

Partner: **Calibr8 Systems, Inc.**

Team Members: **Andy Evans Sandoval, Caryl Apolinario, Joshua Lu**

Infinite District Entry: Office IoT and Operations Sustainability Dashboard

I. Introduction

In today's business landscape, environmental sustainability stands as a paramount concern, demanding proactive measures from organizations worldwide. Recognizing this imperative, we unveil a transformative solution powered by AVEVA's advanced technologies.

Our initiative sets out to revolutionize carbon emission management by seamlessly integrating real-time data, monitoring emissions in real-time, and optimizing resource utilization by incorporating multiple data source, all aimed at achieving net-zero emissions by 2050, aligning with UN Sustainable Development Goals (SDGs).

II. Challenges

Monitoring and managing Scope 1, 2, and 3 emissions, as well as overall energy consumption, presents significant challenges for organizations.

Scope 1 emissions, which are direct emissions from owned or controlled sources, require meticulous tracking and reporting, often complicated by diverse and widespread operations. Data is already being captured but stored in Silos. Thus, not optimizing the value of Data.

Scope 2 emissions, stemming from the purchase of electricity, heat, and steam, necessitate detailed energy usage data and collaboration with utility providers.

Scope 3 emissions, the most complex, include indirect emissions from the entire value chain, such as those from suppliers, transportation, and product use. Accurately capturing this data demands extensive supply chain transparency and cooperation.

Failure to effectively monitor and reduce these emissions can result in regulatory penalties, increased operational costs, and reputational damage, while also hindering global efforts to combat climate change.

III. Integrated Solution Approach and Benefits

At the heart of our strategy lies integration – a strategic amalgamation of diverse data sources, systems, and processes. Leveraging AVEVA's prowess in data integration and analytics, organizations can garner comprehensive insights into their carbon emissions profile, identifying critical emission hotspots and tracking progress towards reduction targets. This consolidated platform empowers organizations and stakeholders to make informed decisions, enact targeted mitigation strategies, and drive impactful change across their operations.

Our approach extends to developing a holistic Sustainability Monitoring and Remote Energy Management platform, offering real-time insights into emissions and remote energy consumption. Organizations can unlock efficiency gains, cost savings, and environmental stewardship by seamlessly integrating emissions tracking with energy optimization. This integrated Carbon Emission Management Solution propels organizations towards sustainability-driven innovation, growth, and resilience, paving the way for a future where economic prosperity coexists seamlessly with environmental responsibility.



IV. Solution Components

Solution Architecture

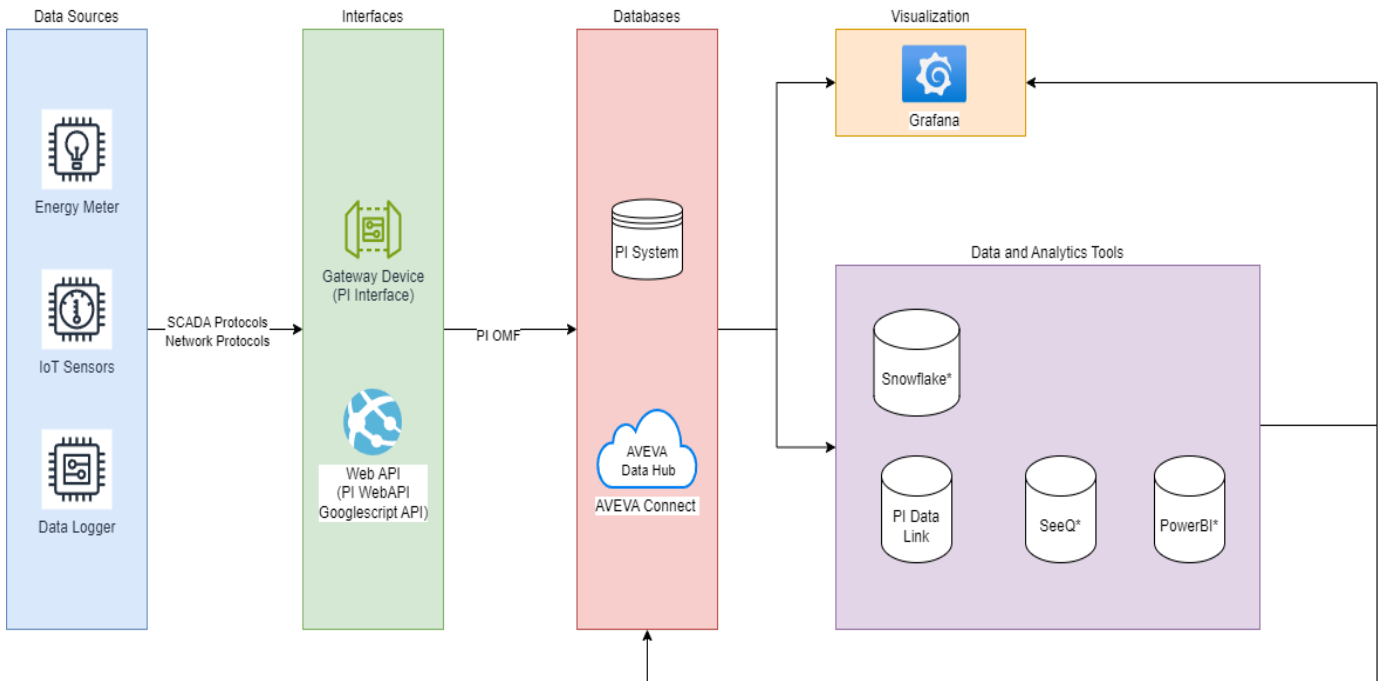
Our solution architecture for the "Office IoT and Operations Sustainability Dashboards" integrates diverse components to effectively monitor and manage carbon emissions and resource quality as well as the energy utilization.

