
Better Buildings®
U.S. DEPARTMENT OF ENERGY
2024 Better Buildings
WEBINARS
REGISTER TODAY: betterbuildingssolutioncenter.energy.gov/better-buildings-webinar-series
U.S. DEPARTMENT OF ENERGY

From Smart to Smarter: Advances in Industrial Control Systems Improve Efficiency

November 19, 2024

11:00 AM – 12:00 PM ET

Ethan Rogers

DOE

U.S. DEPARTMENT OF ENERGY

Agenda

1. Introduction and Overview
2. Welcome Polls
3. Speaker Presentations
4. Q&A and Closing

Please go to www.slido.com

using your mobile device, or by opening a new window

Enter Event Code

#DOE

Polls 1 - 4

We want to learn more about you.

Please go to www.slido.com and enter code **#DOE** to respond

Today's Presenters

Tanmay Soni
3M

Cory Anderson
3M

James Farley
3M

Kit Ying Chen
Niagara Bottling

Robert Minor
Niagara Bottling

Tanmay Soni

3M

3M – Decarbonization

Tanmay Soni -
Sr. Energy & Sustainability Specialist, 3M Corporate Sustainability

19 Nov 2024

3M: Science for Climate

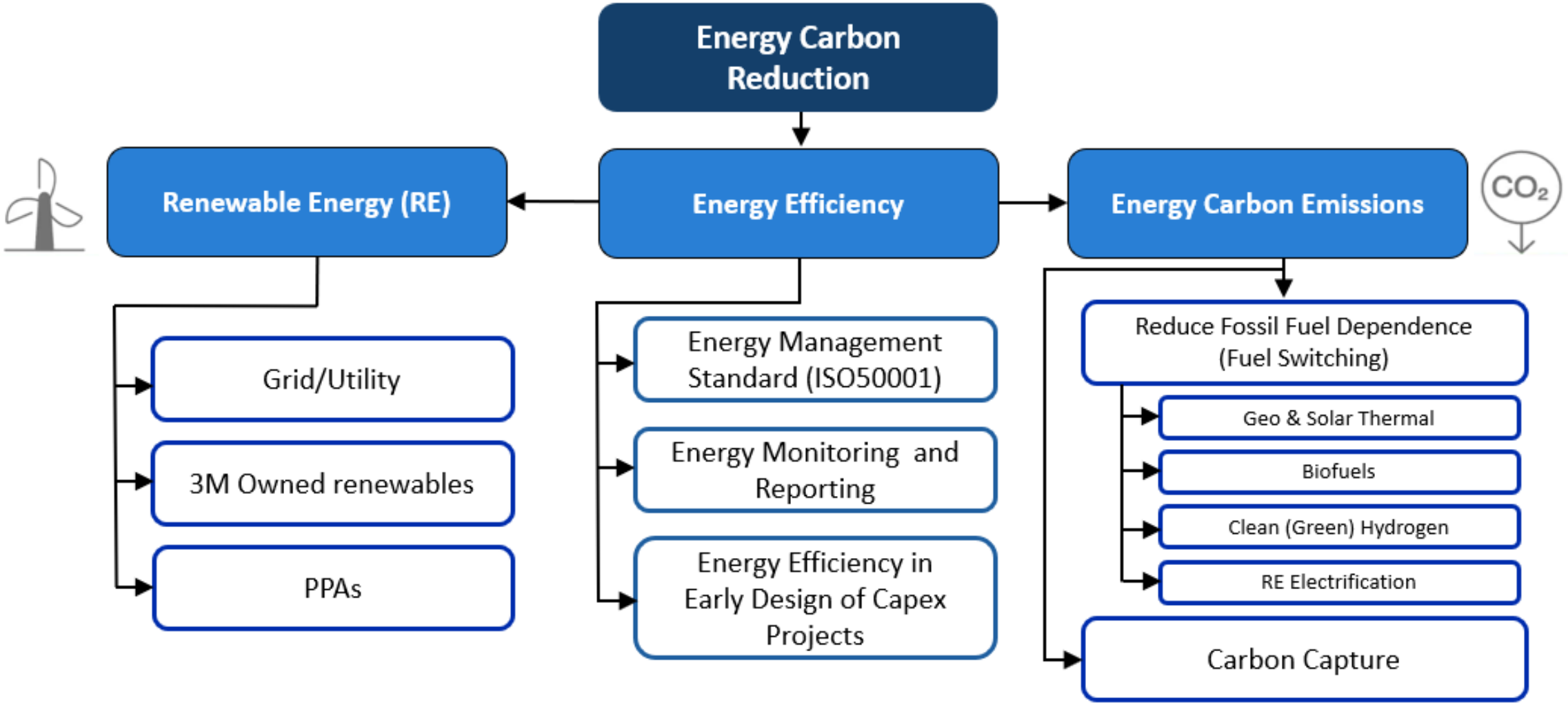
3M™ Dual Brightness Enhancement Film
3M™ Wind Blade Protection Tape
Filtrete™ Room Air Purifiers

Innovate to accelerate global climate solutions and decarbonize industry.

Goal	Progress
Expanded in 2021	**2023**
Reduce **scope 1 and 2 market-based GHG** emissions by at least 50% by 2030, 80% by 2040, and achieve carbon neutrality in our operations by 2050	Decreased scope 1 and 2 absolute emissions **43.2%** below 2019 baseline working toward goal of carbon neutrality by 2050 *Since 2002, 3M has reduced absolute scope 1 and 2 emission by **80.1%*** ●●○
Expanded in 2020	**2023**
Increase **renewable energy** to 50% of total electricity use by 2025 and 100% by 2050	Increased renewable energy by **56.2%** of total electricity use, toward goal ●●○
Our Sustainability Goals	**2023**
Help our **customers** reduce their GHGs by 250 million tons of CO_2 equivalent emissions through use of 3M products	**135 million metric tons** CO_2 equivalent customer avoided emissions, toward goal ●●○
Improve **energy efficiency** indexed to net sales by 30%	Improved energy efficiency by **16.4%** indexed, behind goal ●○○

