
Better Buildings®
SUMMIT

AUGUST 21-23, 2018 • CLEVELAND, OHIO

# Shooting for the Moon: Planning and Execution Towards a Big Energy Goal such as 25%

# Shooting for the Moon: Reaching Big Goals at IPG

Presented by
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2018 Energy Exchange
Cleveland, OH
August 23, 2018

Better Plants CHALLENGE
U.S. DEPARTMENT OF ENERGY

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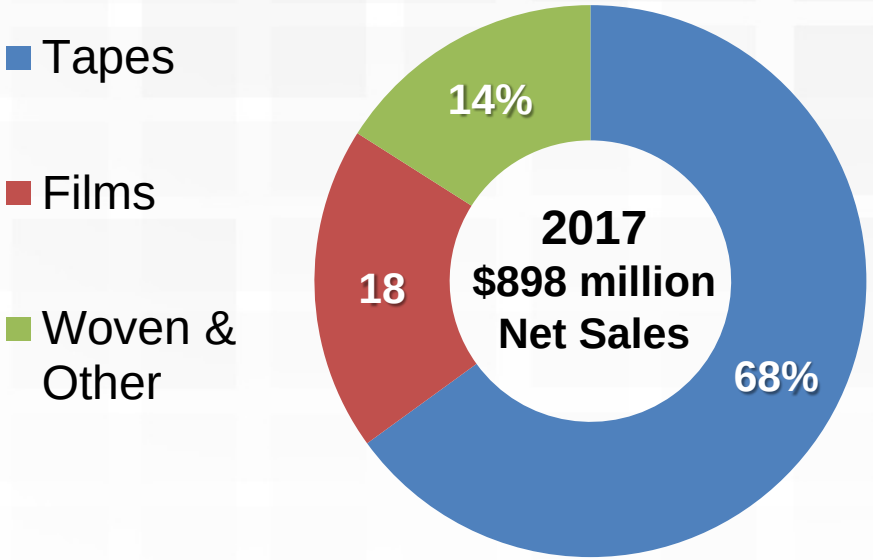
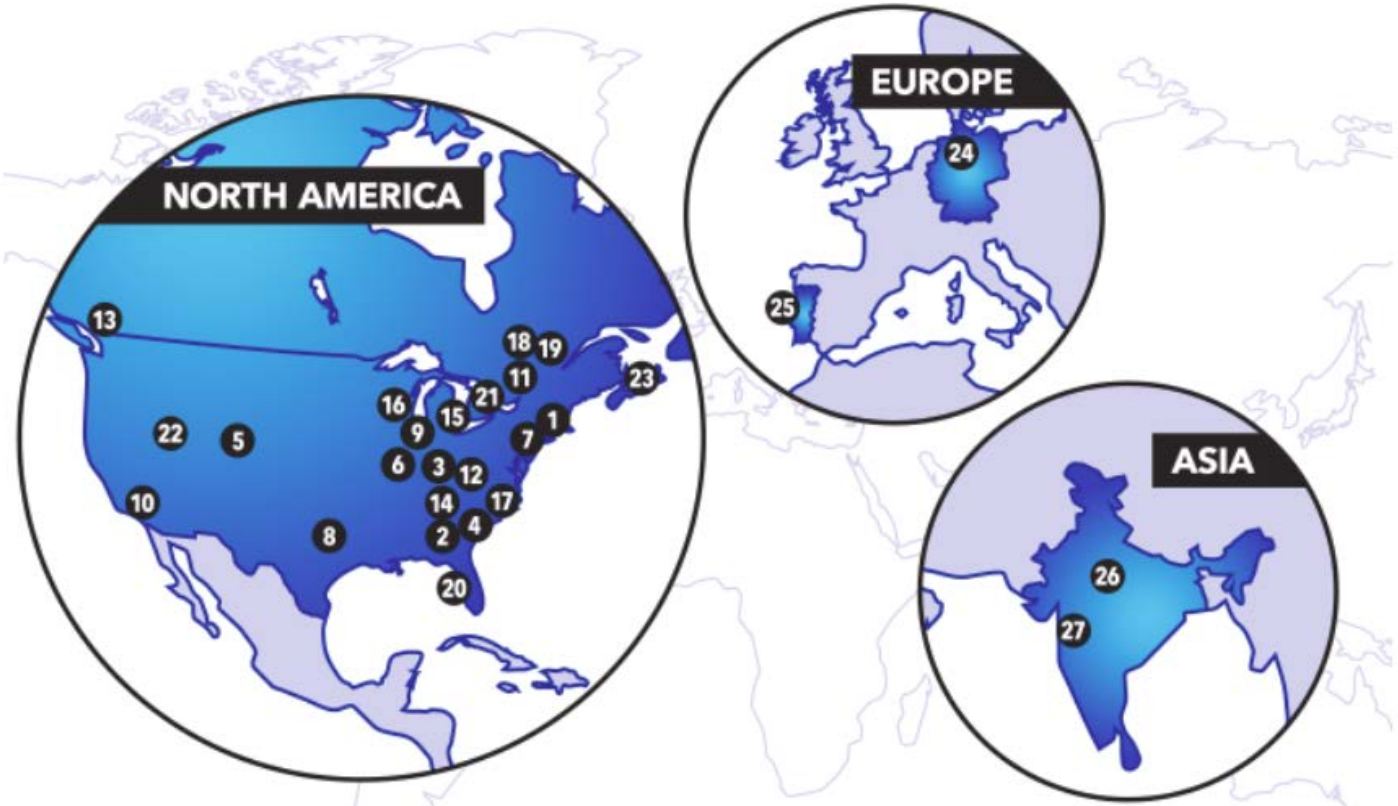
# Company Profile

- The second largest tape manufacturer in North America
- Employs ~2,600 people
- Approximately 68% of sales from products with a Top 2 market position in North America


Check out our corporate video on YouTube

# Locations




NORTH AMERICA

1. Ansonia, CT ■
2. Atlanta, GA ●
3. Bardstown, KY ●
4. Blythewood, SC ●
5. Brighton, CO ●
6. Carbondale, IL ●
7. Carlstadt, NJ ●
8. Carrollton, TX ●
9. Chicago, IL ●
10. Corona, CA ●
11. Cornwall, ON ●

NORTH AMERICA

12. Danville, VA ● ▲
13. Delta, BC ●
14. Johnson City, TN ●
15. Marysville, MI ●
16. Menasha, WI ●
17. Midland, NC ●
18. Montreal, QC ★
19. Montreal, QC ●
20. Sarasota, FL ☆
21. Toronto, ON ●
22. Tremonton, UT ●
23. Truro, NS ●

EUROPE

24. Flensburg, Germany ▲
25. Porto, Portugal ●

ASIA

26. Chopanki, India ●
27. Daman, India ●

● Manufacturing
■ Machine Assembly
▲ Distribution
★ Corporate Headquarters
☆ Executive Headquarters

# Achievements

ISO 14001:2004
Environmental Management System

2014 & 2015 ENERGY STAR Partner of the Year

2016, 2017, & 2018 ENERGY STAR Partner of the Year – Sustained Excellence

11 Plants Achieved ENERGY STAR Challenge for Industry (to reduce energy intensity by 10% within 5 years)

2016 NASCAR Green E3 Challenge (Danville, VA plant)


ENERGY STAR AWARD 2017 PARTNER OF THE YEAR Sustained Excellence

ENERGY STAR AWARD 2016 PARTNER OF THE YEAR Sustained Excellence

ENERGY STAR AWARD 2015 PARTNER OF THE YEAR

ENERGY STAR AWARD 2014 PARTNER OF THE YEAR

NASCAR GREEN ECONOMY ENERGY ENVIRONMENT CHALLENGE VIRGINIA

ACHIEVER ENERGY STAR CHALLENGE FOR INDUSTRY

Better Plants CHALLENGE U.S. DEPARTMENT OF ENERGY

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# BIG Goals

## BETTER PLANTS

Better Plants is partnering with leading manufacturers and water utilities to **improve energy efficiency and competitiveness in the industrial sector, saving money in the process**. Through Better Plants, partners voluntarily set a specific goal, typically to reduce energy intensity by 25% over a 10-year period across all their U.S. operations.

Better Plants
U.S. DEPARTMENT OF ENERGY

Better Plants
CHALLENGE
U.S. DEPARTMENT OF ENERGY

# Planning

- Support from Senior Leadership
- Building Corporate Program
- Energy Action Plan

# Corporate Support

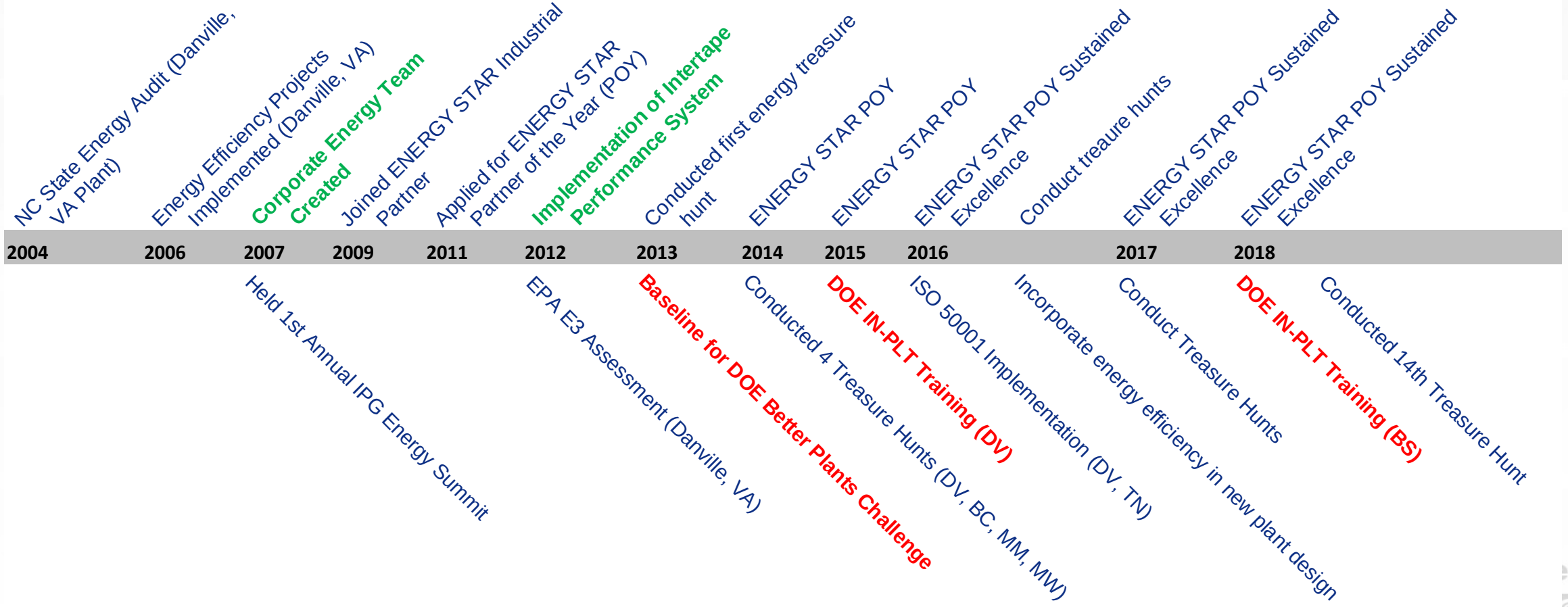
Senior VP Operations

VP Operations

Chief Executive Officer

Senior VP – Logistics & Supply Chain

# History of Energy Management at IPG



# Building Corporate Program

- Plant Energy Teams
  - Comprised of engineering, maintenance, & production employees
    - Meet once per month
    - Treasure Hunts, air Leak audits, kaizen events, training, contests
  - Plant Energy Coordinator is a member of corporate energy team
- Intertape Performance System (IPS)
  - Interfacing energy with production
- Corporate Finance
  - Metrics, reporting
- Logistics/Supply Chain
  - Regional Distribution Center Expansion
  - Suppliers/Customers
- Business Transformation Office
  - New plant and equipment design
  - Corporate standards
  - M&A Activities

Title: **Intertape Energy Action Plan**

Team leader: Philip Kauneckas
Sponsor: Doug Nalette
Revision date: 17-Sep-17

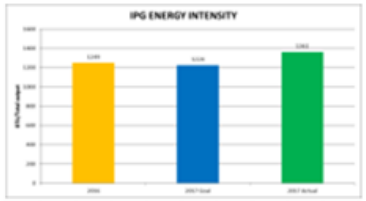
## Energy Policy

Intertape Polymer Group is committed to operating its facilities in an efficient, environmentally responsible, and safe manner. We will uphold legal and other requirements involving energy. Our goal is to reduce energy intensity by 25 percent within 10 years and to reduce CO2 emissions by 3% per year. We will achieve this goal by implementing continuous improvement programs and employee training initiatives across our manufacturing locations. Energy performance will be a consideration in design of new equipment and processes, along with modifications to existing equipment and processes. The Plant Energy Team has the role of measuring progress towards achieving the energy efficiency goal, identifying energy efficiency projects, and providing a forum for identifying best practices. It is the responsibility of every employee to be highly involved in reducing energy usage. Through the awareness, commitment, and capability of our employees, IPG will achieve success and surpass our energy efficiency goals.

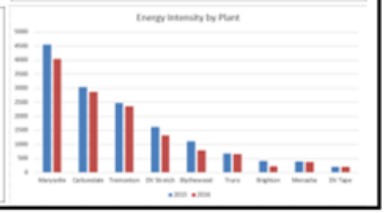
## Objectives

Reduce energy intensity by 2.5% per year
Reduce CO2 emissions by 3% per year
Achieve the Energy Star Partner of the Year (POY) - Sustained Excellence Award

## Current Conditions





## Company Activities (Goals and Objectives)

| 2017 Program Activities | Need Addressed | Status |
|---|---|---|
| Energy Champions | (5C) Build Capacity, (5B) Raise Awareness | Expand Energy Champions role in all plants |
| ENERGY STAR Challenge | (3C) Establish Goals | Plants continue to work on meeting goals |
| CEM Training and Certification | (5C) Build Capacity, (5B) Raise Awareness | 5 CEM, target 5 in 2017 |
| Annual Energy Summit | (5C) Build Capacity, (5B) Raise Awareness | complete 8 plants in 2015, target 9 in 2016 in Washington DC |
| Employee Engagement Survey | (5C) Build Capacity, (5B) Raise Awareness | pilot completed in DV, target 2 plants |
| Energy Action Plan | (3B) Potential for Improvement, (4B) Define Technical Step (4B) Roles | Completed in 2015. Implement for 2016. |
| Monthly Energy Meeting | (5B) Raise Awareness, (5C) Build Capacity, (5E) Track & Monitor | ongoing. Continue team calls and add ops managers calls in 2015 |
| Normalize Energy Data | (2B) - Normalize | Update regression models with 2015 data |
| Corporate Communication/Marketing | (5B) Raise Awareness | Implement and continuously improve for 2016. |
| ISO 50001 Certification in DV, MM, TN | Addresses all needs | Selected for DOE pilot program. 18 month process for certification |
| AEE Chapter in DV | Addresses all needs | Hold monthly meetings. Treasure hunt in DV, CEM Training |
| Support Efficiency Nova Scotia | (5C) Build Capacity, (5B) Raise Awareness | Share best practices and lessons learned. |
| ENERGY STAR Showcase | (5B) Raise Awareness | DV to host in 2016 |

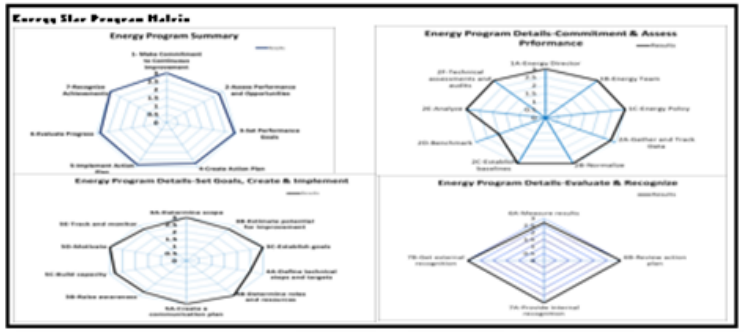
| 2017 Project Activities | Cost | Potential Savings | YTD Savings | Status |
|---|---|---|---|---|
| BC - Chiller Project | $200,000 | $85,000 | | complete |
| MW - Metering Project | $20,000 | | | Getting quotes |
| BS - Solar Project | $3,000,000 | $800,000 | | On hold |
| BS - Net Metering Project | $1,600,000 | $600,000 | | Getting quotes |
| TN - Chiller Replacement | $250,000 | $100,000 | | Getting quotes |

### Long Term Plan (5 years)

| *Program Activities* | 2016 | 2017 | 2018 | 2019 | ### |
|---|---|---|---|---|---|
| Benchmarking activity with external companies | | x | x | | |
| ISO 50001 Certification | | DV, TN | DV | | |
| Incorporate energy management into new plants | BS | WAI Plant | | | x |
| Incorporate energy management into suppliers | | x | x | x | x |
| Energy Champions | x | | | | |
| Normalize Data | | x | x | x | x |
| *Project Activities* | | | | | |
| Operational Improvements | Compressed Air | Lightin | Steam | Process Heating | |
| Energy Management Software all Plants | x | x | x | x | x |

Cost Benefit Analysis

| | 2016 | | 2017 | | 2018 | | 2019 | | 2020 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Cost | Savings | Cost | Savings | Cost | Savings | Cost | Savings | Cost | Savings | Total Cost | Total Savings |
| Program Activities | $50,000 | $50,000 | $50,000 | $85,000 | $50,000 | $75,000 | $50,000 | $50,000 | $50,000 | $75,000 | $250,000 | $345,000 |
| Projects | $1,000,000 | $350,000 | $1,250,000 | $450,000 | $1,500,000 | $500,000 | $2,000,000 | $750,000 | $1,000,000 | $500,000 | $7,750,000 | $2,550,000 |
| Total | $1,050,000 | $400,000 | $1,300,000 | $535,000 | $1,550,000 | $575,000 | $2,050,000 | $800,000 | $1,050,000 | $575,000 | $8,000,000 | $2,895,000 |
| Simple Payback (yrs) | 2.63 | | 2.43 | | 2.70 | | 2.56 | | 1.82 | | 2.76 | |




## Implementation Plan

| 2017 Schedule | Jan | Feb | Mar | Apr | May | June | July | Aug | Sept | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Monthly Team Conference Call | | x | x | x | x | x | x | x | x | x | x | x |
| Monthly OPS Mangr Conf. Cl | x | x | x | x | x | x | x | x | x | x | x | x |
| Planning Meeting w/OPS Mangrs. | | | | | | | | | | | | |
| Treasure Hunt | | | | | | | | MW/TU | | DV | | |
| ENERGY STAR Focus/WEEC | | | | | | | | | x | | | |
| Energy Management Software | | | | | | | | | | | | |
| ISO 50001 Certification | | | | | | | | | | | | x |
| CEM Training | | | | | x | | | | | | | |
| Energy Managers Network (AEE) | | x | | | x | | | x | | | | x |
| Operational Improvements (P | x | x | x | x | x | x | x | x | x | x | x | x |
| Implement Communication P | x | x | x | x | x | x | x | x | x | x | x | x |
| Energy Summit | | | | | | | | | x | | | |
| ENERGY STAR Showcase | | | | | | | | | | TU | | |

Action Register

| # | Register Date | Who/Week? | How | Action Required/Solution | Who is responsible | Due Date | Update/Results achieved | Status |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |

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# Energy Action Plan

# Execution

- Training new team members
  - Tools and Resources
- Building Energy Efficiency Into New Plant and Equipment Design
- Intertape Performance System

# Training New Team Members

- Building energy teams
  - "Playbook"
  - Professional Development
  - Annual IPG Energy Summit
    - Networking
    - Learning best practices → Implement
    - Recognition
- Treasure Hunts
  - Conducted 14 since 2013
  - Engagement (183 employees)
  - Expectation → Implement findings!!


