STARTUP FEEDBACK SOLUTIONS

HOST TEP Tucson Electric Power

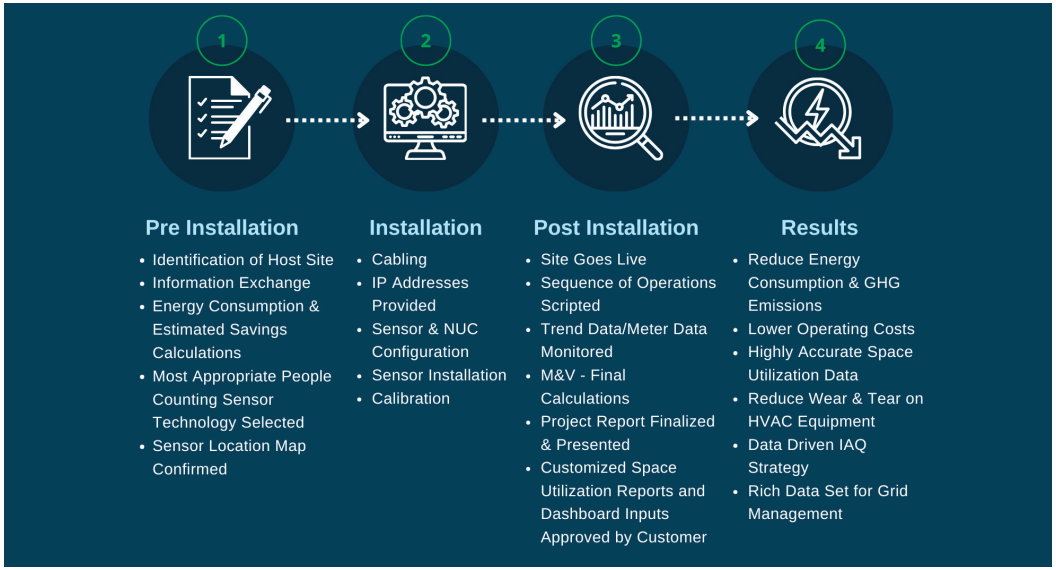
Real-time occupant count-based Demand Control Ventilation (DCV) to reduce HVAC related energy consumption by up to 40%

TECHNOLOGY SOLUTION

Feedback Solutions leverages the raw data from best-in-class people counting sensors with its patented technology platform to continuously calculate highly accurate, real-time occupant counts within each HVAC zone of a building. This data is then communicated via BACnet, cloud platform or DDC controller (sent as an analog input value) to the BMS or rooftop units so that ventilation requirements are optimized based on actual occupant demand. We call it “Sustainable IAQ”.

These real-time adjustments reduce the HVAC energy consumption and related GHG emissions by up to 40% - all while maintaining important ASHRAE guidelines and enhancing indoor air quality.

Feedback Solutions optimizes existing HVAC equipment, making it low cap ex and easy to implement.



PROJECT OVERVIEW

The goal of the demonstration included: Demonstration of the efficacy of an occupant-based ventilation control strategy versus the previously considered ‘state of the art’ CO2 based DCV to reduce energy consumption and reduce GHG emission.

Major tasks included: Installation of people counting sensors covering 12 lecture halls, encompassing 29,000 sq.ft of space.

These spaces were served by one Air Handling Unit (AHU), while each individual lecture hall was served by Variable Air Volume (VAV) boxes to provide Outside Air (OA) based on occupancy.

Integration of the occupancy data sent over BACnet IP to the Automated Logic BMS where the sequence of operation was defined to modulate the VAV dampers to react to actual occupancy and space ventilation requirement, while maintaining temperature set points.

AHU controls: The reduced occupancy measured in the space results in the VAV box damper dictated to a new minimum position which raises the static pressure in the duct work. The static pressure sensor commands the supply fan VFD to slow down. The outcome was:

- Electrical savings and thermal savings (due to the lower volume of air that needed to be conditioned) = reduced operating expenses and GHG emissions