●○○ behind goal ●●○ toward goal ●●● achieving goal

Decarbonization starting at the Source



3M: Science for Climate

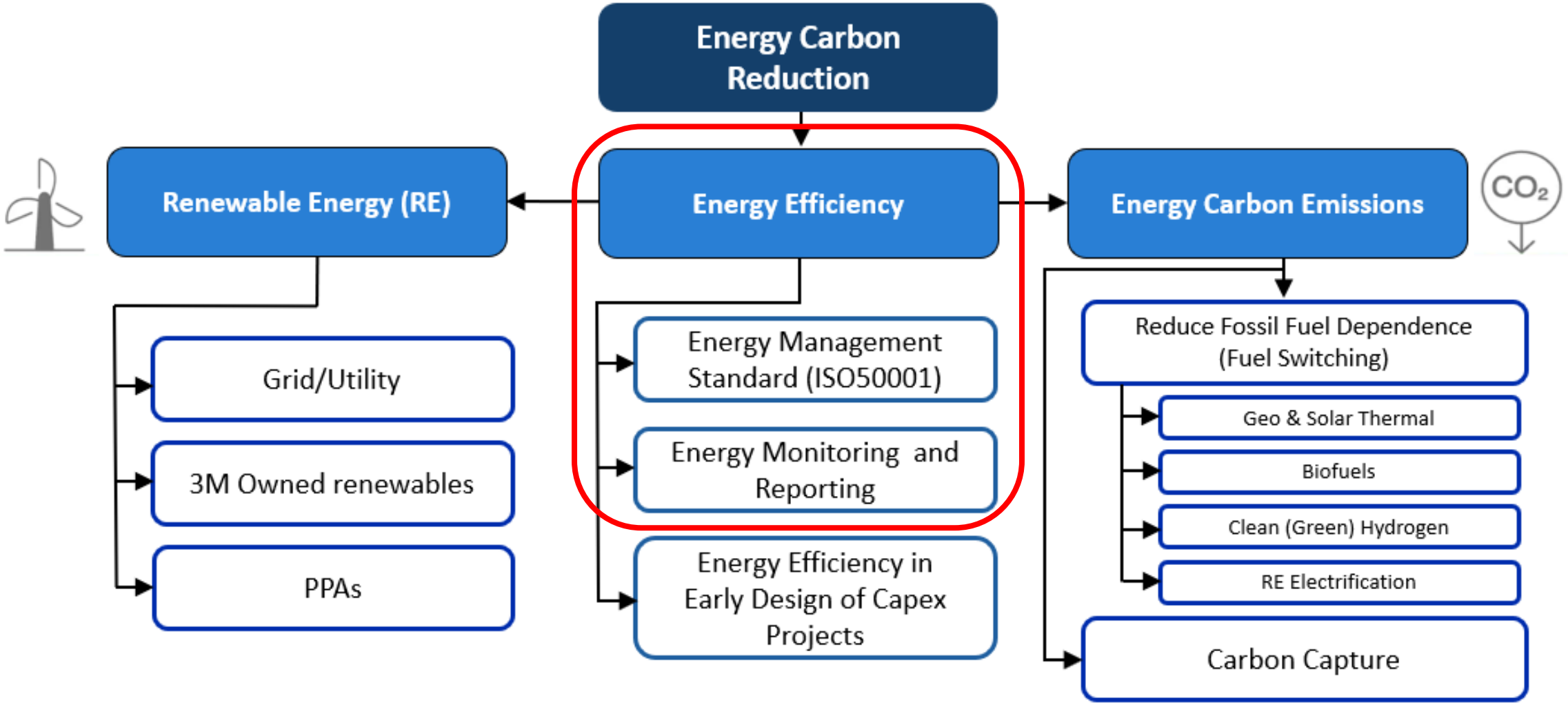
3M™ Dual Brightness Enhancement Film
3M™ Wind Blade Protection Tape
Filtrete™ Room Air Purifiers

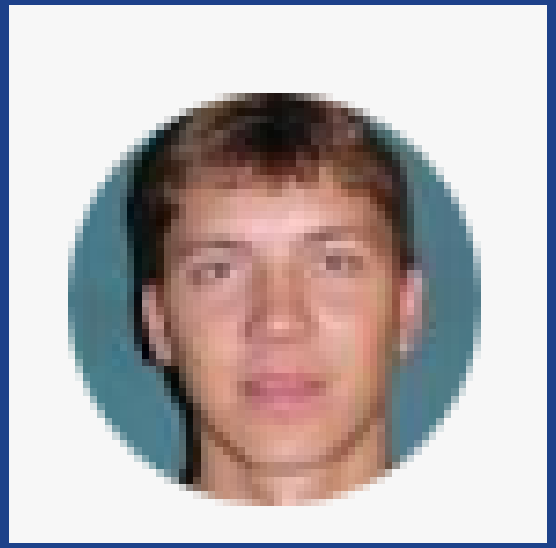
Innovate to accelerate global climate solutions and decarbonize industry.

Goal	Progress
Expanded in 2021	**2023**
Reduce **scope 1 and 2 market-based GHG** emissions by at least 50% by 2030, 80% by 2040, and achieve carbon neutrality in our operations by 2050	Decreased scope 1 and 2 absolute emissions **43.2%** below 2019 baseline working toward goal of carbon neutrality by 2050 *Since 2002, 3M has reduced absolute scope 1 and 2 emission by **80.1%*** ●●○
Expanded in 2020	**2023**
Increase **renewable energy** to 50% of total electricity use by 2025 and 100% by 2050	Increased renewable energy by **56.2%** of total electricity use, toward goal ●●○
Our Sustainability Goals	**2023**
Help our **customers** reduce their GHGs by 250 million tons of CO_2 equivalent emissions through use of 3M products	**135 million metric tons** CO_2 equivalent customer avoided emissions, toward goal ●●○
Improve **energy efficiency** indexed to net sales by 30%	Improved energy efficiency by **16.4%** indexed, behind goal ●○○

●○○ behind goal ●●○ toward goal ●●● achieving goal

Decarbonization starting at the Source





Cory Anderson

3M

Hutchinson Plant

3M Hutchinson Everactive Steam Trap Monitoring Project

- Hutchinson as a Tier 1 plant and leader, sought the benefits of a monitored communication system and dashboard aligned with the communication with energy and operational savings.
- Everactive is a battery less and wireless steam trap monitoring and communication system using an LTE network.
- As a cloud-based platform the system analyzes and alarms on trap anomalies for early identification, trending and energy efficiency.
- Ongoing monitoring identifies early intermittent anomalies not identified in an annual survey. REALTIME vs ONETIME

Better Buildings®
U.S. DEPARTMENT OF ENERGY

Data Flow and Protocol Overview

Gateway

Evercloud

S3 Storage and EC2 Compute Instances host all User-level applications, accessible via HTTPS. Notifications via Email, SMS or API.

Evernet

Proprietary Communications in Sub 1-Ghz band Supports hardware whitelisting and two-way mutual certificate authentication

Eversensors

LTE / Wifi / Ethernet

Transmissions are sent via secure MQTT with AES-256 Encryption. Cloud data store on AWS supports Encryption-at-rest.

MQTT

REST API

Webhooks

SAP

Work Order Systems

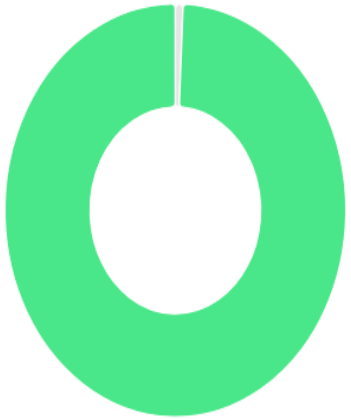
CMMS Servers Data Lakes Analysis Tools

everactive

everactive

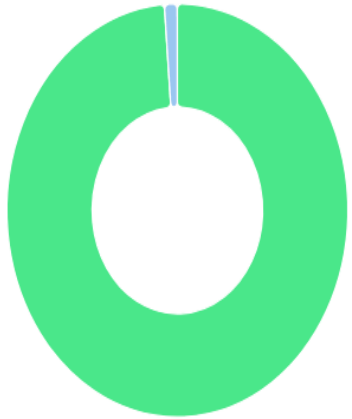
Steam Traps | Dashboard | Summary

99% Steam Trap Coverage



9 Unmonitored
1233 Monitored
Add Sensors

1,233 Traps Monitored



0 Steam Loss
1218 Good
15 Failed Cold

Have a Question?

Visit the Everactive Knowledge Base

Learn expert tips for Insights and get in-depth explanations about your Everactive industrial monitoring solution. The knowledge base is the best reference for tutorials, frequently-asked questions and the latest updates.

