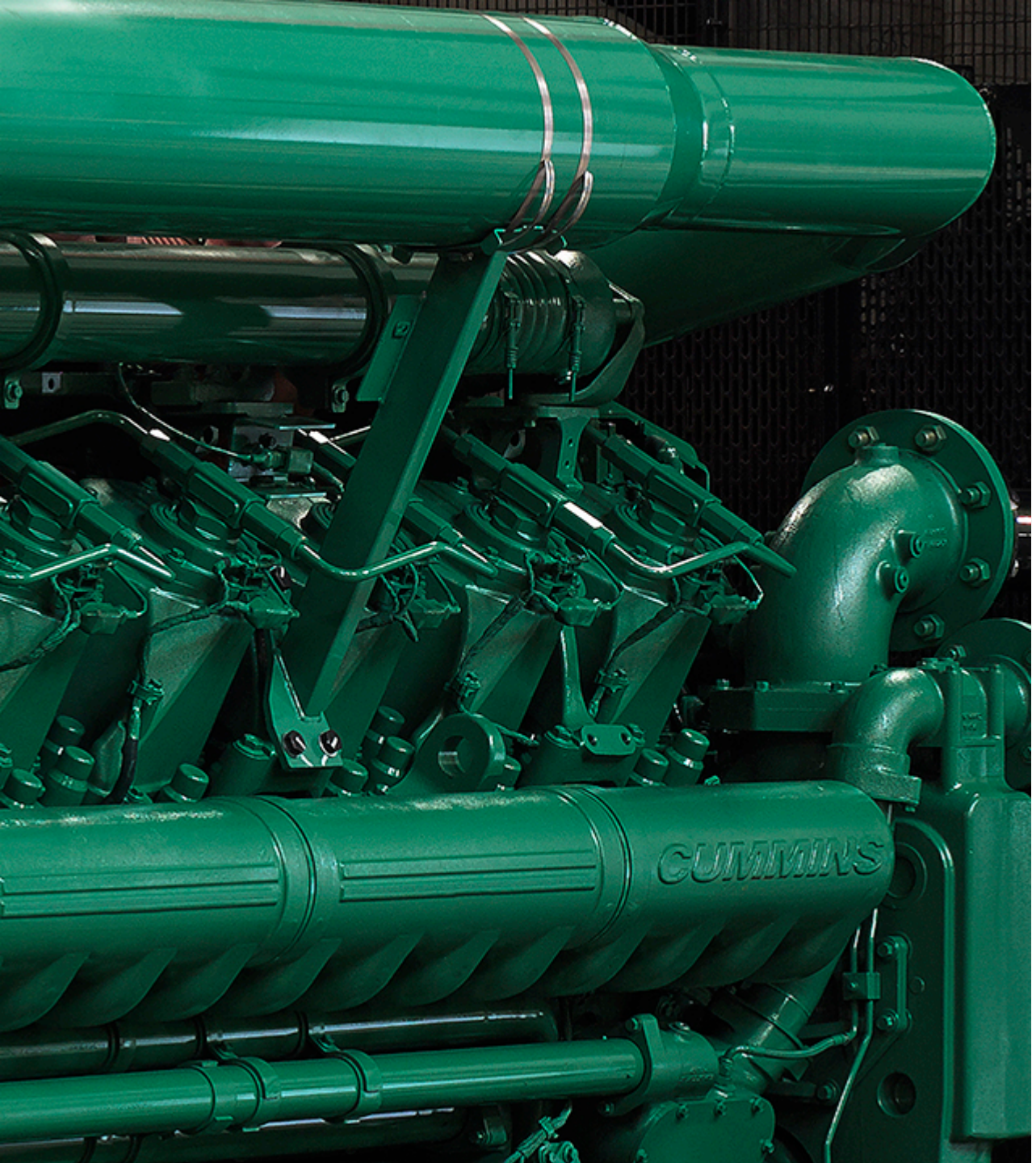


Seymour Engine Plant

Sustainability Journey

Tyler Hudson, Environmental Leader

3/04/2020

Who we are

SEYMOUR

650,000 sq. ft. 51 acres

Power Generation
Locomotive
Mining
Industrial
Marine
Oil and Gas
Military

Seymour Employees

1200

Labor Unions **2**

Office Committee
Diesel Workers

1976

Year facility first opened

Nationalities represented

41

Certified Star Site OSHA Voluntary Protection Program

OHSAS 18001 BUREAU VERITAS Certification

Health & Safety

ISO 9001 BUREAU VERITAS Certification

Quality Management

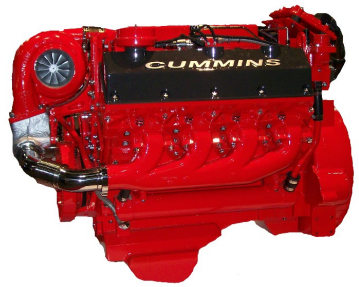
ISO 14001 BUREAU VERITAS Certification

Environmental Management

ISO 50001 BUREAU VERITAS Certification

Energy Management

What we produce and remanufacture



V903

V 8 cylinder

95 Liter

3200-5000 HP

V 16 cylinder

30 Liter

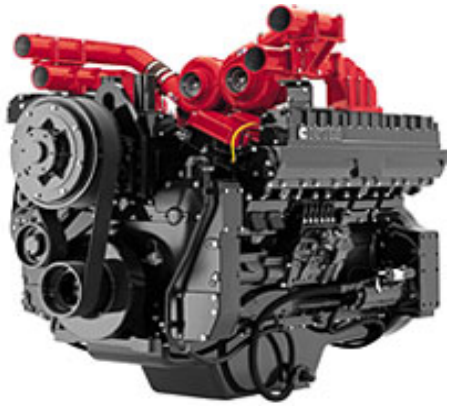
V 12 cylinder

760-1500 HP

19 Liter