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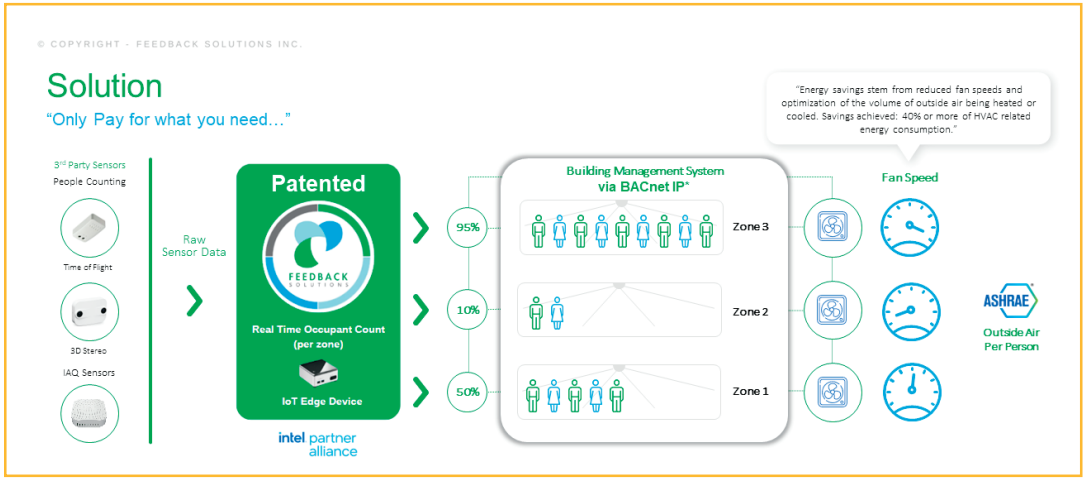
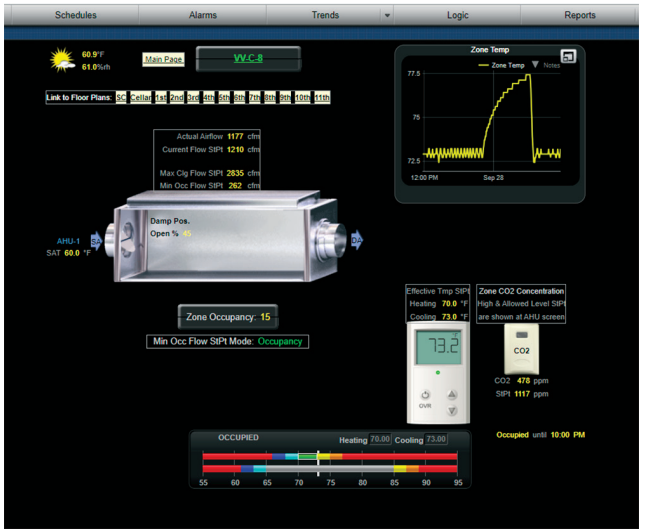
- Proactively ventilating ahead of CO_2 spikes ensures Indoor Air Quality (IAQ) in the spaces and enables us to meet predetermined temperature set points more efficiently

RESULTS & LEARNING

Switching over to an occupant count-based controls sequence allows for reduced supply air volumes through VAV box modulation at the zone level, allowing for reduced conditioned air volumes which is the source of the measured energy savings. The absolute and relative energy savings that result from the interventions are provided are set out as below:



Of the total savings in annual use reported after switching over to occupant count based controls, 35,000 kWh can be attributed to fan energy reduction, 13,000 kWh to cooling electricity reduction, and roughly 1,300 therm of natural gas use reduction i.e. electricity savings of about 48,000 kWh and natural gas savings of 1,300 therm. This has been translated to Greenhouse Gas emission reductions using GHG intensity factors based on those provided by New York City's Local Law 97 and is approximately equivalent to an annual GHG reduction of 0.72 kgCO2e/sf/yr. This translates to approximate electrical savings of 1.6 kWh/sf/yr and 4.0 kbtu/sf/yr of thermal savings for the project.



After a review of Feedback Solutions' approach to occupancy count-based DCV and the calculated estimated energy savings, we approved their incentive application made on behalf of Fordham University for the Walsh Library Building. We issued a preliminary incentive offer letter after evaluating savings calculations based on electrical and thermal savings.

Laziza Rakhimova,
Business Development Manager,
Energy Efficiency Consolidated Edison Company of New York