The data sources come from (1) various IoT sensors for temperature, humidity and carbon emission, (2) energy meters and (3) data loggers which collect real-time data and are sent to the AVEVA PI System and AVEVA Connect Data Historian also known as ADH for centralized storage using PI OMF and PI WEBAPI. The PI System provides tools for managing and analyzing this data and utilizes AVEVA Asset Framework to organize it in a structured manner.

The AVEVA Connect (ADH) enables secure data sharing and collaborative analysis. It is interconnected with AVEVA PI System for needed analysis and to ensure 24/7 data availability. This is how we can leverage PIDI – PI System Data Infrastructure.

For visualization, reporting, and analytics tools, both AVEVA Connect (ADH) and AVEVA PI are integrated with Grafana for real-time monitoring and alerting capabilities, AVEVA PI Datalink for automated generation of reports while SEEQ and PowerBI can be integrated for in-depth analytics, allowing insights into process optimization and anomaly detection.

By leveraging AVEVA technologies in conjunction with powerful visualization and analytics tools like Grafana, SEEQ, and PowerBI, this solution is well-equipped to monitor, analyze, and optimize sustainability efforts. This integrated approach will help effectively track progress towards net-zero emissions and align with 2050's UN Sustainability Development Goals (SDGs).



High-Level Solution Architecture Design. Components with asterisks (*) are applications for possible integration, not included in initial implementation.

Listed below is more detailed solution breakdown:

- **Data Sources**
 - IoT Sensors: Temperature, humidity, and carbon emission sensors provide real-time environmental data.
 - Energy Meters: Track energy consumption and power quality inside the office.
 - Data Loggers: Collect and log scope 3 data from various sources such as google sheets, and csv files.
- **Data Storage and Management**
 - AVEVA PI System: Centralizes data collection, management, and analysis.
 - PI OMF (Open Message Format): Facilitates the integration of data from diverse IoT devices into the PI System.
 - PI WebAPI: Integrates RESTful APIs to the PI System
 - AVEVA Connect (ADH): Ensures long-term storage and easy retrieval of historical data.
 - AVEVA Asset Framework: Organizes data in a structured manner, allowing for efficient data management and analysis.
- **Data Sharing and Collaboration**
 - AVEVA Connect (ADH): Enables secure data sharing and collaborative analysis.
 - Interconnected with AVEVA PI System to ensure continuous data availability and facilitate in-depth analysis.
- **Visualization**
 - Grafana: Provides interactive, real-time dashboards for visualizing data.

- Reporting and Analytics
 - AVEVA PI Datalink: Offers automated generation of reports within Excel.
 - SEEQ*: Advanced analytics platform for processing data.
 - PowerBI*: Business intelligence tool for creating detailed reports and dashboards.
 - Snowflake*: Structured and semi structured data sets are held for processing and analysis

V. Visualization Dashboards

The visualization covers three (3) major components which are ff.

1. Remote Energy Monitoring System (REMS)

Tracks and manages energy consumption data across facilities using sensors and meters. It collects real-time data transmitted to a centralized platform for analysis and reporting.