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# Building Energy Efficiency into New Plant & Equipment Design

- Greenfield manufacturing facility in Midland, North Carolina to support our growing water-activated tapes business.
  - Included best practices in energy management in design
  - Educate employees on energy efficiency during on-boarding process
  - Operations Manager is CEM

- Regional Distribution Center Expansion
- Developing corporate standards for energy efficiency
  - Energy efficiency is discussed during capital request process
- New film lines (TU, DV)

# Intertape Performance System (IPS)

# How does IPS work?

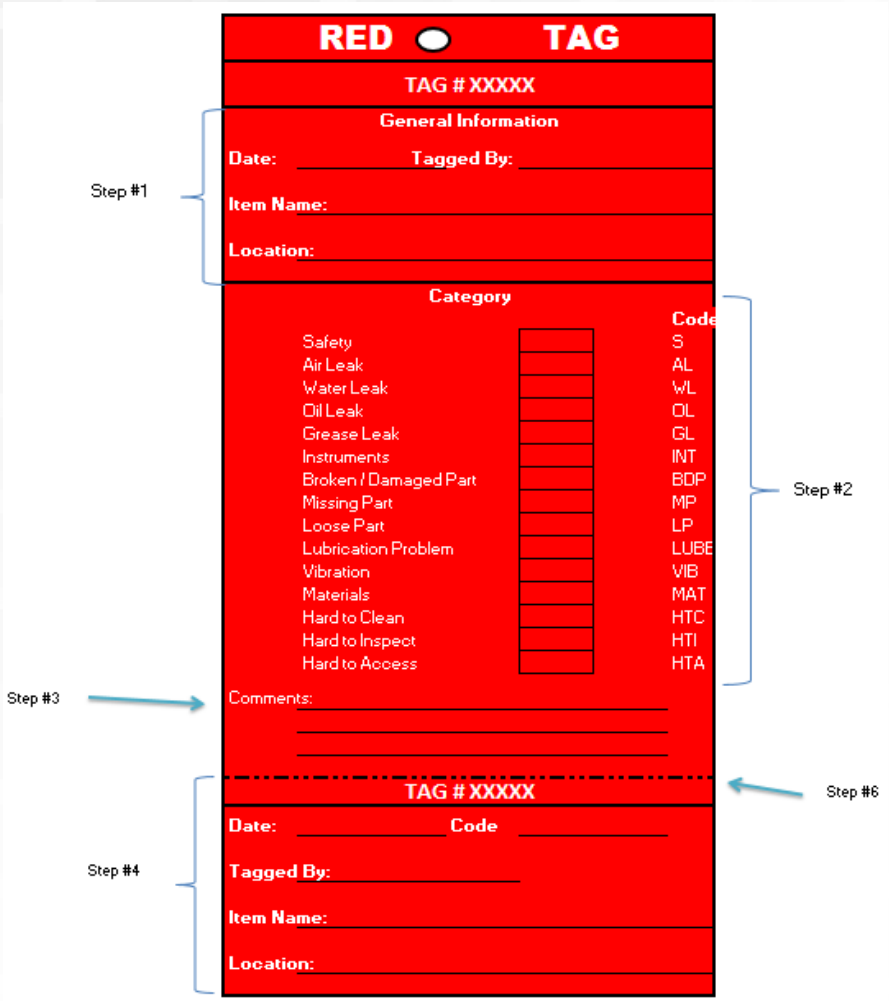
- Promote engagement within our most valuable asset → our associates

- Promotes engagement through pillar activities
  - Safety (focused on hazard identification and correction)
  - Quality (focused on processes that impact external and internal quality)
  - Visual Communication (creates the visual plant and ownership in key metrics)
  - Equipment Optimization (focuses on equipment reliability and key process conditions)
  - Organizational Development (focuses on training needs and employee growth strategies)
  - Stewardship (focuses on our impact to the environment and our community)
- Continuous Improvement
  - This team provides direction for all pillars with a primary focus on training all associates how to identify opportunities for improvement and provide the vehicle to become change agents
  - Provides a structured Plan, Do, Check, Act method and sustainability plan

# Interfacing energy with production

1. Red Tags - identifying machine abnormalities by creating a tag and attaching to the machine. There are 12 categories of machine abnormalities and include:

- air leak
- water leak
- damaged parts
  - Insulation
  - contamination



# Interfacing energy with production

2. Standard Cadence – Turn off/turn down procedures
3. Visuals

| | | | |
|---|---|---|---|
| 18:00 | Department Walk | Verify Turnoff/Turn Down Procedures are followed | |


**Standardized Work: Stretch Supervisor**

**Names**

Date: _____ Day Crew / Night Crew

intertape polymer group

| Time | Task | Details | Sign Off | Attendance Issues |
|---|---|---|---|---|
| 6:30-7:00 | Shift Review in Stretch Office | Review previous shift with oncoming Supervisor | | |
| 7:00 | Review Schedule | Review orders for all lines for the shift | | |
| 7:30 | Prepare for R&R | Gather safety, production, yield, downtime, future 24hrs | | |
| 8:30 | R&R Board | Conduct Stretch R&R meeting @Tier 2 board | | **Quality Issues** |
| 9:00 | Department Walk | Check Stretch Run sheets and downtime sheets. Gather information for first look report | | |
| 9:15 | R&R Board | Cast 5 R&R Tier 1 Review | | |
| 13:00 | Department Walk | Check Stretch Run sheets and downtime sheets. Gather information for second look report | | |
| 15:00 | Department Walk | Check housekeeping and 5S | | |
| 16:00 | Department Walk with John | Check Stretch Run Sheets, Operator 5S Sweepsheets, Downtime sheets at all Tier 1 boards | | |
| [illegible] | Department Walk | Verify Turnoff/Turn Down Procedures are followed | | |
| | | | | |
| 18:30-19:00 | Shift Review in Stretch Office | Review previous shift with oncoming Supervisor and input data for final report | | **Breakdowns** |
| 19:00 | Review Schedule | Review orders for all lines for the shift | | |
| 21:00 | Department Walk | Check Stretch Run sheets and downtime sheets. Gather information for first look report | | |
| 1:00 | Department Walk | Check Stretch Run sheets and downtime sheets. Gather information for second look report | | |
| 3:00 | Department Walk | Check housekeeping and 5S | | |
| 6:00 | Department Walk | Check all Tier 1 boards and verify housekeeping | | |
| 6:30-7:00 | Shift Review in Stretch Office | Review previous shift with oncoming Supervisor and input data for final report | | |

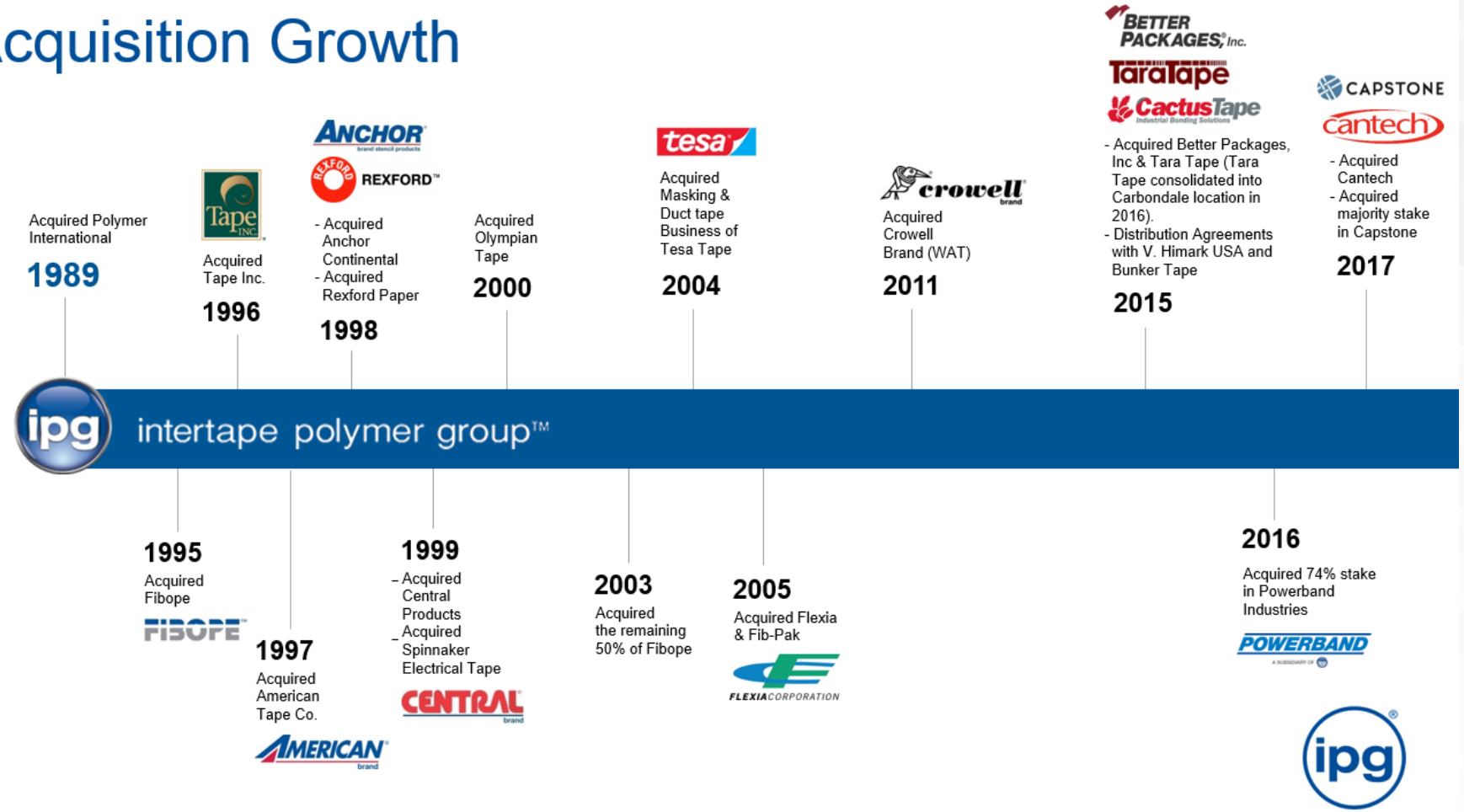
**Stretch Operational Issues**

# Results from IPS

- Improved safety – 50% reduction in TCIR
- Improved quality – major improvement in quality returns and 1st pass yield
- Improved metrics & visual communication – are we winning?
- Improved employee engagement
- Achieving record levels of production
- IndustryWeek Best Plants Finalist – DV (2014, 2015), TU (2016)
- IndustryWeek Best Plants Winner – DV (2016), TU (2017)


# Challenges

## Acquisition Growth

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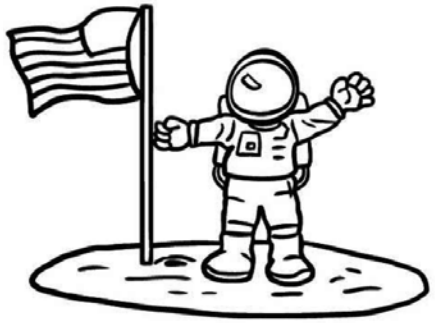
# Results




# THANK YOU!

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# *Shooting for the Moon, Planning and Execution for a Big Energy Goal*

## Making every KW count

# A trip down Memory Lane

- Then:  2006 Hedging strategy to combat out of control energy prices
- Now:  Implementing a PPA to save money and fix price in the future.
- Then: 2005 How to justify and install metering
- Now:  How to justify and use analytics to effectively manage tons of data from many meters and sources
- Then: 2007 How to justify and pay for T8 high bay lights and fixtures
- Now:  How to install an use complex control schemes to maximize the benefit of LED lighting
- Then: <2005 driving HVAC by single thermostats to achieve employee comfort.
- Now:  Using single zone VAV in manufacturing areas, partial load efficiencies and using Psych charts and RH for control.

# SEP / ISO 50001 @ Schneider Electric
# Our Foundation

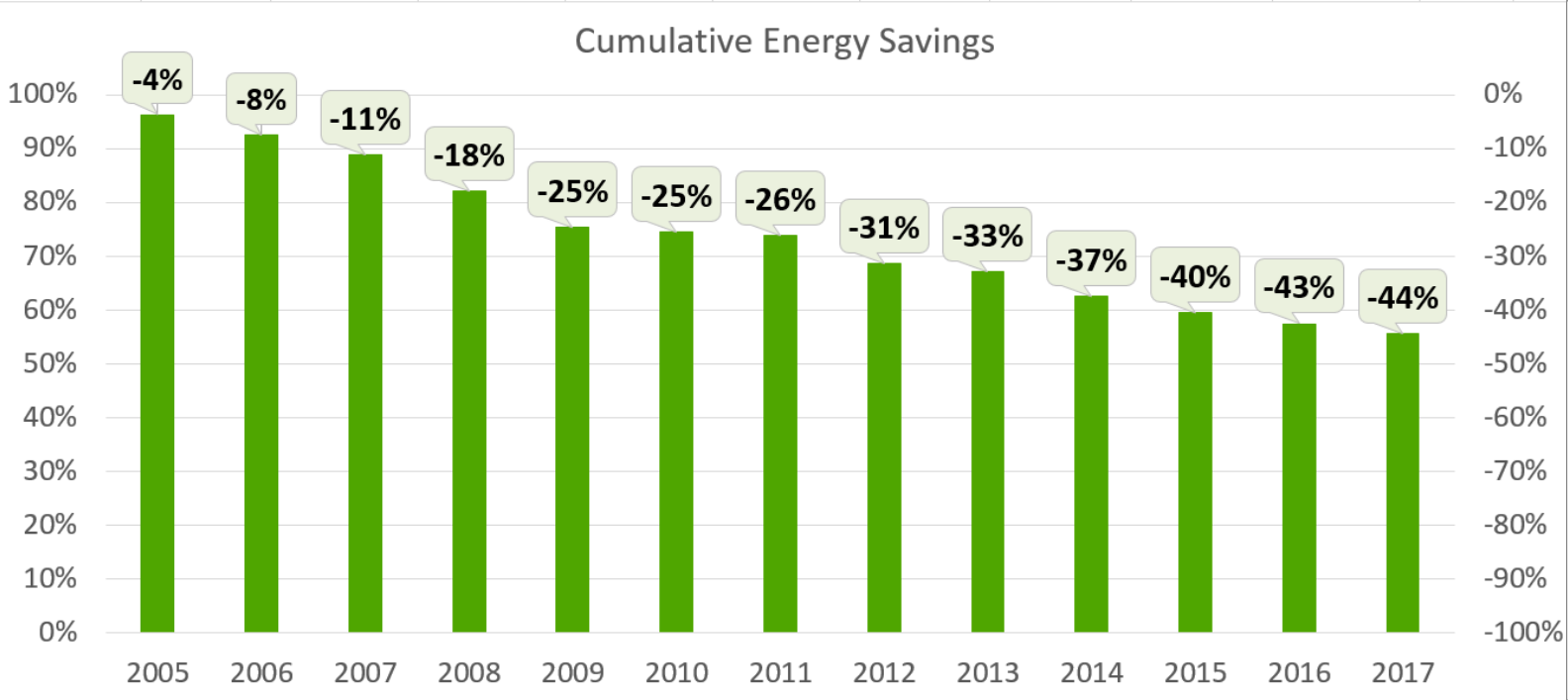
## ISO Program

- 30 sites certified to ISO50001 in program 2018
- 21 sites with SEP certification
- Target sites with ISO14001 certification
- Exposure to Management system
- Seat at table
- Verified results by 3rd party
- Benchmarking for Enterprise
- Documented and Verified Results

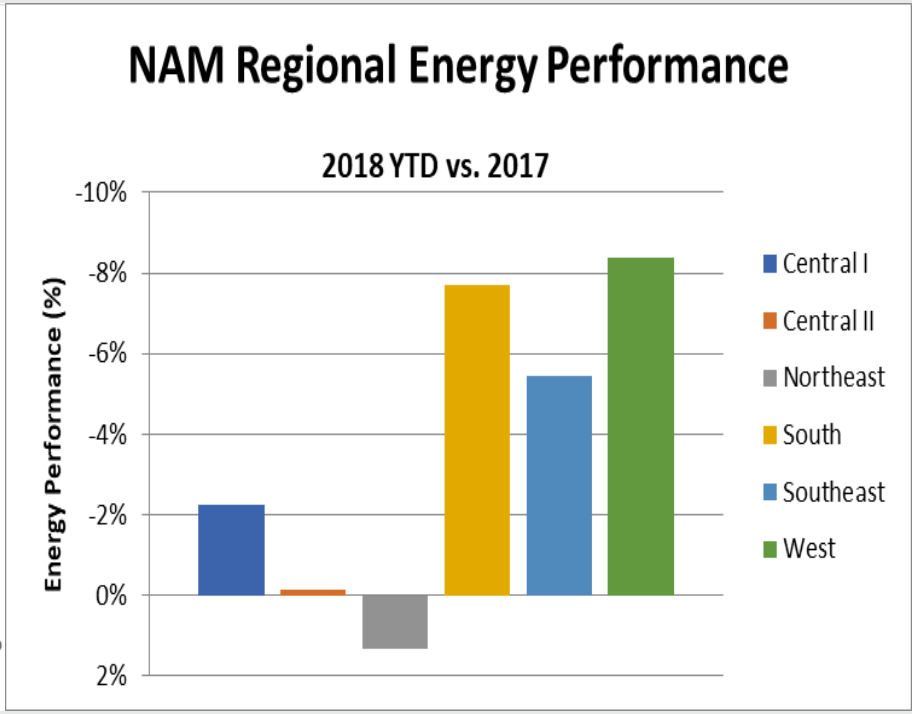

## Demographics

- 72 buildings
- 55 locations
- 12 M $ft^2$
- 105 people
- 7 Regional Leaders
- 12 Facility Managers
- Across North America
- Across all Businesses

