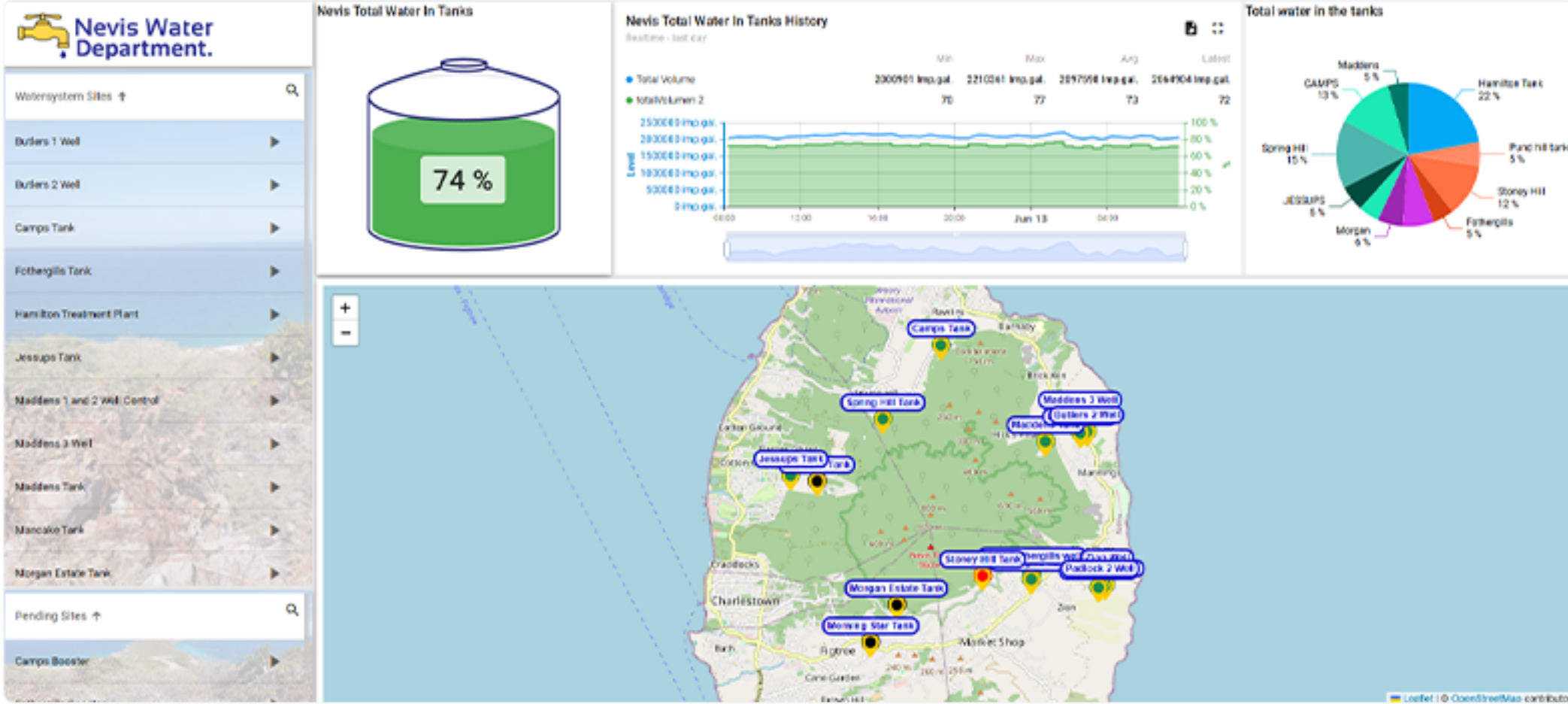
Results

Tank Monitoring System
The EM500-UDL ultrasonic level sensor and UC300 controller enable intelligent management of high-altitude tanks. Non-contact measurement technology ensures stable operation under adverse weather conditions. Synchronized real-time level and pressure data provide precise information for water resource scheduling. Uninterrupted power supplies ensure continuous monitoring at high-altitude sites, addressing data loss due to power outages.

Pump Station Control System
The UC300 controller and VFD-based system achieve full automation of pump station operations. Real-time motor parameter collection allows automatic adjustment of pump speed to meet demand changes, improving energy efficiency. Built-in fault diagnosis algorithms promptly identify anomalies and automatically activate backup equipment, reducing failure risk. Remote monitoring allows maintenance personnel to monitor and adjust equipment status anytime.

Pipeline Pressure Management
The deployment of EM500-PP pressure sensors establishes a complete pipeline pressure monitoring network. High-precision measurement units capture subtle pressure fluctuations, and intelligent analysis algorithms enable early leak detection and fault warnings. Digital valve status monitoring provides real-time data for pipeline scheduling, automatically adjusting equipment parameters to maintain pressure stability and prevent burst pipes.

Integrated Management Platform
The central management platform integrates data from all subsystems and visually displays network operational status through a 3D interface. The mobile application supports real-time data queries and AR-assisted maintenance, enhancing operational efficiency. The intelligent analysis module optimizes system strategies through deep learning of historical data, supporting management decisions. The modular design facilitates functional expansion and system upgrades.

Why Choose Milesight

> Milesight's high-quality, easy-to-use LoRaWAN® solutions have replaced vulnerable wired systems on Nevis. Rugged, certified devices and a unified cloud platform enable real-time monitoring and efficient management. Clear manuals, responsive after-sales support, and professional service make Milesight the trusted choice for reliable, scalable water management in harsh environments.

Relevant Parties

EMASYS
Energy Management Systems

AMNETPRO SAS is a Colombian specialist in industrial automation solutions, focusing on SCADA system integration and IoT technology applications. The company's core competencies include the development of industrial communication protocols, implementation of smart water systems, and deployment of projects in harsh environments, particularly those with high lightning frequencies and high altitudes. Through customized solutions, AMNETPRO SAS has successfully helped clients across various industries achieve equipment connectivity and automation management upgrades, accumulating extensive experience in cross-system integration within the industrial IoT sector. Known for its reliable technical implementation and localized services, the company is a key service provider for industrial automation projects in Colombia and surrounding regions.