Inline 6 cylinder

500-1000 HP



6,000,000 kilowatt-hours

annual electricity production

Cummins Power Systems

Who we serve

Our community

11097 hours

annual employee community service

Day of caring

966 employees
146 projects
6 counties
1 day

122+

Community partners

85%

Employee community participation

Our customers

customers

applications

Military Contractors

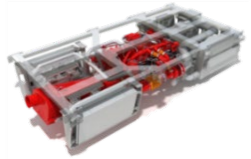
Industrial and Construction Equipment

Computer Data Centers

Commercial Marine

Locomotives

Commuter Rail

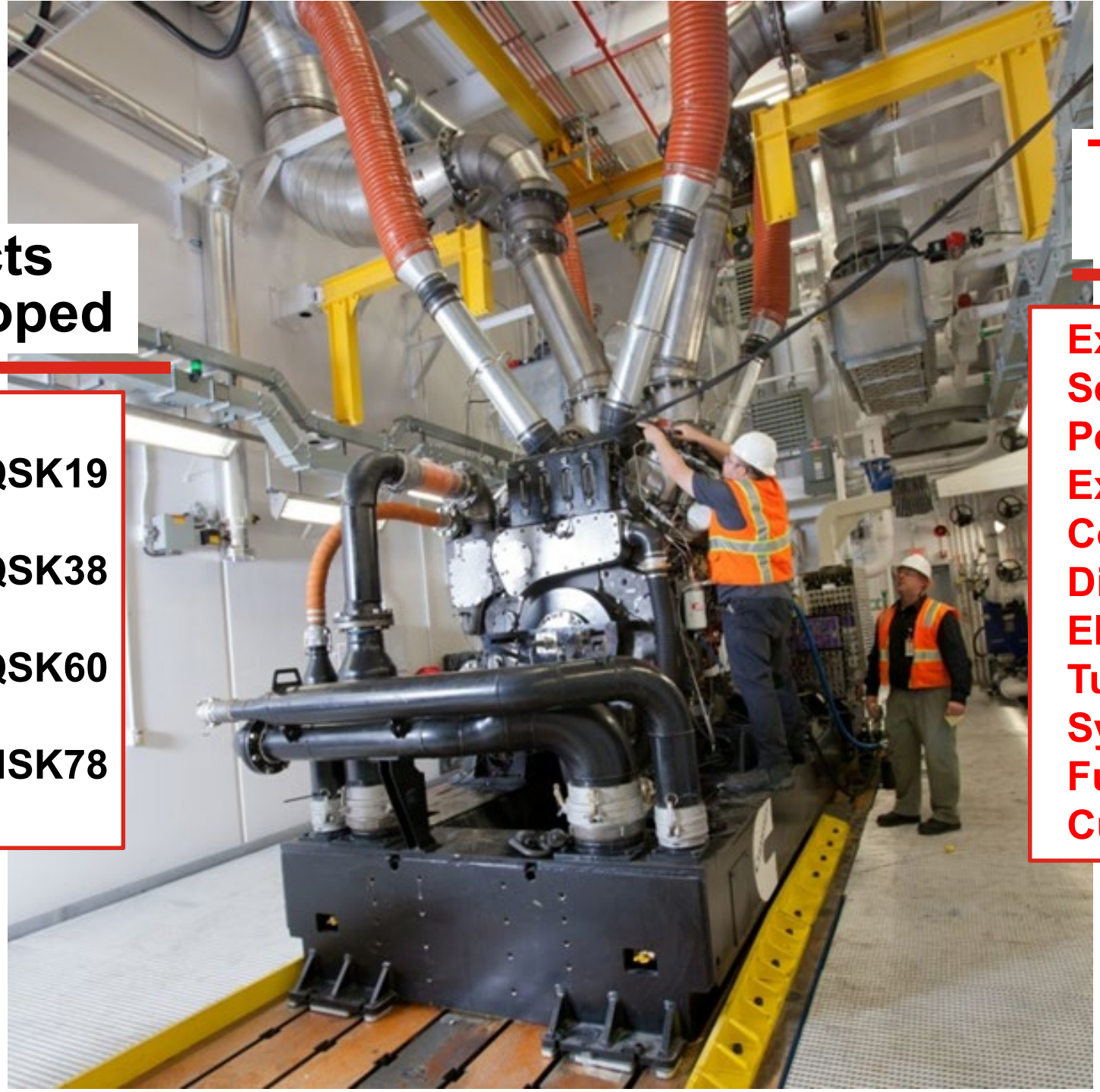


Electric Power Generation

What we develop

Products Developed

V903
QSK19
QST30
QSK38
QSK50
QSK60
QSK78
HSK78
QSK95



Technologies Developed

- Exhaust Aftertreatment
- Service Solutions
- Performance
- Exhaust Emissions
- Combustion
- Diesel and Gaseous Fuels
- Electronic Controls
- Turbochargers
- System Integration
- Fuel Systems
- Customer Application Solutions