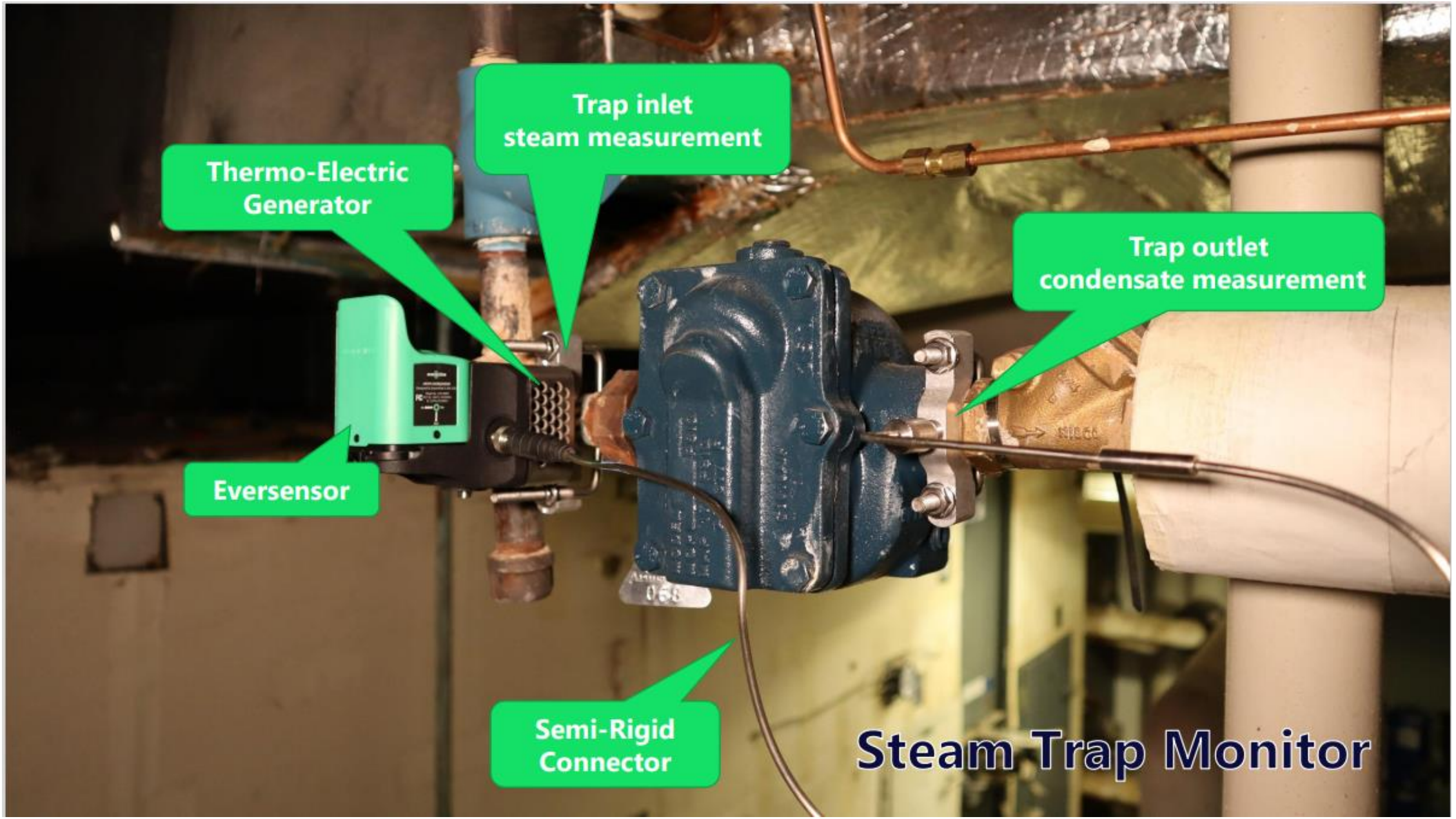
Need Help?

Email the Everactive support team at success@everactive.com

We want to ensure you are getting the most out of your industrial monitoring solution. Should you have any questions or issues, please let us know.

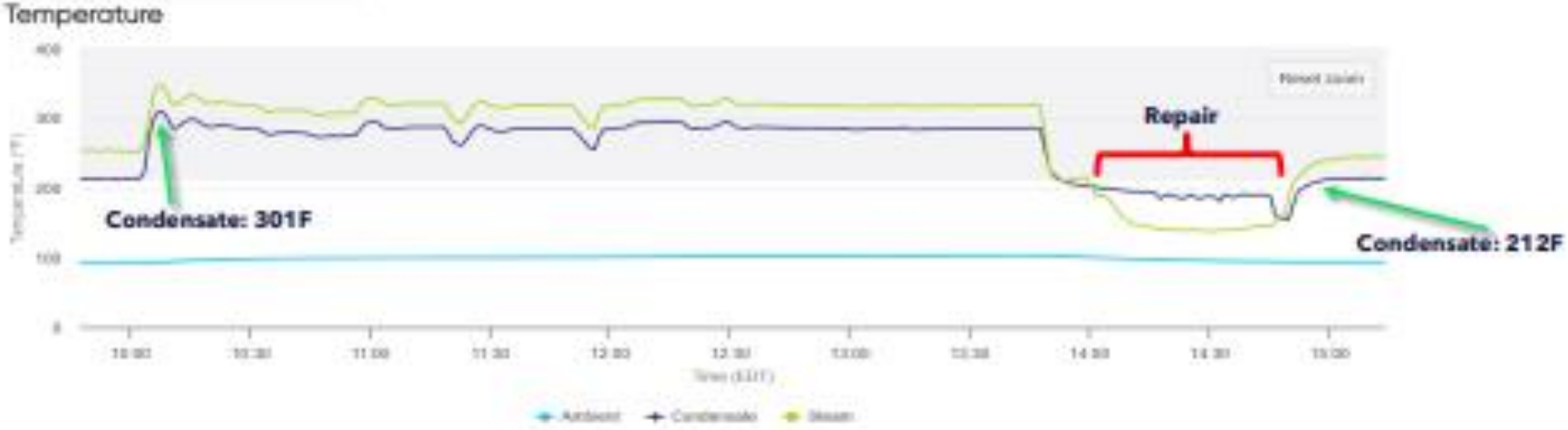
A ticket will be created and we should get back to you within 24 hours during normal business days.

Trap Triage List 15


Trap inlet
steam measurement
Thermo-Electric
Generator
Trap outlet
condensate measurement
Eversensor
Semi-Rigid
Connector
Steam Trap Monitor

Resolved Trap: A205

Trap Tag A205	Armstrong 883
Location	*North – 22 Coater*
Orifice Diameter	*0.175"*
Pressure	*200 psig*
Cost of Steam	*$05.07/1,000lbs*
Savings from Rapid Repair	*$7,078*



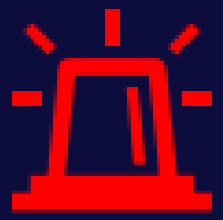
everactive

Sensor Deployment

Q2,Q3 CY 24

1,233

Total number of monitored traps



9

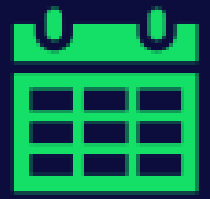
Trap Notifications

9

Resolved Trap Failures

0

Unresolved Trap Failures



26 hours

Average Resolution Time

everactive

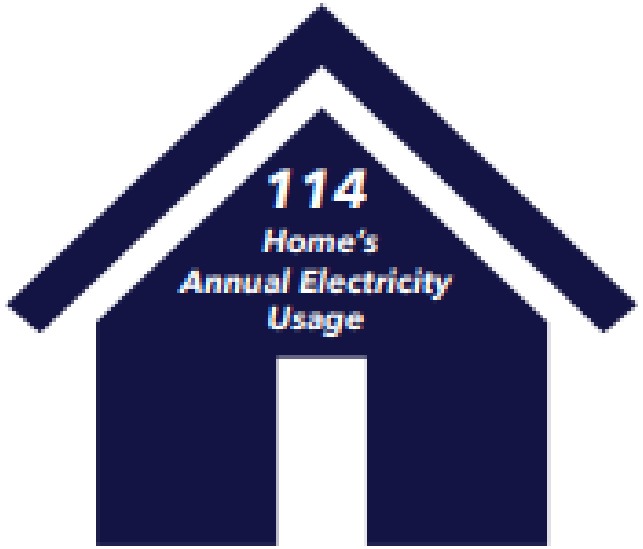
Environmental Savings Impact – Q2 and Q3, CY 24

874 Tons of CO_2

Conserved by reduction in energy usage

Equivalent to:

Barrels of Oil



everactive

James Farley

3M

Science.
Applied to Life.™

3M - Valley Energy Data in Manufacturing

James Farley

11/19/2024

3M - Valley, NE

Respiratory Protection

Breathe easy with protective and comfortable respiratory solutions for a range of complex applications and conditions.

