MAY
17-20
2021

Better Buildings®
U.S. DEPARTMENT OF ENERGY

SUMMIT

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U.S. DEPARTMENT OF ENERGY

Best of the Betters: 2021 Better Project Presentations

Tuesday, May 18, 2021

2:00-3:15 pm ET

Eli Levine

U.S. Department of Energy

U.S. DEPARTMENT OF ENERGY

Agenda

Video Presentations

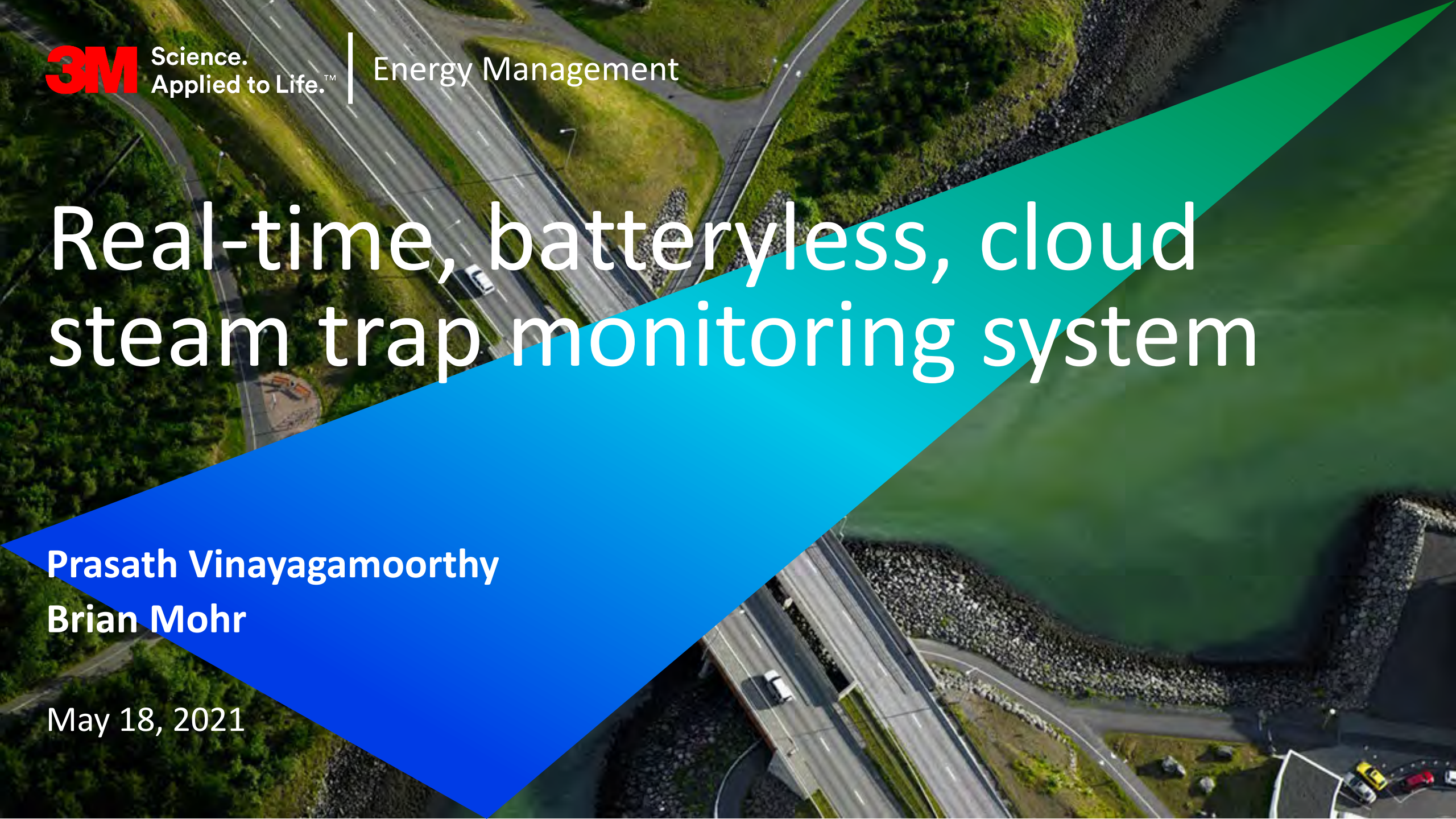
1. **3M** – Prasath Vinayagamoorthy (Senior Energy Engineer) & Brian Mohr (Maintenance Engineer)
2. **Flowers Foods** – Margaret Ann Marsh (VP Environmental & Sustainability)
3. **Graham Packaging** – Scott Christensen (Operations Engineering Manager)
4. **Lockheed Martin** – Michael Stein (Facilities Energy Manager)
5. **Nissan North America** – Brett Rasmussen (Senior Manufacturing Engineer)
6. **Owens Corning** – Don Scarsella (Energy Program Manager)
7. **SugarCreek Packing Co.** – Todd Jackson (Maintenance Administrator)
8. **Tyson Foods** – Alex Floyd (Senior Manager, Sustainability)

Q&A Session

3M – *for implementing a real-time, battery-less steam trap cloud monitoring system that saves 10.6 million pounds of steam per year*

Prasath Vinayagamoorthy (Senior Energy Engineer) & Brian Mohr (Maintenance Engineer)

Submit Questions
www.slido.com event code **#DOE**, Best of the Betters: Better Project Presentations



3M Science. Applied to Life.™ | Energy Management

Real-time, batteryless, cloud steam trap monitoring system

Prasath Vinayagamoorthy
Brian Mohr

May 18, 2021

3M Company

Since 1902...

Our Vision

3M Technology Advancing Every Company
3M Products Enhancing Every Home
3M Innovation Improving Every Life

Corporate Sustainability Goals

Raw Materials

Water

Climate & Energy

Health & Safety

Education & Development

Climate & Energy

Improve energy efficiency indexed to net sales by 30 percent.

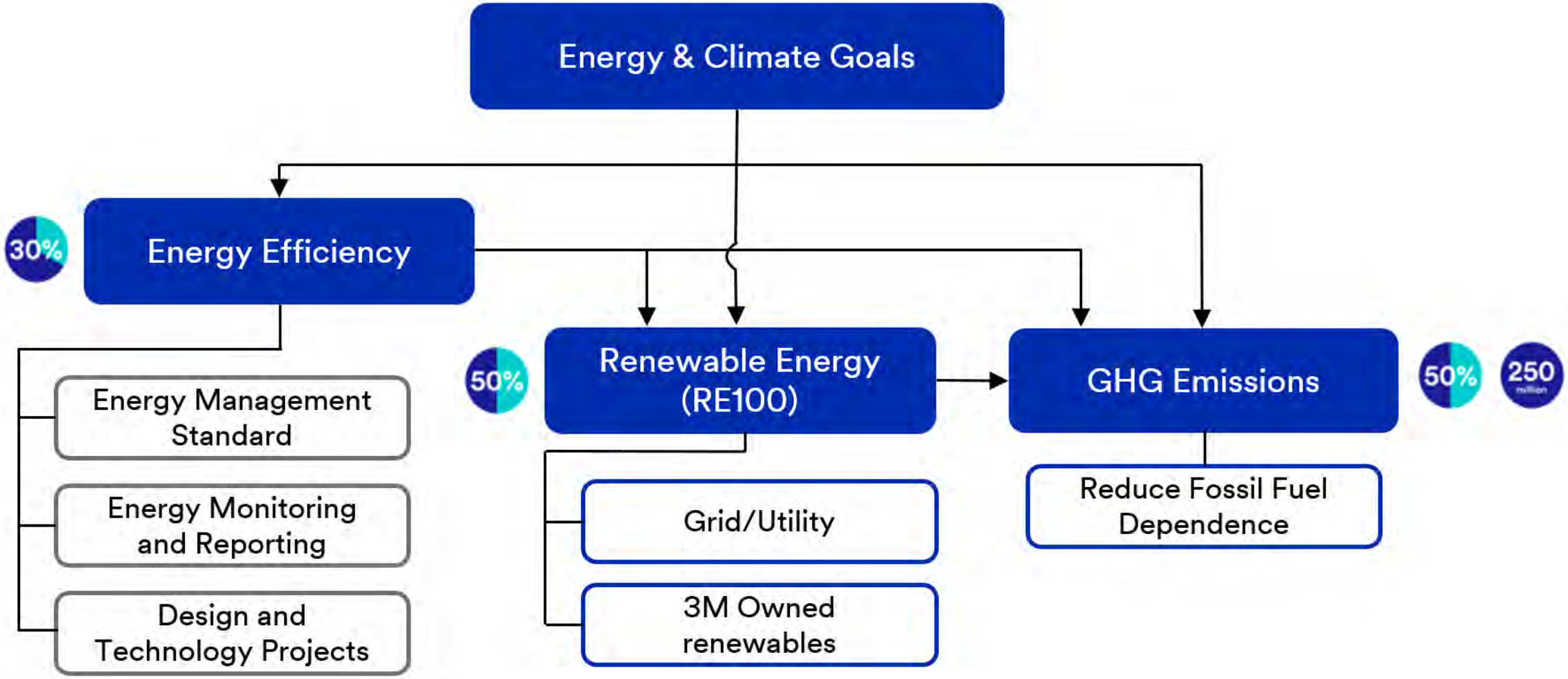
Increase renewable energy to 50% of total electricity use.

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.[1,3]

Help our customers reduce their GHGs by 250 million tons of CO_2 equivalent emissions through use of 3M products.

1. 2019 will be the baseline measure year for these new commitments
2. Expanded commitment from 10% between 2015 and 2025
3. Expanded 3M's 2025 goal to stay below 50% of our 2002 baseline, meaning 3M's 2030 Scope 1 and 2 emissions will now be reduced more than 85% from 2002 levels

Strategies for Climate and Energy Goals



Everactive System: Overview

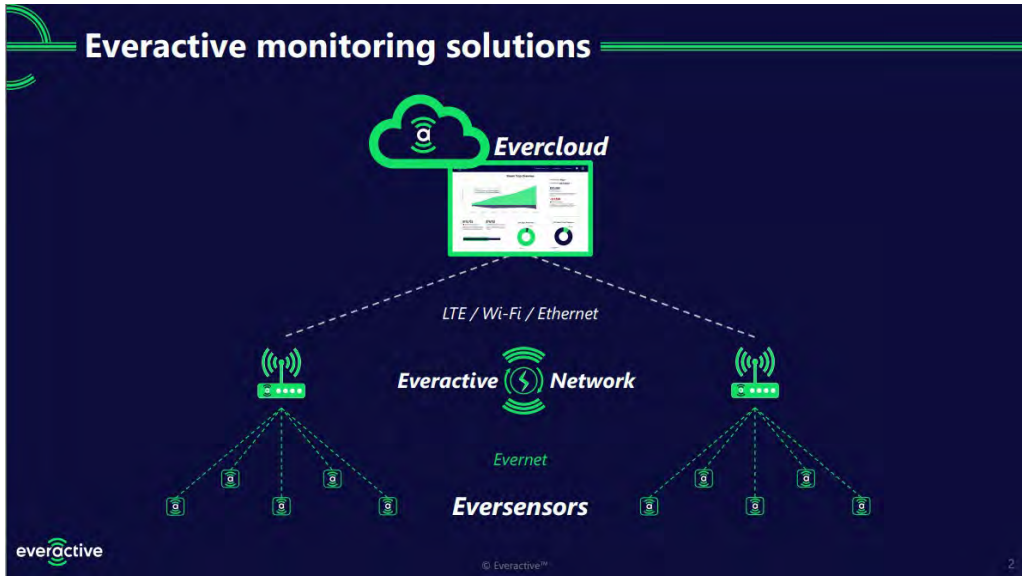
Everactive entered the market with a self-powered IoT sensing technology application around steam traps.

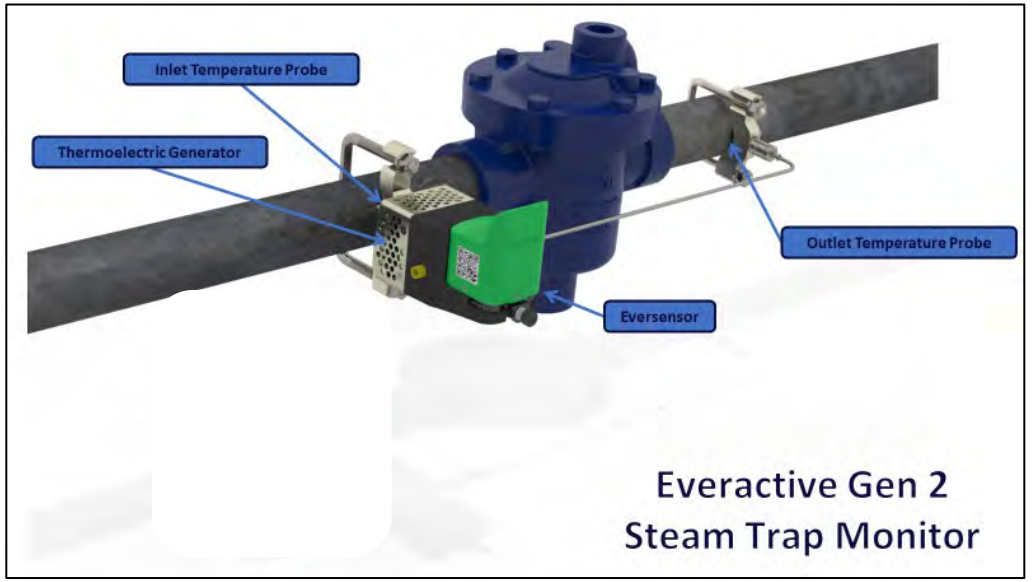
The Eversensors are a unique technology that provide an easy connection to detect leaks on its own, reliably, without human intervention and the need for maintenance (ex: replacing batteries).

The sensor harvests energy from its surroundings through multiple sources including indoor solar, thermal gradients, RF, vibration and more.

It then connects to the cloud via ultra-low-power, proprietary integrated radios to communicate wirelessly to the cloud.

The sensor collects analog data of temperature, humidity, vibration, acceleration, and pressure for a digital front.