Our Story

WHY WE EXIST

OUR MISSION

Making people's lives better by powering a more prosperous world

WHAT WE WANT TO ACCOMPLISH

OUR VISION

Innovating for our customers to power their success

HOW WE WILL DO IT

VALUES

INTEGRITY
Doing what you say you will do and doing what is right

DIVERSITY & INCLUSION
Valuing and including our differences in decision making is our competitive advantage

CARING
Demonstrating awareness and consideration for the wellbeing of others

EXCELLENCE
Always delivering superior results

TEAMWORK
Collaborating across teams, functions, businesses and borders to deliver the best work

LEADERSHIP CULTURE

Inspiring and encouraging all employees to achieve their full potential

BRAND PROMISE

Powering our customers through innovation and dependability

STRATEGY

Delivering value to all stakeholders

Cummins two critical sustainability challenges

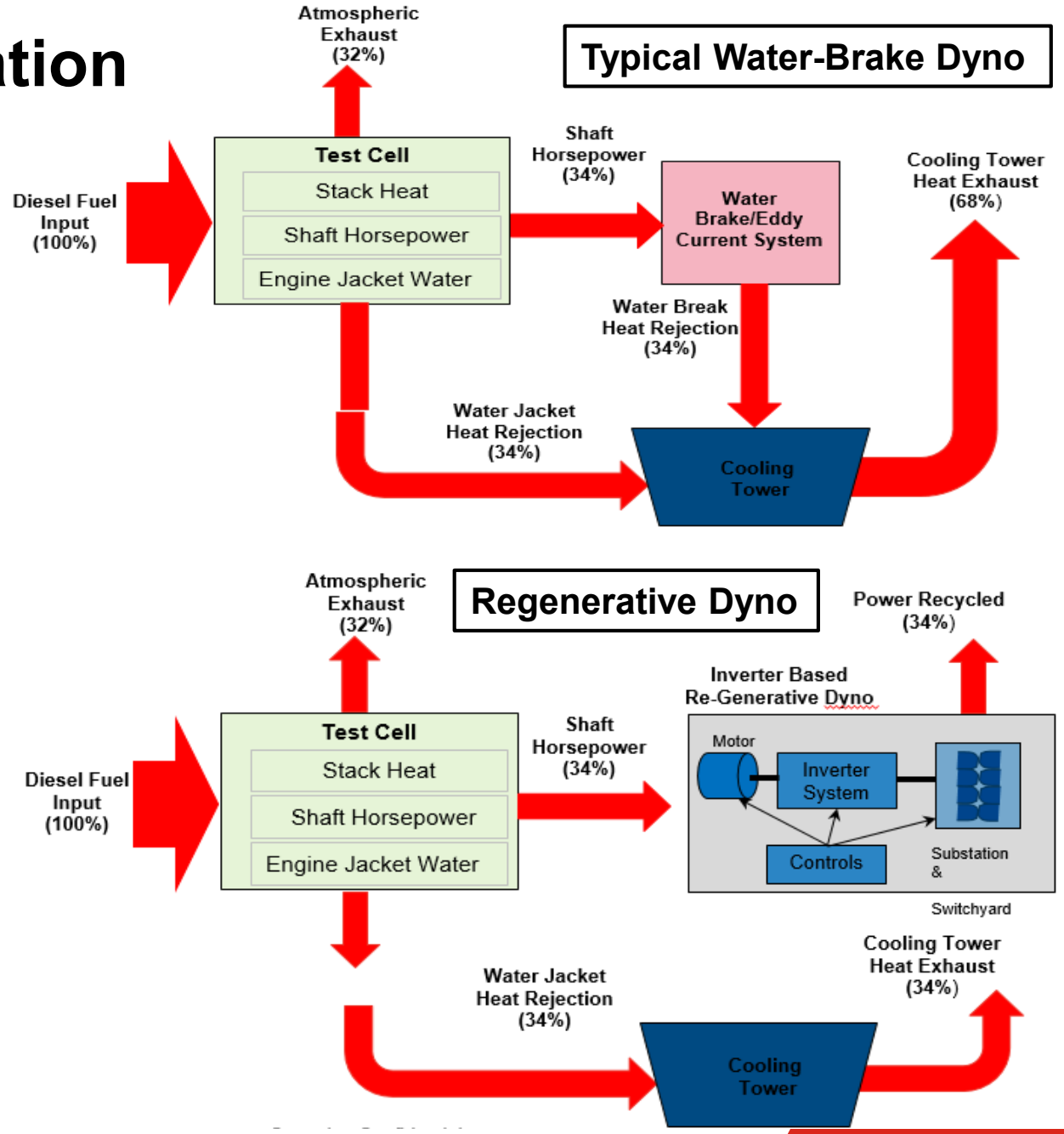
- Achieving our mission of *powering a more prosperous world,* while meeting our obligation to use fewer of its resources.
- Helping customers succeed through innovation and dependability so when they win, we win.