Share credible results at all levels




Based on energy performance reports normalized for weather, production and/or occupancy, as applicable




Energy performance by country through year end 2016

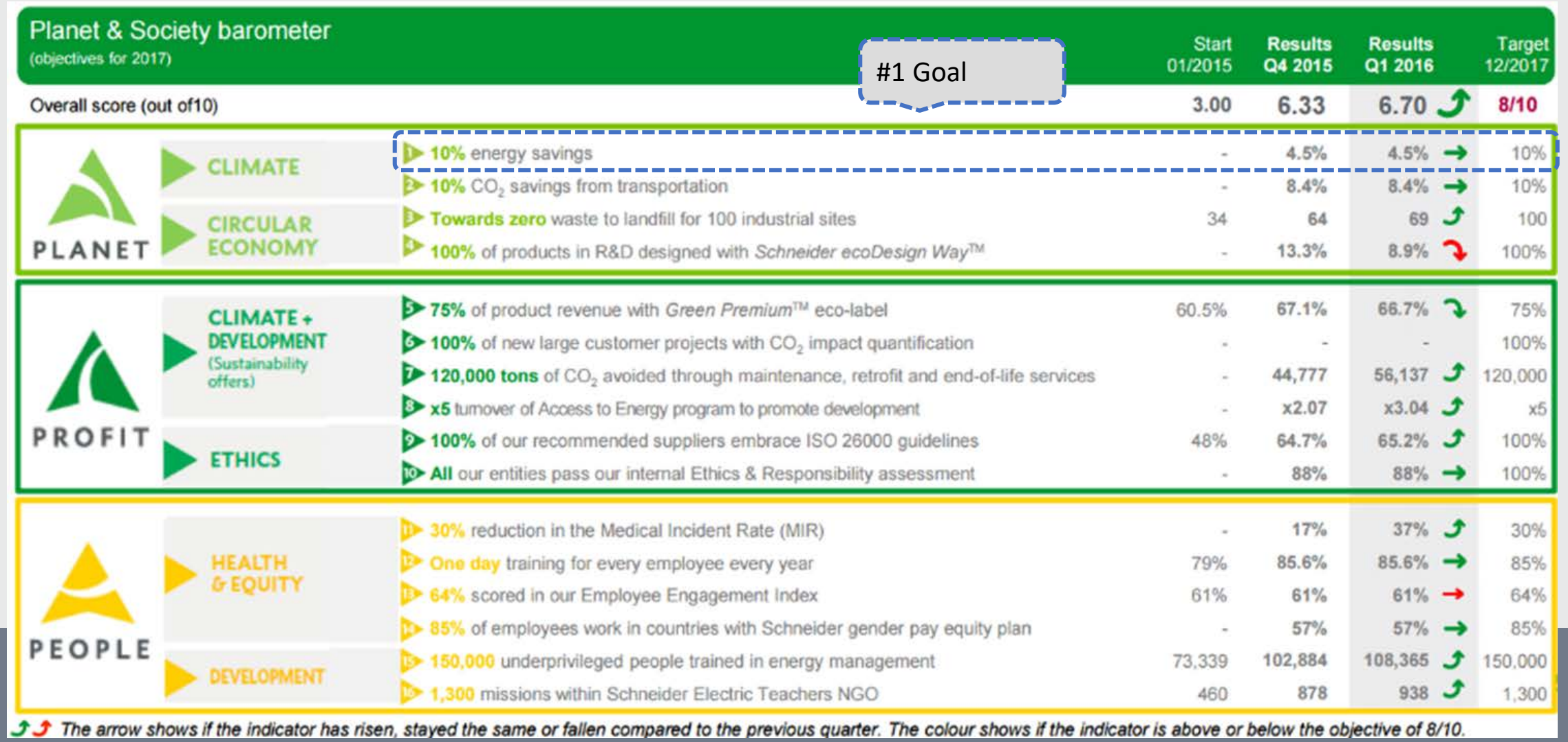
# Milestones

- Active energy program since 2006
- Worked towards a consistent 3.5% year over year goal since 2006
- > 45% normalized energy savings since 2006
- Completed a Better Buildings challenge commitment in 2011 by achieving and documenting a 26% savings in 2016.
- Resigned the Better Buildings commitment in 2017 for an additional 12 years and 20%.
- Participated in 2011 ISO50001/SEP demonstration project and since have certified 30 sites to ISO50001 and 21 to SEP.
- The Smyrna site is the 2nd site to be 3x Platinum and we have 10 other sites with Platinum certification.
- Carbon Neutral by 2050

# Foundation Principles

- Management Commitment and Support

# Planet & Society Barometer



## Planet & Society barometer
(objectives for 2017)

#1 Goal

| | | | Start 01/2015 | Results Q4 2015 | Results Q1 2016 | Target 12/2017 |
|---|---|---|---|---|---|---|
| Overall score (out of10) | | | 3.00 | 6.33 | 6.70 ↗ | 8/10 |
| PLANET | CLIMATE | 1 **10%** energy savings | - | 4.5% | 4.5% → | 10% |
| | | 2 **10%** $CO_2$ savings from transportation | - | 8.4% | 8.4% → | 10% |
| | CIRCULAR ECONOMY | 3 **Towards zero** waste to landfill for 100 industrial sites | 34 | 64 | 69 ↗ | 100 |
| | | 4 **100%** of products in R&D designed with *Schneider ecoDesign Way*™ | - | 13.3% | 8.9% ↘ | 100% |
| PROFIT | CLIMATE + DEVELOPMENT (Sustainability offers) | 5 **75%** of product revenue with *Green Premium*™ eco-label | 60.5% | 67.1% | 66.7% ↘ | 75% |
| | | 6 **100%** of new large customer projects with $CO_2$ impact quantification | - | - | - | 100% |
| | | 7 **120,000 tons** of $CO_2$ avoided through maintenance, retrofit and end-of-life services | - | 44,777 | 56,137 ↗ | 120,000 |
| | | 8 **x5** turnover of Access to Energy program to promote development | - | x2.07 | x3.04 ↗ | x5 |
| | ETHICS | 9 **100%** of our recommended suppliers embrace ISO 26000 guidelines | 48% | 64.7% | 65.2% ↗ | 100% |
| | | 10 **All** our entities pass our internal Ethics & Responsibility assessment | - | 88% | 88% → | 100% |
| PEOPLE | HEALTH & EQUITY | 11 **30%** reduction in the Medical Incident Rate (MIR) | - | 17% | 37% ↗ | 30% |
| | | 12 **One day** training for every employee every year | 79% | 85.6% | 85.6% → | 85% |
| | | 13 **64%** scored in our Employee Engagement Index | 61% | 61% | 61% → | 64% |
| | | 14 **85%** of employees work in countries with Schneider gender pay equity plan | - | 57% | 57% → | 85% |
| | DEVELOPMENT | 15 **150,000** underprivileged people trained in energy management | 73,339 | 102,884 | 108,365 ↗ | 150,000 |
| | | 16 **1,300** missions within Schneider Electric Teachers NGO | 460 | 878 | 938 ↗ | 1,300 |

↗ ↘ *The arrow shows if the indicator has risen, stayed the same or fallen compared to the previous quarter. The colour shows if the indicator is above or below the objective of 8/10.*

# Foundations Principles

- Management Commitment and Support
- Earn a seat at the table

**Foundation of an Energy Management Program**

Do you have challenges obtaining capital for energy projects?

Do you have issues with correctly stating and communicating your energy performance?

Do you have a seat at the table for capital and expense planning?

Do you struggle with consistent management support of energy programs?

Do you face competing priorities when planning energy projects?

Are you able to affect or make changes to process energy?

Does your management know, understand, believe your energy performance?

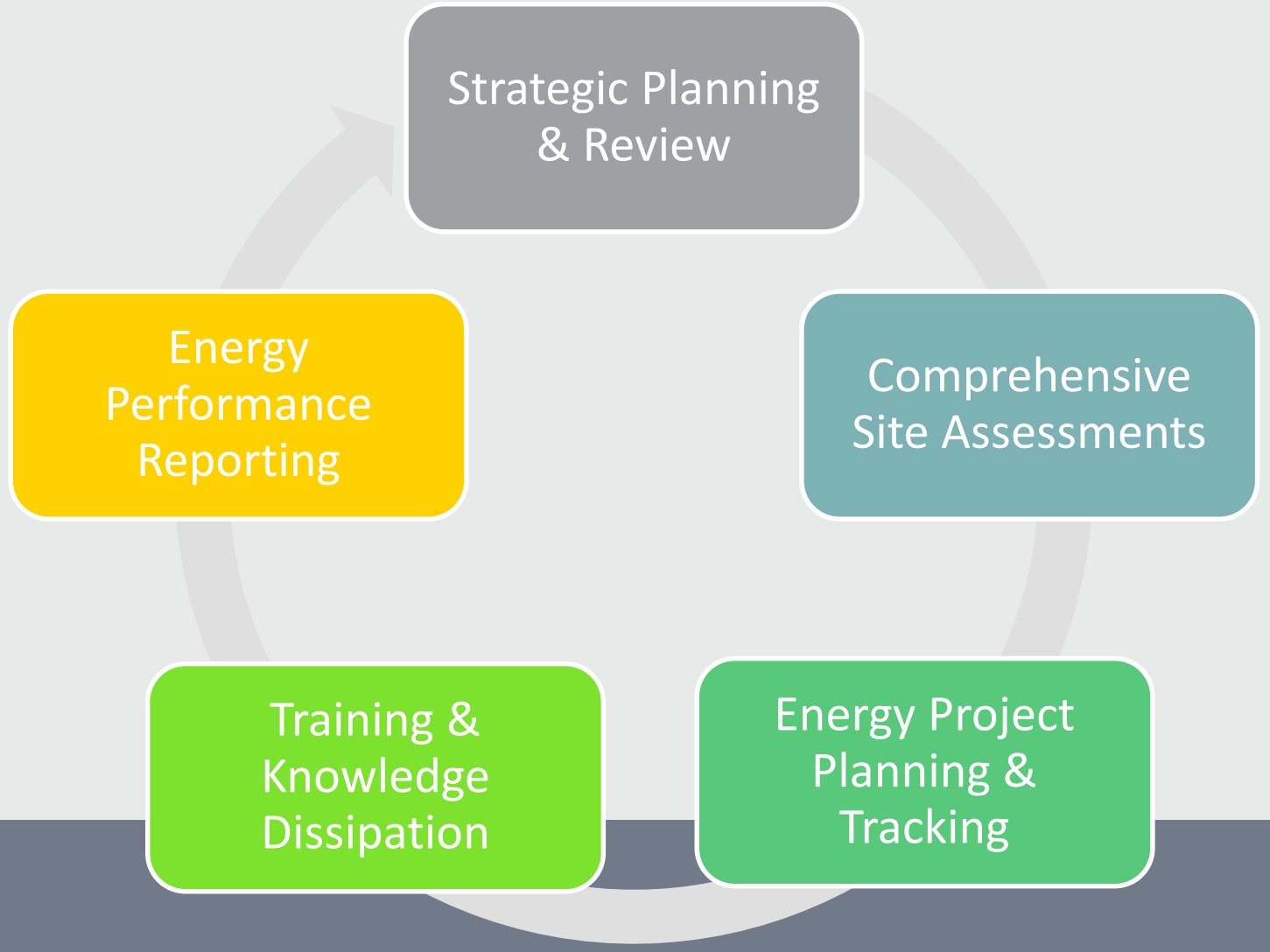
Do you have training, employee involvement and awareness programs for energy efficiency?

# Active Energy Management

- Understand and Use your corporate strategy
- Share credible results at all levels
- Use and share your strategy, and make it relevant to local operations
- Use a sound M & V protocol

# Schneider Energy Action – Active Energy Actions

Use and share your strategy, and make it relevant to local operations




Scope and process flow

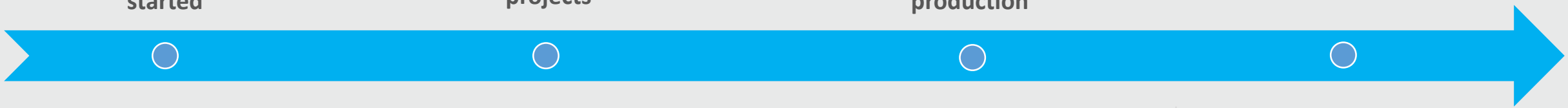
# Foundations Principles

- Management Commitment and Support
- Earn a seat at the table
- Tell your story to anyone that will listen

# Our Energy Story

- Use and share your strategy, and make it relevant to local operations

Early-to-mid 2000s



**Getting started**

- Energy assessments
- Metering (can't manage what you don't measure)
- Chicago Climate Exchange
- Supply-side management

**Santa Claus projects**

- High-bay fluorescent lighting (~20,000 lamps)
- Building automation systems
- New air conditioning units (aging infrastructure)
- LED lighting
- Renewable energy (Smyrna, Rojo Gomez, Palatine, City of Knowledge, Andover, Cocasset)

**Working with production**

- Variable frequency drives
- Process improvement (molding, paint lines, etc.)
- Operational control

**Establishing a management system**

- Global Energy Best Practices Manual
- ISO50001 EnMS
- Building analytics (Advisor)
- Real estate strategies

# Not the End!!!

- Use and share your strategy, and make it relevant to local operations

Early-to-mid 2000s

**Getting started**

**Establishing a ...agement system**

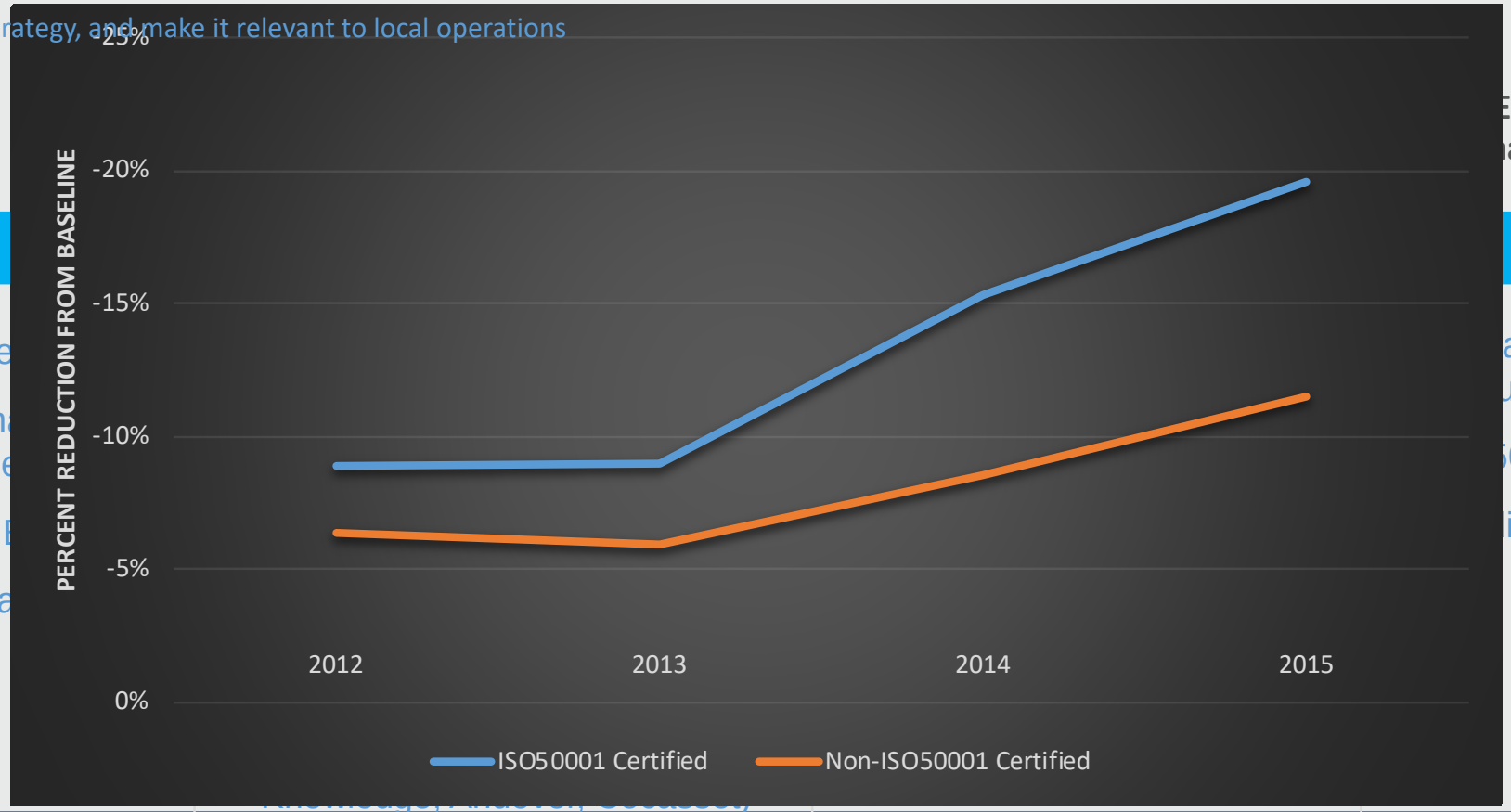
- Energy assessme...
- Metering (can't m... what you don't me...
- Chicago Climate E...
- Supply-side mana...