2. Scope 2 Emission

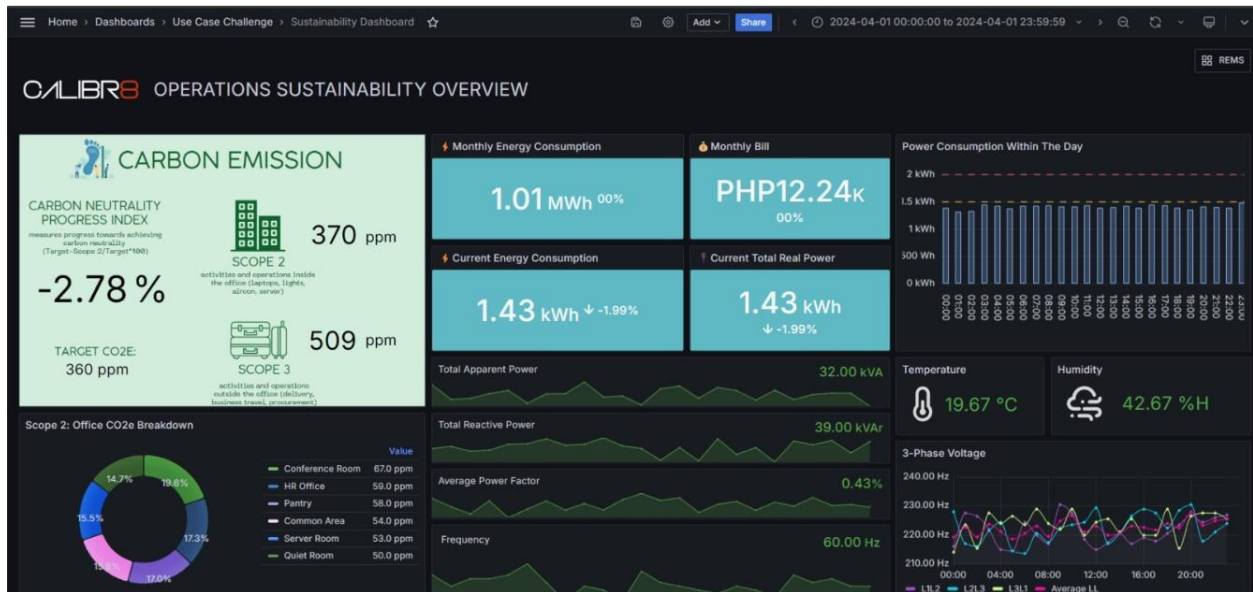
Indirect greenhouse gas emissions that result from the generation of purchased or acquired electricity, steam, heating, or cooling consumed by the organization.

3. Scope 3 Emission

Indirect greenhouse gas emissions in an organization's value chain include sources like purchased goods, business travel, commuting, transportation, waste generation, and product disposal.

Operations Sustainability Overview (Main Dashboard)

This dashboard serves as the summary view of (1) carbon emission from Scope 2 office CO₂e, (2) Scope 3 office business travel and office delivery activities and (3) office REMS average and total energy, power quality parameters, as well as the average office environmental conditions.



Parameters

- Carbon Emission
 - Carbon Neutrality Progress Index
 - Target CO2e
 - Scope 2 Emission
 - Scope 3 Emission

- Scope 2 Distribution
 - Conference Room Co2e
 - Pantry Co2e
 - HR Office Co2e
 - Server Room Co2e
 - Quiet Room Co2e
 - Common Area Co2e

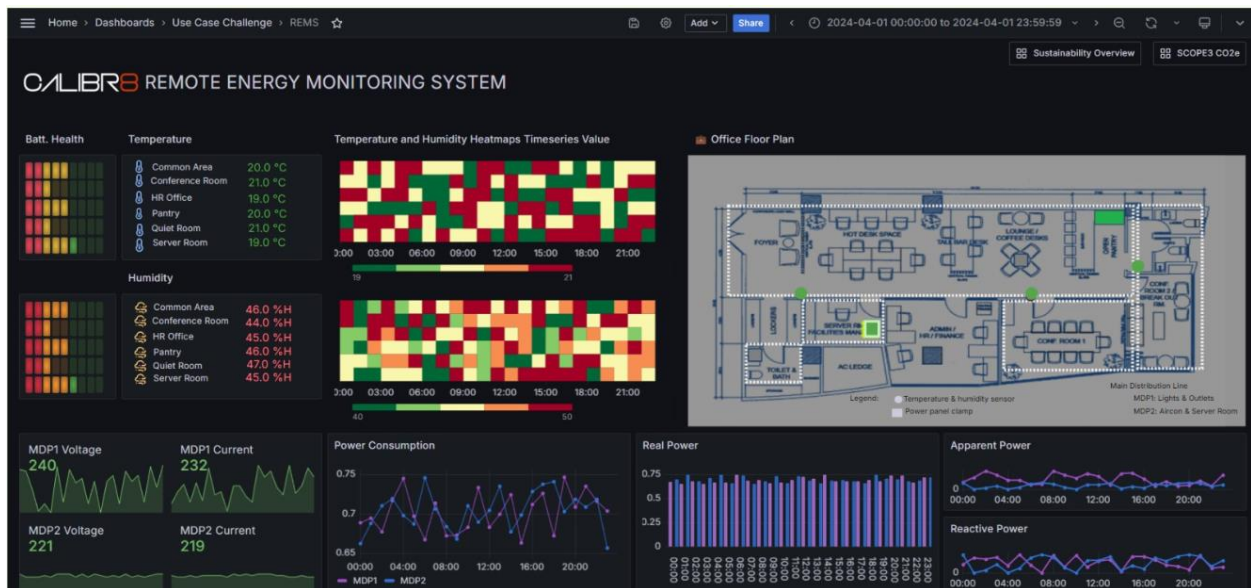
- Environmental Condition
 - Temperature
 - Humidity