ENVIRONMENTAL SUSTAINABILITY = BUSINESS SUSTAINABILITY

HHP 16 & 17 Regenerative Dynos

Project Background and Innovation

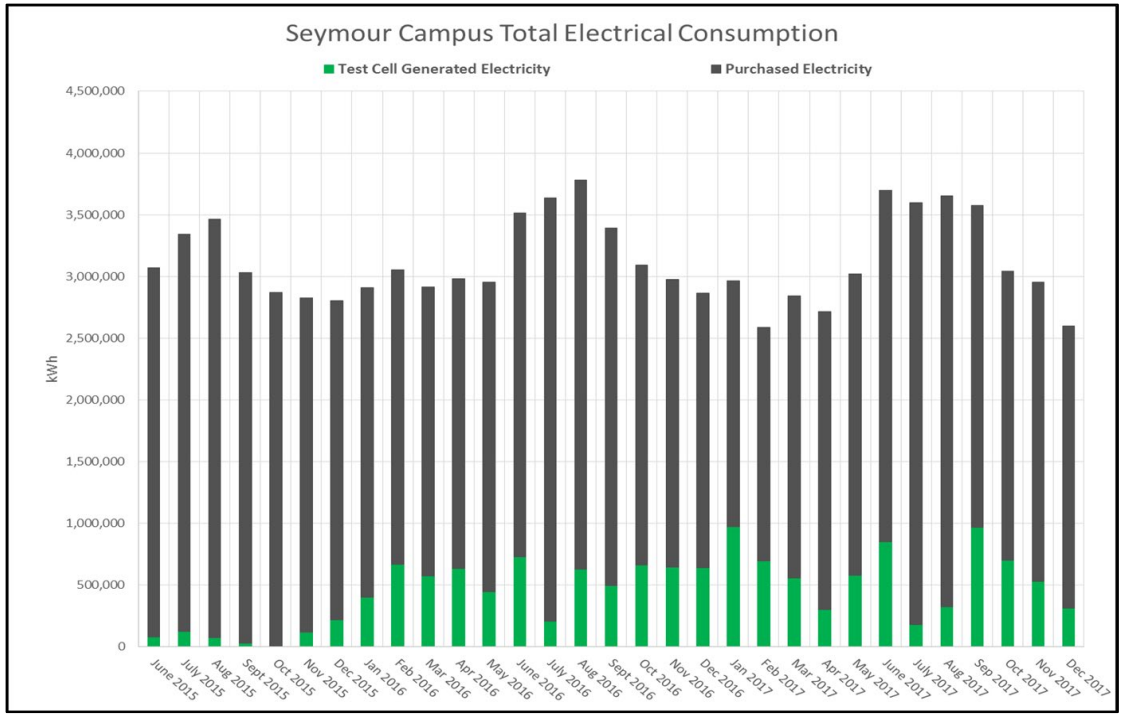
- Regenerative Dynos have been installed at other facilities, but none of this magnitude (voltage and power)
- These are the first Regenerative Dynos for High Horsepower
- Water-brake dynos convert mechanical power produced by the engine into heat which is ultimately dissipated to the atmosphere via engine exhaust and cooling tower.
- Motoring dynos act as a generator by absorbing the mechanical power.
- Through a regenerative drive, power is converted to electricity that is used by the plant or exported to the grid.
- The two – 5 MW dynos installed are capable of generating enough electricity to power the entire SEP/STC site



Environmental Improvements

Energy

- Generate 20% of site electrical consumption that would have otherwise been purchased from the utility
- Annual savings equivalent to the energy use of 516 American homes or 1,031 passenger cars



Air

- Assuming 7,000 MWh generation per year that equates to an annual avoidance of:
  - 17,500 kg PM
  - 84,000 kg SO2
  - 14,000 kg Nox
  - 4,400 metric tons of CO2

Environmental Improvements

Water

- 33% reduction in cooling tower water as compared to a water-brake dyno
- 1,114,667 gal / yr avoided on site
  - Likely would have had to install an additional cooling tower cell at the site if water-brake dynos were installed instead
- 1,850,000 gal / year avoided at the electrical utility

Waste

Indiana is the 3rd largest coal consuming State in the U.S. with 70% of electricity generated from coal

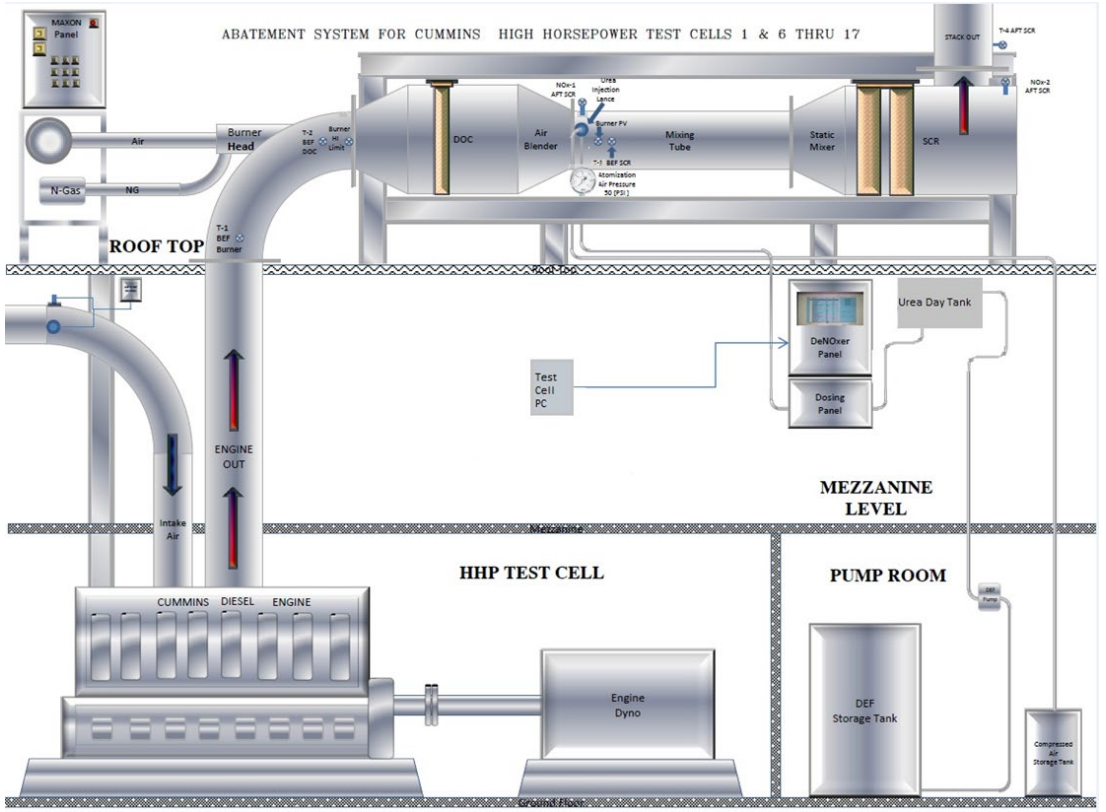
- It takes approximately 123 tons of coal to produce 1000 MWh of electricity*
- 7,000 MWh of avoided electrical consumption is equivalent to 861 tons of coal avoided per year
- Avoidance of additional cooling tower water chemicals