...al Energy Best Practices ...ual

...50001 EnMS

...ing analytics (ClockWorks)

... estate strategies



# Foundations Principles

- Management Commitment and Support
- Earn a seat at the table
- Tell your story to anyone that will listen
- Embrace the future

# Interplay of Various SE Targets Toward Carbon Neutral Objective

## Targets, Objectives, and Milestones



| | COP21 commitments | As of end of Q3 2016 |
|---|---|---|
| 1 | Ensure CO2 impact quantification for 100% of new large customer projects (2015-2017) | To be published in Q4 2016 |
| 2 | Design 100% of new offers with Schneider Electric ecoDesign Way™ and realize 75% of product revenue with Green Premium™ eco-label (2015-2017) | ecoDesign Way: 46%<br>Green Premium: 66.3% |
| 3 | Avoid 120,000 tons of CO2 through Circular Economy "end-of-life" services (2015-2017) | 83,485 t of CO2 |
| 4 | Facilitate access to lighting and communication with low carbon solutions for 50 million inhabitants at the Base of the Pyramid in 10 years (2015-2025) | To be published in Q4 2016 |
| 5 | Implement storage initiatives to develop renewable energy and mini grid (from 2015) | EcoBlade presented in Dec. 2015 |
| 6 | Solve SF6 issues with new alternatives in 5 years and eliminate SF6 (2015-2020) from Schneider Electric products in 10 years (2015-2025) | In progress, outpacing the timeline |
| 7 | Reduce Schneider Electric energy intensity by 3.5% per annum (from 2015) | 5.9% (since end-2014) |
| 8 | Reduce Schneider Electric transportation CO2 emissions by 3.5% per annum (from 2015) | 8.5% (since end-2014) |
| 9 | Invest EUR 10bn in R&D innovation on sustainability in the next 10 years (2015-2025) | To be published in Q4 2016 |
| 10 | Issue a climate bond to finance low CO2 R&D across Schneider Electric businesses | Issued in November 2015 |

"In 2016, Schneider Electric joined the Science-Based Targets initiative to align its objectives… to limit global warming to 2°C maximum.

In line with the **science-based targets**, Schneider Electric takes the following engagements:

- **35% absolute CO2 reduction in scopes 1 & 2 by 2035** (baseline 2015)
- **53% absolute CO2 reduction in scopes 1 & 2 by 2050** (baseline 2015)

These are ***minimum targets*** set for the Group, corresponding to a 2.1% year-on-year emission reduction from 2015. They will **contribute to the objective of achieving carbon neutrality for Schneider Electric and its ecosystem by 2030**. A dedicated carbon committee has been set up to drive these commitments."

## More ELECTRIC

**2X** faster growth of electricity demand compared to energy demand by 2040

Source : IEA WEO 2014

## DIGITIZATION

**10X** more incremental connected devices than connected people by 2020

Source : Cisco, Internet World Statistics

## DECARBONIZATION

**82%** of the economic potential of energy efficiency in buildings and more than half in industry, remains untapped

Source : World Energy Outlook 2012, Internal Analysis

## DECENTRALIZATION

**70%** of new capacity additions will be in Renewables by 2040

Source : BNEF

Life Is On | Schneider Electric

# The Next Chapter – Our Future

- Energy efficiency will still be a driver and our foundation in the future.
- My energy bills are too high, and / or are not predictable
- Grid Resiliency
- Grid stability
- Price certainty
- Carbon reduction goals
- How do we prepare?
- I have ambitions to be more sustainable
- Balancing Real Estate, Sustainability, and Energy Efficiency
- Outages and poor power quality cost me money, harm my assets, and undermine the safety of my employees

# We are thinking about Energy in a New Way

- Reduce energy consumption
- Improve and monetize flexibility
- Energy / Fuel source arbitrage

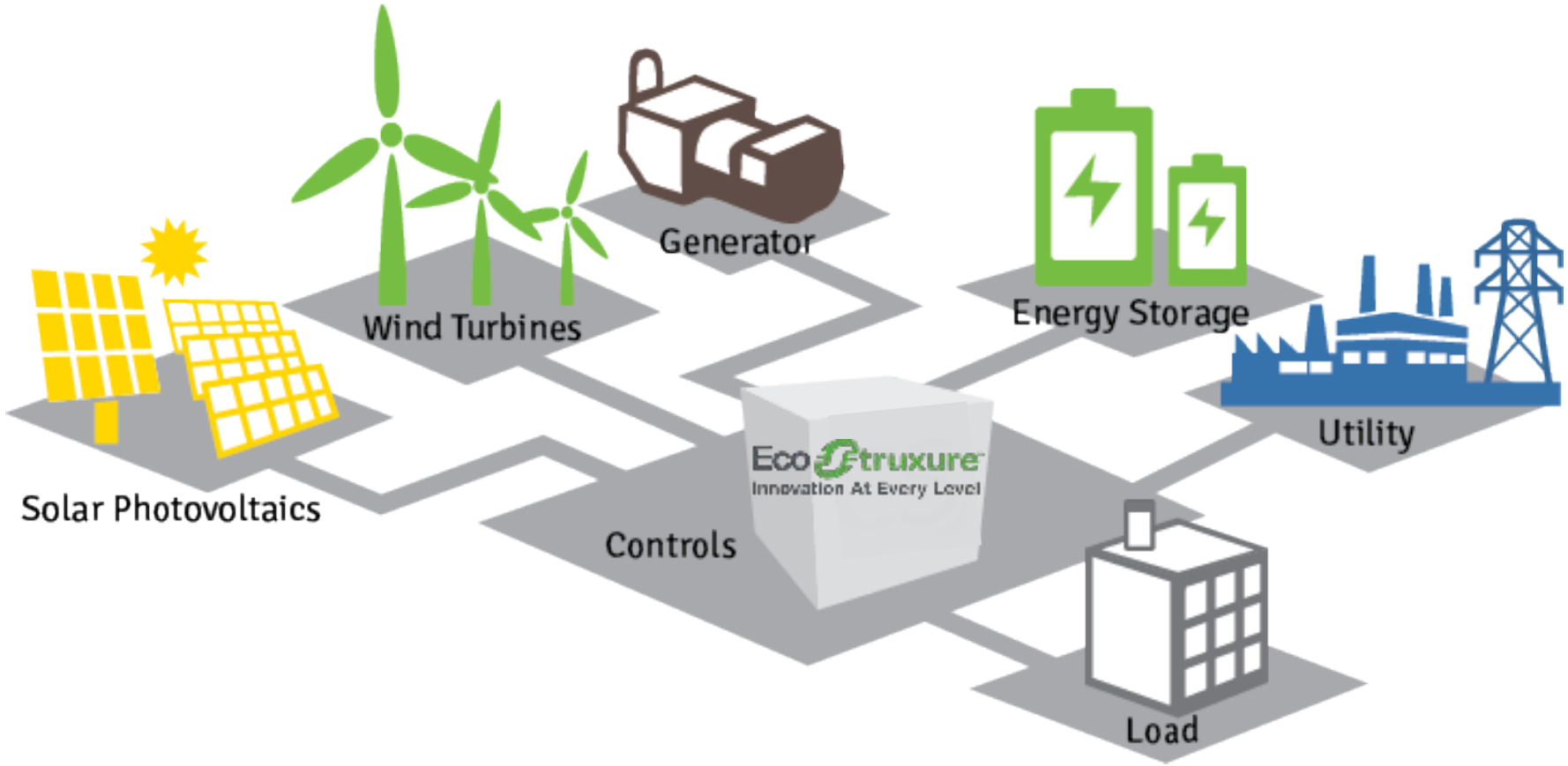
- Reduce Greenhouse Gasses
- Minimize carbon footprint


- Innovative Product and Hedge Structures
- Global Program
- Real-time-price forecasting
- Portfolio Risk Management

- Service site loads during times of grid instability
- Protect assets against harmful effects of poor power quality

# What is a Microgrid?

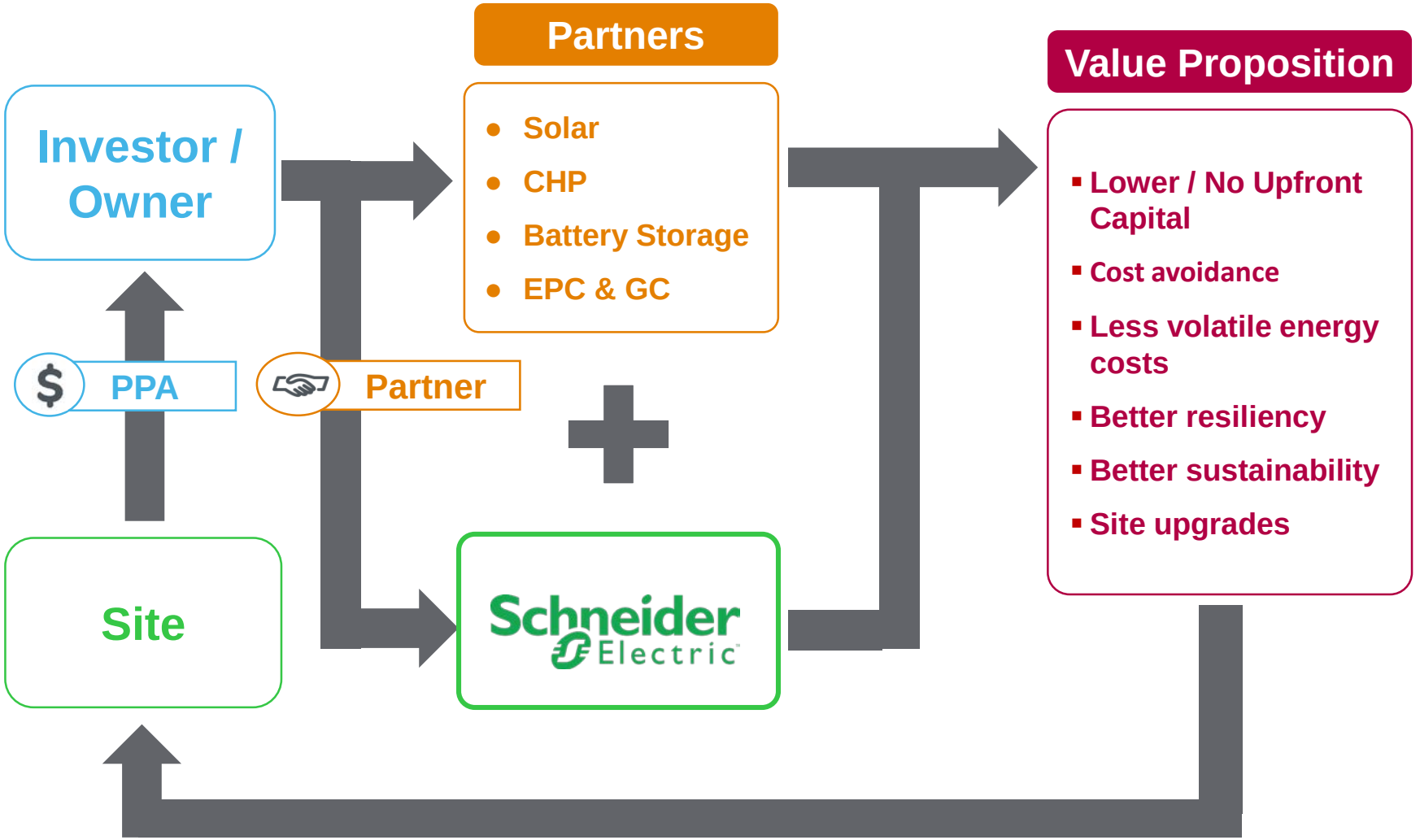
An integrated energy system consisting of interconnected loads and distributed energy resources…




…which as an integrated system can be controlled as a single entity and operate in parallel with the grid or in an intentional *islanded* mode.

# Microgrid as a Service

## The evolution of the business model



# *Shooting for the Moon, Planning and Execution for a Big Energy Goal*

## Foundation Principles

- Management Commitment and Support
- Earn a seat at the table
- Tell your story to anyone that will listen
- Embrace the future

## Our Story

Part one – it is complete but not finished

- Energy Efficiency
- Management Systems and Practices

Part two – Still writing the story

- Sustainability
- Resiliency
- Cost Certainty

# How Nissan is Shooting for the Moon

# With Energy Savings

By Brett Rasmussen

# U.S. FOOTPRINT



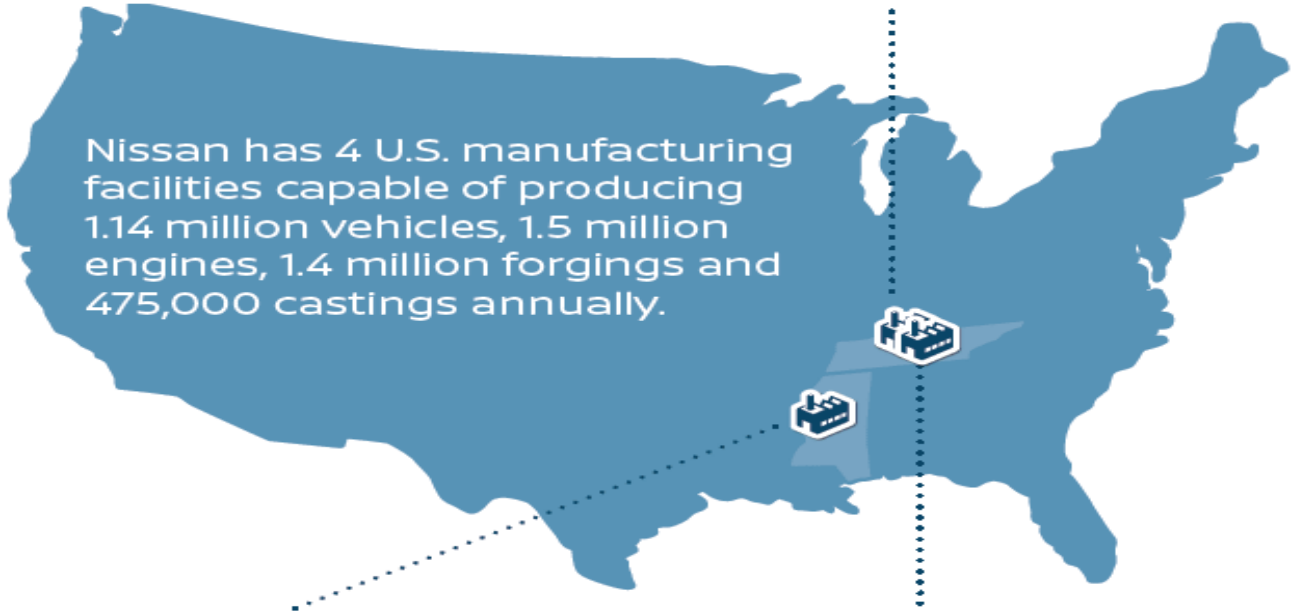



More than **22,000** employees in the U.S.




# U.S. MANUFACTURING & INVESTMENT

**Nissan Smyrna Vehicle Assembly Plant and Battery Plant**
**Employees: 8,400 | Production: 642,000**
Our vehicle production plant in Smyrna, Tenn. is the largest not only in the U.S. but in the Americas.




**Nissan Canton Vehicle Assembly Plant**
**Employees: 6,400**
**Production: 450,000**
Canton, Miss.

**Nissan and Infiniti Decherd Powertrain Plant**
**Employees: 1,900**
**Production: 1.5 million engines**
Decherd, Tenn.

More than **22,000 U.S. employees** including 16,000 manufacturing jobs

**15 million vehicles** proudly manufactured in the U.S. since 1983

**10 million engines** proudly manufactured in the U.S. since 1997

**$14 billion** spent with **300** suppliers in 30 states in U.S. in 2016

**$11 billion investment** in manufacturing in the U.S. since 1981

# U.S. MANUFACTURING

## MISSISSIPPI
CANTON VEHICLE ASSEMBLY PLANT


## NISSAN GROUP OF NORTH AMERICA

## TENNESSEE
SMYRNA VEHICLE ASSEMBLY PLANT


# CANTON PLANT ENERGY STAR 2017 CERTIFICATION

# 12 YEARS

# 4,000,000 VEHICLES

# DOE Recognizes Canton for ISO 50001


# DOE Recognizes Canton for ISO 50001

Superior Energy Performance®
U.S. DEPARTMENT OF ENERGY

PLATINUM
2017-20

## Canton Vehicle Plant

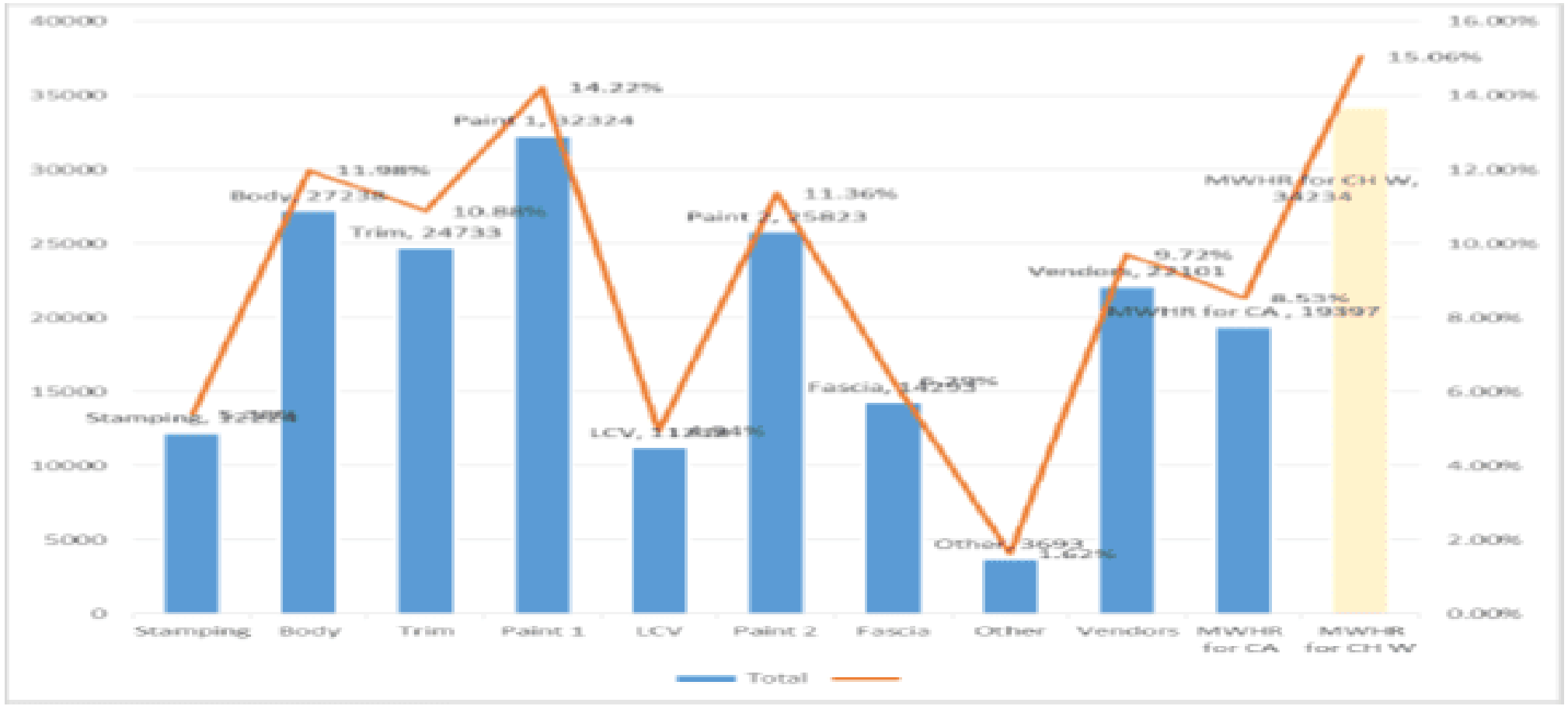
Nissan North America Inc.