- REMS KPI
 - Monthly Energy Consumption
 - Monthly Bill
 - Current Real Power
 - Current Energy Consumption
 - Total Apparent Power
 - Total Reactive Power

- Average Power Factor
- Average Frequency
- Average 3 Phase Voltage
- Energy consumption within the day

Remote Energy Monitoring System (REMS)

This dashboard contains detailed information on the office energy consumption and power quality parameters as well as office environmental conditions such as temperature and humidity. It also shows the office floor plan and electric lines.

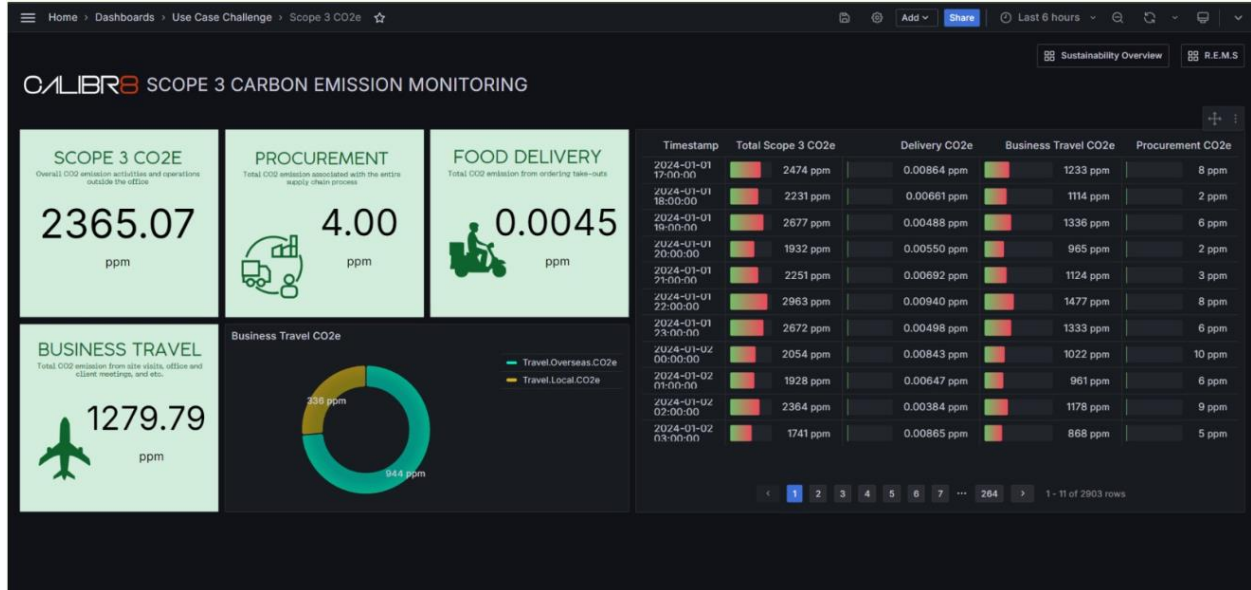


Parameters

- Remote Energy Monitoring System
 - Temperature per room
 - Humidity per room
 - Temperature Heatmap Timeseries Value
 - Humidity Heatmap Timeseries Value
 - Sensors Battery Level
 - Office Floorplan
 - MDP1 (Electric line for light and outlet) and MDP2 (Electric line for aircon and server)
 - Voltage
 - Current
 - Power Consumption
 - Real Power
 - Apparent Power
 - Reactive Power

Scope 3 Carbon Emission Monitoring

This dashboard contains summarized Scope 3 CO2 emission and its breakdown components namely business travel and office delivery activities (procurement and food). It also shows actual CO2e values per category through table.



Parameters

- Scope 3 Emission
 - Total CO2e
 - Procurement CO2e
 - Business Travel CO2e
 - Food Delivery CO2e
 - Overseas Travel CO2e vs Local Travel Co2e
 - Timeseries Table per Category