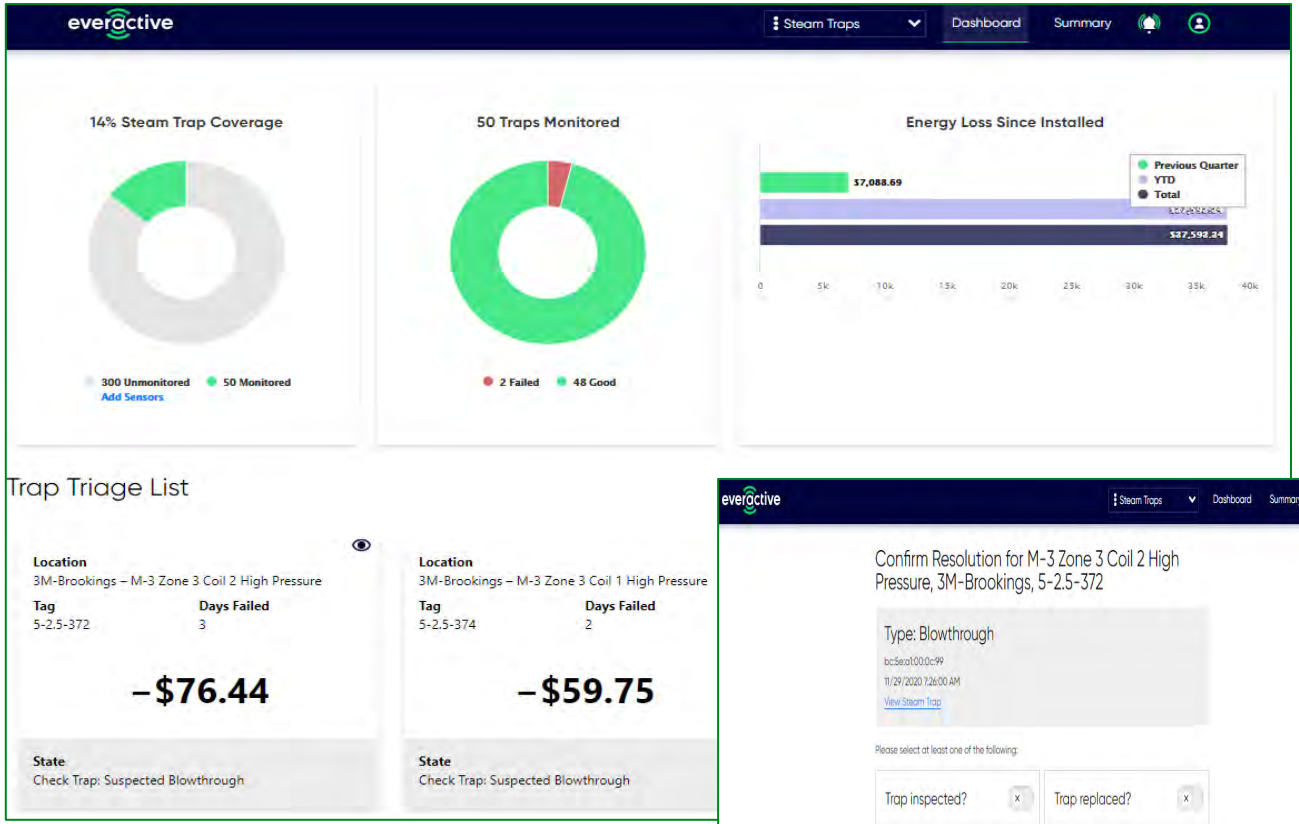




EverActive System: Dashboard

Enhanced dashboard available to review the steam trap status, sensor status, energy loss, energy saved, cost loss and cost saved.

Receive email and text notification regrading the failure and failure details.



Brookings Pilot

Pilot in Brookings, South Dakota (US)*	
Plant Operation	*24*7*
Monitored traps	*50*
Duration of trail	*6 months*
Trap issues detected	*12*
Percentage of failed traps[1]	*24%*
No. of failed steam trap days - Before	*45 days*
No. of failed steam trap days - After	*12 days*
Pay back	*6 Months*

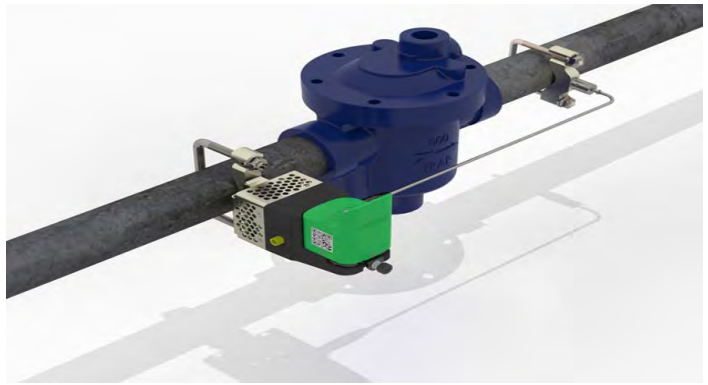
Benefits	
Emission reduction	*0.55 MtCo2*
Cost Saving	*74%*
Steam Loss Saving	*10,600 klbs*
Maintenance time reduction	*25-30%*
Quality Issues due to Steam	*Nil*
Downtime due to Steam	*Nil*
Safety Risk	*Zero risk*

EverActive Sensors installed at 3M Brookings

*Estimates based on Napier's Equation for Steam Loss
[1]= Typical failure rate is 10-15% across an entire production facility

Corporate Replication

- The Corporate Energy Team is currently looking at increasing participation with other 3M sites for real-time steam trap monitoring.
- The team has put together a proposal for top management.
- Evaluate cost-savings for site to site based on actual condition.
- Evaluate cost-savings for different regions (LATAM, APAC, EMEA)



USAC Proposal (16 Tier 1 Sites)	
Steam trap Counts	9371+
Cost saving @15% failure rate:	24%
Emission reduction @15% failure rate	160 KtCO2
Pay Back @15% failure rate	4.2 Months
Cost saving @10% failure rate	12%
Emission reduction @10% failure rate	94 KtCO2
Pay Back @10% failure rate	6.2 Months

3M Energy Management Recognition

Clean Energy Ministerial Global Awards	2019 – Excellence in Energy Management (Corporate)
	2017,2019 – Insight Award (3M Company, 3M Canada)
Dow Jones Sustainability Index	2019 – 20th Consecutive year of recognition

DOE BBBP	2021 - Better Projects Award – Batteryless, cloud steam trap monitoring system
	2020 – iTEAM Awards (Cynthiana & Cottage Grove)
Association of Energy Engineers	2019 – Corporate Energy Management
	2019 – Energy Engineer of the Year Award (Canada)

Canadian Industry Program for Energy Conservation (CIPEC)	2014/2018 – Corporate Stewardship
IESO (Crown Corp.)	2018 – Energy Manager of the Year Award

Questions?

Flowers Foods, Inc. – *for redesigning and rebuilding an existing bread plant to produce organic bread and includes a variety of sustainability features that reduced annual energy and water consumption by 22% and 64%, respectively*

Margaret Ann Marsh (VP Environmental & Sustainability)

Submit Questions
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U.S. DEPARTMENT OF ENERGY

Graham Packaging – *for upgrading a facility air and water management system that led to an 11% reduction in annual electricity usage*

Scott Christensen (Operations Engineering Manager)

Submit Questions
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Better Plants Presentation | 18 May 2021

Florence Energy Savings Project

Graham Packaging

The Graham Story

At the heart of the new Graham brand is the idea of being

“Always Inspired.”

Always Inspired isn’t just a concept, it’s a mentality. A commitment to and focus on the possibilities for a better product, a happier customer, and a cleaner world.

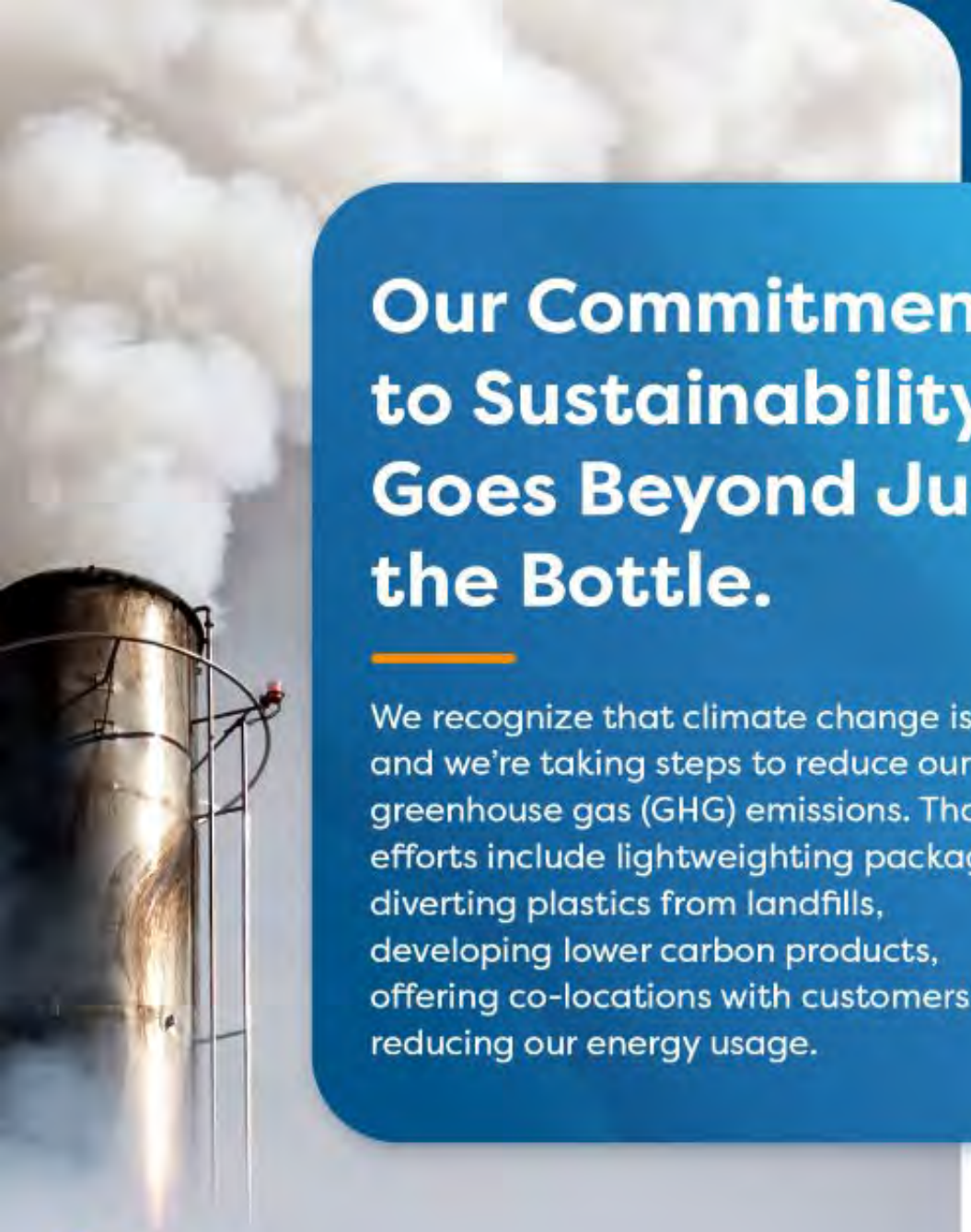
We are the Experts in

SUSTAINABLE
Our commitment to sustainability goes beyond just the bottle. We are committed to minimizing our impact through sustainable operations and creating a circular economy.

INNOVATIVE
Superior technology with a long history of innovation in PET and Polyolefin. We provide safe, attractive and convenient packaging that meets the demands of today’s consumer.

CREATIVE
We have the talent, tools and experience to help craft new bottle shapes to meet branding and manufacturing needs of our customers.

Packaging Solutions



Our Commitment to Sustainability Goes Beyond Just the Bottle.

We recognize that climate change is real, and we're taking steps to reduce our greenhouse gas (GHG) emissions. Those efforts include lightweighting packaging, diverting plastics from landfills, developing lower carbon products, offering co-locations with customers and reducing our energy usage.

Minimizing Our Impact

There isn't a bottle in the world that threw itself in the trash. All parties – from plastic manufacturers to recyclers to consumers – must do their part to create a circular economy.

Up to 52% Lower ESG Risk Than Our Direct Competitors.

Graham Packaging was named **best of all rated plastic, glass and metal packaging companies** in our risk profile in the areas of environmental, social and governance (ESG) from Sustainalytics.

- Increase Recycled Content
- Lightweighting
- Sustainable Operations

Our Goals are Your Goals!

We work to always be the partner of choice by helping customers meet their sustainability goals now and in the future. We have our sights set on protecting the planet, and we know we'll be ready to meet the needs of the markets we serve. And in turn, we'll help our customers be ready, too.

Our Commitments to Creating a Better Tomorrow

We are positioning ourselves for the future through strong sustainability partnerships and commitments to several long-term goals.

100%

Committed to designing for recyclability across all products to achieve our goal of 100% recyclability by 2025.

New Plastics Economy Global Commitment

20%

Committed to increasing our use of PCR by incorporating an average of 20% PCR across all bottles by 2025

New Plastics Economy Global Commitment

25%

As a member of the U.S. Department of Energy's Better Plants Program, we've committed to achieving 25% energy reduction by 2028.

Better Plants® U.S. Department of Energy

30%

From our 2020 baseline, we've committed to a sustainability goal of 30% GHG emission reduction by 2030.

CO_2

Graham Packaging

Project Kick-Off

- Graham's Florence, KY plant produces 283 million PET bottles and 384 million preforms.
- A team tasked with looking at operational efficiencies set a goal to provide energy and water savings.
  - Started by completing an assessment and in-depth audit of the facility. During this process, the team compiled records of production demand, kilowatt usage and water usage.
  - The analysis showed that significant energy savings were attainable through power and water usage controls.
- We identified that a set of comprehensive energy efficiency measure packages, instead of a standalone measure, would have an estimated return on investment of less than 24 months.
- A multi-disciplinary team of different stakeholders, include a technology company, a control system developer and a utility company, was formed to execute the project.

Energy Savings Solutions

- During the team's discussions, it was determined that any energy savings measures implemented needed to also ensure that the plant could continue to operate the equipment at peak performance. Defined the project to include:
  - Variable speed drives on cooling tower pumps
  - Variable speed drives on chiller pumps and cooling tower fans
  - Replacement of an older inefficient centrifugal chiller with a new VSD Magnetic Bearing technology chiller
  - Precision air flow regulators on all bottle blow machines.
- Also installed comprehensive systems management controls for both air and water systems to meet production demand requirements using temperature, flow and pressure with real-time data.