Recognized by the U.S. Department of Energy for implementing ISO 50001 and Superior Energy Performance program standards, and improving energy performance by 20.9% over 3 years.

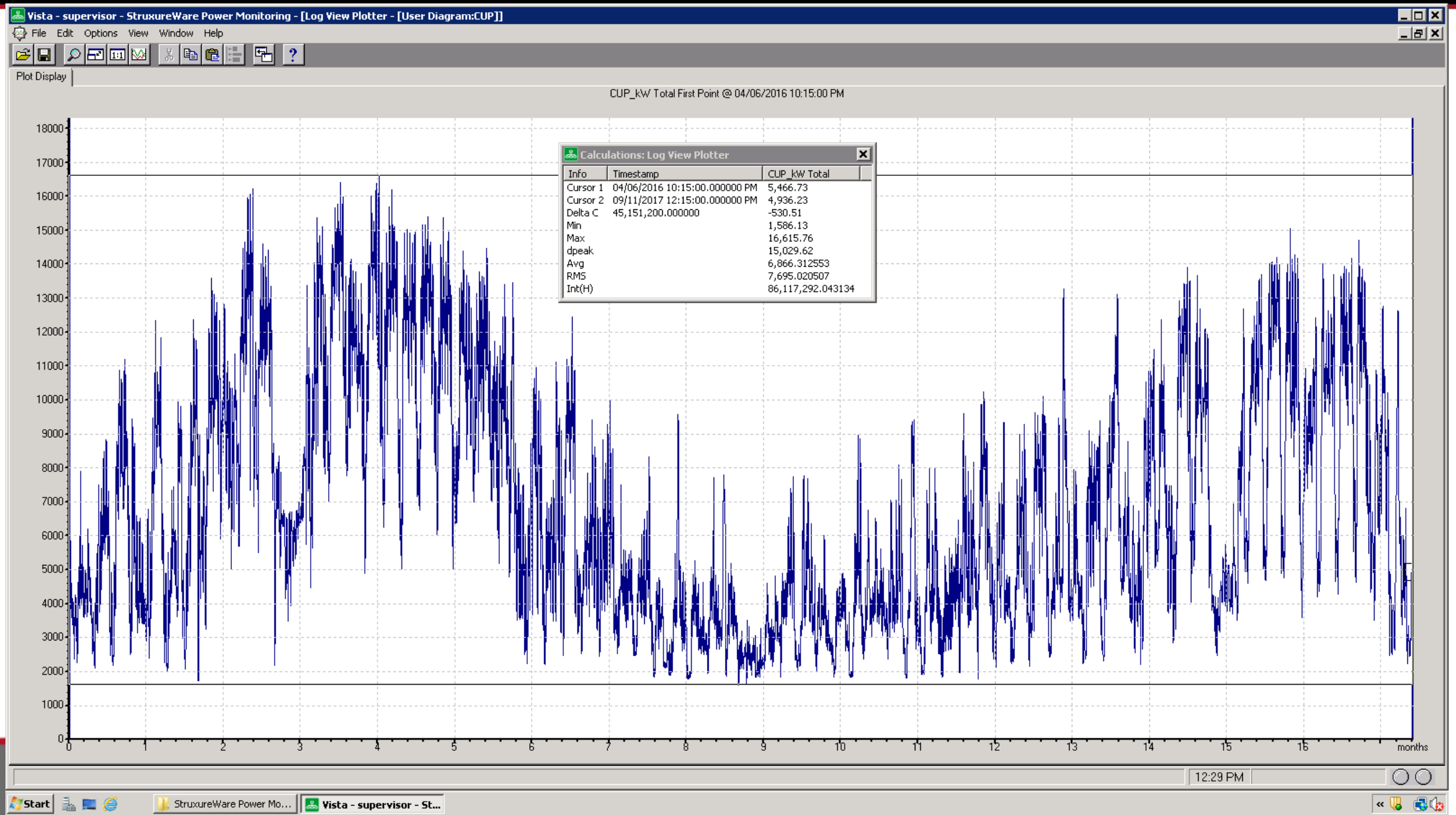
**SEU Determination**

Known energy systems were ranked (Histogram Chart) based on total annual energy consumption. The largest energy use for Nissan Canton is Chilled Water Generation.

## NNA-C 2015 Criteria and Ratings Worksheet for Ranking SEU's



# MAX 16,616 KW

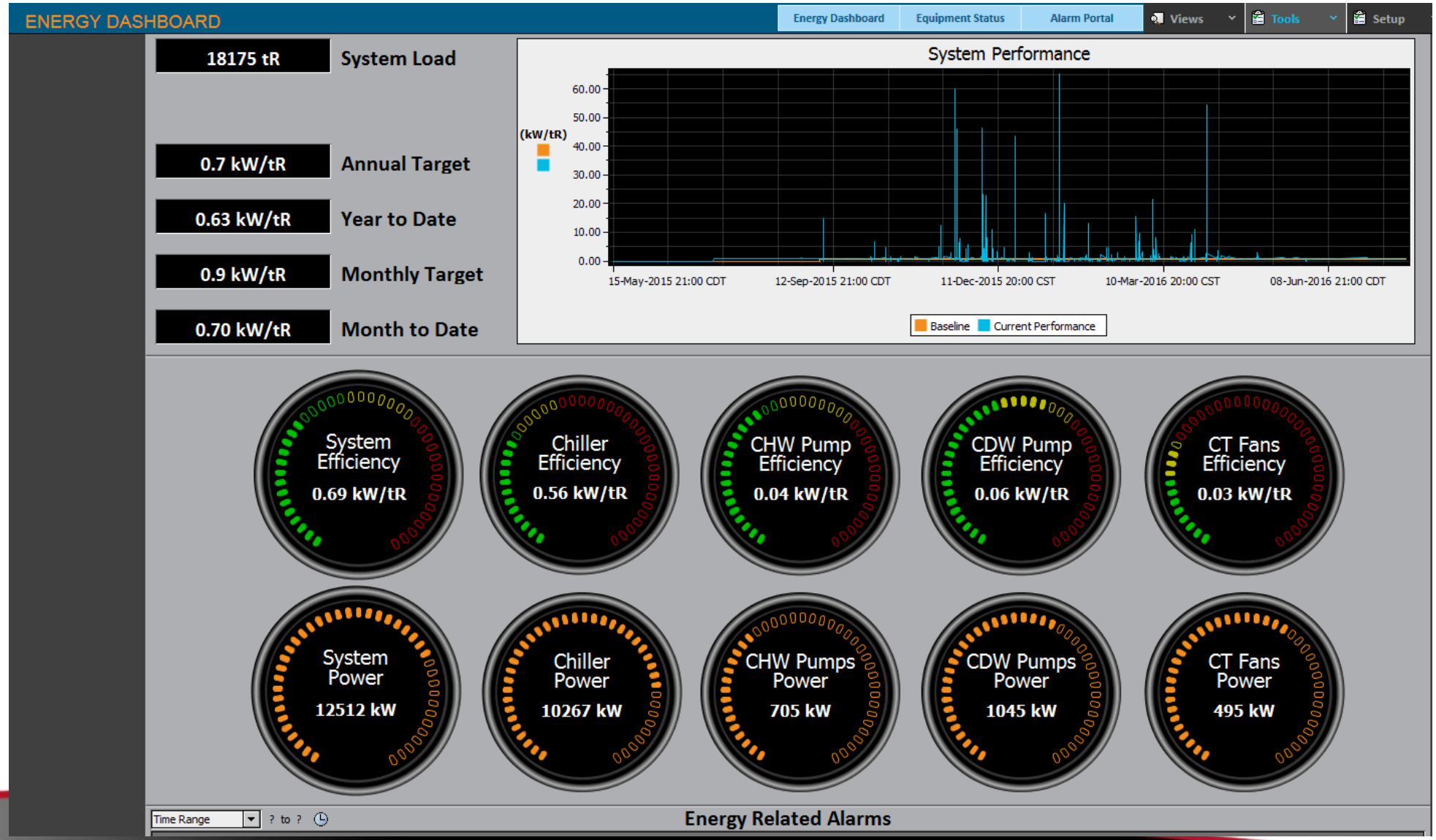

Vista - supervisor - StruxureWare Power Monitoring - [Log View Plotter - [User Diagram:CUP]]
File Edit Options View Window Help
Plot Display
CUP_kW Total First Point @ 04/06/2016 10:15:00 PM
Calculations: Log View Plotter
Info | Timestamp | CUP_kW Total
Cursor 1 | 04/06/2016 10:15:00.000000 PM | 5,466.73
Cursor 2 | 09/11/2017 12:15:00.000000 PM | 4,936.23
Delta C | 45,151,200.000000 | -530.51
Min | | 1,586.13
Max | | 16,615.76
dpeak | | 15,029.62
Avg | | 6,866.312553
RMS | | 7,695.020507
Int(H) | | 86,117,292.043134
18000
17000
16000
15000
14000
13000
12000
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
months
12:29 PM
Start
StruxureWare Power Mo...
Vista - supervisor - St...

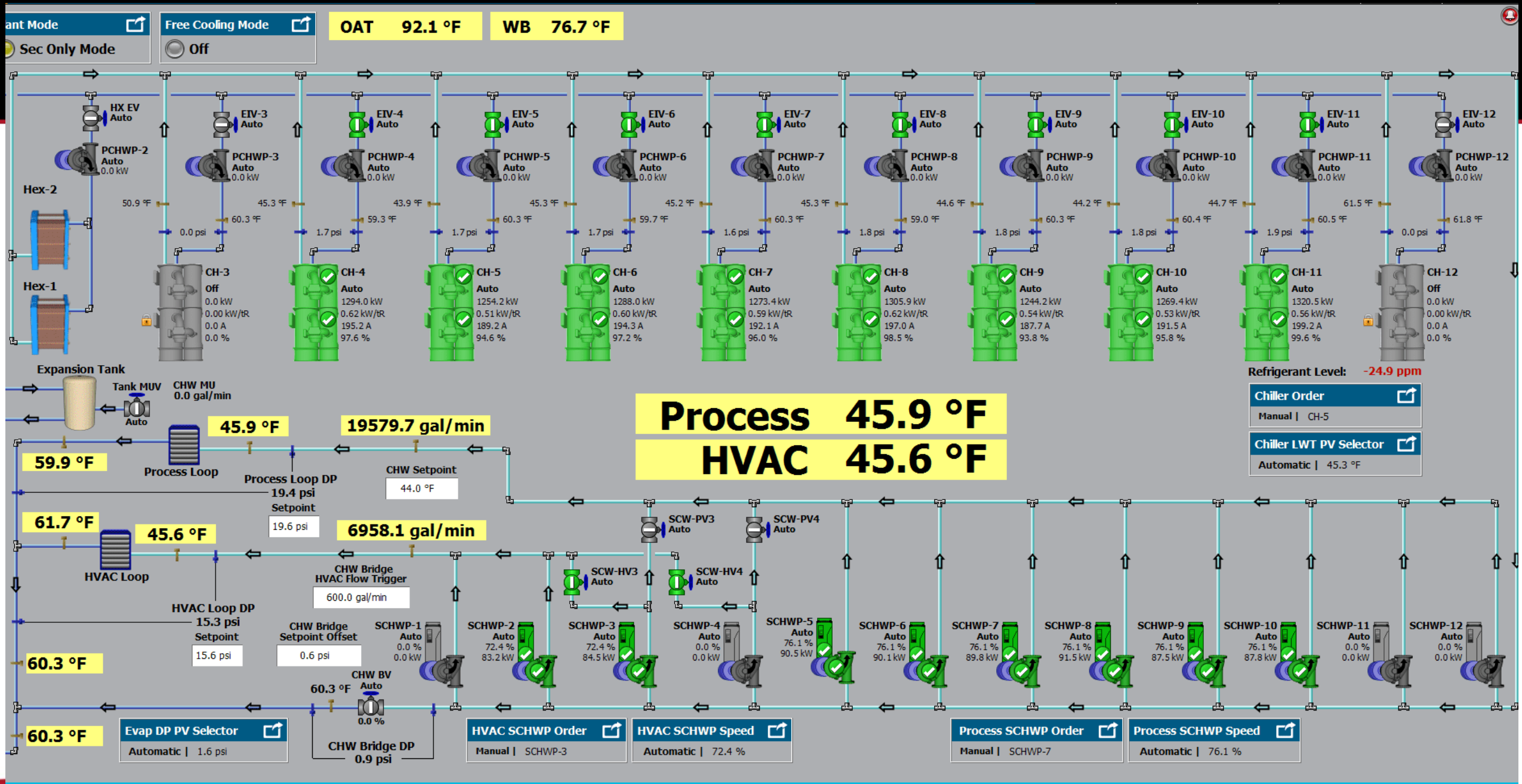
# Canton Utilities Plant (CUP)

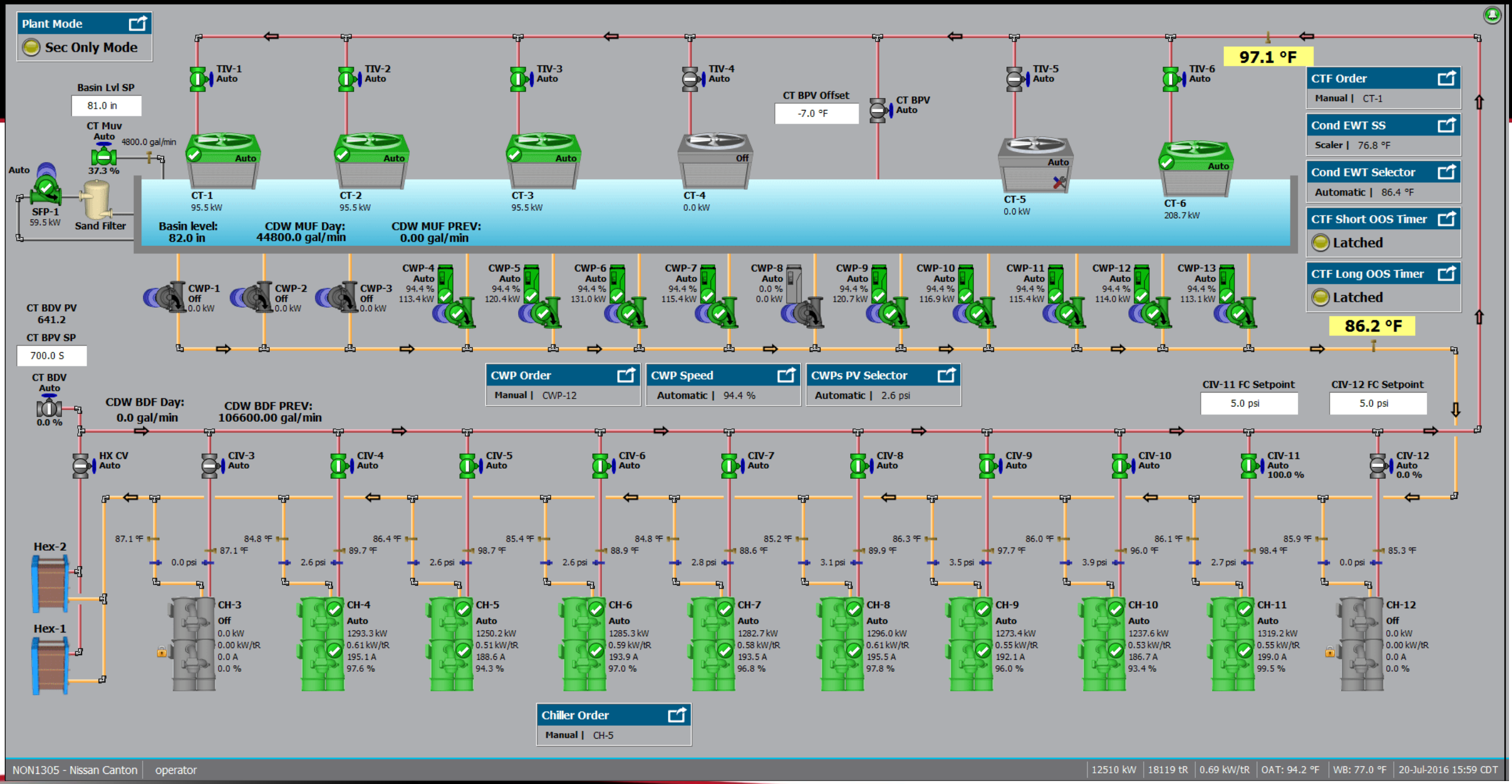
Largest Chiller Plant in State of Mississippi 25,500 Tons