* http://www.kylesconverter.com/energy,-work,-and-heat/tons-of-coal-equivalent-to-megawatt-hours

Facility Emission Abatement

Project Background and Innovation

- SEP needed to implement a system to reduced NOx and CO emissions from the test facility to be able to develop the Hedge Hog engine platforms.
- It was decided that a SCR, DOC, and CEMS would be used to reduce NOx and CO emissions.
- Supplier delivered systems were incapable to perform to our specifications.
- Systems were improved and redesigned (new injection nozzles, mixers, injection locations, measurement locations) by Cummins and now meet our specifications



SCR: *Selective Catalytic Reduction*
DOC: *Diesel Oxidation Catalyst*
CEMS: *Continuous Emission Monitoring System*

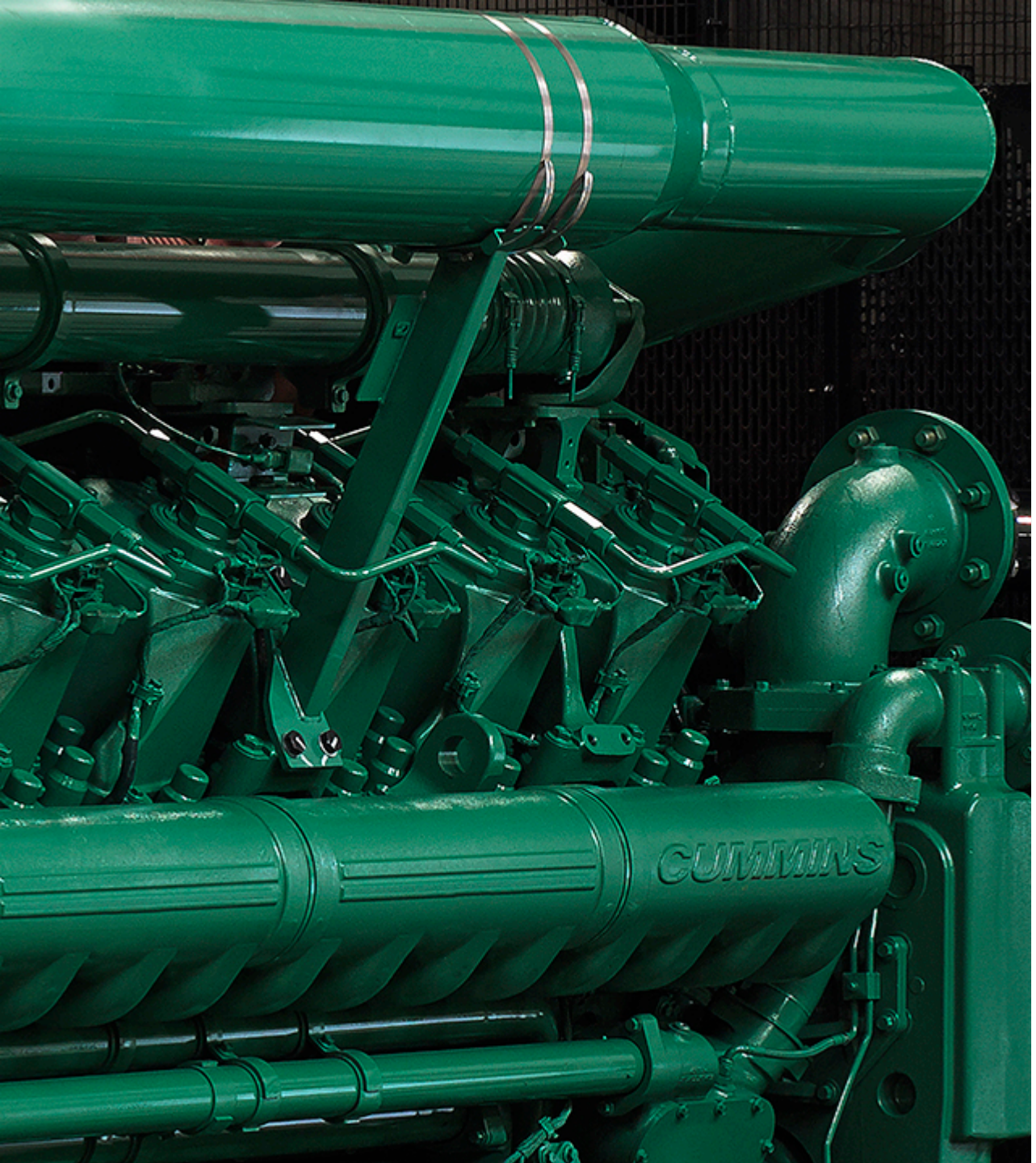
Environmental Improvements

Air

- Systems allowed HH and other platforms to be developed in the newly built test cell addition at SEP.
- Final developed abatement systems showed a reduction of 216.24 tons of NOx in 2017