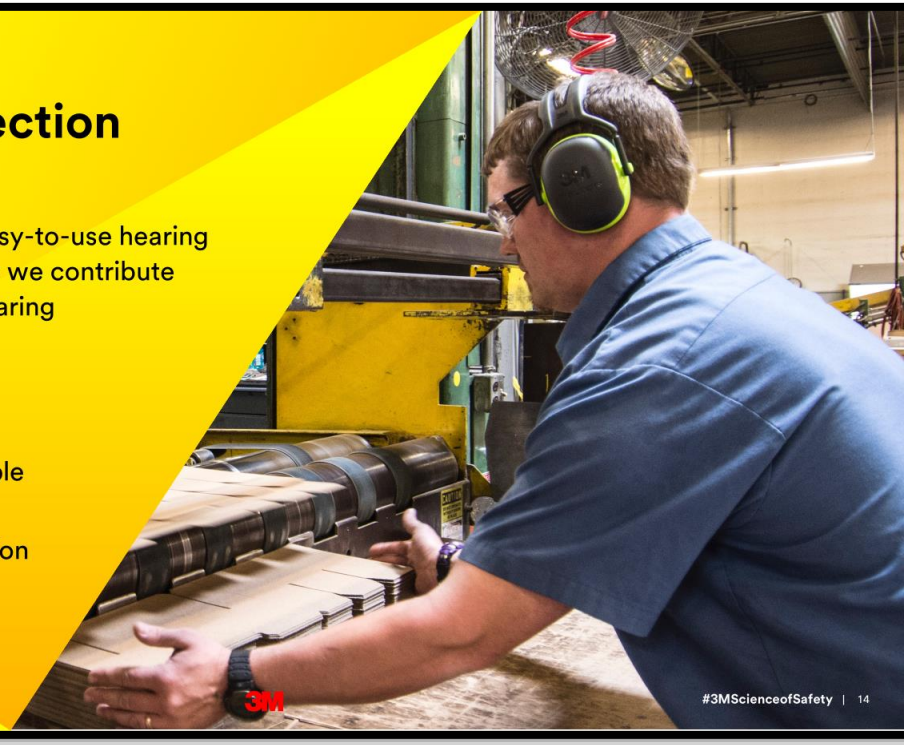
- Disposable Respirators
- Reusable Respirators
- Powered & Supplied Air Respirators

3M

Hearing Protection

Discover comfortable, easy-to-use hearing protection—just one way we contribute to the success of your hearing conservation program.

- Audiometric Testing
- Disposable and Reusable Earplugs
- 3M™ E-A-Rfit™ Validation
- Earmuffs and more



3M

3M

What is our vision for actionable energy data?

Inventory of Energy Data

	Energy Data	
Direct	**Utility Bills**	**Meters/Sensors**
	Electricity	Electric Metering
	Natural Gas	Compressed Air Metering
		Natural Gas Metering
		Water Metering
Indirect (X's or Influences)	**Manufacturing Data (MES)**	**Process Data (PLCs)**
	Output	Machine States (Run/Idle)
	Labor Hours	Machine Settings
	Weather Data (NASA API)	**Building Management Systems**
	Cooling Degree Days (CDD)	HVAC, Lighting, Fans, etc.
	Heating Degree Days (HDD)	

Energy Data Improvements

Energy Data

Direct

Utility Bills

- Electricity
- Natural Gas

Meters/Sensors

- Electric Metering
- Compressed Air Metering
- Natural Gas Metering
- Water Metering

Indirect (X's or Influences)

Manufacturing Data (MES)

- Output
- Labor Hours

Weather Data (NASA API)

- Cooling Degree Days (CDD)
- Heating Degree Days (HDD)

Process Data (PLCs)

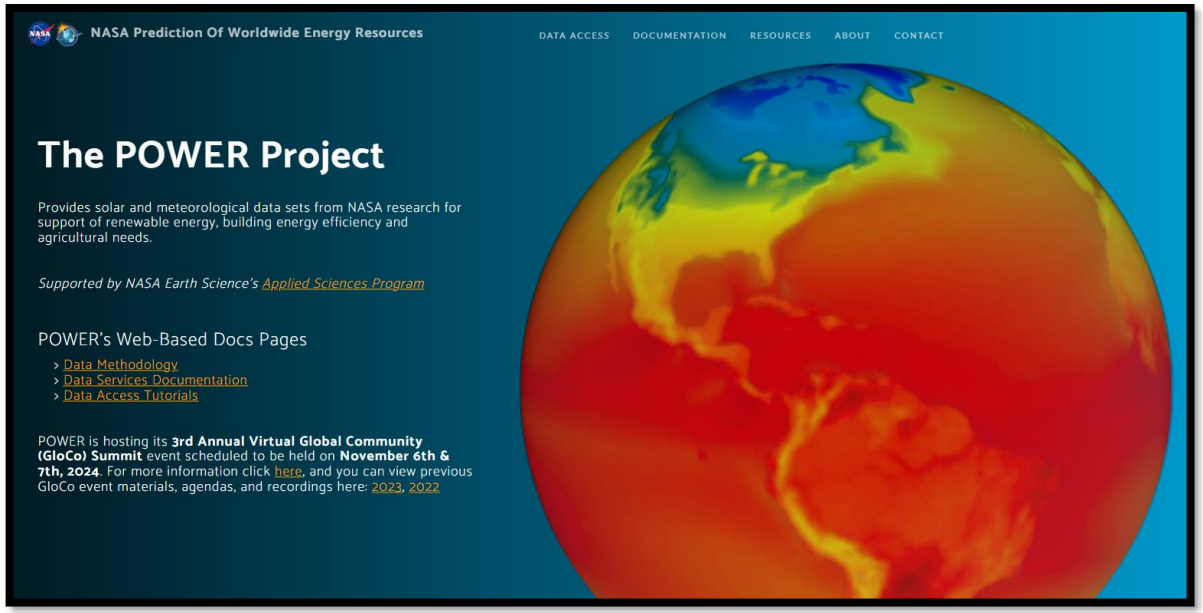
- Machine States (Run/Idle)
- Machine Settings

Building Management Systems

- HVAC, Lighting, Fans, etc.

Weather Data – The POWER Project

- NASA's 'The Power Project' is a great free resource for average temperature data that can be used to create correlations
- Can pull data into from NASA into tools like Excel, Power BI




```
{
    "type": "Feature",
    "geometry": {
        "type": "Point",
        "coordinates": [
            -96.33779,
            41.30744,
            364.82
        ]
    },
    "properties": {
        "parameter": {
            "T2M": {
                "20190101": -13.63,
                "20190102": -6.76,
                "20190103": -1.49,
                "20190104": 0.68,
                "20190105": 2.19,
                "20190106": 2.62,
                "20190107": 4.62,
                "20190108": 2.04,
```

Energy Projects - 3M Valley

HVAC Control Upgrades (Variable compressor and fan speeds)

Energy Data Tools

- Utility Bills
- Meters
- MES
- Machine (PLC)
- Weather
- Sensors
- BMS

Connect, Format, and Automate Data

- Historize energy usage from electrical panels attached to HVAC systems
- Connect to weather dataset and establish a baseline
- Report out energy savings versus target and verify improvements

Power BI

Action

- Make and Document Energy Improvements
- Meet ISO-50001, company objectives

Power BI and Analysis

Energy Usage

Date	Usage (kWh)
1/1/2024	Y
1/2/2024	Y
1/3/2024	Y

Weather

Date	CDD	HDD
1/1/2024	X_1	X_2
1/2/2024	X_1	X_2
1/3/2024	X_1	X_2

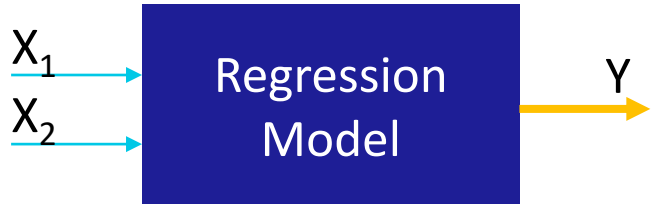
Dates

Date
1/1/2024
1/2/2024
1/3/2024

Why Power BI?