# CUP Chillers 2550 Ton

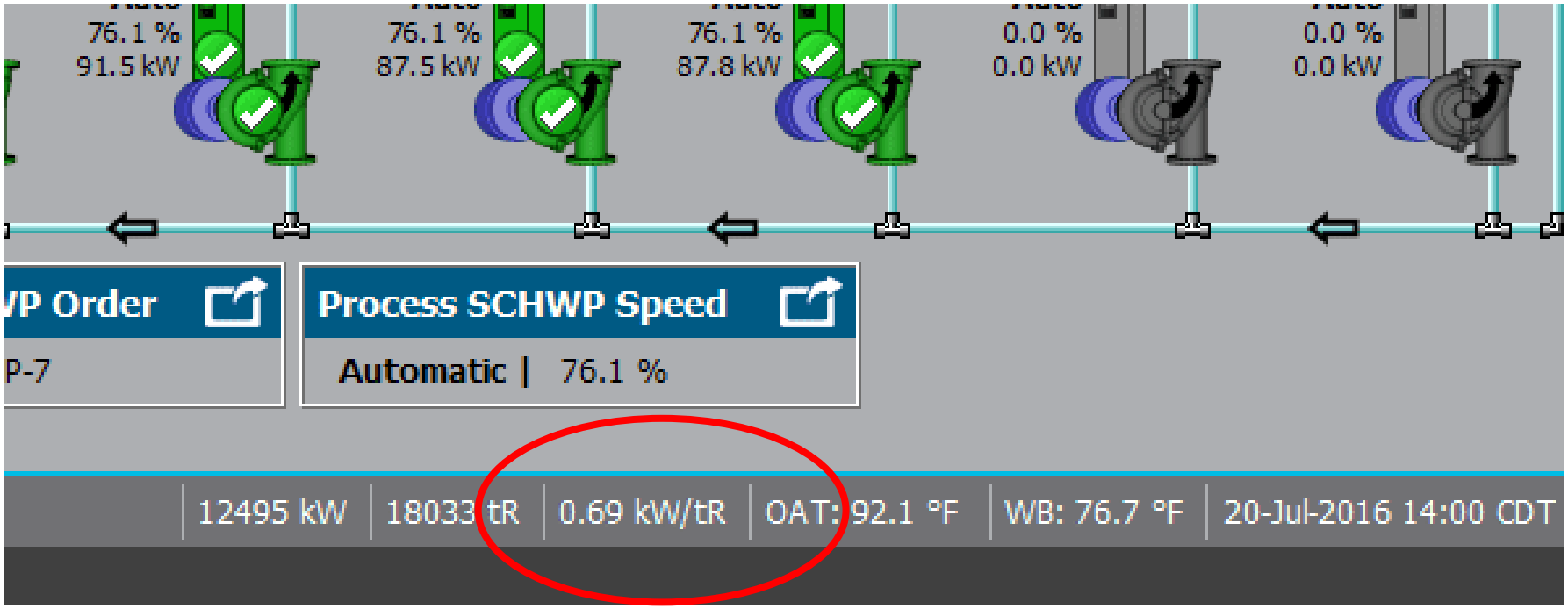
# Energy Dashboard for Chiller Plant

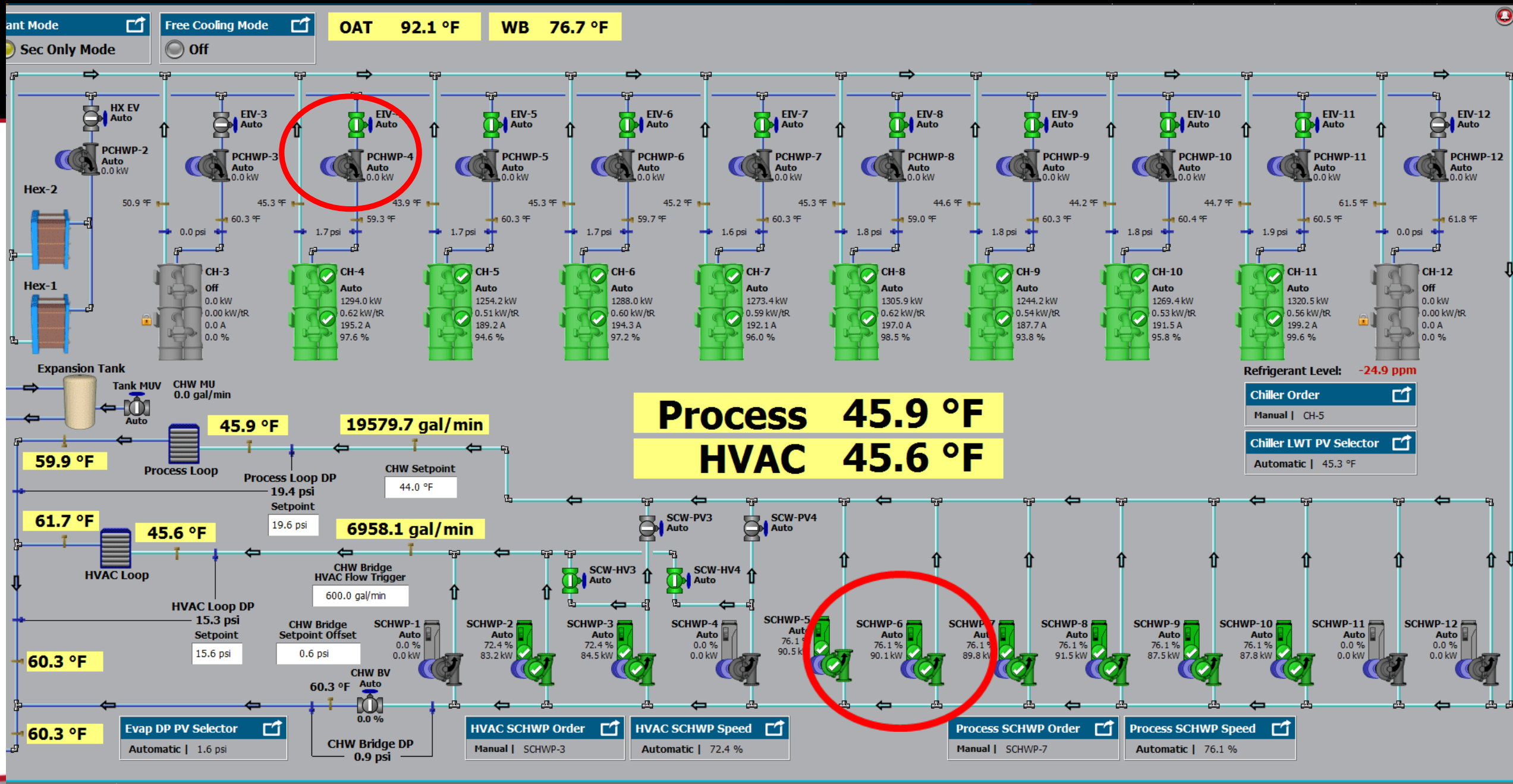



ant Mode
Sec Only Mode
Free Cooling Mode
Off
OAT 92.1 °F
WB 76.7 °F
HX EV Auto
PCHWP-2 Auto 0.0 kW
Hex-2
Hex-1
EIV-3 Auto
PCHWP-3 Auto 0.0 kW
EIV-4 Auto
PCHWP-4 Auto 0.0 kW
EIV-5 Auto
PCHWP-5 Auto 0.0 kW
EIV-6 Auto
PCHWP-6 Auto 0.0 kW
EIV-7 Auto
PCHWP-7 Auto 0.0 kW
EIV-8 Auto
PCHWP-8 Auto 0.0 kW
EIV-9 Auto
PCHWP-9 Auto 0.0 kW
EIV-10 Auto
PCHWP-10 Auto 0.0 kW
EIV-11 Auto
PCHWP-11 Auto 0.0 kW
EIV-12 Auto
PCHWP-12 Auto 0.0 kW
50.9 °F
45.3 °F
43.9 °F
45.3 °F
45.2 °F
45.3 °F
44.6 °F
44.2 °F
44.7 °F
61.5 °F
61.8 °F
0.0 psi
60.3 °F
1.7 psi
59.3 °F
1.7 psi
60.3 °F
1.7 psi
59.7 °F
1.6 psi
60.3 °F
1.8 psi
59.0 °F
1.8 psi
60.3 °F
1.8 psi
60.4 °F
1.9 psi
60.5 °F
0.0 psi
CH-3 Off 0.0 kW 0.00 kW/tR 0.0 A 0.0 %
CH-4 Auto 1294.0 kW 0.62 kW/tR 195.2 A 97.6 %
CH-5 Auto 1254.2 kW 0.51 kW/tR 189.2 A 94.6 %
CH-6 Auto 1288.0 kW 0.60 kW/tR 194.3 A 97.2 %
CH-7 Auto 1273.4 kW 0.59 kW/tR 192.1 A 96.0 %
CH-8 Auto 1305.9 kW 0.62 kW/tR 197.0 A 98.5 %
CH-9 Auto 1244.2 kW 0.54 kW/tR 187.7 A 93.8 %
CH-10 Auto 1269.4 kW 0.53 kW/tR 191.5 A 95.8 %
CH-11 Auto 1320.5 kW 0.56 kW/tR 199.2 A 99.6 %
CH-12 Off 0.0 kW 0.00 kW/tR 0.0 A 0.0 %
Refrigerant Level: -24.9 ppm
Chiller Order
Manual | CH-5
Chiller LWT PV Selector
Automatic | 45.3 °F
Expansion Tank
Tank MUV Auto
CHW MU 0.0 gal/min
Process 45.9 °F
HVAC 45.6 °F
45.9 °F
19579.7 gal/min
59.9 °F
Process Loop
Process Loop DP 19.4 psi
Setpoint 19.6 psi
CHW Setpoint 44.0 °F
61.7 °F
45.6 °F
6958.1 gal/min
HVAC Loop
HVAC Loop DP 15.3 psi
Setpoint 15.6 psi
CHW Bridge HVAC Flow Trigger 600.0 gal/min
CHW Bridge Setpoint Offset 0.6 psi
SCW-PV3 Auto
SCW-PV4 Auto
SCW-HV3 Auto
SCW-HV4 Auto
SCHWP-1 Auto 0.0 % 0.0 kW
SCHWP-2 Auto 72.4 % 83.2 kW
SCHWP-3 Auto 72.4 % 84.5 kW
SCHWP-4 Auto 0.0 % 0.0 kW
SCHWP-5 Auto 76.1 % 90.5 kW
SCHWP-6 Auto 76.1 % 90.1 kW
SCHWP-7 Auto 76.1 % 89.8 kW
SCHWP-8 Auto 76.1 % 91.5 kW
SCHWP-9 Auto 76.1 % 87.5 kW
SCHWP-10 Auto 76.1 % 87.8 kW
SCHWP-11 Auto 0.0 % 0.0 kW
SCHWP-12 Auto 0.0 % 0.0 kW
60.3 °F
CHW BV Auto
60.3 °F
0.0 %
60.3 °F
CHW Bridge DP 0.9 psi
Evap DP PV Selector
Automatic | 1.6 psi
HVAC SCHWP Order
Manual | SCHWP-3
HVAC SCHWP Speed
Automatic | 72.4 %
Process SCHWP Order
Manual | SCHWP-7
Process SCHWP Speed
Automatic | 76.1 %
1305 - Nissan Canton
operator
12495 kW
18033 tR
0.69 kW/tR
OAT: 92.1 °F
WB: 76.7 °F
20-Jul-2016 14:00 CDT


Plant Mode
Sec Only Mode
Basin Lvl SP
81.0 in
CT Muv
Auto
4800.0 gal/min
37.3 %
Auto
SFP-1
59.5 kW
Sand Filter
TIV-1 Auto
TIV-2 Auto
TIV-3 Auto
TIV-4 Auto
CT BPV Offset
-7.0 °F
CT BPV
Auto
TIV-5 Auto
TIV-6 Auto
97.1 °F
CT-1
95.5 kW
CT-2
95.5 kW
CT-3
95.5 kW
CT-4
0.0 kW
CT-5
0.0 kW
CT-6
208.7 kW
Basin level:
82.0 in
CDW MUF Day:
44800.0 gal/min
CDW MUF PREV:
0.00 gal/min
CTF Order
Manual | CT-1
Cond EWT SS
Scaler | 76.8 °F
Cond EWT Selector
Automatic | 86.4 °F
CTF Short OOS Timer
Latched
CTF Long OOS Timer
Latched
CWP-1 Off 0.0 kW
CWP-2 Off 0.0 kW
CWP-3 Off 0.0 kW
CWP-4 Auto 94.4 % 113.4 kW
CWP-5 Auto 94.4 % 120.4 kW
CWP-6 Auto 94.4 % 131.0 kW
CWP-7 Auto 94.4 % 115.4 kW
CWP-8 Auto 0.0 % 0.0 kW
CWP-9 Auto 94.4 % 120.7 kW
CWP-10 Auto 94.4 % 116.9 kW
CWP-11 Auto 94.4 % 115.4 kW
CWP-12 Auto 94.4 % 114.0 kW
CWP-13 Auto 94.4 % 113.1 kW
86.2 °F
CT BDV PV
641.2
CT BPV SP
700.0 S
CT BDV
Auto
0.0 %
CDW BDF Day:
0.0 gal/min
CDW BDF PREV:
106600.00 gal/min
CWP Order
Manual | CWP-12
CWP Speed
Automatic | 94.4 %
CWPs PV Selector
Automatic | 2.6 psi
CIV-11 FC Setpoint
5.0 psi
CIV-12 FC Setpoint
5.0 psi
HX CV Auto
CIV-3 Auto
CIV-4 Auto
CIV-5 Auto
CIV-6 Auto
CIV-7 Auto
CIV-8 Auto
CIV-9 Auto
CIV-10 Auto
CIV-11 Auto 100.0 %
CIV-12 Auto 0.0 %
Hex-2
Hex-1
87.1 °F
84.8 °F
86.4 °F
85.4 °F
84.8 °F
85.2 °F
86.3 °F
86.0 °F
86.1 °F
85.9 °F
0.0 psi
2.6 psi
2.6 psi
2.6 psi
2.8 psi
3.1 psi
3.5 psi
3.9 psi
2.7 psi
0.0 psi
89.7 °F
98.7 °F
88.9 °F
88.6 °F
89.9 °F
97.7 °F
96.0 °F
98.4 °F
85.3 °F
CH-3 Off 0.0 kW 0.00 kW/tR 0.0 A 0.0 %
CH-4 Auto 1293.3 kW 0.61 kW/tR 195.1 A 97.6 %
CH-5 Auto 1250.2 kW 0.51 kW/tR 188.6 A 94.3 %
CH-6 Auto 1285.3 kW 0.59 kW/tR 193.9 A 97.0 %
CH-7 Auto 1282.7 kW 0.58 kW/tR 193.5 A 96.8 %
CH-8 Auto 1296.0 kW 0.61 kW/tR 195.5 A 97.8 %
CH-9 Auto 1273.4 kW 0.55 kW/tR 192.1 A 96.0 %
CH-10 Auto 1237.6 kW 0.53 kW/tR 186.7 A 93.4 %
CH-11 Auto 1319.2 kW 0.55 kW/tR 199.0 A 99.5 %
CH-12 Off 0.0 kW 0.00 kW/tR 0.0 A 0.0 %
Chiller Order
Manual | CH-5
NON1305 - Nissan Canton
operator
12510 kW
18119 tR
0.69 kW/tR
OAT: 94.2 °F
WB: 77.0 °F
20-Jul-2016 15:59 CDT