Overcoming Obstacles

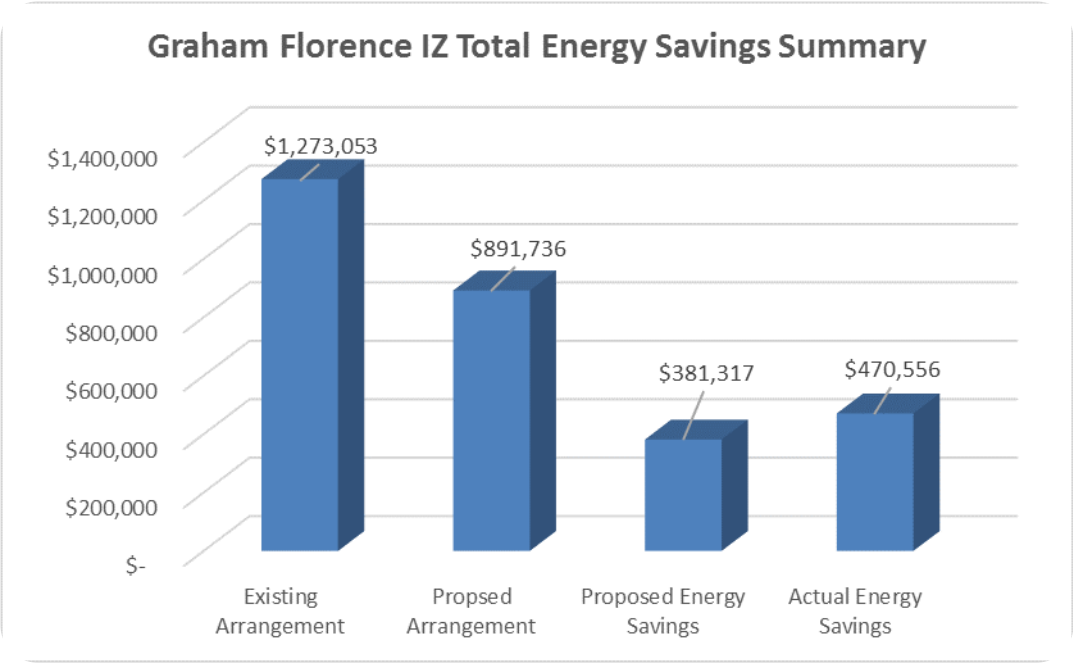
- The project was not without expected challenges. Significant barriers included:
  - The need to maintain precise water temperatures, flows and pressure to key systems and production equipment.
  - The need to limit the downtime of the equipment during implementation as to continue to meet customer demand.
- How we overcame them:
  - Building to the project thermal control valves.
  - Combining the developed project timeline with other projects that were completed during scheduled shutdowns of the facility in order to lessen the impact on production.

Project Implementation and Execution

- Working in partnership with IZ Systems, Johnson Controls, and Duke Energy, Graham was able to create and implement a vigorous timeline:
  - Started first quarter of 2019, completed in July 2019
- To help stay on budget, the maintenance staff at the facility was trained in the operation, management, preventative maintenance, and limitations of the newly installed system.
  - Also proved to be a cost savings in the future by allowing Graham staff to continue to provide the proper care and maintenance of the equipment.
- Johnson Controls provided the York YMC2 VSD chiller, which can handle condenser water temperatures below 50ºF.
  - This allows the plant to take advantage of the colder environmental temperatures within the region to lower energy use while maintaining a production chilled water temperature, and increase cycles of concentration of the cooling towers due to less evaporation created by heat load of the system.
- IZ Systems provided the audit, instrumentation and measurements systems along with its assistance in engineering, installation and implementation of the new system, and assisting the plant to work with Duke Energy to secure any and all rebates and incentives.

Outcomes

- Impressed with the real savings that were recorded and tracked using remote access to the management system.
- By putting in metrics to track water and kilowatt usage, Graham was able to recognize and reduce the required energy to produce air and chilled water for the process of bottle and preform production.
  - Saw an 11% reduction in kWh usage from 2018 to the end of 2020.
  - Saw energy usage drop from an average of 1,267 kWh/1,000 lbs produced in 2018 to 1,127 kWh/1,000lbs produced in 2020.
  - Total kWh savings since project implementation of roughly 7,497,953 kWh in 18 months.



Sustained Impact

- With the project success of the Florence, Kentucky facility, Graham has strengthened its commitment to investing in more of their facilities with this technology.
- So far, Graham has implemented similar energy saving projects at five plants throughout the United States, with plans to grow the program even further.
- While this technology is not a one-size-fits-all solution for eliminating excessive energy usage, it is an example of Graham's commitment to reduce energy usage throughout all of its 60+ locations, and its work towards its long-term goal of achieving 25% energy reduction by 2028.

Graham
Packaging

Lockheed Martin – *for optimizing a facility's cogeneration system and central utility plant, saving $1.5 million in annual energy costs with a 2.2-year payback*

Michael Stein (Facilities Energy Manager)

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Lockheed Martin / Sikorsky Central Utility Plant Optimization Project

May 18, 2021

Site Project Manager – Jonathan Kuczenski, Sikorsky Aircraft Corporation, Stratford, CT

Presenter / Energy Manager – Michael Stein, Sikorsky Aircraft Corporation, Stratford, CT

GO GREEN 2030

Sikorsky Aircraft Corporation; Stratford, CT

esh

LOCKHEED MARTIN

Central Utility Plant

Cogeneration (pre-existing conditions):

- 10.265 MW maximum output capacity
- Installed in 2012
- Provides 75% of facility's annual electric load
- Waste heat used to satisfy heating loads

Central Utility Plant Optimization – Phase 1

GO GREEN 2030

10 Megawatt Gas Turbine/Generator

Exhaust Gas from Turbine

Duct Burner: 96% Efficient and Adds more heat when needed.

Heat Recovery Steam Generator (HRSG) Produces 50,000 Pounds of Steam Per Hour When CHP is at Full Capacity (Up to 80,000 Pounds of Steam Per Hour with Duct Burner at High Fire).

HPS

Plant Heating

HPS

Steam-driven Centrifugal Air Compressor

HPS

LPS

Steam Absorption Chiller, Runs Using Low Pressure Steam to Produce Chilled Water for Plant Cooling.

550 kW Steam-driven Turbine Electric Generator

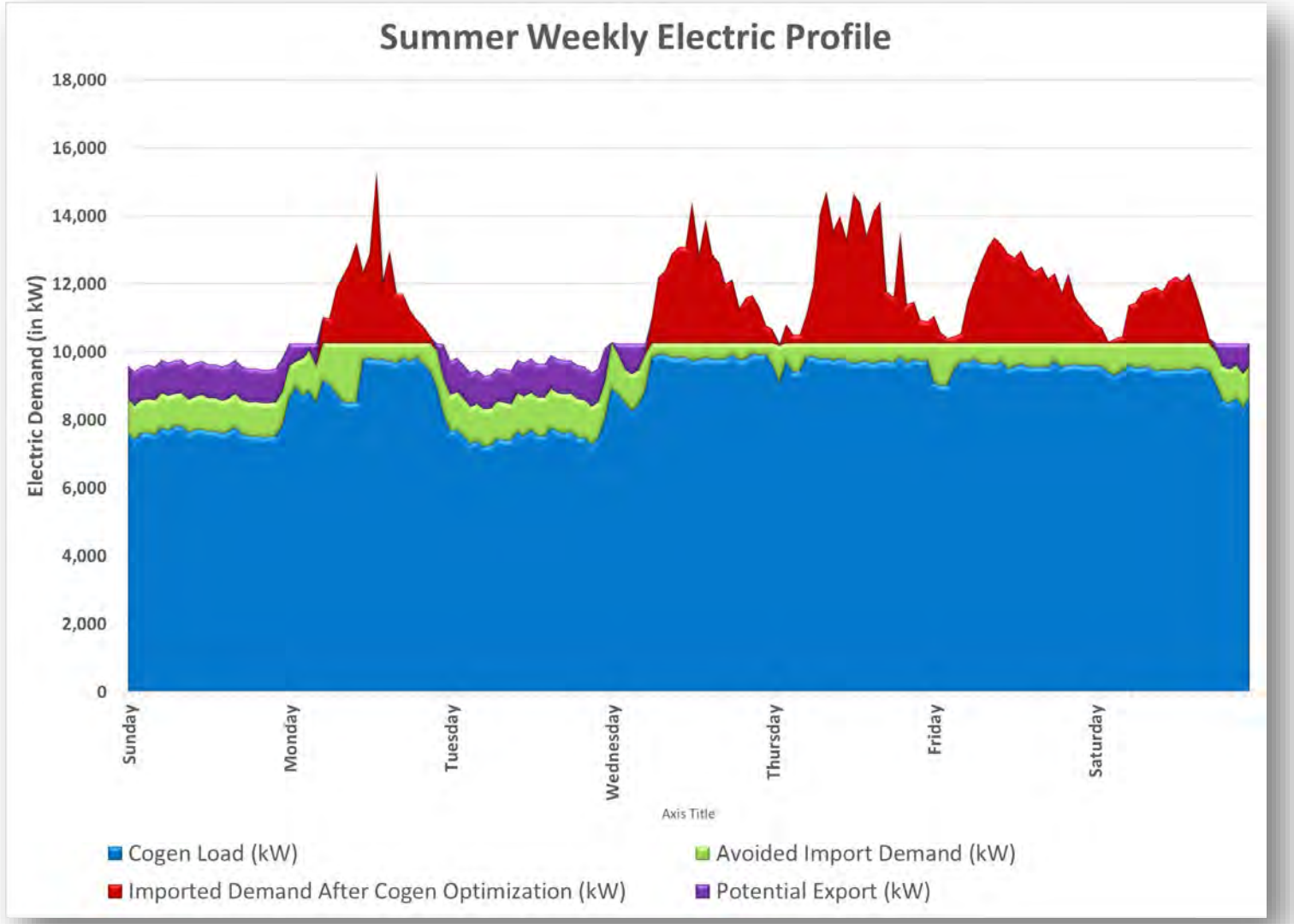
LPS

Central Utility Plant Optimization – Phase 2

Cogen Challenges :

- 600 kW minimum import requirement
- 5MW minimum output capacity on Cogen
- Demand reductions
  - Time of Day
  - Energy Conservation Measures (ECM)
  - 550 kW Steam Turbine Generator

Central Utility Plant Optimization – Phase 2



Interconnection Agreement:

- Operate new 550-kW STG
- 1 MW export limit
- Elimination of 600 kW import requirement

Savings Overview

Phase 1 – Annual Savings:

- Absorption Chiller = 635,000 kWh
- Air Compressor = 732,000 kWh
- 550-kW STG = 1,800,000 kWh

Phase 2 – Annual Savings:

- Avoided Import = 7,100,000 kWh
- Export = 3,200,000 kWh

Total Project Annual Savings

- Import Energy = 10,267,000 kWh
- Export Energy = 3,200,000 kWh
- Cost Avoidance = $1.5M

Payback = 2.2 years


LOCKHEED MARTIN

Nissan North America – *for upgrading air handling unit-controls to enable automatic maintenance of temperature and air quality, saving over $200,000 and 1,800 metric tons of CO2 per year*

Brett Rasmussen (Senior Manufacturing Engineer)

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NISSAN

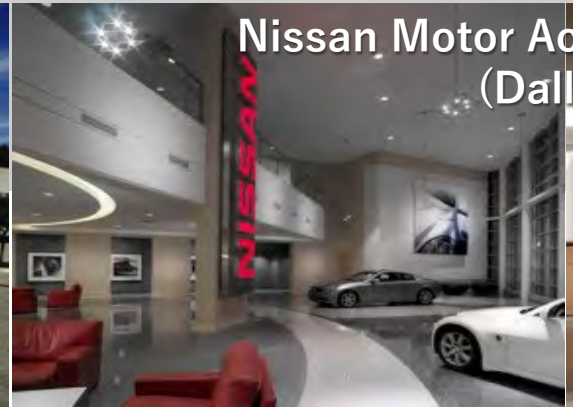
2021 Better Project Award from U.S. Department of Energy's Better Plants Program

Better Plants CHALLENGE U.S. DEPARTMENT OF ENERGY

ENERGY STAR AWARD 2021
PARTNER OF THE YEAR
Sustained Excellence

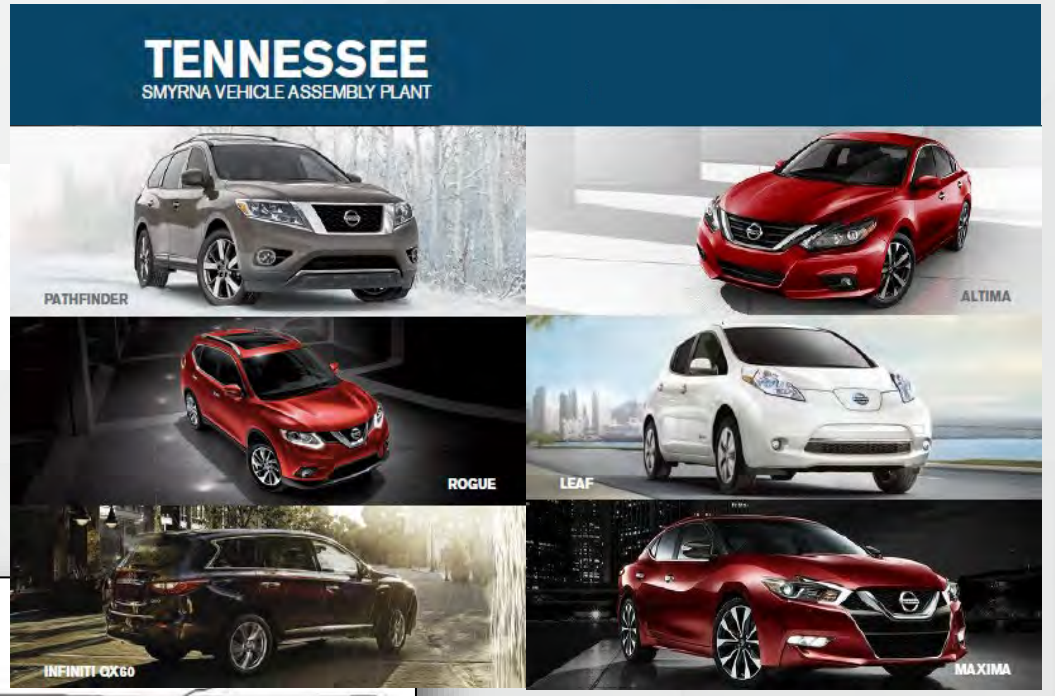
U.S. FOOTPRINT

More than **22,000** employees in the U.S.