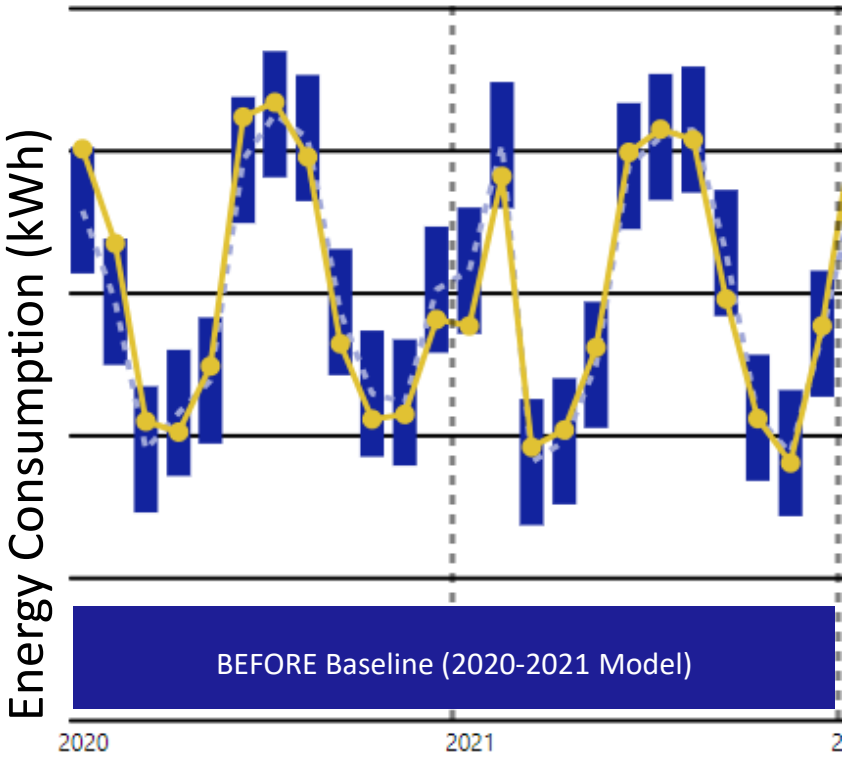
- Automated pull from many different types of data
- Joining and filtering of tables
- Data analytics
- Alerts on thresholds

Alternative: RETScreen



Maximize a Model's Goodness-of-Fit

Result – Baseline, Actual HVAC Usage (2 Factor Regression)

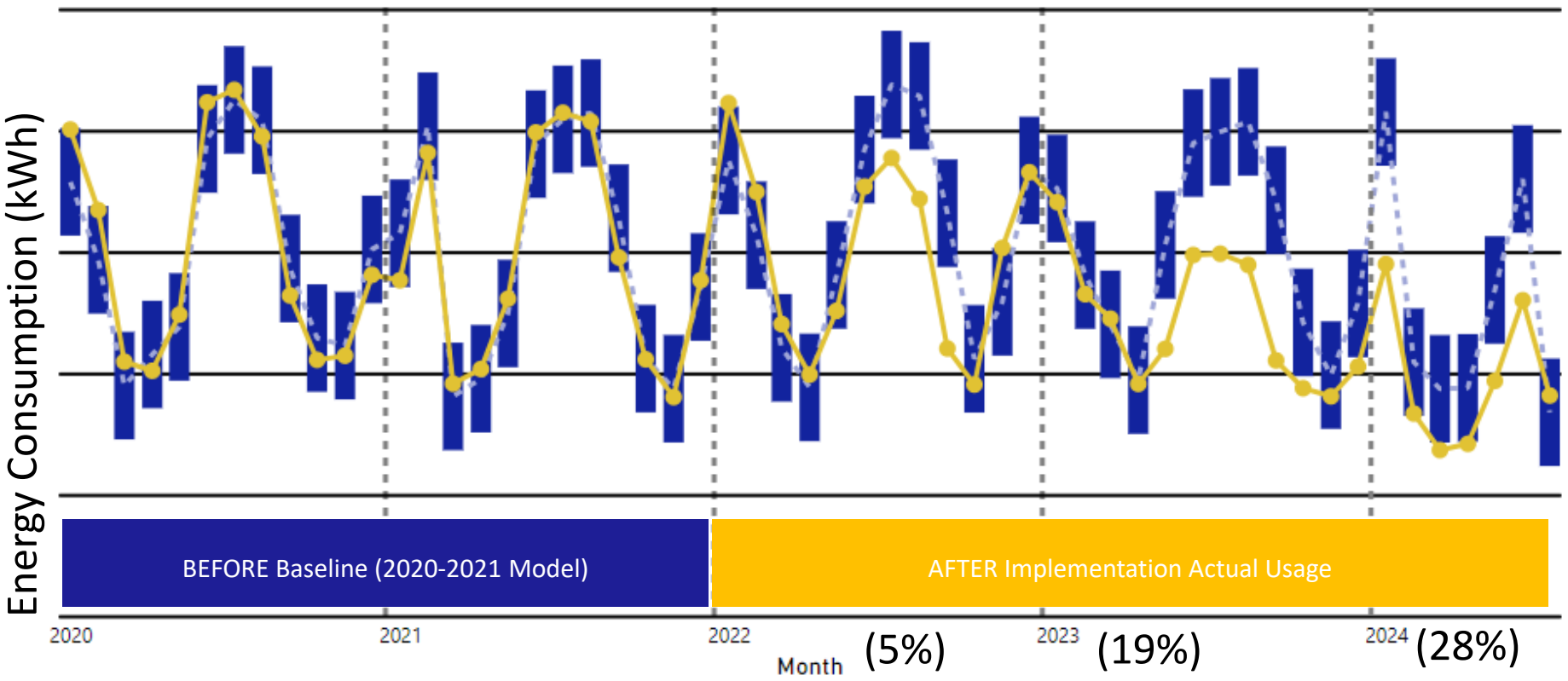


2020-2021 Baseline
2022 Implementation

X1: Cooling Degree Days
X2: Heating Degree Days

Y: HVAC Energy Usage (kWh)

Result – Baseline, Actual HVAC Usage (2 Factor Regression)



2020-2021 Baseline
2022 Implementation

X1: Cooling Degree Days
X2: Heating Degree Days

Y: HVAC Energy Usage (kWh)

Month

1.5M lbs of CO_2 per year

2% Site Improvement

Compressed Air Reduction (Automated Alerts)

Energy Data Tools

- Utility Bills
- Meters
- MES
- Machine (PLC)
- Weather
- Sensors
- BMS

Connect, Format, and Automate Data

- Install compressed air meters, historize data
- Use real-time data to minimize air usage with programming, hardware changes, and eliminating leaks
- Measure idle compressed air usage
- Set up Power BI alerts to let maintenance techs know when idle air usage is above a threshold