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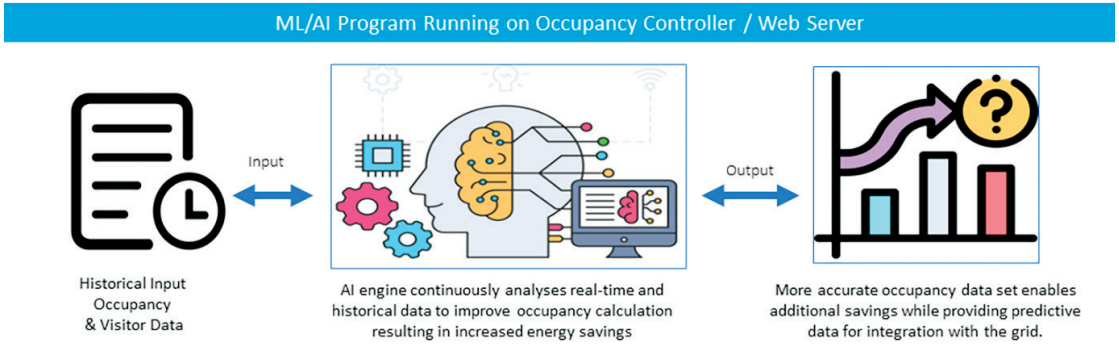
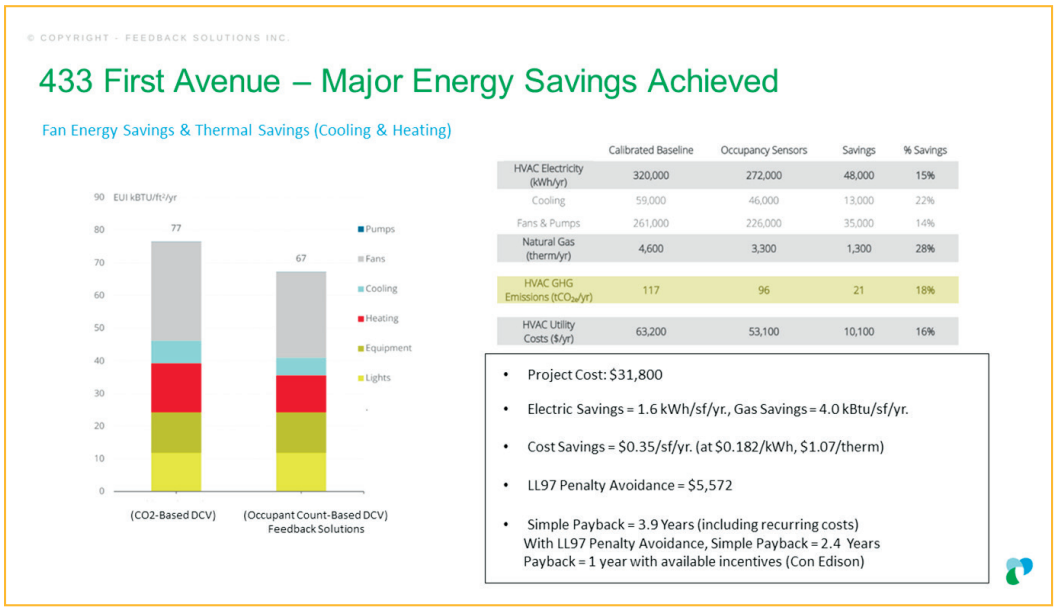
IMPLICATIONS & NEXT STEPS

FSI has demonstrated that it provides a far more consistent accurate data set to more efficiently ventilate buildings vs. CO2.





BACnet Reader
Our Energy Analytics platform collects various data points to measure the performance of the Building Ventilation System (energy consumption) because of using FSI-driven Demand Control Ventilation.

Integrating/Enhancing Core App AI Driven
FSI is fine-tuning a predictive model leveraging massive historical and real-time data sets re: occupancy, energy consumption, and environmental (or micro-climate) conditions to predict energy demand in a facility (campus, portfolio) to facilitate smart grid management at scale.

We have benefited from the support of programs like NYSERDA's NextGen HVAC as we work to bring our technology to the larger market.

Karen Smith
CMO, Feedback Solutions

RESOURCES

CHANDAN CHOWDHURY
CTO
Feedback Solutions Inc.
chandan@feedbacksolutions.io

NICOLE HOPKINS
Principal, Customer-Centric Research and Innovation
UNS Energy Corp./TEP
nicole.hopkins@tep.com

KAREN SMITH
CMO, Co-Founder
Feedback Solutions, Inc.
karen.smith@feedbacksolutions.ca

INCUBATENERGY LABS

RESOURCES

DAN KILLOREN, PH.D.
Program Manager
Global Innovation Hub
dankilloren@epri.com

JERRY LIGRANI
Program Lead
Incubatenergy® Labs
jligrani@epri.com

labs.incubatenergy.org

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EPRI
3420 Hillview Avenue, Palo Alto, California 94304-1338 USA
800.313.3774 • 650.855.2121 • www.epri.com

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