U.S. MANUFACTURING

NISSAN GROUP OF NORTH AMERICA



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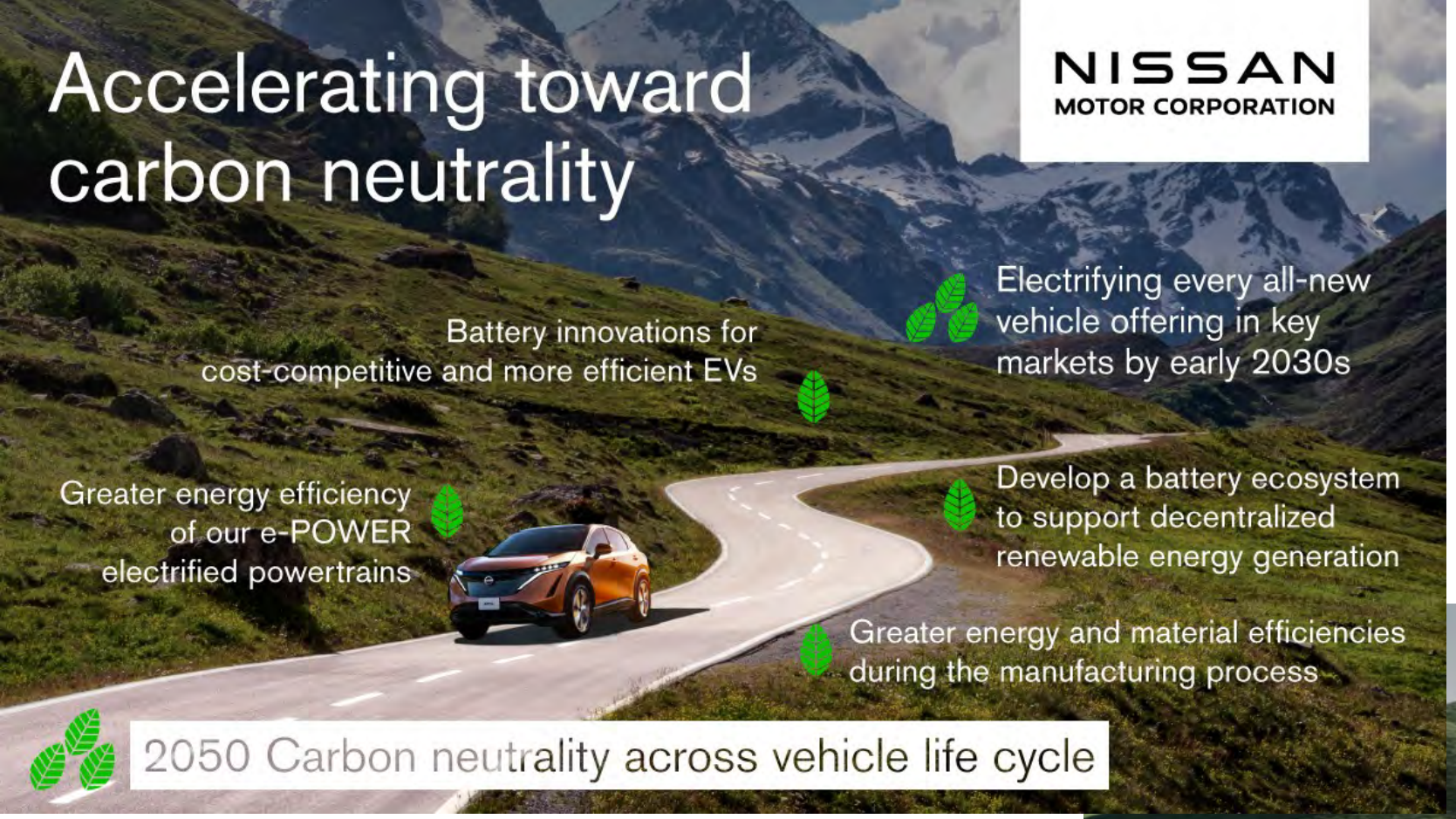
ENERGY STAR PARTNER

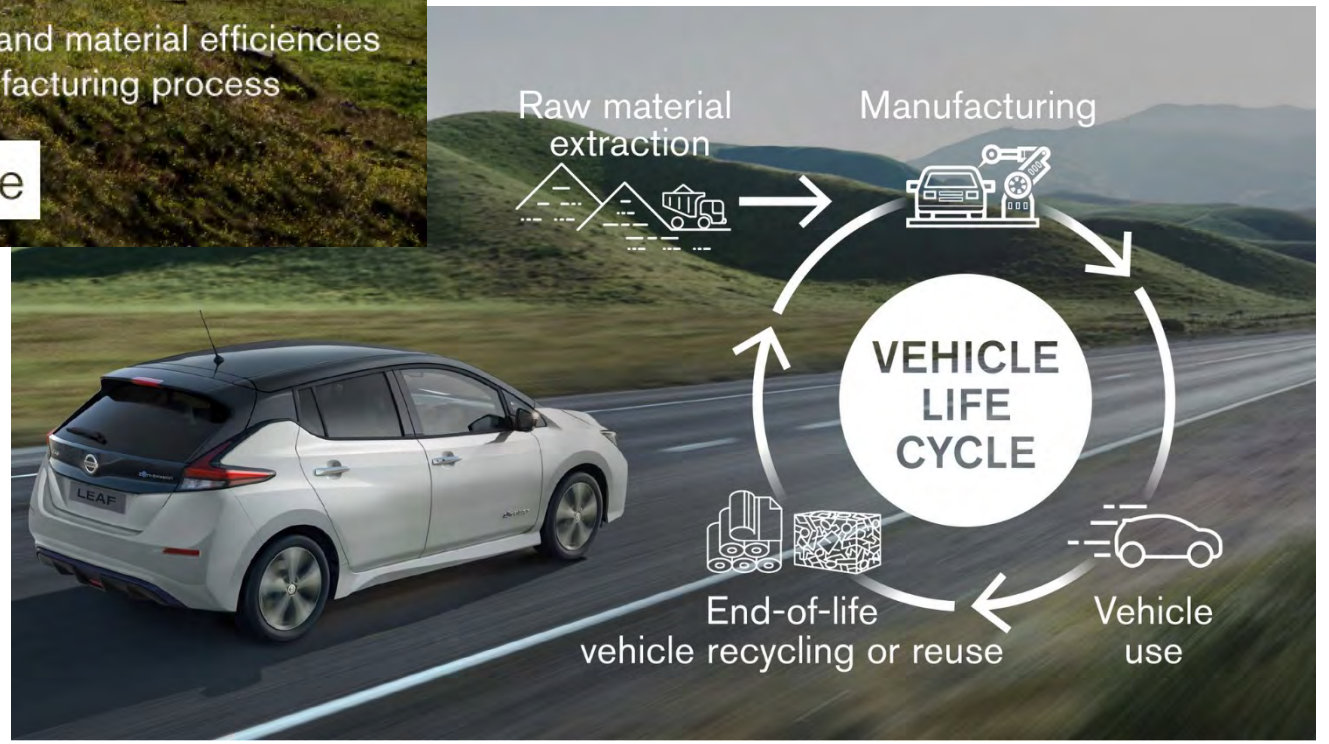


Nissan Intelligent Factory

- Bringing Craftsmanship to Robots
- Making Better Workplaces with Robots
- Building the Future of Mobility

Greener Supply

- Entergy Targets
- TVA Targets



Electrification

- Nissan Ariya
- e-Power (Electric Powertrain w/Generator)

Battery Innovations

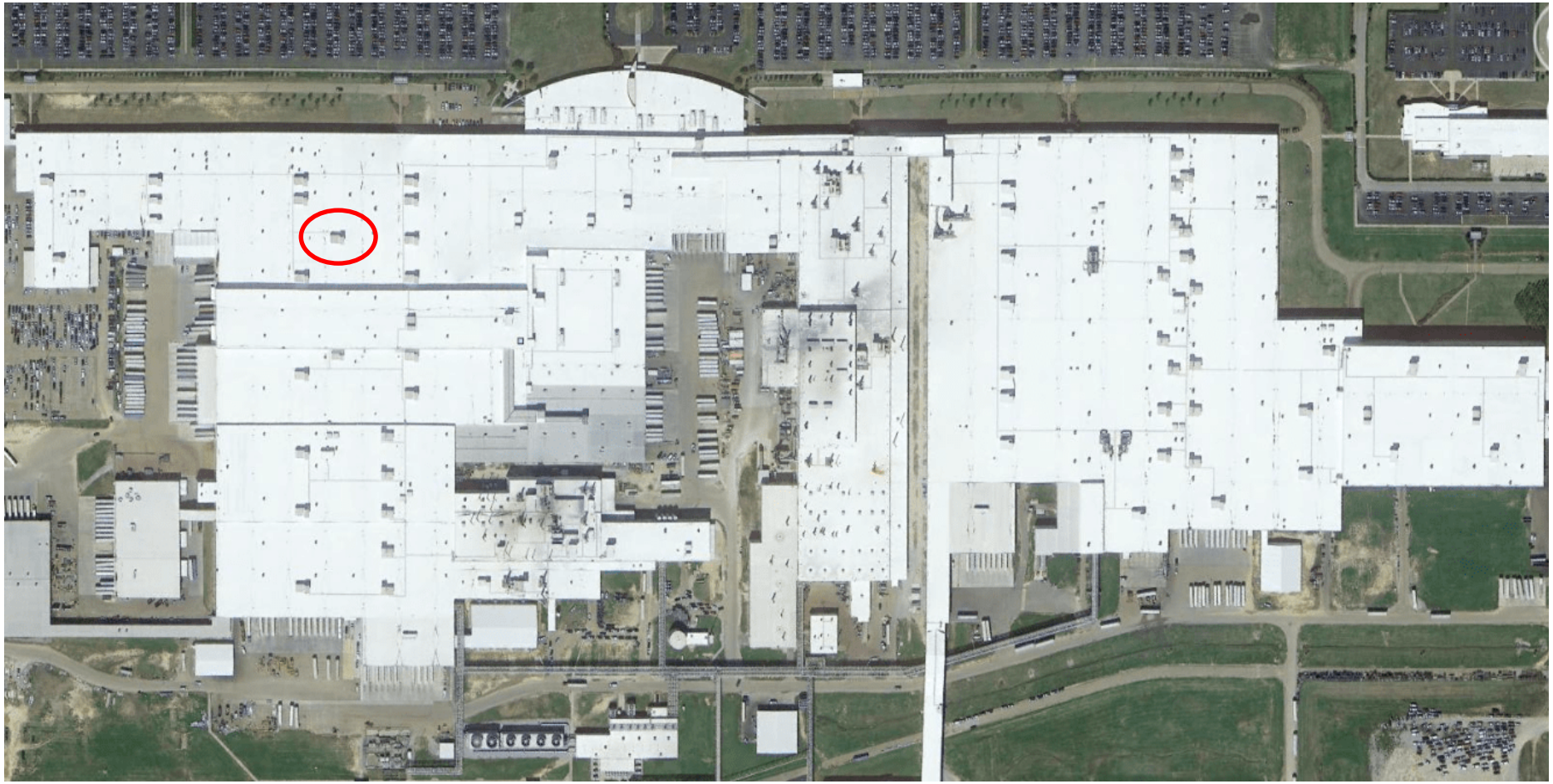
- Battery to Grid (Vehicle to X)
- Battery Re-Use
- Solid State Batteries

Nissan Canton Plant
AHU Control Upgrade

NISSAN MC-AMERICAS

Blue Citizenship

Canton Plant



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Typical AHU

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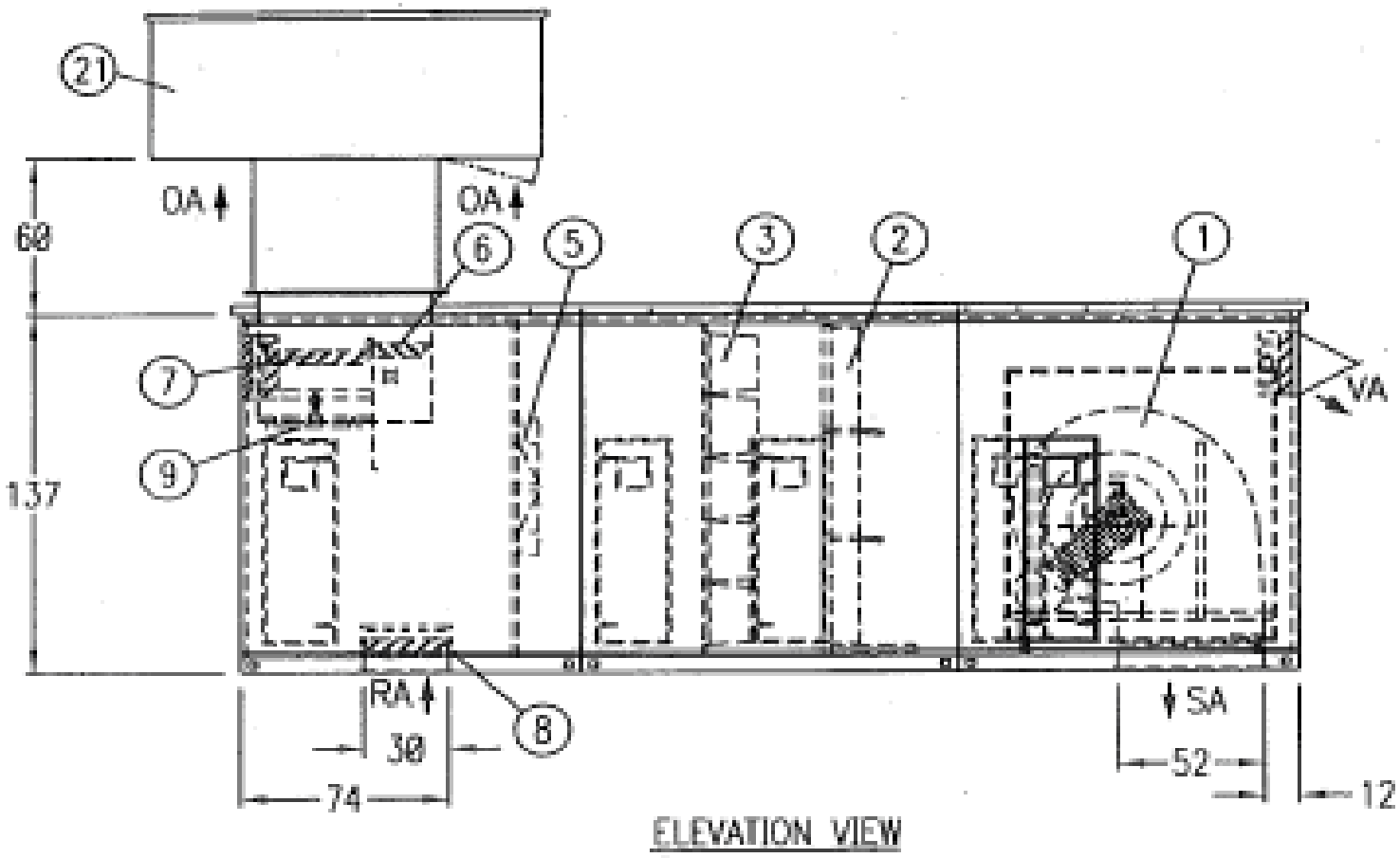
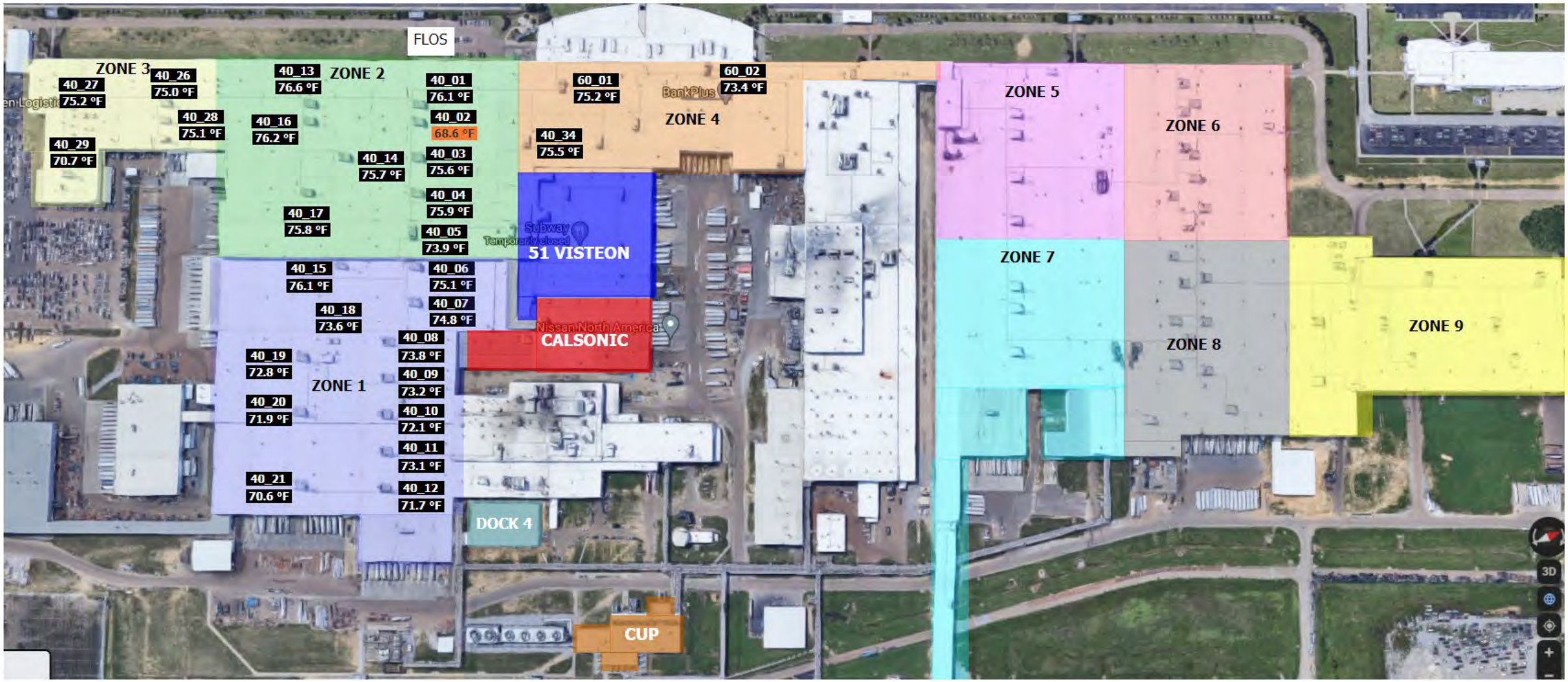
All Units have VFDs on the Fan Motors