Power BI

Action

- Make and Document Energy Improvements
- Meet ISO-50001, company objectives

Machine Compressed Air Reduction

Before

0.8M lbs of CO_2 per year

Machine Compressed Air Reduction

Before

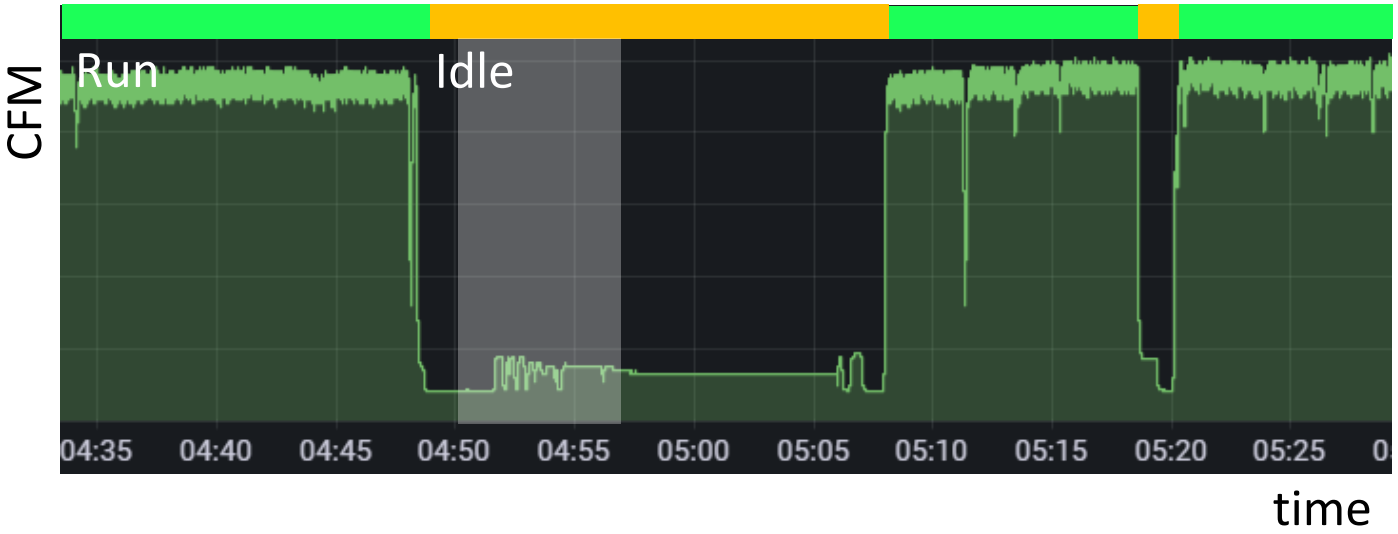
0.8M lbs of CO_2 per year

Machine Compressed Air Reduction

Before

After

70% reduction while idle



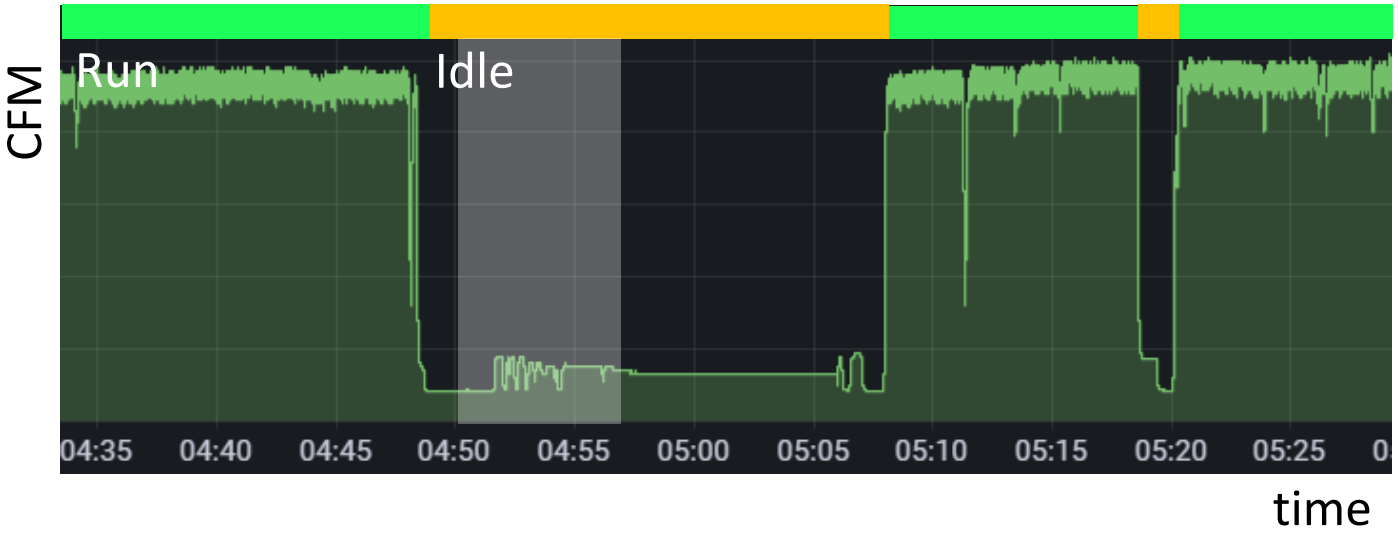
0.8M lbs of CO_2 per year

Machine Compressed Air Reduction