Business

- Without the abatement systems Cummins would have had to spend $15.5M annually to develop engines outside of Cummins since there are no test cells large enough for the 95L engines in Cummins fleet of test cells
- If the engines had to be outsource for development the environment would have not seen the emission reductions that we created since other facilities do not have these systems (SWRI, England, Etc.). SEP created a net global NOx reduction for developing engines at SEP.



Compressed Air Management

Project Background and Innovation

Project Background

- In 2015, Compressed Air was identified as a “Significant Energy User” through the site’s ISO 50001 System
- The Energy Team began to focus on opportunities to better manage compressed air use at the site
- Primary goal was to reduce electrical consumption required for generation of compressed air

Opportunities / Benefits:

- Reduce air pressure to the minimum required for plant equipment
- “Right Size” air compressor equipment
- Reduce waste through leak identification and repair
- Properly manage end uses of compressed air

Photo 1: Before - 500 hp Centac Air Compressor

Implementation – Pressure Reduction

- The Energy Team first identified that the system pressure was likely higher than what the plant needed.
- The facilities team reduced the pressure off the compressors 1 psi per week until any equipment negatively responded
- Pressure off of the compressors was reduced from 107 psi to 99 psi.
- This resulted in a 3.14% reduction in compressor electrical consumption

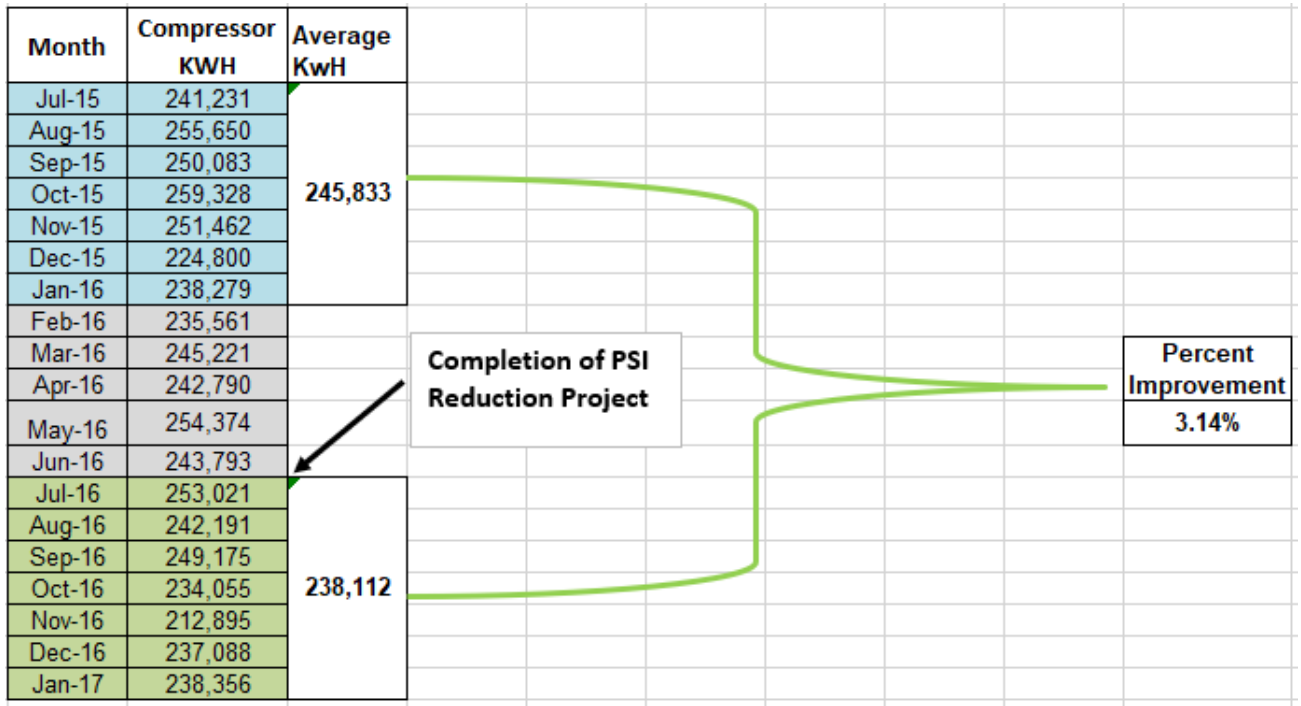
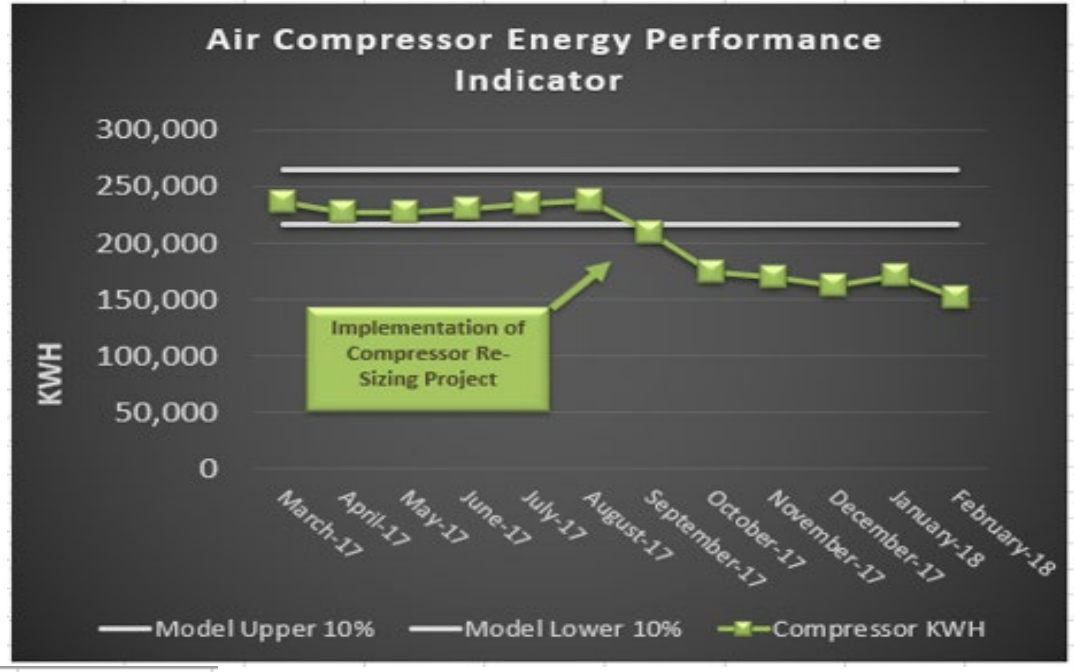