ELEVATION VIEW

Canton Plant Temp Overview

Home



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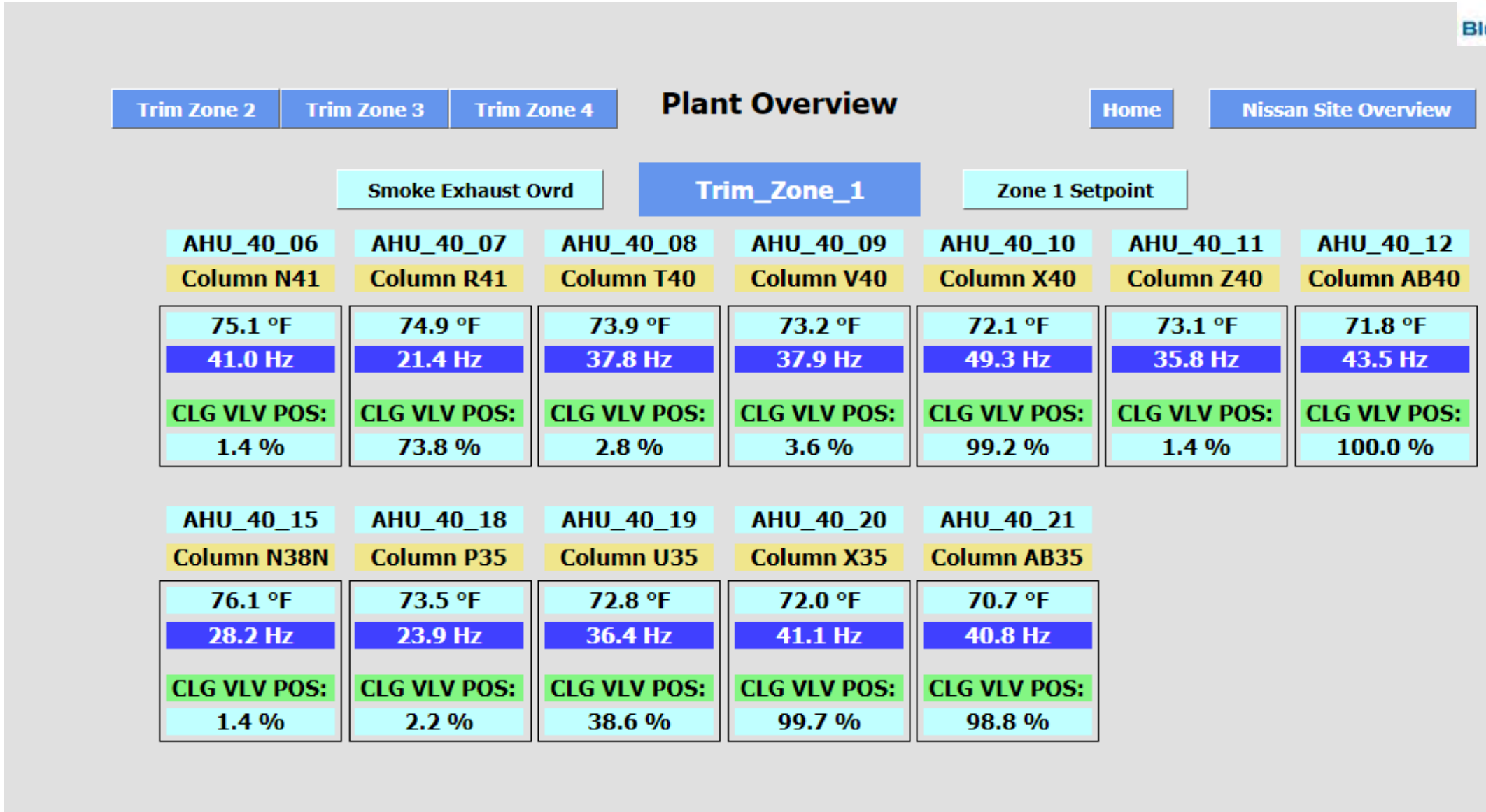
Trim Zone 2
Trim Zone 3
Trim Zone 4
Plant Overview
Home
Nissan Site Overview
Smoke Exhaust Ovrd
Trim_Zone_1
Zone 1 Setpoint
AHU_40_06
Column N41
75.1 °F
41.0 Hz
CLG VLV POS:
1.4 %
AHU_40_07
Column R41
74.9 °F
21.4 Hz
CLG VLV POS:
73.8 %
AHU_40_08
Column T40
73.9 °F
37.8 Hz
CLG VLV POS:
2.8 %
AHU_40_09
Column V40
73.2 °F
37.9 Hz
CLG VLV POS:
3.6 %
AHU_40_10
Column X40
72.1 °F
49.3 Hz
CLG VLV POS:
99.2 %
AHU_40_11
Column Z40
73.1 °F
35.8 Hz
CLG VLV POS:
1.4 %
AHU_40_12
Column AB40
71.8 °F
43.5 Hz
CLG VLV POS:
100.0 %
AHU_40_15
Column N38N
76.1 °F
28.2 Hz
CLG VLV POS:
1.4 %
AHU_40_18
Column P35
73.5 °F
23.9 Hz
CLG VLV POS:
2.2 %
AHU_40_19
Column U35
72.8 °F
36.4 Hz
CLG VLV POS:
38.6 %
AHU_40_20
Column X35
72.0 °F
41.1 Hz
CLG VLV POS:
99.7 %
AHU_40_21
Column AB35
70.7 °F
40.8 Hz
CLG VLV POS:
98.8 %

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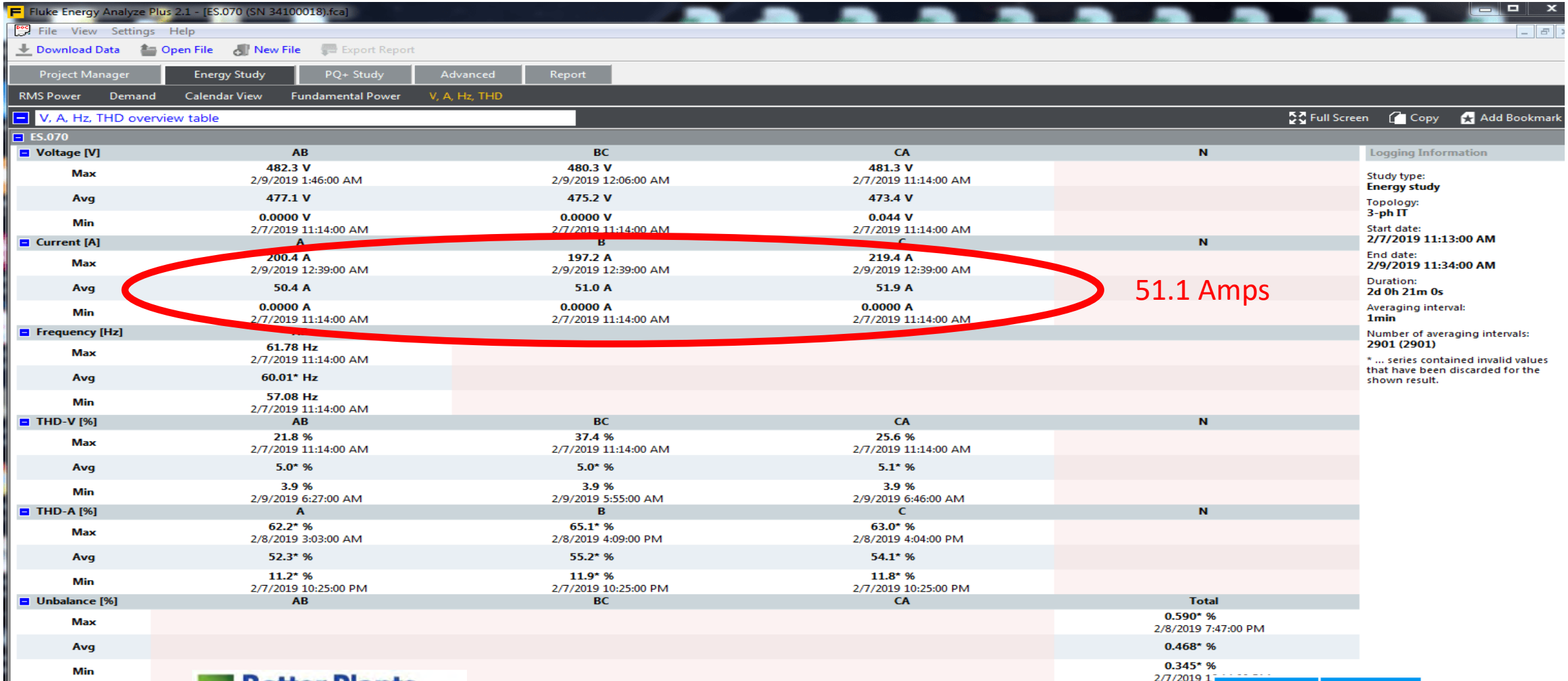
Unit without Controls



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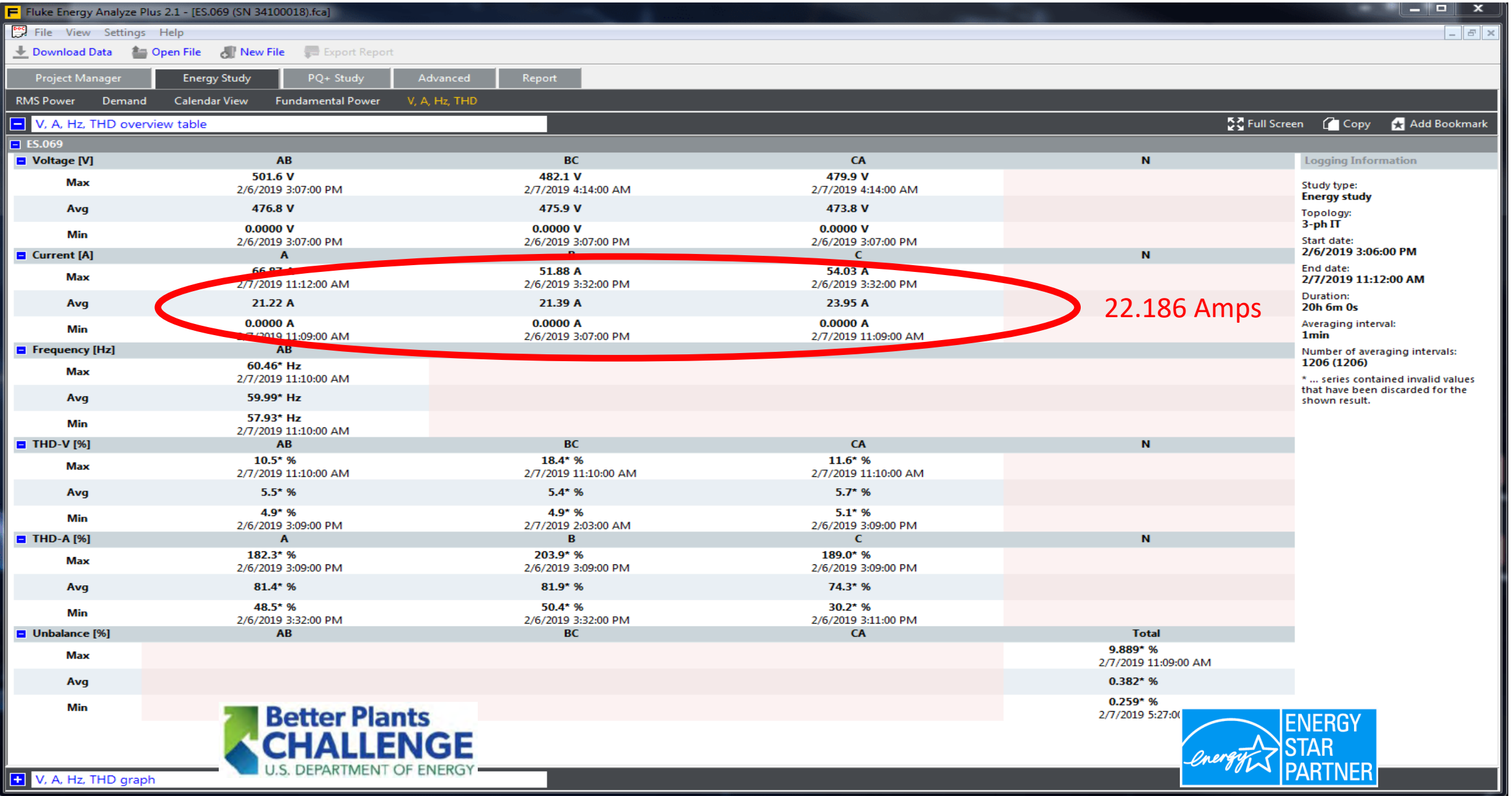
AHU Controls