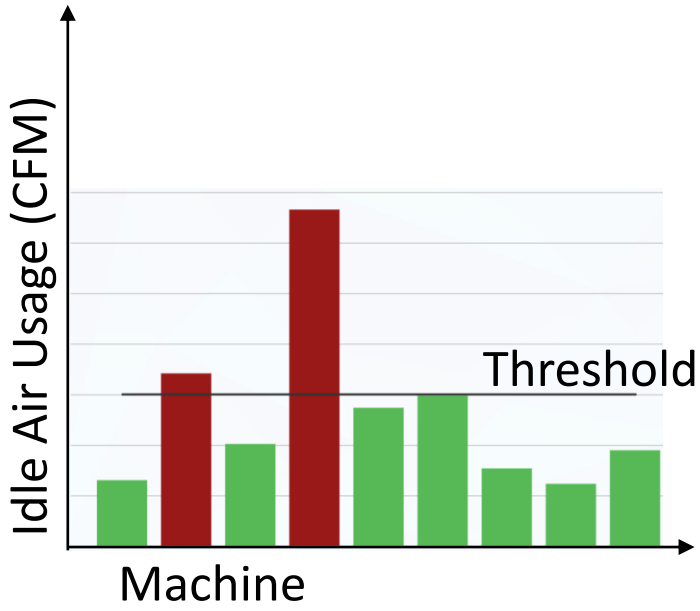
Before

After

70% reduction while idle



Control Plan



0.8M lbs of CO_2 per year

Kit Ying Chen

Niagara Bottling

Robert Minor

Niagara Bottling

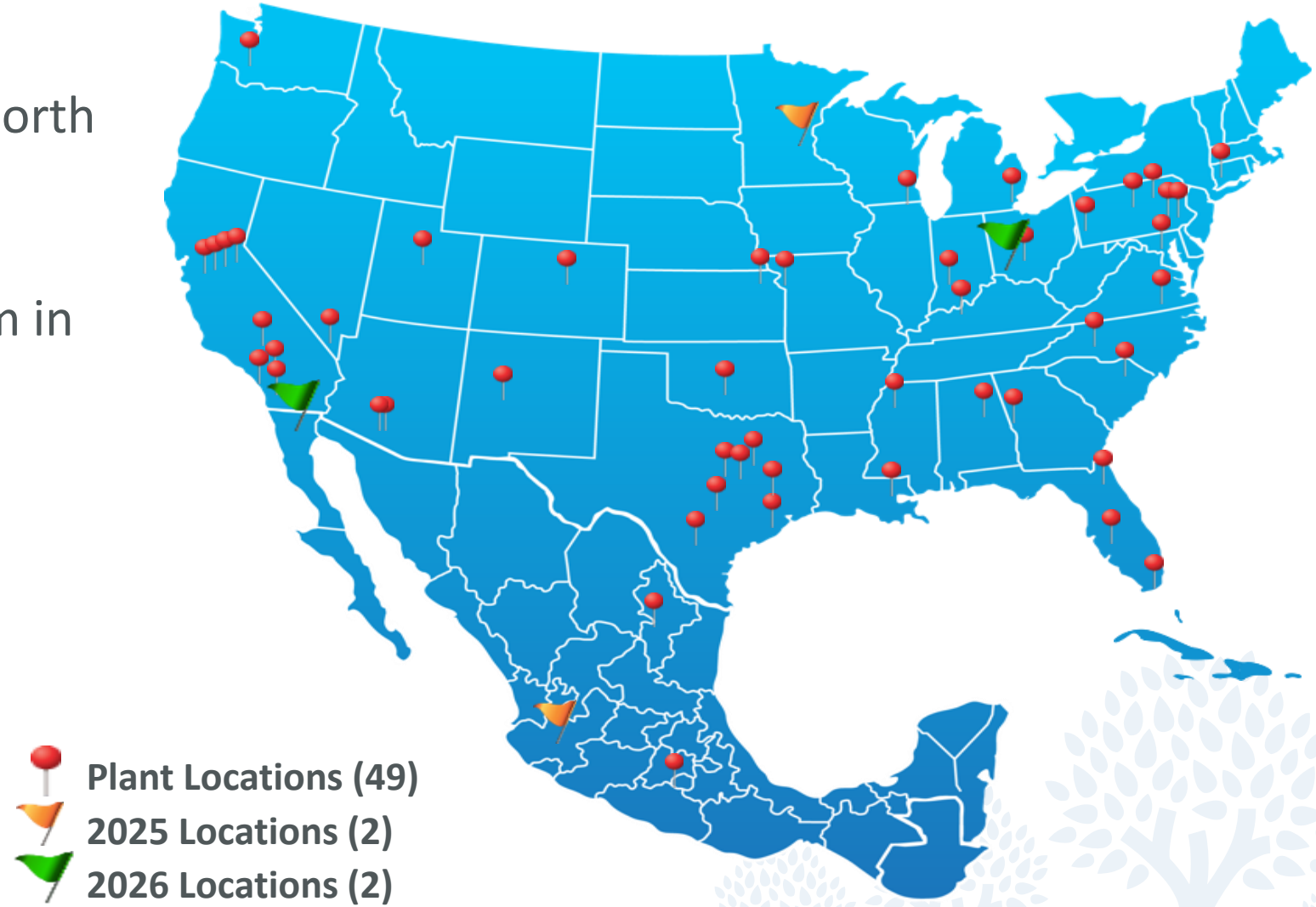
Intelligent Air Compressor Control

Nov 19th 2024

niagara

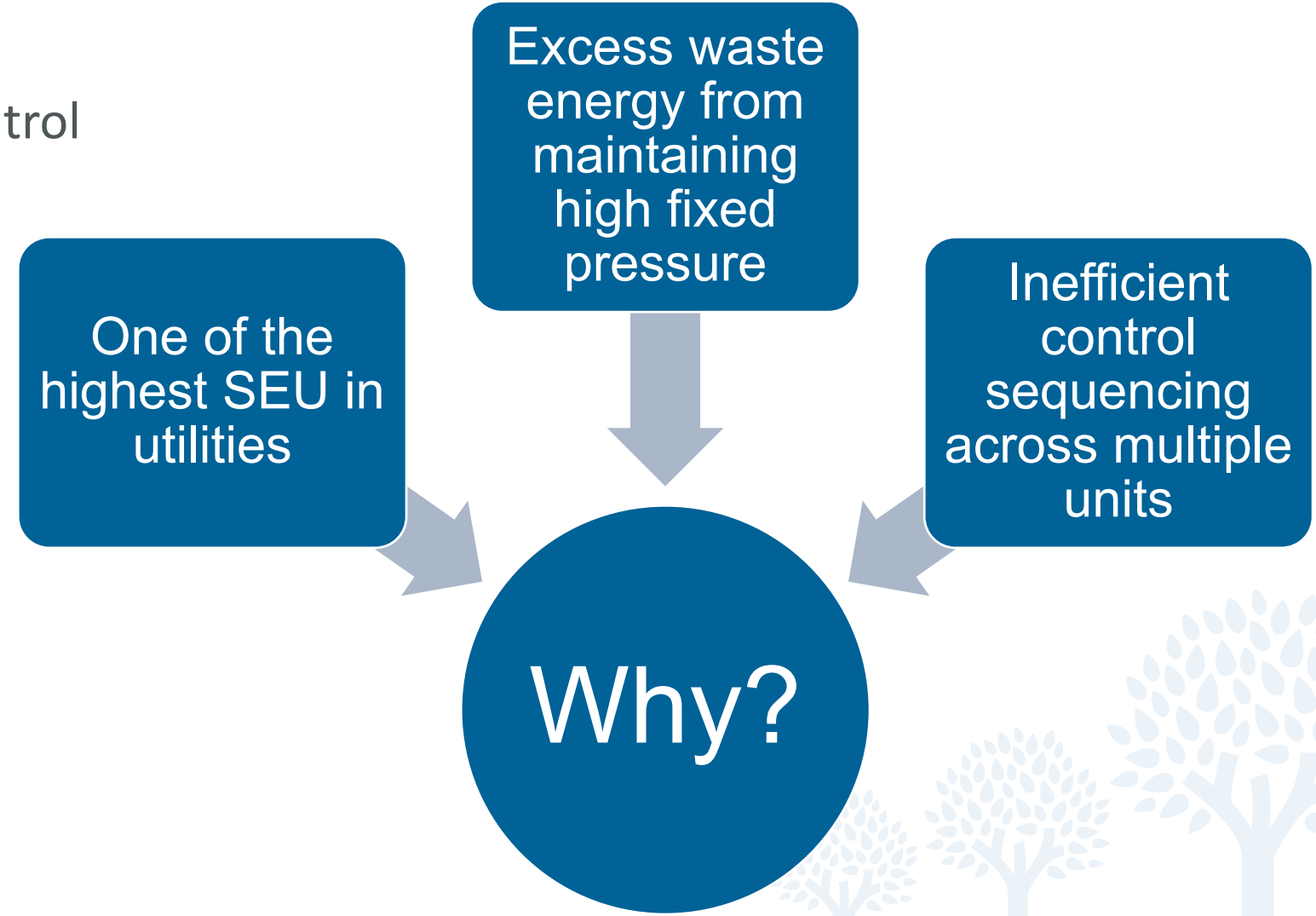
Niagara Bottling - Intro

- Beverage manufacturer in North America
- HQ in Diamond Bar, CA
- Joined Better Plants Program in 2024
- 53 plants in North America