Figure 1: Pressure Reduction Savings

Implementation – “Right Sizing” Compressors

- The team realized the current compressors were oversized for the plant.
- It was decided to replace one of the 500 hp Centacs with a 350 hp Rotary Sierra VFD compressor
- Right Sizing” the compressors resulted in a **28.3%** reduction in compressed air electrical usage!



Month	Compressor KWH
April-17	226,817
May-17	227,484
June-17	230,186
July-17	235,493
August-17	238,100
September-17	209,707
October-17	173,972
November-17	169,543
December-17	162,937
January-18	171,651
February-18	151,934

Monthly Average Before Installation (kWh)
231,616

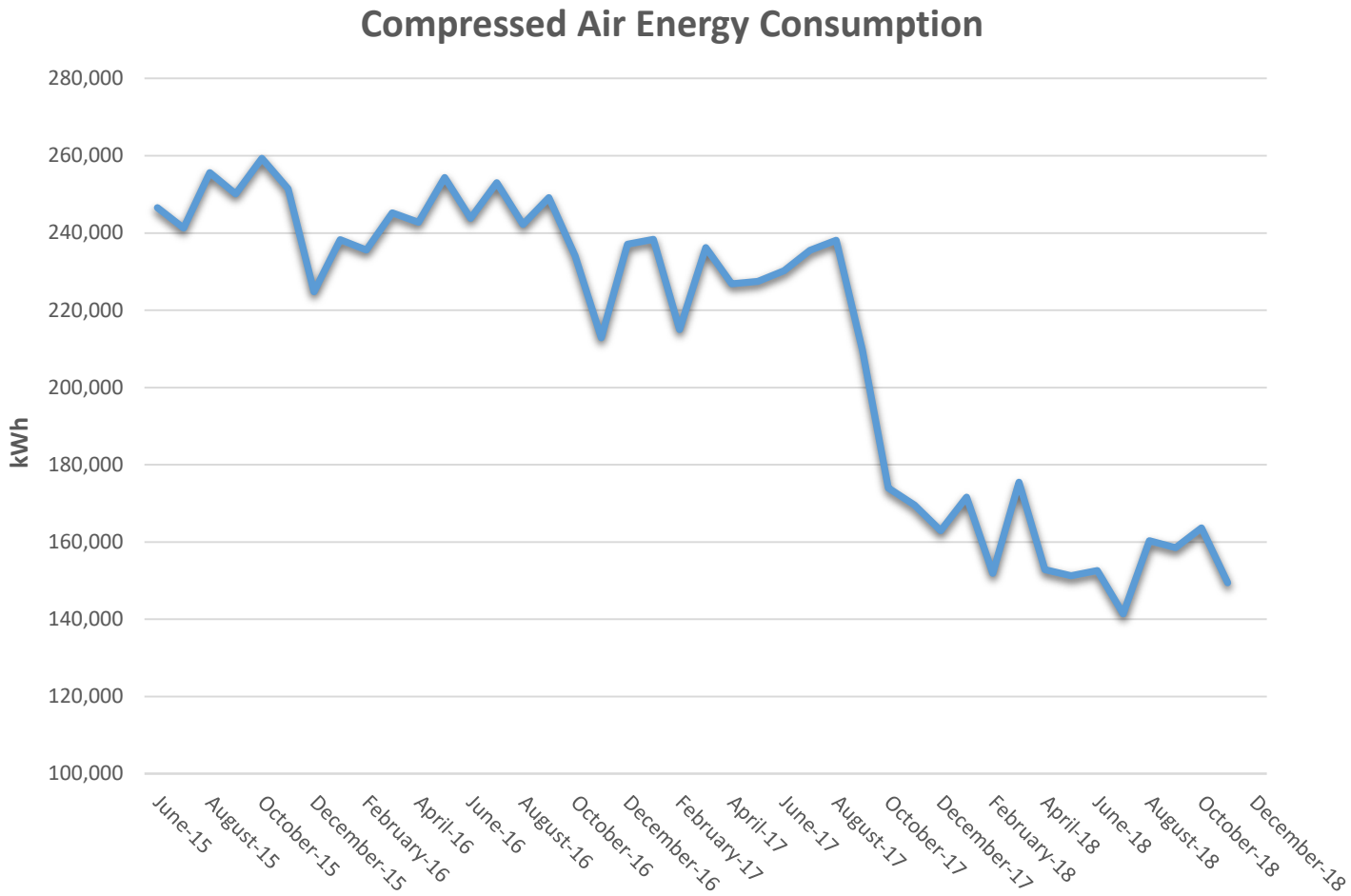
Monthly Average After Installation (kWh)
166,007