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ENERGY STAR PARTNER

Trim Shop Power Usage

Better Plants CHALLENGE U.S. DEPARTMENT OF ENERGY

ENERGY STAR PARTNER

Thank you


Better Plants
CHALLENGE
U.S. DEPARTMENT OF ENERGY


energy
ENERGY STAR
AWARD 2021
PARTNER OF THE YEAR
Sustained Excellence

Owens Corning – *for implementing an advanced HVAC control system at two facilities that optimizes the use of outside air and adjusts equipment sequences and setpoints, saving a combined $350,000 per year*

Don Scarsella (Energy Program Manager)

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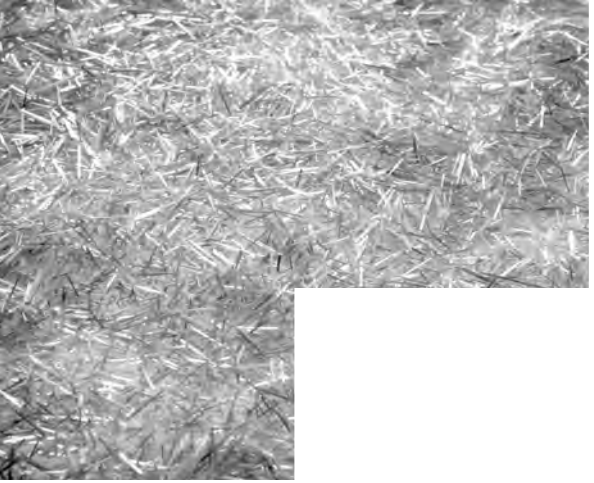
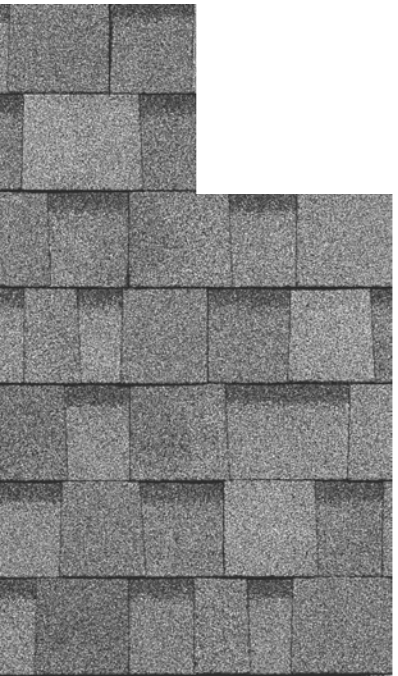




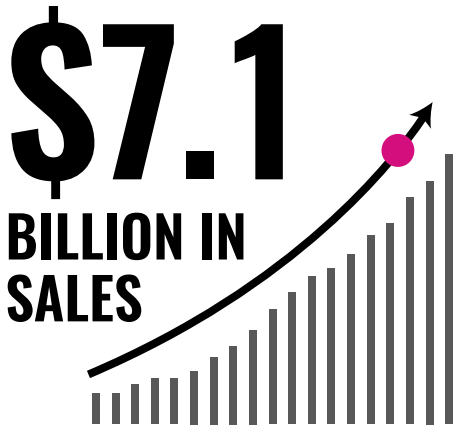
Adaptive Chilled Water Control System

Owens Corning

Don Scarsella

May 18, 2021

OWENS CORNING AT A GLANCE



2020 REVENUE

19,000

EMPLOYEES

COUNTRIES WHERE WE OPERATE

CONSECUTIVE YEARS AS A FORTUNE® 500 COMPANY

Serving residential, commercial, and industrial markets

INSULATION | ROOFING | COMPOSITES

OWENS CORNING INNOVATION IS ALL AROUND US

How We Move

Where We Live

What We Do

How We Power Our Lives

And More!

WHAT SUSTAINABILITY MEANS TO US

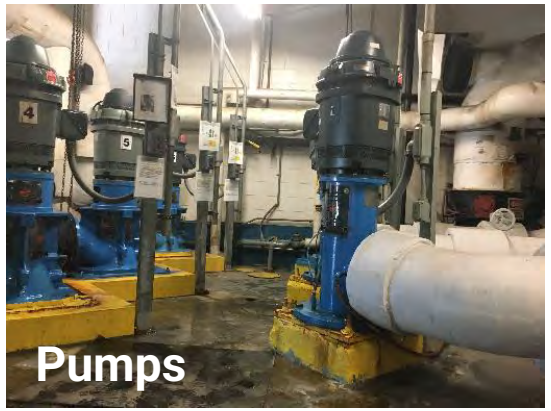
NET-POSITIVE COMPANY ASPIRATION

"Meeting the needs of the present while leaving the world a better place for the future."

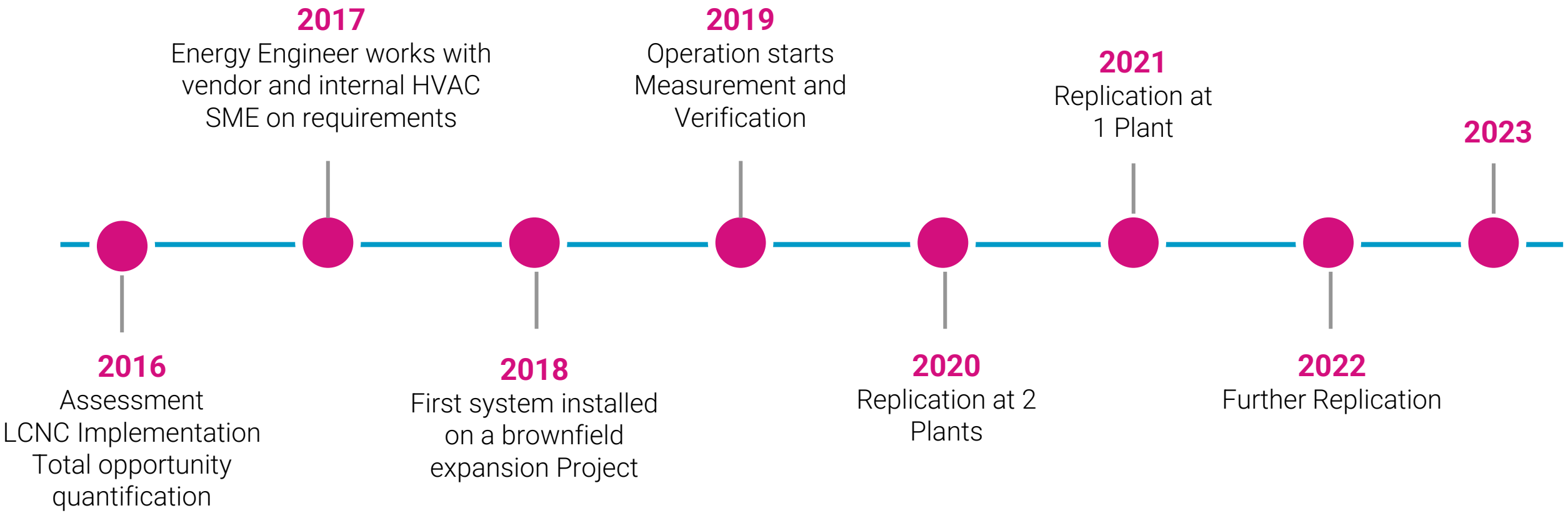
DEMAND SIDE ENERGY MANAGEMENT AT OWENS CORNING

- Plant Energy Teams
- Assessments and Kaizens (Treasure Hunts)
- Dedicated Energy Project Fund
- Low Cost / No Cost Implementations
- Best Practice Sharing
- Reporting, Metrics, Scorecards, Software Tools
- Working across the organization to achieve goals
- Replication
- Benchmarking
- Communications
- Taking advantage of the Better Plants Program!

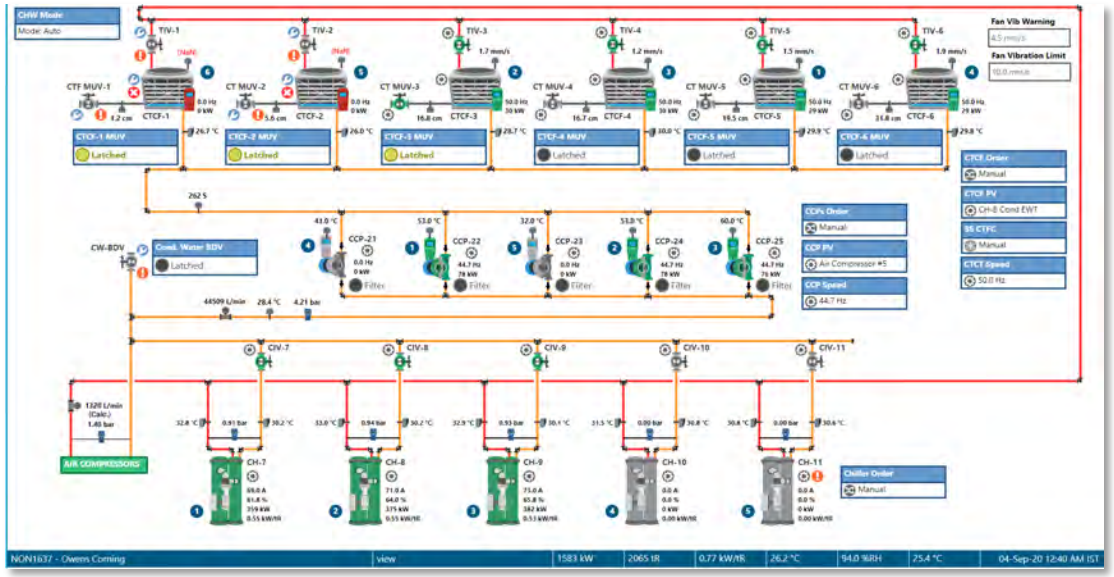
CHILLED WATER SYSTEM COMPONENTS

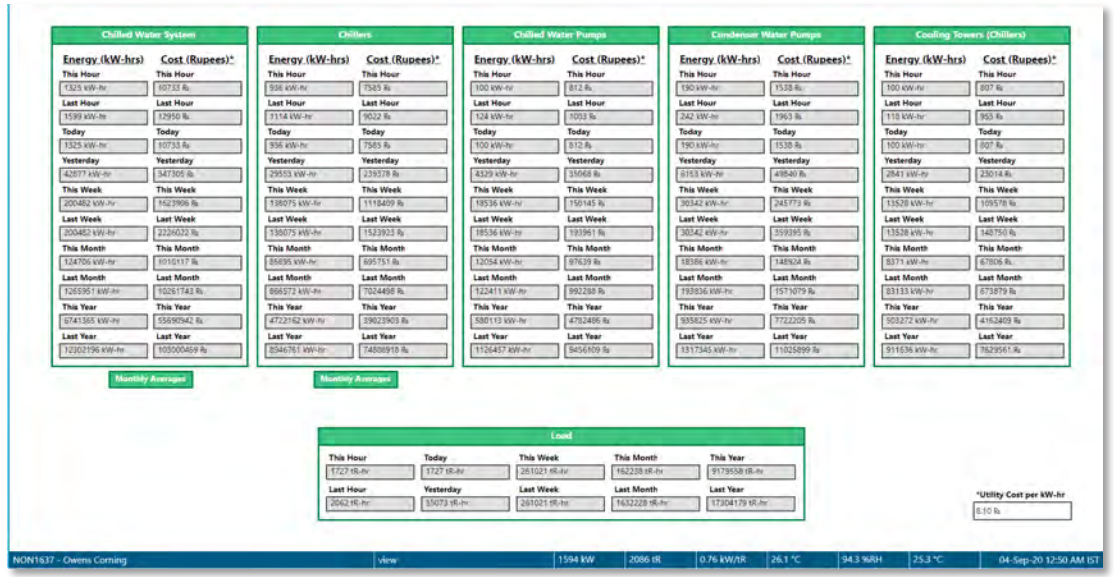


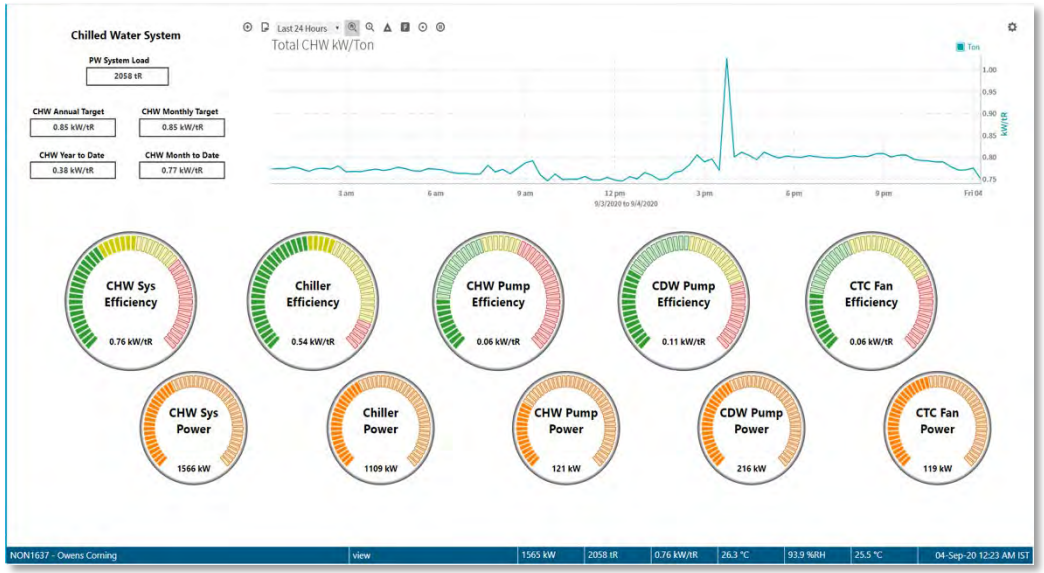
Project Timeline

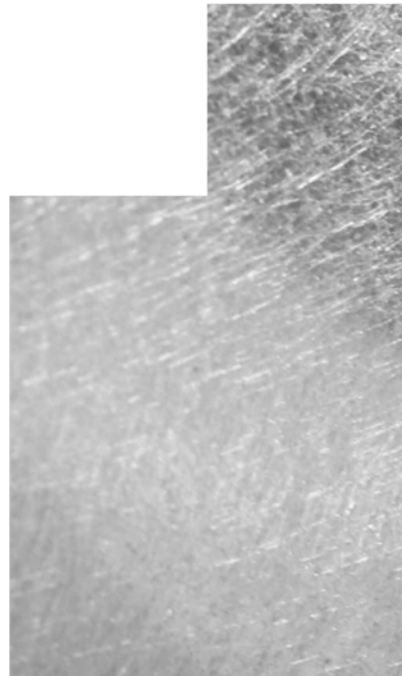


Operator Interface









SugarCreek Packing Co. – *for utilizing a sonic imaging tool to improve leak detection surveys in a plant's compressed air system, leading to energy cost and non-energy benefits totaling $60,000 per year*

Todd Jackson (Maintenance Administrator)

Submit Questions
www.slido.com event code **#DOE**, Best of the Betters: Better Project Presentations

U.S. DEPARTMENT OF ENERGY

Better Plants®
U.S. DEPARTMENT OF ENERGY

SugarCreek™
Brandworthy Food Solutions™
Since 1966

Leak Detection Utilizing Fluke ii900 Ultrasonic Imager

Leak Detection

Leaks can be a significant source of wasted Energy-

- Leak detection is most often done utilizing devices with directional microphones, amplifiers, and audio filters, which utilize either earphones or visual indicators to help detect the leak.
- These devices typically need to be used during a period of no or low production to provide the best results
- An inefficient leak detection program can result in up to a 30% reduction in the efficiency of a compressed air system.