# System kw/ton running at 2:00 PM 7/20/2016

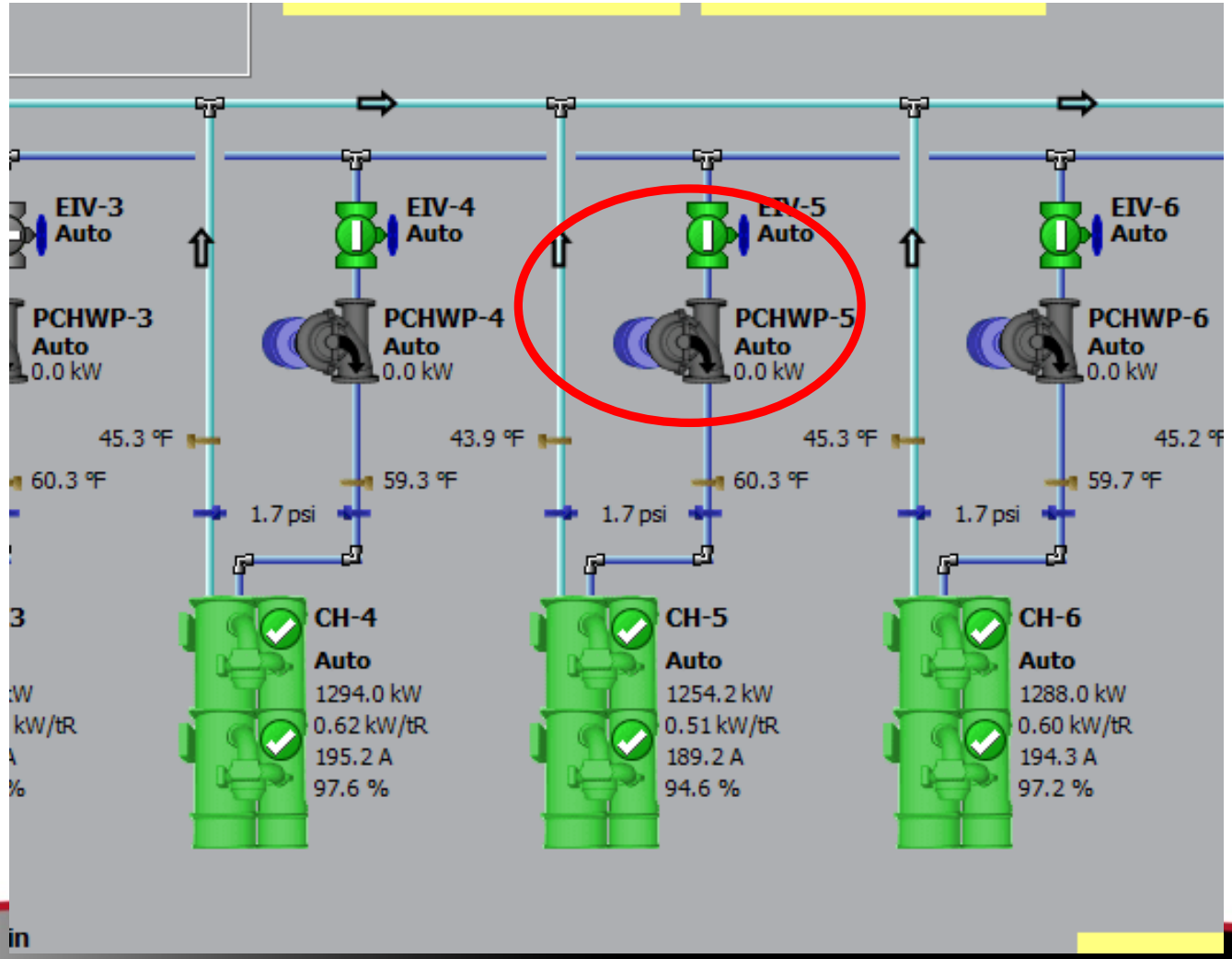


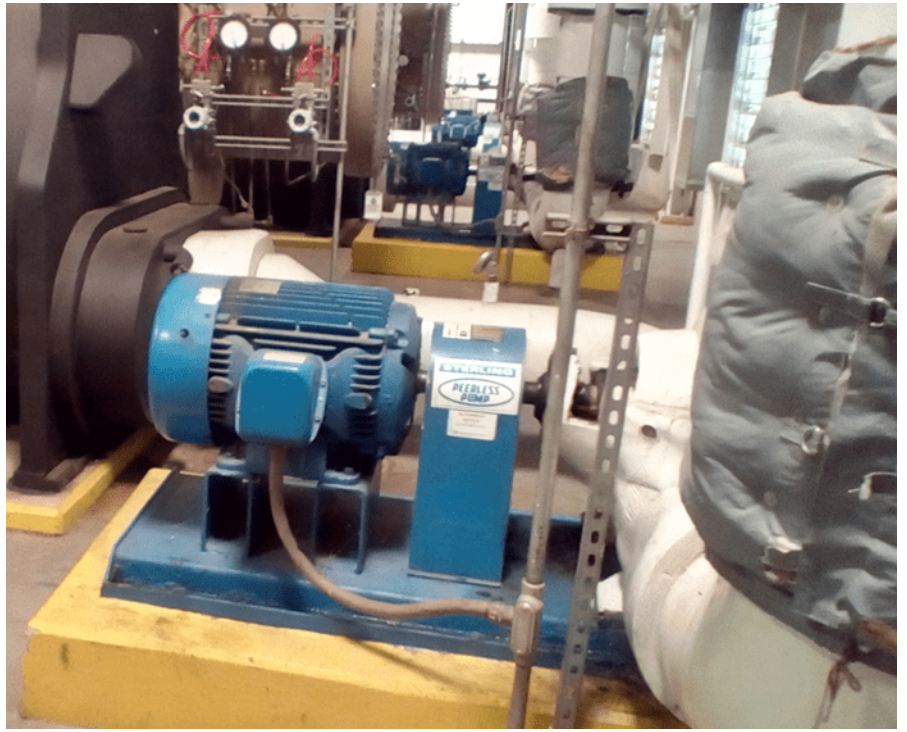

ant Mode
Sec Only Mode
Free Cooling Mode
Off
OAT 92.1 °F
WB 76.7 °F
HX EV Auto
PCHWP-2 Auto 0.0 kW
Hex-2
Hex-1
EIV-3 Auto
PCHWP-3 Auto 0.0 kW
EIV-4 Auto
PCHWP-4 Auto 0.0 kW
EIV-5 Auto
PCHWP-5 Auto 0.0 kW
EIV-6 Auto
PCHWP-6 Auto 0.0 kW
EIV-7 Auto
PCHWP-7 Auto 0.0 kW
EIV-8 Auto
PCHWP-8 Auto 0.0 kW
EIV-9 Auto
PCHWP-9 Auto 0.0 kW
EIV-10 Auto
PCHWP-10 Auto 0.0 kW
EIV-11 Auto
PCHWP-11 Auto 0.0 kW
EIV-12 Auto
PCHWP-12 Auto 0.0 kW
50.9 °F
45.3 °F
43.9 °F
45.3 °F
45.2 °F
45.3 °F
44.6 °F
44.2 °F
44.7 °F
61.5 °F
61.8 °F
60.3 °F
59.3 °F
60.3 °F
59.7 °F
60.3 °F
59.0 °F
60.3 °F
60.4 °F
60.5 °F
0.0 psi
1.7 psi
1.7 psi
1.7 psi
1.6 psi
1.8 psi
1.8 psi
1.8 psi
1.9 psi
0.0 psi
CH-3 Off 0.0 kW 0.00 kW/tR 0.0 A 0.0 %
CH-4 Auto 1294.0 kW 0.62 kW/tR 195.2 A 97.6 %
CH-5 Auto 1254.2 kW 0.51 kW/tR 189.2 A 94.6 %
CH-6 Auto 1288.0 kW 0.60 kW/tR 194.3 A 97.2 %
CH-7 Auto 1273.4 kW 0.59 kW/tR 192.1 A 96.0 %
CH-8 Auto 1305.9 kW 0.62 kW/tR 197.0 A 98.5 %
CH-9 Auto 1244.2 kW 0.54 kW/tR 187.7 A 93.8 %
CH-10 Auto 1269.4 kW 0.53 kW/tR 191.5 A 95.8 %
CH-11 Auto 1320.5 kW 0.56 kW/tR 199.2 A 99.6 %
CH-12 Off 0.0 kW 0.00 kW/tR 0.0 A 0.0 %
Refrigerant Level: -24.9 ppm
Chiller Order
Manual | CH-5
Chiller LWT PV Selector
Automatic | 45.3 °F
Expansion Tank
Tank MUV Auto
CHW MU 0.0 gal/min
Process 45.9 °F
HVAC 45.6 °F
59.9 °F
Process Loop
45.9 °F
19579.7 gal/min
Process Loop DP 19.4 psi
Setpoint 19.6 psi
CHW Setpoint 44.0 °F
61.7 °F
45.6 °F
6958.1 gal/min
HVAC Loop
HVAC Loop DP 15.3 psi
Setpoint 15.6 psi
CHW Bridge HVAC Flow Trigger 600.0 gal/min
CHW Bridge Setpoint Offset 0.6 psi
60.3 °F
60.3 °F
CHW BV Auto 0.0 %
60.3 °F
CHW Bridge DP 0.9 psi
SCW-PV3 Auto
SCW-PV4 Auto
SCW-HV3 Auto
SCW-HV4 Auto
SCHWP-1 Auto 0.0 % 0.0 kW
SCHWP-2 Auto 72.4 % 83.2 kW
SCHWP-3 Auto 72.4 % 84.5 kW
SCHWP-4 Auto 0.0 % 0.0 kW
SCHWP-5 Auto 76.1 % 90.5 kW
SCHWP-6 Auto 76.1 % 90.1 kW
SCHWP-7 Auto 76.1 % 89.8 kW
SCHWP-8 Auto 76.1 % 91.5 kW
SCHWP-9 Auto 76.1 % 87.5 kW
SCHWP-10 Auto 76.1 % 87.8 kW
SCHWP-11 Auto 0.0 % 0.0 kW
SCHWP-12 Auto 0.0 % 0.0 kW
Evap DP PV Selector
Automatic | 1.6 psi
HVAC SCHWP Order
Manual | SCHWP-3
HVAC SCHWP Speed
Automatic | 72.4 %
Process SCHWP Order
Manual | SCHWP-7
Process SCHWP Speed
Automatic | 76.1 %
1305 - Nissan Canton
operator
12495 kW
18033 tR
0.69 kW/tR
OAT: 92.1 °F
WB: 76.7 °F
20-Jul-2016 14:00 CDT

# CHW Pump Optimization

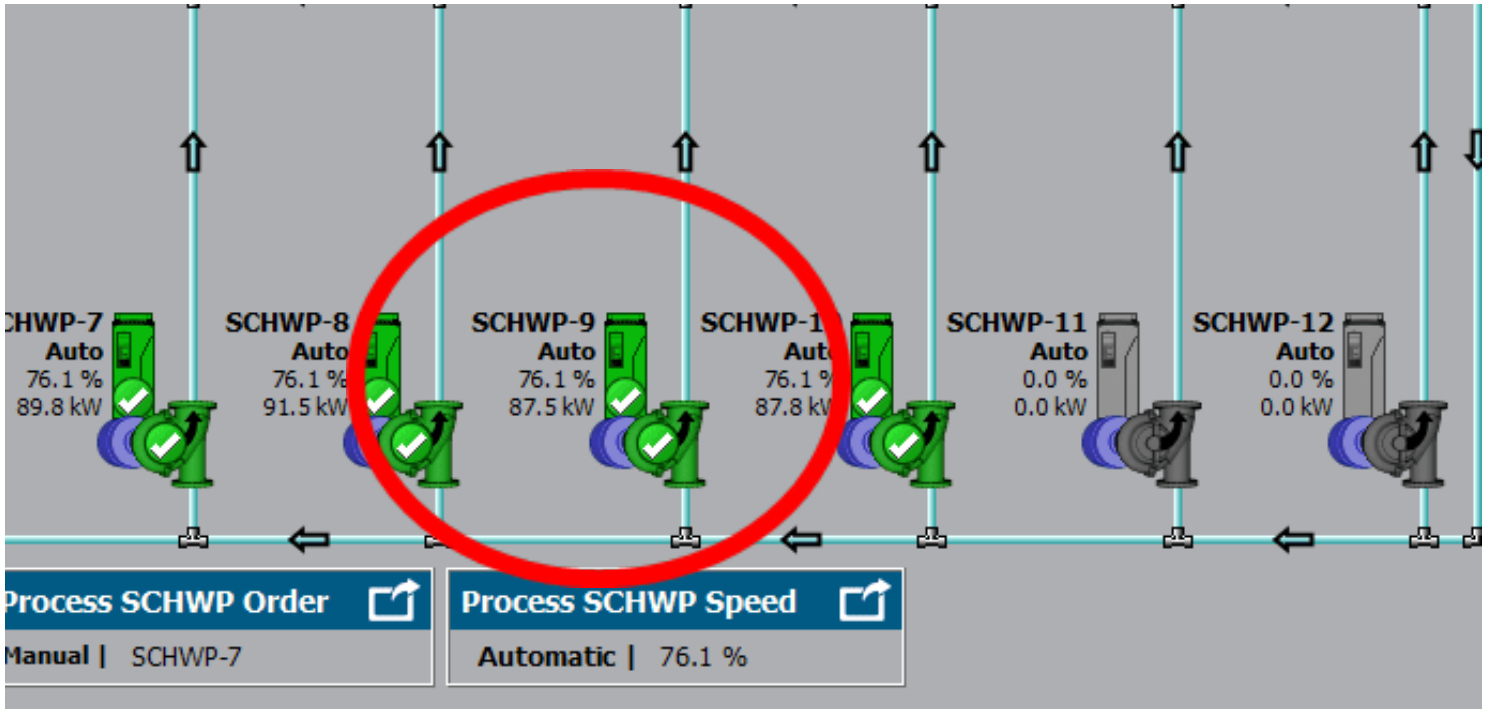
| Nissan - Mississippi - Chiller Plant Upgrade Energy Savings Summary | | | |
|---|---|---|---|
| A | CHW Pump Optimization | | |
| | Estimated existing PCHW pump energy | 752,494 | kWh |
| | Estimated existing SCHW pump energy | 3,262,280 | kWh |
| | Projected PCHW pump energy | 194,530 | kWh |
| | Projected SCHW pump energy | 2,278,301 | kWh |
| | Projected CHW pump energy savings | 1,541,943 | kWh |

# Primary Pumps are Off – Pull Water Through



# Secondary Chiller Water Pumps



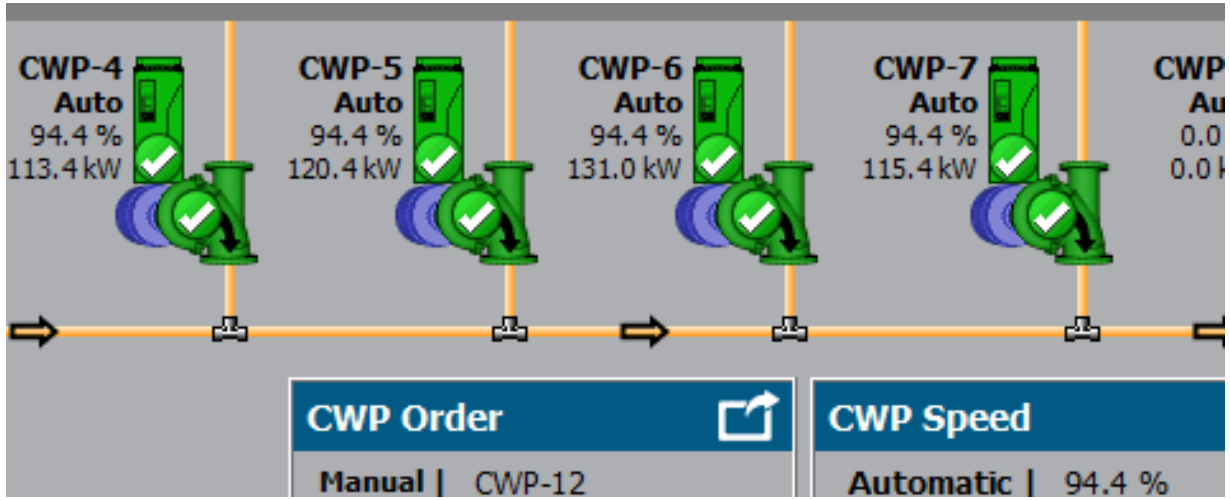
# Reduced Thermal Load From CHW

| Nissan - Mississippi - Chiller Plant Upgrade Energy Savings Summary | | | |
|---|---|---|---|
| B | Reduced Thermal Load From CHW Pumping | | |
| | Reduced CHW pumping electrical energy | 1,541,943 | kWh |
| | Reduced pumping brake hp | 2,066,947 | BHP |
| | Equivalent cooling reduction | 438,365 | Tons |
| | Estimated current plant efficiency | 1.00 | kW / Ton |
| | Estimated electrical savings | 439,033 | kWh |

# Condenser Pump Optimization

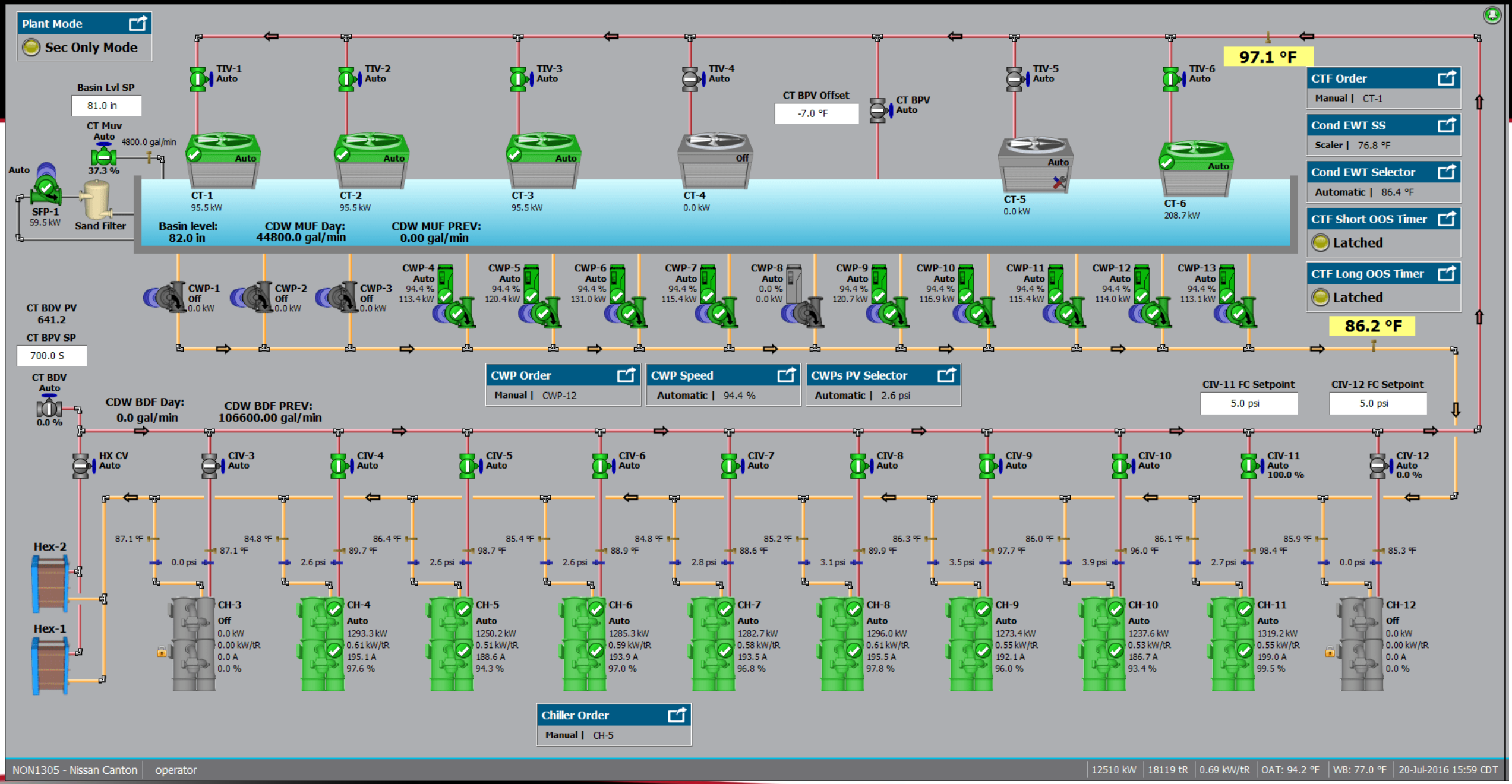
| Nissan - Mississippi - Chiller Plant Upgrade Energy Savings Summary | | | |
|---|---|---|---|
| C | Condenser Pump Optimization | | |
| | Existing CDW pump energy | 2,675,533 | kWh |
| | Projected CDW pump energy | 1,302,602 | kWh |
| | Projected CDW pump energy savings | 1,372,932 | kWh |