Energy Savings:
28.3%

Figure 4: Before and After “Right Sizing” Savings Analysis

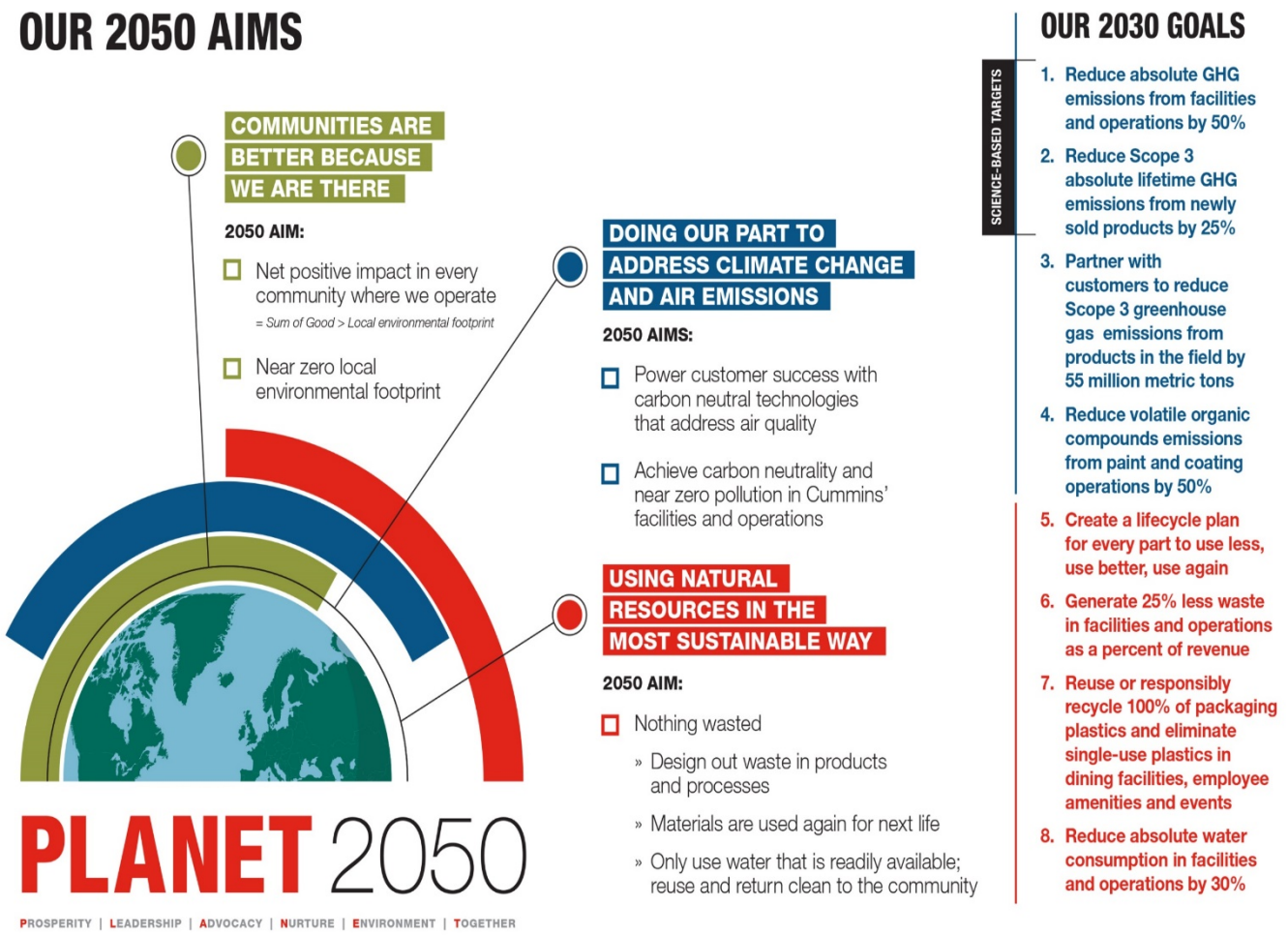
Benefits to the Environment

- Overall **38% reduction** in compressed air energy consumption from 2015 to 2018 (exceeded our goal of a 25% reduction)
- **1,143,000 kWh/yr savings**
- Equivalent to 110 average US households annual consumption
- Removed Compressed Air as a site SEU



Sustainable Future

- Raise environmental awareness throughout facility.
- Continue to collect & analyze data for waste, water, air, and energy
- Partner with cross functional teams to create innovative solutions to improve life cycle foot print of SEP's products.
- Identify opportunities to eliminate waste upstream



Q+A