Costs Money and Time

- Compressed air systems at the Washington Court House facility accounts for roughly 15% of the energy use for the building.
- Typically, personnel would manually survey the 120,000 sq ft and would hire external contractors to make trips to the facility upwards of 20 times per year to fix leaks in multiple systems.

Through the Better Plants Program Enabled We:

- Request the Ultrasonic imager via our Technical Accounts Manager
- Received the Ultrasonic imager within a few weeks with no shipping costs
- Was able to utilize the device for 2 weeks.

Success!

- In two weeks, time, not only were we able to check the compressed air system for leaks. We also were able to find leaks in remote areas and difficult overhead locations, along the ceiling in fire suppression systems as well as in our Nitrogen system.

Outcomes

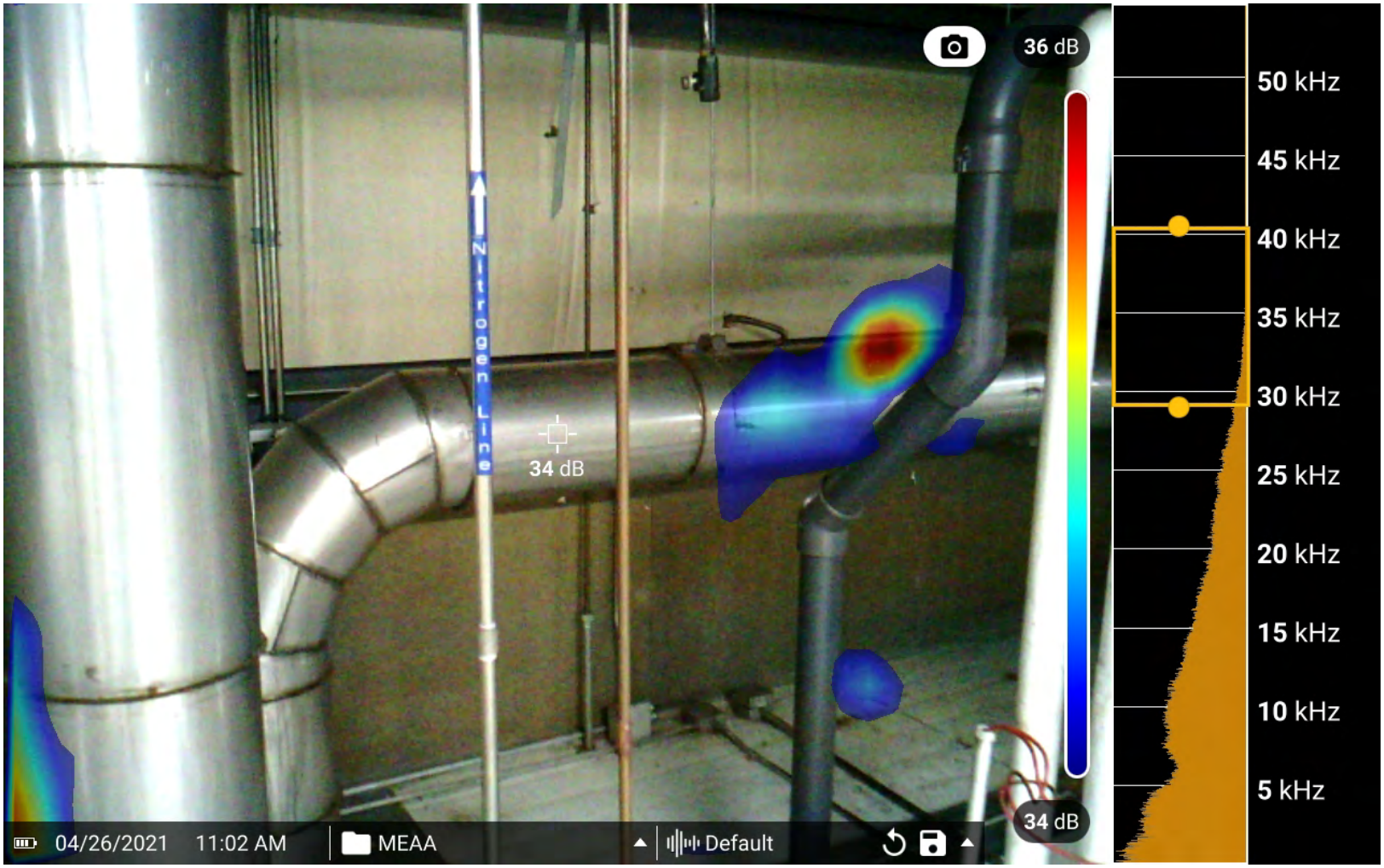
Saved Money and Time:

Instead of taking upwards of 150 hours to locate a minimal number of leaks. The sonic imager enabled personnel to walk the entire production area – roughly 55,000 sq ft. in 20 hours while production was running!

About 30 leaks were located during this audit including some that would have previously gone undetected due to the size and location of the leak.

SugarCreek

High Temperature Area



SugarCreek

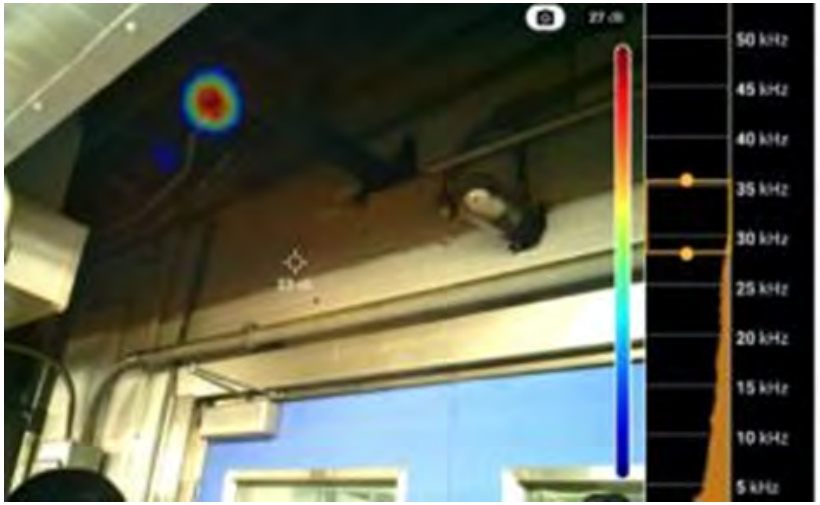
Brandworthy Food Solutions

Cost Savings

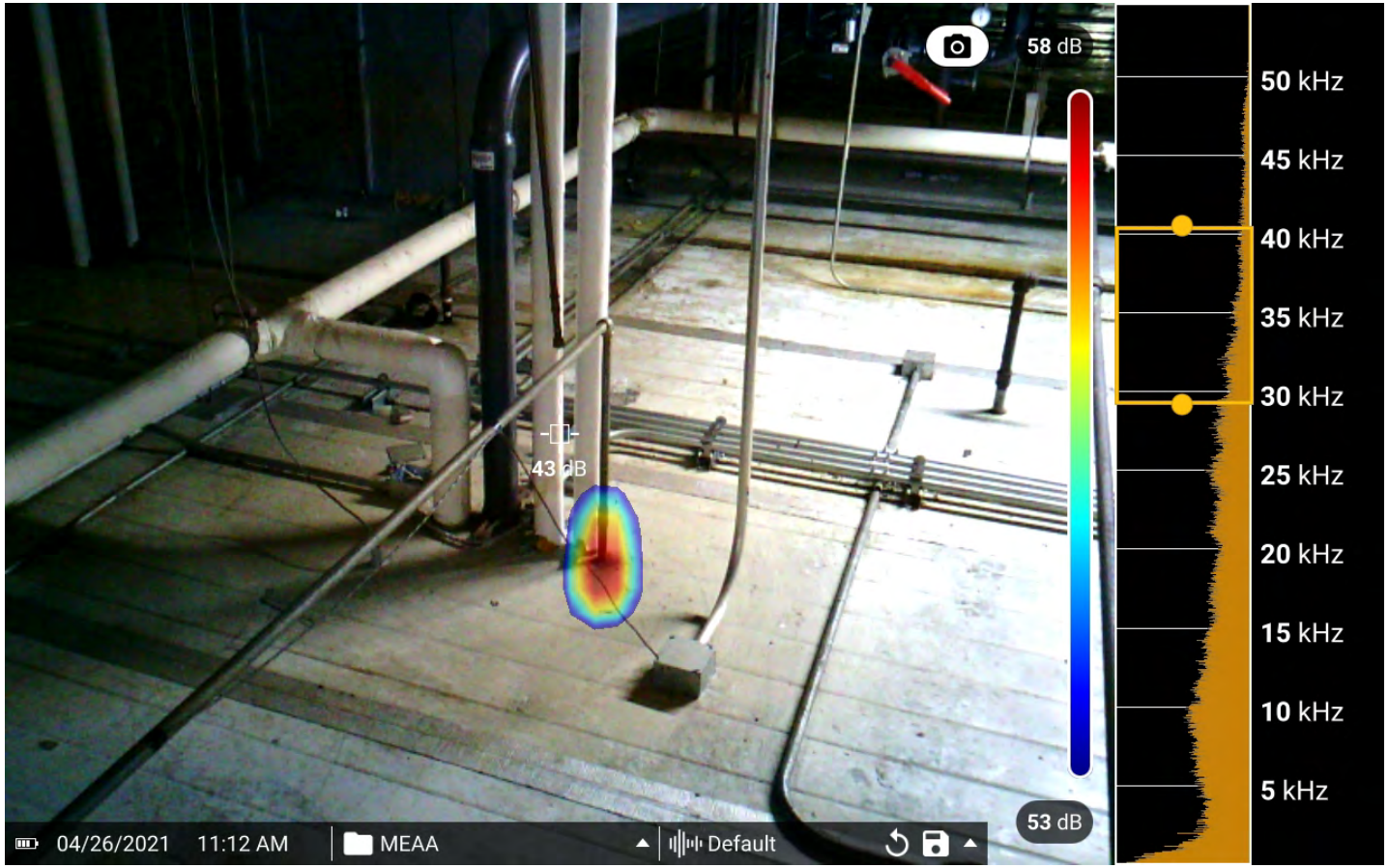
- Reduce contractor visits
- Reduce maintenance costs
- Reduce labor costs
- Reduce energy loss

The ability to survey pipes located in elevated locations without the use ladders or scaffolding reduced risk to personnel and reduced time to perform leak checks

Overhead Leaks Detected



Out Of Reach Areas

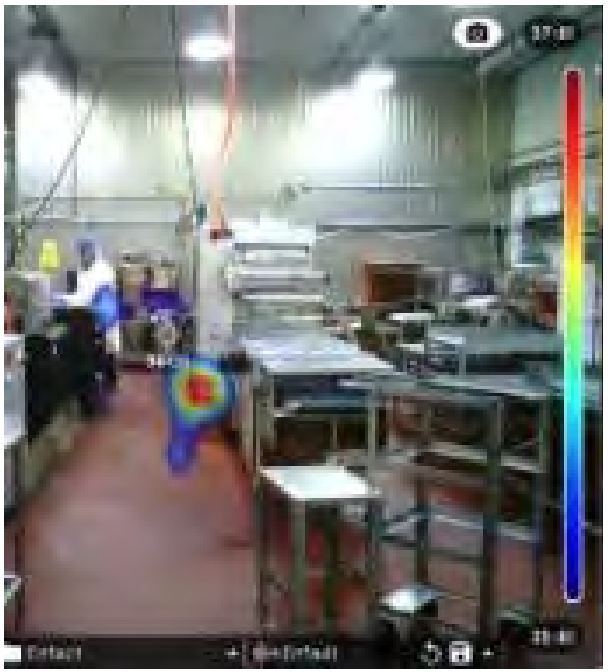


SugarCreek

Brandworthy Food Solutions

Sustained Impact

The newer technology improved the efficiency of leak detection program, streamlined compressor operations, and expanded leak surveillance to include other plant systems (steam, vacuum, and nitrogen).



The use of the Ultra Sonic imager has allowed for:

- More frequent leak checks,
- Leak identification by frequency and location,
- Identifying high occurrence areas, leading to-possible changes in equipment,
- Improved maintenance practices and specifications.

THANK YOU

SugarCreek™

Brandworthy Food Solutions™

Since 1966

SugarCreek.com

Tyson Foods – *for leveraging Virtual In-Plant Trainings on industrial refrigeration systems to help identify annual energy savings opportunities of more than $4 million*

Alex Floyd (Senior Manager, Sustainability)

Submit Questions
www.slido.com event code **#DOE**, Best of the Betters: Better Project Presentations

Utilizing Virtual In-Plant Training During the Pandemic

- Industrial Refrigeration

U.S. Department of Energy's Better Buildings, Better Plants Summit

May 18, 2021

THE PROTEIN COMPANY™


“Continuous learning is nothing without continuous doing.”
Richie Norton

How do we drive success during a pandemic?