# Condenser Pumps – Added VFDs




# Chiller Water Temperature Optimization

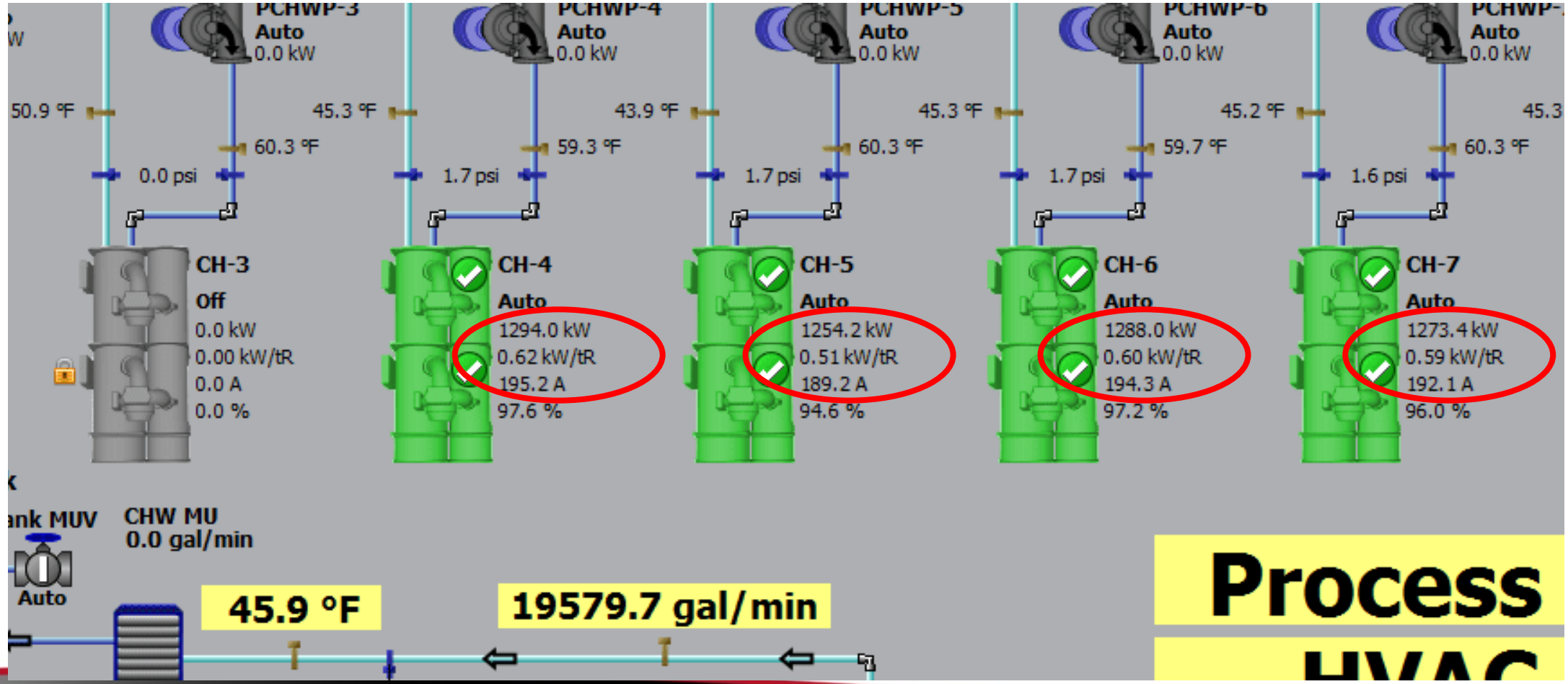
| Nissan - Mississippi - Chiller Plant Upgrade Energy Savings Summary | | | |
|---|---|---|---|
| D | Chiller Water Temperature Optimization | | |
| | Current Efficency Rating CDW = 77°F, CHW = 41°F | 90% | |
| | Projected Efficency Rating CDW = 72°F, CHW = 42°F | 83% | |
| | Projected Water Temperature Savings | 7% | |
| | Rated Chiller average efficiency | 0.726 | kW/ton |
| | Current annual chiller kWh | 24,947,606 | kWh |
| | Projected annual chiller kWh | 23,201,274 | kWh |
| | Savings from water temperature optimization | 1,746,332 | kWh |


Plant Mode
Sec Only Mode
Basin Lvl SP
81.0 in
CT Muv
Auto
4800.0 gal/min
37.3 %
Auto
SFP-1
59.5 kW
Sand Filter
TIV-1 Auto
TIV-2 Auto
TIV-3 Auto
TIV-4 Auto
CT BPV Offset
-7.0 °F
CT BPV
Auto
TIV-5 Auto
TIV-6 Auto
97.1 °F
CT-1
95.5 kW
CT-2
95.5 kW
CT-3
95.5 kW
CT-4
0.0 kW
CT-5
0.0 kW
CT-6
208.7 kW
Basin level:
82.0 in
CDW MUF Day:
44800.0 gal/min
CDW MUF PREV:
0.00 gal/min
CTF Order
Manual | CT-1
Cond EWT SS
Scaler | 76.8 °F
Cond EWT Selector
Automatic | 86.4 °F
CTF Short OOS Timer
Latched
CTF Long OOS Timer
Latched
CWP-1 Off 0.0 kW
CWP-2 Off 0.0 kW
CWP-3 Off 0.0 kW
CWP-4 Auto 94.4 % 113.4 kW
CWP-5 Auto 94.4 % 120.4 kW
CWP-6 Auto 94.4 % 131.0 kW
CWP-7 Auto 94.4 % 115.4 kW
CWP-8 Auto 0.0 % 0.0 kW
CWP-9 Auto 94.4 % 120.7 kW
CWP-10 Auto 94.4 % 116.9 kW
CWP-11 Auto 94.4 % 115.4 kW
CWP-12 Auto 94.4 % 114.0 kW
CWP-13 Auto 94.4 % 113.1 kW
86.2 °F
CT BDV PV
641.2
CT BPV SP
700.0 S
CT BDV
Auto
0.0 %
CDW BDF Day:
0.0 gal/min
CDW BDF PREV:
106600.00 gal/min
CWP Order
Manual | CWP-12
CWP Speed
Automatic | 94.4 %
CWPs PV Selector
Automatic | 2.6 psi
CIV-11 FC Setpoint
5.0 psi
CIV-12 FC Setpoint
5.0 psi
HX CV Auto
CIV-3 Auto
CIV-4 Auto
CIV-5 Auto
CIV-6 Auto
CIV-7 Auto
CIV-8 Auto
CIV-9 Auto
CIV-10 Auto
CIV-11 Auto 100.0 %
CIV-12 Auto 0.0 %
Hex-2
Hex-1
87.1 °F
84.8 °F
86.4 °F
85.4 °F
84.8 °F
85.2 °F
86.3 °F
86.0 °F
86.1 °F
85.9 °F
0.0 psi
2.6 psi
2.6 psi
2.6 psi
2.8 psi
3.1 psi
3.5 psi
3.9 psi
2.7 psi
0.0 psi
89.7 °F
98.7 °F
88.9 °F
88.6 °F
89.9 °F
97.7 °F
96.0 °F
98.4 °F
85.3 °F
CH-3 Off 0.0 kW 0.00 kW/tR 0.0 A 0.0 %
CH-4 Auto 1293.3 kW 0.61 kW/tR 195.1 A 97.6 %
CH-5 Auto 1250.2 kW 0.51 kW/tR 188.6 A 94.3 %
CH-6 Auto 1285.3 kW 0.59 kW/tR 193.9 A 97.0 %
CH-7 Auto 1282.7 kW 0.58 kW/tR 193.5 A 96.8 %
CH-8 Auto 1296.0 kW 0.61 kW/tR 195.5 A 97.8 %
CH-9 Auto 1273.4 kW 0.55 kW/tR 192.1 A 96.0 %
CH-10 Auto 1237.6 kW 0.53 kW/tR 186.7 A 93.4 %
CH-11 Auto 1319.2 kW 0.55 kW/tR 199.0 A 99.5 %
CH-12 Off 0.0 kW 0.00 kW/tR 0.0 A 0.0 %
Chiller Order
Manual | CH-5
NON1305 - Nissan Canton
operator
12510 kW
18119 tR
0.69 kW/tR
OAT: 94.2 °F
WB: 77.0 °F
20-Jul-2016 15:59 CDT

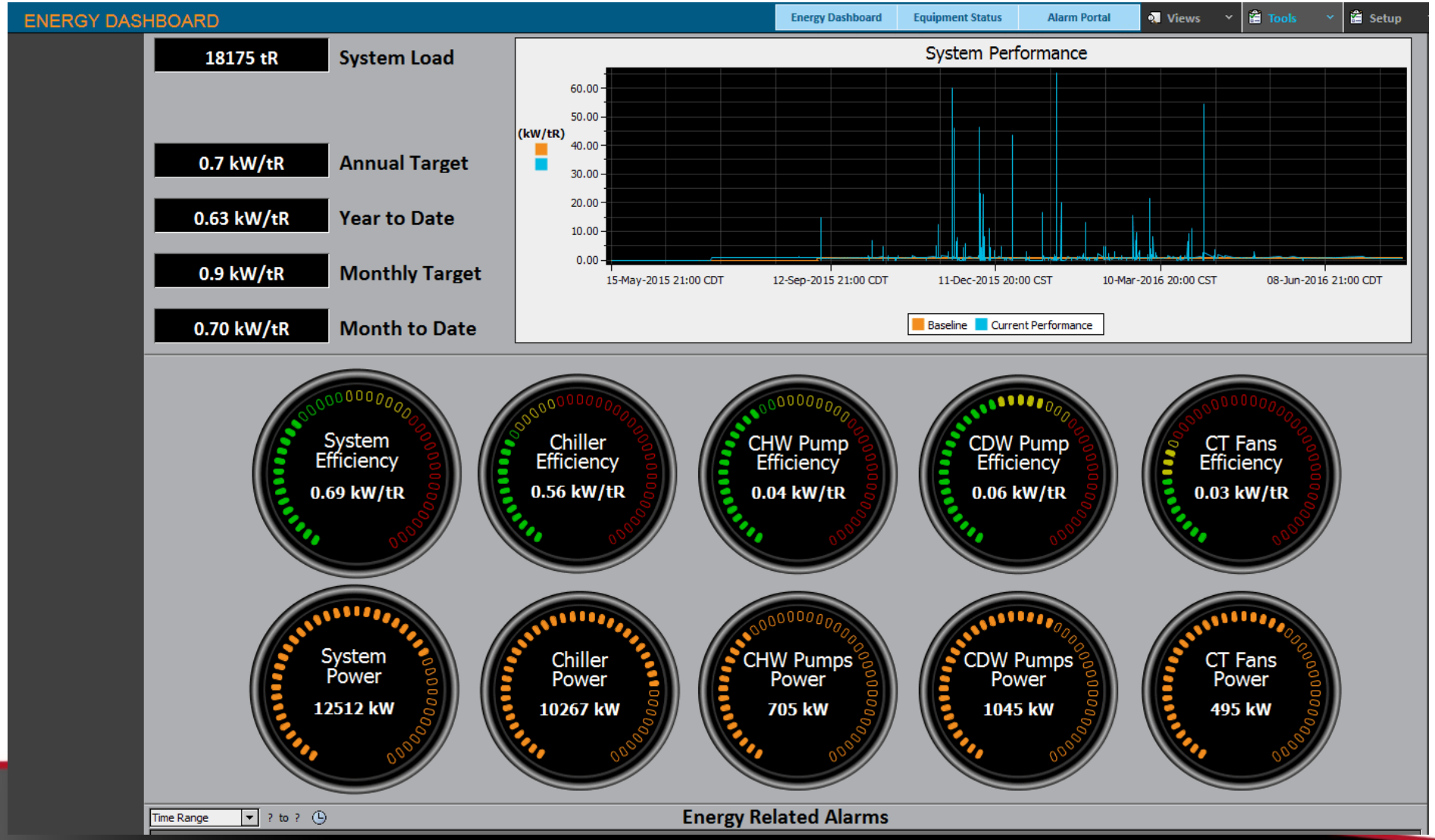
# Chiller Sequence Optimization

| Nissan - Mississippi - Chiller Plant Upgrade Energy Savings Summary | | | |
|---|---|---|---|
| E | Chiller Sequence Optimization | | |
| | Current Chiller average efficiency | 0.726 | kW/ton |
| | Projected Chiller average efficiency | 0.596 | kW/ton |
| | Chiller average efficiency savings | 0.130 | kW/ton |
| | Cooling Production | 35,639,438 | ton-hours |
| | Projected Chiller energy savings | 4,622,630 | kWh |

# Chiller kw/ton running at 3:00 PM 7/20/2016



# Energy Dashboard for Chiller Plant



# Cooling Tower Fan Optimization

| Nissan - Mississippi - Chiller Plant Upgrade Energy Savings Summary | | | |
|---|---|---|---|
| F | Cooling Tower Fan Optimization | | |
| | Current Cooling Tower Fan energy | 2,520,612 | |
| | Projected Cooling Tower Fan energy | 2,424,059 | |
| | Savings from water temp optimization | 96,553 | kWh |

# Chiller Cooling Towers

# Chiller Efficiency Savings

| Nissan - Mississippi - Chiller Plant Upgrade Energy Savings Summary | | | | | |
|---|---|---|---|---|---|
| | Annual Savings Summary* | kWh | | $* | |
| A | Estimated electrical savings | 1,541,943 | $ | 84,807 | |
| B | Reduced thermal load | 439,033 | $ | 24,147 | |
| C | Projected Efficency Rating CDW = 72°F, CHW = 42°F | 1,372,932 | $ | 75,511 | |
| D | Projected annual chiller kWh | 1,746,332 | $ | 96,048 | |
| E | Cooling Production | 4,622,630 | $ | 254,245 | |
| F | Projected Cooling Tower Fan energy | 96,553 | $ | 5,310 | |
| | Totals | 9,819,423 | $ | 540,068 | |
| | * Energy cost - blended average | 0.06 | $ / kWh | | |
| | Overall improvement | 0.28 | kW per ton | | |

# Savings from Optimization

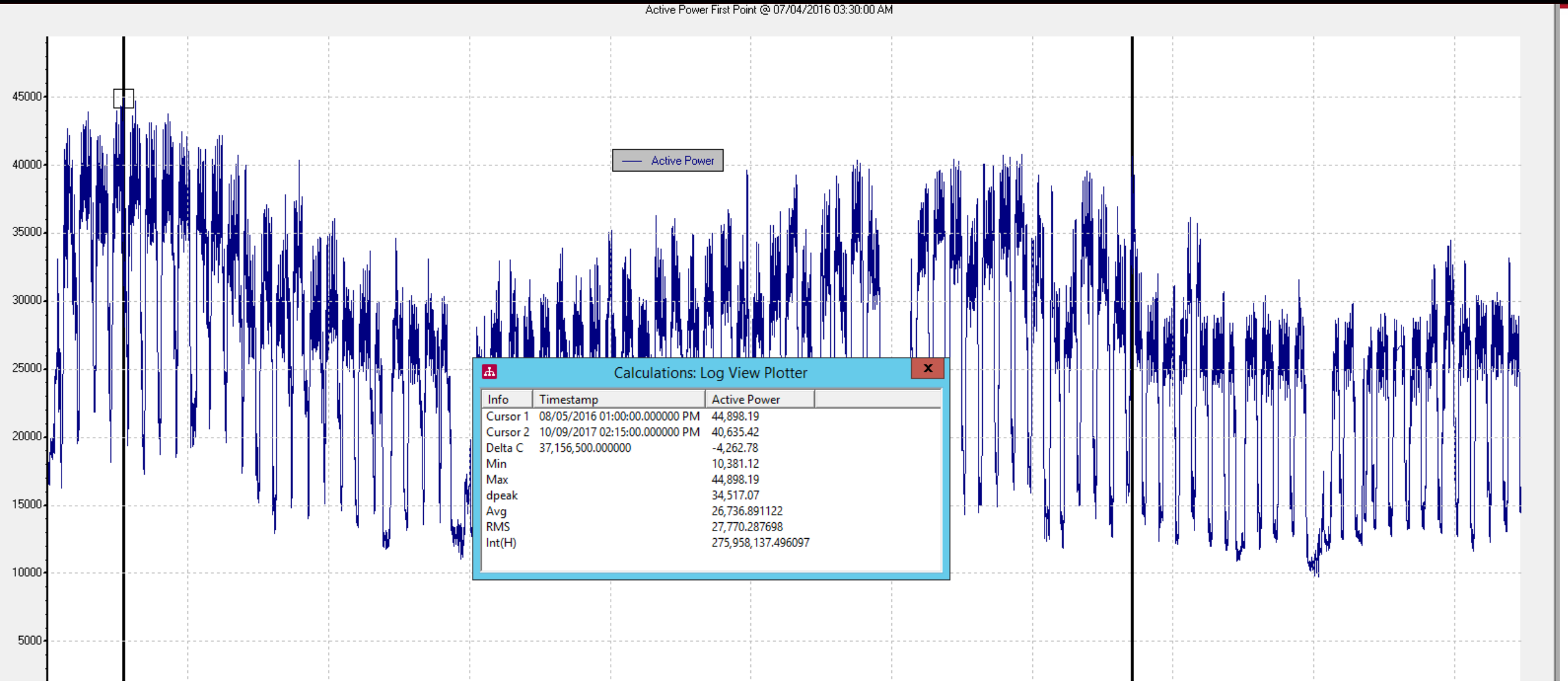
At $0.06/KWHR total savings
$498,480

| Actual Savings | MWHR |
|---|---|
| Sep-15 | 829 |
| Oct-15 | 1230 |
| Nov-15 | 844 |
| Dec-15 | 608 |
| Jan-16 | 574 |
| Feb-16 | 724 |
| Mar-16 | 834 |
| Apr-16 | 741 |
| May-16 | 902 |
| Jun-16 | 513 |
| Jul-16 | 509 |
| Aug-16 | 0 |
| Total | 8308 |

At $0.06/KWHR total savings
$598800

| Actual Savings | MWHR |
|---|---|
| Sep-16 | 935 |
| Oct-16 | 1350 |
| Nov-16 | 1121 |
| Dec-16 | 839 |
| Jan-17 | 851 |
| Feb-17 | 626 |
| Mar-17 | 907 |
| Apr-17 | 847 |
| May-17 | 906 |
| Jun-17 | 707 |
| Jul-17 | 331 |
| Aug-17 | 560 |
| Total | 9980 |

# Over 4000 KW DROP 2016 to 2017



# Over 4000 KW DROP 2016 to 2017

Calculations: Log View Plotter

| Info | Timestamp | Active Power |
|---|---|---|
| Cursor 1 | 08/05/2016 01:00:00.000000 PM | 44,898.19 |
| Cursor 2 | 10/09/2017 02:15:00.000000 PM | 40,635.42 |
| Delta C | 37,156,500.000000 | -4,262.78 |
| Min | | 10,381.12 |
| Max | | 44,898.19 |
| dpeak | | 34,517.07 |
| Avg | | 26,736.891122 |
| RMS | | 27,770.287698 |
| Int(H) | | 275,958,137.496097 |

Savings per Month
$20,000*12=
$240K/year

# END

Questions???