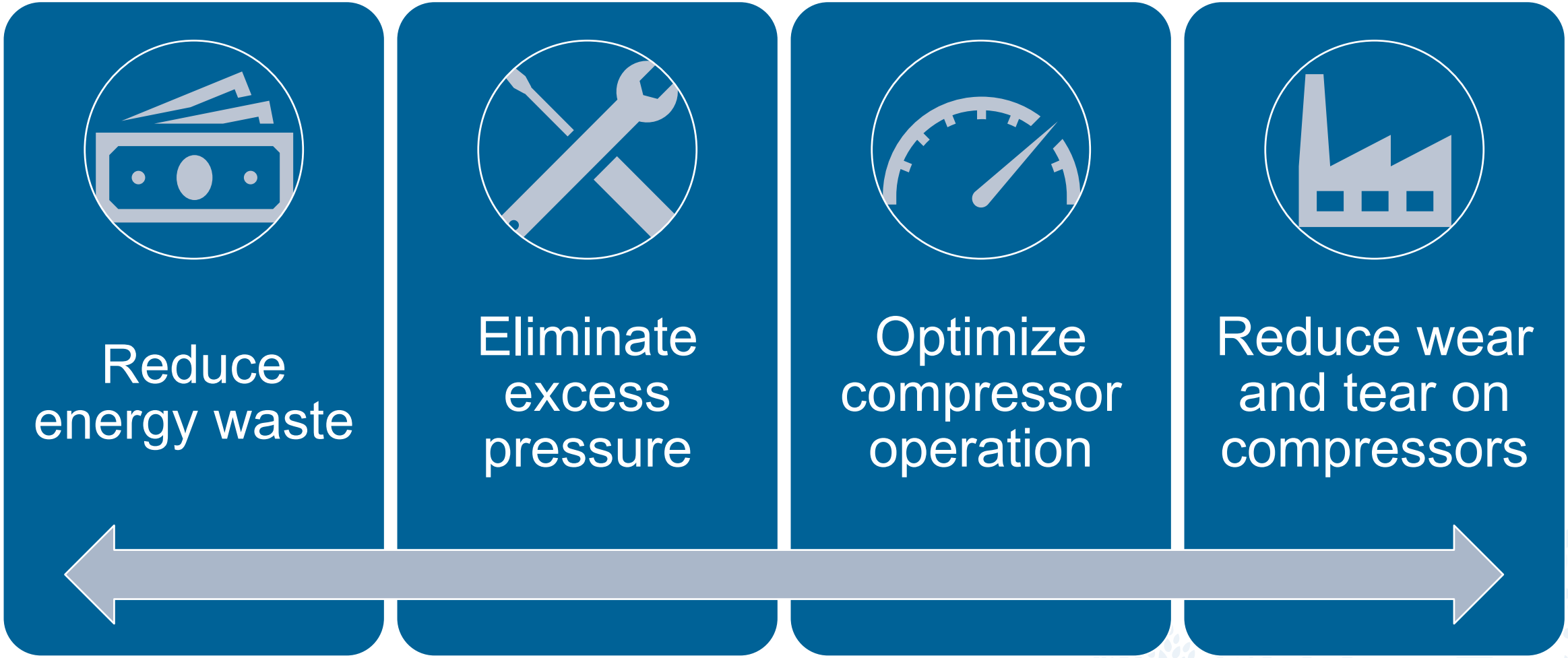


Overview – Intelligent Compressed Air Controls

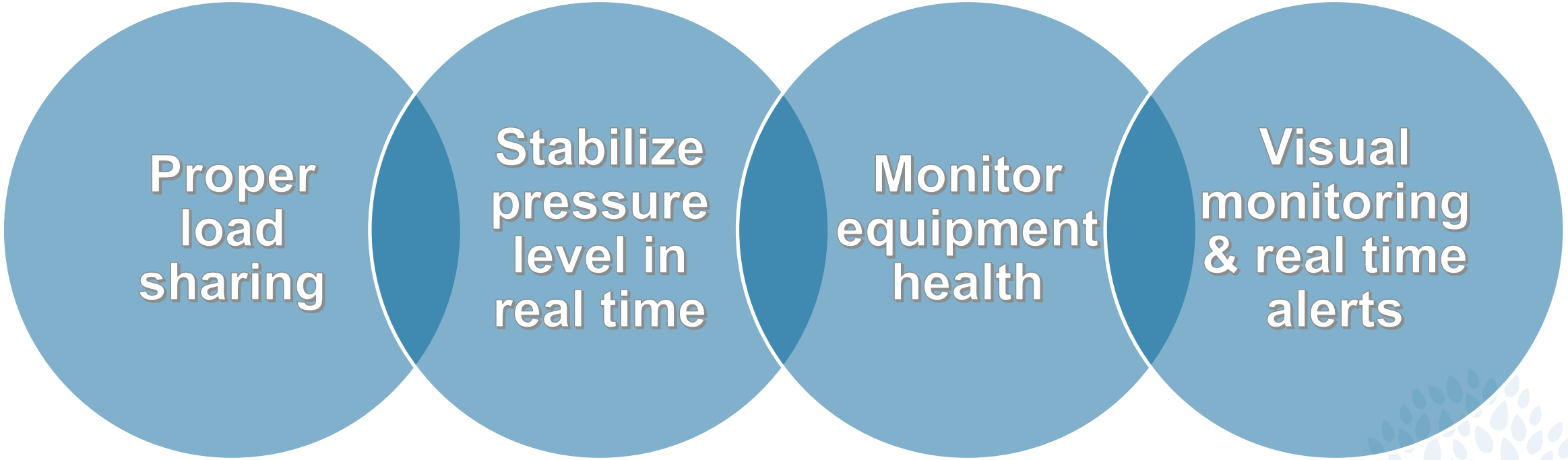
- AI sequencing
- Cloud based dynamic control



Goal



Benefits



How it works

IoT collection – analyze data and baseline

Utilize predictive analysis

Dynamically control system to hit max efficiency

Visualization for better monitoring

Results & Energy Savings

- Lower energy demand and consumption
  - Draw less power
- Energy savings range from 8.7% to 26.2%
  - Monthly average: 18.6%
- Proactively predict repairs & dispatch OEM techs
- Able to shut down 2 entire machines in 2 sites due better capacity utilization
  - Cost avoidance $

Challenges & Limitations

Need for reliable sensors and baseline data collection

Calibrating AI algorithms to specific plant conditions

Total savings depend on equipment spec

- VFD or non-VFD

Challenging to validate savings with utility bill

- Submetering would be beneficial to breakdown usage for comparison
- Other factors: various EU drivers (injection, blowmolding, production etc.)

Next Steps:

- Scalable project for other facilities
- Potential for HVAC and chillers operation

Q & A

Submit Questions
www.slido.com event code **#DOE**

Better Buildings®
U.S. DEPARTMENT OF ENERGY

Better Buildings
FALL WEBINARS

01 OCT	29 OCT	12 NOV	19 NOV	03 DEC	10 DEC






REGISTER TODAY: betterbuildingssolutioncenter.energy.gov/bbws

Coming up next…

A SMASHING SUCCESS:

SUSTAINABLE MANAGEMENT OF DEMOLITION DEBRIS

Tuesday, December 3, 2024 | 11:00 AM - 12:00 PM ET

REGISTER TODAY

Sustainable Management of Construction and Demolition (C&D) debris can significantly reduce the vast waste streams generated by demolition waste. Discover how C&D materials, like steel, asphalt, concrete, wood, brick, and drywall, can be diverted from disposal and repurposed into new productive uses, including fuels and manufactured products.


APRIL 30
- MAY 2
2025
Better Buildings, Better Plants
SUMMIT
Better Buildings®
U.S. DEPARTMENT OF ENERGY
LEARN MORE: betterbuildingssolutioncenter.energy.gov/summit
U.S. DEPARTMENT OF ENERGY

Additional Questions?

Please Contact Us

Follow us on X
@BetterBldgsDOE

Follow us on LinkedIn
Company/Better-Buildings

Better Buildings Solution Center
https://betterbuildingssolutioncenter.energy.gov/

Program Support
BetterBuildings@retechadvisors.com

Tanmay Soni
3M
tsoni@mmm.com

Cory Anderson
3M
clanderson1@mmm.com

James Farley
3M
jfarley2@mmm.com

Kit Ying Chen
Niagara Bottling
kchen@niagarawater.com

Robert Minor
Niagara Bottling
rminor@niagarawater.com

Better Buildings U.S. DEPARTMENT OF ENERGY

U.S. DEPARTMENT OF ENERGY