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N38

Tyson Foods

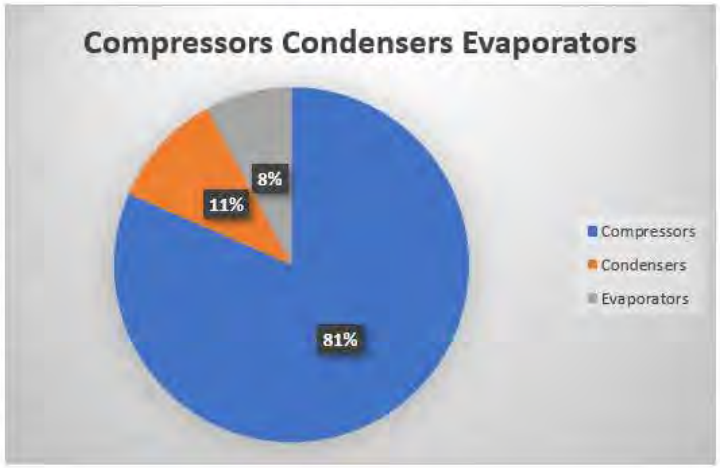
AMMONIA REFRIGERATION SYSTEM ENERGY EFFICIENCY TOOL, Version 1.6

AMMONIA REFRIGERATION SYSTEM BASIC DATA

Plant		
Business Unit		
Division		
City		
Annual kWh	19,459,666	kWh
Annual Electricity Cost	$1,344,037.05	
Avg Electric Rate	0.0691	$/kWh

Refrigeration System	Energy Consumption	Energy Cost	% of Total Electricity
Compressors	8,129,596	$561,493.63	41.8%
Condensers	1,052,817	$72,715.81	5.4%
Evaporators	788,628	$54,468.80	4.1%
			51%

Measure	Energy Savings	Energy Cost Savings	% of Total Electricity
Reduce Discharge Pressure	60,940	$4,209.02	0.3%
Increase Suction Pressure	1,523,033	$105,192.63	7.8%
Compressor Sequencing	585,744	$40,456.05	3.0%
Superheat	-	-	-
Non-Condensables	*Add to Discharge Pressure Reduction		
Optimize Defrost			
Total Refrigeration Energy Savings Opportunity		**2,169,718**	**$149,857.70**



Summary | Compressors | Condensers | Evaporators | Discharge Pressure | Increase Suction Temp | Compressor Sequencing | Superheat | Non-Condensab ...

Compressors

Season	# Months per Year	System	Discharge Pressure (psig)
Summer		High Stage	
Fall		High Stage	
Winter		High Stage	
Spring		High Stage	

Additional Notes (if needed)

Stage	Compressor Name	Compressor Type	Oil Cooling	Compressor Control	Control Panel	VI	System Type	Suction Pressure Setpoint	Actual Suction Pressure	Actual Suction Temp	Calculated Suction Temp (°F)	Nameplate HP	Motor Efficiency	Avg Slide Valve %	kW	% Run Time	Annual Run Hours	Annual kWh

Condensers

										Description Below				
Condenser Name	System #	Nominal Capacity (MBH)	Total Fan Power (HP)	Motor Efficiency	kW	Total Pump Power (HP)	Motor Efficiency	kW	Fan Part Load Control	Average Fan % Duty or Fan Speed (%)	Online Condenser Operation (%)	Annual Pump Duty (%)	Annual kWh	

Evaporators

Pump Name	Pump Power (HP)	Avg Pump Efficiency (%)	Annual Pump Duty (%)	kW	Annual kWh

0

Zone Name	What Type of Load?	Meeting Temperature?	How Are the Fans or Processing Equipment Controlled?	Annual Zone Duty (%)	Refrigeration Load (TR)	Design Temp Difference (TD) (°F)	Room Temp Setpoint (°F)	Suction or Fluid Temp (°F)	Total Power (HP)	Avg Motor Efficiency (%)	Annual kWh

How often is it on?

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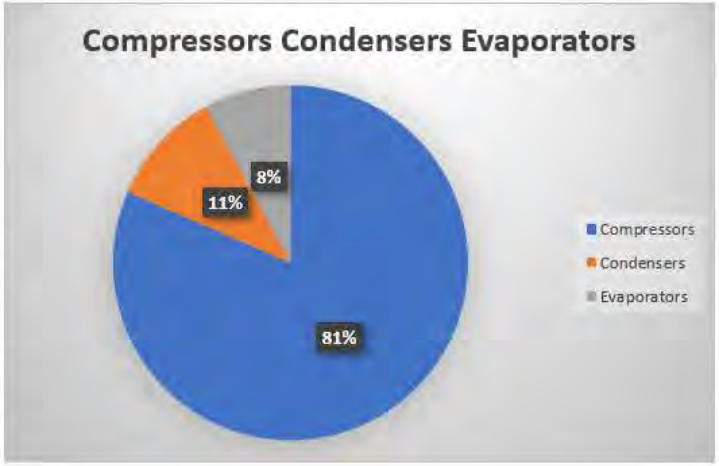

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Summary | Compressors | Condensers | Evaporators | Discharge Pressure | Increase Suction Temp | Compressor Sequencing | Superheat | Non-Condensab ...

Reducing Discharge Pressure

What Drives Discharge Pressure Setpoint?

- Condenser Capacity / Heat Rejection (Ex: Higher in the summer because of high outdoor wetbulb temps)
- Liquid Injection Oil Cooling Requirements
- DX Valve Requirements
- Defrost Pressure Requirements
- Can Cause Oil Carry Over in Compressors at Lower Head Pressures

Energy Efficiency Rules of Thumb

* Reducing Discharge Temp Increases Compressor Efficiency 1.5% per 1°F Increase

	Season	# Months per Year	System	Total kWh	Current Discharge Pressure	Proposed Discharge Pressure	Annual kWh Savings
Engine Room A,B,C	Summer		High Stage				
	Fall		High Stage				
	Winter		High Stage				
	Spring		High Stage				

What limits your plant's ability to lower discharge pressure?

Increase Suction Temp

Energy Efficiency Rules of Thumb

* Increasing Suction Pressure Increases Compressor Efficiency 2% per 1°F Increase

Notes:

Compressor	Suction Pressure	Suction Temp (°F)	Proposed Suction Temp (°F)	% Of The Time That The Setpoint Can Change	Annual kWh Savings

Compressor Sequencing

Screw compressors operate most efficient at 90-100% fully loaded. They perform very inefficient at part load, so we should minimize multiple compressors operating at part load for extended periods of time. Look through the compressor log and identify opportunities to turn off compressors. Log which compressors could be turned off and the hours per week that each can be turned off.

Notes:

Compressor	Compressor Type	Hrs per week that compressor can be turned off	Average Slide Valve %	kW	Hrs per week that compressor will be turned on	Average Slide Valve %	kW	Annual kWh Savings

Superheat

Common Causes of Excess Superheat:
- Poor Insulation
- Hot Gas Valves Bleeding By
- Improper Liquid Feeding
- Improper Suction Regulator Settings

(IRC EEG Data) - Energy Efficiency Rules of Thumb
* Overfeed & Flooded Systems: Compressor Capacity Decreases 0.25% per 1°F Superheat Increase
* DX Systems: Refrigeration Net Capacity Decreases 0.13% per 1°F Superheat Increase

Compressor	Annual kWh	System Type	Actual Suction Pressure	Actual Suction Temp	Calculated Suction Temp (°F)	Superheat (deg F)	kWh Savings if reduced to 5F (overfeed) or 15F (DX)

Non-Condensables

Non-condensable gasses reduce the overall efficiency of refrigeration systems.
- Increases electrical power demand
- Decreases Refrigeration system capacity
- Increased pressure leads to increased temperature, which shortens the life of compressor valves and promotes the breakdown of lubricating oil.

Condenser	Coil	Drain Temp	Calculated Drain Pressure	Discharge Pressure	Non-Condensables
	A				
	B				
	A				
	B				
	A				
	B				
	A				
	B				
	A				
	B				
	A				
	B				
	A				
	B				
	A				
	B				
	A				
	B				
	A				
	B				
	A				
	B				
	A				
	B				
	A				

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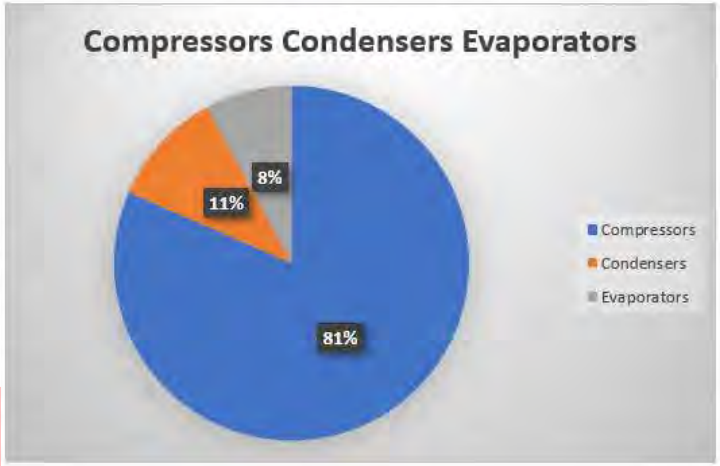


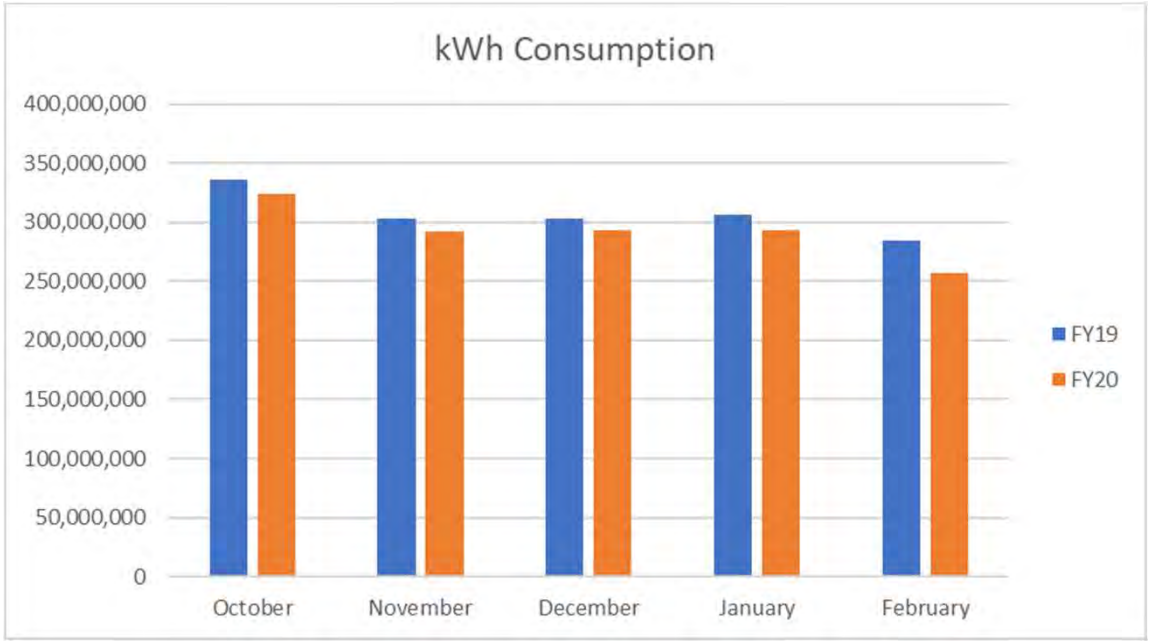
Summary | Compressors | Condensers | Evaporators | Discharge Pressure | Increase Suction Temp | Compressor Sequencing | Superheat | Non-Condensab ...

Performance Tracking

	Total Electric Spend	kWh	Calculated Refrigeration Energy Cost	% of Total	Total Reduction Opportunity	% of Total	Progress - thru Feb (% Savings)	Progress - thru Feb (kWh Savings)	Progress - thru Feb ($ Savings)
TYSON				26.8%		2.9%	3.2%		
				2.8%		0.6%	0.7%		
				8.7%		4.1%			
						-	0.7%		
				54.8%		1.1%	7.4%		
				61.6%		1.6%	7.0%		
						-	4.0%		
				60.3%		11.0%	10.3%		
				37.2%		0.6%	6.2%		
				59.1%		1.3%	7.6%		
						-	0.0%		
				43.1%		9.0%	9.8%		
				63.3%		0.3%	2.2%		
						-	5.4%		
				61.9%		4.6%	1.1%		
				62.5%		6.1%	-8.8%		
				54.0%		4.8%	6.7%		
				51.6%		9.9%	-6.3%		
				47.3%		1.7%	0.4%		
						-	8.8%		
				59.2%		1.3%	7.6%		
						-	-8.5%		
						-	-14.9%		
				37.3%		1.9%	2.9%		

These are total energy savings from the project and due to inability to isolate data, we cannot confirm 100% of the savings comes from refrigeration systems.

Results from Oct 2020 to Feb 2021



Energy Savings in first 5 months: 73,267,160 kWh (4.8%)

* Texas plants did not contain February billing.

** New plants, acquisition plants, and expansion plants not reflected in this data.

These are total energy savings from the project and due to inability to isolate data, we cannot confirm 100% of the savings comes from refrigeration systems.

Questions / Comments

To submit questions, please go to

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Q & A

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U.S. DEPARTMENT OF ENERGY

Better Buildings: Summer Webinar Series

ELECTRIFYING OUR BUILDINGS: CHALLENGES AND SOLUTIONS

June 8

BECOMING ESPC-READY

June 15

BOOSTING INDUSTRIAL AND MANUFACTURING EFFICIENCY AND RESILIENCY WITH CHP

June 17

FINANCING IN HIGHER EDUCATION

June 22

WHAT'S HOT WITH HEAT PUMPS

June 29

HOW TO IDENTIFY CHP PROJECTS THAT FIT YOUR GOALS

July 1

KICK THE TIRES: UNDERSTANDING THE ROLE OF R&D IN THE DEPLOYMENT OF BUILDING ENERGY TECHNOLOGIES

July 6

ESPC IN THE EXPRESS LANE: NEW PROJECT TRACKING TOOLS

July 13

WORKPLACE EVOLUTION: SUPPORTING OCCUPANT HEALTH WHILE ACHIEVING ENERGY EFFICIENCY

July 20

ENERGY-SAVING ENVELOPE SUCCESS STORIES

July 27

WASTE REDUCTION: LESSONS LEARNED AND WHAT COMES NEXT

August 3

VISUALIZE YOUR ENERGY FUTURE WITH 'SLOPE': THE STATE AND LOCAL PLANNING FOR ENERGY PLATFORM

August 10

Additional Questions?

Please Contact Us

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